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- Eight Bit Digital Audio Systems -
- AB-100 AudioBrick -
- AB-Clock Clock and Carillon System -
- DR-50 MiniRepeater -
- AB-50 MiniAudioBrick -
- Eight Bit Sound Compression Software -

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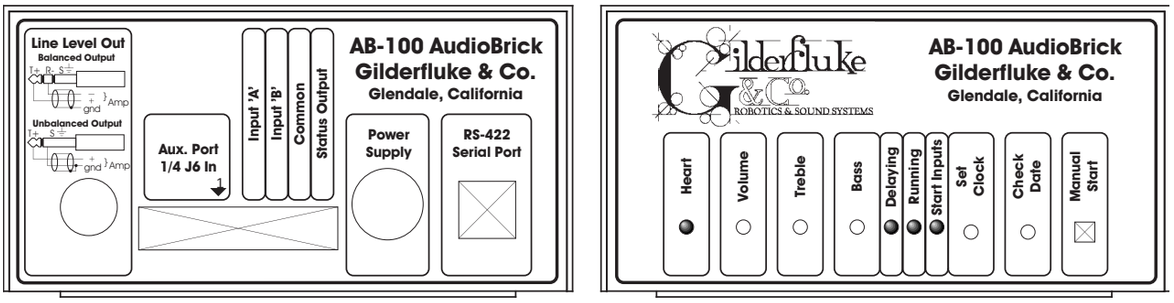
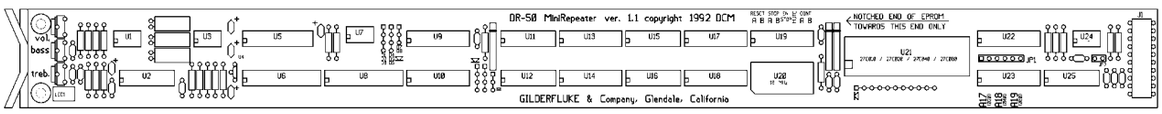
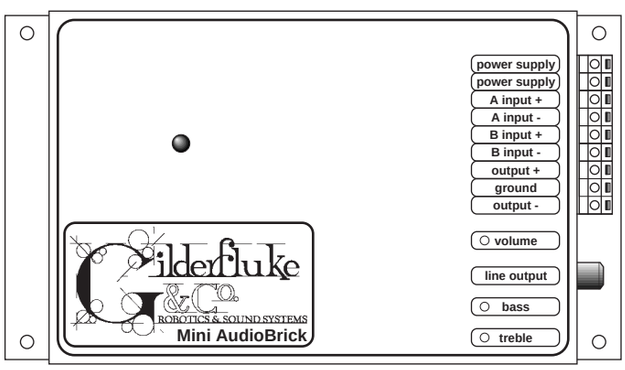


AB-100 or AB-Clock Digital Audio Repeater



DR-50 MiniRepeater



AB-50 MiniAudioBrick

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A System Overview 1
AB-100 Digital AudioBrick 1
AB-Clock 1
DR-50 1
AB-50 1
What is a Digital Audio Repeater? 1
Approximate Play Times 4
Actual Playing Times 5
2 KHz Bandwidth 5
3 KHz Bandwidth 5
4 KHz Bandwidth 6
5 KHz Bandwidth 6
7.5 KHz Bandwidth 7
10 KHz Bandwidth 7
15 KHz Bandwidth 8
Front Panel Adjustments, Inputs & Indicators 10
Adjustments 10
Volume 10
Treble 10
Bass 10
Inputs 10
'Manual Start' Button 10
'Set Clock' Button 10
'Check Date' Button 10
'Default Reload' Button 10
Indicators 11
'Running' LED 11
'Start' LED 11
'Delay' LED 11
LCD Display 11
AB-100 and AB-Clock Connections 12
Line Level Output 12
Aux. Port & 1/4-J6 Input 12
Start Inputs and Status Outputs 13
Power Supply 13
RS-422 Serial Port 13
AB-100 AudioBrick Configuration 15
Enter Track Number 16
Baud Rate 16
Odd Parity Toggle 17
Eprom Type 17
Inputs Debounce 17
DR-400 Mode 17
Select From Aux. 17
Direct Select 17
Mute if Stopped 18
Start Delay 18
Early Starts 19
#1 Priority PA Station 19
#2 Priority PA Station 19
Standard PA Priorities 19
PA Zone Priorities 20
Loop All 20
Group Assignments 20

PA Zone Enables 20
Half-Mute Zone Enables 20
Full-Mute Zone Enables 20
Input Triggering 21
'A' Input Closing Edge 21
'A' Input Opening Edge 21
'B' Input Closing Edge 21
'B' Input Opening Edge 21
'PB' Input Closing Edge 21
'PB' Input Opening Edge 21
'Aux. Port' Input Closing Edge 21
'Aux. Port' Input Opening Edge 21
eXit Setup Mode 21
AB-100 AudioBrick Summary of Setup Commands 23
AB-100 AudioBrick Serial Port Commands 25
All 26
Track Specific 26
Group 26
Cocked 27
AB-100 AudioBrick Serial Commands 28
Enter Setup Echo Mode 28
Exit Setup Echo Mode 28
Enter Global Echo Mode 28
Exit Global Echo Mode 28
Enter Echo All Mode 28
Exit Echo All Mode 29
Enter Echo Mode 29
Exit Echo Mode 29
Track Status Report 29
Special Default Setup 30
LED Port Status 30
Switch Status 30
Enter Configuration Mode 30
Memory Address Status 31
Dipswitch #1 Status 31
Dipswitch #2 Status 31
Aux. Port Status 31
Configuration Dump 31
Load Configuration 32
Start Commands 32
Start Track 32
Start All 32
Start Cocked 32
Start Group 32
Stop Commands 32
Stop Track 32
Stop All 32
Stop Cocked 32
Stop Group 32
Reset Commands 32
Reset Track 32
Reset All 33
Reset Cocked 33
Reset Group 33
Mute Commands 33

Mute Track 33
Mute All 33
Mute Cocked 33
Mute Group 33
Half-Mute Commands 33
Half-Mute Track 33
Half-Mute All 33
Half-Mute Cocked 33
Half-Mute Group 33
Un-Mute Commands 33
Un-Mute Track 33
Un-Mute All 33
Un-Mute Cocked 33
Un-Mute Group 33
Cock Track 33
Un-Cock Track 33
Un-Cock All 33
Loop Commands 34
Loop Track 34
Loop All 34
Loop Cocked 34
Loop Group 34
Stop At End Commands 34
Stop At End Track 34
Stop At End All 34
Stop At End Cocked 34
Stop At End Group 34
Select Spiel Commands 34
Select Spiel Track 35
Select Spiel All 35
Select Spiel Cocked 35
Select Spiel Group 35
Set Delay 35
Set Memory Address 35
Clock Commands 35
Stop Clock 35
Start Clock 35
Mute Masks 36
PA Command 36
Clear PA Request 36
Summary of AB-100 AudioBrick Serial Port Commands 38
AB-Clock Configuration 41
Select and Play a Sound 42
Baud Rate 42
Odd Parity Toggle 42
Eprom Type 42
Input Debounce 42
Pulse Output Once 43
Status Output 43
Input Actions 43
'A' Input Action 43
'B' Input Action 43
'PB' Input Action 43
Sounds for Automatic Tolling 43
Sound On Hour 43

Sound On 1/4 Hour 43
Sound On 1/2 Hour 43
Sound On 3/4 Hour 43
Sound On Chime 1 43
Sound On Chime 2 43
Sound On Tick 44
Sound On Tick 44
Tick/Tock Delay 44
J-6 Direct Select 44
Set Clock 44
Set Tolling Hours 44
Skip Weekends 45
Schedule Displayed 46
Modify Schedule 46
Configuration Download 46
Reload Defaults 47
eXit Setup Mode 47
Summary of AB-Clock Setup Commands 48
AB-Clock Serial Port Command 49
Load Configuration 49
Summary of AB-Clock Command 49
MX-100 / MX-200 51
DR-50 MiniRepeaters 53
AB-50 Mini AudioBricks 53
Actual Playing Times for MiniRepeaters 54
2 KHz Bandwidth 54
3 KHz Bandwidth 54
4 KHz Bandwidth 54
5 KHz Bandwidth 54
7.5 KHz Bandwidth 54
10 KHz Bandwidth 54
15 KHz Bandwidth 54
Configuration Dipswitches 55
Switch #1: Reset from 'A' 55
Switch #2: Reset from 'B' 55
Switch #3: Stop from 'A' 55
Switch #4: Stop from 'B' 55
Switch #5: Enable Stop 55
Switch #6: Mute Enable 55
Switch #7: 'A' Input Continuous 55
Switch #8: 'B' Input Continuous 55
Switch #9: 'A2' Continuous 56
Eprom Installation 57
CC-3250 Connections for DR-50 MiniRepeaters 57
Connecting Directly to a DR-50 57
CC-3251 Connections for DR-50 MiniRepeaters 58
Audio Outputs 58
Trigger Inputs 59
AB-50 Connections 60
Digital Audio Compressor 63
Internal Details 67
Summary of AB-100 and AB-Clock Connections 69

Balanced Audio Output 69
Digital Audio Repeater/Mixer to Adjustment Card 69
RS-485 Serial Data 69
Power Supply 69
Digital Audio Repeater/Mixer to Memory Expansion Card 70
Start Inputs, Status Output, and Audio Output 70
HEXadecimal to Decimal to Percentage 72

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- MACs Eight Bit Digital Audio System -
- A System Overview -

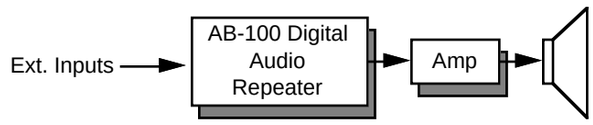
The MACs Eight Bit Digital Audio System has been developed to meet all of your needs for Digital Audio Repeaters. The following repeaters are available:

- **AB-100 Digital AudioBrick:** Complete stand alone Digital Audio Repeater. It comes in a 5" x 12" x 2-1/2" aluminum box which can be mounted wherever you need to put it. Holds up to 255 different sounds and can be expanded almost without limits. The AB-100 can be set to play continuously or only when triggered. It includes a UL listed power supply. A 12 to 24 VDC power supply is available for mobile installations.
- **AB-Clock:** As above, but with real-time clock option installed. Schedules in the AB-Clock can be configured to play different sounds on:
  - Quarter hours
  - Half hours
  - Three-Quarter hours
  - Full hours
  - Tolling of the hours on full hours
  - Any of thirty special times for each of the seven days of the week
  - Any of thirty special times every day of the week (optionally only on weekdays)
  - Tick and Tock sounds which alternate with each other with a one to ninty-nine second delay between each.
- **DR-50:** Card cage mounted MiniRepeater that holds a single Eprom. These are especially well suited in installations where you need many relatively short audio sources. Examples are ride-through attractions, shooting galleries, miniature golf courses, and museum displays. Up to 32 of these cards can be installed in each 1-3/4 inch tall CC-3250 card cage. A DR-50 can be set to play continuously or only when triggered. The DR-50 circuitry is identical to the AB-50.
- **AB-50:** As above, but comes in its own 4" x 5" x 1" aluminum case. The AB-50 can be set to play continuously or only when triggered. These are used where you need just a single short audio source. It runs from the included 12 VAC power supply. The AB-50 circuitry is identical to the DR-50.

Each of these can be used alone or as part of your overall audio system. When used together, all you need to add to make a complete audio system are the power amplifiers and speakers. If higher bandwidth and dynamic audio ranges are needed, you can use our DR-3000 series of sixteen bit Audio Repeaters. These feature CD-Quality sound and more audio processing and control options than our eight bit repeaters.

What is a Digital Audio Repeater?:

A Digital Audio Repeater is a solid state replacement for loop and cartridge tape decks. It meets the demanding requirements for professional voice message, high quality music, and sound effects systems.



Because it is completely solid state, a Digital Audio Repeater never requires any maintenance. A sound which is recorded on a Digital Audio Repeater will sound just as good twenty or thirty years from now.

Each AB-100, AB-Clock, AB-50 or DR-50 is a complete Digital Audio Repeater. Their features include:

- Each card is a single complete audio playback system (except for power amplification and speakers).
- Any sound that can be recorded can be digitized into a Digital Audio Repeater. This includes any type of chimes, bells, voice announcements, music, alarms or sound effects.
- Message length is virtually unlimited on the AB-100 and AB-Clock. Memory expansion cards can be added as needed. AB/DR-50s each hold a single Eprom.
- Bandwidths of up to 15 KHz supported (35.1 KHz sample rate). This is roughly equivalent to a new cassette audio tape. Each card will also reproduce at 10, 7.5, 5, 4, 3, and 2 KHz bandwidths as well.
- Dynamic range of up to 72 dB, again roughly equivalent to a new cassette audio tape.
- Up to 255 different messages can be stored on each repeater. On an AB-100, any of these can instantly be accessed through the RS-485 serial port or switch inputs. This lets you easily build interactive audio systems by just adding the buttons to select different spiels! Up to 99[1] of these can instantly be accessed by the AB-Clock through the switch inputs. Multiple spiels can be accessed sequentially in the AB/DR-50s.
- An AB-100 or AB-Clock can actually stop using any memory at all if an instant of silence occurs.
- Two opto-isolated switch inputs, as well as a parallel auxiliary port and RS-485 serial port on each card (AB-100 & AB-Clock only).
- OP-100 optoisolator available for auxiliary port. 1/4 J6 input is compatible with all our animation systems (AB-100 & AB-Clock only).
- Operating hours for the AB-Clock can be set for 24 hours a day or specific times for each day of the week.
- The AB-Clock is factory laser trimmed to within +/- 10 PPM. A lithium battery provides protection against power failures.
- Clock can be programmed for daily, weekly, monthly or annual adjustments to correct for slow or fast timekeeping.
- All AB-100 & AB-Clock configuration is done through the serial port with easy to use menus. Configuration is stored in nonvolatile EEprom memory. AB/DR-50s are configured using dipswitches.
- One optically isolated status output for remote 'running' indicators (AB-100 & AB-Clock only).

1 Although the AB-Clock can hold up to 255 different spiels, the software in the AB-Clock limits your access to the first 97 messages from the two start inputs, push button on the front, or keyboard. The real time clock can trigger any of the first 98 spiels for the chimes and tolling of the hours. It can select and play any of the first 31 spiels from the special show tables. Only the optional 1/4 J-6 input can access all 255 messages.

- Volume, Bass and Treble controls on every card.
- You can use any number of cards in a system to provide any number of simultaneous audio tracks.

To record a sound into a Digital Audio Repeater, a master (tape, CD, DAT, video tape) of the sound is played into a Macintosh or IBM compatible computer which has some sort of sixteen bit sound card installed. This takes the original audio and turns it into digital computer data. This data is then run through the SNDCMP8 utility program we provide and 'burned' into computer memory chips called Eproms. These are plugged into the Digital Audio Repeaters. From this point on, the repeaters can play back this sound whenever they are told to. Since the sound is stored on the repeater in computer memory chips, it will never change or require any service of any kind. Any tape deck would require regular cleaning and lubrication of the tape heads and moving parts, as well as their regular replacement.

The SNDCMP8 software for digitizing the audio into the AB-Clock is available from Gilderfluke & Company. If you would prefer to have us digitize your sounds then simply send your master audio recording to us. When sending audio masters to us to digitize, DAT or CD recordings are preferred. 1/4" quarter track at 15 IPS reel to reel or a cassette with Dolby B/C encoding can also be used, but be aware that any tape hiss from these original masters will be permanently recorded into the AB-Clock.

Gilderfluke also has libraries of prerecorded sounds and sound effects which we can record into the AB-Clock for you if you would like.

Each AB-100 or AB-Clock can store up to 255 separate messages in its memory. Each of these can be any length from 1/35th of a second on up. Each of these individual messages is known as a 'spiel'. To access these individual spiels on a card, you can use the serial port interface to the audio system or the AUX PORT available on each card. Any spiel on any card can be played through or looped at any time.

When using the AB-Clock to select and play spiels, the order of priorities is as follows. If it finds any sound it should play it will skip the remainder of the checks until the next time through. This means that if a special show is scheduled for today, it will take precedence over any weekly shows or the tolling of the hours. Everything has priority over the tick and tock sounds:

1) Once each minute checks for any special shows to play for today.
2) Once each minute checks weekly schedule for any special shows to play.
3) Once each minute checks to see if it it time to toll the quarter, half, three-quarter or full hour.
4) Once each second checks to see if it is time to make a tick or tock sound, but only if it is not already making any other sound.

Our Digital Audio Repeaters are intelligent. They know how to 'downshift' their bandwidths to whatever bandwidth the audio was recorded at. If there is a moment of silence in your recording, An AB-100 or AB-Clock will actually stop using any memory at all until the sound starts up again. Because of this, our systems are able use far less memory for an equivalent bandwidth. They are also able to play back both low and high bandwidth sounds from the same Repeater card. The Digital Audio Repeaters each check on how much memory they need to use and adjust their speeds as often as thirty-five times each second.

Although this 'downshifting' saves the amount of memory you need to use, it can make it darned difficult to estimate the number of Eproms your recording will need until it has actually been digitized. The following charts

show the capacities with a variety of sounds using different sized Eproms:

Approximate Play Times:

Estimated Playing Times For Various Types Of Sounds

Number Of 27C512 Memory Chips	Low Rumbles ← Voices → High Voices →			← Music →		High Music → Sharp Sound Effects	
	2 Khz	3 Khz	4 Khz	5 Khz	7.5 Khz	10 Khz	15 Khz
Each Chip (1 chip)	14 Sec.	9.3 Sec.	7.5 Sec.	5.6 Sec.	3.7 Sec.	2.8 Sec.	1.7 Sec.
each Repeater (16 chips)	3.7 Min.	2.5 Min.	2 Min.	89.5 Sec.	1 Min.	44.6 Sec	30 Sec.
each Expansion (32 chips)	7.5 Min.	5 Min.	4 Min.	3 Min.	2 Min.	89.5 Sec.	1 Min.

Number Of 27C010 Memory Chips	Low Rumbles ← Voices → High Voices →			← Music →		High Music → Sharp Sound Effects	
	2 Khz	3 Khz	4 Khz	5 Khz	7.5 Khz	10 Khz	15 Khz
Each Chip (1 chip)	28 Sec.	18.6 Sec.	14.9 Sec.	11.2 Sec.	7.5 Sec.	5.6 Sec.	3.7 Sec.
each Repeater (16 chips)	7.4 Min.	4.9 Min.	4 Min.	2.75 Min.	2 Min.	1.5 Min.	1 Min.
each Expansion (32 chips)	14.9 Min.	9.9 Min.	8 Min.	5.5 Min.	4 Min.	3 Min.	2 Min.

Number Of 27C020 Memory Chips	Low Rumbles ← Voices → High Voices →			← Music →		High Music → Sharp Sound Effects	
	2 Khz	3 Khz	4 Khz	5 Khz	7.5 Khz	10 Khz	15 Khz
Each Chip (1 chip)	55.9 Sec.	37.3 Sec.	30 Sec.	22.4 Sec.	14.9 Sec.	11.1 Sec.	7.5 Sec.
each Repeater (16 chips)	14.9 Min.	9.9 Min.	8 Min.	6 Min.	4 Min.	3 Min.	2 Min.
each Expansion (32 chips)	29.8 Min.	19.9 Min.	16 Min.	12 Min.	8 Min.	6 Min.	4 Min.

Number Of 27C040 Memory Chips	Low Rumbles ← Voices → High Voices →			← Music →		High Music → Sharp Sound Effects	
	2 Khz	3 Khz	4 Khz	5 Khz	7.5 Khz	10 Khz	15 Khz
Each Chip (1 chip)	111.8 Sec.	74.6 Sec.	59.7 Sec.	44.7 Sec.	29.8 Sec.	22.3 Sec.	14.9 Sec.
each Repeater (16 chips)	29.8 Min.	19.9 Min.	15.9 Min.	11.9 Min.	8 Min.	6 Min.	4 Min.
each Expansion (32 chips)	59.6 Min.	39.8 Min.	31 Min.	23 Min.	16 Min.	12 Min.	8 Min.

Number Of 27C080 Memory Chips	Low Rumbles ← Voices → High Voices →			← Music →		High Music → Sharp Sound Effects	
	2 Khz	3 Khz	4 Khz	5 Khz	7.5 Khz	10 Khz	15 Khz
Each Chip (1 chip)	223.7 Sec.	149.1 Sec.	119.3 Sec.	89.5 Sec.	59.7 Min.	44.7 Sec.	29.8 Sec.
each Repeater (16 chips)	59.6 Min.	39.8 Min.	32 Min.	24 Min.	16 Min.	12 Min.	8 Min.
each Expansion (32 chips)	119.3 Min.	79.5 Min.	64 Min.	48 Min.	32 Min.	24 Min.	16 Min.

Each AB-100 or AB-Clock holds sixteen Eproms. If your recording needs more space than this, you can add memory expansion cards to the Repeater cards. Each expansion card holds another thirty-two Eproms. Each AB-100 or AB-Clock can support unlimited amount of data storage. The only limitation is the physical mounting of the memory expansion cards. In the AB-100 or AB-Clock there is room for up to three memory expansion cards if you plan to leave the lid on. With the lid off, the sky is the limit.

Each DR-50 or AB-50 MiniRepeater holds one Eprom. There is no expansion available on these repeaters.

The AB-100 or AB-Clock can support any type of Eprom memory chips from 27C512 up to 27C080. Each AB-100 or AB-Clock must be told what type of memory chips are being used. This is done in the configuration mode. The AB/DR-50s support memory chips from 27C010 through 27C080.

Actual Playing Times:

The following tables show in seconds the capacities of several different types of Eproms at several different fixed bandwidths. All values shown are in seconds.

- 2 KHz Bandwidth (4,687 Hz UPDATE RATE) -

Eprom type:			27C512	27C010	27C020	27C040	27C080
Size:			64K x 8	128K x 8	256K x 8	512K x 8	1 M x 8
Number of bytes per Eprom:			65,536	131,072	262,144	524,288	1,048,576
1 Eprom (1 DR-50 MiniRepeater)			13.98	27.96	55.92	111.85	223.70
2 Eproms			27.96	55.92	111.85	223.70	447.39
3 Eproms			41.94	83.89	167.77	335.54	671.09
4 Eproms			55.92	111.85	223.70	447.39	894.78
5 Eproms			69.91	139.81	279.62	559.24	1,118.48
6 Eproms			83.89	167.77	335.54	671.09	1,342.18
7 Eproms			97.87	195.73	391.47	782.94	1,565.87
8 Eproms			111.85	223.70	447.39	894.78	1,789.57
9 Eproms			125.83	251.66	503.32	1,006.63	2,013.27
10 Eproms			139.81	279.62	559.24	1,118.48	2,236.96
11 Eproms			153.79	307.58	615.16	1,230.33	2,460.66
12 Eproms			167.77	335.54	671.09	1,342.18	2,684.35
13 Eproms			181.75	363.51	727.01	1,454.03	2,908.05
14 Eproms			195.73	391.47	782.94	1,565.87	3,131.75
15 Eproms			209.72	419.43	838.86	1,677.72	3,355.44
16 Eproms			223.70	447.39	894.78	1,789.57	3,579.14
Each Expansion:	32	Eproms	447.39	894.78	1,789.57	3,579.14	7,158.28
Repeater + 1 Expansion:	48	Eproms	671.09	1,342.18	2,684.35	5,368.71	10,737.42
Repeater + 2 Expansions:	80	Eproms	1,118.48	2,236.96	4,473.92	8,947.85	17,895.70
Repeater + 3 Expansions:	112	Eproms	1,565.87	3,131.75	6,263.49	12,526.99	25,053.98
Repeater + 4 Expansions:	144	Eproms	2,013.27	4,026.53	8,053.06	16,106.13	32,212.25
Repeater + 5 Expansions:	176	Eproms	2,460.66	4,921.32	9,842.63	19,685.27	39,370.53
Repeater + 6 Expansions:	208	Eproms	2,908.05	5,816.10	11,632.20	23,264.41	46,528.81
Repeater + 7 Expansions:	240	Eproms	3,355.44	6,710.89	13,421.77	26,843.55	53,687.09

- 3 KHz Bandwidth (7,031 Hz UPDATE RATE) -

Eprom type:			27C512	27C010	27C020	27C040	27C080
Size:			64K x 8	128K x 8	256K x 8	512K x 8	1 M x 8
Number of bytes per Eprom:			65,536	131,072	262,144	524,288	1,048,576
1 Eprom (1 DR-50 MiniRepeater)			9.32	18.64	37.28	74.57	149.13
2 Eproms			18.64	37.28	74.57	149.13	298.26
3 Eproms			27.96	55.92	111.85	223.70	447.39
4 Eproms			37.28	74.57	149.13	298.26	596.52
5 Eproms			46.60	93.21	186.41	372.83	745.65
6 Eproms			55.92	111.85	223.70	447.39	894.78
7 Eproms			65.24	130.49	260.98	521.96	1,043.92
8 Eproms			74.57	149.13	298.26	596.52	1,193.05
9 Eproms			83.89	167.77	335.54	671.09	1,342.18
10 Eproms			93.21	186.41	372.83	745.65	1,491.31
11 Eproms			102.53	205.05	410.11	820.22	1,640.44
12 Eproms			111.85	223.70	447.39	894.78	1,789.57
13 Eproms			121.17	242.34	484.68	969.35	1,938.70
14 Eproms			130.49	260.98	521.96	1,043.92	2,087.83
15 Eproms			139.81	279.62	559.24	1,118.48	2,236.96
16 Eproms			149.13	298.26	596.52	1,193.05	2,386.09
Each Expansion:	32	Eproms	298.26	596.52	1,193.05	2,386.09	4,772.1
Repeater + 1 Expansion:	48	Eproms	447.39	894.78	1,789.57	3,579.14	7,158.28
Repeater + 2 Expansions:	80	Eproms	745.65	1,491.31	2,982.62	5,965.23	11,930.46
Repeater + 3 Expansions:	112	Eproms	1,043.92	2,087.83	4,175.66	8,351.33	16,702.65
Repeater + 4 Expansions:	144	Eproms	1,342.18	2,684.35	5,368.71	10,737.42	21,474.84
Repeater + 5 Expansions:	176	Eproms	1,640.44	3,280.88	6,561.76	13,123.51	26,247.02
Repeater + 6 Expansions:	208	Eproms	1,938.70	3,877.40	7,754.80	15,509.60	31,019.21
Repeater + 7 Expansions:	240	Eproms	2,236.96	4,473.92	8,947.85	17,895.70	35,791.39

- 4 KHz Bandwidth (8,789 Hz UPDATE RATE) -

Eprom type:			**27C512**	**27C010**	**27C020**	**27C040**	**27C080**
Size:			**64K x 8**	**128K x 8**	**256K x 8**	**512K x 8**	**1 M x 8**
Number of bytes per Eprom:			**65,536**	**131,072**	**262,144**	**524,288**	**1,048,576**
1	Eprom (1 DR-50 MiniRepeater)		7.46	14.91	29.83	59.65	119.30
2	Eproms		14.91	29.83	59.65	119.30	238.61
3	Eproms		22.37	44.74	89.48	178.96	357.91
4	Eproms		29.83	59.65	119.30	238.61	477.22
5	Eproms		37.28	74.57	149.13	298.26	596.52
6	Eproms		44.74	89.48	178.96	357.91	715.83
7	Eproms		52.20	104.39	208.78	417.57	835.13
8	Eproms		59.65	119.30	238.61	477.22	954.44
9	Eproms		67.11	134.22	268.44	536.87	1,073.74
10	Eproms		74.57	149.13	298.26	596.52	1,193.05
11	Eproms		82.02	164.04	328.09	656.18	1,312.35
12	Eproms		89.48	178.96	357.91	715.83	1,431.66
13	Eproms		96.94	193.87	387.74	775.48	1,550.96
14	Eproms		104.39	208.78	417.57	835.13	1,670.27
15	Eproms		111.85	223.70	447.39	894.78	1,789.57
16	Eproms		119.30	238.61	477.22	954.44	1,908.87
Each Expansion:	32	Eproms	238.61	477.22	954.44	1,908.87	3,817.75
Repeater + 1 Expansion:	48	Eproms	357.91	715.83	1,431.66	2,863.31	5,726.62
Repeater + 2 Expansions:	80	Eproms	596.52	1,193.05	2,386.09	4,772.19	9,544.37
Repeater + 3 Expansions:	112	Eproms	835.13	1,670.27	3,340.53	6,681.06	13,362.12
Repeater + 4 Expansions:	144	Eproms	1,073.74	2,147.48	4,294.97	8,589.93	17,179.87
Repeater + 5 Expansions:	176	Eproms	1,312.35	2,624.70	5,249.40	10,498.81	20,997.62
Repeater + 6 Expansions:	208	Eproms	1,550.96	3,101.92	6,203.84	12,407.68	24,815.37
Repeater + 7 Expansions:	240	Eproms	1,789.57	3,579.14	7,158.28	14,316.56	28,633.12

- 5 KHz Bandwidth (11,718 Hz UPDATE RATE) -

Eprom type:			**27C512**	**27C010**	**27C020**	**27C040**	**27C080**
Size:			**64K x 8**	**128K x 8**	**256K x 8**	**512K x 8**	**1 M x 8**
Number of bytes per Eprom:			**65,536**	**131,072**	**262,144**	**524,28**	**1,048,576**
1	Eprom (1 DR-50 MiniRepeater)		5.59	11.18	22.37	44.74	89.48
2	Eproms		11.18	22.37	44.74	89.48	178.96
3	Eproms		16.78	33.55	67.11	134.22	268.44
4	Eproms		22.37	44.74	89.48	178.96	357.91
5	Eproms		27.96	55.92	111.85	223.70	447.39
6	Eproms		33.55	67.11	134.22	268.44	536.87
7	Eproms		39.15	78.29	156.59	313.17	626.35
8	Eproms		44.74	89.48	178.96	357.91	715.83
9	Eproms		50.33	100.66	201.33	402.65	805.31
10	Eproms		55.92	111.85	223.70	447.39	894.78
11	Eproms		61.52	123.03	246.07	492.13	984.26
12	Eproms		67.11	134.22	268.44	536.87	1,073.74
13	Eproms		72.70	145.40	290.81	581.61	1,163.22
14	Eproms		78.29	156.59	313.17	626.35	1,252.70
15	Eproms		83.89	167.77	335.54	671.09	1,342.18
16	Eproms		89.48	178.96	357.91	715.83	1,431.66
Each Expansion:	32	Eproms	178.96	357.91	715.83	1,431.66	2,863.31
Repeater + 1 Expansion:	48	Eproms	268.44	536.87	1,073.74	2,147.48	4,294.97
Repeater + 2 Expansions:	80	Eproms	447.39	894.78	1,789.57	3,579.14	7,158.28
Repeater + 3 Expansions:	112	Eproms	626.35	1,252.70	2,505.40	5,010.80	10,021.59
Repeater + 4 Expansions:	144	Eproms	805.31	1,610.61	3,221.23	6,442.45	12,884.90
Repeater + 5 Expansions:	176	Eproms	984.26	1,968.53	3,937.05	7,874.11	15,748.21
Repeater + 6 Expansions:	208	Eproms	1,163.22	2,326.44	4,652.88	9,305.76	18,611.52
Repeater + 7 Expansions:	240	Eproms	1,342.18	2,684.35	5,368.71	10,737.42	21,474.84

- 7.5 KHz Bandwidth (17,578 Hz UPDATE RATE) -

Eprom type:			**27C512**	**27C010**	**27C020**	**27C040**	**27C080**
Size:			**64K x 8**	**128K x 8**	**256K x 8**	**512K x 8**	**1 M x 8**
Number of bytes per Eprom:			**65,536**	**131,072**	**262,144**	**524,288**	**1,048,576**
1	Eprom (1 DR-50 MiniRepeater)		3.73	7.46	14.91	29.83	59.65
2	Eproms		7.46	14.91	29.83	59.65	119.30
3	Eproms		11.18	22.37	44.74	89.48	178.96
4	Eproms		14.91	29.83	59.65	119.30	238.61
5	Eproms		18.64	37.28	74.57	149.13	298.26
6	Eproms		22.37	44.74	89.48	178.96	357.91
7	Eproms		26.10	52.20	104.39	208.78	417.57
8	Eproms		29.83	59.65	119.30	238.61	477.22
9	Eproms		33.55	67.11	134.22	268.44	536.87
10	Eproms		37.28	74.57	149.13	298.26	596.52
11	Eproms		41.01	82.02	164.04	328.09	656.18
12	Eproms		44.74	89.48	178.96	357.91	715.83
13	Eproms		48.47	96.94	193.87	387.74	775.48
14	Eproms		52.20	104.39	208.78	417.57	835.13
15	Eproms		55.92	111.85	223.70	447.39	894.78
16	Eproms		59.65	119.30	238.61	477.22	954.44
Each Expansion:	32	Eproms	119.30	238.61	477.22	954.44	1,908.87
Repeater + 1 Expansion:	48	Eproms	178.96	357.91	715.83	1,431.66	2,863.31
Repeater + 2 Expansions:	80	Eproms	298.26	596.52	1,193.05	2,386.09	4,772.19
Repeater + 3 Expansions:	112	Eproms	417.57	835.13	1,670.27	3,340.53	6,681.06
Repeater + 4 Expansions:	144	Eproms	536.87	1,073.74	2,147.48	4,294.97	8,589.93
Repeater + 5 Expansions:	176	Eproms	656.18	1,312.35	2,624.70	5,249.40	10,498.81
Repeater + 6 Expansions:	208	Eproms	775.48	1,550.96	3,101.92	6,203.84	12,407.68
Repeater + 7 Expansions:	240	Eproms	894.78	1,789.57	3,579.14	7,158.28	14,316.56

- 10 KHz Bandwidth (23,437 Hz UPDATE RATE) -

Eprom type:			**27C512**	**27C010**	**27C020**	**27C040**	**27C080**
Size:			**64K x 8**	**128K x 8**	**256K x 8**	**512K x 8**	**1 M x 8**
Number of bytes per Eprom:			**65,536**	**131,072**	**262,144**	**524,288**	**1,048,576**
1	Eprom (1 DR-50 MiniRepeater)		2.80	5.59	11.18	22.37	44.74
2	Eproms		5.59	11.18	22.37	44.74	89.48
3	Eproms		8.39	16.78	33.55	67.11	134.22
4	Eproms		11.18	22.37	44.74	89.48	178.96
5	Eproms		13.98	27.96	55.92	111.85	223.70
6	Eproms		16.78	33.55	67.11	134.22	268.44
7	Eproms		19.57	39.15	78.29	156.59	313.17
8	Eproms		22.37	44.74	89.48	178.96	357.91
9	Eproms		25.17	50.33	100.66	201.33	402.65
10	Eproms		27.96	55.92	111.85	223.70	447.39
11	Eproms		30.76	61.52	123.03	246.07	492.13
12	Eproms		33.55	67.11	134.22	268.44	536.87
13	Eproms		36.35	72.70	145.40	290.81	581.61
14	Eproms		39.15	78.29	156.59	313.17	626.35
15	Eproms		41.94	83.89	167.77	335.54	671.09
16	Eproms		44.74	89.48	178.96	357.91	715.83
Each Expansion:	32	Eproms	89.48	178.96	357.91	715.83	1,431.66
Repeater + 1 Expansion:	48	Eproms	134.22	268.44	536.87	1,073.74	2,147.48
Repeater + 2 Expansions:	80	Eproms	223.70	447.39	894.78	1,789.57	3,579.14
Repeater + 3 Expansions:	112	Eproms	313.17	626.35	1,252.70	2,505.40	5,010.80
Repeater + 4 Expansions:	144	Eproms	402.65	805.31	1,610.61	3,221.23	6,442.45
Repeater + 5 Expansions:	176	Eproms	492.13	984.26	1,968.53	3,937.05	7,874.11
Repeater + 6 Expansions:	208	Eproms	581.61	1,163.22	2,326.44	4,652.88	9,305.76
Repeater + 7 Expansions:	240	Eproms	671.09	1,342.18	2,684.35	5,368.71	10,737.42

- 15 KHz Bandwidth (35,156 Hz UPDATE RATE) -

Eprom type:	27C512	27C010	27C020	27C040	27C080
Size:	64K x 8	128K x 8	256K x 8	512K x 8	1 M x 8
Number of bytes per Eprom:	65,536	131,072	262,144	524,288	1,048,576
1 Eprom (1 DR-50 MiniRepeater)	1.86	3.73	7.46	14.91	29.83
2 Eproms	3.73	7.46	14.91	29.83	59.65
3 Eproms	5.59	11.18	22.37	44.74	89.48
4 Eproms	7.46	14.91	29.83	59.65	119.30
5 Eproms	9.32	18.64	37.28	74.57	149.13
6 Eproms	11.18	22.37	44.74	89.48	178.96
7 Eproms	13.05	26.10	52.20	104.39	208.78
8 Eproms	14.91	29.83	59.65	119.30	238.61
9 Eproms	16.78	33.55	67.11	134.22	268.44
10 Eproms	18.64	37.28	74.57	149.13	298.26
11 Eproms	20.51	41.01	82.02	164.04	328.09
12 Eproms	22.37	44.74	89.48	178.96	357.91
13 Eproms	24.23	48.47	96.94	193.87	387.74
14 Eproms	26.10	52.20	104.39	208.78	417.57
15 Eproms	27.96	55.92	111.85	223.70	447.39
16 Eproms	29.83	59.65	119.30	238.61	477.22
Each Expansion: 32 Eproms	59.65	119.30	238.61	477.22	954.44
Repeater + 1 Expansion: 48 Eproms	89.48	178.96	357.91	715.83	1,431.66
Repeater + 2 Expansions: 80 Eproms	149.13	298.26	596.52	1,193.05	2,386.09
Repeater + 3 Expansions: 112 Eproms	208.78	417.57	835.13	1,670.27	3,340.53
Repeater + 4 Expansions: 144 Eproms	268.44	536.87	1,073.74	2,147.48	4,294.97
Repeater + 5 Expansions: 176 Eproms	328.09	656.18	1,312.35	2,624.70	5,249.40
Repeater + 6 Expansions: 208 Eproms	387.74	775.48	1,550.96	3,101.92	6,203.84
Repeater + 7 Expansions: 240 Eproms	447.39	894.78	1,789.57	3,579.14	7,158.28

The Digital Delay feature allows the AB-100 or AB-Clock to delay the start time of any audio track. Delays can be anywhere from approximately 1/35th of a second to about 1/2 an hour from the time it is given a start command. The delay will occur any time a start command is received after a AB-100 or AB-Clock has received a reset command. In many applications this allows a single start signal to be used for a number of the Digital Audio Repeaters. The actual start of the spiels is then adjusted in the field as needed. The 'DELAY' LED on the front of each AB-100 or AB-Clock shows when it is in delay mode before starting its spiel.

When a AB-100 or AB-Clock is in looping mode, the delay will be inserted between each iteration of the playback loop. In normal looping mode a single spiel is played repeatedly. If the LOOP ALL option is on, then all the spiels on the card will be played sequentially, with the delay inserted between each one.

Both the 'start' inputs and 'running status' output for the AB-100 or AB-Clock are optically isolated from all other parts of the system. Connections are made through four screw terminals. They can be configured to run either from the isolated 'Dirty' power supply or from external power. Eight additional inputs are available through the AUX PORT on each card. These are used to select specific spiels from manual push buttons or switches. The AUX PORT can be configured to select 'one of eight' with individual switch closures to each input or 'one of 255' with a binary spiel select to the inputs.

The AB-100 or AB-Clock checks both the rising (switch closure) and falling (switch opening) edges of each input. This allows you to configure a AB-100 or AB-Clock to do one action on one edge of a switch opening or closing, and then take a different action on the opposite edge. An example of this feature would be if you told the AB-100 or AB-Clock to start on finding a closure on one of the inputs, and then stop when the same input is opened again.

The two optically isolated inputs on an AB-100 and the push button on the front of the case can be configured to:

1) MUTE AUDIO

2) HALF MUTE AUDIO
3) UN-MUTE AUDIO
4) RESET REPEATER TO START
5) STOP REPEATER IMMEDIATELY
6) START REPEATER
7) START REPEATER LOOPING A SPIEL
8) STOP REPEATER AT END OF CURRENT SPIEL

The two optically isolated inputs on an AB-Clock and the push button on the front of the case can be configured to:

1) do nothing
2) select and play any spiel numbered 1 to 97
3) select and play whatever the next spiel in line is
4) prevent the clock from starting any spiel ("muting")

There are several options which you can select for start commands which come while the AB-100 or AB-Clock is still playing the last spiel. You can tell the AB-100 or AB-Clock to:

1) Ignore early starts.
2) Jump immediately to the beginning of the current spiel.
3) Jump immediately to the beginning of the next spiel.
4) Ignore the early start for now, but save and do it as soon as the current spiel is done.

Also available on all AB-100 and AB-Clocks is a single optoisolated status output. On the AB-100 this output is active whenever a spiel is being played. On an AB-Clock it can be configured to:

- pulse once each minute
- pulse once each second
- turn on whenever the AB-Clock is making sound

This output can also be pulsed from the keyboard when you are configuring the AB-Clock. The one pulse per minute setting is used to run 'regulator' or 'remote' type clock faces. The one pulse per second setting as well as the single pulse command are normally used for setting any clocks which are slaved to the AB-Clock.

Front Panel Adjustments, Inputs & Indicators:

Several adjustments and indicators are available on the front panels of the AB-100, AB-Clock, DR-50 and AB-50. The front of an AB-100 or AB-Clock is shown below:

Adjustments:

The following adjustments are available on all of our Digital Audio Repeaters:

Volume: This control sets the volume of the output from the Repeater. This adjustment is available on the AB-100, AB-Clock, DR-50 and AB-50.

Treble: This control is used to adjust the level of the high end of the Shelving Equalizer. This adjustment is available on the AB-100, AB-Clock, DR-50 and AB-50.

Bass: This control is used to adjust the level of the low end of the Shelving Equalizer. This adjustment is available on the AB-100, AB-Clock, DR-50 and AB-50.

Inputs:

The **'Manual Start' Button** on the front of each AB-100 or AB-Clock feeds directly into the Digital Audio Repeater's circuitry, and so doesn't light the 'Start' LED. Other than this one detail, the Manual Start Button acts just like any other 'Start' input. It can be configured identically.

'Set Clock' Button: An AB-Clock adds two additional recessed buttons that are used to check and set the clock. You must use the end of a pencil or paper clip to press this button. This button is used to set the clock. Each time you press it, the minutes will be incremented by one. If the 'Check Date' Button is held in when this button is pressed, then the hours will be incremented.

'Check Date' Button: An AB-Clock adds two additional recessed buttons that are used to check and set the clock. You must use the end of a pencil or paper clip to press this button. This button is used to check the date. The first single digit is the day of the week (1-7). If it is pressed in and held, the 'Set Clock' Button will advance the hours of the clock each time it is pressed.

'Default Reload' Button: The AB-100 and AB-Clock have a button hidden inside the case which is used to reload the default configuration on the repeater. It is labeled as DIPSW1-2. To use it you must:

a) Power down the AB-100 or AB-Clock. You should always do this by unplugging the power supply from the wall rather than unplugging the 5 pin DIN connector at the AB-100/AB-Clock.
b) Remove the AB-100 or AB-Clock case top.

c) Press and hold the button down while plugging the power supply back into the wall.
d) After the repeater reboots, release the button.
d) Reassemble the AB-100/AB-Clock.

The defaults are now reloaded. You can reconfigure the AB-100/AB-Clock through the serial port at address 00h operating at 9600 baud, no parity.

Indicators:

The **'Running' LED** on the front of each Digital Audio Repeater shows when each is currently running. When this LED is lit on the front, then sound should be coming out the back. This indicator is available on the AB-100, AB-Clock, DR-50 and AB-50.

The **'Start' LED** on the front of each AB-100 or AB-Clock is actually a combination of the two opto-isolated start inputs. This shows the actual start inputs' status as it is seen by the Digital Audio Repeater, and not a processed version of them.

The **'Delay' LED** on the front of each AB-100 or AB-Clock shows when:

a) The repeater is performing a delayed start or the delay between each iteration of a loop.

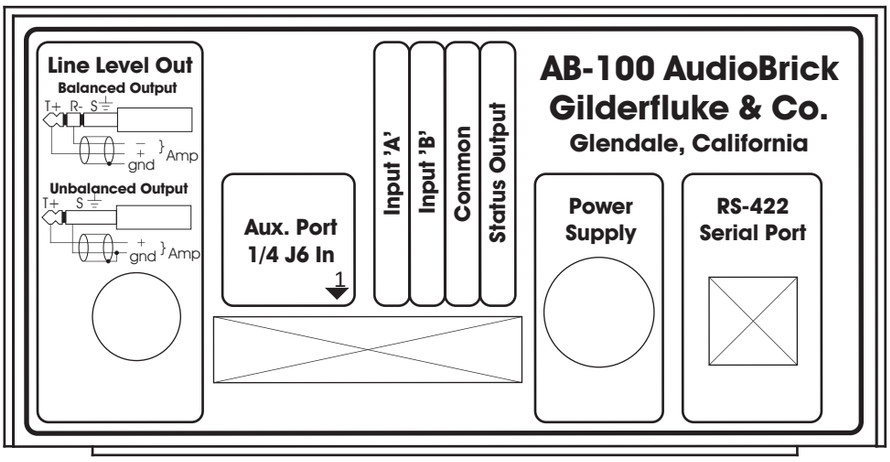
b) The repeater is skipping over a part of the audio that has been encoded in the Eproms as a moment of silence. You can tell when the repeater is doing a 'running delay' because the 'Running' LED will also be lit at the same time.

LCD Display: AB-Clocks also have a **LCD Display** added to them which is used to display and set the current time and calendar. This display normally shows the current time in twenty-four hour 'military' time format. Following the time, "ds" will be displayed if the clock is currently using daylight savings time. The clock will also display "mute" if an external input is keeping any sound from playing or "run" if the time is currently between the hours that have been set for automatic tolling.

Pressing the 'Check Date' Button will cause the display to momentarily switch to displaying the day (1=Sunday through 7= Saturday) and date (mm/dd/yy).

- AB-100 and AB-Clock Connections -

The connections to the AB-100 and AB-Clock are identical. See the sections of this manual that cover the AB-50 and DR-50 for their connections.

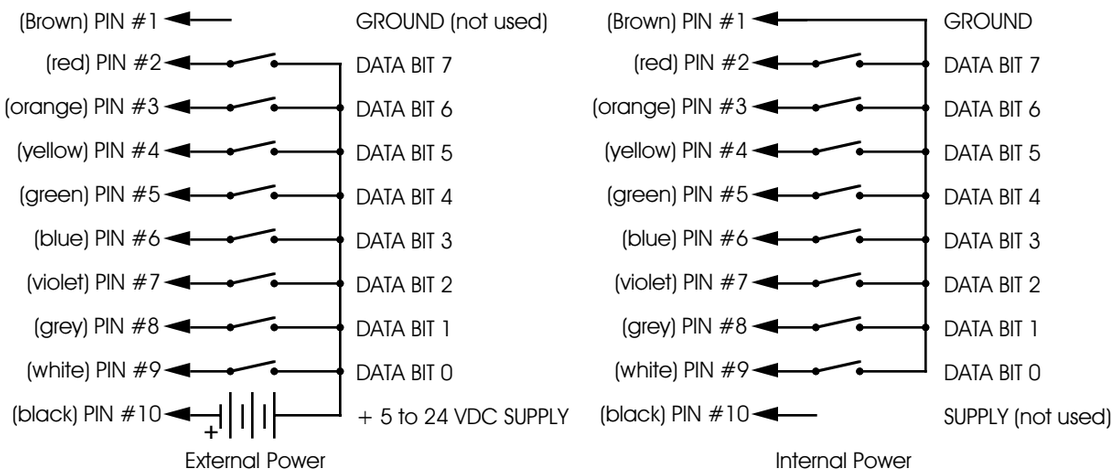


Line Level Output:

The output of the AB-100 and AB-Clock is a +10 dB balanced output. The connection is through a 1/4" stereo phone plug. If this output is operated in single ended mode, the unused output MUST be grounded. If it is not, then the output will be excessively noisy. As shown by the illustration on the end of the case, using a mono 1/4" phone plug will automatically ground this unused output in single ended applications. Use a 1/4" stereo phone plug only in balanced applications.

Aux. Port & 1/4-J6 Input:

The AUX PORT is used to select a specific spiel on a single AB-100 or AB-Clock. You will need to select the OP-100 AUX PORT OPTO-ISOLATOR option if you want to use the Aux. port. The input to the Aux. Port is the same 1/4 J-6 connection used by all of our Animation Control Systems. If you are using a source other than our Animation Control Systems, the connections are as follows:

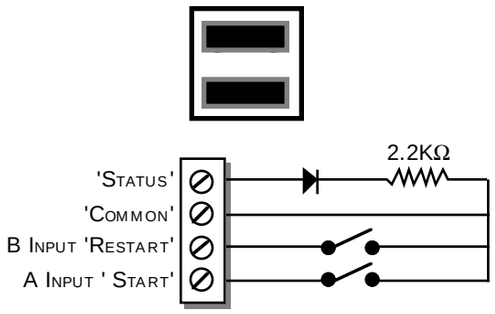


JP-11 is used to select whether the 1/4-J6 input is to be run from external power or from the same power supply as the AB-100 or AB-Clock. With JP-11 in the Left position, the inputs use same power supply as the AB-100 or AB-Clock. Any switch closure between the data bits and ground will trigger a spiel. With JP-11 in the Right position, an external source of power is needed by the 1/4-J6 input. This is the safer method of operating this port, since any spikes on these input lines won't be coupled into the AB-100/AB-Clock through its power supply. The input to the 1/4 J-6 connection is simply eight opto-isolators. Each input is equivalent to turning on a LED with a 4.7 Kohm in series.

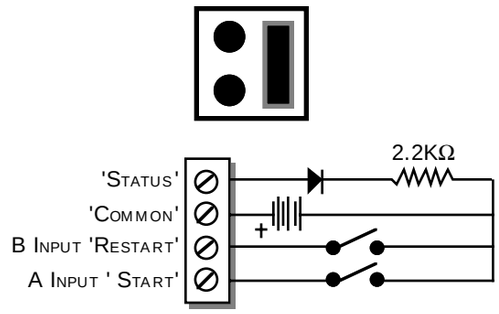
Start Inputs and Status Outputs:

Both the 'start' inputs and 'status' output for the AB-100 or AB-Clock are optically isolated from all other parts of the system. Connections are made through four screw terminals on the back of the AB-100 or AB-Clock. They can be configured to run either from the same power as the AB-100 or AB-Clock or from external power supply. The jumper selection and connections for these two modes of operation are as follows:

INTERNAL POWER



EXTERNAL POWER



In the vast majority of cases, the 'EXTERNAL' power configuration is preferred, as it isolates the audio circuitry inside the AB-Clock from any possible interference from the wires leading to your switches.

Power Supply:

Five position 180° DIN connector [2]. Plugging and unplugging this connector from the AB-100/AB-Clock is not recommended while the power supply is plugged in. You should always unplug the power supply from the wall before plugging/unplugging the 5 pin DIN connector at the AB-100/AB-Clock. The pinout for the Power Supply connector is as follows:

	SIGNAL NAME:
Pin #1	Ground
Pin #2	N/C
Pin #3	+ 5 VDC
Pin #4	- 12 to 15 VDC
Pin #5	+ 12 to 15 VDC

RS-422 Serial Port:

For AB-100 and AB-Clocks, a six position RJ-11 (modular telephone style connector) is used for the serial data. Facing the end of the cable with the release latch upwards, its pin out is as follows:

	COLOR	**SIGNAL NAME:**
LEFT	WHITE	SIGNAL GROUND
	BLACK	- SERIAL DATA OUT FROM REPEATER
	RED	+ SERIAL DATA OUT FROM REPEATERS
	GREEN	- SERIAL DATA IN TO REPEATERS
	YELLOW	+ SERIAL DATA IN TO REPEATERS
RIGHT	BLUE	SIGNAL GROUND

To communicate with the AB-100 and AB-Clocks through the serial port, you can use just about any computer or terminal that has a serial port on it. Some newer computer designs, like the Apple Macintosh, come with serial ports that are directly compatible with the RS-422/RS-485 signal levels the AB-100 and AB-Clocks want to see. These signal levels are close enough to be used with the RS-232 signal levels found on most older computers (like all IBM PCs and compatibles). They can be attached with only a simple

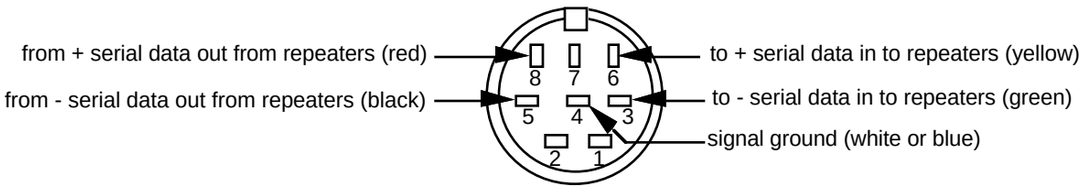
2 Use extreme caution when making discrete wire connections to this connection! Five pin 180° DIN connectors are numbered 3, 5, 2, 4, 1 as you face the socket on the outside of the AudioBrick.

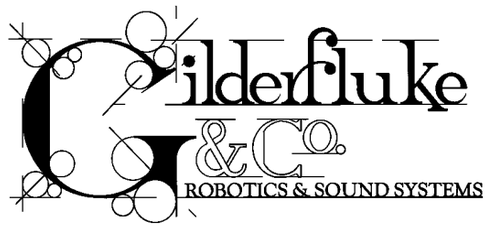
adapter cable, so long as the wire isn't too long and there aren't too many AB-100s and AB-Clocks attached to the same serial line. To gain the full advantage of the RS-422/RS-485 signal levels (multidrop networking, distances of up to a mile) you will need to use a signal level adapter.

To cross wire the RS-422/RS-485 signals from the digital audio system to the RS-232 serial port of an IBM compatible, cross connect the signals as follows:

DB-25	**DE-9**	**SIGNAL**	**SIGNAL FROM/TO AUDIO SYSTEM**
2	3	DATA OUT	- SERIAL DATA IN TO REPEATERS (GREEN)
3	2	DATA IN	- SERIAL DATA OUT FROM REPEATER (BLACK)
7	5	GROUND	SIGNAL GROUND (BLUE or WHITE)

Apple Macintosh computers have true RS-422 serial ports built in. To connect to the digital audio system, the pin out is as follows (view is of connector on the outside of a Macintosh):





- AB-100 AudioBrick Configuration -

To configure the system through the serial port, you need to connect the system just as you do for any serial communications (see the 'AB-100 AudioBrick Serial Port Commands' section of the manual). The configuration mode is entered by the command:

"m" (5AA5) (TRACK#)

This command will bring up the following menu from the Repeater which was addressed.

EXAMPLE: to bring up the configuration screen for a card addressed as 'track 00' (this is the normal default configuration address when a Repeater is shipped): m5AA500

This would bring up the following configuration screen (the screen shown is the default configuration):

```
-MACs DIGITAL AUDIO SYSTEM revision 1.12 copyright 1991 GILDERFLUKE & Co. DCM-

  a) Channel number- 00  | g) Select from AUX- yes  | l) #1 PA station- 01
  b) Baud rate- 9600     | h) Direct select- yes    | m) #2 PA station- 02
  c) Odd parity- no      | i) Mute if stopped- no   | o) Std PA priorities- no
  d) EPROM type- 27C010  | j) Start delay- 0010     | p) Zone Priorities- no
  e) Inputs Debounce- 0A | k) Early starts- Jmp Fwd | q) Loop all mode- no
  f) DR-400 mode- no     | X) exit
                                    1   2   3   4   5   6   7   8
    G) Group assignments:         | 1 | 0 | 0 | 0 | 0 | 0 | 0 | F |
    H) PA Zones Enabled:          | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
    I) Half Mute Zones Enabled:   |yes|___|___|___|___|___|___|___|
    J) Full Mute Zones Enabled:   |yes|___|___|___|___|___|___|___|
                                                                  STOP
    INPUT and EDGE      HALF   MUTE    UN    STOP  RESET  START   LOOP  AT END
K) A input Closing:  |______|______|______|______|______|__on__|______|______|
L) A input Opening:  |______|______|______|______|______|______|______|______|
M) B input Closing:  |______|__on__|______|__on__|______|______|______|______|
O) B input Opening:  |______|______|__on__|______|______|______|______|______|
P) PB input Closing: |__on__|______|______|______|__on__|__on__|______|______|
Q) PB input Opening: |______|______|__on__|______|______|______|______|______|
R) Aux input Closing:|______|______|______|______|______|______|__on__|______|
S) Aux input Opening:|______|______|______|______|______|______|______|______|
                                Enter command- _
```

The (5AA5) part of the command is a key to keep this mode from being inadvertently entered. The card addressed by the TRACK# will put a configuration menu on the screen. When this mode is entered by any card, it disables all of the other serial commands on all the cards in the system. As with the normal serial command mode, the upper and lower 'case' of all input is important. An 'a' is a command while an 'A' is a number. All numeric values are entered in HEX (0 - 9, A - F).

If another command is entered while the last command is waiting for additional input, the new command will be started. If at any point you enter a command in error and it is waiting for additional input, you can leave the command by entering an <ESC>ape key. With the exception of the GROUP ENABLE and PA ZONE ENABLE commands, this will leave the original configuration unaltered. These two commands will only be changed up to the point where you <ESC>aped.

If you want to keep a hard copy printout of the current configuration of

any card, you should use the <ESC>ape key to redraw the screen while saving the print in the modem program running on your computer. This file can then be printed out at any time.

Note that only one card in the entire system is allowed to be in configuration mode at one time. For this reason, if you try to put a card which doesn't exist into configuration mode, not only will you not see a configuration screen from that nonexistent card, no other card in the system will want to listen to you until you take the nonexistent card out of configuration mode. To do this, type a: xn

The other cards will then start listening to you again.

The AB-100 and AB-Clock have a button hidden inside the case which is used to reload the default configuration on the repeater. It is labeled as DIPSW1-2. To use it you must:

a) Power down the AB-100 or AB-Clock. You should always do this by unplugging the power supply from the wall rather than unplugging the 5 pin DIN connector at the AB-100/AB-Clock.
b) Remove the AB-100 or AB-Clock case top.
c) Press and hold the button down while plugging the power supply back into the wall.
d) After the repeater reboots, release the button.
d) Reassemble the AB-100/AB-Clock.

The defaults are now reloaded. You can reconfigure the AB-100/AB-Clock through the serial port at address 00h operating at 9600 baud, no parity.

.....

"a" Enter Track Number:

This command is used to tell the card which addresses it should respond to from the serial commands. No two cards in the system should have the same address assigned to them. When loaded with the default configuration, the address assigned to a card is 00. If more than one card is used in the system, they should be plugged in one at a time and have their addresses changed. Once it has been changed, each card can stay plugged in the card cage.

.....

"b" Baud Rate:

The serial port on each Repeater card can support any of the following baud rates:

1) 110
2) 150
3) 300
4) 600
5) 1200
6) 2400
7) 4800
8) 9600 (default value)
9) 19,200
10) 48,000
11) 96,000

The lower baud rates may require that the dead man circuit will need to be disconnected (U-7 pin #6) while in configuration mode. The reason for this is that the dead man needs to be updated about once a second, and at the lowest baud rates it will be spending so much time printing that it will time out and reset the system. 9600 baud is an average speed to run the

system.

All cards in the system must be set to the same baud rate. The default speed is 9600 baud. This command doesn't take effect until you enter the eXit command.

.....

"c" Odd Parity Toggle:

This toggle enables the ODD PARITY data check on the serial port for this Repeater. Parity is a method of confirming that the data sent to the audio system arrives intact. Any data that gets jumbled is ignored. If ODD PARITY is enabled, it must be enabled on all the cards in the system as well as on your computer or terminal. The default value for this command is off. This command doesn't take effect until you enter the eXit command.

.....

"d" Eprom Type:

If the repeater is playing snippets of the sound you have burnt into a set of Eproms and repeats each section 2, 4 or 8 times, then this variable is set improperly for the type of Eproms you have installed. The following types of Eproms are currently supported by the digital audio Repeaters Repeaters:

27C512
27C010 (default setting)
27C020
27C040
27C080

All the Eproms on a card must be of the same type. Different cards in the same system can each have different types of Eproms on them. This command doesn't take effect until the eXit command is completed.

.....

"e" Inputs Debounce:

This command allows you to set the number of times the software inside the Digital Audio Repeater will check any inputs before it actually believes a change has happened. A typical value is 0A. If you experience multiple triggers on any input, just raise this number until the problem disappears.

.....

"f" DR-400 Mode:

NOT USED WITH AB-100 AudioBrick: This toggle should only be turned on only when operating on a DR-400 Audio Processing Cards. It disables all of the commands which DR-400's can't (or shouldn't) use. This saves you the time of turning all of these off individually.

.....

"g" Select From Aux.:

If more than one recording is stored on a single Digital Audio Repeater card, each separate recording is referred to as a spiel. Each spiel can be accessed individually and played back. Up to 255 of these spiels can be stored on a single Digital Audio Repeater card. These requests can be made through the serial port or through the AUX PORT.

This toggle enables the auxiliary port for requesting the spiels on this card. There are two methods of selecting spiels from the AUX PORT. Which one is used is selected by the next command.

.....

"h" Direct Select:

This command is used to switch the AUX PORT between selecting directly (1 of 8) instead of using binary inputs for requesting up to 255 different spiels. The direct select is useful when you have eight or less spiels which need to be called up through the AUX PORT. The AUX PORT can be wired directly to up to eight different pushbuttons. When any of these buttons are pressed it will select the appropriate spiel. The first button pushed will be played at the next start or looping command, unless it is overridden by another spiel request from the serial ports. (The board can also be told to start playing the newly requested spiel immediately if you set the EARLY STARTS option to either 'jump forward' or 'jump back'.)

If this mode is off, then up to 255 different spiels can be selected through the AUX PORT. The AUX PORT can be connected directly to the output of a computer or animation control system. If you need to connect it to pushbuttons, you will need to use diodes or a keyboard encoder to encode a binary number to be sent to the AUX PORT.

As with changes in inputs on the A, B, or PB input, changes on the AUX PORT can be used to start, stop, or whatever a card. If the direct select option is 'on', then a rising edge is on any new arrival of a new closure, and a falling edge is when all input lines are opened. If the direct selection is 'off', then a rising edge is on any change in the AUX PORT except for when all of the inputs go open, which is considered to be a falling edge.

This option defaults to an 'on' condition.

.....

"i" Mute if Stopped:

This toggle allows you to tell an AB-100 to mute all the audio when the Repeater is stopped. This can be used if the mix inputs to the card aren't used for anything else. This defaults to a 'off' condition.

.....

"j" Start Delay:

This command is used to set the START DELAY for this card. If the START DELAY is anything other than 0000, then any start which follows a reset will cause the Repeater to delay for the time set by the START DELAY until it actually starts the Repeater. This is useful in applications where a single start input can be used to start a number of different cards, with the actual starting time of each of the cards set by the delay time. The actual amount of delay time can be adjusted using the START DELAY in the field.

The START DELAY is also used when a Repeater is in looping mode. In between each loop, the Repeater delays by the amount of time set by the START DELAY. This allows you to record a fairly short announcement which needs to repeat all day long. The START DELAY can be used to set how often this spiel repeats. Again, the amount of delay can be adjusted in the field as needed.

Each count of the START DELAY is equal to .029127111 seconds. This allows you to set the delay from about 1/34th of a second on up to about 1/2 hour.

To determine the value you need to use for a particular delay:

1) Divide the number of seconds you want to delay by .029127111.
2) Round the result off to the nearest whole number.
3) Convert result to HEX (a HEX calculator makes this easier).

This feature defaults to a value of 0010. Acceptable input range for the delay is 0000 to FFFF. A 0000 input disables this option.

"k" Early Starts:

The user has the choice of what each card does when it is still playing a spiel and receives a new 'start' or 'loop' command. The options are:

1) DO NOTHING.
2) JUMP FORWARD to the next spiel.
3) JUMP BACKWARDS to the start of the current spiel.
4) BANK START so that it won't be acted upon until the current spiel finishes.

The JUMP FORWARD and JUMP BACKWARDS commands have the lowest priority of all possible spiel requests. Any serial port or AUX PORT spiel request will take priority over these commands.

This feature defaults to a setting of 'JUMP FORWARD'.

"l" #1 Priority PA Station:

NOT USED WITH AB-100 AudioBrick: In the Public Address System there are a number of different ways to assign priorities to different PA STATIONS and PA zones. This command allows you to assign a single PA STATION as the top priority PA STATION. Any valid PA requests made by the top priority PA STATION will be honored by this card at the exclusion of any other PA requests. The top and second priority PA STATION assignments are usually given to either a PA STATION which is local to the speakers which are controlled by this card, or to a PA STATION from which safety announcements will be made.

The top priority PA STATION defaults to a value of 01. Acceptable input range is from 00 to FF.

"m" #2 Priority PA Station:

NOT USED WITH AB-100 AudioBrick: In the Public Address System there are a number of different ways to assign priorities to different PA STATIONS and PA zones. This command allows you to assign a single PA STATION as the second priority PA STATION. Any valid PA requests made by the second priority PA STATION will be honored by this card at the exclusion of any other PA requests except those from the top PA STATION. The top and second priority PA STATION assignments are usually given to either a PA STATION which are local to the speakers which are controlled by this card, or to a PA STATION from which safety announcements will be made.

The second priority PA STATION defaults to a value of 02. Acceptable input range is from 00 to FF.

"o" Standard PA Priorities:

NOT USED WITH AB-100 AudioBrick: In the Public Address System there are a number of different ways to assign priorities to different PA STATIONS and PA zones. If STANDARD and ZONE PRIORITIES are both off, then all valid PA requests (from PA STATIONS other than the top and second priority PA STATIONS for this card) will be treated equally. Any valid request will be honored, and if more than one valid request comes in to the same card, they will simply be mixed.

If the STANDARD PA PRIORITY option is 'on', then PA STATIONS with higher numbers will take priority over those with lower numbers. Only one PA request will be honored at one time.

This feature defaults to an 'off' condition.

.....

"p" PA Zone Priorities:

NOT USED WITH AB-100 AudioBrick: In the Public Address System there are a number of different ways to assign priorities to different PA STATIONS and PA zones. If STANDARD and ZONE PRIORITIES are both off, then all valid PA requests (from PA STATIONS other than the top and second priority PA STATIONS for this card) will be treated equally. Any valid request will be honored, and if more than one valid request comes in to the same card, they will simply be mixed.

If the PA ZONE PRIORITY option is 'on', then PA zone requests with higher numbers will take priority over those with lower numbers. Only one PA request will be honored at one time.

This feature defaults to an 'off' condition.

.....

"q" Loop All:

Under normal looping mode, a single spiel will repeat over and over again. If this feature is 'on', all the spiels recorded on a single card will be played in a loop. A delay, if enabled, will be inserted between each individual spiel.

This feature defaults to an 'off' condition.

.....

"G" Group Assignments:

When using the serial port to control the audio system, you have the choice of using a number of commands (start, stop, etc.) which select only a single 'group' of cards. This command is used to select which of 12 GROUP ASSIGNMENTS this card will respond to.

Acceptable input range for GROUP ASSIGNMENTS are from 0 to F. If you need less than 12 GROUPS, you should assign the unused spaces to any of the group numbers you have already used.

.....

"H" PA Zone Enables:

NOT USED WITH AB-100 AudioBrick: You can tell any card in the system to respond to up to 8 different PA zone requests. This command is used to tell the card which zones it should respond to. Any PA requests to a zone other than ones which has been assigned to it will be ignored by this card.

Acceptable input range for ZONE ASSIGNMENTS are from 00 to FF. If you need less than 8 ZONES, you should assign the unused spaces to any of the PA ZONE numbers to FF.

.....

"I" Half-Mute Zone Enables:

NOT USED WITH AB-100 AudioBrick: There are eight HALF-MUTE zones available in the Digital Audio System. This command is used to select which of the eight, if any, you wish to use. Any HALF-MUTE request for an enabled HALF-MUTE ZONE will half-mute this card.

.....

"J" Full-Mute Zone Enables:

There are eight FULL-MUTE zones available in the Digital Audio System. This command is used to select which of the eight, if any, you wish to use. Any FULL-MUTE request for an enabled FULL-MUTE ZONE will mute this card.

Input Triggering:

"K"	**'A' Input Closing Edge:**
"L"	**'A' Input Opening Edge:**
"M"	**'B' Input Closing Edge:**
"O"	**'B' Input Opening Edge:**
"P"	**'PB' Input Closing Edge:**
"Q"	**'PB' Input Opening Edge:**
"R"	**'Aux. Port' Input Closing Edge:**
"S"	**'Aux. Port' Input Opening Edge:**

Each Digital Audio Repeater card has two opto-isolated external inputs, one push button input on the front panel, and one AUX PORT input. These commands are used to select what actions will take place on each edge of each of these inputs. Note that both rising and falling edge actions are available to the user. This allows you to do things like start a Repeater on a closing edge and then stop it on the opening edge of the same input.

The closing edge on the 'A', 'B', and 'PB' inputs are considered to be when a normally open push button or switch is closed. The opening edge is when that same switch or push button is opened. A closing edge on the AUX PORT is considered to be any of the eight inputs closing if the direct select option is 'on', or any change in the input (except going to all inputs open) if the direct select option is off. An opening edge on the AUX PORT is when all eight of the inputs go to an open condition.

The hardware for the 'A', 'B', and 'AUX PORT' inputs can be configured to run from either an internal power supply and a simple switch closure, or from an external power supply or powered output.

When each Digital Audio Repeater card resets or is first powered up, it checks the conditions on all the inputs, inverts them, and then compares them with the steady-state conditions of the inputs. What this means is that on power-up, if an input you are using to tell a card to run is in the 'run' condition, the system will start immediately.

If multiple inputs to the system arrive simultaneously, they have the following priorities:

1) 'AUX PORT" INPUTS
2) 'A' input
3) 'B' INPUT
4) 'PB' INPUT

This will probably happen only on power-up.

"x" or "X" **eXit Setup Mode:**

This command is used to exit the setup mode. If you hit this command in error, hitting an <ESC>ape key will get you back to the setup mode. All the setup commands that don't take effect immediately, take effect when the eXit command is entered. This includes things like the BAUD RATE, so you will have to change the baud rate of the terminal you are using at this time.

The eXit command asks you if you want to save the current setup permanently. If you answer 'Y', the EEprom will be written with the current configuration. If you answer 'N', the setup mode will be exited without writing to the EEprom.

All cards in the system have their serial ports disabled while any card in the system is in setup mode. This is the only command to which they will respond. After the initial 'X', all of the other cards wait for a 'Y' or 'N' before

they will start accepting other serial commands again.

- AB-100 AudioBrick Summary of Setup Commands -

"a"	ENTER TRACK NUMBER:
"b"	BAUD RATE:
"c"	ODD PARITY TOGGLE:
"d"	Eprom TYPE:
"e"	CLOCK ENABLED:
"g"	SELECT FROM AUX:
"h"	DIRECT SELECT:
"i"	MUTE IF STOPPED:
"j"	START DELAY:
"k"	EARLY STARTS:
"l"	#1 Priority PA Station:
"m"	#2 Priority PA Station:
"o"	STANDARD PA PRIORITIES:
"p"	PA ZONE PRIORITIES:
"q"	Loop All:
"G"	GROUP ASSIGNMENTS:
"H"	PA ZONE ENABLES:
"I"	HALF-MUTE ZONE ENABLES:
"J"	FULL-MUTE ZONE ENABLES:
"K"	'A' INPUT CLOSING EDGE:
"L"	'A' INPUT OPENING EDGE:
"M"	'B' INPUT CLOSING EDGE:
"O"	'B' INPUT OPENING EDGE:
"P"	'PB' INPUT CLOSING EDGE:
"Q"	'PB' INPUT OPENING EDGE:
"R"	'AUX PORT' INPUT CLOSING EDGE:
"S"	'AUX PORT' INPUT OPENING EDGE:
"x" or "X"	eXit SETUP MODE:

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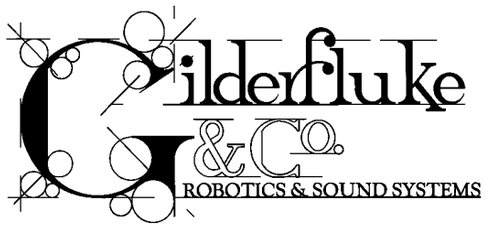

- AB-100 AudioBrick Serial Port Commands -

The MACs digital audio system can be controlled by simple switch closures to start and stop playback or looping, mute the audio, and perform a variety of functions. Besides this method of controlling the Repeater cards, you can talk to any or all the cards at one time through a serial data line from your computer, terminal, or control system.

All commands sent to the MACs digital audio system through its serial interface take the following format. All characters are sent in ASCII. All numeric values are sent in HEXadecimal (HEX for short), and consist of one or more ASCII characters (0-9, A through F). The case (as in upper and lower) of all input is important. A lower case 'a' signifies a command, while an 'A' is a numeric value. If the digital audio system receives another command while it is waiting for additional input needed to complete the previous command, it will abandon the previous command and start working on the new one.

In the following documentation any input you will send to the audio system is shown in outline. The response to a command is shown in *italics*.

If the digital audio system is in a mode where you expect to receive some response from it (generally in one of the echo modes), you must wait to receive all the characters you are expecting before sending the system a new command. The reason for this is that you are actually talking to up to 256 microprocessors at a time. If you issue a command that gives a response from one card, and then a command that gives a response from a second card before the first has finished, then the two may try to output data at the same time. This won't cause any damage, but may result in garbled data at the receiver.

It is also possible to overload the digital audio system with too many commands through the serial port. You don't want to take too much time away from the Digital Audio Repeater to serve the serial port.

If you are using a computer as a terminal you will need to run a modem or terminal emulation program. These will send everything you type on the keyboard out the serial port on your computer while printing on the screen anything that comes in from the audio system through the serial port. A modem program will usually have the advantage over a terminal emulation program in that it will allow you to save data to your computer's disk drives and then send it back to the audio system at a later date. The digital audio system uses no screen control codes or ESCape sequences, so it should work on any machine with a 80 column by 24 line display. Machines with other display formats will work, but may not look so neat on the screen.

When configuring your modem program, you should set it for 9600 baud, 8 data bits, one stop bit, and no parity. Higher or lower baud rates can be used if you configure the Digital Audio Repeaters' serial port to run at a different speed. You should set your program not to insert an extra LineFeed (LF) character after each Carriage Return (CR) it receives. If you are going to be downloading configuration strings to the system (command 's'), you will also need to tell the modem program to put a slight delay be-

tween each character sent. Without this delay, you might over run the Digital Audio Repeaters' incoming data buffer.

If you have hooked up the Digital Audio Repeaters to your computer and it still doesn't seem to respond to the keyboard, the first thing to check is that you are attached to the right serial port. The easiest way to do this is to disconnect the Digital Audio Repeaters and short between the Tx data out and Rx data in pins on the serial port connector on the back of your computer. On all IBMs and compatibles this means sticking a paper clip or similar tool between pins 2 and 3 on the 'Com.' connector. While still running the modem program, anything you type should be shown on the screen while this paper clip is in place, while nothing will appear when you remove it. If your computer passes this test, then you are using the right serial port and the problem is most likely the baud rate setting or in your wiring to the Digital Audio Repeaters. If you get characters on the screen even with the paper clip removed from the serial port, it means you probably need to set the 'echo' mode to 'none' or 'full duplex' and try this test again.

The digital audio system expects to see the serial data in the following format:

ONE START BIT
EIGHT DATA BITS
ONE STOP BIT

If the odd parity is enabled, then the data appears in the following format:

ONE START BIT
SEVEN DATA BITS
ODD PARITY BIT
ONE STOP BIT

When the parity is enabled, any data with a parity error in it is simply ignored.

There are a number of methods that you can use to access a number of cards in the digital audio system at the same time. If you are controlling the audio through the serial input, you can use any or all of them as best suits your application. The Types of Commands Available are:

1) **All -** Any command of this type affects all of the cards in the system.

   EXAMPLE: A 'Start All' command will Start All of the Digital Audio Repeaters in the system.

2) **Track Specific -** Only the one card addressed by the command is affected by this type of command. Each card in the system must be configured to respond to a different TRACK NUMBER address in order for the system to operate properly.

   EXAMPLE: A 'Start Track#' command will start only the one card addressed by the TRACK# in the command.

3) **Group -** There are 16 possible groups in the digital audio system. They are numbered from 0 through F. You can configure any card in the system to respond to anywhere between 1 and 12 of the different groups (see the configuration sections of this manual for instructions on how to do this). Commands of this type affect all cards that have the matching GROUP NUMBER. This type of command can be used when you wish to access a number of cards at the same time.

   EXAMPLE: A 'Start Group#' command will Start All cards which have been configured to respond to the GROUP# in the command.

4) Cocked - You can set a flag on any number of different cards in the digital audio system which, when set, will cause those cards to respond to commands of this type. Once cocked, you will have to uncock a card to stop it from responding to any more COCKED commands.

EXAMPLE: A 'Start Cocked' command will start only those Digital Audio Repeaters which have had their 'COCKED' flags set.

- AB-100 AudioBrick Serial Commands -

"a" (TRACK#) **Enter Setup Echo Mode:**

This command puts the one card addressed by the TRACK# into this mode while taking all other cards out of this mode. This is a special mode that lets you play with the command structure of the digital audio system and get an echo of all commands accepted in plain English. This form of echo should normally be used only while manually manipulating the system. When this mode is entered, it can take a relatively long time to echo the 20 to 30 ASCII characters most commands will return when in this mode. During this response time, no additional commands should be given.

When in this mode, address specific commands are echoed by the card to which the command was sent. Non-track-specific commands are echoed by the card that was specified by the TRACK# when this mode was entered. This means that any track specific command sent to a nonexistent card will not be echoed, while any non-track-specific command (like a COCKED command) will be echoed even when no card in the system is actually effected by the command.

EXAMPLE: to put card 00 into SETUP ECHO mode: a00

TRACK 00 Setup Mode Selected

EXAMPLE: a 'Start All' command will echo: 'Start All'

.....

"b" **Exit Setup Echo Mode:**

This command takes all cards in the system out of SETUP ECHO MODE.

EXAMPLE: to take any and all cards out of SETUP ECHO mode: b

.....

"c" (TRACK#) **Enter Global Echo Mode:**

This command puts the one card addressed by the TRACK# into this mode while taking all other cards out of this mode. The one card that is in this mode will echo all non-track-specific commands accepted by the system. This type of echo can be used in an automated system to ensure that the digital audio system has received any non-track-specific command. Note that since only one card in the system is in this mode at a time, this form of echo only verifies the operation of this one card and no other parts of the system.

EXAMPLE: to put card 00 into GLOBAL ECHO mode: c00

EXAMPLE: a 'Start All' command will echo: *u*

.....

"d" **Exit Global Echo Mode:**

This command takes all cards in the system out of GLOBAL ECHO MODE.

EXAMPLE: to take any and all cards out of GLOBAL ECHO mode: d

.....

"e" (TRACK#) **Enter Echo All Mode:**

This command puts the one card addressed by the TRACK# into this mode while taking all other cards out of this mode. The one card that is in ECHO ALL MODE echoes all characters sent to the digital audio system through the serial port. This type of echo can be used to verify that the digital audio system has received all characters sent to it. Note that since only one card in the system is in this mode at a time, this form of echo only veri-

fies the operation of this one card and no other parts of the system.

EXAMPLE: to put card 00 into ECHO ALL mode: e00

EXAMPLE: a 'Start Track# 00' command will echo: *t00*

"f" **Exit Echo All Mode:**

This command takes all cards in the system out of ECHO ALL MODE.

EXAMPLE: to take any and all cards out of ECHO ALL mode: f

"g" **Enter Echo Mode:**

This command puts all the cards in the system into ECHO MODE. When in this mode, all track-specific commands are echoed by the card addressed by the command. This is the type of echo mode which best verifies the proper operation of all the cards in the digital audio system.

EXAMPLE: to put card 00 into ECHO mode: g00

EXAMPLE: a 'Start Track# 00' command will echo: *t00*

"h" **Exit Echo Mode:**

This command takes all cards in the system out of ECHO MODE.

EXAMPLE: to take any and all cards out of ECHO mode: h

"i" (TRACK#) **Track Status Report:**

This command responds with a stream of ASCII HEX data containing the current status of the card specified by the TRACK#:

BYTE 1 &2 = LED Port Status
- BIT 0 = MUTE STATUS (1 = muted)
- BIT 1 = DELAY STATUS (1 = in delay)
- BIT 2 = HALF-MUTE STATUS (1 = half-muted)
- BIT 3 = not used
- BIT 4 = RUN STATUS (1 = running)
- BIT 5 = STATUS OUTPUT STATUS (1 = on)
- BIT 6 = PA STATUS (1 = on)
- BIT 7 = REPEATER CLOCK ENABLED (1 = on)

BYTE 3 & 4 = INPUT STATUS
- BIT 0 = A INPUT STATUS (1 = closed)
- BIT 1 = B INPUT STATUS (1 = closed)
- BIT 2 = PB INPUT STATUS (1 = closed)
- BIT 3 = not used
- BIT 4 = not used
- BIT 5 = not used
- BIT 6 = not used
- BIT 7 = not used

BYTES 5 through 12 = Memory Address Status BITS 10 THROUGH 42

BYTE 13 & 14 = Dipswitch #1 Status
BYTE 15 & 16 = Dipswitch #2 Status
BYTE 17 & 18 = Aux. Port Status
BYTE 19 & 20 = PA TRUNKS 8 through 15
BYTE 21 & 22 = PA TRUNKS 0 through 7
BYTE 19 = CARRIAGE RETURN
BYTE 21 = LINE FEED

EXAMPLE: to poll the status for card 00: i00*380000000129000000000*

"j" (5AA5) Special Default Setup:

This command should not be used if there is more than one card in the system. It loads the configuration EEprom with the default setups. As this sets all cards to address 00, it can cause problems if invoked lightly. The '5AA5' that follows the command is a key which keeps garbage from accidentally issuing this command.

The values for the default settings are shown in the setup section of the manual.

EXAMPLE: to do a Special Default Setup to the one and only card in the system: j5AA5

"k" (TRACK#) LED Port Status:

This command responds with the following information for the card specified by the TRACK#:

BIT 0 = MUTE STATUS (1 = muted)
BIT 1 = DELAY STATUS (1 = in delay)
BIT 2 = HALF-MUTE STATUS (1 = half-muted)
BIT 3 = not used
BIT 4 = RUN STATUS (1 = running)
BIT 5 = STATUS OUTPUT STATUS (1 = on)
BIT 6 = PA STATUS (1 = on)
BIT 7 = REPEATER CLOCK ENABLED (1 = on)

EXAMPLE: to poll the LED Port Status for card 00: k00*38*

"l" (TRACK#) Switch Status:

This command responds with the following information for the card specified by the TRACK#:

BIT 0 = A INPUT STATUS (1 = closed)
BIT 1 = B INPUT STATUS (1 = closed)
BIT 2 = PB INPUT STATUS (1 = closed)
BIT 3 = not used
BIT 4 = not used
BIT 5 = not used
BIT 6 = not used
BIT 7 = not used

EXAMPLE: to poll the input Switch Status for card 00: l00*00*

"m" (5AA5) (TRACK#) Enter Configuration Mode:

This command puts the card specified by the TRACK# into the configuration mode. All other cards in the system are locked off from receiving any serial commands when there is even one card in setup mode. They will not accept any serial commands until they hear the commands to exit setup mode being sent to the one card which is in this mode. For details on the setup mode, see the setup section of this manual.

EXAMPLE: to put card 00 into setup mode: m5AA500

Note that only one card in the entire system is allowed to be in configuration mode at one time. For this reason, if you try to put a card that doesn't exist into configuration mode, not only will you not see a configuration screen from that nonexistent card, no other card in the system will want to listen to you until you take the nonexistent card out of configuration mode.

To do this, type a:

xn

The other cards will then start listening to you again.

.....

"n" (TRACK#) Memory Address Status:

This command responds with the address bits 10 through 42 for the card specified by the TRACK#. By polling this value, you can determine at what point in the audio any card is currently at.

EXAMPLE: to poll the Memory Address Status for card 00: n00*00000000*

.....

"o" (TRACK#) Dipswitch #1 Status:

This command responds with the current status of the dip switch 1 for the card specified by the TRACK#.

EXAMPLE: to poll the dipswitch #1 status for card 00: o00*00*

.....

"p" (TRACK#) Dipswitch #2 Status:

This command responds with the current status of the dip switch 2 for the card specified by the TRACK#

EXAMPLE: to poll the dip switch #2 status for card 00: p00*00*

.....

"q" (TRACK#) Aux. Port Status:

This command responds with the current status of the AUX PORT for the card specified by the TRACK#.

EXAMPLE: to poll the Aux. Port Status for card 00: q00*00*

.....

"r" (TRACK#) Configuration Dump:

This command responds with the current contents of the configuration EEprom for the Digital Audio Repeater specified by the TRACK#. This string of 74 ASCII characters is led off by the character string 's5AA5'. As it happens, this is the lead in string for the CONFIGURATION LOAD command. This allows you to save the configuration of one or more Digital Audio Repeaters in your computer for later retrieval or archiving, and then simply and easily reload this data at any time. To save the data to the disk of your computer:

1) Turn off all echo modes.
2) Tell your computer to save all ASCII received from the Digital Audio System.
3) Give this command to any card in the system.
4) Save all stored input to your computer's disk drives.

Step #3 above can be repeated for any number of cards in the system. This stored file can then be played back to the digital audio system where it will be reloaded into the configuration EEproms of all the appropriate cards in the system.

The data returned by this command is as follows:

BYTE 1 = 's'
BYTE 2 = '5'
BYTE 3 = 'A'
BYTE 4 = 'A'
BYTE 5 = '5'
BYTE 6 & 7 = TRACK# (00 to FF)

BYTE 8 through 72 = ASCII HEX DATA DUMP FROM CONFIGURATION EEprom
BYTE 73 = CARRIAGE RETURN
BYTE 74 = LINE FEED

EXAMPLE: to poll the configuration for card 00: r00

s5AA5000020000A0431044000010200010203040506070100000000
F0010100100A0864

.....

"s" (TRACK#) (STRING) Load Configuration:

This command loads the string that follows it into the configuration EEprom for the Digital Audio Repeater specified by the TRACK#. This command is used to load the configuration from another source into one or more Digital Audio Repeater. Since the Configuration Dump command leads off its string with a 's5AA5', data saved in the Configuration Dump command can be reloaded into the audio system by simply sending back to it.

To do this:

1) Tell your modem program to delay slightly between characters so you don't over run the input buffer of the Digital Audio Repeater (or lower the baud rate 110 or so).
2) Tell your computer to send out the previously saved output string from the Configuration Dump command.

.....

Start Commands

"t" (TRACK#)	**Start Track:**
"u"	**Start All:**
"v"	**Start Cocked:**
"w" (GROUP#)	**Start Group:**

These commands start the digital audio Repeater playing on the card(s) addressed by the command. If an addressed card is looping, it will have its looping mode reset. If the card is already playing, it can be configured to do one of the following things:

1) IGNORE IT.
2) SAVE THE START UNTIL IT FINISHES RUNNING.
3) JUMP TO THE START OF THE NEXT SPIEL.
4) JUMP TO THE START OF THE CURRENT SPIEL.

If the card receives a start command after it has received a request for a specific spiel, it will play that spiel. Requests for specific spiels can come from the serial port (highest priority), the AUX PORT (middle priority), and the jump forward, looping, and jump back internal show requests (lowest priority).

.....

Stop Commands:

"x" (TRACK#)	**Stop Track:**
"y"	**Stop All:**
"z"	**Stop Cocked:**
"G" (GROUP#)	**Stop Group:**

These commands stop the selected card(s) unconditionally. The stop takes place after the current 1 KByte block of sound data has played.

.....

Reset Commands:

"H" (TRACK#)	**Reset Track:**

"I"	**Reset All:**
"J"	**Reset Cocked:**
"K" (GROUP#)	**Reset Group:**

These commands reset the addressed card(s) to the start of their memory. If the cards are running, the reset takes place after the current 1 KByte block of sound data has played. The sound then continues from the start of the memory. A start delay will only take place after a card has received a RESET.

.....

Mute Commands:

"L" (TRACK#)	**Mute Track:**
"M"	**Mute All:**
"N"	**Mute Cocked:**
"O" (GROUP#)	**Mute Group:**

These commands unconditionally mute the card(s) selected. If the card(s) selected are already half-muted this command will override that condition and fully mute them.

.....

Half-Mute Commands:

"P" (TRACK#)	**Half-Mute Track:**
"Q"	**Half-Mute All:**
"R"	**Half-Mute Cocked:**
"S" (GROUP#)	**Half-Mute Group:**

NOT USED WITH AB-100 AudioBrick: These commands unconditionally half-mute the card(s) selected. If the card(s) selected are already muted this command will override that condition and half-mute them.

.....

Un-Mute Commands:

"T" (TRACK#)	**Un-Mute Track:**
"U"	**Un-Mute All:**
"V"	**Un-Mute Cocked:**
"W" (GROUP#)	**Un-Mute Group:**

These commands unconditionally un-mute the card(s) selected. If the card(s) selected have their PA system active, the PA system will continue to hold the cards in a half-muted condition until it is finished.

.....

"X" (TRACK#) **Cock Track:**

This command sets the cocked flag on the Digital Audio Repeater Card specified by the TRACK#. Until this flag is reset, this card will respond to all COCKED commands. Any number of cards can be cocked at the same time. This flag will be reset upon the receipt of any 'COCKED' command, or by using one of the two following RESET COCKED commands.

EXAMPLE: to cock card 00: X00

.....

"Y" (TRACK#) **Un-Cock Track:**

This command resets the cocked flag on the Digital Audio Repeater Card addressed by the TRACK#. After this flag is reset, the addressed card will no longer respond to COCKED commands.

EXAMPLE: to un-cock card 00: Y00

.....

"Z" **Un-Cock All:**

This command resets the cocked flag on all the Digital Audio Repeater

Cards in the system. After the cocked flags are reset, no cards in the system will respond to any COCKED commands.

EXAMPLE: to un-cock all cards in the system: ℤ

.....

Loop Commands:

"!" (TRACK#)	**Loop Track:**
""	**Loop All:**
"#"	**Loop Cocked:**
"$" (GROUP#)	**Loop Group:**

These commands work exactly like the Start Commands, except that at the end of the current spiel, it will start over again. This will continue until:

1) Another spiel is selected and this new spiel will begin looping.
2) A stop command is received.
3) A start command is received.
4) A stop-at-end command is received.

If the card that is looping has any value other than 0000, then this delay will be inserted between each iteration of the loop. This allows you to record a fairly short announcement and put along enough delay between each time it repeats so that it won't drive everyone crazy. The delay value can be set in the field through hardware and software to adjust how often the spiel repeats. The delay can be set from 0 on up to about 1/2 an hour in 1/34th second increments.

Looping mode usually plays a single spiel over and over again. If the LOOP ALL option is enabled, then all the spiels recorded on the card will play in succession. The delay, if enabled, will be inserted between each spiel.

If the spiel that is looped is located in the first 16 memory chips and there is no delay entered, then the card will use a special fast looping mode. This will give you 'seamless' looped spiels. To accomplish the fast looping mode, the start of the loop is considered to be where ever the last start or loop command was given. What this means is that if you play a part of a spiel located in the first 16 memory chips and then stop the card, and then restart (followed by a loop command) or loop it, the card will play to the end of the spiel and then loop back to wherever the card was when the start or loop command was entered. Assuming you normally start the spiel from its beginning, this shouldn't cause any problems. Any spiel that extends beyond the first 16 memory chips or has a delay entered will always play a looped spiel from its start. This means that there is a slightly longer delay between the end of a spiel and the time it starts over.

.....

Stop At End Commands:

"%" (TRACK#)	**Stop At End Track:**
"&"	**Stop At End All:**
"'"	**Stop At End Cocked:**
"(" (GROUP#)	**Stop At End Group:**

These commands tell the card(s) selected to stop playing when the end of the current spiel is reached. This allows a spiel that is playing in the looping mode to run to its end before stopping. This compares to the normal STOP commands, which would make the Repeater stop the the instant they are received.

.....

Select Spiel Commands:

")" (TRACK#) (SPIEL#) **Select Spiel Track:**
"*" (SPIEL#) **Select Spiel All:**
"+" (SPIEL#) **Select Spiel Cocked:**
"/" (GROUP#) (SPIEL#) **Select Spiel Group:**

Up to 255 different recordings can be stored on a single card. Each of these individual recordings are called 'spiels'. These commands can be used to select an individual spiel on the selected card(s). Individual spiels can be requested with SPIEL# requests with a range of 01 to FF. Once a spiel is selected, it will be played on the next start. If the card is looping then it will play the requested spiel on the next iteration of the loop. If a spiel selection has been made inadvertently, it can be cleared by sending a request for SPIEL# 00. Spiel requests from the serial port have the highest priority in the system.

":" (TRACK#) (DELAY TIME) **Set Delay:**

This command allows the user to adjust the time set for the delay function on the card selected by TRACK#. The delay can serve two functions:

1) Delay the actual start of playing from 1/34 th of a second to about 1/2 hour from the time the start command is received after a reset command.
2) While in looping mode, delay for a period of 1/34 th of a second to about 1/2 hour between each iteration of the loop.

Acceptable values for DELAY are from 0000 to FFFF. Each count is equal to .029127111 seconds. If the value is 0000, the function is disabled.

EXAMPLE: to give card 00 a delay value of 1 minute (080CH is equal to 2060 counts, which is equal to 60.00184866 seconds): :00080C

"=" (TRACK#) (ADDRESS) **Set Memory Address:**

Address bits 10 through 42 for the Eprom array are stored in the microcontroller. These can be read out using the Memory Address Status command, or loaded using this command. Because the addressing for any memory chips mounted on expansion boards is not direct, this method can only be used for accessing the first 16 memory chips. If the system is running when this command is received, then after the current 1 KByte is played, the new address will take effect. If the system is stopped when this command is received, then it will take effect as soon as the card is started.

Setting address values only effects the first 16 memory chips.

EXAMPLE: to set the Digital Repeater on card 00 to address 12345678: =0012345678

Clock Commands:

"<" (TRACK#) **Stop Clock:**
">" (TRACK#) **Start Clock:**

NOT USED WITH AB-100 AudioBrick: Only one card in the entire digital audio system will normally be enabled as the master clock for all the Digital Audio Repeaters in the system. For multi track systems, starting together and then running from the same clock will usually give a good enough synchronization between tracks. If a greater level of synchronization is needed, these commands can be used. They must be used cautiously, however, as they can cause problems if used improperly.

These commands are used to start and stop the clock on the card speci-

fied by the TRACK#. To use these commands to tighten the synchronization between cards, you will need to stop the clock before issuing Start Commands, and then restart the clock. If the clock remains stopped for too long, the dead man timer will time out and reset the cards. The dead man time is about 1 second.

EXAMPLE: to start clock on card 00: <00

EXAMPLE: to stop clock on card 00: >00

.....

"?" (HALF-MASK) (FULL-MASK) Mute Masks:

This command usually comes from the PA MASTER in a digital audio system that is equipped with a PA system.

This command is followed by an 8 bit half-mute mask and an 8 bit full-mute mask. Any bits on these two masks which match enabled full and half mute zones will cause an appropriate mute level to be taken.

EXAMPLE: to mute zone 1, 5 and 6, and half mute zone 3, 4, and 8: ?8C31

.....

"[" (PA ZONE) (PA STATION) (TRUNK#) PA Command:

NOT USED WITH AB-100 AudioBrick: This command usually comes from the PA MASTER in a digital audio system that is equipped with a PA system.

This command opens the TRUNK# for each valid request for a PA ZONE. The only PA ZONES that any card will respond to are those which have been enabled through the setup routine.

If the PA STATION number is equal to the TOP PRIORITY PA STATION for a given card, then that PA request will take priority over all other PA requests for that card. The same holds true for the SECOND PRIORITY PA STATION, except that TOP PRIORITY PA requests will take precedence over these too.

If no other priority options are 'on', then all other valid PA requests are treated equally. If more than one valid PA request is active at a time, the audio from both will be mixed.

If the STANDARD PRIORITIES are on, then it uses the PA STATION number to prioritize PA requests. Any request from a higher numbered PA STATION will take precedence over lower numbered PA STATIONS. Only one PA request is allowed on at a time.

If the ZONE PRIORITIES are on, then it uses the PA ZONE number to prioritize PA requests. Any request from a higher numbered PA zone will take precedence over lower numbered PA zones. Only one PA request is allowed on at a time.

If both ZONE and STANDARD PA PRIORITY options are 'on', then the system will use a combination of the two priorities. If the PA system is active and a request from either a higher numbered PA STATION or PA ZONE comes in, the new request will be honored. All other requests will be ignored.

EXAMPLE: if a pa request comes in from PA STATION 55 to access PA zone AA, with the audio feed to be found on trunk line 3: [AA553

.....

"]" (TRUNK#) Clear PA Request:

NOT USED WITH AB-100 AudioBrick: This command usually comes from the PA MASTER in a digital audio system that is equipped with a PA system.

This command is used to clear PA requests on the digital audio Repeater

cards. When a valid PA request comes in to any card, it opens up the appropriate PA TRUNK LINE to feed the audio from the PA STATION to the Repeater card. This command clears the PA request by turning off the TRUNK# of the PA request. If all the trunk lines are off, then it turns off the PA LED on the front of the card and allows the mute level to return to whatever it was before.

EXAMPLE: to clear any PA requests which used trunk line 3:]3

Summary of AB-100 AudioBrick Serial Port Commands:

"a" (TRACK#)	Enter Setup Echo Mode:
"b"	Exit Setup Echo Mode:
"c" (TRACK#)	Enter Global Echo Mode:
"d"	Exit Global Echo Mode:
"e" (TRACK#)	Enter Echo All Mode:
"f"	Exit Echo All Mode:
"g"	Enter Echo Mode:
"h"	Exit Echo Mode:
"i" (TRACK#)	Track Status Report:
"j" (5AA5)	Special Default Setup:
"k" (TRACK#)	LED Port Status:
"l" (TRACK#)	Switch Status:
"m" (5AA5) (TRACK#)	Enter Configuration Mode:
"n" (TRACK#)	Memory Address Status:
"o" (TRACK#)	Dipswitch #1 Status:
"p" (TRACK#)	Dipswitch #2 Status:
"q" (TRACK#)	Aux. Port Status:
"r" (TRACK#)	Configuration Dump:
"s" (TRACK#) (STRING)	Load Configuration:
"t" (TRACK#)	Start Track:
"u"	Start All:
"v"	Start Cocked:
"w" (GROUP#)	Start Group:
"x" (TRACK#)	Stop Track:
"y"	Stop All:
"z"	Stop Cocked:
"G" (GROUP#)	Stop Group:
"H" (TRACK#)	Reset Track:
"I"	Reset All:
"J"	Reset Cocked:
"K" (GROUP#)	Reset Group:
"L" (TRACK#)	Mute Track:
"M"	Mute All:
"N"	Mute Cocked:
"O" (GROUP#)	Mute Group:
"P" (TRACK#)	Half-Mute Track:
"Q"	Half-Mute All:
"R"	Half-Mute Cocked:
"S" (GROUP#)	Half-Mute Group:
"T" (TRACK#)	Un-Mute Track:
"U"	Un-Mute All:
"V"	Un-Mute Cocked:
"W" (GROUP#)	Un-Mute Group:
"X" (TRACK#)	Cock Track:
"Y" (TRACK#)	Un-Cock Track:
"Z"	Un-Cock All:
"!" (TRACK#)	Loop Track:
"""	Loop All:
"#"	Loop Cocked:
"$" (GROUP#)	Loop Group:
"%" (TRACK#)	Stop At End Track:
"&"	Stop At End All:
"'"	Stop At End Cocked:
"(" (GROUP#)	Stop At End Group:

")" (TRACK#) (SPIEL#)	**Select Spiel Track:**
"*" (SPIEL#)	**Select Spiel All:**
"+" (SPIEL#)	**Select Spiel Cocked:**
"/" (GROUP#) (SPIEL#)	**Select Spiel Group:**
":" (TRACK#) (DELAY TIME)	**Set Delay:**
"=" (TRACK#) (ADDRESS)	**Set Memory Address:**
"<" (TRACK#)	**Stop Clock:**
">" (TRACK#)	**Start Clock:**
"?" (HALF-MASK) (FULL-MASK)	**Mute Masks:**
"[" (PA ZONE) (PA STATION) (TRUNK#)	**PA Command:**
"]" (TRUNK#)	**Clear PA Request**

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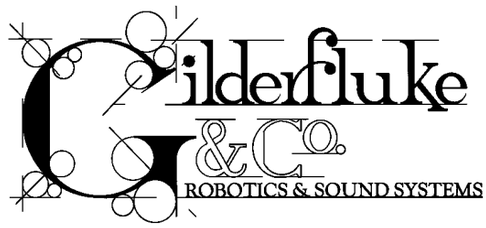

AB-Clock Configuration:

To configure the AB-Clock through the serial port, you need to connect the system just as you do for any serial communications (see the 'AB-100 AudioBrick Serial Port Commands' section of the manual). The serial port interface on the AB-Clock is a bit different from most of the products offered by Gilderfluke & Company. Most of our products are designed to be operated on a multi-drop serial network. The AB-Clocks are designed to be the only piece of equipment on the serial network at one time. As soon as the serial port of the AB-Clock is attached to the serial port it will start outputting data to the screen of your computer. At the very least you should see the time being updated each second. Hit the <ESC>ape key to redraw the screen. The screen shown is the default configuration.

```
- MACs DIGITAL AUDIO CLOCK rev. 1.05 copyright 1989-1996 GILDERFLUKE & Co. DCM -

a) Select & play a sound  | k) sound on hour- 03       | H) set clock
b) Baud rate- 9600        | l) sound on 1/4 hour- 04   |
c) odd parity- no         | m) sound on 1/2 hour- 05   | I) set tolling hours
d) EPROM type- 27C040     | o) sound on 3/4 hour- 06   | J) skip weekends- no
e) Inputs debounce- 10    | p) sound on chime 1- 01    |
                          | q) sound on chime 2- 02    | K) schedule displayed
f) pulse output once      |                            | L) modify schedule
g) status output- 1 PPM   | t) sound on tick- none     |
                          | u) sound on tock- none     | M) download
h) A input action- 01     | v) tick/tock delay- 02     | O) reload defaults
i) B input action- 02     |                            |
j) PB input action- next  | w) J-6 direct select- yes  | X) eXit

                                hours for weekly tolling: none
 01) none       |07) none       |13) none       |19) none       |25) none
 02) none       |08) none       |14) none       |20) none       |26) none
 03) none       |09) none       |15) none       |21) none       |27) none
 04) none       |10) none       |16) none       |22) none       |28) none
 05) none       |11) none       |17) none       |23) none       |29) none
 06) none       |12) none       |18) none       |24) none       |30) none

                        23:59:59 Monday 12/31/99 - enter password-
```

The password for entering the configuration mode is:

"m5AA5"

Entering this will change the 'enter password' prompt to 'enter command'. When entered, it allows you to adjust all the variables in the AB-Clock. To permanently save changes you have made in the configuration you must use the 'eXit' command and tell the AB-Clock to 'save configuration'. Any changes made to the eight special show schedules will be permanently recorded as they are made.

If another command is entered while the last command is waiting for additional input, the new command will be started. If at any point you enter a command in error and it is waiting for additional input, you can leave the command by entering an <ESC>ape key. This will leave the original configuration unaltered.

You can keep a hard copy printout of the current configuration of any AB-Clock. To do this you just hit the <ESC>ape key to redraw the screen while saving the text with your modem program. This file can then be printed out at any time.

"a" Select and Play a Sound:

This command is used when you just want to play any sound recorded in the AB-Clock. Valid entries are from 1 to 98 to select specific spiels, or 99 to hear whatever spiel is next in line.

"b" Baud Rate:

The serial port on each AB-Clock can support any of the following baud rates:

- 110
- 150
- 300
- 600
- 1200
- 2400
- 4800
- **9600 (default value)**
- 19,200
- 48,000
- 96,000

The lower baud rates will require that the dead man circuit be disconnected (U-7 pin #6) while in configuration mode. The reason for this is that the dead man needs to be updated about once a second. At the lowest baud rates it will be spending so much time printing that it will time out and reset the system. 9600 baud is an average speed to run the system.

The default speed is 9600 baud. This command doesn't take effect until you enter the eXit command.

"c" Odd Parity Toggle:

This toggle enables the ODD PARITY data check on the serial port on the AB-Clock. Parity is a method of confirming that the data sent to the audio system arrives intact. Any data that gets jumbled is ignored. If ODD PARITY is enabled, it must be enabled on your computer or terminal. The default value for this command is OFF. This command doesn't take effect until you enter the eXit command. It is not normally used.

"d" Eprom Type:

The following types of Eproms are currently supported by the AB-Clocks:

- 27C512
- 27C010
- 27C020
- **27C040 (default setting)**
- 27C080

All the Eproms on an AB-Clock must be of the same type. This command doesn't take effect until the eXit command is completed.

"e" Input Debounce:

This sets the number of times the firmware inside the AB-Clock will check an input before it believes that it is valid. A typical value is 10 or so. If you are operating in a particularly noisy electrical environment, you may need to raise this to prevent false triggering.

"f" Pulse Output Once:

This command is used when the Status Output is set to pulse once each minute to run 'regulator' or 'remote' style clocks. It will pulse the status output once to assist you in setting this style of clock.

"g" Status Output:

This toggle allows you to choose what will be done with the Status Output from the AB-Clock. The options are:

a) One Pulse per Minute. This is typically used to run 'regulator' or 'remote' style clocks that require a single electrical pulse to step forward by one minute.
b) One Pulse per Second. Typically used when setting 'regulator' or 'remote' style clocks
c) Status. When operating in this mode, the status output will be active whenever the AB-Clock is playing a sound.

Input Actions:

"h" 'A' Input Action:
"i" 'B' Input Action:
"j" 'PB' Input Action:

These commands select what actions will take place on a closure to the A, B, or Manual Start Pushbutton on the front of the AB-Clock. The options are:

a) No action
b) Select a spiel number from 01 to 97 and play it (enter a value from 1 to 97 to do this)
c) Mute the AB-Clock. When in this mode, the word 'MUTED' will appear on the command line on the screen (if any) and no sounds will be started by the AB-Clock until this signal is removed. Sounds selected by the other hardware inputs or from the Select and Play a Sound command will still be played (enter a value of '98' to do this). This mode is used to attach a remote 'on/off' switch to the AB-Clock.
d) Select whatever the next spiel is and play it (enter a value of '99' to do this)

Sounds for Automatic Tolling:

"k" Sound On Hour:
"l" Sound On 1/4 Hour:
"m" Sound On 1/2 Hour:
"o" Sound On 3/4 Hour:

These sounds are what will be played on the full, quarter, half, and three quarter hour marks. Your options are as follows for each of these:

a) No action
b) Select a spiel number from 01 to 98 and play it (enter a value from 1 to 98 to do this)
c) Select whatever the next spiel is and play it (enter a value of '99' to do this)

"p" Sound On Chime 1:
"q" Sound On Chime 2:

These commands select what sound will be played when the AB-Clock is

tolling the hours on each full hour. 'CHIME 1' is the sound played for all but the last chime in a sequence, which is played as 'CHIME 2'. This allows the last chime to be recorded with a much longer fade out than those which are called up by 'CHIME 1'. Options for these two entries are as follows:

a) No action
b) Select a spiel number from 01 to 98 and play it (enter a value from 1 to 98 to do this)
c) Select whatever the next spiel is and play it (enter a value of '99' to do this)

.....

"t" Sound On Tick:
"u" Sound On Tick:

These commands select the two sounds that will be alternated with a delay between them set by the TICK TOCK DELAY. Options for these two entries are as follows:

a) No action
b) Select a spiel number from 01 to 98 and play it (enter a value from 1 to 98 to do this)
c) Select whatever the next spiel is and play it (enter a value of '99' to do this)

Along with the obvious tick and tock applications for these two settings, with a fairly long delay they can also be used when you need to alternate between any two announcements. i.e. "the white zone is for loading...." and "unauthorized vehicles will be towed.....".

.....

"v" Tick/Tock Delay:

This command lets you set how many seconds will elapse between each tick or tock sound. Valid entries are from 00 (none) to 99 seconds. If a period of less than one second is required between the tick and tock sounds, a single spiel that holds both sounds can be recorded and played back on both the ticks and the tocks.

.....

"w" J-6 Direct Select:

When toggled 'ON', this command tells the AB-Clock to use a 'one of eight' selection for the 1/4 J-6 port on the AB-Clock. When in this mode, bit 0 selects spiel number one, bit 1 selects spiel number two, ... up through bit 6 selecting spiel number seven.

When toggled 'OFF', spiel selections are made through the 1/4 J-6 input on the AB-Clock by presenting it with a binary pattern. This allows you to select spiels 1 through 255.

.....

"H" Set Clock:

These commands are used to set the battery backed up real time clock inside the AB-Clock, and are used exactly as you would expect them to be used. The final question is whether you would like the AB-Clock to automatically adjust for Daylight Savings' Time. If you answer Yes to this question, the clock will automatically jump forward by on hour on the first Sunday in April, and fall back on the last Sunday in October. The clock is set and the seconds cleared to 00 immediately upon selecting the Daylight Savings option.

.....

"I" Set Tolling Hours:

Sometimes the neighbors don't like to hear a clock tolling at all hours of the night. This command is used to set the hours during which the AB-Clock will make noise if it has been set to tick and/or tock, chime on any of the quarter hours or toll the full hours. Just like the special schedules, you can set different operating hours for each of the days of the week, or one weekly operating hour setting for seven (or five) days of the week. The daily operating hours take precedence over the weekly settings.

Entering this command will prompt you for two different hours. Depending on the values entered, and the order they are entered, in there are four different options you can choose.

a) If you enter 00 and 00 for the two entries on any of the daily schedules, they will use the weekly operating hours, if any. This will be displayed as follows (the word 'Sunday' will be replaced by whichever day has been selected for display and editing by the Schedule Displayed command below):

Hours for Sunday tolling: using weekly hours

If you enter 00 and 00 for the two entries on the weekly schedule, then there will be no hours set for the operating hours. This is displayed as:

Hours for weekly tolling: none

b) If you enter two identical numbers for the start and stop times, then you will have selected (the word 'weekly' will be replaced by whichever schedule has been selected for display and editing by the Schedule Displayed command below):

Hours for weekly tolling: 24 hour operation

c) If you enter smaller hour first, and then a larger hour, then the automatic tolling will play only for the hours selected. This is displayed as follows (the word 'weekly' will be replaced by whichever schedule has been selected for display and editing by the Schedule Displayed command below):

Hours for weekly tolling: 08:00-10:00

d) If you enter a larger hour first, and then a smaller hour, the AB-Clock will start tolling at midnight and continue until the smaller hour is reached. It will be silent until the larger entry is reached. This is used when you want the AB-Clock to pause its operations for a period during the night. This is displayed as follows (the word 'weekly' will be replaced by whichever schedule has been selected for display and editing by the Schedule Displayed command below):

Hours for weekly tolling: 00:00-02:00 / 08:00-23:59

"J" Skip Weekends:

There are seven daily schedules and one weekly schedule in the AB-Clock. The daily schedules are used for the operating hours and special shows for Sunday through Saturday. The eighth (weekly) schedule is used to set the operating hours and special shows which will be used:

a) seven days a week when this toggle is 'OFF'
b) five days a week when this toggle is 'ON'

This feature is typically used in school and business and installations where the Monday through Friday bell schedule is set using the weekly schedule.

"K" Schedule Displayed:

There are seven daily schedules and one weekly schedule in the AB-Clock. The daily schedules are used for the operating hours and special shows for seven days Sunday through Saturday. The eighth (weekly) schedule is used to set the operating hours and special shows that will be used five or seven days a week (see the SKIP WEEKENDS command). This command is used to select which of these eight schedules will be displayed along the bottom of the screen for modification by the SPECIAL SHOWS command.

"L" Modify Schedule:

There are seven daily schedules and one weekly schedule in the AB-Clock. The daily schedules are used for the operating hours and special shows for seven days Sunday through Saturday. The eighth (weekly) schedule is used to set the operating hours and special shows that will be used five or seven days a week (see the SKIP WEEKENDS command). This command is used to change the settings of the schedule that is currently being displayed. This command will ask you:

a) The first question asked is which entry you would like to change (01 through 30).
b) the time you would like this special show to play at.
c) Which show you would like to hear. Entering '00' will simply play whatever show is next in the sequence. Entering 01 through 31 will select and play a specific show at the time you entered.

Entering all 0's for the time and the show you want to play will clear out a special request and the word 'none' will be displayed on the screen.

"M" Configuration Download:

This command responds with the current contents of the configuration EEprom for the AB-Clock. This string of 1031 ASCII characters is led off by the character string 's5AA5'. As it happens, this is the lead in string for the CONFIGURATION LOAD command. This allows you to save the configuration of one or more AB-Clocks in your computer for later retrieval or archiving, and then simply and easily reload this data at any time. To save the data to the disk of your computer:

1) Give this command to the AB-Clock.
2) Tell your computer to save all ASCII received from the AB-Clock.
3) Hit the <Space Bar> to start the AB-Clock sending out data.
4) Stop receiving data and save all stored input to your computer's disk drives when the AB-Clock has finished.
5) Hit the <space Bar> again to return to the normal menu on the AB-Clock.

The data returned by this command is as follows:

BYTE 1 = 's'
BYTE 2 = '5'
BYTE 3 = 'A'
BYTE 4 = 'A'
BYTE 5 = '5'
BYTES 6 through 1029 = ASCII HEX DATA DUMP FROM CONFIGURATION EEprom
BYTE 1030 = CARRIAGE RETURN

BYTE 1031 = LINE FEED

.....

"O" **Reload Defaults:**

This command is used to part or all of the memory back to its default status. When it is invoked it asks:

"1= clear only menu, 2=clear this schedule, 3=clear all schedules (1-3)-"

Hitting #1 will only clear out the variables that appear on the main menu. Hitting #2 will only clear out the schedule that is currently being displayed on the main menu. Hitting #3 will clear out all eight of the schedules.

.....

"x" or "X" **eXit Setup Mode:**

This command is used to exit the setup mode. If you hit this command in error, hitting an <ESC>ape key will get you back to the setup mode. All the setup commands that don't take effect immediately, take effect when the eXit command is entered. This includes things like the BAUD RATE, so you will have to change the baud rate of the terminal you are using at this time.

The eXit command asks you if you want to save the current setup permanently. If you answer 'Y', the EEprom will be written with the current configuration. If you answer 'N', the setup mode will be exited without writing to the EEprom.

Note that the operating hour schedules are written to the EEprom as they are entered.

Summary of AB-Clock Setup Commands:

"a"	Select and Play a Sound:
"b"	Baud Rate:
"c"	Odd Parity Toggle:
"d"	Eprom Type:
"e"	Input Debounce:
"f"	Pulse Output Once:
"g"	Status Output:
	Input Actions:
"h"	'A' Input Action:
"i"	'B' Input Action:
"j"	'PB' Input Action:
	Sounds for Automatic
Tolling:	
"k"	Sound On Hour:
"l"	Sound On 1/4 Hour:
"m"	Sound On 1/2 Hour:
"o"	Sound On 3/4 Hour:
"p"	Sound On Chime 1:
"q"	Sound On Chime 2:
"t"	Sound On Tick:
"u"	Sound On Tick:
"v"	Tick/Tock Delay:
"w"	J-6 Direct Select:
"H"	Set Clock:
"I"	Set Tolling Hours:
"J"	Skip Weekends:
"K"	Schedule Displayed:
"L"	Modify Schedule:
"M"	Configuration Download:
"O"	Reload Defaults:
"x" or "X"	eXit Setup Mode:

AB-Clock Serial Port Command:

This command will only be accepted by the AB-Clock when it is not already in configuration mode.

"s" (TRACK#) (STRING) Load Configuration:

This command loads the string that follows it into the configuration EEprom for the AB-Clock. This command is used to load the configuration into an AB-Clock. Since the CONFIGURATION DUMP command leads off its string with a 's5AA5', data saved in the configuration dump command can be reloaded into the audio system by simply sending back to it.

To do this:

1) Tell your modem program to delay slightly between characters so you don't over run the input buffer of the AB-Clock (or lower the baud rate).
2) Tell your computer to send out the previously saved output string from the CONFIGURATION DUMP command.

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Summary of AB-Clock Command:

"s" (TRACK#) (STRING) Load Configuration:

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- MX-100 / MX-200 -
- Memory Expansion Boards -
for use with AB-100
Digital Audio Repeaters

A MX-100 or MX-200 Memory Expansion Board is used to increase the capacity of a Digital Audio Repeater by thirty-two additional memory chips. Any number of these memory expansion cards can be used on any Repeater card within the physical space limitations of the Repeater housing. The practical limits are three MX-100's in an AB-100 AudioBrick case. This gives a capacity of up to 112 Eproms on an AB-100 AudioBrick or AB-Clock.

The MX- expansion cards, like the Repeaters they work with, support Eproms from 27C512 (64 KBytes x 8) up to 27C080 (1024 KBytes x 8). A red LED on each MX- card shows when the memory chips on that card are active. All Eprom sockets in the Repeater card with which the MX- is used with must be filled. The Eproms on the MX- card are installed starting with the socket marked as 'ROM 1' and extending through the socket marked 'ROM 32'. There can be no breaks in the Eprom sequence, and the MX- card must be completely filled if additional MX- cards are going to be used.

WHEN INSTALLING Eproms, BE SURE TO OBSERVE THE 'PIN ONE' MARKINGS ON THE Eproms, SOCKETS, AND PRINTED CIRCUIT BOARDS. PLUGGING AN Eprom IN BACKWARDS CAN DAMAGE BOTH THE Eprom AND REPEATER!

The only difference between the MX-100 and the MX-200 are the height above the board the Eproms take. The MX-100 is the standard card. The Eproms are mounted in standard-style Eprom sockets and the cards can be used in any memory expansion card position. The MX-200 cards use special low profile Eprom sockets. They are used when there isn't room to mount a normal MX-100 card. MX-200 cards can only be used as the last or only card in a stack of memory cards. They don't have connectors on their top to allow additional MX- cards to be stacked on their tops.

Configuration and Installation:

Each MX- Repeater card plugs into J-5 (2 x 17 pin header) and J-4 (1 x 24 pin header) on the card below. They are mounted by four 6-32 standoffs from the card below.

The Repeater card to which the first MX- card is attached must have four 6-32 x 1/2" hex standoffs attached to it. With AB-100 AudioBricks and AB-Clocks, the standoffs are 6-32 x 1/2" male/female spacers which replace the screws which normally mount the card into the case.

MX- cards beyond the first one all mount using 6-32 x 7/16" male/female spacers (or a 6-32 x 3/8" male/female spacer with a 1/16" thick nylon washer under it) to the MX- card below them. The last card in the series is fastened down with four 6-32 x 1/4" round head machine screws.

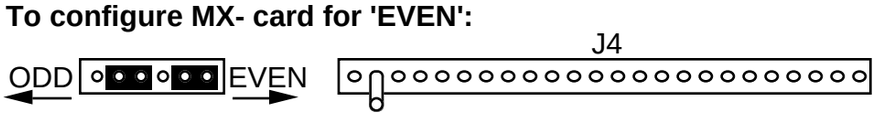
The MX-100 cards are all configured as either 'EVEN' or 'ODD' cards. The first card on top of the Repeater is always an 'EVEN' one. The cards are always configured as follows:

FIRST MX- MEMORY EXPANSION = EVEN
SECOND MX- MEMORY EXPANSION = ODD
THIRD MX- MEMORY EXPANSION = EVEN
FOURTH MX- MEMORY EXPANSION = ODD
FIFTH MX- MEMORY EXPANSION = EVEN
SIXTH MX- MEMORY EXPANSION = ODD
SEVENTH MX- MEMORY EXPANSION = EVEN

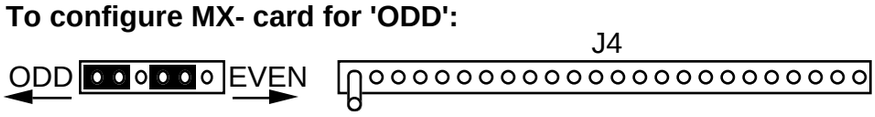
All MX-200 cards are factory configured as EVEN card, since they are normally mounted in the first, third, fifth, or seventh MX- positions.

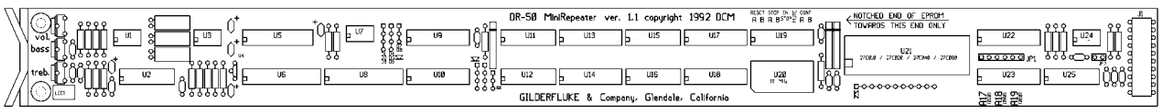
To configure an MX-100 card, two jumpers are moved to the positions shown below, and one of the pins on the J-4 connection is bent downward slightly so that this one pin doesn't plug into any additional MX- card which is mounted on top of it. If the configuration of the MX- cards is to be made permanent, these pins can be cut off instead of merely bent.

To configure MX- card for 'EVEN':

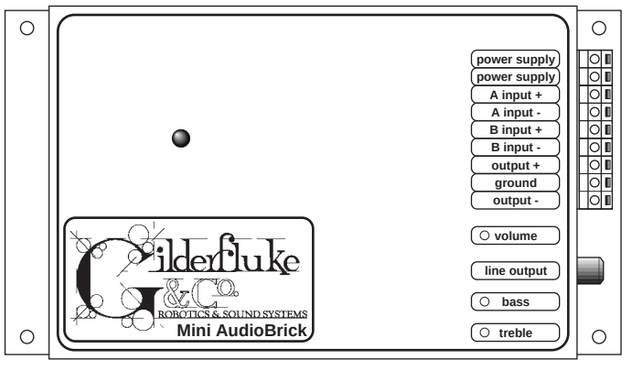


To configure MX- card for 'ODD':





- DR-50 MiniRepeaters -



- AB-50 Mini AudioBricks -

AB-50 and DR-50 MiniRepeaters are used where all you need is a fairly short sound with a good quality audio output. Their output quality is up to 15 KHz bandwidth with a dynamic range of 72 dB. This is roughly equivalent to the audio quality of a new cassette tape. Being completely solid state, the sound that is recorded into a MiniRepeater will sound exactly as good twenty or thirty years after it was installed. They never need any preventative maintenance.

Any sound that can be recorded can be digitized into a Digital Audio Repeater. This includes any type of chimes, bells, voice announcements, music, alarms or sound effects. The MiniRepeaters can be configured to run continuously or play only when triggered. More than one sound can be recorded on each MiniRepeater as long as it is within the total capacity of the memory installed. Each spiel can be recorded at a different bandwidth, if desired. The spiels can be accessed sequentially (our full-sized Digital Audio Repeaters can access spiels randomly).

Each AB-50 or DR-50 MiniRepeater holds one Eprom for audio storage. This limits the maximum capacity of each repeater to about thirty seconds at its maximum bandwidth (15 KHz). At voice bandwidths this can be stretched to between sixty to ninety seconds. If longer play times are needed then we recommend the AB-100 AudioBrick. If a higher quality audio output is needed, we recommend the sixteen bit AB/DR-3000 series of CD-Quality Digital Audio Repeaters.

The DR-50 is a MiniRepeater card that is designed for installations where you need a large number of sounds that must be played simultaneously. Typical of these installations are theme park ride-through attractions, shooting galleries, museums and miniature golf courses. Up to thirty-two DR-50 cards can fit into each of these 1-3/4" tall, 19 inch rack mounted CC-3250 card cage.

The AB-50 circuitry is identical to the DR-50. The difference is that the AB-50 comes in its own 4" x 5" x 1" aluminum case. It is powered by the included 12 VAC wall mounted transformer. AB-50s are used where you need one

or more sounds at any remote location. You can just screw an AB-50 to the wall, attach an amplifier and speaker and you have a completed sound system.

Actual Playing Times for MiniRepeaters:

The following tables show in seconds the capacities of several different types of Eproms at several different fixed bandwidths. With the exception of when you are recording a 'silent spiel' or sub woofer rumble, it is rare to use sample rates below the 5 KHz bandwidth. All values shown are in seconds.

- 2 KHz Bandwidth (4,687 Hz UPDATE RATE) -

Eprom type:	27C010	27C020	27C040	27C080
Size:	**128K x 8**	**256K x 8**	**512K x 8**	**1 M x 8**
Number of bytes per Eprom:	**131,072**	**262,144**	**524,288**	**1,048,576**
One Eprom in each AB-50 or DR-50:	27.96 sec.	55.92 sec.	111.85 sec.	223.70 sec.

- 3 KHz Bandwidth (7,031 Hz UPDATE RATE) -

Eprom type:	27C010	27C020	27C040	27C080
Size:	**128K x 8**	**256K x 8**	**512K x 8**	**1 M x 8**
Number of bytes per Eprom:	**131,072**	**262,144**	**524,288**	**1,048,576**
One Eprom in each AB-50 or DR-50:	18.64 sec.	37.28 sec.	74.57 sec.	149.13 sec.

- 4 KHz Bandwidth (8,789 Hz UPDATE RATE) -

Eprom type:	27C010	27C020	27C040	27C080
Size:	**128K x 8**	**256K x 8**	**512K x 8**	**1 M x 8**
Number of bytes per Eprom:	**131,072**	**262,144**	**524,288**	**1,048,576**
One Eprom in each AB-50 or DR-50:	14.91 sec.	29.83 sec.	59.65 sec.	119.30 sec.

- 5 KHz Bandwidth (11,718 Hz UPDATE RATE) -

Eprom type:	27C010	27C020	27C040	27C080
Size:	**128K x 8**	**256K x 8**	**512K x 8**	**1 M x 8**
Number of bytes per Eprom:	**131,072**	**262,144**	**524,28**	**1,048,576**
One Eprom in each AB-50 or DR-50:	11.18 sec.	22.37 sec.	44.74 sec.	89.48 sec.

- 7.5 KHz Bandwidth (17,578 Hz UPDATE RATE) -

Eprom type:	27C010	27C020	27C040	27C080
Size:	**128K x 8**	**256K x 8**	**512K x 8**	**1 M x 8**
Number of bytes per Eprom:	**131,072**	**262,144**	**524,288**	**1,048,576**
One Eprom in each AB-50 or DR-50:	7.46 sec.	14.91 sec.	29.83 sec.	59.65 sec.

- 10 KHz Bandwidth (23,437 Hz UPDATE RATE) -

Eprom type:	27C010	27C020	27C040	27C080
Size:	**128K x 8**	**256K x 8**	**512K x 8**	**1 M x 8**
Number of bytes per Eprom:	**131,072**	**262,144**	**524,288**	**1,048,576**
One Eprom in each AB-50 or DR-50:	5.59 sec.	11.18 sec.	22.37 sec.	44.74 sec.

- 15 KHz Bandwidth (35,156 Hz UPDATE RATE) -

Eprom type:	27C010	27C020	27C040	27C080
Size:	**128K x 8**	**256K x 8**	**512K x 8**	**1 M x 8**
Number of bytes per Eprom:	**131,072**	**262,144**	**524,288**	**1,048,576**
One Eprom in each AB-50 or DR-50:	3.73 sec.	7.46 sec.	14.91 sec.	29.83 sec.

Configuration Dipswitches:

There are two opto-isolated inputs on each MiniRepeater which can be used for starting, stopping, and resetting them. All configuration for the DR-50's is done on an eight position Configuration Dipswitch (nine positions on the AB-50). These are used as follows:

SWITCH #1: RESET FROM 'A':

When this switch is turned on, the repeater will reset to the beginning of the first spiel every time the 'A' input is activated. This is an edge triggered input activated on the closing edge of the input.

SWITCH #2: RESET FROM 'B':

When this switch is turned on, the repeater will reset to the beginning of the first spiel every time the 'B' input is activated. This is edge triggered input activated on the closing edge of the input. Closing Switch #8 removes the one-shot circuit from this input for applications where the reset signal must be held.

SWITCH #3: STOP FROM 'A':

When this switch is turned on, the repeater will stop when the A input is released. This allows you to set up a card to start running when the A input is activated and stop as soon as this input is released. This can be used in conjunction with Switch #1 if you would like the repeater to always restart at the beginning of the first spiel.

SWITCH #4: STOP FROM 'B':

When this switch is turned on, the repeater will stop when the B input is activated. When used in conjunction with Switch #8 it will effectively lock out any starts from the card as long as the B input is held active.

SWITCH #5: ENABLE STOP:

When this switch is turned on, the repeater will pay attention to the 'stop' commands encoded into the Eprom. When off it will repeatedly play whatever is recorded on the Eprom until it is explicitly told to stop. You can use this switch to make a repeater start running from a pulse on the A input until you tell it to stop with a pulse on the B input.

To loop a sound on a AB/DR-50 with a delay between each iteration of the loop you will need to record tow spiels on the repeater. The first is the actual spiel you want to play. The second is a 'silent' spiel that is the length of the delay between each loop iteration. This 'silent' threshold is usually recorded at a 2 KHz sample rate with a 0 KHz filter rate. With this switch ON, the repeater will play both spiels as one.

SWITCH #6: MUTE ENABLE:

When this switch is turned on, the repeater will activate the mute input on the filter chip whenever the repeater is stopped. This reduces the quiescent noise level from the card and so is almost always left 'on'.

SWITCH #7: 'A' INPUT CONTINUOUS

When this switch is turned on, the A input is held continuously activated. Turning this switch on is the easiest way to make a card start looping as soon as power is applied. With this switch on the only way to stop the repeater is to turn on switches #2 and #8, and use the B input to stop (actually reset) the repeater.

SWITCH #8: 'B' INPUT CONTINUOUS

When this switch is turned on the one-shot circuit on the B input is disabled. When used in combination with other switches, it allows you to hold the repeater in a reset or stopped state through the B input.

SWITCH #9: 'A2' CONTINUOUS (THIS IS A JUMPER ON THE DR-50S)

When this switch is turned on the one-shot circuit on the A input is disabled. When this switch is 'on' with a combination of other switches, this will allow you to tell the AB-50 to loop as long as this input is held active. Turning this switch 'off' will enable the one shot on the 'A' input so that a signal on this input will only start the repeater once.

Eprom Installation:

The MiniRepeaters can hold a single Eprom in any of the following sizes:

27C010
27C020
27C040
27C080

The unused upper address bits are ignored in the smaller sized chips Eproms from most manufacturers. Some manufacturer's chips don't do this, and this is where JP-1 comes into play. If you find that your Eproms aren't working, cut the traces on the bottom of the board between pins 1 and 2, pins 3 and 4, and pins 5 and 6. With these pins disconnected, the unused pins on the Eproms are pulled up to 5 volts. For a given type of Eprom, insert the following jumpers:

27C010: none
27C020: 1 to 2
27C040: 1 to 2 and 3 to 4
27C080: 1 to 2 and 3 to 4 and 5 to 6

CC-3250 Connections for DR-50 MiniRepeaters:

The inputs and outputs from the backplane of the CC-3250 are connected as follows:

Top	1)	A input negative
	2)	A input positive
	3)	B input negative
	4)	B input positive
	5)	Ground
	6)	Negative audio output
Bottom	7)	Positive audio output

The A and B inputs require a powered switch closure. The voltage applied can be anywhere between 5 and 24 volts AC or DC.

The audio outputs are a + 10 dB balanced line level signal. If one of the two outputs is left floating, the output from the DR-50 will be excessively noisy. If you are using an amplifier with a single ended input, you will need to:

1) attach the shield to the amplifier to the GROUND connection.
2) attach the signal to the amplifier to the POSITIVE AUDIO OUTPUT connector.
3) attach the NEGATIVE AUDIO OUTPUT to the GROUND. A small piece of wire is needed to do this.

Power is connected to the CC-3250 through a four position screw terminal:

1) +5 volts DC
2) +12 volts DC
3) Ground
4) -12 volts DC

The DR-50 MiniRepeaters can be run from as low as +/- 12 VDC to as high as +/- 15 VDC. The +5 VDC Supply must be within 5% of 5 volts (tolerance is +/- .25 volt) for proper operation.

If you are Connecting Directly to a DR-50, the backplane connections are as follows:

Top	1)	A input negative
	2)	A input positive
	3)	B input negative
	4)	B input positive
	5)	Ground
	6)	Negative audio output
	7)	Positive audio output
	8)	+ 5 volt supply
	9)	+12 to +15 volt supply
Bottom	10)	-12 to -15 volt supply

CC-3251 Connections for DR-50 MiniRepeaters:

The CC-3251 card cage is the same as the CC-3250, except that the audio outputs are through four DB-25 connectors and the trigger inputs are through two 40 position ribbon cable connectors arranged in our standard 'J6'. Power supply connections are identical to the CC-3250.

Audio Outputs: Twenty-five position female DB-25 connector. This is used for the balanced audio outputs from the DR-50s installed in the card cage. Each DR-50 has one balanced audio output on it. The pinout of the the first of these connectors is as follows. The other three connectors are identical for the remaining cards' outputs.

The first connector is for cards one through eight.

The second connector is for cards nine through sixteen.

The third connector is for cards seventeen through twenty-four.

The fourth connector is for cards twenty-five through thirty-two.

	SIGNAL NAME	COLOR	SIGNAL FUNCTION
PIN #1	Ground 1	BROWN	card #1 Ground
PIN #14	+ Output 1	RED	card #1 Balanced Audio Line Level Positive (+)
PIN #2	- Output 1	ORANGE	card #1 Balanced Audio Line Level Negative (-)
PIN #15	Ground 2	YELLOW	card #2 Ground
PIN #3	+ Output 2	GREEN	card #2 Balanced Audio Line Level Positive (+)
PIN #16	- Output 2	BLUE	card #2 Balanced Audio Line Level Negative (-)
PIN #4	Ground 3	VIOLET	card #3 Ground
PIN #17	+ Output 3	GRAY	card #3 Balanced Audio Line Level Positive (+)
PIN #5	- Output 3	WHITE	card #3 Balanced Audio Line Level Negative (-)
PIN #18	Ground 4	BLACK	card #4 Ground
PIN #6	+ Output 4	BROWN	card #4 Balanced Audio Line Level Positive (+)
PIN #19	- Output 4	RED	card #4 Balanced Audio Line Level Negative (-)
PIN #7	Ground 5	ORANGE	card #5 Ground
PIN #20	+ Output 5	YELLOW	card #5 Balanced Audio Line Level Positive (+)
PIN #8	- Output 5	GREEN	card #5 Balanced Audio Line Level Negative (-)
PIN #21	Ground 6	BLUE	card #6 Ground
PIN #9	+ Output 6	VIOLET	card #6 Balanced Audio Line Level Positive (+)
PIN #22	- Output 6	GRAY	card #6 Balanced Audio Line Level Negative (-)
PIN #10	Ground 7	WHITE	card #7 Ground
PIN #23	+ Output 7	BLACK	card #7 Balanced Audio Line Level Positive (+)
PIN #11	- Output 7	BROWN	card #7 Balanced Audio Line Level Negative (-)
PIN #24	Ground 8	RED	card #8 Ground
PIN #12	+ Output 8	ORANGE	card #8 Balanced Audio Line Level Positive (+)
PIN #25	- Output 8	YELLOW	card #8 Balanced Audio Line Level Negative (-)
PIN #13	N/C	GREEN	

The balanced line drivers used on the DR-50s are a SSM-2142. This chip provides a high quality balanced output that is compensated for 600 ohm lines. **If operating in single ended mode, the unused outputs must be tied to their respective ground lines.** If you don't, the output will be excessively noisy.

Trigger Inputs: Each J6 cable is arranged in the following order. The inputs to the DR-50s are optisolated. You must provide a 12 to 24 VDC voltage to pins 10, 20, 30 and 40 of each cable. To protect the DR-50s from spikes on these connections, we reccomend an isolated power supply should be used for these connections. Any small 12 to 24 VDC power supply with a current capacity of about 1/2 amp (500 ma) will work fine.

The first connector covers the first sixteen DR-50s.

The second connector is for cards seventeen through thirty-two.

wire number	color	wire function
1	brown	circuit ground (no connection)
2	red	channel 0 data bit 7 (Card 4 Stop)
3	orange	channel 0 data bit 6 (Card 4 Start)
4	yellow	channel 0 data bit 5 (Card 3 Stop)
5	green	channel 0 data bit 4 (Card 3 Start)
6	blue	channel 0 data bit 3 (Card 2 Stop)
7	violet	channel 0 data bit 2 (Card 2 Start)
8	gray	channel 0 data bit 1 (Card 1 Stop)
9	white	channel 0 data bit 0 (Card 1 Start)
10	black	+ unregulated power supply
11	brown	circuit ground (no connection)
12	red	channel 1 data bit 7 (Card 8 Stop)
13	orange	channel 1 data bit 6 (Card 8 Start)
14	yellow	channel 1 data bit 5 (Card 7 Stop)
15	green	channel 1 data bit 4 (Card 7 Start)
16	blue	channel 1 data bit 3 (Card 6 Stop)
17	violet	channel 1 data bit 2 (Card 6 Start)
18	gray	channel 1 data bit 1 (Card 5 Stop)
19	white	channel 1 data bit 0 (Card 5 Start)
20	black	+ unregulated power supply
21	brown	circuit ground (no connection)
22	red	channel 2 data bit 7 (Card 12 Stop)
23	orange	channel 2 data bit 6 (Card 12 Start)
24	yellow	channel 2 data bit 5 (Card 11 Stop)
25	green	channel 2 data bit 4 (Card 11 Start)
26	blue	channel 2 data bit 3 (Card 10 Stop)
27	violet	channel 2 data bit 2 (Card 10 Start)
28	gray	channel 2 data bit 1 (Card 9 Stop)
29	white	channel 2 data bit 0 (Card 9 Start)
30	black	+ unregulated power supply
31	brown	circuit ground (no connection)
32	red	channel 3 data bit 7 (Card 16 Stop)
33	orange	channel 3 data bit 6 (Card 16 Start)
34	yellow	channel 3 data bit 5 (Card 15 Stop)
35	green	channel 3 data bit 4 (Card 15 Start)
36	blue	channel 3 data bit 3 (Card 14 Stop)
37	violet	channel 3 data bit 2 (Card 14 Start)
38	gray	channel 3 data bit 1 (Card 13 Stop)
39	white	channel 3 data bit 0 (Card 13 Start)
40	black	+ unregulated power supply

AB-50 Connections:

The inputs and outputs on an AB-50 are connected as follows:

1) power supply
2) power supply
3) A input positive
4) A input negative
5) B input positive
6) B input negative
7) Positive audio output
8) Ground
9) Negative audio output

The power supply connections need to be made to a 12 to 18 VAC transformer (supplied with the AB-50).

The A and B inputs require a powered switch closure. The voltage applied can be anywhere between 5 and 24 volts AC or DC. The AC power supply used for the AB-50 can be used for this if desired by attaching the inputs through switches to the power supply screw terminals. To do this:

1) Attach a jumper wire between terminal #1 and terminal #3 (for the A input) and/or terminal #1 and terminal #5 (for the B input).
2) Attach your switch(es) between terminals #2 and #4 (for the A input) and terminals #2 and #6 for the B input.

The audio outputs are a + 10 dB balanced line level signal. If one of the two outputs is left floating, the output from the AB-50 will be excessively noisy. If you are using an amplifier with a single ended input, you will need to:

1) attach the shield to the amplifier to the GROUND connection.
2) attach the signal to the amplifier to the POSITIVE AUDIO OUTPUT connector.
3) attach the NEGATIVE AUDIO OUTPUT to the GROUND. A small piece of wire is needed to do this.

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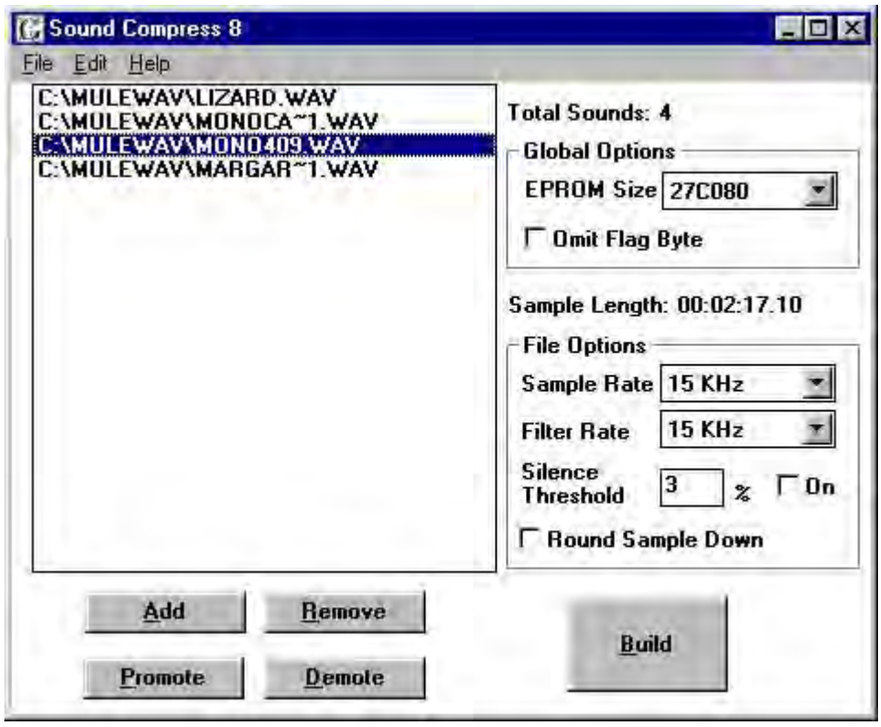
- SNDCMP8.EXE -
- Eight Bit Digital Audio Compressor -

for use with
AB-100 Digital Audio Repeaters
and
DR-50 or AB-50
Mini Audio Repeaters

The Eight Bit Digital Audio Compressor is a small utility program which is used to convert standard sixteen bit 44.1 KHz mono .WAV [3] and .AIFF [4] files so that they can be burnt into Eproms to be used with any of Gilderfluke & Company's eight bit Digital Audio Repeaters. Any PC or Macintosh that has a sound input can be used to record the sounds and save them as a .WAV or .AIFF file [5] . Once the sounds are converted and stored on the hard disk, they then need to be burnt into Eproms using any commercially available Eprom Programmer [6] . These Eproms are then installed into the repeaters.

This manual assumes at least a working knowledge of the care and feeding of IBM compatible computers. We assume when we tell you to install a copy of the software on your hard disk, you know how to do this. Refer to the instructions that come with your Eprom Programmer to learn how to burn Eproms.

Double clicking on the SNDCMP8 program or its icon brings up the following menu:



Taking up most of the space on the menu is a list of samples that have been previously selected using the ADD button. These sounds will be programmed into a single set of Eprom files when the BUILD button is pressed. The size of the files that will be generated is set using the Eprom Size popup.

[3] .WAV files are the standard format used for sound files generated on Windows computers.

[4] .AIFF files are the standard format used for sound files generated on Apple Macintosh computers.

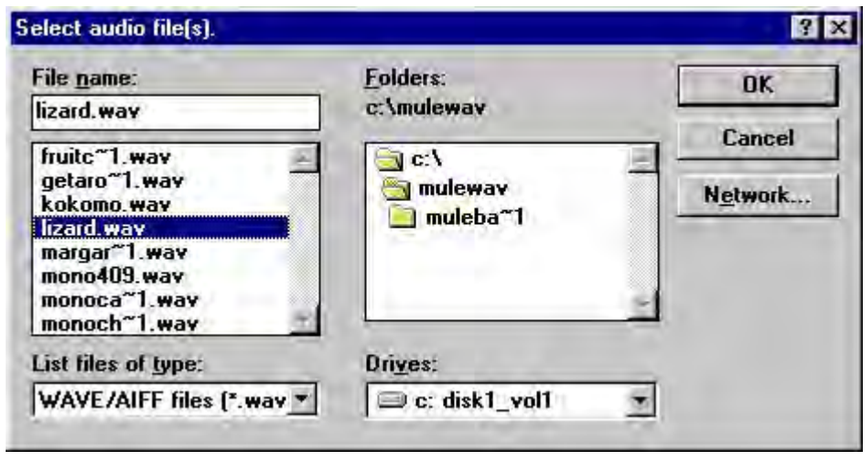
[5] The sound quality of may low cost PC sound cards is not very good. You may want to use a higher quality card for doing your sampling.

[6] The ones we use cost about $220.

The Omit Flag Byte CheckBox should only be used when programming samples for our 1.0 revision repeaters. This can also be used for burning Eproms for some of our competitor's repeaters.

There are five commands buttons available on the SNDCMP8 main window. These are:

1) **Add:** This brings up a standard Macintosh/Windows file open dialog. You can select any sixteen bit 44.1KHz mono .WAV or .AIFF file for adding to the list of files to go into this Eprom set. These will be the sounds that go onto a single Digital Audio Repeater. You can use the <shift> and <command> buttons to select more than one file at a time.

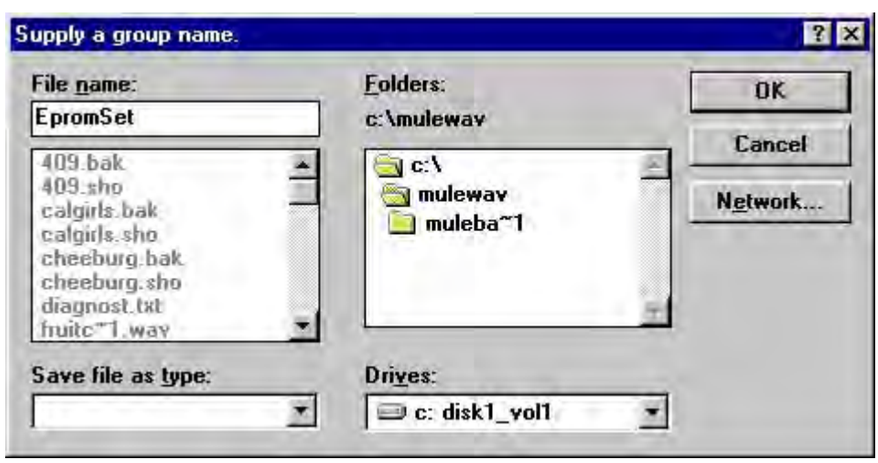


2) **Remove:** This button is used to remove any highlighted sound file(s) from the list of samples that are going to go onto a single repeater.

3) **Promote:** The files are loaded into the Eprom set in the order they appear in the list. This button is used to move a highlighted file further up in the list.

4) **Demote:** The files are loaded into the Eprom set in the order they appear in the list. This button is used to move a highlighted file further down in the list.

5) **Build:** This button tells the program to do the deed. It opens a standard Mac/Windows file save dialog that allows you to name and select where the Eprom files will be saved. Once saved, these files can be burnt into any standard Eproms using any standard Eprom Burner. The extension of '.r01', '.r02', '.r03', '.r04', '.r05', etc. will be appended onto whatever name you give the file set. After 99 Eproms the '.r99' will increment to '.s00'.



A filename.SET file will be generated at the same time as the Eprom files. This contains the checksums and other data about the Eprom set that is used by the PRINT utility to print out labels for the Eproms.

Any of the previously 'ADDed' sample files can be highlighted on the SNDCMP8 main window. The length of the sample will then be displayed and you can set the Sample and Filter Rate, Silence Threshold and Rounding for each sample. If more than one sample is selected the Sample Length will change to show the total length of all the selected samples. Any changes will effect all the selected samples.

The following settings are available for each sample in a set:

1) Sample Rate: There are seven Sample Rates available for the final audio files. These are:

15 KHz
10 KHz
7.5 KHz
5 KHz
3.75 KHz
3 KHz
2 KHz

With the exception of when you are recording a 'silent spiel' or sub woofer rumble, it is rare to use sample rates below the 5 KHz bandwidth. The Sample Rate is virtually always equal to or above the Filter Rate that is set for a sound. Two KHz Sample Rates are occasionally used when you want to convert a sound into a long silence to be used to generate a delay on a looping AB/DR-50. In this case you would probably use a 2 KHz Sample Rate and 0 KHz Filter Rate.

2) Filter Rate: There are eight Filter Rates available for the final audio files. These are:

15 KHz
10 KHz
7.5 KHz
5 KHz
3.75 KHz
3 KHz
2 KHz
0 KHz (absolute silence)

The Filter Rate is virtually always set to be equal to or below the Sample Rate that is set for a sound.

3) Silence Threshold: Sounds that are going to be programmed into an AB-100 and AB-Clock can have all the 'silent' portions of the sound removed from the final Eprom set. The reason you may want to do this is to reduce the amount of Eproms the samples will use. The threshold must be determined by trial and error. With a clean digitally mastered original sound you can use a threshold of two or three. If the sound is from a noisy source or analog audio tape you will need to use a higher threshold. Silence removal can not be used with AB/DR-50 MiniRepeaters.

4) Silence Threshold On/Off: Sounds that are going to be programmed into an AB-100 and AB-Clock can have all the 'silent' portions of the sounds removed from the Eprom set. The reason you may want to do this is to reduce the amount of Eproms the audio will use. This checkbox is used to turn the Silence Removal feature on and off. Silence removal can not be used with AB/DR-50 MiniRepeaters.

5) Round Sample Down: Sample lengths on our eight bit repeaters must be at an even one KByte boundaries in the Eprom(s). This checkbox is used to select whether the sample length will be round-

ed up (padded out with silence) or down (lopped off at the closest one KByte boundary) once the sound is converted to the final sample rate. This checkbox can be used to make sure that no silence is appended onto the end of a looping sample.

- Internal Details -

The format of the data which is burned into the Eproms is in blocks of 1 KByte each. The first byte of the audio data is normally replaced by one flag byte. This sets the operating settings for the following 1023 audio data bytes. Bits 0 to 2 set the sample rate, while bits 3 to 5 set the output filter cutoff point. The last two bits flag the ends of samples.

bits	**2**	**1**	**0**	**sample rate frequency**	**cutoff**
	1	1	1	35,156.25 Hz	15.00 KHz
	1	1	0	23,437.50	10.00 KHz
	1	0	1	17,578.125	7.50 KHz
	1	0	0	11,718.75	5.00 KHz
	0	1	1	8,789.00	3.75 KHz
	0	1	0	7,031.00	3.00 KHz
	0	0	1	4,687.00	2.00 KHz
	0	0	0	Delay [7]	OFF

bits	**5**	**4**	**3**	**filter frequency**	**frequency cutoff**
	1	1	1	1.5 MHz	15.00 KHz
	1	1	0	1.0 MHz	10.00 KHz
	1	0	1	750.0 Khz	7.50 KHz
	1	0	0	500.0 KHz	5.00 KHz
	0	1	1	375.0 KHz	3.75 KHz
	0	1	0	300.0 KHz	3.00 KHz
	0	0	1	200.0 KHz	2.00 KHz
	0	0	0	OFF [8]	OFF

bit6:

0 no effect

1 end of all sampled data after this 1 KByte is played.

bit7:

0 no effect

1 stop after this 1 KByte is played.

[7] If the sample frequency is set to delay, then the next two bytes following the flag byte are used to set how long the delay will be (MSB first). Each count is equivalent to one 1 KByte block of data played when played at a 15 KHz bandwidth (this is equal to 1024/35,156.25 of a second). The normal flag byte for the remaining 1021 bytes of data follows the two delay bytes. All four of these flag bytes take the place of the normal flag bytes which would be found in these positions.

[8] This condition doesn't effect the frame rate, but just shuts down the output filter.

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- Summary of AB-100 and AB-Clock Connections -

- J-10 -
- 1/4" Stereo Phone Jack -
- Balanced Audio Output -

SLEEVE	GROUND
RING	-OUTPUT
TIP	+OUTPUT

- J-3 -
- 20 PIN HEADER/SOCKET ASSEMBLY -
- Digital Audio Repeater/Mixer to Adjustment Card -

1	FILTER OP AMP OUTPUT
2	FILTER - OP AMP
3	AUDIO FEED TO ADJUSTMENT CARD
4	AUDIO OUTPUT
5	AUDIO -15 VOLTS
6	AUDIO +15 VOLTS
7	MIX BUS LEVEL POT INPUT
8	MIX BUS LEVEL POT WIPER
9	PA LEVEL POT INPUT
10	PA LEVEL POT WIPER
11	MIX 'B' POT INPUT
12	MIX 'B' POT WIPER
13	MIX 'A' POT INPUT
14	MIX 'A' POT WIPER
15	DIGITAL POT INPUT
16	DIGITAL POT WIPER
17	GROUND
18	VOLUME POT REFERENCE
19	1/2 MUTE WIPER
20	VOLUME WIPER

- J-7 -
- RJ-11 / 6 POSITION TELEPHONE CONNECTOR -
- RS-485 Serial Data -

	COLOR	SIGNAL NAME:
LEFT	WHITE	SIGNAL GROUND
	BLACK	- SERIAL DATA OUT FROM REPEATER
	RED	+ SERIAL DATA OUT FROM REPEATERS
	GREEN	- SERIAL DATA IN TO REPEATERS
	YELLOW	+ SERIAL DATA IN TO REPEATERS
RIGHT	BLUE	SIGNAL GROUND

- J-8 -
- 5 position DIN -
- Power Supply -

1	GROUND
2	N/C
3	+ 5 VDC
4	- 12 VDC
5	+ 12 VDC

- J-4 -
- 18 PIN SIP HEADER -
- Digital Audio Repeater/Mixer to Memory Expansion Card -

1	MEMORY CHAIN (NORMALLY REMOVED)
2	MEMORY CHAIN
3	Eprom CHIP SELECT #1
4	Eprom CHIP SELECT #2
5	Eprom CHIP SELECT #3
6	Eprom CHIP SELECT #4
7	Eprom CHIP SELECT #5
8	Eprom CHIP SELECT #6
9	Eprom CHIP SELECT #7
10	Eprom CHIP SELECT #8
11	Eprom CHIP SELECT #9
12	Eprom CHIP SELECT #10
13	Eprom CHIP SELECT #11
14	Eprom CHIP SELECT #12
15	Eprom CHIP SELECT #13
16	Eprom CHIP SELECT #14
17	Eprom CHIP SELECT #15
18	Eprom CHIP SELECT #16
19	LOGIC +5 VOLT SUPPLY
20	LOGIC +5 VOLT SUPPLY
21	LOGIC +5 VOLT SUPPLY
22	GROUND
23	GROUND
24	GROUND

- J-9 -
- 7 POSITION. screw terminal -
- Start Inputs, Status Output, and Audio Output -

1	STATUS OUTPUT
2	COMMON
3	B INPUT (RESTART)
4	A INPUT (START)
5	GROUND
6	- OUTPUT
7	+ OUTPUT

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- HEXadecimal to Decimal to Percentage -

The following chart shows decimal, HEXadecimal, and a few percentage equivalents to aid you when you need to convert between numbering bases:

decimal	HEX	ASCII	%	decimal	HEX	ASCII	%	decimal	HEX	ASCII	%	decimal	HEX	ASCII	%
00	00h	null	0	64	40h	@	25%	128	80h	(null)	50%	192	C0h	(@)	75%
1	01h	soh/^A		65	41h	A		129	81h	(soh)		193	C1h	(A)	
2	02h	stx/^B		66	42h	B		130	82h	(stx)		194	C2h	(B)	
3	03h	etx/^C		67	43h	C		131	83h	(etx/)		195	C3h	(C)	
4	04h	eot/^D		68	44h	D		132	84h	(eot)		196	C4h	(D)	
5	05h	eng/^E		69	45h	E		133	85h	(eng)		197	C5h	(E)	
6	06h	ack/^F		70	46h	F		134	86h	(ack)		198	C6h	(F)	
7	07h	bell/^G		71	47h	G		135	87h	(bell)		199	C7h	(G)	
8	08h	bs/^H		72	48h	H		136	88h	(bs)		200	C8h	(H)	
9	09h	ht/^I		73	49h	I		137	89h	(ht)		201	C9h	(I)	
10	0Ah	lf/^J		74	4Ah	J		138	8Ah	(lf)		202	CAh	(J)	
11	0Bh	vt/^K		75	4Bh	K		139	8Bh	(vt)		203	CBh	(K)	
12	0Ch	ff/^L		76	4Ch	L		140	8Ch	(ff)		204	CCh	(L)	
13	0Dh	cr/^M		77	4Dh	M		141	8Dh	(cr)		205	CDh	(M)	
14	0Eh	so/^N		78	4Eh	N		142	8Eh	(so)		206	CEh	(N)	
15	0Fh	si/^O		79	4Fh	O		143	8Fh	(si)		207	CFh	(O)	
16	10h	dle/^P		80	50h	P		144	90h	(dls)		208	D0h	(P)	
17	11h	dc1/^Q		81	51h	Q		145	91h	(dc1)		209	D1h	(Q)	
18	12h	dc2/^R		82	52h	R		146	92h	(dc2)		210	D2h	(R)	
19	13h	dc3/^S		83	53h	S		147	93h	(dc3)		211	D3h	(S)	
20	14h	dc4/^T		84	54h	T		148	94h	(dc4)		212	D4h	(T)	
21	15h	nak/^U		85	55h	U		149	95h	(nak)		213	D5h	(U)	
22	16h	syn/^V		86	56h	V		150	96h	(syn)		214	D6h	(V)	
23	17h	etb/^W		87	57h	W		151	97h	(etb)		215	D7h	(W)	
24	18h	can/^X		88	58h	X		152	98h	(can)		216	D8h	(X)	
25	19h	em/^Y		89	59h	Y		153	99h	(em)		217	D9h	(Y)	
26	1Ah	sub/^Z		90	5Ah	Z		154	9Ah	(sub)		218	DAh	(Z)	
27	1Bh	ESC		91	5Bh	[		155	9Bh	(ESC)		219	DBh	([)	
28	1Ch	FS		92	5Ch	\		156	9Ch	(FS)		220	DCh	(\)	
29	1Dh	GS		93	5Dh	]		157	9Dh	(GS)		221	DDh	(])	
30	1Eh	RS		94	5Eh	^		158	9Eh	(RS)		222	DEh	(^)	
31	1Fh	VS		95	5Fh			159	9Fh	(VS)		223	DFh	( )	
32	20h	SP	12.5%	96	60h	`	37.5%	160	A0h	(SP)	62.5%	224	E0h	(`)	87.5%
33	21h	!		97	61h	a		161	A1h	(!)		225	E1h	(a)	
34	22h	"		98	62h	b		162	A2h	(")		226	E2h	(b)	
35	23h	#		99	63h	c		163	A3h	(#)		227	E3h	(c)	
36	24h	$		100	64h	d		164	A4h	($)		228	E4h	(d)	
37	25h	%		101	65h	e		165	A5h	(%)		229	E5h	(e)	
38	26h	&		102	66h	f		166	A6h	(&)		230	E6h	(f)	
39	27h	`		103	67h	g		167	A7h	(')		231	E7h	(g)	
40	28h	(		104	68h	h		168	A8h	(()		232	E8h	(h)	
41	29h	)		105	69h	i		169	A9h	())		233	E9h	(i)	
42	2Ah	*		106	6Ah	j		170	AAh	(*)		234	EAh	(j)	
43	2Bh	+		107	6Bh	k		171	ABh	(+)		235	EBh	(k)	
44	2Ch	`		108	6Ch	l		172	ACh	(')		236	ECh	(l)	
45	2Dh	-		109	6Dh	m		173	ADh	(-)		237	EDh	(m)	
46	2Eh	·		110	6Eh	n		174	AEh	(·)		238	EEh	(n)	
47	2Fh	/		111	6Fh	o		175	AFh	(/)		239	EFh	(o)	
48	30h	0		112	70h	p		176	B0h	(0)		240	F0h	(p)	
49	31h	1		113	71h	q		177	B1h	(1)		241	F1h	(q)	
50	32h	2		114	72h	r		178	B2h	(2)		242	F2h	(r)	
51	33h	3		115	73h	s		179	B3h	(3)		243	F3h	(s)	
52	34h	4		116	74h	t		180	B4h	(4)		244	F4h	(t)	
53	35h	5		117	75h	u		181	B5h	(5)		245	F5h	(u)	
54	36h	6		118	76h	v		182	B6h	(6)		246	F6h	(v)	
55	37h	7		119	77h	w		183	B7h	(7)		247	F7h	(w)	
56	38h	8		120	78h	x		184	B8h	(8)		248	F8h	(x)	
57	39h	9		121	79h	y		185	B9h	(9)		249	F9h	(y)	
58	3Ah	:		122	7Ah	z		186	BAh	(:)		250	FAh	(z)	
59	3Bh	;		123	7Bh			187	BBh	(;)		251	FBh	( )	
60	3Ch	<		124	7Ch			188	BCh	(<)		252	FCh	( )	
61	3Dh	=		125	7Dh	|		189	BDh	(=)		253	FDh	(|)	
62	3Eh	>		126	7Eh	~		190	BEh	(>)		254	FEh	(~)	
63	3Fh	?		127	7Fh	del		191	BFh	(/)		255	FFh	(del)	100%