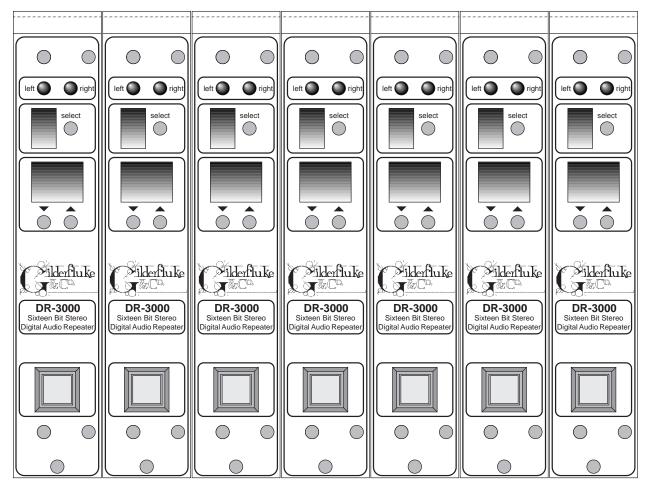
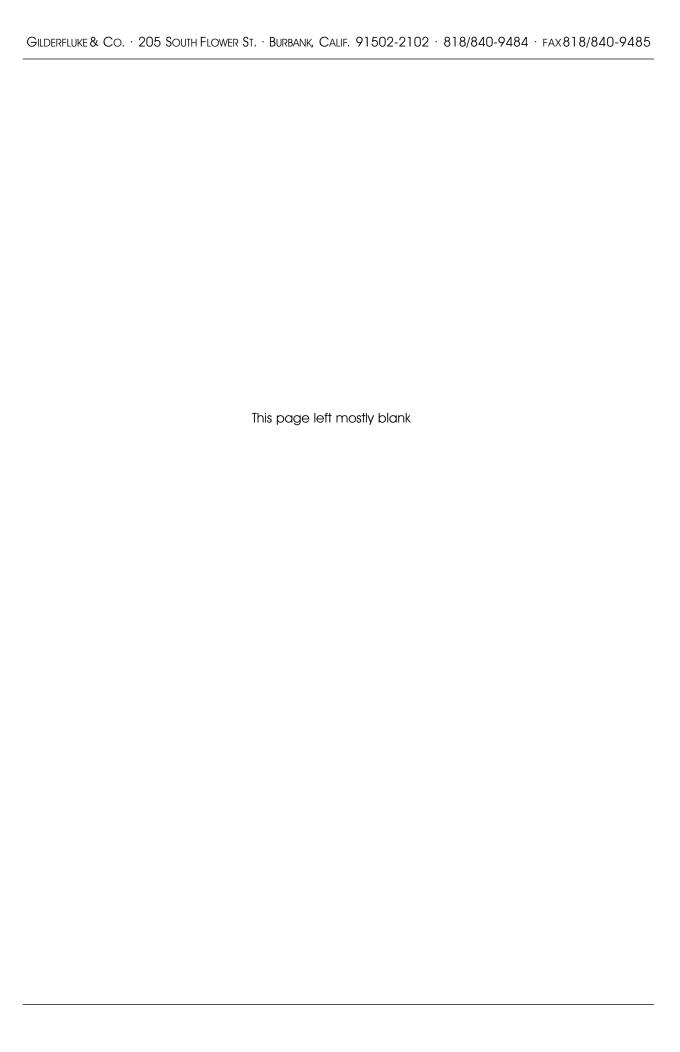


- DR-3000 DIGITAL AUDIO REPEATER SYSTEMS -

PRELIMINARY Printed February 27, 1999







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- DR-3000 SERIES DIGITAL AUDIO SYSTEM - A SYSTEM OVERVIEW -

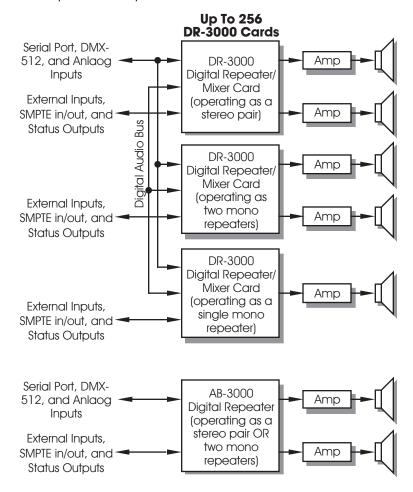
The DR-3000 SERIES DIGITAL AUDIO SYSTEM has been developed to meet all of your needs for Digital Audio Repeaters, Low Level Processing, and Public Address Systems. The following sub systems are available:

- Digital Audio Repeaters (DR-3000, AB-3000)
- Digital Audio MiniRepeaters (DR-500, and AB-500)¹
- Audio Processing Modules (DR-4000)²
- · Intelligent Public Address System³

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 supplies, amplifiers and speakers.

DIGITAL AUDIO REPEATERS:

A Digital Audio Repeater is a solid state replacement for loop and cartridge tape decks. All of our Digital Audio Repeaters meet the demanding requirements for professional voice message, high quality music, and sound effects reproduction systems.



Instead of using tape or any moving parts, a Digital Audio Repeater stores sounds digitally in computer-style memory chips. Because it has absolutely no moving parts, a Digital Audio Repeater never requires any maintenance. A sound on a Digital Audio Repeater will sound just as good twenty or thirty years from now as it did on the day it was installed.

¹ future product

² future product

³ does not yet fully support the DR-3000 series repeaters

Each DR-3000 or AB-3000 is a complete stereo audio source. It can be used as two separate monophonic repeaters, or as a single stereo pair. Any number of DR-3000s can be plugged into one or more card cages to provide any number of simultaneous audio tracks. Any number of DR-3000 repeaters can be synchronized within 1/44,100 of a second for use as a multitrack bin loop tape deck replacement. Multiple bin loops as well as independent repeaters can all be operated within the same card cage.

An AB-3000 is identical to a DR-3000, but comes in its own case and includes a power supply. It can be mounted anywhere you need just one or two CD-Quality audio tracks. All you need to add are amplifiers and speakers. All configuration and commands for the AB-3000s are identical to those for the DR-3000 Repeaters. An AB-3000 just won't respond to commands for features for which it doesn't have the necessary hardware. An example of commands that the AB-3000 can't use are those for the PA system.

You can record a sound into a AB/DR-3000 yourself, or send us a tape to do it for you ⁴. A recording of the sound is first recorded into an IBM compatible or Macintosh computer that has a some sort of sixteen bit audio sampling hardware installed. The audio card in your computer takes your original audio and turns it into digital computer data. This is stored in one of several industry standard file formats on your computer. On an IBM compatible this will be a '.WAV' file. On Macintosh and Amiga computers an 'AIFF' file format is used. Most audio editing systems can generate these file formats directly. Sample rates supported on the AB/DR-3000s are at 11 KHz, 14.7 KHz, 22 KHz and 44.1 KHz for audio reproduction at bandwidths of 10 Hz to 5 KHz, 6.5 KHz, 10 KHz or 20 KHz respectively ⁵. Sixteen bit linear encoding gives a dynamic audio range of 96 dB, which is identical to the sound quality from a Compact Disc (CD).

Once sampled, the .WAV or AIFF file is run through a small program which we provide to convert it into the format the AB/DR-3000s can use. This program allows you to select from all the .WAV and AIFF files on your computer to decide which ones will be loaded onto each AB/DR-3000. Up to 255 different messages can be loaded onto each AB/DR-3000 card ⁶. You can set the amount of compression you would like to use, and how low a level signal to use when doing silence evaluations. The compression uses an algorithm similar to Dolby's, but with extensions to stop using any memory at all if an instant of silence occurs. The data compression alone gives you about a 4:1 reduction in the amount of memory a sound needs ⁷. The silence removal can extend this even further.

The program compresses the data and divides it up into appropriately sized and formatted files for use by the AB/DR-3000s. These files are then 'burned' into computer memory chips using a commercially available EPROM programmer, or sent to appropriate PCMCIA memory cards. These are then plugged into the AB/DR-3000s ⁸. From this point on, the AB/DR-3000 can play back the sounds that have been loaded onto it. Any of the different messages can be instantly accessed through the optoisolated inputs, serial port or DMX-512 input. Any spiel on any card can be played through once or looped so that it repeats. Mono recordings can be directed to play through either the left, right or both outputs. You can even play a mono recording out of both AB/DR-3000's outputs asynchronously. This is useful on long vehicles (like trains) where the same message must be played for the rear half of the vehicle at a slightly later time.

Although 'data compression' saves the amount of memory you need to use, it makes it darned difficult to estimate the number of Eproms your recording will need until it has been digitized. The following charts show the capacities with a variety of sounds using different sized Eproms:

⁴ Tapes can be sent on DAT (this is the preffered medium), cassette, 1/4" reel/reel, CD or video tape.

⁵ No matter the sample rate used, the AB/DR-3000 reproduces the sound at a full 44.1KHz update rate. Because of this, and the lower efficiency of the compression at lower sample rates will give you, we recommend that 44.1KHz samples be used in the majority of applications.

⁶ These individual messages are refered to by the industry standard term 'spiel' in this manual.

⁷ The actual compression ratios uou get depends on the sounds you are compressing. A clean recording from a digital source will compress much better than one from a noisy recording.

⁸ A PCMCIA card requires a MCRD-1000 or MCRD-4000 installed on the AB/DR-3000 to hold it. A special card is available which allows a PCMCIA hard disk drive to be used.

- ESTIMATED EPROM AND PCMCIA MEMORY CARD CAPACITIES-

4 MBIT (27C040) EPROM	OR EQUIVALENT RA	AM OR	FLASH ROM):
----------------	---------	-------------------------	-------	-------------

524,288 x 8:	5 KHz Bandwidth		6.5 KHz Bandwidth		10 KHz Bandwidth		20 KHz Bandwidth	
			(sample rat	te = 14,700	(sample rat	te =22,050)	(sample ra	te =44,100)
Compression:	1 to 1	4 to 1	1 to 1	4 to 1	1 to 1	4 to 1	1 to 1	4 to 1
Bytes per second:	22,050	5,513	29,400	7,350	44,100	11,025	88,200	22,050
Each Chip:	23.8 sec.	95.1 sec.	17.8 sec.	71.3 sec.	11.9 sec.	47.6 sec.	5.9 sec.	23.8 sec.
Each AB/DR-3000:	4.8 min.	19.0 min.	3.6 min.	14.3 min.	2.4 min.	9.5 min.	1.2 min.	4.8 min.
Each Expansion:	12.7 min.	50.7 min.	9.5 min.	38.0 min.	6.3 min.	25.4 min.	3.2 min.	12.7 min.

8 MBIT (27C080) EPROM (OR EQUIVALENT RAM OR FLASH ROM):

1,048,576 x 8:	5 KHz Bandwidth		6.5 KHz Bandwidth		10 KHz Bandwidth		20 KHz Bandwidth		
	(sample ra	te = 11,025	(sample ra	te = 14,700	(sample rat	te =22,050)	(sample rat	te =44,100)	
Compression:	1 to 1	4 to 1	1 to 1	4 to 1	1 to 1	4 to 1	1 to 1	4 to 1	
Bytes per second:	22,050	5,513	29,400	7,350		11,025	88,200	22,050	
Each Chip:	47.6 sec.	190.2 sec.	35.7 sec.	142.7 sec.	23.8 sec.	95.1 sec.	11.9 sec.	47.6 sec.	
Each AB/DR-3000:	9.5 min.	38.0 min.	7.1 min.	28.5 min.	4.8 min.	19.0 min.	2.4 min.	9.5 min.	
Each Expansion:	25.4 min.	101.4 min.	19.0 min.	76.1 min.	12.7 min.	50.7 min.	6.3 min.	25.4 min.	

2 MBYTE PCMCIA MEMORY CARD:

2,097,152 x 8:	5 KHz Bandwidth		6.5 KHz Bandwidth		10 KHz Bandwidth		20 KHz Bandwidth		
	(sample ra	te =11,025)	(sample ra	te = 14,700	(sample rat	te =22,050)	(sample rat	e =44,100)	
Compression:	1 to 1	4 to 1	1 to 1	4 to 1	1 to 1	4 to 1	1 to 1	4 to 1	
Bytes per second:	22,050	5,513	29,400	7,350	44,100	11,025	88,200	22,050	
Each card:	1.6 min.	6.3 min.	1.2 min.	4.8 min.	.8 min.	3.2 min.	.4 min.	1.6 min.	
Each MCRD-4000:	6.3 min.	25.4 min.	4.8 min.	19.0 min.	3.2 min.	12.7 min.	1.6 min.	6.3 min.	

4 MByte PCMCIA MEMORY CARD:

4,194,304 x 8:	5 KHz Bandwidth		6.5 KHz B	6.5 KHz Bandwidth		andwidth	20 KHz Bandwidth		
	(sample rai	te = 11,025	(sample ra	te = 14,700	(sample ra	te =22,050)	(sample rate $=44,100$)		
Compression:	` 1 to 1	4 to 1	` 1 to 1	4 to 1	` 1 to 1	4 to 1	` 1 to 1	4 to 1	
Bytes per second:	22,050	5,513	29,400	7,350	44,100	11,025	88,200	22,050	
Each card:	3.2 min.	12.7 min.	2.4 min.	9.5 min.	1.6 min.	6.3 min.	.8 min.	3.2 min.	
Each MCRD-4000:	12.7 min.	50.7 min.	9.5 min.	38.0 min.	6.3 min.	25.4 min.	3.2 min.	12.7 min.	

8 MByte PCMCIA MEMORY CARD:

8,388,608 x 8:			6.5 KHz Bandwidth (sample rate = 14,700)		10 KHz Bandwidth (sample rate =22,050)		20 KHz Bandwidth (sample rate =44,100)	
Compression:	1 to 1	4 to 1	1 to 1	4 to 1	1 to 1	4 to 1	1 to 1	4 to 1
Bytes per second:	22,050	5,513	29,400	7,350	44,100	11,025	88,200	22,050
Each card:	6.3 min.	25.4 min.	4.8 min.	19.0 min.	3.2 min.	12.7 min.	1.6 min.	6.3 min.
Fach MCRD-4000	25.4 min	101 4 min	19 N min	76 1 min	12.7 min	50.7 min	6.3 min	25.4 min

10 MByte PCMCIA MEMORY CARD:

10,485,760 x 8:	5 KHz Bandwidth		6.5 KHz Bandwidth		10 KHz Bandwidth		20 KHz Bandwidth	
	(sample ra	te = 11,025	(sample rat	e = 14,700	(sample rat	e =22,050)	(sample rat	e =44,100)
Compression:	1 to 1	4 to 1	1 to 1	4 to 1	1 to 1	4 to 1	1 to 1	4 to 1
Bytes per second:	22,050	5,513	29,400	7,350	44,100	11,025	88,200	22,050
Each card:	7.9 min.	31.7 min.	5.9 min.	23.8 min.	4.0 min.	15.9 min.	2.0 min.	7.9 min.
Each MCRD-4000:	31.7 min.	126.8 min.	23.8 min.	95.1 min.	15.9 min.	63.4 min.	7.9 min.	31.7 min.

16 MByte PCMCIA MEMORY CARD:

16,777,216 x 8:	5 KHz Bo	andwidth	6.5 KHz B	andwidth	10 KHz Bo	andwidth	20 KHz Bo	andwidth
	(sample ra	te = 11,025)	(sample ra	te =14,700)	(sample ra	te =22,050)	(sample rat	e =44,100)
Compression:	1 to 1	4 to 1	1 to 1	4 to 1	1 to 1	4 to 1	1 to 1	4 to 1
Bytes per second:	22,050	5,513	29,400	7,350	44,100	11,025	88,200	22,050
Each card:	12.7 min.	50.7 min.	9.5 min.	38.0 min.	6.3 min.	25.4 min.	3.2 min.	12.7 min.
Each MCRD-4000:	50.7 min.	202.9 min.	38.0 min.	152.2 min.	25.4 min.	101.4 min.	12.7 min.	50.7 min.

20 MByte PCMCIA MEMORY CARD:

20,971,520 x 8:	5 KHz Bandwidth		6.5 KHz Bandwidth		10 KHz Bandwidth		20 KHz Bandwidth	
	(sample ra	te = 11,025	(sample rat	te = 14,700)	(sample ra	te =22,050)	(sample rat	e = 44,100
Compression:	1 to 1	4 to 1	1 to 1	4 to 1	1 to 1	4 to 1	1 to 1	4 to 1
Bytes per second:	22,050	5,513	29,400	7,350	44,100	11,025	88,200	22,050
Each card:	15.9 min.	63.4 min.	11.9 min.	47.6 min.	7.9 min.	31.7 min.	4.0 min.	15.9 min.
Each MCRD-4000:	63.4 min.	253.6 min.	47.6 min.	190.2 min.	31.7 min.	126.8 min.	15.9 min.	63.4 min.

32 MByte PCMCIA MEMORY CARD:

33,554,432 x 8:		andwidth te = 11,025)	6.5 KHz B (sample rai		10 KHz Be (sample ra			andwidth te =44,100)
Compression:	1 to 1	4 to 1	1 to 1	4 to 1	1 to 1	4 to 1	1 to 1	4 to 1
Bytes per second:	22,050	5,513	29,400	7,350	44,100	11,025	88,200	22,050
Each card:	25.4 min.	101.4 min.	19.0 min.	76.1 min.	12.7 min.	50.7 min.	6.3 min.	25.4 min.
Fach MCRD-4000	101 4 min	405.8 min	76 1 min	304.3 min	50.7 min	202.9 min	25.4 min	101 4 min

40 MByte PCMCIA MEMORY CARD:

41,943,040 x 8:	5 KHz Bo	andwidth	6.5 KHz B	andwidth	10 KHz Be	andwidth	20 KHz B	andwidth
	(sample ra	te = 11,025	(sample rat	e = 14,700	(sample rat	te =22,050)	(sample ra	te =44,100)
Compression:	1 to 1	4 to 1	1 to 1	4 to 1	1 to 1	4 to 1	1 to 1	4 to 1
Bytes per second:	22,050	5,513	29,400	7,350	44,100	11,025	88,200	22,050
Each card:	31.7 min.	126.8 min.	23.8 min.	95.1 min.	15.9 min.	63.4 min.	7.9 min.	31.7 min.
Each MCRD-4000:	126.8 min.	507.2 min.	95.1 min.	380.4 min.	63.4 min.	253.6 min.	31.7 min.	126.8 min.

64 MBYTE PCMCIA MEMORY CARD:

67,108,864 x 8:	5 KHz Bo	andwidth	6.5 KHz B	andwidth	10 KHz B	andwidth	20 KHz Bo	andwidth
Compression:	1 to 1	4 to 1	1 to 1	4 to 1	1 to 1	4 to 1	1 to 1	4 to 1
Bytes per second:	22,050	5,513	29,400	7,350	44,100	11,025	88,200	22,050
Each MCRD-1000:	50.7 min.	202.9 min.	38.0 min.	152.2 min.	25.4 min.	101.4 min.	12.7 min.	50.7 min.
Each MCRD-4000:	202.9 min.	811.6 min.	152.2 min.	608.7 min.	101.4 min.	. 405.8 min.	50.7 min.	202.9 min.

80 MByte PCMCIA MEMORY CARD:

83,886,080 x 8:		andwidth te = 11,025)	6.5 KHz B (sample ra		10 KHz Bo (sample ra		20 KHz Bo (sample rat	
Compression:	1 to 1	4 to 1	1 to 1	4 to 1	1 to 1	4 to 1	1 to 1	4 to 1
Bytes per second:	22,050	5,513	29,400	7,350	44,100	11,025	88,200	22,050
Each card:	63.4 min.	253.6 min.	47.6 min.	190.2 min.	31.7 min.	126.8 min.	15.9 min.	63.4 min.
Each MCRD-4000:	253.6 min.	1014.5 min.	190.2 min.	760.9 min.	126.8 min.	507.2 min.	63.4 min.	253.6 min.

110 MByte PCMCIA MEMORY CARD:

110.10Mb x 8:	5 KHz Bo	andwidth	6.5 KHz B	andwidth	10 KHz Bo	andwidth	20 KHz Bo	andwidth
	(sample ra	te = 11,025)	(sample rat	te = 14,700)	(sample ra	te =22,050)	(sample rai	te =44,100)
Compression:	1 to 1	4 to 1	1 to 1	4 to 1	1 to 1	4 to 1	1 to 1	4 to 1
Bytes per second:	22,050	5,513	29,400	7,350	44,100	11,025	88,200	22,050
Each MCRD-1000:	83.2 min.	332.9 min.	62.4 min.	249.7 min.	41.6 min.	166.4 min.	20.8 min.	83.2 min.
Each MCRD-4000:	332.9 min.	1331.5 min.	249.7 min.	998.6 min.	166.4 min.	665.8 min.	83.2 min.	332.9 min.

175 MBYTE PCMCIA MEMORY CARD:

175.37Mb x 8:	5 KHz Bandwidth		6.5 KHz Bandwidth		10 KHz Bandwidth		20 KHz Bandwidth	
	(sample rat	te = 11,025)	(sample rat	te = 14,700	(sample ra	te =22,050)	(sample rat	e =44,100)
Compression:	` 1 to 1	4 to 1	` 1 to 1	4 to 1	` 1 to 1	4 to 1	` 1 to 1	4 to 1
Bytes per second:	22,050	5,513	29,400	7,350	44,100	11,025	88,200	22,050
Each card:	132.6 min.	530.2 min.	99.4 min.	397.7 min.	66.3 min.	265.1 min.	33.1 min.	132.6 min.
Each MCRD-4000:	530.2 min.	2120.9 min.	397.7 min.	1590.7 min.	265.1 min.	1060.4 min.	132.6 min.	530.2 min.

Each AB/DR-3000 holds up to twelve Eproms. Using 27C080 Eproms, this will give you a capacity of approximately eight minutes of mono or four minutes of stereo (at a four to one compression ratio) on each card. If your recording needs more space than this, you can add memory expansion cards to the AB/DR-3000s. Each MX-1000 expansion card holds another 32 Eproms. Each MCRD-1000 holds a single PCMCIA memory card or a PCMCIA format hard disk drive °, while a MCRD-4000 holds up to PCMCIA memory cards. FLASH, RAM and EPROM types of PCMCIA cards are all supported.

With two or more MX-1000 memory expansion cards on a DR-3000, additional one inch wide spaces will be needed within the card cage. Each AB/DR-3000 can support almost twenty-four hours of data storage. The only limitation is the physical mounting of the memory expansion cards. Seven expansion cards on a DR-3000 is the normal physical limit for card cage mounted systems. This forms a package that takes up 4 inches of card cage space.

In AB-3000 AudioBricks there is room for up to two memory expansion cards. If you leave the lid off the case, then you can add up to fifteen memory expansion cards to an AudioBrick.

The densities available on PCMCIA cards is such that we are currently supporting only one MCRD- ex-

⁹ Because of the hard disk's head access time, a hard drive equipped repeater must be used as a stereo pair, or only play one mono audio track at a time.

pansion card on each AB/DR-3000 at one time. As of this writing, 175 MByte FLASH cards are (or soon will be) available. These potentially give you instant access to up to 701 MBytes of memory. This translates into almost nine hours of CD-quality audio storage on each MCRD-4000 equipped AB/DR-3000.

These AB/DR-3000s access their memory in sixteen bit wide words. For this reason you will always need to use an even number of Eproms on all AB/DR-3000s. PCMCIA cards are sixteen bits wide, so they can be added one at a time.

The AB/DR-3000 can support any type of EPROM memory chips from 27C040 (four Mbits or 512 KBytes) up to 27C080 (eight Mbits or 1 MByte). Note that all memory chips used with our AB/DR-3000s must use 'CMOS' technology. These use far less current and generate far less heat than the older 'NMOS' technology. CMOS memory chips can be recognized by the letter 'C' following the numbers '27' in their part numbers. Luckily, the older NMOS technology is pretty rare in these higher density memory chips.

DIGITAL AUDIO BUS:

The DR-3000 includes a powerful mixing bus that can be used to send audio signals between all the DR-3000s in a set of interconnected card cages. There are 120 time slots available on the Digital Audio Mix Bus, divided into two 60 channel 'banks'. Any DR-3000 can be configured to use either the first or second 60 time slots, but not both. One 'hidden' channel from each bank is reserved for internal use by the DR-3000s to relay **GROUP START** commands to all the other cards within the cage. Any single DR-3000 can use up to four of the following functions:

- 1) Listen to any one time slot, and mix the audio signals found there into the left or right output channels of a DR-3000. The 'level' of this signal can be permanently fixed, or adjusted dynamically using:
 - a) 0-10 volt analog voltage inputs
 - b) DMX-512 input
 - c) RS-422 serial port
 - d) AB/DR-3000's front panel
- 2) Send the left or right DR-3000's repeater or output to any one time slot. The 'level' of this signal can also be permanently fixed, or adjusted dynamically using:
 - a) 0-10 volt analog voltage inputs
 - b) DMX-512 input
 - c) RS-422 serial port
 - d) AB/DR-3000's front panel

A simple example of the use of the Digital Audio Mix Bus would be where you have an installation with a number of audio point sources with their own speakers, and a single background audio track that you want to send to all the point source speakers. The background track would be sent to one time slot on the Digital Audio Mix Bus and all the point source DR-3000s would then be told to listen to this time slot. The background audio track is then mixed into all the point source outputs. The levels can be fixed or configured to follow an external command.

A second example of the use of the Digital Audio Mix Bus is where you need to 'chase' an audio signal across a room to simulate movement. A single track on a DR-3000 can be used for the source signal. Its output would be sent to a single time slot on the mix bus. Additional DR-3000s or DR-4000s would then be used to receive the signal by listening to the same time slot. An external signal from an Animation Control System would then be used to adjust the volume on each of the DR-3000s to 'chase' the audio across all of their speakers.

Other possible uses for the Digital Audio Mix Bus are:

- Implementing simple 'non-zoned' Public Address systems.
- Monitoring the audio in an attraction by feeding a number of audio tracks to a single monitor speaker.
- Sub-woofer and multi-amplifier applications where the outputs of a number of DR-3000s are fed to a single specially filtered output channel.

The Public Address system also uses sixteen of the time slots on the Digital Mix Bus from the first 'bank'.

These are unavailable to the rest of the audio system when the Intelligent Public Address System is used on a DR-3000 installation. The PA System is unavailable if the repeater is using the second Digital Audio Buss bank.

VOLTAGE CONTROLLED AMPLIFIER (VCA):

A Voltage Controlled Amplifier ('VCA') is an electronic component which is used to adjust the volume of an audio signal remotely by applying a control voltage. Although the AB/DR-3000s don't actually have any real VCAs on them, several VCA functions are simulated inside the AB/DR-3000's Digital Signal Processor (DSP). These functions can be used to adjust any of the different audio signals on the AB/DR-3000s:

- 1) Left volume level.
- 2) Right volume level.
- 3) Left half muted level.
- 4) Right half muted level.
- 5) Left Bass level.
- 6) Left Treble level.
- 7) Right Bass level.
- 8) Right Treble level.
- 9) Digital Mix Bus input volume level. Any of the four possible inputs from the Digital Audio Mix Bus can be adjusted remotely.
- 10) Digital Mix Bus Output volume level. Any of the four possible outputs to the Digital Audio Mix Bus can be adjusted remotely.

The control signals for these "VCAs" can be fixed at a preset level or come from one of three different sources. These sources are:

- 1) Front panel. Any of these signals can be set to be adjusted from the buttons on the front of the AB/DR-3000.
- 2) DMX-512 input channels. Up to four DMX-512 channels can be used at one time.
- 3) Any one of the eight 0-10 volt analog inputs. (Only two of these are available on the outside of an AB-3000, although the other six inputs are still available inside the unit if you need them.)
- 4) RS-422 serial port commands. The serial command structure allows up to eight different 'volume zones' to be controlled.

When using the analog voltage inputs, the control signal is a simple 0 to 10 VDC signal just as you would feed to a lamp dimmer. This can be fed to each card through any of the eight 'VCA BUS' lines which are connected to all the DR-3000s in a cage. Any number of DR-3000s can use the same analog VCA bus line. The pinout of the VCA Bus connector is compatible with the analog outputs from all of Gilderfluke & Company's Animation Control Systems and MA-100 PA MASTER. Using the Intelligent PA system, commands from the PA STATIONS can be used to ramp the levels of these outputs up and down to control the volume of a group of AB/DR-3000s. Serial commands sent to the MA-100 can also control these outputs directly.

All the control functions are normalized for 'logarithmic' response. This means that a 50% control signal will give a 50% perceived volume level.

To keep external inputs from being set too high or too low, any signal that is controlled from an external input can be limited to within a user defined range. This range of adjustment can only be set through the serially accessed configuration screens.

SHELVING EQUALIZER:

The Shelving Equalizer can be used to adjust the output filters of the AB/DR-3000 to compensate for slight errors in the original recording, speakers or other parts of the installation. Although not a full graphic equalizer, these bass and treble controls can be used to cover a multitude of sins.

REAL TIME CLOCK:

A very accurate real time clock is available as an option on both the DR-3000 and AB-3000 AB/DR-3000s. When this option is installed, the AB/DR-3000s can be configured to chime the quarter hours, toll the full hours, and play any specific spiel at any specific time of the day or night. To keep from disturbing

the neighbors, the hours of operation can be set for each day of the week.

There are eight schedules which are used to select when specific messages are played from the real time clock. The first seven schedules are for each of the seven days of the week. The last 'weekly' schedule is used for sounds you want to play at the same time seven days a week ¹⁰. Operating hours can be set for the weekly schedule, or individually for each of the seven days of the week.

An example of the real time clock's use would be in a clock tower that uses a 'Westminster' chime. This plays a slightly different chime on each quarter hour and tolls the full hours. The operating hours are from 6:00 AM to 12:00 Midnight. Every day of the week, a 'special' chime sounds each day at noon, with other 'specials' scattered throughout the day. On Mondays through Fridays, a 'special' plays at 5:00 when the last work shift of the day ends.

To support 'regulator' style clocks, the AB/DR-3000s can be configured to pulse the **Status Outputs** once per second, minute, hour, day or year. Regulator clocks typically use a single pulse every minute to advance the minute hand, with a special pulse once each twenty-four hours to synchronize all the clocks.

The clock can be set through the serial port or the front panel of the AB/DR-3000. Configuring the schedules must be done through the AB/DR-3000's serial port using any computer or terminal.

When the clock is set, the AB/DR-3000 gives you the option of automatically adjusting for Daylight Savings Time. If this option is used, then the clock will automatically 'Spring forward' on the first Sunday of each April, and 'Fall back' on the last Sunday of each October. When the time is displayed on the Main Menu of the AB/DR-3000, a 'DST' will appear before the time to indicate that it is currently in Daylight Savings Time.

RS-422 SERIAL PORT:

The RS-422 Serial Port is the main method of communicating with the AB/DR-3000s. It is used for doing virtually all the AB/DR-3000's configuration, and can be used for triggering and making dynamic adjustments. Full details on the care and feeding of the RS-422 Serial Port can be found in the section of the manual on **Serial Port Commands**.

Any standard computer can be used to talk to the AB/DR-3000s through its serial port. Modern computers, like Apple's Macintosh computers come with RS-422 compatible ports already built in. Older computers, like all IBM compatibles, have RS-232 serial ports on them. These can be used to communicate with only a few AB/DR-3000s at a time with only a simple adapter cable. If you need to talk to several AB/DR-3000s simultaneously, or over a distance of more than a few feet, you will need to add a RS-232 to RS-422 converter to your serial port.

The DR-3000 Serial Ports are usually connected with other Digital Audio Repeaters and Animation Systems in a multi-drop network. Connections to other DR-3000s within the same card cage are made through the card cage's backplane. Adjacent card cages can be interconnected through the fifty position Digital Audio Bus connector, or they can be run independently. Although they can be used on a serial network, AB-3000s tend to be used in stand-alone applications where they are typically the only device on their own very small network.

Commands are directed to a specific AB/DR-3000 or other piece of equipment located on the network by using the device's address. This is the one setting that must be made before a AB/DR-3000 is accessed as an upstanding member of the multiple drop serial port community. This will usually require powering up the card to be addressed by itself so that its address can be changed. When any AB/DR-3000 is powered up, it will display its current address setting for a few seconds on it front panel display.

When operating with the Intelligent Public Address System, the MA-100 PA Master acts as a 'bridge' between any external computer or terminal and the rest of the system. All serial port commands are sent through the MA-100, which also uses its serial connection to all the AB/DR-3000s for all of the public address commands.

FRONT PANEL ADJUSTMENTS AND INDICATORS:

Most of the minor adjustments which can be made to the AB/DR-3000 can be set through the front panel on each unit. At your option, any or all of these adjustments can be enabled or disabled on the

¹⁰ Or you can set the weekly schedule for Monday through Friday.

front panel. Additionally, all of the analog level settings can have limits placed on them so that a casual user can't set a volume at too high or low a level from the front panel.

The available adjustments are:

- 1) Left Level Adjustment
- 2) Left Half-muted Level Adjustment
- 3) Left Treble
- 4) Left Bass
- 5) Right Level Adjustment
- 6) Right Half-muted Level Adjustment
- 7) Right Treble
- 8) Right Bass
- A) Mix bus A levels 11
- B) Mix bus B levels 11
- C) Mix bus C levels 11
- D) Mix bus D levels 11
- y) Set Real Time Clock Year (0-99) 12
- i) Set Real Time Clock mlnutes (0-59) 12
- h) Set Real Time Clock Hours (0-23) 12
- n) Set Real Time Clock moNth (1-12) 12
- d) Set Real Time Clock Date (1-31)
- o) Set Real Time Clock day of week (1-7) 12

All of these setting are adjusted by pressing the 'Select' button on the front of the AB/DR-3000. Any setting that is not available to you (because it has been configured with a 'fixed' setting or it is being controlled from another source) will be displayed, but can't be changed. You can see any externally controlled variable change as its control source alters it.

Values that can be adjusted are indicated by the flashing digits that show their current level. Once the desired function number is displayed on the upper display, you can use the 'up' and 'down' buttons to adjust the setting as needed. Holding either of these buttons down for a moment will cause the numbers to automatically increment/decrement. When you are happy with the selection, pressing the 'Select' Button until it is cleared stores the new settings permanently in the AB/DR-3000's nonvolatile memory ¹³. The time will only be written to the Real Time Clock chip if you have made any changes in the clock settings.

When not being used to configure one of the AB/DR-3000's functions, the front panel will display a variety of status indications. First and foremost among these is the AB/DR-3000's 'heartbeat'. This appears in the lower right decimal point of the seven segment 'Select' display. If the AB/DR-3000 is alive, then this LED should be flashing at a steady rate. The same output is attached to an integrated circuit called a 'dead man timer'. If the heartbeat ever stays off for more than about a second, the dead man will reset and restart the AB/DR-3000.

The decimal points of the other two displays show the state of the two status outputs. These are typically configured to turn ON as the left or right repeaters are playing. They can also be told to turn on, off, or pulse at specific points as spiels are played, or at intervals controlled by the real time clock.

The number of the most recently started spiel is displayed on the front of each AB/DR-3000. This is shown as a two digit decimal number (hexadecimal numbers are used if more than 99 spiels are loaded on the repeater) on the two digit seven segment display.

The two modulation LEDs on the front of the AB/DR-3000 will flash along with the sound as it plays.

There is one command which can be made only from the front panel. It is used to set the card back to it's default configuration. This should rarely be needed. It is invoked by holding both the up and down buttons as the repeater is powered up.

¹¹ Availible on DR-3000 only, and only if configured for use.

¹² Availible only if the clock option is installed. Clock can only be set if this has been enabled on the Clock Setup menu.

¹³ The EEPROM must not be write protected if you want to permanently store these changes.

DIGITAL INPUTS:

Each AB/DR-3000 has eight optically isolated inputs along with one manual start button on its front panel. The manual start button is generally used for maintenance and testing purposes. The eight optically isolated inputs are 'switch closure inputs' normally used to trigger the AB/DR-3000.

The eight optically isolated inputs are arranged in the same 1/4 J6 standard pinout used in all of Gilderfluke & Company's Animation Control Systems. The AB/DR-3000 checks both the rising (switch closure) and falling (switch opening) edges of each input. This allows you to configure a AB/DR-3000 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/DR-3000 to start looping on finding a closure on one of the inputs, and then stop when the same input is opened again. The manual start button and 1/4 J6 inputs can be configured to tell the AB/DR-3000 to do any of the following things:

- 1) **MUTE AUDIO:** This sets the left, right or both channels immediately to their minimum output level.
- 2) HALF MUTE AUDIO: This sets the left, right or both channels immediately to the half muted level you have selected.
- **3) UN-MUTE AUDIO:** This sets the left, right or both channels immediately to the normal output levels you have selected.
- **4) FADE IN:** This ramps the left, right or both channels to the normal level you have selected. The length of the fade ins can be selected from .1 to 9.9 seconds.
- **5) FADE OUT:** This ramps the left, right or both channels to the muted level. The length of the fade outs can be selected from .1 to 9.9 seconds.
- 6) STOP REPEATER IMMEDIATELY: This immediately stops the left, right or both channels.
- 7) STOP REPEATER AT END OF CURRENT SPIEL: This stops the left, right or both channels at the end of the current iteration of a loop.
- 8) START TRACK: This immediately starts the left, right or both channels. If no request for a specific spiel has been received, then whatever spiel is next in line will be played.

Modifiers which can be used with the **START TRACK** command are:

- a) LOOPING: When used with a START TRACK or START GROUP command, the spiel will continue to repeat. It can be stopped by either a STOP IMMEDIATELY or STOP AT END command is received. If the delay has been set on the repeater's main menu, then this time will be inserted between each iteration of the loop. The range of delay is from .1 to 999.9 seconds. This can be set independently for the left and right outputs if you are using the repeater with mono spiels.
- b) **DELAYED START:** When this modifier is set it will tell the repeater to wait for the amount of time specified on the main menu before it actually starts playing. The range of delay is from .1 to 999.9 seconds, and can be set independently for the left and right outputs if you are using the repeater with mono spiels.
- c) START GROUP: When the Group Start modifier is set, the Start command works just like normal, except that it is relayed down the Digital Audio Bus. Any card that is assigned to the requested group will be started within 44,100 of a second of all the others. This is how perfect sync is achieved in bin loop applications. Delayed Start and Looping modifiers can be used normally. All of the repeaters that are assigned to the same Group will follow whatever this repeater is told to do.
- 9) REQUEST A SPECIFIC SPIEL: Any one bit can be used to select a specific spiel, or a group of bits can be used to make up a binary address. The latter can be used to select a number of different spiels using only a few inputs. The same bit(s) that are used to request a spiel can also be used to perform any of the above input commands at the same time as the request is made. This means that a separate command is not needed to start the repeater after a request is made. The request alone can also start the requested spiel playing.

There are several options that you can select for early start commands. These are start commands that come while the AB/DR-3000 is still playing the last spiel. You can tell the AB/DR-3000 to:

- 1) **Ignore** early starts.
- 2) Jump Forward: Go immediately to the beginning of the next spiel.
- 3) **Store**: Ignore the early start for now, but save and do it as soon as the current spiel is done. This can save requests approximately ten deep before overflowing.

When a AB/DR-3000 is first turned on, it checks the conditions of all the inputs, inverts them, and then uses these to make the first checks of the inputs. What this allows you to do is to set any command to happen when the AB/DR-3000 is first turned on. The most common example of this feature's use is when you need the AB/DR-3000 to start looping as soon as power is applied. All you need to do is set any one input to **START** and **LOOP** on the falling edge and the AB/DR-3000 will start playing as soon as power is applied. This will work as long as there isn't a <u>real</u> input coming in on the input you have selected for this function.

STATUS OUTPUTS:

Each AB/DR-3000 has two optically isolated status outputs. These are the open collector outputs of a pair of darlington output optoisolators. They can be used for driving LEDs, solid state relays, and similar low-current loads directly. Any heavier loads will require a relay.

These outputs can be configured to:

- 1) Activate when the right channel of the AB/DR-3000 is playing a spiel.
- 2) Activate when the left channel of the AB/DR-3000 is playing a spiel.
- 3) Pulse momentarily, turn on or turn off at a specific time during a spiel.
- 4) Pulse once per second, minute, hour or every twenty-four hours. This option is only available when the real time clock option has been installed.

ANALOG INPUTS:

Each AB/DR-3000 has eight 0-10 volt analog inputs which can be used for adjusting a variety of volume and mix functions dynamically. On the DR-3000s, the eight inputs are bused between all the DR-3000s through the card cage and brought out to a standard 1/2 J6/A connector. This allows up to eight different analog signals to be sent to all the DR-3000s in a card cage.

On AB-3000 AudioBricks, there are only two of the eight analog inputs which are brought out to the screw terminals on the outside of the case. The other six inputs are still available inside the case if you need them.

The input impedance on these inputs is 10 Kohms, and they are protected against slightly overvoltage signals. The input resistors can be modified if a different control voltage range is required.

DMX-512 INPUT:

The DMX-512 standard was developed by the United States Institute for Theatrical Technology (USITT) for a high speed (250 KBaud asynchronous) serial link. Although it was originally designed for controlling light dimmers, it is now supported by hundreds of suppliers throughout the world for controlling all kinds of theatrical equipment. Along with the direct analog or digital outputs, all PC·MACs systems come with a DMX-512 compatible output. The Analog Smart Brick can be used to generate a DMX-512 output from a Smart Brick System.

You can set AB/DR-3000s to listen to any four DMX-512 addresses between 0 and 255 (00h to FFh). One DMX-512 channel can be set to mirror the eight optically isolated trigger inputs. In that way, any function you could trigger with the external inputs can also be triggered through the DMX-512. Any channels that aren't being used for triggering can be used to adjust the volumes and mixes on the AB/DR-3000s.

The DMX-512 input to a Repeater is disabled whenever **SMPTE IN**, **SMPTE OUT** or **IR MODE** are being used. They all use the same serial ports and timers.

Even though the DMX-512 standard calls for 512 channels of data, the DMX transmission from a PC·MACs Animation Control System is limited to 256 eight bit wide channels. Addresses above the 256th are used in PC·MACs for transmitting a checksum. The AB/DR-3000 can use this to verify that the data received from PC·MACs has no transmission errors in it. If you address a light dimmer or other DMX-512 device to addresses 256 or 257, you will see this verification data displayed as a flickering pattern. This

feature can be turned off for running Gilderfluke & Co. equipment from systems that can't generate a checksum.

AUDIO OUTPUTS:

The normal audio output from the AB/DR-3000 is a balanced +10 dB line level. The output driver is a SSM-2142 transformerless output driver. This chip is compensated for driving standard 600 ohm balanced audio lines. If running to a single ended amplifier, you will need to ground the unused output. If you don't, the output will be excessively noisy.

Several digital output options are available with the AB/DR-3000 series of repeaters. They allow audio data to be sent to your amplifiers in a completely digital form for absolutely no noise and distortion. All of these options require a digital output driver chip be installed on the AB/DR-3000, and a special conditioning card on the back of the card cage ¹⁴. These conditioning cards provide the proper signal levels and connectors for running the signals to your amplifiers in one of three industry-standard formats. These are:

- a) AES/EBU: Three position XLR connector for running balanced digital signals to your amplifier.
- b) SPDIF: RCA connector for running single ended digital signals to your amplifier.
- c) OPTICAL: Fiber optic connector for running optical digital signals to your amplifier. Surprisingly, this is the most economical digital link to use.

When running digital output signals from the AB/DR-3000s, the normal analog outputs remain active and usable.

SMPTE IN AND OUT:

SMPTE (pronounced "simp-T") is a time code which was developed by the Society of Motion Picture and Television Electronics (SMPTE) for use in audio, film, and television production. It is normally recorded on a spare audio track on the medium being used (audio tape, video tape, or film), and then used to synchronize various pieces of compatible equipment together. As an industry standard, virtually every audio, video or film studio in the world will have the equipment to support a SMPTE time code track.

SMPTE is usually recorded at thirty frames per second. Twenty-five frames per second is used in Europe and places where this is the normal television frequency. Twenty-four frames per second is occasionally used in film production. What this means is that 30 (or 25 or 24) times each second a number is recorded on the tape or film. This number represents the hours, seconds, minutes and frame (00:00:00.00) for this particular little stretch of film or tape. Since each little stretch is represented by a unique number, SMPTE is known as an 'absolute' time code. No matter where the tape is, the AB/DR-3000 will instantly evaluate the numbers it gets from the SMPTE time code to figure out where it is.

If enabled, AB/DR-3000s generate SMPTE time code whenever their LEFT channel output is playing. This is whenever a stereo sample is being played back, but only when the Left channel is playing if mono ROMs are installed.

When generating SMPTE time code, the AB/DR-3000 will start at zero minutes, frames and seconds (00:00.00). The hour number generated is taken from the spiel number being played. For spiels numbered one to ninty-nine, they are displayed as-is. If there are more than ninty-nine spiels on a repeater, they are displayed using the hexadecimal numbering system.

The only frame rate the AB/DR-3000s will generate is 30 FPS, non drop frame ¹⁵. Note that the actual frame rate generated by the DR-3000 is slightly off from an actual 30 Hz frequency. Over the course of a 10 minute spiel, it will get off by about one second from the actual time. Additional error can also be generated by drift between the crystal that is used for audio reproduction and the one that is used by the microcontroller. Any equipment which is synchronized to the AB/DR-3000 system should never so small an error.

One of the advantages of programming a show to a SMPTE time code is that it is easy to start and stop a tape or just back up a little. The disadvantage with a repeater is that they always insist on starting at the beginning of a spiel. We recommend that before you program a show you generate a 'scratch'

¹⁴ This plugs right into the AB-3000.

¹⁵ 'Drop Frame' time code literally 'drops' a frame every few seconds.

tape for use during programming ¹⁶. This is done by using the repeater as both the audio source and SMPTE generator. You can then program the show normally with absolute assurance that the final audio and time code will be perfectly in sync.

The SMPTE time code input on each AB/DR-3000 can listen to a SMPTE time code signal and trigger spiels on the left or right side of the repeater. Once triggered, the repeater will NOT follow variations in the SMPTE time code input. The table of SMPTE trigger points holds up to forty-eight different entries. Triggering resolution is down to a single frame, but only one spiel can be triggered during a single second. The AB/DR-3000 needs to have been listening to time code long enough to receive the beginning of the second before the trigger. This means that if the time code is starting at 00:00:00:00.01, that no spiel can be triggered before 00:00:02.00. The AB/DR-3000s should accept SMPTE time code within 25% of 30 Hz which is recorded with 24, 25, 30 or 29.97 Frames Per Second. The time code can be either Drop or non-Drop frame. The only thing you have to do is not to ask the AB/DR-3000 to trigger on a frame which doesn't exist in the incoming frame rate. i.e.: If you are using SMPTE at 25 FPS, don't try to trigger sounds on the 26th frame.

INTELLIGENT PUBLIC ADDRESS SYSTEM:

The Intelligent Public Address System is used where a powerful and flexible zoned Public Address System is needed. It can be used with our DR-3000 and DR-4000 Digital Audio Repeater cards or in stand alone installations. Complete information on the Intelligent Public Address System can be found in its manual.

The Intelligent Public Address System features include:

- Up to 255 PA zones are available. Sixteen cross-zone announcements can be made at one time, along with any number of local PA zone requests. These latter take place when any PA station requests it's local PA output.
- · Supports up to 256 PA stations. These are available in:
 - a) One Button PA Stations use the microphone's Push To Talk (PTT) button to select any one of the PA zones.
 - b) The Four Button PA stations can select any of four different PA zones, plus one more with the microphone's PTT button. You can tell the buttons on these stations to latch the zone requested, only momentarily select the zone, or latch it until the next time the PTT button is released. Any of the four buttons can also be configured to raise or lower the volume or mute and unmute an area.
 - c) The Smart PA stations can be set up to access all the features in the entire audio system. These include any Digital Audio Repeaters, Animation Control Systems, and volume control zones that happen to be attached to it. They are available with backlit LCD displays on them. Their pushbuttons are normally located on the microphone itself, or any DTMF keypad can be used.
 - d) Phantom PA Stations are used to tie the output from Digital Audio Repeater to the PA system for automated announcements. When the Repeater is triggered, it will select a PA zone and feed the audio output from the repeater to the selected zone.
- All setup is done through easy to use menus using any PC or terminal. Configuration includes selecting which zones any PA station button will select, and the normal, half-muted, and PA announcement volumes for the local PA outputs. A key lock and battery protects the configuration data from unauthorized access and power failure.
- Separate printer and terminal outputs can give a running record of all PA system activity.
- PA Master controls up to eight volume zones, or any other 0 to 10 VDC controlled device (lights, screens, etc.).
- Eight PA stations per Interface Panel. Stations are transformer and opto isolated from the rest of the system.
- · Wiring to all PA stations is by standard 8 conductor modular telephone line. Power for the sta-

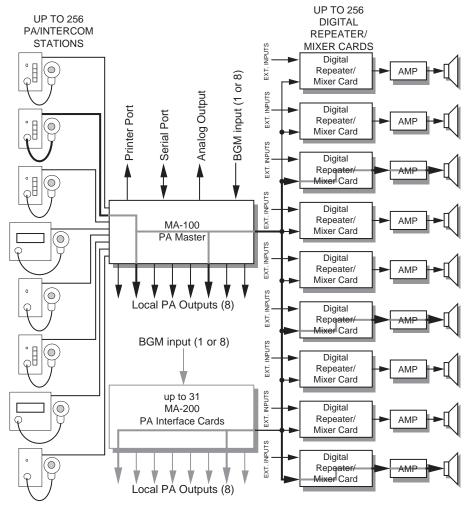
¹⁶ The tape can be a cassette or any other suitable format.

tions is provided by the PA interface.

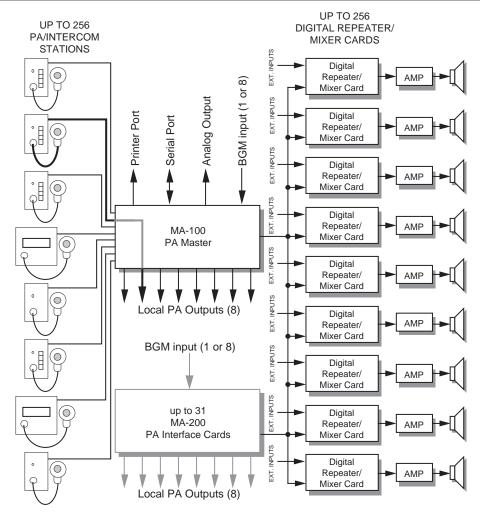
- Each DR-3000 or DR-4000 Repeater added to the Intelligent PA system adds another possible PA output to it.
- The PA system can act as a bridge to run animation systems, Digital Audio Repeaters, etc. from PA stations.

The PA system consists of one PA Master, one PA Interface Panel for each eight PA stations (the first one of these is part of the PA Master), and the PA Stations themselves. These are available in four different styles:

Each PA Interface Panel has connections for eight PA stations, eight balanced 'local' PA outputs, and one (optionally eight) balanced Back Ground Music (BGM) inputs. The BGM is normally fed to the eight local PA outputs. When one of these responds to a PA zone request, the PA announcement is fed to it as the BGM is half-muted. Each local PA output can respond to four different prioritized PA zone requests.



As shown by the darkened audio path in the previous illustration, when a user at any PA station requests a PA ZONE, an audio path is opened to any of the Local PA Outputs and DR-3000s in the system that have been configured to respond to requests for that PA ZONE (in this example there are three DR-3000s or DR-4000s and four Local PA Outputs responding). The normal audio on those outputs is dropped to the half muted level (this level is adjustable on each output) while the audio from the PA station is routed to the outputs (the volume of the announcement is also adjustable on each output). The rest of the audio system and the Repeaters on the affected DR-3000s continue to operate as usual. Up to sixteen such PA announcements can go on at the same time.



Eight LOCAL PA OUTPUTS are available from each MA-100 or MA-200 card. Each of these outputs normally carries whatever audio is being fed into the 'Back Ground Music (BGM) input' on the back of the unit. When a request for a PA zone comes in, the BGM level on that LOCAL PA OUTPUT is dropped to a half-muted level and the PA audio is mixed into it. All audio levels and settings for the LOCAL PA OUTPUTS are adjusted through the software on the MA-100 PA Master. Each LOCAL PA OUTPUT can be told to respond to up to four different PA zone requests. If the PA STATION requesting the LOCAL PA OUTPUT has the same 'number' as the output being requested, a special 'LOCAL PA MODE' can be used as shown above. This bypasses the sixteen trunk lines that normally carry the PA audio feeds to allow up to 256 such PA announcements to go on at the same time.

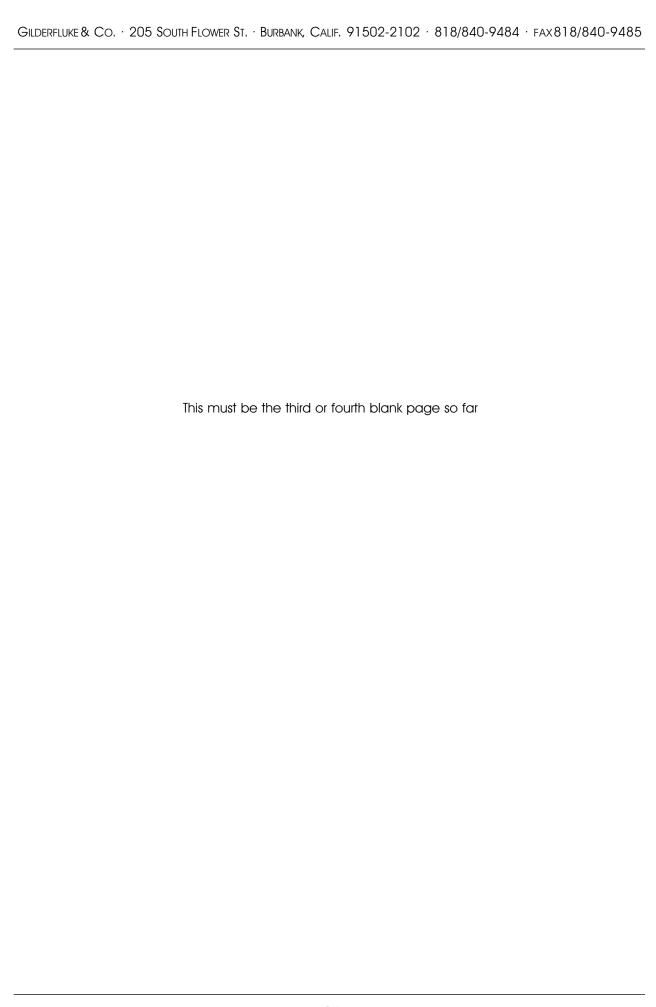
There are 256 possible PA ZONES. Any DR-3000 can be configured to respond to up to sixteen different PA ZONE requests (eight per side). Any number of DR-3000s can be configured to respond to any individual PA ZONE request. This allows a PA ZONE to be assigned as a global PA ZONE by simply telling all the DR-3000s in the system to respond to it. The priority of PA requests is set by the order in which they are entered when configuring the DR-3000.

DUMB PA STATIONS are available with either four buttons (plus the microphone button) or one button (just the microphone button). Any of the buttons can be configured to access any PA zone in the system. The buttons on the front of the four button stations can be configured as push-to-talk buttons, to latch the last requested zone, or auto-release the last zone latched when the microphone button is released.

For automated PA announcements, a phantom PA station is used. It is like any other PA STATION except that it has no buttons or microphone on it. The audio and status outputs from a AB/DR-3000 is attached to the phantom PA station. When the Repeater is started, the status output triggers the phantom PA station to request a PA ZONE and then feeds its audio into it. The audio will then be routed to the appropriate audio outputs through the PA system just like any other announcement. Different spiels can

also be requested and PA Zones accessed through the serial port if needed.

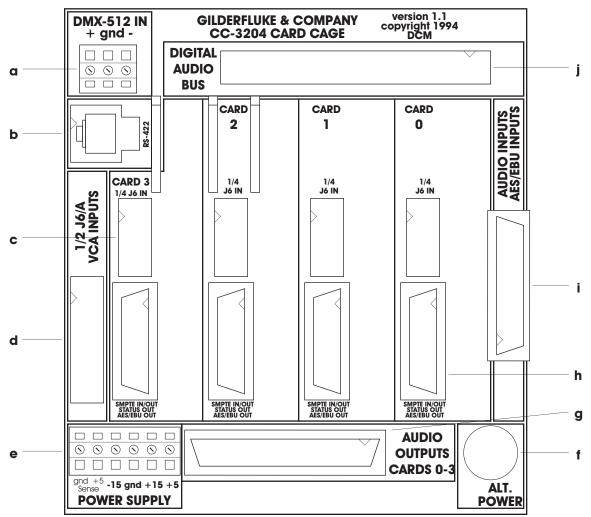
SMART PA STATIONS are available with up to eighteen buttons on their microphones. Any button can be configured to request any other intercom station, mute or half-mute zone, send commands to one or more AB/DR-3000s, or ramp the volume of any volume control zone up or down. For those PA STATIONS which need access to more features than this number of buttons would allow, a numeric-style entry is used to give them access to any features which you have enabled.



- AB-3000, CARD CAGE AND POWER SUPPLY CONNECTIONS-

Each CC-3016 card cage holds sixteen DR-3000s or DR-4000s. The CC-3004 holds up to four DR-3000s or DR-4000s. All card cage slots on each motherboard will accept any DR-3000. Slot number 0 has an additional 15 position connector that is used by DR-4000s to bring analog and digital inputs to the card. If required, additional slots can have this connector added. All the connections to the each DR-3000 are made through the card cages' backplane. Several of these connections are bused between DR-3000s, while others are brought out to a variety of connectors on the backplane. Each CC-3004 card cage has the following connections. A CC-3016 has the identical connections, but just more of them. An AB-3000 AudioBrick has most of these same connections on the outside of its case:

CC-3004 (OR CC-3016):

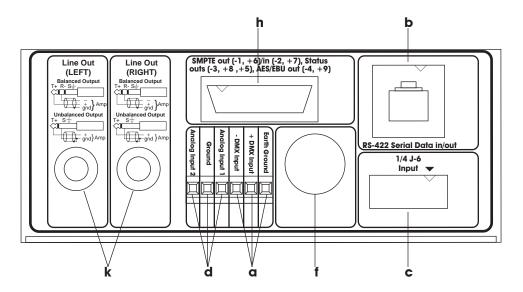


- a) DMX-512: Three position screw terminal block. These signals are bused to any other interconnected card cages through the DIGITAL AUDIO BUS connector (if it is used), so the other bused cages don't need their own DMX-512 connections. This connection is used to feed the USITT standard DMX-512 serial data into the DR-3000 and DR-4000s mounted in this cage. This can be used for adjusting volumes and triggering the DR-3000 and DR-4000s.
- b) RS-422: Six position RJ-11 (modular telephone style connector jack). These signals are bused to any other interconnected card cages through the DIGITAL AUDIO BUS connector (if it is used). The other bused cages then don't need their own RS-422 connections. This input is used to connect the DR-3000 and DR-4000s installed in this cage to a computer or terminal for configuration or remote control. Facing the end of the cable with the release latch upwards, its pin out is as follows:

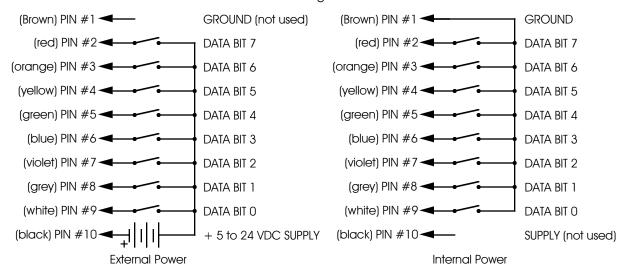
	pin#	COLOR	SIGNAL NAME:
(left)	1	WHITE	signal ground
	2	BLACK	- serial data OUT from AB/DR-3000
	3	RED	+ serial data OUT from AB/DR-3000
	4	GREEN	- serial data IN to AB/DR-3000
	5	YELLOW	+ serial data IN to AB/DR-3000
(right)	6	BLUE	signal ground

The proper data format, and pinouts for connecting this plug to a PC or Macintosh computer are in the section of the manual on **Serial Port Commands**.

AB-3000:



c) 1/4 J6 In: Ten position enclosed header compatible with IDS-10 connectors. There is one of these connectors for each slot in the card cage.



A CC-3004 has four for these connectors on it, while the CC-3016 has sixteen. This input connector uses the standard '1/4 J6' pinout used in all the Animation Control Systems manufactured by Gilderfluke & Company. All eight inputs are optically isolated from the AB/DR-3000, and so an external source of power is needed to run this input ¹⁷. The current draw is less than sixteen ma. per input, so a small wall mounted DC power supply will be sufficient to drive it. The PS-200 Power Supplies have a 24 VDC output on them that can be used to power

¹⁷ The AB-3000 has a jumper option of supplying power to the 1/4 J6 input from the AB-3000's power supply. If this option is used, then simple switch closures can be used on these inputs.

these inputs. Be aware that this supply is not isolated from the others. This defeats the opto isolation and there is a possibility of AB/DR-3000s getting 'zapped' through this connection.

The DR-3000 can only be attached as shown above for 'External Power'. The AB-3000 has the option of running from 'Internal Power'. This allows simple 'switch closures' to be used with the AB-3000. As with using the 24 VDC output from the PS-200, this reduces the protection afforded the AB-3000 by the optoisolator inputs.

d) 1/2 J6/A VCA Inputs: Twenty position enclosed header compatible with IDS-20 connectors. This connector is used to run up to eight 0 to 10 VDC control signals to the DR-3000 and DR-4000s installed in this card cage. These can be used to remotely control the volumes and other analog adjustments on the DR-3000s. The impedance of each input is 20 Kohms. The pinout is as follows:

	SIGNAL NAME	COLOR	SIGNAL FUNCTION
Pin #1	n/c	BROWN	no connection on CC-3004 or CC-3016
Pin #2	n/c	RED	no connection on CC-3004 or CC-3016
Pin #3	Analog Input 8	ORANGE	Channel 8 (07H) Positive Analog Input
Pin #4	Analog Ref. 8	YELLOW	Channel 8 (07H) Negative Reference
Pin #5	Analog Input 7	GREEN	Channel 7 (06H) Positive Analog Input
Pin #6	Analog Ref. 7	BLUE	Channel 7 (06H) Negative Reference
Pin #7	Analog Input 6	VIOLET	Channel 6 (05H) Positive Analog Input
Pin #8	Analog Ref. 6	GRAY	Channel 6 (05H) Negative Reference
Pin #9	Analog Input 5	WHITE	Channel 5 (04H) Positive Analog Input
Pin #10	Analog Ref. 5	BLACK	Channel 5 (04H) Negative Reference
Pin #11	n/c	BROWN	no connection on CC-3004 or CC-3016
	. , -	DICOMIN	
Pin #12	n/c	RED	no connection on CC-3004 or CC-3016
Pin #12 Pin #13		RED	
	n/c	RED	no connection on CC-3004 or CC-3016
Pin #13	n/c Analog Input 4	red Orange Yellow	no connection on CC-3004 or CC-3016 Channel 4 (03H) Positive Analog Input
Pin #13 Pin #14	n/c Analog Input 4 Analog Ref. 4	red Orange Yellow	no connection on CC-3004 or CC-3016 Channel 4 (03H) Positive Analog Input Channel 4 (03H) Negative Reference
Pin #13 Pin #14 Pin #15	n/c Analog Input 4 Analog Ref. 4 Analog Input 3	RED ORANGE YELLOW GREEN BLUE	no connection on CC-3004 or CC-3016 Channel 4 (03H) Positive Analog Input Channel 4 (03H) Negative Reference Channel 3 (02H) Positive Analog Input
Pin #13 Pin #14 Pin #15 Pin #16	n/c Analog Input 4 Analog Ref. 4 Analog Input 3 Analog Ref. 3	RED ORANGE YELLOW GREEN BLUE VIOLET	no connection on CC-3004 or CC-3016 Channel 4 (03H) Positive Analog Input Channel 4 (03H) Negative Reference Channel 3 (02H) Positive Analog Input Channel 3 (02H) Negative Reference
Pin #13 Pin #14 Pin #15 Pin #16 Pin #17	n/c Analog Input 4 Analog Ref. 4 Analog Input 3 Analog Ref. 3 Analog Input 2	RED ORANGE YELLOW GREEN BLUE VIOLET GRAY	no connection on CC-3004 or CC-3016 Channel 4 (03H) Positive Analog Input Channel 4 (03H) Negative Reference Channel 3 (02H) Positive Analog Input Channel 3 (02H) Negative Reference Channel 2 (01H) Positive Analog Input

On the AB-3000 AudioBricks, only two of the eight analog inputs are brought out to screw terminals on the outside of the case. The remaining six inputs are available inside the case if you need to use them.

e) Power Supply: Four position screw terminals on revision 1.0 backplanes, six positions on all later ones. This connector is wired in parallel with the AUX. POWER connector. The screw terminal is used on CC-3016 cad cages for attaching it to a PS-200 power supply. The AUX. POWER connector is used on CC-3004 card cages. The pinouts for the screw terminals are silkscreened on the backplane.

The two 'sense' terminals are used to feed voltage information back to the PS-200 power supplies so that the five volt regulation is more stable. On the earlier (1.0 revision) CC-3016 backplanes, the sense inputs to the PS-200 should be connected to the **AUX. POWER** connector.

f) Aux. Power: Five position 180° DIN connector ¹⁸. This connector is wired in parallel with the POWER SUPPLY screw terminal. The screw terminal is used on CC-3016 cad cages for attaching it to a PS-200 power supply. The AUX. POWER connector is used on CC-3004 card cages. The pinouts for the screw terminals are silkscreened on the backplane. The pinout for the ALT. POWER connector is as follows:

¹⁸ Use extreme caution when making discrete wire connections to the AUX. Power, as five pin 180° DIN connectors are numbered 3, 5, 2, 4, 1 as you face the socket on the back of the card cage.

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

This is the only power supply connection on the AB-3000 AudioBrick.

g) Audio Outputs: Twenty-five position female DB-25 connector. This is used for the balanced audio outputs from the DR-3000 and DR-4000s installed in the card cage. CC-3004 Card cages have one of these connectors on them. CC-3016 Card cages have four of these connections on them. Each DR-3000 or DR-4000 has two balanced audio outputs on it. The pinouts of these connectors is as follows:

9	SIGNAL NAME	COLOR	SIGNAL FUNCTION
PIN #1	Ground 1	BROWN	right card #0 Ground
PIN #14	+ Output 1	RED	right card #0 Balanced Audio Line Level Positive (+)
PIN #2	- Output 1	ORANGE	right card #0 Balanced Audio Line Level Negative (-)
PIN #15	Ground 2	YELLOW	left card #0 Ground
PIN #3	+ Output 2	GREEN	left card #0 Balanced Audio Line Level Positive (+)
PIN #16	- Output 2	BLUE	left card #0 Balanced Audio Line Level Negative (-)
PIN #4	Ground 3	VIOLET	right card #1 Ground
PIN #17	+ Output 3	GRAY	right card #1 Balanced Audio Line Level Positive (+)
PIN #5	- Output 3	WHITE	right card #1 Balanced Audio Line Level Negative (-)
PIN #18	Ground 4	BLACK	left card #1 Ground
PIN #6	+ Output 4	BROWN	left card #1 Balanced Audio Line Level Positive (+)
PIN #19	- Output 4	RED	left card #1 Balanced Audio Line Level Negative (-)
PIN #7	Ground 5	ORANGE	right card #2 Ground
PIN #20	+ Output 5	YELLOW	right card #2 Balanced Audio Line Level Positive (+)
PIN #8	- Output 5	GREEN	right card #2 Balanced Audio Line Level Negative (-)
PIN #21	Ground 6	BLUE	left card #2 Ground
PIN #9	+ Output 6	VIOLET	left card #2 Balanced Audio Line Level Positive (+)
PIN #22	- Output 6	GRAY	left card #2 Balanced Audio Line Level Negative (-)
PIN #10	Ground 7	WHITE	right card #3 Ground
PIN #23	+ Output 7	BLACK	right card #3 Balanced Audio Line Level Positive (+)
PIN #11	- Output 7	BROWN	right card #3 Balanced Audio Line Level Negative (-)
PIN #24	Ground 8	RED	left card #3 Ground
PIN #12	+ Output 8	ORANGE	left card #3 Balanced Audio Line Level Positive (+)
PIN #25	- Output 8	YELLOW	left card #3 Balanced Audio Line Level Negative (-)
PIN #13	N/C	GREEN	

The balanced line drivers used on the DR-3000 and DR-4000s 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.

i) Audio Inputs & AES/EBU Inputs: Fifteen position male DB-15 connector. This is used to feed analog and digital audio signals into a DR-4000 installed in slot 0 of the card cage. Additional connectors may be wired to any other slots in the card cage if more than a single DR-4000 is to be used. The pinout is as follows:

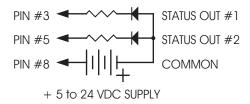
	SIGNAL NAME	COLOR	SIGNAL FUNCTION
PIN #1	Ground 1	BROWN	#1 Ground #1 Balanced Audio Line Level Positive (+) #1 Balanced Audio Line Level Negative (-)
PIN #9	+ Input 1	RED	
PIN #2	- Input 1	ORANGE	
PIN #10	Ground 2	YELLOW	#2 Ground
PIN #3	+ Input 2	Green	#2 Balanced Audio Line Level Positive (+)
PIN #11	- Input 2	Blue	#2 Balanced Audio Line Level Negative (-)
PIN #4	Ground 3	VIOLET	#3 Ground
PIN #12	+ Input 3	GRAY	#3 Balanced Audio Line Level Positive (+)
PIN #5	- Input 3	WHITE	#3 Balanced Audio Line Level Negative (-)
PIN #13	Ground 4	BLACK	#4 Ground
PIN #6	+ Input 4	BROWN	#4 Balanced Audio Line Level Positive (+)
PIN #14	- Input 4	RED	#4 Balanced Audio Line Level Negative (-)
PIN #7	Ground	Orange	#AES/EBU Ground
PIN #15	+ AES/EBU IN	Yellow	#AES/EBU POSITIVE Input
PIN #8	- AES/EBU IN	Green	#AES/EBU NEGATIVE Input

This connection is not available on the AB-3000 AudioBrick.

h) **SMPTE Out/In, Status Out, AES/EBU Out:** Nine position male DE-09 connector. There is one of these connectors for each slot in the card cage. A CC-3004 has four for these connectors on it, while the CC-3016 has sixteen. As can be seen by the functions carried on this connector, it is used for all of the left over inputs and outputs on each of the DR-3000 and DR-4000s:

	SIGNAL NAME	COLOR	SIGNAL FUNCTION
PIN #1	- SMPTE OUT	BROWN	SMPTE OUT Ground
PIN #2	- SMPTE IN	ORANGE	SMPTE IN Ground
PIN #3	Status #1	GREEN	#1 Status Output 19
PIN #4	- AES/EBU	VIOLET	AES/EBU NEGATIVE Output
PIN #5	+5 v/Status #2	WHITE	#2 Status Output 20 (+5 VDC on rev. 1.0)
PIN #6	+ SMPTE OUT	RED	SMPTE OUT SIGNAL
PIN #7	+ SMPTE IN	YELLOW	SMPTE IN SIGNAL
PIN #8	Status COMMON	BLUE	Status OUT COMMON
PIN #9	+ AES/EBU	GRAY	AES/EBU POSITIVE Output

- **1 & 6 SMPTE Out:** If enabled, The AB/DR-3000 can generate SMPTE time code as they play. This is a line level output which can be attached to the inputs of most animation and audio systems.
- 2 & 7 SMPTE In: This is the line level input for SMPTE time code to each AB/DR-3000.
- **3, 8, & 5 Status Out:** Status output #2 is not available on revision 1.0 card cages. These are two optically isolated open collector outputs. They can be configured to go active when a repeater is playing sound, at specific points while the repeater is playing, or, if operating from the Real Time Clock, once per second, minute, hour or every 24 hours. This latter mode is used to run 'regulator' style clock faces that require a 'pulse' every minute, and another each day to resynchronize all the attached clocks.



The two status outputs are fed directly from the a darlington output optoisolator. The

¹⁹ Open collector switch to status common (pin #8)

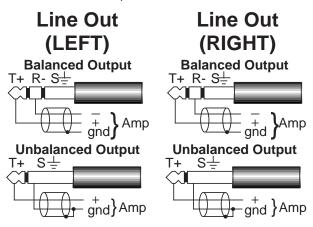
²⁰ Open collector switch to status common (pin #8)

output is limited to driving low current loads like solid state relays, optoisolators, logic level inputs and LEDs. When attaching to a logic input, just use pullup resistors (4.7 Kohm typically) to the logic Vcc, and pick up to output at the DE-09 output pin. For the base resistor in series with a LED, use a 1 K at 5 volts, 2.2 K at 12 volts, and a 4.7 K at 24 volts. These will limit the current to about 5 ma. through the optoisolators. Solid state relays need no current limiting resistors, as they are internally current limited to the proper levels.

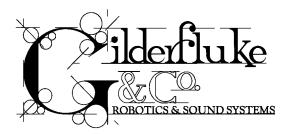
- **4 & 9 AES/EBU:** This is the direct output from the C\$8401 AES/EBU driver chip. Although this chip outputs a differential signal, to fit the specifications for SPDIF (single ended output), AES/EBU (balanced output) or Optical (fiber optic), it needs to be fed through a pulse transformer and a few resistors first. A Small PC board with these parts and the appropriate connector (along with the C\$8401 chip) are available from Gilderfluke & Company as part numbers 'SPDIF-OUT', 'AES/EBU-OUT', and 'OPTO-OUT' respectively.
- **Digital Audio Bus:**²¹ Fifty position enclosed header compatible with IDS-50 connectors. This connector can be used to bus several signals between interconnected card cages. If used, these signals are:
 - 1) Digital Audio Bus: This includes the clock and bus master signals, so <u>only one card</u> within any set of interconnected card cages can be used as the bus master.
 - 2) DMX-512: This eliminates the need to connect the DMX-512 input to each of the interconnected card cages.
 - **3) RS-422:** As with the DMX-512 above, this signal is bused to all other interconnected card cages to eliminate the need to connect the RS-422 to each one individually.

This connection is not available on the AB-3000 AudioBrick.

k) AB-3000 Audio Outputs: The AB-3000 AudioBricks use two 1/4" phone jacks for their audio outputs. Electrically, these are identical to the outputs of the DR-3000s. As shown on the AB-3000 case silkscreening, if you are using balanced input amplifiers, you can use 'stereo' plugs to connect to your amplifiers. When using single ended input amplifiers, use a 'mono' style plug and this will ground out the unused output as needed.



²¹ As there is no user wiring to this connector, the function of each wire is documented in the appendix at the end of this manual rather than here.



- AB/DR-3000 FRONT PANEL -

There are several adjustments that can be made through the front panel of a AB/DR-3000. In addition the front panel displays various AB/DR-3000 conditions. Chief among these is the AB/DR-3000 heart-beat. This is shown as the decimal point of the 'select' display. If this ever stops flashing, the hardware deadman circuit on the AB/DR-3000 will reset both the Microcontroller and DSP within one second.

Each AB/DR-3000 has two status outputs. The state of these outputs is reflected onto the decimal points of the other two displays. The #1 status output is shown on the left. The #2 status output is shown on the right.

If the repeater is performing a countdown and the display isn't otherwise occupied, a spinning 'o' will be displayed. These will be on the left display if the left (or stereo) output is in delay, and on the right for the right output. Start delays are shown by the 'o' spinning in the upper half of the display. A delay between iterations when looping a single spiel will be shown by a clockwise spinning 'o' in the lower portion of the display. Delaying while doing a 'loo-all' will spin the 'o' in a counterclockwise direction.

FRONT PANEL ADJUSTMENTS

The front panel adjustments are made by pressing the 'SELECT' button to choose the function you wish to adjust. The selection is then incremented and decremented by using the up/down buttons. Once an adjustment has been made, continue pressing the 'SELECT' button to return the AB/DR-3000 to its home position (the 'select' display blanked). These buttons have a one second delay before they start repeating at ten counts per second. The 'SELECT' button has an additional one second delay each time it passes its home position. This makes it a bit easier to get back to home.

Any adjustment which can be made on the front panel will be indicated by the 'current value' blinking at the same rate as the 'heart' decimal point on the 'select' display. If an adjustment is unavailable (because you have selected a 'fixed' level or another adjustment source), the 'current value' will not be blinking.

If the Configuration EEPROM is enabled for writing (see JP-7 below), any changes in the settings you make will be saved. The next time the AB/DR-3000 is turned on, it will return to the levels you have set. If writing to the EEPROM has been disabled, then the settings that can be adjusted will flash at a slower rate than the 'heart' decimal point. This indicates that any settings you change will only have an effect until the repeater is turned off. The next time it is turned on, it will revert to the 'default' values for all of the settings.

The Real Time Clock (RTC) on a repeater (if this option is installed) will be unaffected by the front panel until you change any of the current settings. The 'select' display will then start flashing to indicate that the new settings will be written to the RTC the moment the 'select' display is returned to its home position (display blanked). The seconds will be reset to zero and the clock will start keeping time.

The following adjustments are available:

- 1) Left Volume: This selection is used to adjust the level of this audio output from the AB/DR-3000. The range of adjustment is from 0-99 (default value = 99). This adjustment is linear, which means that a setting of '50' is pretty close to a 50% output level.
- 2) Left Half Mute: This selection is used to adjust the level this audio output from the AB/DR-3000 when the HALF MUTED audio level is selected. The range of adjustment is from 0-99 (default value = 99). This adjustment is linear, which means that a setting of '50' is pretty close to a 50% output level.
- **3) Left Treble:** This selection is used to adjust the high pass filter of this audio output from the AB/DR-3000. The range of adjustment is from 0-99 (default value = 99). A flat level output is set by a value of 99.
- **4) Left Bass:** This selection is used to adjust the low pass filter of this audio output from the AB/DR-3000. The range of adjustment is from 0-99 (default value = 99). A flat level output is set by a value of 99.
- **5) Right Volume:** This selection is used to adjust the level of this audio output from the AB/DR-3000. The range of adjustment is from 0-99 (default value = 99). This adjustment is linear, which means that a setting of '50' is pretty close to a 50% output level.
- **6) Right Half Mute:** This selection is used to adjust the level this audio output from the AB/DR-3000 when the HALF MUTED audio level is selected. The range of adjustment is from 0-99 (default value = 99). This adjustment is linear, which means that a setting of '50' is pretty close to a 50% output level.
- **7) Right Treble:** This selection is used to adjust the high pass filter of this audio output from the AB/DR-3000. The range of adjustment is from 0-99 (default value = 99). A flat level output is set by a value of 99.
- **8) Right Bass:** This selection is used to adjust the low pass filter of this audio output from the AB/DR-3000. The range of adjustment is from 0-99 (default value = 99). A flat level output is set by a value of 99.

If the Digital Audio Bus is being used on a DR-3000, the following selections will also be available:

- **A) Mix Bus 'A':** (This adjustment available on DR-3000s that are using the Digital Audio Mix Bus). This selection is used to adjust level of audio sent to or received from the Digital Audio Mix Bus. The range of adjustment is from 0-99.
- **B) Mix Bus 'B':** (This adjustment available on DR-3000s that are using the Digital Audio Mix Bus). This selection is used to adjust level of audio sent to or received from the Digital Audio Mix Bus. The range of adjustment is from 0-99.
- **C) Mix Bus 'C':** (This adjustment available on DR-3000s that are using the Digital Audio Mix Bus). This selection is used to adjust level of audio sent to or received from the Digital Audio Mix Bus. The range of adjustment is from 0-99.
- **D) Mix Bus 'D':** (This adjustment available on DR-3000s which are using the Digital Audio Mix Bus). This selection is used to adjust level of audio sent to or received from the Digital Audio Mix Bus. The range of adjustment is from 0-99.

If the Real Time Clock (RTC) option has been installed on a AB/DR-3000, the following selections will also be available:

- y) Year: Available only if Real Time Clock (RTC) option is installed. The range of adjustment is from 0-99. If <u>any</u> RTC adjustment is changed, the 'Select' digit will start flashing to indicate that the new settings will be written to the RTC chip the instant the 'select' is returned to the 'home' position (display blanked). This value will continue to indicate until <u>any</u> RTC value is changed.
- i) mlnute: Available only if Real Time Clock (RTC) option is installed. The range of adjustment is from 0-59. If <u>any</u> RTC adjustment is changed, the 'Select' digit will start flashing to indicate that the new settings will be written to the RTC chip the instant the 'select' is returned to the 'home' position (display blanked). This value will continue to indicate until

any RTC value is changed.

- h) Hour: Available only if Real Time Clock (RTC) option is installed. The range of adjustment is from 0-23. If <u>any</u> RTC adjustment is changed, the 'Select' digit will start flashing to indicate that the new settings will be written to the RTC chip the instant the 'select' is returned to the 'home' position (display blanked). This value will continue to indicate until any RTC value is changed.
- t) daTe: Available only if Real Time Clock (RTC) option is installed. The range of adjustment is from 0-31. If <u>any</u> RTC adjustment is changed, the 'Select' digit will start flashing to indicate that the new settings will be written to the RTC chip the instant the 'select' is returned to the 'home' position (display blanked). This value will continue to indicate until <u>any</u> RTC value is changed.
- n) moNth: Available only if Real Time Clock (RTC) option is installed. The range of adjustment is from 0-12. If <u>any</u> RTC adjustment is changed, the 'Select' digit will start flashing to indicate that the new settings will be written to the RTC chip the instant the 'select' is returned to the 'home' position (display blanked). This value will continue to indicate until <u>any</u> RTC value is changed.
- o) day Of week: Available only if Real Time Clock (RTC) option is installed. The range of adjustment is from 1-7 (Sunday=1, Saturday=7). If <u>any</u> RTC adjustment is changed, the 'Select' digit will start flashing to indicate that the new settings will be written to the RTC chip the instant the 'select' is returned to the 'home' position (display blanked).

The default settings for the entire configuration EEPROM can be reloaded by pressing and holding both the 'UP' and 'DOWN' buttons as power is applied to the AB/DR-3000. The configuration EEPROM must be enabled for writing (see JP-7 below) for the defaults to be reloaded.

GILDERFLUKE & CO. 1 200 3001H PLOWER 31. 1 BURDANK, CALIF. 91302-2102 1 010/040-9404 1 FAX 010/040-9403

- Front Panel Display Messages -

There are a number of different messages that the AB/DR-3000 can display on its front. Some of these you will see regularly as the repeater operates. Others you may never see.

The 'Select' digit lights to show what the two other digits are trying to tell you. The possible conditions are:

- <u>u</u>= **Unit Address:** The serial port address of a repeater is displayed for two seconds when it is first turned on. The address is shown as HEXadecimal numbers, as this is most often the form it is needed in (for entering configuration or serial port commands).
- <u>n</u>= **Number of Mono Spiels:** The number of messages stored on a repeater is displayed two seconds immediately after the unit address (see above). The '<u>n</u>' indicates that the spiels are recorded in Mono. Values from one to ninty-nine will be shown as decimal numbers. If more than ninty-nine spiels are loaded then HEXadecimal numbers will be used.
- <u>o</u>= Number of Stereo Spiels: (Note the 'S' looks exactly like the number '5' on the display) The number of messages stored on a repeater is displayed for two seconds immediately after the unit address (see above). The 'S' indicates that the spiels are recorded in Stereo. Values from one to ninty-nine will be shown as decimal numbers. If more than ninty-nine spiels are loaded then HEXadecimal numbers will be used.
- **<u>c</u>**= **In Serial Port Configuration Mode:** This indicates that the configuration mode has been entered by the repeater. The two digit display will continue to operate normally.
- **P= Playing a Stereo message:** The number of the spiel appears on the two digit display. If up to 99 spiels are recorded on a repeater, then they are shown as decimal numbers. Above this they are shown as HEXadecimal numbers.
- **L= Playing a mono spiel through the Left output:** If the Right side is also playing, then this indicates that the Left side was the most recently started. The number of the spiel appears on the two digit display. If up to ninty-nine spiels are recorded on a repeater, then they are shown as decimal numbers. Above this they are shown as HEXadecimal numbers.
- **r= Playing a mono spiel through the Right output:** If the Left side is also playing, then this indicates that the Right side was the most recently started. The number of the spiel appears on the two digit display. This will always be displayed when you start both left and right spiels simultaneously, as the repeater checks and starts the left side prior to the right. If up to ninty-nine spiels are recorded on a repeater, then they are shown as decimal numbers. Above this they are shown as HEXadecimal numbers.
- **E= Error Messages:** The number of the error appears on the two digit display. An error message will overwrite anything else that might have been on the display. It will then go away after one second. Some error messages can appear regularly (depending on your configuration), while others you hopefully will never see.

The repeaters start the left side before the Right. This means that if you are using the repeater for two mono audio tracks, and commands arrive simultaneously (as when using the same binary bits to select and start messages, and using the left/right split to decide where each goes), the error message for the right side will take precedence over those for the Left.

Error messages are:

Universal Error Messages:

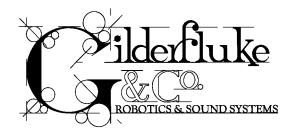
- **00:** Microcontroller failed to establish contact with the Digital Signal Processor. This means that there is a hardware problem that has locked up the AB/DR-3000's DSP. This is not one of those messages you want to see.
- **01: No Sound Loaded:** The DSP was unable to find any valid sound memory. You can configure the repeater, but any attempts to start it playing will just redisplay this message.
- **02: Invalid Spiel Zero:** Requested a spiel number zero. This isn't a valid spiel number.
- **03: Invalid Spiel:** Requested a spiel number which is larger than the number of spiels loaded on this AB/DR-3000. The request is ignored and this message is displayed.
- **04: Loading Defaults:** This will be displayed as the AB/DR-3000 is reloading its EEPROM with default values. This happens if you depress both the up and down buttons as the repeater is powered on, or if the repeater senses that the EEPROM is corrupted during power up.
- **05: Error While Loading Defaults:** This message indicates that the AB/DR-3000 is trying to reload the defaults (see above), and finds that the EEPROM has been write protected. If you ever see this message, you should power down the repeater, enable the EEPROM writes, and apply power again. After the EEPROM is successfully reloaded and reconfigured you can again disable writing to the EEPROM.
- **06: DMX Checksum Error:** There has been an error in the incoming DMX data. Errors can only be sensed if DMX Checksum Error checking has been turned ON.
- **07: Uploading Configuration through Serial Port:** This message is displayed as a file is being uploaded into the EEPROM on an AB/DR-3000.

Left (or Stereo) Channel Messages:

- **11: Invalid Spiel for Left:** Trying to play a mono spiel on the Left side which is over the left/right split. This will only be displayed if the left/right split has been set.
- **12: Ignoring an Early Start on Left (or stereo):** Start ignored because the repeater is already playing and it has been configured to ignore additional messages.
- **13: Storing an Early Start on Left (or stereo):** Start ignored because the repeater is already playing. The requested spiel has been stored and will be playing after the current spiel ends.
- 17: Starting a spiel on the Left (or stereo) when audio is fully muted: This error message is to remind you why you don't hear any sound when you start a spiel and have forgotten to un-mute the audio first. If you have configured a spiel to start and fade in on the same input, you will also see this message displayed, even though the sound will become audible as the fade in kicks in.

Right Channel Messages:

- **21: Invalid Spiel for Right:** Trying to play a mono spiel on the Right side which is under the left/right split. This will only be displayed if the left/right split has been set.
- **22: Ignoring an Early Start on Right:** Start ignored because the repeater is already playing and it has been configured to ignore additional messages.
- **23: Storing an Early Start on Right:** Start ignored because the repeater is already playing. The requested spiel has been stored and will be playing after the current spiel ends.
- 27: Starting a spiel on the Right when audio is fully muted: This error message is to remind you why you don't hear any sound when you start a spiel and have forgotten to unmute the audio first. If you have configured a spiel to start and fade in on the same input, you will also see this message displayed, even though the sound will become audible as the fade in kicks in.

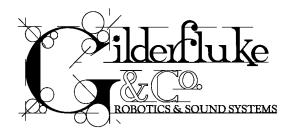


- AB/DR-3000 HARDWARECONFIGURATION-

There are four that are set using jumpers on each card. With the exception of the jumper which is used to enable and disable the EEPROM, you should never have to adjust any of these.

JUMPER ADJUSTMENTS

- **JP4)** A18 or /WR: This jumper selects what signal will be sent to pin number thirty-one on the AB/DR-3000's onboard EPROM sockets. It is normally set to the 'A18' side, unless FLASH ROMs are installed on the card.
- **JP5) V+ or A19:** This jumper selects what signal will be sent to pin number one on the AB/DR-3000's onboard EPROM sockets. It is normally set to the 'A19' side, unless FLASH ROMs are installed on the card.
- JP6) Clock Enable: (available only on early DR-3000s) This jumper must be inserted on one, and only one DR-3000 within a set of interconnected card cages. This jumper, when installed, causes that card to act as the master clock for all the other DR-3000s. That is why only one card can be set to act as a clock at one time. If more than one card is enabled as a clock, or no DR-3000s have been enabled to act as the clock, then none of the DR-3000s in the interconnected card cages will run. This jumper is not available on the AB-3000 AudioBricks. The clock is provided by the card cage for all later DR-3000s.
- JP7) EEPROM Write Protect: All the configuration data for a AB/DR-3000 is stored in a type of nonvolatile memory chip called an EEPROM. When this jumper is installed in the WRITE PROTECT position, it disables all writes to the configuration EEPROM. This locks your current configuration against accidental or unauthorized changes until the jumper is removed. When the EEPROM has had been write protected you will find the following changes in the repeater:
 - a) Any front panel adjustments that are enabled will not be saved. When the repeater is reset (turned off and then on again), the DEFAULT setting for these adjustments will be returned.
 - b) When entering CONFIGURATION MODE, a message will be displayed telling you no changes will be saved.
 - c) Once in configuration, the title of each menu will tell you that the EEPROM has been write protected.
 - d) While in configuration mode, all commands will behave normally, but no changes will be saved.
 - e) The SET DELAY command from the serial port will not alter the current settings.
 - f) If you change the Digital Audio Buss bank selection, the reboot function will not work.
- **JP10, JP11) 1/4 J6 Input Internal/External Power: (AB-3000's only)** These jumpers set whether the 1/4 J6 input to the AB-3000 will be powered by externally (normal mode) or by the AB-3000 itself. The latter allows simple switch closures to be used to trigger the AB-3000. On revision 1 AB-3000's jumpers are inserted to set the port to internal power. On 2.0+ AB-3000's, a pair of three pin headers are used. With the jumpers in the left position the 1/4 J6 is set for internal power. With the jumpers set in the right position it is set for external power.



- AB/DR-3000 SOFTWARE CONFIGURATION-

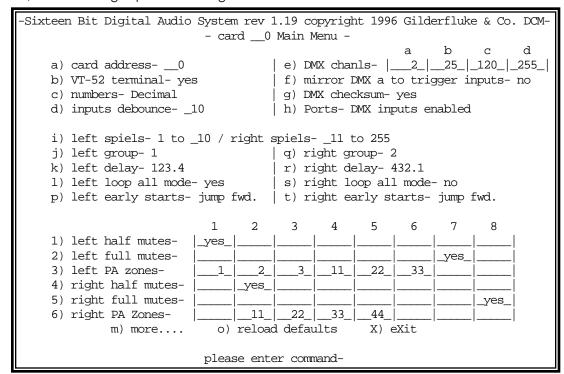
The configuration on a AB/DR-3000 tells it what you want to happen when it receives signals on its inputs and what it does on its outputs. Typically the configuration needs only be done once on each unit. There is only one way to configure a AB/DR-3000. This is through the serial port. To do this, you need to connect the system just as you do for any serial communications (see the 'serial commands' section of the manual). You can use any computer (Mac or PC), or even a dumb terminal. The configuration mode is entered by the command:

"m" (5AA5) (CARD#)

EXAMPLE: To bring up the configuration screen for a card addressed as 'ADDRESS 00' (An address of 00h is the normal address when a AB/DR-3000 is shipped): m5AA500

The "m" is the command for entering the configuration mode. The (5AA5) part of the command is a 'combination lock' to keep this mode from being inadvertently entered. If the 'combination' and **CARD#** match, the card addressed by the **CARD#** will put a configuration menu on the screen. When this mode is entered by any device on the same serial network, it disables all the other serial commands on all the other devices in the system.

The AB/DR-3000 brings up the following Main Menu screen:



Commands are entered by pressing the single character shown next to the command you wish to invoke. If no command has been entered, the <ESC>ape key or <SPACE BAR> can be used to redraw the screen. If you want to keep a hard copy printout of the current configuration of any screen, you should hit either of these keys while saving the text on your computer. This file can then be printed out or incorporated into your show documentation package.

The <DELETE> key can be used to erase the last character entered. If you have already entered some characters, the <ESC>ape key can be used to erase all the characters you have entered thus far. If you try to enter more characters than the command calls for, the extra keystrokes will 'scroll'. Hitting the <RETURN> key will tell the AB/DR-3000 to accept your entry as typed. If the entry is invalid, the AB/DR-3000 will beep annoyingly and ask for the same input again. If at any point you enter a command and have yet to enter any other characters, you can leave the command by hitting the <ESC>ape or <RETURN> key.

The configuration of a AB/DR-3000 can be locked at any time by simply removing JP-7 pin #1 to #2 and moving it to pin #2 to Pin #3 22 . The AB/DR-3000 will warn you when you enter the setup mode if the configuration EEPROM has been locked.

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 AB/DR-3000s will then start listening to you again.

"a" Card Address:

Card address used by serial port commands and configuration. The address is displayed on the front of the repeater each time it is turned on. Only one device on the same serial network can use the same address. For AB-3000s, which usually run solo, this usually present no problem and the default 00 address can be used.

For card cage mounted DR-3000s, the addresses must be set to talk to any of the DR-3000s within the cage. This can be done through the serial port only if one card is installed at a time, and has its address set before installing the next card.

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"b" VT-52 Termingl:

When this toggle is enabled, the AB/DR-3000 will use special escape sequences to clear the current line (<ESC>ape 'I'), or position the cursor (<ESC>ape 'Y' ROW COLUMN). When disabled, the AB/DR-3000 has to redraw the entire screen to change any value, so it can save a good deal of screen redraw time if you have a compatible display. Virtually all terminal programs will support VT-52 terminal emulation.

"c" Numbers:

This toggles the AB/DR-3000 between Decimal (0 to 255) and Hexadecimal (00 to FF) numbering systems. In most cases these will turn to absolute values when Hex mode is selected. The table at the back of this manual will allow you to translate between these different numbering systems if necessary.

All commands received through the serial port will use the HEXadecimal numbering system, regardless of which has been selected.

This setting will have no effect on the front panel display. It will show spiel numbers as decimal values (00 to 99) unless more than 100 spiels are stored on a repeater. It will then use HEXadecimal numbers.

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"d" Input Debounce:

This command is used to set the number of times the software in the AB/DR-3000 will check the serial port input for the same value when operating in IR Mode. Too small a value will cause the AB/DR-3000 to

²² Some earlier versions of the AB/DR-3000 only had two pins for JP-7. Insert a jumper across these two pins to protect the configuration memory, and remove it to allow full access.

accept bad signals and trigger the wrong spiels. Too large of a value can delay the start of a spiel. The default value is eight.

DMX Channels:

"e"

Each AB/DR-3000 can listen to as many as four DMX-512 data channels at one time. This command is used to select which ones will be used. DMX Channels must be entered in ascending order. This command will beep annoyingly at you if you try to do otherwise. All other commands in the AB/DR-3000 setup menus refer to the DMX channels as 'a', 'b', 'c', or 'd'. Only the first DMX channel 'a' can be used as a trigger input for the AB/DR-3000 (see next command).

This command is unavailable if DMX Mode has been turned OFF.

"f"

Mirror DMX 'a' to Trigger Inputs:

If desired, the first DMX-512 channel (a) can also be sent to the trigger inputs. When you do this, the AB/DR-3000 will treat any data coming through this DMX channel just as if it were coming in through the 1/4 J6 optoisolated inputs. This DMX-512 input can the be used to randomly select shows, start or stop spiels, mute and unmute outputs, or do anything else you can do with any of the 1/4 J6 inputs. Separate configurations are not available for the DMX-512 and 1/4 J6 inputs.

This command is unavailable if DMX Mode has been turned OFF.

"g" DMX Checksum:

This tells the AB/DR-3000 to use a checksum that is transmitted by PC·MACs in the 256th and 257th DMX channels. This checksum is used by this and other Gilderfluke & Co. equipment to verify that no errors were found in the transmitted data before it is used to update their outputs. It should always be used if the AB/DR-3000 is being controlled by any Gilderfluke & Co. Animation Control System.

When a checksum error is encountered in the incoming DMX data an error message 'E06' will be displayed on the front of the AB/DR-3000.

This command is unavailable if DMX Mode has been turned OFF.

"h"

Ports = DMX, SMPTE In/Out or IR Mode:

The serial port on the AB/DR-3000 can be set to one of four modes. These are:

- A) DMX-512 Input: The DMX-512 mode is used to receive a high speed serial data stream from a Animation Control or lighting system. This allows any number of AB/DR-3000s to be controlled through a single twisted pair of wires. Each AB/DR-3000 can listen to as many as four different DMX-512 channels and use this information to control various volumes. If the Mirror DMX 'a' to Trigger Inputs is ON, then one of the DMX-512 channels can be used to select and trigger spiels, mute/unmute, or ramp the outputs up and down.
- **B) SMPTE Input:** When the SMPTE Input is on, the AB/DR-3000 will listen to any SMPTE time code sent to it and trigger spiels based on table you enter on the **SMPTE TRIGGER** menu. Once triggered, the sound will not follow any variations in speed in the incoming SMPTE. Up to forty-eight (48) different triggers can be entered. The AB/DR-3000s will process only one trigger on each second. If more than one trigger is set for the same second, then just the first one will honored.

The SMPTE input on the AB/DR-3000s isn't as 'picky' as the readers on our Animation Control systems. It doesn't require a number of consecutive good frames of data before it believes the SMPTE it receives. It should accept SMPTE at 24, 25, 30 or 29.97 FPS. All you need to do is NOT schedule any starts on frames that don't exist in the incoming SMPTE. i.e.: If you are

using SMPTE at 25 FPS, don't try to trigger sounds on the 26th frame. The AB/DR-3000's SMPTE input should follow SMPTE with a speed variation of approximately 25% from 30 FPS.

The AB/DR-3000s check for any spiels they might need to trigger one second ahead of the SMPTE time they are receiving. If one is found then they use the incoming SMPTE frame number to trigger the spiel. This allows the SMPTE triggers to be handled at a high priority interrupt level for the greatest possible accuracy.

The AB/DR-3000 needs to receive at least one second of timecode, including that second's frame 'zero', to trigger a spiel. i.e.: If the time code starts at 00:00:00.01, the first possible trigger would be at 00:00:02.00. A 'preroll', can be used if you need to trigger right at the start of the received timecode. Unlike the timecode readers in our Animation Control Systems, the AB/DR-3000s won't be offended by receiving the end of the previous hour. Note that the AB/DR-3000's reader expects 23:59:59 to roll over to 00:00:00.

If there is a glitch in the timecode which makes the SMPTE reader do a search for the sync word after a trigger is found in the table but before it is played, the sound will not be played. If for some reason the frame where a trigger is supposed to take place is missed, but no error is generated, then the spiel will be played during the next good second. If the SMPTE is stopped cleanly (without nay error) after an entry has been found in the table but before it has been played, and then restarted cleanly (again without nay error) at a different time, the spiel will play at the selected frame regardless of what the new time is. The odds of the latter two events ever actually happening in the field are VERY small.

For those of you who want to know exactly when the sounds are triggered: It is two bits into the SMPTE sync word that follows the frame upon which the sound is to be triggered. The SMPTE triggers are handled at an interrupt level, and are the most time-accurate triggers available on these repeaters.

C) SMPTE Output: When the SMPTE Output is enabled, the AB/DR-3000 will act as a SMPTE time code generator whenever the Left side (or a stereo spiel) is playing. When generating SMPTE timecode the minutes, seconds and frames always start at 00:00.00. The 'Hour' digit of the SMPTE will reflect the number of the spiel being played. As with the front panel display, decimal numbers (01 to 99) will be used as long as there are less than 100 spiels on a repeater. HEXadecimal numbers will be used if there are more than 100.

The only frame rate the AB/DR-3000s will generate is 30 FPS, non drop frame 23 . Note that the actual frame rate generated by the DR-3000 is slightly off from an actual 30 Hz frequency by -.0008. Over the course of a 20 minute spiel, the generated SMPTE will get off by about one second from the actual time. Anything which is listening to the AB/DR-3000 timecode will simply follow it, taking this error in stride. Additional timecode error can be generated by drift between the crystal that is used for audio reproduction and the one that is used by the microcontroller. The crystals we use are typically specified with accuracies of +/-.0001. Any equipment which is synchronized to the AB/DR-3000 system should never so small an error.

Although the SMPTE generation is started right when a spiel is triggered, the end is treated as a low priority by the AB/DR-3000. Depending on other tasks you have the AB/DR-3000 doing at the time (scanning RTC, Status output or SMPTE tables, receiving or transmitting serial data, running delays), the final time received from the SMPTE output may vary slightly.

D) IR Mode: This is a special mode to be used with the InfraRed Remote Control from Gilderfluke & Company. It is typically used to trigger a sound system mounted on a vehicle, turntable, or other installation where wires can't be used for the triggers. Any binary show spiel number received by this serial port for more times than the value stored in the **DEBOUNCE** variable will trigger that spiel. Typically the transmitters are placed along the path of the vehicle's travel to trigger the appropriate spiels at the appropriate times.

The connections to the IR Remote Receiver are as follows (view is facing end of cable with latch up):

²³ 'Drop Frame' time code literally 'drops' a frame every few seconds.

LEFT	<u>NAME</u> Ground	COLOR WHITE	Signal Ground
	n/c n/c	BLACK RED	no connection no connection
	- TxD + TxD	GREEN YELLOW	- DATA IN TO AB/DR-3000 (use DMX-512 - Input) + DATA IN TO AB/DR-3000 (use DMX-512 + Input)
RIGHT	Ground	BLUE	Signal Ground

Besides these connections, the IR Receiver requires a 7 to 24 volt DC power supply connection. This is normally attached to the two pads marked "+" and "-" on the receiver. A jumper option allows you to bring this in through the blue wire on the RJ-11 connector.

The IR Transmitter has an eight position dipswitch that sets which spiel it selects. The spiel number is set in HEXadecimal as follows. If the **Left/Right Split** has been set, spiel requests below the split will be sent out the Left output while those over the split will be sent out the Right output. Valid spiel numbers are 01h through FFh. If the **Left/Right Split** has not been set, then the eighth (high order) bit is used to select whether the spiel will be sent out of the Left or Right outputs. Valid spiel numbers are 01h through 7Fh. The lower nibble of the address are set with the first four switches, and the upper nibble is set with the last four:

Switch #1	SWITCH #2	Switch#3	SWITCH #4	LOWER NIBBLE OF SPIEL NUMBER
OFF	OFF	OFF	OFF	x0h
ON	OFF	OFF	OFF	x1h
OFF	ON	OFF	OFF	x2h
ON	ON	OFF	OFF	x3h
OFF	OFF	ON	OFF	x4h
ON	OFF	ON	OFF	x5h
OFF	ON	ON	OFF	x6h
ON	ON	ON	OFF	x7h
OFF	OFF	OFF	ON	x8h
ON	OFF	OFF	ON	x9h
OFF	ON	OFF	ON	xAh
ON	ON	OFF	ON	xBh
OFF	OFF	ON	ON	xCh
ON	OFF	ON	ON	xDh
OFF	ON	ON	ON	xEh
ON	ON	ON	ON	xFh
Switch#5	SWITCH#6	CMT-011 #7	Currou #0 2	UPPER NIBBLE OF SPIEL NUMBER
SWIICH#5	SWIICH#0	SWITCH #7	SWIICH # O	Obbek WIRRIE OF Shiff MOWREK
OFF	OFF	OFF	OFF	Oxp
OFF	OFF	OFF	OFF	0xh
OFF ON	OFF OFF	OFF OFF	OFF OFF	0xh 1xh
OFF ON OFF	OFF OFF ON	OFF OFF	OFF OFF	0xh 1xh 2xh
OFF ON OFF ON	OFF OFF ON ON	OFF OFF OFF	OFF OFF OFF	Oxh 1xh 2xh 3xh
OFF ON OFF ON OFF	OFF OFF ON ON OFF	OFF OFF OFF ON	OFF OFF OFF OFF	0xh 1xh 2xh 3xh 4xh
OFF ON OFF ON OFF ON	OFF OFF ON ON OFF OFF	OFF OFF OFF ON ON	OFF OFF OFF OFF OFF	0xh 1xh 2xh 3xh 4xh 5xh
OFF ON OFF ON OFF ON OFF	OFF OFF ON ON OFF OFF	OFF OFF OFF ON ON	OFF OFF OFF OFF OFF	0xh 1xh 2xh 3xh 4xh 5xh 6xh
OFF ON OFF ON OFF ON OFF	OFF OFF ON ON OFF OFF ON	OFF OFF OFF ON ON ON	OFF OFF OFF OFF OFF OFF	0xh 1xh 2xh 3xh 4xh 5xh 6xh
OFF ON OFF ON OFF ON OFF	OFF OFF ON OFF OFF ON ON ON	OFF OFF OFF ON ON ON ON	OFF OFF OFF OFF OFF OFF OFF	0xh 1xh 2xh 3xh 4xh 5xh 6xh 7xh
OFF ON OFF ON OFF ON OFF ON	OFF OFF ON OFF OFF ON ON OFF	OFF OFF OFF ON ON ON ON OFF	OFF OFF OFF OFF OFF OFF ON ON	0xh 1xh 2xh 3xh 4xh 5xh 6xh 7xh 8xh
OFF ON OFF ON OFF ON OFF ON OFF	OFF OFF ON ON OFF ON ON OFF OFF OFF	OFF OFF OFF ON ON ON ON OFF OFF	OFF OFF OFF OFF OFF OFF ON ON	0xh 1xh 2xh 3xh 4xh 5xh 6xh 7xh 8xh 9xh Axh
OFF ON OFF ON OFF ON OFF ON OFF	OFF OFF ON ON OFF OFF OFF OFF ON OFF OFF	OFF OFF OFF ON ON ON OFF OFF	OFF OFF OFF OFF OFF OFF ON ON ON	0xh 1xh 2xh 3xh 4xh 5xh 6xh 7xh 8xh 9xh Axh Bxh
OFF ON OFF ON OFF ON OFF ON OFF ON	OFF OFF ON ON OFF OFF ON ON OFF OFF	OFF OFF OFF ON ON ON ON OFF OFF OFF	OFF OFF OFF OFF OFF OFF ON ON ON	Oxh 1xh 2xh 3xh 4xh 5xh 6xh 7xh 8xh 9xh Axh Bxh Cxh
OFF ON OFF ON OFF ON OFF ON OFF ON	OFF OFF ON ON ON ON OFF OFF ON ON OFF OFF	OFF OFF OFF ON ON ON OFF OFF OFF OFF	OFF OFF OFF OFF OFF OFF ON ON ON ON	Oxh 1xh 2xh 3xh 4xh 5xh 6xh 7xh 8xh 9xh Axh Bxh Cxh Dxh

²⁴ If the **Left/Right Split** has not been set, then this switch is used to select whether the spiel will be sent out of the Left (switch OFF) or Right (switch ON) outputs.

The IR mode has some special features to keep it from continuously starting the same spiel several times each second when an IR signal is continuously applied. Once a spiel has been started by an IR input, that <u>same</u> spiel can not be retriggered by the IR until it has stopped playing. Any other spiel can be triggered immediately. You can set the 'EARLY STARTS' to 'IGNORE', "STORE' or 'JUMP IMMEDIATELY' as needed just as with any other trigger source when operating in IR MODE.

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Left/Right Spiel Split (mono spiels only):

One of the design problems with a stereo channel repeater that can be used as two independent mono channels is how to determine which mono spiels 'belong' to each side of the repeater. This command is used with mono spiels to 'assign' all the spiels up to the threshold to the left output, while those over this threshold are sent to the right. If you enter a zero value for this setting, then the 'split' is disabled and any mono spiel can be sent to either output of the repeater. The left/right split will have the following effect on the following commands:

1) If Binary spiel requests are used to select a spiel through the 1/4 J6 inputs (or DMX input 'a' mirrored to the 1/4 J6 inputs). Spiel numbers that are up to the split are sent to the left output of the AB/DR-3000, while larger numbered requests are routed to the right output. This allows you to set up the identical set of bits as binary spiel selects/triggers for both the left and right outputs. If a request comes in which is below the threshold, the AB/DR-3000 will know to route the request to the left channel. If it is above the threshold, it will know to send it the right output.

If the bit that has been assigned as 'bit zero' is also being used to trigger actions on the opening or closing edge of the entire binary word, it will only send the commands to the channel for which the requested spiel is valid.

- 2) If no specific spiel is requested, each 'start' input will trigger the next spiel in turn. When the left/right split has been set, the left channel will start with spiel number one, and play each spiel until the threshold is reached. It will then recycle back to the first spiel. The right channel will start with the first spiel after the threshold and play each spiel in turn until the last spiel is played. It will then recycle back to the first spiel after the threshold.
- 3) If the 'loop all' mode is set for either channel, the AB/DR-3000 will cycle the left channel through the first spiel through the spiel at the threshold. The right channel will be cycled between the spiel after the threshold and the last spiel.
- 4) When selecting spiels through the **IR Mode** and the **Left/Right Split** has been set, spiel requests up to the threshold will be sent out the Left output while those over it will be sent out the Right output. If the **Left/Right Split** has not been set, then the eighth (high order) bit of the incoming IR spiel selection is used to set whether the spiel will be sent out of the Left or Right outputs.
- 5) When the **RESET** command is received through he serial port: If stereo ROMs are installed or the command is received by the left side repeater, then the 'next spiel' pointers are set the first spiel on the repeater. If the Left/Right Split has been set, then the Right side's 'next' is set to the next spiel after the 'split'. Otherwise it too is set to point to the first spiel.

"j"

Left Group: Right Group (mono spiels only):

Any AB/DR-3000 or Smart Brick Brain can be configured to respond to one of sixteen possible 'group' commands issued through the serial port. This allows you to start several devices with only a single serial command. This menu selection is used to set which group this card will respond to. The allowable range for this entry is 0-9, A-F.

DR-3000s also have a second use for the 'Group Starts'. If a card is started that has a 'Group Start' set on the Trigger Menu, it will relay that start command through the Digital Audio Bus to all the other DR-3000s in the cage. All other DR-3000s that are using that group number will then be started within one

44,100 th of a second. If the card that started the group is also set to loop, then at the end of its spiel it will **DELAY** as needed, and resend the start command down the Bus. This mode allows any number of DR-3000s to be perfectly synchronized as a replacement for bin loop tape decks. With sixteen possible groups, sixteen independent bin loop reproduction systems can exist within the same interconnected set of card cages.

.....

Left Delay:

Left Loop All Mode:

"k"

Right Delay (mono spiels only):

The delay can be set anywhere up to 999.9 seconds for either channel. If the delay flag has been set on the trigger menu, the delay will take place before the spiel plays. If a card is set to **LOOP** or **LOOP ALL MODE** is on, then the delay will be inserted between each iteration of the loop.

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"[" "s"

Right Loop All Mode (mono spiels only):

When a spiel is started with the **'LOOP**' modifier set, the current spiel will be played over and over until it is told to stop. The loop all mode tells the AB/DR-3000 to play all the spiels stored on the Eproms in turn, delaying by the **DELAY TIME** as needed between each spiel. ²⁵

.....

"p"

Left Early Starts:
Right Early Starts (mono spiels only):

You have the choice of what each AB/DR-3000 does when it is still playing a spiel and receives a new 'START' command. The options are:

- 1) DO NOTHING.
- 2) JUMP FORWARD to the next show.
- 3) BANK START so that it won't be acted upon until the current show finishes. If a show request is also received, it will be banked one request deep. Any **Group Start**, **Looping**, or **Delayed Start** modifier will also be stored along with the spiel request.

"1" Left Half Mutes:
"2" Right Full Mutes:
"4" Left Half Mutes:
"5" Right Full Mutes:

There are eight possible Half Mute zones, and eight possible full mute zones that can be requested by a MA-100 PA Master. These commands are used to set which zones each DR-3000 will respond to. When a channel is fully muted, it will have its output set to the lowest possible volume. When a channel is 'Half Muted', then the volume is set to the 'Half Mute' levels set on the Volume Menu. There is nothing to keep you from setting the Half Muted level higher than that for the normal un-muted level.

"3" "6" Left Public Address Zones: Right Public Address Zones:

There are eight possible Public Address zones that each channel on the DR-3000 will respond to when they are requested by a MA-100 PA Master. These commands are used to set which zones each

²⁵ If the ROM set is mono, and the **LEFT/RIGHT SPLIT** has been set, then the left channel will only play spiel numbers up to the split, and the right channel will play only spiels over the split.

DR-3000 will respond to. When a channel is responding to a PA request, its output is set to the 'Half Muted' level, and the audio from the appropriate Digital Audio Bus channel is routed to that output. PA zones enabled for the Left or Right channel will each use up one of the four Digital Audio Bus connections available on each DR-3000 ²⁶.

Priorities for each channel are set by the order in which zones are entered on this menu. PA zones that are in the first slots will take precedence over those that are farther down the list.

These two commands are slightly different than most others. The <ESC>ape key will not work to exit the command if you enter it inadvertently. You have to make all eight entries once this command is started. To clear a single entry, you can either type a <carriage return> by itself or enter 255/FFh.

The PA System uses the first sixteen channels of the first bank of the Digital Audio Buss. If mixing is being done using any buss channel from the second bank (61 through 120), then the DR-3000 is set to use the second bank and the PA selections will be unavailable.

Be careful when entering PA zones that both the PA system and DR-3000 are using the same numbering system! As of this writing, all PA zone entry in the PA system is by HEX numbers. If the DR-3000 is set to use decimal numbering, it will give you fits trying to figure out why it is not responding to the PA zones you have set.

"m" More....:

This command allows you to select from the other menus:

- 1) Main Menu. This brings you back to this menu.
- 2) Triggers. If mono ROMs are installed, it will ask if you want to setup the Left or Right Triggers.
- 3) SMPTE Setup. This is where you enter the SMPTE triggers for starting spiels. This menu is available only if you have selected the **SMPTE IN** mode for the repeater.
- 4) Clock. This is where you setup the eight possible schedules, tolls, and set the clock. This menu is available only if the Real Time Clock option has been installed on the AB/DR-3000.
- 5) Volume. This is where you set up the Digital Audio Bus and volumes.
- 6) Status Outputs. This is where you setup what the two status outputs do.
- 7) Diagnostics. This displays the status of the mutes zones, switch, analog, and DMX inputs.

"o" Reload Defaults:

This command is used to reload the default conditions for:

- A) Just the variables set on the main menu of the AB/DR-3000.
- B) All defaults for the entire AB/DR-3000 repeater.

All of the defaults for all of the menus can also be loaded from the front panel by depressing both the up and down keys simultaneously as power is first applied to the AB/DR-3000.

"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 menu.

For compatibility with other products that might be on the same RS-422 serial network, this command asks you to enter a 'Y' or 'N'. This lets them know that the setup mode has been exited on this card. If you hit this command by mistake, then you can hit the <ESC>ape key to get back to where you were before.

All other AB/DR-3000 and Brick Brains in the same serial network 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

²⁶ The Left channel PA requests use the third Digital Audio Bus channel, and the Right channel uses the fourth.

initial 'X', all the other AB/DR-3000s wait for a 'Y' or 'N' before they will start accepting other serial commands again. If you find that you are having trouble communicating with any of the AB/DR-3000s in the system, try entering an 'XN' to trick it into thinking you have exited the configuration mode.

- TRIGGER MENU -

This menu is used to set what the 1/4 J6 inputs and manual start pushbutton on the front of the AB/DR-3000 will do. If the **Mirror DMX 'a' to Trigger Inputs** option is ON, DMX channel 'a' is routed to the AB/DR-3000 in parallel with the 1/4 J6 inputs. This allows a DMX-512 channel to be used to select or trigger spiels, mute and unmute outputs, or do anything else you can do with the 1/4 J6 inputs.

If the ROMs installed in the AB/DR-3000 are mono, then separate screens are used for setting up the Left and Right trigger inputs. One screen is used for Stereo ROM sets (actually it is the Left side trigger screen in disauise).

-Sixteen Bit D	igita]									ilder	fluke	& Co. DCM-
			- card									
_		100%	UN								STRT	~
INPUT and EDGE	MUTE	MUTE	MUTE	OUT	IN	IMED	@END	TRAK	DLYD	LOOP	GRUP	SPIEL
a) 0 closing-	ļ			_on_	_on_		ļ	ļ	ļ	ļ	ļ	
b) 0 opening-	l											
c) 1 closing-												bit 2
d) 1 opening-												
e) 2 closing-												bit 3
f) 2 opening-												
g) 3 closing-	İ		_on_				İ	_on_	İ	_on_	İ	bit 0
h) 3 opening-	İ						İ	ĺ	İ	İ	İ	İi
i) 4 closing-	İ						İ	İ	İ	İ		bit 1
j) 4 opening-							İ	İ	İ	i		
k) 5 closing-	on_					İ	İ	İ	İ	Ì	İ	ii
1) 5 opening-	i		on					on		i		req.123
p) 6 closing-							i	on	on	on	on	ii
g) 6 opening-							i	i	i	i	i	
r) 7 closing-	on	on	on			i		i	i	i		
s) 7 opening-	i – –	i –										
t) PB closing-			on					on				
u) PB opening-									 			_req.255_
v) toggle 1	Left/F	Riaht	r	n) m∩ n) m∩	re		0) re	eload	defa	ılts	X) eXit
please enter command-												
			P-	LCUDC	C11CC1							

Each input can trigger an action on either its opening or closing edge. This allows you to do different actions on each edge. An example of this would be to set an input to 'start looping' on the closing edge, and then 'stop at end' on the opening edge of the same input. The AB/DR-3000 would start playing and continue as long as the input was held active. When it was released, the AB/DR-3000 would continue to the end of the current spiel and then stop.

In the example screen above:

- **bit 0:** Will Fade Out on the first push of this button, and Fade In on the second push. The fade rates are set on the Volume Menu. There is no action on the opening edge.
- **bit 1:** This bit is used as bit 2 of a binary address. No specific actions are possible on the opening or closing edges.
- **bit 2:** This bit is used as bit 3 of a binary address. No specific actions are possible on the opening or closing edges.
- **bit 3:** This bit is used as bit 0 of a binary address. This means that actions can take place on either edge of this input. A closing edge is any change on any of the bits used as part of this binary address, except when all of the bits go to a zero value, which is treated as an opening edge. In this case the repeater is Un muted and the requested track is started looping on the closing edge. There is no action on the opening edge.
- **bit 4:** This bit is used as bit 1 of a binary address. No specific actions are possible on the opening or closing edges.
- **bit 5:** On the closing edge of this input the repeater is Half Muted. On the opening edge the output is Un Muted and spiel 123 is requested and started.

- **bit 6:** The closing edge of this bit starts the next spiel (or any previously requested spiel) Looping after a Start Delay. This command is being relayed down the bus via the Group Start modifier, so that all cards with the same group number assigned will play in perfect synchronization. There is no action on the opening edge.
- **bit 7:** This input will rotate through the Half Muted, Fully Muted, and Un Muted states on each subsequent activation. There is no action set for the opening edge.
- **PB:** This is the front panel button on the repeater. In this case the repeater is Un Muted and the next spiel (or any previously requested) is Started on the closing edge. Spiel 255 is requested on the opening edge of this bit, but not asked to play. If the next start received does not include a request for a specific spiel, then this spiel will be played.

If you want the AB/DR-3000 to start playing a spiel as soon as it is powered up, you can set a 'START' command on the opening edge of any of the inputs. On power-up, the AB/DR-3000 checks all the inputs and will think that the one you are using has just opened. It will then act upon any commands you have set for this edge. This would normally be a 'START' command if you only want the AB/DR-3000 to play a single show, or a 'START' command with the 'LOOPING' modifier set if you want it to continue playing until it is told to stop. We often use the 'PB opening' edge to start shows on power-up (you can use any of the 'opening' edges) and then put in a 'STOP' or 'STOP at END' command on the same input's 'closing' edge so that we can stop the shows once they have started.

For each of the nine possible inputs to the AB/DR-3000 you have the following options:

Half Mute:

Quickly ramps the output to the level set on the Volume Menu for the half muted output. This level can in turn be referenced to the front panel, external input, or a number of other sources. The Half Muted level can be set on the Volume Menu to anywhere between 0 and 99%, including at a higher level than the normal un-muted audio output level.

This command can be used in the following combinations on the same input line. These combinations can be used to give you a 'Push ON/Push OFF'-style input on any one input line:

- A) Half Mute / 100% Mute: The first press will half mute the audio, the next press will fully mute it.
- **B)** Half Mute / Un Mute: The first press will half mute the audio, the next press will return the volume back to the normal level
- **C) Half Mute / 100% Mute / Un Mute:** The first press will half mute the audio, the next press will mute the audio fully, and the third press will return the volume back to the normal level.
- D) Any Start, Start modifier (Delayed Start, Loop or Group Start), or Spiel Request command.

Commands which should **NOT** be used in combination on the same command line are:

- **A)** Half Mute/Fade In: On every press the repeater will drop the level down to the half muted level and then start ramping up towards full level.
- **B)** Half Mute/Fade Out: On every press the repeater will drop the level down to the half muted level and then start ramping down towards a fully muted level.

100% Mute:

Quickly ramps the output to the minimum possible output level. If you start a spiel playing while an output is fully muted, a 'E17' (Left or stereo) or 'E27' (right) will be displayed. This will help you know why the repeater isn't making any noise.

This command can be used in the following combinations on the same input line. These combinations can be used to give you a 'Push ON/Push OFF'-style input on any one input line:

- A) 100% Mute / Half Mute: The first press will Half Mute the audio, the next press will fully mute it.
- B) 100% Mute / Un Mute: The first press will fully mute the audio, the next press will return the vol-

ume back to the normal level

- C) 100% Mute / Half Mute / Un Mute: The first press will half mute the audio, the next press will mute the audio fully, and the third press will return the volume back to the normal level
- D) Any Start, Start modifier (Delayed Start, Loop or Group Start), or Spiel Request command.

Commands which should **NOT** be used in combination on the same command line are:

- **A) 100% Mute / Fade In:** On every press the repeater will drop the level immediately and then fade up from there.
- **B) 100% Mute / Fade Out:** On every press the repeater will drop the level immediately. The Fade Out command will have no effect, since the audio level is already all the way down.

Un Mute:

Quickly ramps the output to the level set on the Volume Menu for the 'normal' output if it was previously muted or half muted. This level can in turn be referenced to the front panel, external input, or a number of other sources.

This command can be used in the following combinations on the same input line. These combinations can be used to give you a 'Push ON/Push OFF'-style input on any one input line:

- **A) Un Mute / Half Mute:** The first press will Half Mute the audio, the next press will return the volume back to the normal level.
- B) Un Mute / 100% Mute: The first press will fully mute the audio, the next press will return the volume back to the normal level
- C) Un Mute / 100% Mute / Half Mute: The first press will half mute the audio, the next press will mute the audio fully, and the third press will return the volume back to the normal level
- D) Any Start, Start modifier (Delayed Start , Loop or Group Start), or Spiel Request command.

Commands which should **NOT** be used in combination on the same command line are:

- **A) Un Mute / Fade In:** On every press the repeater will immediately return the level to normal. The Fade Up command will have no effect, since the audio level is already all the way up.
- **B) Un Mute / Fade Out:** On every press the repeater will immediately return the audio level to the normal level, and the Fade Out command will then ramp the audio down from there.

Fade Out:

Ramps the output down to the minimum levels at the speed selected by the user on the Volume Menu. The range of adjustment available is from .1 to 9.9 seconds. If received on the same input as a 'Stop At End' command, a looping spiel won't stop the repeater from playing until the fade out has been completed. If you start a spiel playing while an output is fully muted, a 'E17' (Left or stereo) or 'E27' (right) will be displayed. This will help you know why the repeater isn't making any noise.

This command can be used in the following combinations on the same input line. These combinations can be used to give you a 'Push ON/Push OFF'-style input on any one input line:

- **A) Fade In / Fade Out:** The first press will fade the audio out until it is fully muted. The second press will ramp the audio up to the normal level.
- B) Any Start, Start modifier (Delayed Start, Loop or Group Start), or Spiel Request command.

Commands which should **NOT** be used in combination on the same command line are:

- **A) Fade Out / Half Mute:** On every press the repeater will drop the level down to the half muted level and then start ramping down towards a fully muted level.
- **B) Fade Out / 100% Mute:** On every press the repeater will drop the level immediately. The Fade Out command will have no effect, since the audio level is already all the way down.

C) Fade Out / Un Mute: On every press the repeater will immediately return the audio level to the normal level, and the Fade Out command will then ramp the audio down from there.

Fade In:

Ramps the output up to the level set on the Volume Menu for normal operating levels at the speed selected by the user on the Volume Menu. The range of adjustment available is from .1 to 9.9 seconds.

This command can be used in the following combinations on the same input line. These combinations can be used to give you a 'Push ON/Push OFF'-style input on any one input line:

- **A) Fade In / Fade Out:** The first press will fade the audio out until it is fully muted. The second press will ramp the audio up to the normal level.
- B) Any Start, Start modifier (Delayed Start, Loop or Group Start), or Spiel Request command.

Commands which should **NOT** be used in combination on the same command line are:

- **A) Fade In / Half Mute:** On every press the repeater will drop the level down to the half muted level and then start ramping up towards full level.
- **B) Fade In / 100% Mute:** On every press the repeater will drop the level immediately and then fade up from there.
- **C) Fade In / Un Mute:** On every press the repeater will immediately return the level to normal. The Fade Up command will have no effect, since the audio level is already all the way up.

Stop Immediately:

The repeater will stop playing immediately no matter what. If the repeater is doing a delay when this command is received, it will be stopped immediately.

This command can be used in the following combinations on the same input line. These combinations can be used to give you a 'Push ON/Push OFF'-style input on any one input line:

- A) Stop Immediately / Start: If the card isn't running (or running a delay) the first push will start the repeater. If the card is running (or running a delay), the input will stop the repeater playing. The start command can be modified with either a Loop, Delayed Start or Group modifier if needed.
- B) Stop Immediately / and any Fade or mute command.

Commands which should **NOT** be used in combination on the same command line are:

A) Stop Immediately / Stop at End: The Stop Immediately command takes precedence over the Stop at End command.

Stop At End:

If the repeater is looping, it will stop playing at the end of the current spiel. If this command is received along with a 'Fade Out' command, the fade out has to complete before the looping is stopped. This command has no effect if the repeater is not looping.

This command can be used in the following combinations on the same input line. These combinations can be used to give you a 'Push ON/Push OFF'-style input on any one input line:

- A) Stop at End / Start: If the card isn't running (or running a delay) the first push will start the repeater. If the card is running (or running a delay), the input will stop the repeater playing when the current spiel has finished. The start command can be modified with either a Loop, Delayed Start or Group modifier if needed.
- B) Stop at End / and <u>any</u> Fade or mute command.

Commands which should **NOT** be used in combination on the same command line are:

- **A) Stop at End / Start Track wo/Looping Modifier:** Although this doesn't do anything abnormal, a spiel which isn't looping will stop at its end with or without the Stop at End command.
- **B) Stop at End / Stop Immediately:** The Stop Immediately command takes precedence over the Stop at End command.

.....

Start Track:

Starts the AB/DR-3000 playing the next spiel in line, unless a spiel request has been received (in which case it plays that spiel). If you start a spiel playing while an output is fully muted, a 'E17' (Left or stereo) or 'E27' (right) will be displayed. This will help you know why the repeater isn't making any noise. Any normal 'Start Track' that is honored will also clear 'Looping Mode' if it was previously set. Starts that are associated with a spiel request for an invalid number (too small or too big for the requested track) will be ignored and display an appropriate error message.

If any spiel is already playing when another **Start Track** command is received, the AB/DR-3000 can be set to:

- a) Ignore the new input. If Ignore is ON, an 'E12' (Left or stereo) or 'E22' (right) will be displayed if you try to start another spiel while another spiel is still running.
- **Store** the input until the current spiel finishes (also stores any pending spiel request, Looping, Delayed Start or Group Start flags). An 'E13' (Left or stereo) or 'E23' (right) will be displayed if you try to start another spiel while another is still running and the new start is being stored.
- **c) Jump Forward** to the next spiel (spiel number played is overridden if any spiel request is pending). This is the default setting.

These are selected on the Main Menu.

Three modifiers are available which can be used with the Start Track command. Any combination of these modifiers can be used, or none at all:

- A) no modifiers: Plays the next spiel, or any spiel which has been requested. Requests can be made by specific spiel requests on the same command line, or any request that has been received previously will be used. If none has been received, then the next spiel will be played. This will clear the Looping Mode if it has been previously set by another Start w/Looping. This means that even if the repeater is currently looping, it will play the next (or requested) spiel and then stop.
- B) Start Delayed: Before the spiel starts playing it will be delayed by the amount of time set for the delay on the main menu. The range of adjustment for this delay is from .1 second to 999.9 seconds. When the repeater is in a start delay, the LEDs on the front of the repeater will chase in a 'figure eight' pattern. The left (or stereo) will be shown in the left digit of the 'value' display, and the right will be shown in the right digit. If this modifier is set along with either of the other loop modifiers, then the repeater will immediately start the first loop delay, so the LEDs on the front of the repeater will chase the segments in a 'o' instead of the 'figure eight'.

This modifier has no effect if used without the Start command.

C) Loop: The next (or requested) spiel will repeat at its end. If the Loop All toggle is set to YES on the main menu, then instead of repeating the same spiel, it will play each spiel in turn. If a delay has been set on the main menu, then this delay will be inserted between each iteration of the loop. The range of adjustment for this delay is from .1 second to 999.9 seconds. When the repeater is in a looping delay, the LEDs on the front of the repeater will chase in a 'o' pattern. The left (or stereo) will be shown in the left digit of the 'value' display, and the right will be shown in the right digit.

If while Looping All or Looping with a Delay there is a spiel requested (without a Start command), the requested spiel begins looping at the next loop point. This will not work if looping a single spiel without a delay. When in this mode the looping is handled at the DSP level so that there is no audible tick at the loop point. To start looping another spiel under these conditions,

you will need to set Early Starts to Stored, and then request the new spiel along with a Start command w/looping set. The spiel request will be stored and take effect as soon as the current spiel ends.

This modifier has no effect if used without the Start command.

D) Group Starts: This is a special mode which can be used with card cage mounted DR-3000s only. The card which receives this command relays the start command along with the spiel number and Group Number (as set on the Main Menu) down the Digital Audio Buss. Any other repeaters that are set to the same Group Number will accept this command and start playing the requested spiel. This is used to start a number of repeaters within one 44.100 th of a second of each other. This gives you absolute phase locked synchronization between any number of audio tracks.

Cards sending Group Start commands down the Digital Audio Buss must be set to the same bank as the cards that are meant to receive them. If the Digital Audio Buss is not being used for any PA or mixing, then the DR-3000 defaults to using the first bank. If the PA is being used, then it forces the DR-3000 to the first bank. If mixing is being done on any channel using any buss channel from the second bank, then the DR-3000 is set to use the second bank. The PA selections are unavailable if the repeater is using the second Digital Audio Buss bank.

There is one time slot on each Digital Audio Bus bank which is used to carry Group Start commands. For this reason only one group start command can be sent down the bus within any 1/44,100 th of a second. There is no error or collision detection, so it is up to you to make sure that no two Group Start commands are sent at the same time. Collisions can never happen if there is only one card that is transmitting Group Start commands within a cage.

This modifier can be used in any combination of the Loop and Delayed Start modifiers. If the card is set to Delayed Start or for looping with a delay, then the delay time on the card which issues the command will be used and the Group Start command will be retransmitted down the bus at the appropriate time. If there is no delay set for looping spiels, then they will be looped at the DSP level.

This modifier has no effect if used without the Start command.

The Start command can be used in the following combinations on the same input line. These combinations can be used to give you a 'Push ON/Push OFF'-style input on any one input line:

- **A) Start Track / Stop Immediately:** If the card isn't running (or running a delay) the first push will start the repeater. If the card is running (or running a delay), the next input will stop the repeater playing immediately. The start command can be modified with either a Loop, Delayed Start or Group modifier if needed.
- B) Start Track w/Looping Modifier / Stop at End: If the card isn't running (or running a delay) the first push will start the repeater. If the card is running (or running a delay), the second input will stop the repeater playing when the current spiel has finished. The start command can be modified with either a Loop, Delayed Start or Group modifier if needed.
- C) Start Track / and any Fade or mute commands.

Commands which should **NOT** be used in combination on the same command line are:

- **A) Start Track wo/Looping Modifier / Stop at End:** Although this doesn't do anything abnormal, a spiel which isn't looping will stop at its end with or without the Stop at End command.
- **B) Start Track / Stop at End / Stop Immediately:** The Stop Immediately command takes precedence over the Stop at End command.

Start Delayed:

A modifier for the **Start Track** command. When 'ON' the spiel will be delayed by the amount of time set for the delay on the main menu. The range of adjustment for this delay is from .1 second to 999.9 seconds. When the repeater is in a start delay, the LEDs on the front of the repeater will chase in a 'fig-

ure eight' pattern. The left (or stereo) will be shown in the left digit of the 'value' display, and the right will be shown in the right digit. If this modifier is set along with either of the other loop modifiers, then the repeater will immediately start the first loop delay, so the LEDs on the front of the repeater will chase the segments in a 'o' instead of the 'figure eight'.

This modifier can be used with any combination of \underline{any} Fade or mute commands. It has no effect if used without the Start Track command.

Start Loop:

A modifier for the **Start Track** command which causes the the AB/DR-3000 to:

- a) If the LOOP ALL mode is off: Plays the next spiel just like a standard Start Track command, but repeats the same spiel until a STOP or STOP AT END command is received, putting the *Delay Time* (if any) between each iteration of the loop. The range of adjustment for this delay is from .1 second to 999.9 seconds. When the repeater is in a Loop Delay, the LEDs on the front of the repeater will chase in a clockwise 'o' pattern. The left (or stereo) will be shown in the left digit of the 'value' display, and the right will be shown in the right digit.
- b) If the LOOP ALL mode is on: Plays the next spiel just like a standard Start Track command, but then plays the next spiel in line until a Stop or Stop At End command is received, putting the Delay Time (if any) between each spiel 27. The range of adjustment for this delay is from .1 second to 999.9 seconds. When the repeater is in a Loop Delay, the LEDs on the front of the repeater will chase in a counterclockwise 'o' pattern. The left (or stereo) will be shown in the left digit of the 'value' display, and the right will be shown in the right digit.

If while Looping All or Looping with a Delay there is a spiel requested (without a Start command), the requested spiel begins looping at the next loop point. This will not work if looping a single spiel without a delay. When in this mode the looping is handled at the DSP level so that there is no audible tick at the loop point. To start looping another spiel under these conditions, you will need to set Early Starts to Stored, and then request the new spiel along with a Start command w/looping set. The spiel request will be stored and take effect as soon as the current spiel ends.

This modifier can be used with any combination of <u>any</u> Fade or mute commands. It has no effect if used without the Start Track command.

Start Group:

This command only works on DR-3000s that are on the same bank of the Digital Audio Bus:

If ON, then this card will relay any **Start Track** commands down the Digital Audio Bus to any other cards which are configured to respond to the same **Group Number**. This is used to synchronize multiple cards for 'bin loop' applications within 1/44,100 th of a second.

The actual command that is relayed to all the other cards in the group is a **Start Track** with the spiel and group number that this card intends to play. In this way all cards will start playing the correct spiel at the exact same instant.

Cards sending Group Start commands down the Digital Audio Buss must be set to the same bank as the cards that are meant to receive them. If the DAB is not being used for any PA or mixing, then the DR-3000 defaults to using the first bank. If the PA is being used, then it forces the DR-3000 to the first bank. If mixing is being done on any channel using any buss channel from the second bank, then the DR-3000 is set to use the second bank. The PA selections are unavailable if the repeater is using the second Digital Audio Buss bank.

There is one time slot on each Digital Audio Bus bank which is used to carry Group Start commands. For this reason only one group start command can be sent down the bus within any 1/44,100 th of a

²⁷ If the ROM set is mono, and the **LEFT/RIGHT SPLIT** has been set, then the left channel will only play spiel numbers up to the split, and the right channel will play only spiels over the split.

second. There is no error or collision detection, so it is up to you to make sure that no two Group Start commands are sent at the same time. Collisions can never happen if there is only one card that is transmitting Group Start commands within a cage.

If Looping All or Looping w/Delay, the card that received the input will use its **Delay Time** for the period between iterations, and then send out a new **Start Track** command and spiel number to all the other cards at the appropriate time. This will resynchronize any cards that may have gotten out of sync from the card that originated the loop. IF Looping with no delay, then each card will loop at the DSP level once they are started.

Request Spiel:

This column is used to randomly select messages to be played. If the same bit(s) that make the random selection also trigger a **Start**, then the spiel will be played immediately. Otherwise, it just sets the spiel that will be played on the next **Start** input, wherever it comes from. '**Request Messages**' has two modes of operation:

a) Binary Mode: These can be set only on the closing edge of the 1/4 J6 input. A collection of between one and eight bits make up the binary number for a random spiel selection. These bits can be arranged in any order. This allows you to use some bits for the left side spiel select and others for the right (as well as correcting any wiring errors 'on the fly').

If all the bits used for a binary address change to a 0 value, this is interpreted as a 'falling edge'. Any action that has been configured on the least significant bit's ('bit zero') falling edge will take place. Any other change in these bits is interpreted as a 'rising edge', and any action that has been configured on the least significant bit's rising edge will take place. No actions can be configured to happen on any of the inputs used as bits one through seven.

Note that all bits but zero that are being used for a binary selection are disabled from use for any other function. That is why these bits are drawn with 'periods' rather than 'underlines' on this menu.

b) Direct Select Mode: Either edge of any bit can be used to select a specific spiel (1-255). Inputs which are being used to directly select a spiel can still be used to trigger any other actions.

When using inputs for directly selecting spiels, all bits which are being used for selection returning to an open state is considered to be an 'opening' edge.

Request Spiel can be used alone or with any combination of any Fade, mute or Start commands.

"m" More....:

This command allows you to select from the other menus:

- 1) Main Menu. This brings you back to the main menu.
- 2) Triggers. This selects this menu.
- 3) SMPTE Setup. This is where you enter the SMPTE triggers for starting spiels. This menu is available only if you have selected the **SMPTE IN** mode for the repeater.
- 4) Clock. This is where you setup the eight possible schedules, tolls, and set the clock. This menu is available only if the Real Time Clock option has been installed on the AB/DR-3000.
- 5) Volume. This is where you set up the Digital Audio Bus and volumes.
- 6) Status Outputs. This is where you setup what the two status outputs do.
- 7) Diagnostics. This displays the status of the mutes zones, switch, analog, and DMX inputs.

"V"

Toggle Left/Right (mono spiels only):

This command toggles between the Left and Right trigger screens.



"o" Reload Defaults:

This command is used to reload the default conditions for the variables set on the Trigger Menu of the AB/DR-3000. The default condition for this screen enables only the Start Track command on the front panel pushbutton input. All the defaults for all the menus can be loaded from the front panel by depressing both the up and down keys simultaneously as power is first applied to the AB/DR-3000.

"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 menu.

For compatibility with other products that might be on the same RS-422 serial network, this command asks you to enter a 'Y' or 'N'. This lets them know that the setup mode has been exited on this card. If you hit this command by mistake, then you can hit the <ESC>ape key to get back to where you were before.

All other AB/DR-3000 and Brick Brains in the same serial network 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 the other cards wait for a 'Y' or 'N' before they will start accepting other serial commands again. If you find that you are having trouble communicating with any of the cards in the system, try entering an 'XN' to trick it into thinking you have exited the configuration mode.

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- SMPTE TRIGGER MENU -

SMPTE (pronounced "SIMP-T") is a time code that was developed by the Society of Motion Picture and Television Electronics (SMPTE) for use in audio, film, and television production. It is normally recorded on a spare audio track on the medium being used (audio tape, video tape, or film), and then used to synchronize various pieces of compatible equipment together. As an industry standard, virtually every audio, video or film studio will have the equipment to lay down a SMPTE time code track.

SMPTE is usually recorded at 30 frames per second ²⁸. What this means is that 30 (or 24 or 25) times each second a number is recorded on the tape or film. This number represents the hours, seconds, minutes and frame (00:00:00.00) represented by this particular little stretch of medium. Since each little stretch is represented by a unique number, SMPTE is known as an 'absolute' time code. No matter where the tape is, the AB/DR-3000 will instantly evaluate the numbers it gets from the SMPTE time code.

This menu is used to set the points in the incoming SMPTE time code the AB/DR-3000 will trigger various spiels. It is available only if you have selected **SMPTE In** for the repeater.

-Sixteen Bit Digital Audio	System rev 1.19 copyright	1996 Gilderfluke & Co. DCM-
- (card0 SMPTE Trigger Menu	. –
· —	,	03) 03:04:05.06 nxt both
04) 03:03:04.05 <u>6</u> left	05)	06)
07)	08)	09)
10)	11)	12)
13)	14)	15)
16)	17)	18)
19)	20)	21)
22)	23)	24)
25)	26)	27)
28)	29) 32)	30)
24)	35)	36)
37)	38)	39)
40)	i	42)
42)	41) 44)	45)
43)	47)	48)
10,	1	10/
a) alter entry	m) more o) reload	defaults X) eXit
	please enter command-	
	Picase circui contiana	

For each of the forty-eight entries in the table, you can enter the SMPTE HOUR, MINUTE, SECOND, and FRAME where you want the AB/DR-3000 to trigger a spiel.

You can tell the AB/DR-3000 a specific spiel to play (shown by the spiel number), or simply to play the next spiel in line (shown by a 'nxt') 29 . If a mono ROM set has been installed, you can direct the spiel to either the left, right or both outputs. Stereo spiels are always routed to both outputs.

The SMPTE input on the AB/DR-3000s isn't as 'picky' as the readers on our Animation Control Systems. It doesn't require a number of consecutive good frames of data before it believes the SMPTE it receives. It should accept SMPTE at 24, 25, 30 or 29.97 FPS. All you need to do is NOT schedule any starts on frames that don't exist in the incoming SMPTE. i.e.: If you are using SMPTE at 25 FPS, don't try to trigger sounds on the 26th frame. The AB/DR-3000's SMPTE input should follow SMPTE with a speed variation of approximately 25% from 30 FPS.

The AB/DR-3000s check for any spiels they might need to trigger one second ahead of the SMPTE time they are receiving. If one is found then they use the incoming SMPTE frame number to trigger the

²⁸ Twenty-five frames per second is used in Europe and places where this is the normal television frequency, and twenty-four frames per second is occasionally used in film production.

²⁹ If the ROM set is mono, and the **LEFT/RIGHT SPLIT** has been set, then the left channel will only play spiel numbers up to the split, and the right channel will play only spiels over the split.

spiel. This allows the SMPTE triggers to be handled at a high priority interrupt level for the greatest possible accuracy. If that frame is missed for any reason, or if a bit is missed which makes the SMPTE reader do a search for the sync word after it is found in the table but before it is played, the sound will not be played. If the SMPTE is stopped cleanly after an entry has been found in the table but before it has been played, and then restarted cleanly at a different time, the spiel will play at the selected frame regardless of what the new time is. The odds of this ever actually happening in the field are VERY small.

For those of you who want to know exactly when the sounds are triggered: It is two bits into the SMPTE sync word that follows the frame upon which the sound is to be triggered. The SMPTE triggers are handled at an interrupt level, and are the most time-accurate triggers available on these repeaters.

"a" Alter Entry:

This command allows you to change any of the entries in the table. This command will prompt you for each of the values it needs.

Entries to this table must be made consecutively. Any empty entry will be interpreted as the last entry in the table, even if more entries can be found further on. The values of each of the entries can be in any order.

.....

"m" More....:

This command allows you to select from the other menus:

- 1) Main Menu. This brings you back to the main menu.
- 2) Triggers. If mono ROMs are installed, it will ask if you want to setup the Left or Right Triggers.
- 3) SMPTE Setup. This selects this menu.
- 4) Clock. This is where you setup the eight possible schedules, tolls, and set the clock. This menu is available only if the Real Time Clock option has been installed on the AB/DR-3000.
- 5) Volume. This is where you set up the Digital Audio Bus and volumes.
- 6) Status Outputs. This is where you setup what the two status outputs do.
- 7) Diagnostics. This displays the status of the mutes zones, switch, analog, and DMX inputs.

.....

"o" Reload Defaults:

This command is used to reload the default conditions for the variables set on the SMPTE Trigger Menu of the AB/DR-3000. All of the defaults for all of the menus can be loaded from the front panel by depressing both the up and down keys simultaneously as power is first applied to the AB/DR-3000.

"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 menu.

For compatibility with other products that might be on the same RS-422 serial network, this command asks you to enter a 'Y' or 'N'. This lets them know that the setup mode has been exited on this card. If you hit this command by mistake, then you can hit the <ESC>ape key to get back to where you were before.

All other AB/DR-3000 and Brick Brains in the same serial network 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 the other cards wait for a 'Y' or 'N' before they will start accepting other serial commands again. If you find that you are having trouble communicating with any of the cards in the system, try entering an 'XN' to trick it into thinking you have exited the configuration mode.

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- REAL TIME CLOCK TRIGGER MENU -

The AB/DR-3000 can be fitted with an optional real time clock. The clock has been factory laser trimmed to be accurate within ten parts per million. A battery keeps the clock running even during power failures. This menu is available only if this hardware option has been installed.

-Sixteen Bit Digital	Audio System rev 1.19 copyright 1996 Gilderfluke & Co. DCM-
	- card0 RTC Trigger Menu -
	c) tick/tock delay- 9.9 e) all-week= Sat thru Sun d) set from front- no f) tolling- left
g) Clock tolls-	1/4 1/2 3/4 full chime1 chime2 tick tock 11 22 33 44 55 66 77 88
Sunday: h) hours for	tolling- 00:00-01:15 / 08:00-23:59
05)	02) 03:045 right 03) 04:056 both 04) 11:22 nxt left 06) 07) 08) 10) 11) 12) 14) 15) 16) 18) 20) 22) 23) 24) 26) 27) 28) 30) 31) 32)
	le m) more o) reload defaults X) eXit 5 Wednesday September 07,'95 command-

The AB/DR-3000 supports an eight day schedule. The first seven of these schedules represent the days of the week (Sunday through Saturday). The eighth schedule is a special 'all-week' schedule. This is for events you want to happen every day of the week 30 .

If the AB/DR-3000 is not currently playing any other spiel (except for the two designated as Tick and Tock), it will check the schedules in the following order. Most are checked once per minute:

- 1) Day of week: This takes precedence over all other schedules.
- 2) All-week schedule is checked next if no day of week entry was found.
- 3) If within the 'tolling hours of operation' you have set for the day, it will check for quarter, half, three quarter and full hour tolls.
- 4) If within the 'tolling hours of operation' you have set for the day, it will check if it is time to toll the hour.
- 5) If within the 'tolling hours of operation' you have set for the day, it will check for Tick and Tock. These spiels are not respected by anyone, and another scheduled spiel can be started even if they are running. Be sure to set the **STORE** function for early starts if you don't want these to be cut off at mid-spiel! The Tick/Tock delay should be set to a time that is longer than it takes for the Tick and Tock sounds to play. If you don't, the storage buffer will quickly overflow.

"a" Modify Entry:

You are prompted as to which entry in the table you would like to modify. You are then prompted for:

1) If mono ROMs are installed, you are asked whether the spiel should be sent to the Left, right or

³⁰ The 'All-week =' toggle is used if you want the whole week to only include weekdays (Monday through Friday).

both outputs. Stereo spiels are always send to both outputs. You can enter a zero at this point if you are just clearing an existing entry.

- 2) Spiel number to be triggered, or zero for whatever spiel is next 31.
- 3) Time the spiel is to be played (HOURS and MINUTES).

Entries to the schedules must be made consecutively. Any empty entry will be interpreted as the last entry in the table, even if more entries can be found further on. The values of each of the entries can be in any order.

"b" Set Time:

You are prompted for the current time. At the end, you have to option of enabling Automatic Daylight Savings Time. When ON, this will tell the AB/DR-3000 to automatically 'Spring forward' at 2:00 AM on the first Sunday in April, and 'Fall back' at 2:00 AM on the last Sunday in October. The time displayed on this menu will have 'DST' before the time during the Summer months.

Note that once you have begun setting the clock, all scanning for special events, chimes, etc. will cease until you have finished.

.....

"c" Tick/Tock Delay:

The Tick and Tock Spiels are used if you have to simulate the sound of a mechanical clock running. These two sounds will be played alternately if anything has been entered for the Tick and Tock, and the time is during the hours of tolling. This delay will be inserted between each playing of each Tick or Tock sound.

"d" Set from Front:

This toggle enables or disables the ability to set the clock from the front panel of the AB/DR-3000. When the RTC option is installed in an AB/DR-3000, the following adjustments are available on the front panel of the repeater. If this toggle is set to enable changing the time, they will flash to show they are adjustable.

Note that once you have begun setting the clock, all scanning for special events, chimes, etc. will cease until you have finished.

- Year: Available only if Real Time Clock (RTC) option is installed. The range of adjustment is from 0-99. If <u>any</u> RTC adjustment is changed, the 'Select' digit will start flashing to indicate that the new settings will be written to the RTC chip the instant the 'select' is returned to the 'home' position (display blanked). This value will continue to indicate the current time until <u>any</u> RTC value is changed. It will then stop advancing.
- i) minute: Available only if Real Time Clock (RTC) option is installed. The range of adjustment is from 0-59. If <u>any</u> RTC adjustment is changed, the 'Select' digit will start flashing to indicate that the new settings will be written to the RTC chip the instant the 'select' is returned to the 'home' position (display blanked). This value will continue to indicate until any RTC value is changed.
- h) Hour: Available only if Real Time Clock (RTC) option is installed. The range of adjustment is from 0-23. If <u>any</u> RTC adjustment is changed, the 'Select' digit will start flashing to indicate that the new settings will be written to the RTC chip the instant the 'select' is returned to the 'home' position (display blanked). This value will continue to indicate the current time until <u>any</u> RTC value is changed. It will then stop advancing.
- daTe: Available only if Real Time Clock (RTC) option is installed. The range of adjustment is from 0-31. If any RTC adjustment is changed, the 'Select' digit will start flashing to indicate that

³¹ If the ROM set is mono, and the **LEFT/RIGHT SPLIT** has been set, then the left channel will only play spiel numbers up to the split, and the right channel will play only spiels over the split.

the new settings will be written to the RTC chip the instant the 'select' is returned to the 'home' position (display blanked). This value will continue to indicate the current time until <u>any</u> RTC value is changed. It will then stop advancing.

- n) moNth: Available only if Real Time Clock (RTC) option is installed. The range of adjustment is from 0-12. If <u>any</u> RTC adjustment is changed, the 'Select' digit will start flashing to indicate that the new settings will be written to the RTC chip the instant the 'select' is returned to the 'home' position (display blanked). This value will continue to indicate the current time until <u>any</u> RTC value is changed. It will then stop advancing.
- o) day Of week: Available only if Real Time Clock (RTC) option is installed. The range of adjustment is from 1-7 (Sunday=1, Saturday=7). If <u>any</u> RTC adjustment is changed, the 'Select' digit will start flashing to indicate that the new settings will be written to the RTC chip the instant the 'select' is returned to the 'home' position (display blanked). This value will continue to indicate the current time until <u>any</u> RTC value is changed. It will then stop advancing.

....

"e" All-Week=:

This toggle is used to select whether the 'all-week' schedule is checked on all seven days of the week, or only on weekdays (Monday through Friday). This is used in business and school applications where you don't want the AB/DR-3000 making noise on the weekends.

"f"

Tolling (avail. only if any tolls have been set):

If mono ROMs have been installed, this allows you to select whether tolls disabled or are routed to the left, right or both outputs. If stereo ROMs are installed, you can enable and disable the tolling using this toggle.

"g"

Tolls:

If the AB/DR-3000 is between the 'tolling hours of operation', then a number of spiels can be automatically scheduled to simulate the operation of a clock tower. Any spiel can be selected for playing on the quarter, half, three-quarter or full hour.

The AB/DR-3000 can toll the hour on the full hour. This will automatically follow the spiel that plays on the hour. The 'Chime 1' is used to play all strikes except for the final one. The final strike of any chime is played by 'Chime 2'. This allows you to record a chime with an abbreviated ring-out for the first strikes (the length of the spiels sets the space between them) and a chime with a long ring out for the final strike. Although the clock is set using '24 hour time', the chiming always uses a 12 hour clock for deciding the number of times it should strike.

This command is slightly different than most others. The <ESC>ape key will not work to exit the command if you enter it inadvertently. You have to make all eight entries once this command is started. To clear a single entry, you can either type a <carriage return> by itself or enter 255/FFh.

.....

"h" Hours for Tolling:

This is used to set the hours of operation for the tolling on the selected day of the week. The hour of operation can be set using the following rules:

- a) Hours are set just to cover the hours you wish to make noise (i.e.: 9:00 AM to 5:00 PM)
- b) If the ending time is before the start time, then the hours of operation are the time you <u>don't</u> want the clock to chime. i.e.: if the hours are set for 08:00 to 02:00, then the clock will start chiming at 12:00 AM and play until 2:00 AM. They will then start chiming again at 8:00 AM and continue until 11:59 PM. This is shown on the display as:

'h) hours for tolling- 00:00-02:00 / 08:00 to 23:59'

This is the setting you use if you want to let your neighbors sleep. Assuming the previous day has also been set in the same way, it will carry the tolling up through 23:59 before this day's schedule takes over. If the next day's schedule is also set in the same way then it will pick up at midnight of the next morning. In this way the hours for tolling will roll over from day to day without a break.

- c) If any other identical times are entered, then '24 hour operation' is selected and displayed.
- d) If 00:00 to 00:00 are entered as the start and end times, then no hours of operation are selected for that day's schedule and 'none' is displayed. Unless:
 - 1) If there are hours of operation selected on the all-week schedule, and this is a weekday (Monday through Friday) or the 'All-Week' selection is set for 'Sunday through Saturday', then these hours will be displayed and used.

.....

"j" Next Schedule:

This simply displays the next of the eight schedules. It saves you having to go into the 'more....' command to select another schedule.

"m" More....:

This command allows you to select from the other menus:

- 1) Main Menu. This brings you back to the main menu.
- 2) Triggers. If mono ROMs are installed, it will ask if you want to setup the Left or Right Triggers.
- 3) SMPTE Setup. This is where you enter the SMPTE triggers for starting spiels. This menu is available only if you have selected the **SMPTE IN** mode for the repeater.
- 4) This selects this menu.
- 5) Volume. This is where you set up the Digital Audio Bus and volumes.
- 6) Status Outputs. This is where you setup what the two status outputs do.
- 7) Diagnostics. This displays the status of the mutes zones, switch, analog, and DMX inputs.

"o" Reload Defaults:

This command is used to reload the default conditions for the variables set on the Real Time Clock Menu of the AB/DR-3000. All of the defaults for all of the menus can be loaded from the front panel by depressing both the up and down keys simultaneously as power is first applied to the AB/DR-3000.

"x" eXit Setup Mode:

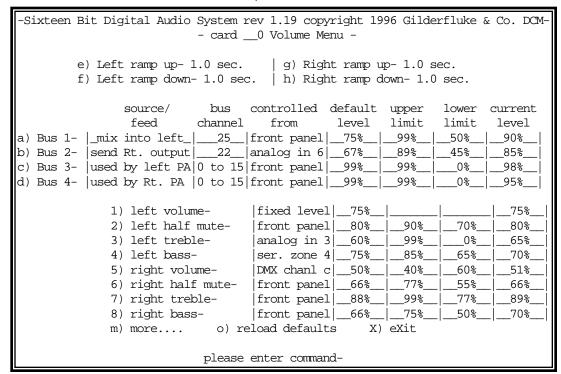
This command is used to exit the setup mode. If you hit this command in error, hitting an <ESC>ape key will get you back to the menu.

For compatibility with other products that might be on the same RS-422 serial network, this command asks you to enter a 'Y' or 'N'. This lets them know that the setup mode has been exited on this card. If you hit this command by mistake, then you can hit the <ESC>ape key to get back to where you were before.

All other AB/DR-3000 and Brick Brains in the same serial network 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 the other cards wait for a 'Y' or 'N' before they will start accepting other serial commands again. If you find that you are having trouble communicating with any of the cards in the system, try entering an 'XN' to trick it into thinking you have exited the configuration mode.

- VOLUME MENU -

This menu is used to set the levels of the outputs, and what sets them to that level.



All of the level controls can be set to be adjusted by one of the five following sources:

- a) Fixed level that will be held no matter what.
- b) Front Panel Controls. Using the 'select' button on the front of the AB/DR-3000 you can select the control to adjust. Once selected, the 'up/down' buttons are used to adjust it. You can set the default level, as well as the upper and lower limits that the level won't be allowed to go above or below as it is adjusted. If the configuration EEPROM isn't write protected, the level you set will be saved to act as the 'default' the next time the card is powered up.
- c) Analog Inputs. There are eight 0-10 VDC analog inputs to the DR-3000, and two on the AB-3000. Any one of these can be used to adjust a level. You can set the upper and lower limits that the level won't be allowed to go above or below as it is adjusted.
- d) Serial Port Volume Control Zones. There are eight 'volume zones' that can be accessed through the serial port. These are normally used by the PA system for adjusting volumes from the PA stations. Any one of these zones can be assigned to adjust a level on the AB/DR-3000. You can set the default level (the level that will be assumed when the AB/DR-3000 powers up, until it receives a volume control zone command), as well as the upper and lower limits that the level won't be allowed to go above or below as it is adjusted.
- e) DMX Channel Input. The AB/DR-3000 can listen to any four DMX-512 channels. You can assign any one of these to control a level. You can set the default level (the level that will be assumed when the AB/DR-3000 powers up, until it receives valid DMX-512 data), as well as the upper and lower limits that the level won't be allowed to go above or below as it is adjusted.

"e" Left Ramp Up:
"f" Left Ramp Down:
"g" Right Ramp Up:
"h" Right Ramp Down:

The left and right outputs can be told to fade in or fade out when signals are received through the 1/4 J6 inputs. This is set on the Trigger Menu. This is used to set how quickly the outputs will be ramped up or down. The length of the ramp is set in tenths of seconds from zero to 9.9 seconds. The time is how long it would take to ramp an output from full muted to full volume, or visa-versa. If the ramp is less than between the full extremes, it will take a proportionately shorter time.

"a" Digital Audio Bus #1:
"b" Digital Audio Bus #2:
"c" Digital Audio Bus #3 (only volume adj. if Left PA is used):
"d" Digital Audio Bus #4 (only volume adj. if Right PA is used):

The DR-3000 can access any four channels on the Digital Audio Bus. Although these menu selections are available on AB-3000s, they won't do anything if they are used. Each of these four channels can be used to do one of the following eight things:

- a) Digital Audio Bus not used.
- b) Listen to audio found on the bus and mix it into the Left output.
- c) Listen to audio found on the bus and mix it into the Right output.
- d) Send audio from the Left channel Repeater to a Digital Audio Bus channel. This gets the audio data right from the repeater, so that even if the channel is muted or otherwise processed, the data from the repeater will be sent out unaltered.
- e) Send audio from the Left channel output to a Digital Audio Bus channel. This gets the audio data from the output, so that any volume controls, Bass, Treble, or any other processing that has been done to the audio will also be sent to the Digital Audio Bus.
- f) Send audio from the Right channel Repeater to a Digital Audio Bus channel. This gets the audio data right from the repeater, so that even if the channel is muted or otherwise processed, the data from the repeater will be sent out unaltered.
- g) Send audio from the Right channel output to a Digital Audio Bus channel. This gets the audio data from the output, so that any volume controls, Bass, Treble, or any other processing that has been done to the audio will also be sent to the Digital Audio Bus.

These commands ask you to set:

- 1) Whether you want to set the bus you have selected to listen to a bus, send audio to it, or clear a bus you are already using.
- 2) Bus you want to use. Although there are 120 time slots on the Digital Audio Bus, they are divided into two banks of sixty (1 through 60 or 61 through 120). Any one DR-3000 can only access time slots on one bank at a time. If you want two DR-3000s within a single system to talk to each other, make sure they are set to operate on the same bank.

If the DAB is not being used for any PA or mixing, then the DR-3000 defaults to using the first bank (1 through 60). If the PA is being used, then the DR-3000 is forced to use the first bank. If mixing is being done on any channel using any buss channel from the second bank (61 through 120), then the DR-3000 is set to use the second bank. The first time a DR-3000 is set to use the second bank or if the bank selection changes, the DR-3000 will reset itself to reinitialize the DSP. The PA selections are unavailable if the repeater is using the second Digital Audio Buss bank.

3) The volume control source, default level, and upper and lower limits for the Digital Audio Bus Channel. When sending audio to the Digital Audio Bus, a 'Fixed' level of 99% is typically used.

The PA System, when used with a DR-3000, uses the Digital Audio Bus for sending PA announcements to the DR-3000s. If any PA zones have been set up for the Left or Right outputs, the third and fourth bus entries will be taken over to service them. The only setting you can make for these two channels is what level control source will control their volume when they are mixed into the normal audio output(s).

The PA system automatically routes announcements to Digital Audio Bus time slots 0 through 15. For this reason, any DR-3000 that is used in a PA application must not use Digital Audio Bus channels 0 through fifteen for any other purpose. A DR-3000 responding to pages will automatically listen to the appropriate bus and send its audio to the output(s) while dropping the normal audio to a half-muted level. If the audio is already half- or fully muted, it will be unaffected.

"1" **Left Volume:** "5" **Right Volume:** These set the 'normal' volume level for an output, including all Digital Audio Bus sources that are mixed into it. You must set the volume control source, default level, and upper and lower limits for the Channel. "2" **Left Half Mute:** "6" **Right Half Mute:** The 'Half Mute' volume level is an alternative setting for the output level for a channel. It is selected by a serial port command or 1/4 J6 input trigger. Although it is usually set to a lower level than the 'normal' volume setting, it can be set to a higher level if desired. You must set the Half Mute control source, default level, and upper and lower limits for the Half Muted level. "3" **Left Treble:** "7" **Right Treble:** This adjusts the AB/DR-3000's output filters to boost the high end output from a repeater. This simulates the function of a 'treble' control, and can be used to adjust the output sound quality in the field. You must set the Treble control source, default level, and upper and lower limits for the Treble level. "4" Left Bass: "8" **Right Bass:** This adjusts the AB/DR-3000's output filters to boost the low end output from a repeater. This simulates the function of a 'bass' control, and can be used to adjust the output sound quality in the field. You must set the Bass control source, default level, and upper and lower limits for the Bass level. "m" More....:

This command allows you to select from the other menus:

- 1) Main Menu. This brings you back to the main menu.
- 2) Triggers. If mono ROMs are installed, it will ask if you want to setup the Left or Right Triggers.
- 3) SMPTE Setup. This is where you enter the SMPTE triggers for starting spiels. This menu is available only if you have selected the **SMPTE IN** mode for the repeater.

- 4) Clock. This is where you setup the eight possible schedules, tolls, and set the clock. This menu is available only if the Real Time Clock option has been installed on the AB/DR-3000.
- 5) Volume. This selects this menu.
- 6) Status Outputs. This is where you setup what the two status outputs do.
- 7) Diagnostics. This displays the status of the mutes zones, switch, analog, and DMX inputs.

"o" Reload Defaults:

This command is used to reload the default conditions for the variables set on the Volume Control Menu of the AB/DR-3000. All of the defaults for all of the menus can be loaded from the front panel by depressing both the up and down keys simultaneously as power is first applied to the AB/DR-3000.

.....

"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 menu.

For compatibility with other products that might be on the same RS-422 serial network, this command asks you to enter a 'Y' or 'N'. This lets them know that the setup mode has been exited on this card. If you hit this command by mistake, then you can hit the <ESC>ape key to get back to where you were before.

All other AB/DR-3000 and Brick Brains in the same serial network 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 the other cards wait for a 'Y' or 'N' before they will start accepting other serial commands again. If you find that you are having trouble communicating with any of the cards in the system, try entering an 'XN' to trick it into thinking you have exited the configuration mode.

- STATUS OUTPUTS MENU -

The AB/DR-3000 has two optically isolated status outputs. This menu is used to control how they are used. They can be set to operate when the left or right repeaters are playing, at specific periods (if the Real Time Clock Option has been installed), or at specific points during a spiel being played out of the

left side of the repeater (or a stereo spiel). The last option is only available if the SMPTE Output has been enabled. If it has not, then the area where the table is shown will be blanked.

-Sixteen Bit Digital Audio System rev 1.19 copyright 1996 Gilderfluke & Co. DCM-				
- card0 Status Output Menu -				
a) modify table c) Status #1- Left running e) Pulse #1 output b) Pulse length- 9.9 sec. d) Status #2- Right running f) Pulse #2 output				
01) 1 on 01:23 _5 02) 1 pul 01:02 all 03) 2 pul 51:25 all 04) 2 on 02:02 _2 05) 1 off 01:24 _5 06) 2 off 03:03 _2 07)				
please enter command-				

All the activities of the two status outputs is also shown on the two decimal points of the seven segment displays on the front of the AB/DR-3000.

"a" Modify Table:

This command is used to alter the fifty-two entries in the pulse table. It is unavailable if the SMPTE Output has been disabled on this repeater. This command asks:

- 1) Whether you want this entry to act on the #1 or #2 Status Output. You can enter a zero if you want to clear an existing entry.
- 2) You can set the output to:
 - a) Turn on. The output will stay on until turned off or pulsed by one of the other commands.
 - b) Turn off. The output will stay off until turned on or pulsed by one of the other commands.
 - c) Pulse for the period set by the **Pulse Length**.
- 3) Minutes and seconds into a spiel when you want this to happen.
- 4) The specific spiel you want this to happen during, or a zero if you want this to happen during all spiels (shown by 'all' in place of the specific spiel number on the menu entry).

Entries to this table must be made consecutively. Any empty entry will be interpreted as the last entry in the table, even if more entries can be found further on. The values of each of the entries can be in any order.

- 5) Volume. This is where you set up the Digital Audio Bus and volumes.
- 6) Status Outputs. This selects this menu.
- 7) Diagnostics. This displays the status of the mutes zones, switch, analog, and DMX inputs.

"o" Reload Defaults:

This command is used to reload the default conditions for the variables set on the Status Output Menu of the AB/DR-3000. All of the defaults for all of the menus can be loaded from the front panel by

GILDEBELLIKE & CO	· 205 SOUTH FLOWER ST.	· BUDBANK CALLE	91502-2102 -	818/8/0-9/8/	· FAX818/840-9485

depressing both the up and down keys simultaneously as power is first applied to the AB/DR-3000.

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"x" eXit Setup Mode:

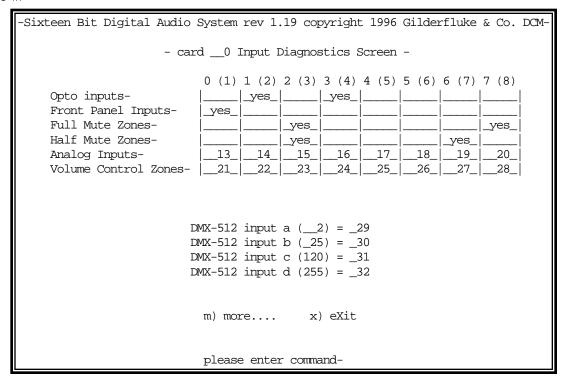
This command is used to exit the setup mode. If you hit this command in error, hitting an <ESC>ape key will get you back to the menu.

For compatibility with other products that might be on the same RS-422 serial network, this command asks you to enter a 'Y' or 'N'. This lets them know that the setup mode has been exited on this card. If you hit this command by mistake, then you can hit the <ESC>ape key to get back to where you were before.

All other AB/DR-3000 and Brick Brains in the same serial network 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 the other cards wait for a 'Y' or 'N' before they will start accepting other serial commands again. If you find that you are having trouble communicating with any of the cards in the system, try entering an 'XN' to trick it into thinking you have exited the configuration mode.

- INPUT DIAGNOSTICSMENU -

This screen is used to check the status of the various hardware and software inputs to the AB/DR-3000. This is often used to help in diagnosing problems with the AB/DR-3000, or just for testing connections to it.



Note that if nothing in this AB/DR-3000 has been configured to use the Analog or DMX-512 inputs, that these values will NOT be updated.

The front panel inputs are used as follows:

- 1) 'Manual' front panel button
- 2) 'Select' front panel button
- 3) 'Up' front panel button
- 4) 'Down' front panel button

"m" More....:

This command allows you to select from the other menus:

- 1) Main Menu. This brings you back to the main menu.
- 2) Triggers. If mono ROMs are installed, it will ask if you want to setup the Left or Right Triggers.
- 3) SMPTE Setup. This is where you enter the SMPTE triggers for starting spiels. This menu is available only if you have selected the **SMPTE IN** mode for the repeater.
- 4) Clock. This is where you setup the eight possible schedules, tolls, and set the clock. This menu is available only if the Real Time Clock option has been installed on the AB/DR-3000.
- 5) Volume. This is where you set up the Digital Audio Bus and volumes.
- 6) Status Outputs. This is where you setup what the two status outputs do.
- 7) Diagnostics. This selects this menu.

.....

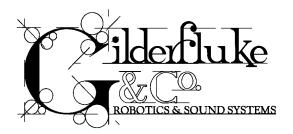
"x" eXit Setup Mode:

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 menu.

For compatibility with other products that might be on the same RS-422 serial network, this command asks you to enter a 'Y' or 'N'. This lets them know that the setup mode has been exited on this card. If you hit this command by mistake, then you can hit the <ESC>ape key to get back to where you were before.

All other AB/DR-3000 and Brick Brains in the same serial network 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 the other cards wait for a 'Y' or 'N' before they will start accepting other serial commands again. If you find that you are having trouble communicating with any of the cards in the system, try entering an 'XN' to trick it into thinking you have exited the configuration mode.





- AB/DR-3000 SERIAL PORT COMMANDS-

The AB/DR-3000 can be controlled by simple switch closures to start and stop playback or looping, mute the audio, and perform a variety of functions. Along with this method of controlling the AB/DR-3000s, you can talk to as many as 255 AB/DR-3000s at one time through a serial data line from your computer, terminal, or control system.

All commands sent to the AB/DR-3000 through its serial port take the following format. All characters are in ASCII. All numeric values are in HEXadecimal (HEX for short) unless otherwise noted. They 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 AB/DR-3000 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 AB/DR-3000 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, 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 AB/DR-3000 with too many commands through the serial port. You don't want to take too much time away from the AB/DR-3000 to service the serial port.

To communicate with the AB/DR-3000 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/DR-3000 wants 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 adapter cable, so long as the wire isn't too long and there aren't too many AB/DR-3000s 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.

If you are using a computer as a terminal you will need to run a modem or terminal emulation program. 'TERMINAL' that comes with Windows will work just fine. Z-Term for Macintoshes is a shareware program available for free or a nominal fee, as is BitCom for DOS. 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 restore it later. Unless **VT-52 MODE** is turned ON, the AB/DR-3000 uses no screen control codes or <ESC>ape 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. You should set your program <u>not</u> to insert an extra LineFeed (LF) character after each Carriage Return (CR) it receives, or else the menus will print 'double spaced'. 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 between each character sent or use what is called 'ACK/NAK' handshaking.

Otherwise it might over run the AB/DR-3000s' incoming data buffer.

If you have hooked up the AB/DR-3000s 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 AB/DR-3000s 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 appear 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 AB/DR-3000s. 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'. Then you should repeat this test.

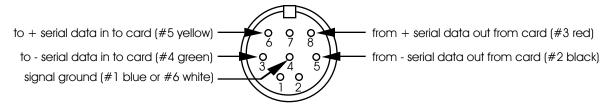
The serial data signals from the AB/DR-3000s are brought out on the six position RJ-11 (modular telephone style) connector labeled 'RS-422 Serial Port'. On the AB-3000s, this is right on the unit's case. For DR-3000s, you will find this on the back of the CC-3016 or CC-3004 card cages. Facing the end of the cable with the release latch upwards, its pin out is as follows:

	<u>pin #</u>	COLOR	<u>SIGNAL NAME:</u>
(left)	1	WHITE	signal ground
	2	BLACK	- serial data OUT from AB/DR-3000
	3	RED	+ serial data OUT from AB/DR-3000
	4	GREEN	- serial data IN to AB/DR-3000
	5	YELLOW	+ serial data IN to AB/DR-3000
(right)	6	BLUE	signal ground

PC and Compatible Connection: To cross wire the RS-422/RS-485 signals from the AB/DR-3000 to the RS-232 serial port of an IBM compatible, cross connect the signals as follows:

<u>DB-25</u>	<u>DE-9</u>	<u>SIGNAL</u>	SIGNAL FROM/TO AUDIO SYSTEM
2	3	DATA OUT	- serial data IN to AB/DR-3000 (GREEN)
3	2	DATA IN	- serial data OUT from AB/DR-3000 (BLACK)
7	5	Ground	signal ground (BLUE or WHITE)

Apple Macintosh computers have true RS-422 serial ports built in. To connect to the AB/DR-3000, the pin out is as follows for a Macintosh mini-DIN-8:



The AB/DR-3000 expects to see the serial data in the following format:

ONE START BIT EIGHT DATA BITS ONE BIT

There are many methods you can use to access a number of cards in an AB/DR-3000 system at the same time. If you are controlling the audio through the serial port, you can use any or all of them as best suits your application. They are:

- 1) <u>ALL</u> Any command of this type effects all the cards in the system.
 - **EXAMPLE:** A 'START ALL' command will start all the AB/DR-3000s in the system.
- 2) ADDRESS 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 ADDRESS NUMBER address in order for the system to operate properly.
 - **EXAMPLE**: A 'START CARD#' command will start only the one card addressed by the CARD# in

the command.

- 3) **GROUP** There are sixteen possible groups in the AB/DR-3000. They are numbered from '0' through 'F'. You can configure any AB/DR-3000 in the system to respond to any one of these 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 that have been configured to respond to the GROUP# in the command.
- **4) COCKED** You can set a flag on any number of different AB/DR-3000s that, 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 AB/DR-3000s which have had their 'COCKED' flags set.

Many of the commands sent to the AB/DR-3000s require you to specify whether it should be directed to the Right, Left, or Both outputs if Mono ROMs are installed. This requires an extra '1', '2', or '3' ASCII character to follow the actual command (1=left, 2=right, 3=both). Other Animation Control Systems and repeaters from Gilderfluke & Co. will simply ignore this extra character, so compatibility with other equipment is maintained. Stereo ROMs require this extra character, but always play out of both the Left and Right outputs.

"a" (CARD#)

Enter Setup Echo Mode:

This command puts the one AB/DR-3000 addressed by the CARD# into this mode while taking all other AB/DR-3000s out of this mode. This is a special mode that lets you play with the command structure of the AB/DR-3000 and get an echo of all commands accepted in plain English. This form of echo should be used only while manually manipulating the system as it can take a relatively long time to echo the 20 to 30 characters most commands will return when in this mode. During this response time, no additional commands should be issued.

When in this mode, address specific commands will be echoed by the card to which the command was sent. Non-card address-specific commands are echoed by the AB/DR-3000 that was specified by the CARD# when this mode was entered. This means that any address specific command sent to a nonexistent AB/DR-3000 will not be echoed, while any non-card address-specific command (like a COCKED command) will be echoed even when no AB/DR-3000 in the system is actually affected by the command.

EXAMPLE: to put AB/DR-3000 addressed at 55h into SETUP ECHO mode: a 55

ADDRESS 00 Setup Mode Selected

EXAMPLE: a 'START ALL' command will echo: 'START ALL'

"b"

Exit Setup Echo Mode:

This command takes all AB/DR-3000s in the system out of **SETUP ECHO MODE**.

EXAMPLE: to take any and all AB/DR-3000s out of **SETUP ECHO MODE**: b

"c" (CARD#)

Enter Global Echo Mode:

This command puts the one AB/DR-3000 addressed by the CARD# into this mode while taking all other AB/DR-3000s out of this mode. The one AB/DR-3000 that is in this mode will echo all non-card address-specific commands accepted by the system. This type of echo can be used in an automated system to assure that the AB/DR-3000 has received any non-card address-specific command. Note that since only one AB/DR-3000 in the system is in this mode at a time, this form of echo only verifies the operation of this one AB/DR-3000 and no other parts of the system.

EXAMPLE: to put AB/DR-3000 addressed at 55h into **GLOBAL ECHO MODE**: © 55

EXAMPLE: a 'START ALL' command will echo: u

.....

"d"

Exit Global Echo Mode:

This command takes all AB/DR-3000s in the system out of GLOBAL ECHO MODE.

EXAMPLE: to take any and all AB/DR-3000s out of **GLOBAL ECHO MODE**: d

"e" (CARD#)

Enter Echo All Mode:

This command puts the one AB/DR-3000 addressed by the CARD# into this mode while taking all other AB/DR-3000s out of this mode. The one AB/DR-3000 that is in **ECHO ALL MODE** echoes all characters sent to the AB/DR-3000 through the serial port. This type of echo can be used to verify that the AB/DR-3000 has received all characters sent to it. Note that since only one AB/DR-3000 in the system is in this mode at a time, this form of echo only verifies the operation of this one AB/DR-3000 and no other parts of the system.

EXAMPLE: to put AB/DR-3000 addressed at 55h into ECHO ALL mode: @55

EXAMPLE: a 'START CARD# 00' command will echo: t00

"f" Exit Echo All Mode:

This command takes all AB/DR-3000s in the system out of ECHO ALL MODE.

EXAMPLE: to take any and all AB/DR-3000s out of ECHO ALL mode: f

"g"

Enter Echo Specific Mode:

This command puts all the AB/DR-3000s in the system into **ECHO SPECIFIC MODE**. When in this mode, all AB/DR-3000 address-specific commands are echoed by the AB/DR-3000 addressed by the command. This is the type of echo mode which best verifies the proper operation of all the AB/DR-3000s.

.....

EXAMPLE: to put AB/DR-3000 addressed at 55h into ECHO mode: g 55

EXAMPLE: a 'START CARD# 00' command will echo: t00

"h"

Exit Echo Specific Mode:

This command takes all AB/DR-3000s in the system out of ECHO SPECIFIC MODE.

EXAMPLE: to take any and all AB/DR-3000s out of ECHO mode: h

"i" (CARD#)

Address Status Report:

This command responds with a stream of ASCII HEX data containing the current status of the AB/DR-3000 specified by the CARD#

.....

EXAMPLE: to poll the status for AB/DR-3000 addressed at 55h: 155

"I" (CARD#)

Switch Status:

This command responds with the following information for the AB/DR-3000 specified by the CARD#:

EXAMPLE: to poll the input switch status for AB/DR-3000 addressed at 55h: 155

"m" (5AA5) (CARD#)

Enter Configuration Mode:

This command puts the AB/DR-3000 specified by the CARD# into the configuration mode. All other AB/DR-3000s in the system are prohibited from receiving any serial commands when there is even one AB/DR-3000 in setup mode. They will not accept any serial commands until they hear the commands to exit setup mode being sent to the one AB/DR-3000 which is in this mode. For details on the setup mode, see the setup section of this manual.

EXAMPLE: to put AB/DR-3000 addressed at 00h into setup mode: m5AA500

Note that only one AB/DR-3000 in the entire system is allowed to be in configuration mode at one time. For this reason, if you try to put a AB/DR-3000 that doesn't exist into configuration mode you not see a configuration screen from that nonexistent AB/DR-3000. All the other AB/DR-3000 in the system won't listen to you until you take the nonexistent AB/DR-3000 out of configuration mode. To do this, type

a:

хn

The other AB/DR-3000s will then start listening to you again.

.....

"q" (CARD#)

1/4 J6 Input Status:

This command responds with the current status of the 1/4 J6 input for the AB/DR-3000 specified by the CARD#.

EXAMPLE: to poll the 1/4 J6 input status for AB/DR-3000 addressed at 55h: **q5**500

.....

"r" (CARD#)

Configuration Dump:

This command responds with the current contents of the configuration EEPROM for the AB/DR-3000 specified by the CARD#. This string of 4103 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/DR-3000s in a single file on your computer for later retrieval or archiving. You can 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 on the AB/DR-3000s.
- 2) Tell your computer to save all ASCII received from the AB/DR-3000.
- 3) Give this command to any one AB/DR-3000 in the system. The AB/DR-3000 will respond with a seemingly endless string of gibberish.
- 4) Tell your computer to save all of the gibberish it received to its disk drive.

Step #3 above can be repeated for any number of AB/DR-3000s in the system. This stored file can then be played back to one or more AB/DR-3000s where it will be reloaded into the configuration EEproms of all the appropriate AB/DR-3000s in the system.

.....

"s" (CARD#) (STRING)

Load Configuration:

This command is used to download the configuration that was previously saved into one or more AB/DR-3000s. If the EEPROM is write protected, the data will not be saved.

While a download is taking place the front panel will display 'E07', and all other repeater functions are disabled. If all 4103 bytes of configuration data are relieved the AB/DR-3000 will display a 'successful reload' message and reboot. Assuming the data was good, the repeater will boot normally. If the data was corrupt, the repeater should not recognize the configuration data and will reload the default configuration (message 'E04' displayed on the front panel) during the reboot. If there is a pause in the uploaded data of more than about five seconds or not enough bytes are relieved, the AB/DR-3000 will display a 'bad reload' message and reboot, reloading the default configuration as it does.

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) You will need to tell your terminal program to either use 'ACK/NACK' handshaking or delay slightly between each character it sends. The advantage of using the handshaking is that a download will only take about ten seconds. Using a delay between characters may take as long as ten minutes. Some computers might not respond to the ACK/NACK signals with enough speed to keep from overrunning the small (64 character) buffer on the AB/DR-3000. If this is the case you may have to use the delay between characters.

Usually the delay adjustment is set in one/tenths of a second, so a value of one/tenth of a second is the minimum available delay.

2) Tell your computer to send this file through the serial port to the repeaters. The same string of gibberish you saw during the **Configuration Dump** command will go shooting by as it is reloaded into the the addressed AB/DR-3000s.

Start Commands:

"t" (CARD#) (1=left, 2=right, 3=both)

"u" (1=left, 2=right, 3=both)

"v" (1=left, 2=right, 3=both)

"v" (GROUP#) (1=left, 2=right, 3=both)

Start Card #:

Start All:

Start Cocked:

"w" (GROUP#) (1=left, 2=right, 3=both)

These commands start the AB/DR-3000(s) addressed by the command. If the addressed AB/DR-3000 is looping, it will have its looping mode reset. If the AB/DR-3000 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.

If the AB/DR-3000 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 or the 1/4 J6 inputs (DMX 'a' can also be mirrored to the 1/4 J6 input).

.....

Stop Commands:

"x" (CARD#) (1=left, 2=right, 3=both)

"y" (1=left, 2=right, 3=both)

"z" (1=left, 2=right, 3=both)

"GROUP#) (1=left, 2=right, 3=both)

Stop Card #:

Stop All:

Stop Cocked:

Stop Group:

These commands stop the selected AB/DR-3000(s) unconditionally.

Reset Commands:

"H" (CARD#) (1=left, 2=right, 3=both)
"I" (1=left, 2=right, 3=both)
"J" (1=left, 2=right, 3=both)
"K" (GROUP#) (1=left, 2=right, 3=both)
Reset Card #:
Reset All:
Reset Cocked:
Reset Group:

These commands reset the addressed AB/DR-3000s to the start of their memory. If stereo ROMs are installed or the command is received by the left side repeater, then the 'next spiel' pointers are set the first spiel on the repeater. If the Left/Right Split has been set, then the Right side's 'next' is set the next spiel after the 'split'. Otherwise it too is set to point to the first spiel. If the repeater was playing when the RESET was received, the sound then continues from the new point in memory.

Mute Commands:

"L" (CARD#) (1=left, 2=right, 3=both)

"M" (1=left, 2=right, 3=both)

"N" (1=left, 2=right, 3=both)

"O" (GROUP#) (1=left, 2=right, 3=both)

Mute Card #:

Mute All:

Mute Cocked:

Mute Group:

These commands unconditionally mute the AB/DR-3000(s) selected. If the AB/DR-3000(s) selected are already half-muted, this command will override that condition and fully mute them.

Half-Mute Commands:

"P" (CARD#) (1=left, 2=right, 3=both)

"Q" (1=left, 2=right, 3=both)

"R" (1=left, 2=right, 3=both)

"S" (GROUP#) (1=left, 2=right, 3=both)

Half-Mute Cocked:

"S" (GROUP#) (1=left, 2=right, 3=both)

These commands unconditionally half-mute the AB/DR-3000(s) selected. If the AB/DR-3000(s) selected are already muted, this command will override that condition and half-mute them.

Un-mute Commands:

"T" (CARD#) (1=left, 2=right, 3=both)

"U" (1=left, 2=right, 3=both)

"V" (1=left, 2=right, 3=both)

"W" (GROUP#) (1=left, 2=right, 3=both)

Un-Mute Cocked:
Un-Mute Group:

These commands unconditionally un-mute the AB/DR-3000(s) selected. If the DR-3000(s) selected have their PA system active, the PA command will continue to hold the AB/DR-3000s in a half-muted condition until it is released.

"X" (CARD#)

Cock Card:

This command sets the cocked flag on the AB/DR-3000 specified by the CARD#. Until this flag is reset, this AB/DR-3000 will respond to all **COCKED** commands. Any number of AB/DR-3000s 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 AB/DR-3000 addressed at 55h: X55

"Y" (CARD#)

Un-Cock Card:

This command resets the cocked flag on the AB/DR-3000 addressed by the CARD#. After this flag is reset, the addressed AB/DR-3000 will no longer respond to **COCKED** commands.

EXAMPLE: to un-cock AB/DR-3000 addressed at 55h: Y55

.....

"**Z**"

Un-Cock All AB/DR-3000s:

This command resets the cocked flag on all the AB/DR-3000s in the system. After the cocked flags are reset, no AB/DR-3000s in the system will respond to any **COCKED** commands.

EXAMPLE: to un-cock all AB/DR-3000s in the system: \mathbb{Z}

.....

Loop Commands:

"!" (CARD#) (1=left, 2=right, 3=both)

""" (1=left, 2=right, 3=both)

"#" (1=left, 2=right, 3=both)

"\$" (GROUP#) (1=left, 2=right, 3=both)

Loop Cocked:

"\$" (GROUP#) (1=left, 2=right, 3=both)

These commands work exactly like the start commands, except that at the end of the current spiel, the spiel 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 AB/DR-3000 that is looping has a delay set, then this delay will be inserted between each iteration of the loop. This allows you to record a fairly short announcement and put a long enough delay between each iteration that it won't drive everyone crazy. The delay value can be set in the field through the serial port to adjust how often the spiel repeats. The delay can be set from .1 second on up to 999.9 seconds in 1/10 th 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 AB/DR-3000 will play in succession. The delay, if enabled, will be inserted between each spiel.

```
"%" (CARD#) (1 = left, 2 = right, 3 = both)
"&" (1=left, 2=right, 3=both)
"'" (1=left, 2=right, 3=both)
"(" (GROUP#) (1=left, 2=right, 3=both)
```

Stop At End Commands: Stop at End Card #: Stop at End All: Stop at End Cocked: **Stop at End Group:**

These commands tell the AB/DR-3000(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 instant they are received. These commands have no effect on repeaters that are not looping.

Select Spiel Commands:

")" (CARD#) (SPIEL#) (1=left, 2=right, 3=both) "*" (SPIEL#) (1 = left, 2 = right, 3 = both) "+" (SPIEL#) (1=left, 2=right, 3=both) "/" (GROUP#) (SPIEL#) (1=left, 2=right, 3=both) Select Spiel Group:

Select Spiel Card #: **Select Spiel All: Select Spiel Cocked:**

Up to 255 different recordings can be stored on a single AB/DR-3000. Each of these individual recordings are called 'spiels'. These commands can be used to select an individual spiel on the selected AB/DR-3000(s). Individual spiels can be requested with SPIEL# requests with a HEXadecimal number in the range of 01 to FFH. Once a spiel is selected, it will be played on the next start. If the AB/DR-3000 is looping then it will play the requested spiel on the next iteration of the loop.

":" (CARD#) (DELAY TIME) (1 = left, 2 = right, 3 = both) Set Delay:

This command allows the user to adjust the time set for the delay function on the AB/DR-3000 selected by CARD#. The delay can serve two functions:

- 1) Delay the actual start of playing from 1/10 th of a second to 999.9 seconds from the time the start command is received.
- 2) While in **LOOPING** mode, delay for a period of 1/10 th of a second to 999.9 seconds between each iteration of the loop.
- 2) While in **LOOP ALL** mode, delay for a period of 1/10 th of a second to 999.9 seconds between each spiel.

Acceptable values for DELAY are from 0000 to 9999. Each count is equal to 1/10 th of a second. If the value is 0000, the delay is disabled.

EXAMPLE: to give AB/DR-3000 addressed at 55h a delay value of 1 minute: ;550600



"?" (HALF-MASK) (FULL-MASK)

Mute Mask:

This command usually comes from the PA MASTER to a AB/DR-3000. It is followed by an eight bit half-mute mask and an eight bit full-mute mask. Any bits on these two masks which match enabled full and half mute zones will cause the repeater to set its output level as needed.

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

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

This command usually comes from the PA MASTER to a DR-3000 which is part of the PA system. AB-3000s, having no Digital Audio Bus, can't respond properly to PA requests. They will be half-muted if they think they are responding to a PA request.

This command opens the TRUNK# for each valid request for a PA ZONE. The only PA ZONES which any DR-3000 will respond to are those which have been enabled on the Main Configuration Menu. If a higher priority PA request comes in than is already being serviced, it will be honored. If a lower priority PA request comes in, it will be ignored by the DR-3000.

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:

This command usually comes from the PA MASTER to a DR-3000 that is part of the PA system. AB-3000s, having no Digital Audio Bus, can't respond properly to PA requests.

This command is used to clear PA requests on the AB/DR-3000s. When a valid PA request comes in to any DR-3000, it opens up the appropriate PA TRUNK LINE to feed the audio from the PA STATION to the DR-3000. This command clears the PA request by turning off the TRUNK# of the PA request. In clearing the PA request, it allows the mute level to return to whatever it should be.

EXAMPLE: to clear any PA requests which used trunk line 3: 13

- SUMMARY OF SERIAL COMMANDS -

Enter Setup Echo Mode: "a" (CARD#)

Exit Setup Echo Mode: "b"

Enter Global Echo Mode: "c" (CARD#)

Exit Global Echo Mode: "d"

Enter Echo All Mode: "e" (CARD#)

Exit Echo All Mode: "f"
Enter Echo Specific Mode: "g"
Exit Echo Specific Mode: "h"

Address Status Report: "i" (CARD#)
Switch Status: "I" (CARD#)

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

1/4 J6 Input Status: "q" (CARD#)
Configuration Dump: "r" (CARD#)

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

Start Commands:

Start Card #: "t" (CARD#) (1=left, 2=right, 3=both)

Start All:
"u" (1=left, 2=right, 3=both)
Start Cocked:
"v" (1=left, 2=right, 3=both)

Start Group: "w" (GROUP#) (1=left, 2=right, 3=both)

Stop Commands:

Stop Card #: "x" (CARD#) (1=left, 2=right, 3=both)

Stop All:

"y" (1=left, 2=right, 3=both)
Stop Cocked:

"z" (1=left, 2=right, 3=both)

Stop Group: "G" (GROUP#) (1=left, 2=right, 3=both)

Reset Commands:

Reset Card #: "H" (CARD#) (1=left, 2=right, 3=both)

Reset All:

"I" (1 = left, 2 = right, 3 = both)

Reset Cocked:

"J" (1 = left, 2 = right, 3 = both)

Reset Group: "K" (GROUP#) (1 = left, 2 = right, 3 = both)

Mute Commands:

Mute Card #: "L" (CARD#) (1=left, 2=right, 3=both)

Mute All:

"M" (1=left, 2=right, 3=both)

Mute Cocked:

"N" (1=left, 2=right, 3=both)

Mute Group: "O" (GROUP#) (1=left, 2=right, 3=both)

Half-Mute Commands:

Half-Mute Card #: "P" (CARD#) (1=left, 2=right, 3=both)

Half-Mute All:

"Q" (1=left, 2=right, 3=both)

Half-Mute Cocked:

"R" (1=left, 2=right, 3=both)

Half-Mute Group: "S" (GROUP#) (1=left, 2=right, 3=both)

Un-mute Commands:

Un-Mute Card #: "T" (CARD#) (1=left, 2=right, 3=both)

Un-Mute All:
"U" (1=left, 2=right, 3=both)
Un-Mute Cocked:
"V" (1=left, 2=right, 3=both)

Un-Mute Group: "W" (GROUP#) (1=left, 2=right, 3=both)

Cock Card: "X" (CARD#)
Un-Cock Card: "Y" (CARD#)

Un-Cock All AB/DR-3000s: "Z"

Loop Commands:

Loop Card #: "!" (CARD#) (1=left, 2=right, 3=both)

Loop All: """ (1 = left, 2 = right, 3 = both)
Loop Cocked: "#" (1 = left, 2 = right, 3 = both)

Loop Group: "\$" (GROUP#) (1=left, 2=right, 3=both)

Stop At End Commands:

Stop at End Card #: "%" (CARD#) (1=left, 2=right, 3=both)

Stop at End All:

"&" (1=left, 2=right, 3=both)
Stop at End Cocked:

""" (1=left, 2=right, 3=both)

Stop at End Group: "(" (GROUP#) (1 = left, 2 = right, 3 = both)

Select Spiel Commands:

Select Spiel Card #: ")" (CARD#) (SPIEL#) (1=left, 2=right, 3=both)

Select Spiel All:

"*" (SPIEL#) (1 = left, 2 = right, 3 = both)

Select Spiel Cocked:

"+" (SPIEL#) (1 = left, 2 = right, 3 = both)

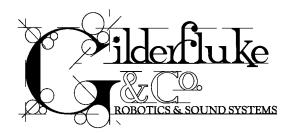
Select Spiel Group: "/" (GROUP#) (SPIEL#) (1 = left, 2 = right, 3 = both)

Set Delay: ":" (CARD#) (DELAY TIME) (1 = left, 2 = right, 3 = both)

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

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

Clear PA Request: "]" (TRUNK#)



- MX-1000 MEMORY EXPANSIONBOARDS-FOR USE WITH AB/DR-3000 DIGITAL AUDIO REPEATERS

A MX-1000 Memory Expansion Board is used to increase the capacity of a AB/DR-3000 by thirty-two additional memory chips. Up to fifteen of these memory expansion cards can be used on any AB/DR-3000 within the physical space limitations of the AB/DR-3000 housing. The practical limits are two MX-1000's in an AB-3000 AudioBrick case ³², and seven MX-1000's on a DR-3000. This gives a capacity of up to seventy-six Eproms on an AB-3000 AudioBrick, or 236 Eproms on a card cage mounted DR-3000.

The MX-1000 expansion cards, like the AB/DR-3000s they work with, support Eproms from 27C040 (512 KBytes x 8) up to 27C080 (1024 KBytes x 8). A red LED on each MX-1000 shows when the memory chips on that card are being accessed. All the EPROM sockets on the AB/DR-3000 must be filled before adding more chips by using a MX-1000. The Eproms on the MX-1000 are installed starting with the socket marked as 'ROM 1' and extending through the socket marked 'ROM 32'. Since these AB/DR-3000s are sixteen bit devices, memory chips must always be used in pairs. There can be no breaks in the EPROM sequence, and the MX-1000 must be completely filled if additional MX- cards are going to be used.

WHEN INSTALLING Eproms, BE SURE TO OBSERVE THE 'PIN ONE' MARK-INGS ON THE Eproms, SOCKETS, AND PRINTED CIRCUIT BOARDS. PLUG-GING AN EPROM IN BACKWARDS CAN DAMAGE BOTH THE EPROM AND REPEATER!

When using memory expansion cards in card cage mounted systems, DR-3000 fronts in special 2" wide size are available. These can be ordered as needed under part number RF-2000.

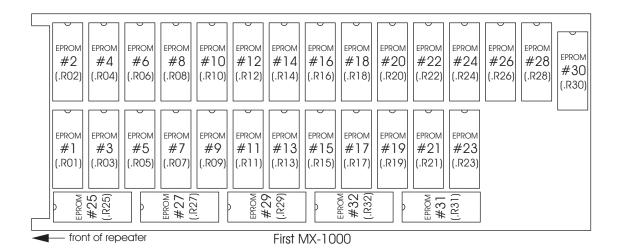
 $^{^{32}}$ Up to 15 MX-1000s can be added to an AB-3000 if you leave the lid off the top of the case.

- Installation & Configuration

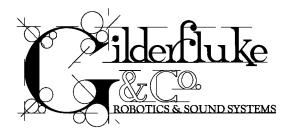
Each MX-1000 plugs into JP2A (1 \times 30 pin header), JP2B (1 \times 10 pin header), and JP3 (1 \times 24 pin header) on the AB/DR-3000. The first MX-1000 is mounted on the four 7/16" tall standoffs using four 1/4" long round head machine screws. The remaining memory expansion cards are mounted using the supplied 6-32 \times 3/8" tall male/female standoffs with a 1/16" thick nylon washer under each. This maintains a 1/2" center-to-center spacing between the cards. On installations where two or more MX-1000s are installed on a DR-3000, the provided angle brackets can be used to anchor them to the RF-2000 front panels. These are attached to the front of the MX-1000s using the provided 6-32 hardware, and then to the wide DR-3000 front using the provided 6-32 \times 1/4" Allen head machine screws.

The MX-1000s must be addressed using the sixteen position rotary dipswitch. Cards should be addressed sequentially starting at '1' (the AB/DR-3000 itself is normally using the '0' address). The LED on each card will light as the AB/DR-3000 accesses its memory. This gives a quick way to diagnose any addressing problems you might have.

Eproms are installed in the MX-1000 in the following order. Shown below the EPROM numbers are the .R?? number that the Sound Compressor software will name the EPROM files for the first two MX-1000 boards:



EPROM EPROM EPROM EPROM EPROM EPROM EPROM EPROM EPROM EPROM EPROM **EPROM EPROM EPROM EPROM** #20 #2 #4 #6 #8 #10 #12 #14 #16 #18 #22 #24 #26 #28 #30 (.R46) (.R48) l(.R50) (.R52) l(.R54) (.R56) (.R58) (.R60) (.R62) (.R64) (.R66) (.R68) (.R70) (.R72) (.R74)**EPROM** EPROM EPROM **EPROM EPROM** EPROM **EPROM EPROM EPROM** FPROM FPROM **EPRON** #1 #3 #5 #7 #9 #11 #13 #15 #17 #19 #21 #23 (.R49) (.R45)(.R51)(.R53)(.R55) (.R57) (.R59)(.R61)(.R63)(.R67 (.R47) (.R65)#32 #25 #27 (.R71) .R69) #31 front of repeater Second MX-1000



- SOUND COMPRESSORSOFTWARE-FOR USE WITH AB/DR-3000 DIGITAL AUDIO REPEATERS

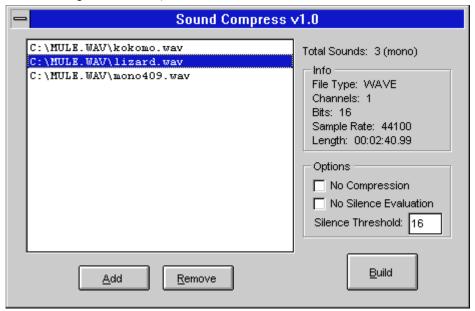
The Sound Compression Software is the small program that will turn industry-standard .AIFF (Macintosh and Amiga), .SD (Sound Designer I) or .WAV (Windows) sound files into a set of ROM-sized files which can then be loaded into memory chips for installation in AB/DR-3000 Digital Audio Repeaters.

The software package consists of several small programs which, as of this writing, will run only under Microsoft's Windows. These can be copied directly to your hard disk. The programs are:

- a) SNDCOMP.EXE = The main sound compression program
- b) GILDCONV.DLL = Sub-program called by SNDCOMP.EXE to actually do the work
- c) SNDLABLE.EXE = Program which can be used to print labels for Eproms

If you make the two .EXE programs accessible from your Windows desktop, included icons will appear for them.

The Sound Compression program has but one window. If you place the mouse over any command for more than a short moment, a 'help' balloon will appear for that command. On this window is a list of the sound files you want to compress. The three buttons are used to add or remove sound files to this list, or to start the compression process. These all act upon the list of sounds to be put into a single set of Eproms which are to be generated. Typically this set of EPROM files will be burnt into Eproms to be used on a single AB/DR-3000 Digital Audio Repeater.



The three commands which are available to you are:

Add: This command is opens a standard Windows 'file open' dialog which allows you to select sound files to add to list of sounds to be compressed for a repeater:



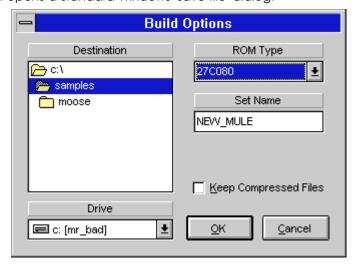
Files will be added to the list on the selected line, or if none are selected, they will be added to the end of the list. You can use <SHIFT>+<CLICK> or <CONTROL+<CLICK> to select multiple files.

The program will not let you mix mono and stereo samples on the same repeater. If the AB/DR-3000 is going to be used for two mono outputs with some spiels dedicated to the Left output and the rest to the Right, you must add all the Left spiels at the top of the list. When you set the **Left/Right Split** on the repeater, it will send all the sounds up to the split to the Left output, and all the sounds over the split to the Right.

As a default, the files shown will be of the .AIFF, .WAV, and .SD types. You can also open previously compressed sound files. These will have been automatically been renamed with the FileName of the sound set they were compressed into, and the EXTension which shows the number of the sound within that sound set. You can select more than a single file at one time to add to the list, but since the sounds will be placed in the Eproms in the order in which they appear in the list, you may want to add them one-by-one.

Remove: This button is used to remove the selected files(s) from the list of sounds to be compressed.

Build: This button is used to tell the program to use the list of sounds as it now stands to generate an EPROM set. It opens a standard Windows 'save file' dialog:



The options allow you to select the size of the EPROM or PCMCIA card that the sounds will be burnt into, the name for this set of files, and whether you will save the compressed files. Saving the compressed files can take up a lot of disk space, but will save you the time it will take to compress the sounds a second time if you need to burn them again. Compression on

a '486-66 PC should take about four times longer than the actual sound. The faster the computer, the less time the compression will take.

Clicking on the OK button will start the process of compressing and building the EPROM files. When it is complete, the program will have generated the following files:

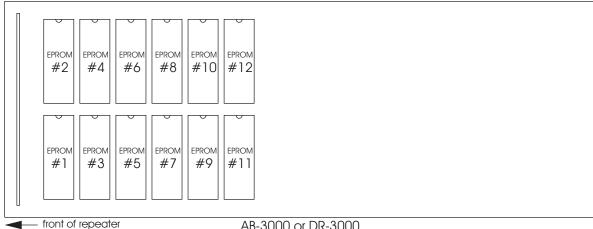
- a) Actual EPROM files (with the FileName you gave this set and the extension of 'R01', 'R02', 'RO3', etc.). EPROM files are always generated in pairs.
- b) File which the label printing utility uses (with the FileName you gave this set and the extension of '.SET').
- c) If you asked for the compressed files to be saved, a set of files that represents each of the individual sounds in this EPROM set (with the FileName you gave this set and the extension 'C01', 'C02', 'C03', etc.).

Once sound files have been added to the list, you can select them individually and the program will tell you:

- a) the type of file it is
- b) the number of channels (1=mono, 2=stereo)
- c) the number of bits of resolution
- d) the sample rate
- e) sample length

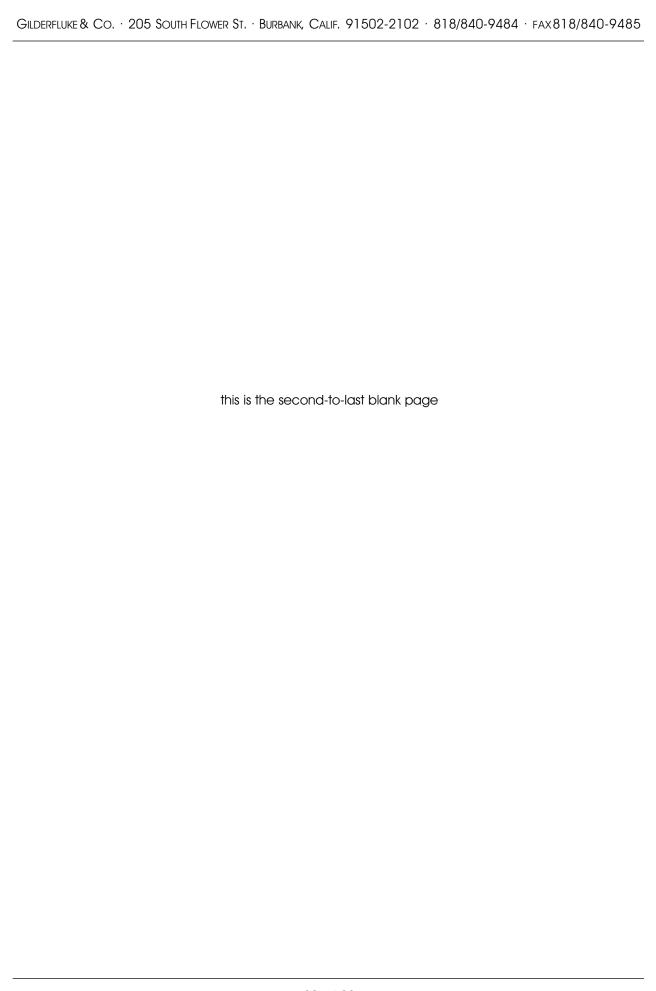
You can select for each individual file whether they will be compressed, and whether a silence threshold will be used to remove all the sound that is below a certain level. Depending on your sample, this can save a great deal of EPROM space. If the threshold is set too high, the sample will sound 'choppy' as the repeater turns on and off. If the threshold is set too low, then you won't achieve the space savings you might otherwise.

Once generated, the EPROM files can be burnt into Eproms using any commercially available EPROM Programmer. They are installed in the following order:



AB-3000 or DR-3000

If you want to print labels for the EPROM sets generated by the compression program, you can use SNDI ABI F.FXF.



- System Connections -

- DR-3000 Digital Audio Repeater / Mixer Connections -

- JP1 - 96 PIN DIN CONNECTOR - DR-3000/DR-4000 DIGITAL AUDIO REPEATER / MIXER TO MOTHERBOARD -

	A	В	C
1	BCLK 2	Ground	BCLK 3
2	BCLK 0	Ground	BCLK 1
3	DAB 14	Ground	DAB 15
4	DAB 12	Ground	DAB 13
5	DAB 10	Ground	DAB 11
6	DAB 8	Ground	DAB 9
7	DAB 6	Ground	DAB 7
8	DAB 4	Ground	DAB 5
9	DAB 2	Ground	DAB 3
10	DAB 0	Ground	DAB 1
11	SIO 4 (+ DMX-512)	Ground	SIO 5 (- DMX-512)
12	SIO 2 (- TxD)	Ground	SIO 3 (+ TxD)
13		- AES/EBU Input (#8)	
14	ANA 7 (1/2 J-6/A #3)		OPTO 10 (ISO V+ 1/4 J-6 #10)
15	ANA 6 (1/2 J-6/A #5)	` ,	SOPTO 9 (STAT COMMON #8)
16	ANA 5 (1/2 J-6/A #7)	` ,	BOPTO 8 (Status 1 #3)
17	ANA 4 (1/2 J-6/A #9)	, ,	BOPTO 7 (D7 1/4 J-6 #2)
18	,	AUDIO IN 3 Ground (#13)	,
19	,	AUDIO IN 2 Ground (#4)	BOPTO 5 (D5 1/4 J-6 #4)
20	ANA 1 (1/2 J-6/A #17)	- AUDIO IN 2 (#5)	BOPTO 4 (D4 1/4 J-6 #5)
21	ANA 0 (1/2 J-6/A #19)	+ AUDIO IN 2 (#12)	BOPTO 3 (D3 1/4 J-6 #6)
22	` ,	AUDIO IN 2 Ground (#4)	BOPTO 2 (D2 1/4 J-6 #7)
23	SMPTE IN (#7)	- AUDIO IN 1 (#11)	BOPTO 1 (D1 1/4 J-6 #8)
24	OOUT 2 (Status 2 #5)	+ AUDIO IN 1 (#3)	BOPTO 0 (D0 1/4 J-6 #9)
25	,	AUDIO IN 1 Ground (#10)	, ,
26	ANA 1 (- AUDIO OUT RIGHT)	` ,	ANA 4 (- AUDIO OUT LEFT)
27	ANA 0 (+ AUDIO OUT RIGHT)	` ,	ANA 3 (+ AUDIO OUT LEFT)
28	ANA 2 (Ground RIGHT)	AUDIO IN 0 Ground (#1)	ANA 2 (Ground LEFT)
29 30	Ground	Ground	Ground
30 31	- 12 SUPPLY + 12 SUPPLY	- 12 SUPPLY + 12 SUPPLY	- 12 SUPPLY + 12 SUPPLY
31 32	+ 12 SUPPLY + 5 SUPPLY	+ 12 SUPPLY + 5 SUPPLY	+ 12 SUPPLY + 5 SUPPLY
_	1 0 0011 21	1 0 001121	. 0 001121

- JP2A - 1 x 30 Header - Memory Expansion Connector -

1	Vcc
2	SA 0
3	SA 1
4	SA 2
5	SA 3
6	SA 4
7	SA 5
8	SA 6
9	SA 7

10	SA 8
11	SA 9
12	SA 10
13	SA 11
14	SA 12
15	SA 13
16	SA 14
17	SA 15
18	SA 16
19	SA 17
20	SA 18
21	SA 19
22	/OBSMINH
23	V+
24	V+
25	n/c
26	Ground
27	n/c
28	n/c
29	n/c
30	n/c

- JP2B -- 1 x 10 Header -

- Memory Expansion Connector -

1	Vcc
2	SA 20
3	SA 21
4	SA 22
5	SA 23
6	SA 24
7	SA 25
8	SA 26
9	SA 27
10	Ground

- JP3 -- 1 x 24 Header -

- Memory Expansion Connector -

1	Vcc
2	Vcc
3	/RD
4	/SMEM
5	/WR
6	Sd 0
7	Sd 1
8	Sd 2
9	Sd 3
10	Sd 4
11	Sd 5
12	Sd 6
13	Sd 7
14	Sd 8

```
15
                      Sd 9
 16
                     Sd 10
 17
                     Sd 11
 18
                     Sd 12
 19
                     Sd 13
                     Sd 14
 20
 21
                     Sd 15
 22
                    Ground
 23
                    Ground
 24
                    Ground
          - JP4 -
     - 1 x 3 Header -
     - Write Enable -
  1
                     SA 18
  2
                     MEM2
  3
                      /WR
          - JP5 -
     - 1 x 3 Header -
     - Flash Enable -
  1
                      ٧+
  2
                      Vpp
  3
                     SA 19
          - JP6 -
     - 1 x 2 Header -
     - Clock Enable -
  1
                    U24 #12
  2
                    Ground
          - JP7 -
     - 1 x 2 Header -
     - Write Protect -
  1
                    Ground
  2
                    U50 #1
  3
                      Vcc
          - JP8 -
    - 2 x 10 Header -
- Front Panel Connector -
           PORT 4.0 (LED SEGMENT 'C')
  2
           PORT 4.1 (LED SEGMENT 'D')
  3
           PORT 4.2 (LED SEGMENT 'A')
           PORT 4.3 (LED SEGMENT 'dp')
  4
            PORT 4.4 (LED SEGMENT 'E')
  5
  6
            PORT 4.5 (LED SEGMENT 'F')
```

```
7
          PORT 4.6 (LED SEGMENT 'B')
          PORT 4.7 (LED SEGMENT 'G')
8
9
            PORT 5.0 (LED SELECT 0)
            PORT 5.1 (LED SELECT 1)
10
            PORT 5.2 (LED SELECT 2)
11
       PORT 5.3 (LED SELECT 3) (not used)
12
            PORT 5.4 ('UP' BUTTON)
13
           PORT 5.5 ('DOWN' BUTTON)
14
15
          PORT 5.6 ('SELECT' BUTTON)
          PORT 5.7 ('MANUAL' BUTTON)
16
17
                LEFT VU LED +
                RIGHT VU LED +
18
19
                     Vcc
20
                   Ground
```

InfraRed Transmitter -6 position RJ-11 'Telephone' Connector -

LEFT	NAME	COLOR	SIGNAL FUNCTION
	Ground	WHITE	SIGNAL Ground
	n/c	BLACK	no connection
	n/c	RED	no connection
	- TxD	GREEN	- DATA IN TO AB/DR-3000 (use DMX-512 - Input)
	+ TxD	YELLOW	+ DATA IN TO AB/DR-3000 (use DMX-512 + Input)
RIGHT	Ground	BLUE	SIGNAL Ground

- CC-3004 and CC-3016 Card Cage Connections -

- DMX-512 -

- 3 position Screw Terminal -

1 + DMX-512 (11 A) 2 Ground 3 - DMX-512 (11 C)

- RS-422 Serial Port -

- 6 position RJ-11 'Telephone' Connector -

	pin#	COLOR	SIGNAL NAME:
(left)	1	WHITE	signal ground
	2	BLACK	- serial data OUT from AB/DR-3000 (12A)
	3	RED	+ serial data OUT from AB/DR-3000 (12C)
	4	GREEN	- serial data IN to AB/DR-3000 (13C)
	5	YELLOW	+ serial data IN to AB/DR-3000 (13A)
(right)	6	BLUE	signal ground

- 1/4 J-6 Digital Input -

- 10 position Male IDS Connector -

	COLOR	SIGNAL FUNCTION
1	BROWN	no connection on CC-3004 or CC-3016
2	RED	Data Bit 7 (17 C)
3	ORANGE	Data Bit 6 (18 C)
4	YELLOW	Data Bit 5 (19 C)
5	GREEN	Data Bit 4 (20 C)
6	BLUE	Data Bit 3 (21 C)
7	VIOLET	Data Bit 2 (22 C)
8	GRAY	Data Bit 1 (23 C)
9	WHITE	Data Bit 0 (24 C)
10	BLACK	12 TO 24 VDC Supply (14 C)

- 1/2 J6/A VCA Analog Inputs -

- 20 position Male IDS Connector -

1 2	SIGNAL NAME Ground + Supply	COLOR BROWN RED	SIGNAL FUNCTION no connection on CC-3004 or CC-3016 no connection on CC-3004 or CC-3016
3	Analog Input 8	Orange	CH. 8 (07H) Positive Analog Input (14 A)
4	Analog Ref. 8	Yellow	CH. 8 (07H) Negative Reference
5	Analog Input 7	GREEN	CH. 7 (06H) Positive Analog Input (15 A)
6	Analog Ref. 7	BLUE	CH. 7 (06H) Negative Reference
7	Analog Input 6	VIOLET	CH. 6 (05H) Positive Analog Input (16 A)
8	Analog Ref. 6	GRAY	CH. 6 (05H) Negative Reference
9	Analog Input 5	WHITE	CH. 5 (04H) Positive Analog Input (17 A)
10	Analog Ref. 5	BLACK	CH. 5 (04H) Negative Reference
11	Ground	BROWN	no connection on CC-3004 or CC-3016 no connection on CC-3004 or CC-3016
12	+ Supply	RED	
13	Analog Input 4	ORANGE	CH. 4 (03H) Positive Analog Input (18 A)

14	Analog Ref. 4	YELLOW	CH. 4 (03H) Negative Reference
15	Analog Input 3	GREEN	CH. 3 (02H) Positive Analog Input (19 A)
16	Analog Ref. 3	BLUE	CH. 3 (02H) Negative Reference
17	Analog Input 2	VIOLET	CH. 2 (01H) Positive Analog Input (20 A)
18	Analog Ref. 2	GRAY	CH. 2 (01H) Negative Reference
19	Analog Input 1	WHITE	CH. 1 (00H) Positive Analog Input (21 A)
20	Analog Ref. 1	BLACK	CH. 1 (00H) Negative Reference

- Power Supply - Six Position Screw Terminal -

1	Ground (-) Sense 33
2	+ 5 Volt Sense 34
3	-12 VDC Supply (30 A, B &C)
4	Ground
5	+12 VDC Supply (31 A, B &C)
6	+ 5 VDC Supply (32 A, B &C)

- Auxiliary Power Supply - Five Position 180° DIN Connector 35 -

1	Ground
2	Case Ground
3	+ 5 VDC Supply (32 A, B &C)
4	- 12 VDC Supply (30 A, B &C)
5	+ 12 VDC Supply (31 A, B &C)

- Audio Outputs -- 25 Position Female DB-25 Connector -

1 14 2	SIGNAL NAME Ground 1 Output 1 Output 1	COLOR BROWN RED ORANGE	SIGNAL FUNCTION Ground (right card #0) (28 A) Balanced Audio Line Level Positive (+) (right card #0) (27 A) Balanced Audio Line Level Negative (-) (right card #0) (26 A)
15	Ground 2	YELLOW	Ground (left card #0) (28 C) Balanced Audio Line Level Positive (+) (left card #0) (27 C) Balanced Audio Line Level Negative (-) (left card #0) (26 C)
3	+ Output 2	Green	
16	- Output 2	Blue	
4	Ground 3	VIOLET	Ground (right card #1) (28 A) Balanced Audio Line Level Positive (+) (right card #1) (27 A) Balanced Audio Line Level Negative (-) (right card #1) (26 A)
17	+ Output 3	GRAY	
5	- Output 3	WHITE	
18	Ground 4	BLACK	Ground (left card #1) (28 C) Balanced Audio Line Level Positive (+) (left card #1) (27 C) Balanced Audio Line Level Negative (-) (left card #1) (26 C)
6	+ Output 4	BROWN	
19	- Output 4	RED	
7	Ground 5	ORANGE	Ground (right card #2) (28 A) Balanced Audio Line Level Positive (+) (right card #2) (27 A)
20	+ Output 5	YELLOW	

³³ Not availible on revision 1.0 motherboards

³⁴ Not availible on revision 1.0 motherboards

³⁵ Use extreme caution when making discrete wire connections to the AUX. Power, as five pin 180° DIN connectors are numbered 3, 5, 2, 4, 1 as you face the socket on the back of the card cage.

8	- Output 5	GREEN	Balanced Audio Line Level Negative (-) (right card #3) (26 A)
21	Ground 6	BLUE	Ground (left card #2) (28 C) Balanced Audio Line Level Positive (+) (left card #2) (27 C) Balanced Audio Line Level Negative (-) (left card #2) (26 C)
9	+ Output 6	VIOLET	
22	- Output 6	GRAY	
10	Ground 7	WHITE	Ground (right card #3) (28 A) Balanced Audio Line Level Positive (+) (right card #3) (27 A) Balanced Audio Line Level Negative (-) (right card #3) (26 A)
23	+ Output 7	BLACK	
11	- Output 7	BROWN	
24	Ground 8	RED	Ground (left card #3) (28 C) Balanced Audio Line Level Positive (+) (left card #3) (27 C) Balanced Audio Line Level Negative (-) (left card #3) (26 C)
12	+ Output 8	ORANGE	
25	- Output 8	YELLOW	
13	N/C	GREEN	

- Audio and AES/EBU Inputs - 15 Position Male DB-15 Connector -

1 9 2	SIGNAL NAME Ground 0 + Input 0 - Input 0	COLOR BROWN RED ORANGE	#0 Ground (28 B) #0 Balanced Audio Line Level Positive (+) (27 B) #0 Balanced Audio Line Level Negative (-) (26 B)
10	Ground 1	YELLOW	#1 Ground (25 B) #1 Balanced Audio Line Level Positive (+) (24 B) #1 Balanced Audio Line Level Negative (-) (23 B)
3	+ Input 1	Green	
11	- Input 1	Blue	
4	Ground 2	VIOLET	#2 Ground (19 B) (22 B) #2 Balanced Audio Line Level Positive (+) (21 B) #2 Balanced Audio Line Level Negative (-) (20 B)
12	+ Input 2	GRAY	
5	- Input 2	WHITE	
13	Ground 3	BLACK	#3 Ground (18B)
6	+ Input 3	BROWN	#3 Balanced Audio Line Level Positive (+) (17 B)
14	- Input 3	RED	#3 Balanced Audio Line Level Negative (-) (16 B)
7	Ground	ORANGE	#AES/EBU Ground (15 B) #AES/EBU POSITIVE Input (14 B) #AES/EBU NEGATIVE Input (13 B)
15	+ AES/EBU IN	YELLOW	
8	- AES/EBU IN	GREEN	

SMPTE In/Out, Status Outputs, and AES/EBU Output 9 Position Male DB-9 Connector -

	SIGNAL NAME	COLOR	SIGNAL FUNCTION
1	- SMPTE OUT	BROWN	SMPTE OUT Ground
6	+ SMPTE OUT	RED	SMPTE OUT SIGNAL (22 C)
2 7	- SMPTE IN + SMPTE IN	ORANGE YELLOW	SMPTE IN Ground SMPTE IN SIGNAL (23 C)
3 8	Status #1 Status COMMON	GREEN BLUE	Status 1 Output (16 C) Status OUT COMMON (15C)
4 9	- AES/EBU + AES/EBU	VIOLET GRAY	AES/EBU NEGATIVE Output (25 A) AES/EBU POSITIVE Output (25 C)
5	+5 v/Status #2	WHITE	Status 2 Output ³⁶ (24 A)

³⁶ + 5 VDC on revison 1.0 card cages

- Digital Audio Bus -- 50 Position Male IDS Connector -

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 33 34 34 36 37 37 38 38 38 38 38 38 38 38 38 38 38 38 38	BROWN RED ORANGE YELLOW GREEN BLUE VIOLET GRAY WHITE BLACK BROWN RED ORANGE YELLOW GREEN BLUE VIOLET GRAY WHITE BLACK BROWN RED ORANGE YELLOW GREEN BLUE VIOLET GRAY WHITE BLACK BROWN RED ORANGE YELLOW GREEN BLUE VIOLET GRAY WHITE BLACK BROWN RED ORANGE YELLOW GREEN BLUE VIOLET GRAY WHITE BLACK BROWN RED ORANGE YELLOW GREEN BLUE VIOLET GRAY WHITE BLACK BROWN RED ORANGE YELLOW	SIO 0 (+ RxD) (13 A) SIO 1 (- RxD) (13 C) Ground SIO 3 (+ TxD) (12 C) Ground SIO 2 (- TxD) (12 A) Ground SIO 5 (- DMX-512) (11 C) Ground SIO 4 (+ DMX-512) (11 A) Ground DAB 1 (10 C) Ground DAB 0 (10 A) Ground DAB 3 (9 C) Ground DAB 2 (9 A) Ground DAB 5 (8 C) Ground DAB 5 (8 C) Ground DAB 7 (7 C) Ground DAB 6 (7 A) Ground DAB 9 (6 C) Ground DAB 8 (6 A) Ground DAB 11 (5 C) Ground DAB 10 (5 A)
33	ORANGE	Ground DAB 10 (5 A) Ground
36 37 38 39 40 41	BLUE VIOLET GRAY WHITE BLACK BROWN RED	DAB 13 (4 C) Ground DAB 12 (4 A) Ground DAB 15 (3 C) Ground DAB 14 (3 A)
43 44 45 46 47 48 49 50	ORANGE YELLOW GREEN BLUE VIOLET GRAY WHITE BLACK	Ground BCLK 1 (2 C) Ground BCLK 0 (2 A) Ground BCLK 3 (1 C) Ground BCLK 2 (1 A)

- AB-3000 AudioBrick Connections -

- RS-422 Serial Port -

- 6 position RJ-11 'Telephone' Connector -

	pin#	COLOR	SIGNAL NAME:
(left)	1	WHITE	signal ground
	2	BLACK	- serial data OUT from AB/DR-3000
	3	RED	+ serial data OUT from AB/DR-3000
	4	GREEN	- serial data IN to AB/DR-3000
	5	YELLOW	+ serial data IN to AB/DR-3000
(right)	6	BLUE	signal ground

- 1/4 J-6 Digital Input -

- 10 position Male IDS Connector -

	COLOR	SIGNAL FUNCTION
1	BROWN	isolated Ground
2	RED	Data Bit 7
3	ORANGE	Data Bit 6
4	YELLOW	Data Bit 5
5	GREEN	Data Bit 4
6	BLUE	Data Bit 3
7	VIOLET	Data Bit 2
8	GRAY	Data Bit 1
9	WHITE	Data Bit 0
10	BLACK	isolated 12 TO 24 VDC Supply

- Analog Control Inputs, DMX-512 Input, Power Supply -

- 8 Position Screw Terminal -

1	Analog Control Input #2
2	Ground
3	Analog Control Input #1
4	- DMX-512 Input
5	+ DMX-512 Input
6	Earth Ground
7	12.6 VAC power Supply
8	12.6 VAC power Supply

SMPTE In/Out, Status Outputs, and AES/EBU Output 9 Position Male DB-9 Connector -

	SIGNAL NAME	COLOR	SIGNAL FUNCTION
1	- SMPTE OUT	BROWN	SMPTE OUT Ground
6	+ SMPTE OUT	RED	SMPTE OUT SIGNAL
2	- SMPTE IN	ORANGE	SMPTE IN Ground
7	+ SMPTE IN	YELLOW	SMPTE IN SIGNAL
3	Status #1	GREEN	#1 Status Output
8	Status COMMON	Blue	Status OUT COMMON
4	- AES/EBU	VIOLET	AES/EBU NEGATIVE Output
9	+ AES/EBU	GRAY	AES/EBU POSITIVE Output
5	Status #2	WHITE	#2 Status Output

- Audio Outputs -- 3 Conductor 1/4" Jack -

TIP + AUDIO Output RING - AUDIO Output SLEEVE Ground

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introducing the very last blank page	

- DECIMAL TO HEXADECIMAL TO ASCII TO PERCENTAGE -

The following chart shows decimal, HEXadecimal, ASCII and a few percentage equivalents to aid you when you need to convert between numbering bases. Also shown are the 'special' characters used by PC·MACs and Smart Brick Animation Control Systems. ASCII values that have their uppermost bit set (bit 7) are shown in parenthesis:

	IL/(<u>ASCII</u>	<u>%</u>	<u>decimal</u>	<u>HEX</u>	<u>ASCII</u>	<u>%</u>	<u>decimal</u>	<u>HEX</u>	ASCII %	<u>decima</u>	<u>HEX</u>	<u>ASCII</u>	<u>%</u>
1 0 2 0 3 4 0 5 6 0 7 0 8 9 0 10 0 11 0 12 0 13 0 14 0	02 03 04 05 06 07 08 09 0A 0B 0C 0D 0E 0F	stx/^B etx/^C eot/^C eot/^C eot//C eot//C eot//C eot//C eot//C bell//C eot//C et ht//L et//C et//C M so//C et//C et//C M so//C et//C	0 LaserSearch PB Input wait BLUE in wait GREEN in wai STOP Relay PLAY Relay REWIND Rela HDTV Mode HOUr = '01'	69 70 71 72 73 74 75 76 77 78	40 41 42 43 44 45 46 47 48 49 4A 4B 4C 4D 4F	@ A B C D E F G H I J K L M N O	25%	128 129 130 131 132 133 134 135 136 137 138 139 140 141 142 143	80 81 82 83 84 85 86 87 88 88 80 80 80 80 80 80 80 80 80 80 80	(soh) (stx) (etx/) (eot) (eot) (eng) (ack) (bell) (bs) (ht) (ff) (vt) (ff) (cr) (so) (si)	(don't care)192 193 194 195 196 197 198 199 200 201 202 203 204 205 206	CO C1 C2 C3 C4 C5 C6 C7 C8 C9 CA CB CC CD CE CF	(A) (B) (C) (E) (E) (E) (E) (E) (E) (E) (E) (E) (E	75%
17 11 18 11 19 11 20 11 22 11 22 11 23 11 24 11 25 11 26 12 27 128 11 29 11 30 11	11 c 12 c 13 c 14 c 15 r 16 : 17 e 18 c	dle/^P dc1/^Q dc2/^R dc3/^S dc4/^T nak/^U syn/^V etb/^W can/^X em/^Y sub/^Z ESC FS GS RS VS		80 81 82 83 84 85 86 87 88 89 91 92 93 94 95	50 51 52 53 54 55 55 55 55 55 55 55 55 55 55 55 55	P Q R S T U V W X Y Z [\] ^		144 145 146 147 148 149 150 151 152 153 154 155 156 157 158	90 91 92 93 94 95 96 97 98 99 9D 9E 9F	(dls) (dc1) (dc2) (dc3) (dc4) (nak) (syn) (etb) (can) (em) (sub) (ESC) (FS) (GS) (RS)	208 209 210 211 212 213 214 215 216 217 218 219 220 221 222 223	B0 B1 B2 B3 B4 B5 B6 B7 B8 B9 BA BB BD BE BF	(P) (Q) (R) (S) (T) (U) (X) (X) (Y) (Z) (II) (A) (A) (A) (A) (A) (A) (A) (A) (A) (A	
33 22 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60	201223456789ABCDEF 012333333333333333333333333333333333333	SP!"#\$%&\\(\)*+\\\-\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	12.5%	96 97 98 99 100 101 102 103 104 105 106 107 108 110 111 112 113 114 115 116 117 118 119 120 121 122 123 124 125	60 61 62 63 64 65 66 66 66 67 71 72 73 74 77 77 77 77 77 77	· abcdefghijklmnoparstuvwxyz~	37.5%	160 161 162 163 164 165 166 167 168 169 170 171 172 173 174 175 176 177 178 179 180 181 182 183 184 185 186 187	A0 A1 A2 A3 A4 A6 A6 A7 AAA AAAAAAAAAAAAAAAAAAAAAAA	(SP) 62.5 (!) (#) (\$) (%) (%) (%) (*) (!) (!) (!) (!) (!) (!) (!) (!) (!) (!	5% 224 225 226 227 228 229 230 231 232 233 234 235 236 237 238 239 240 241 242 243 244 245 246 247 248 249 250 251 252 253	E0 E1 E2 E3 E4 E5 E6 E7 E8 EB EC EEF F0 F1 F5 F6 F7 F8 F7 F7 F8 F7 F7 F7 F7 F7 F7 F7 F7 F7 F7 F7 F7 F7		87.5%