

DC1

AUTOMATIC PRE-PROCESSOR

WITH ADAPTIVE PROPORTIONAL GAIN ALGORITHM*

(Version 2.0 and higher)

OPERATING INSTRUCTIONS

LECTROSONICS, INC.
Rio Rancho, NM

* US Patent Pending

INTRODUCTION

The DC1 is a sophisticated, microprocessor-based audio signal processor which will add the capability of automatic mixing to any standard mixing console. The DC1 provides the capability to automate up to 4 standard channels. Since more than one DC1 may be used together, any number of channels may be automated. The DC1 is intended for use in any system that already has a standard mixing console, but where automation on some channels is helpful. Examples might be TV and radio broadcast studios, large churches, etc.

The DC1 uses Lectrosonics' unique "Adaptive Proportional Gain" mixing algorithm rather than hard switching to turn channels off and on. This results in totally inaudible automatic action. Complete control over all operational parameters is afforded by the DC1. The actual automatic mixing algorithm is implemented in software, and as a result much greater control and flexibility may be exercised than would normally be the case in a purely analog system.

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Note: This manual contains instructions which are specific to version 1.4 of the firmware.

THEORY OF OPERATION

Please refer to the block diagram of the DC1 for the following discussion.

The DC1 has two major subsystems; the analog signal processing and the digital control section.

The audio signal processing includes an ultra-low noise microphone preamp, a high-quality Voltage Controlled Amplifier (VCA), and an output transformer to prevent ground loops and RF interference. In addition, speech filters and precision log amplifiers detect audio signals over a wide dynamic range. The headroom detection circuitry monitors internal signal levels and gives a front panel indication of the amount of signal headroom left. The attenuation detection circuitry monitors the control voltage to the VCA and gives a front panel indication of the instantaneous gain reduction in the channel.

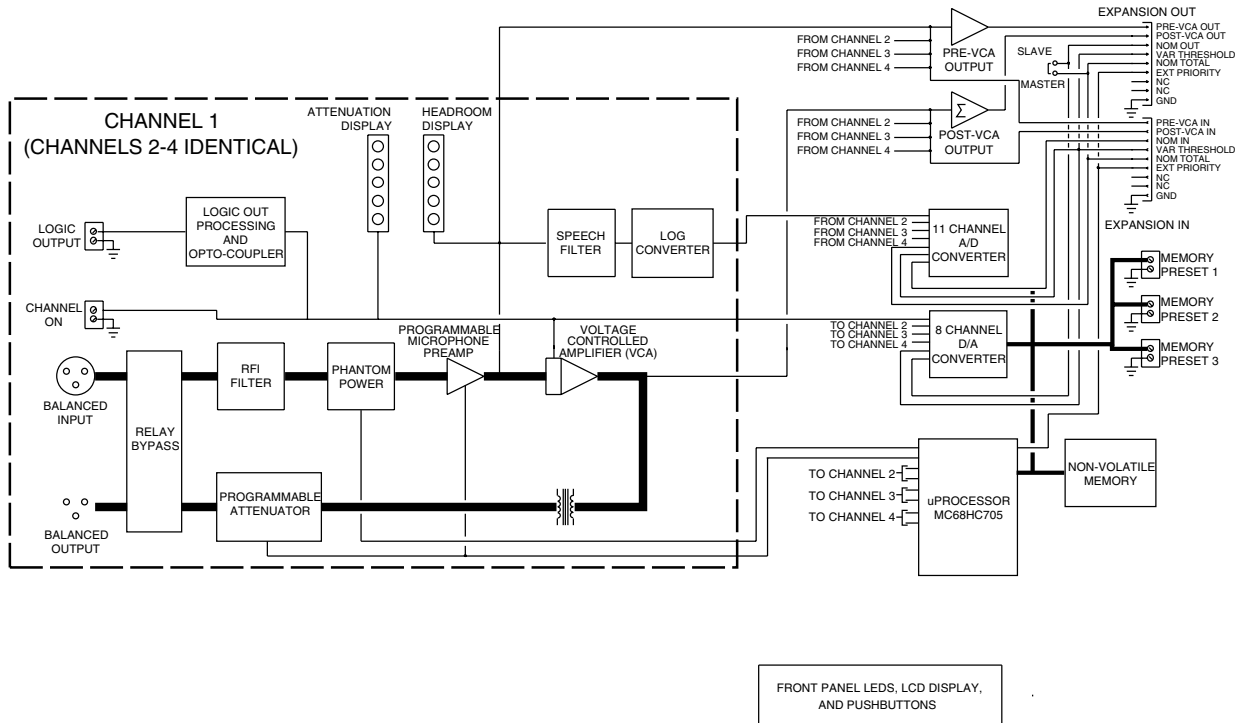


Figure 1 - DC1 Block Diagram

The heart of the digital control section consists of a Motorola 68HC705 micro-controller. The micro-controller is interfaced to the LCD display and front panel buttons, internal analog-to-digital and digital-to-analog converters, and relay drivers. The automatic mixing algorithm is completely software controlled, which provides a level of performance difficult to obtain with purely analog systems.

The DC1 is a mic level in, mic level out device. The microphone preamp in each channel may be set (via front panel control) to 40dB (Input Type: High) or 60dB (Input Type: Low) to accommodate all types of microphones. 48 volt phantom power is also available (via front panel control) on a per channel basis. After the signal is amplified, it passes through the VCA. From there, the signal is buffered and transformer coupled to a passive attenuation network, which brings the signal back down to mic level.

THEORY OF OPERATION (cont'd)

The DC1 audio signal path is designed to eliminate any signal degradation from the DC1 itself. State of the art microphone preamplifier and voltage controlled amplifier (VCA) ICs are used to process the audio signals. When the Bypass mode of operation is selected from the front panel, all VCAs are set to unity gain and microphone signal pass through unaffected. A hardware bypass capability is provided by relays which switch all three pins of the input and output XLR connectors. If power to the DC1 is lost for any reason, the relays will automatically drop into the hardware bypass mode, giving fail safe operation. A setup mode exists on the DC1 where the actual input levels of the microphones are displayed in real time so that differences in microphone sensitivity may be determined.

The automatic mixing algorithm used by the DC1 is called "Adaptive Proportional Gain" (patent pending). The channel sense level (consisting of a combination of Pre-VCA and Post-VCA signals) from each channel is continuously compared to the system sense level (the sum of all channel sense levels). Each channel is then attenuated based on the difference, in dB, between its sense level and the overall sense level. System gain is automatically shifted toward the microphone(s) with the greatest signal level. As a result, no "threshold" is necessary to determine when to turn a channel on or off, and the gain allocation is not affected by changes in ambient noise in the room.

In addition to preamp gain and phantom power, there are a number of other operational parameters that may be adjusted on the DC1 to optimize the performance for any application. Each channel has two modes of operation, Auto and Direct. Auto mode sets the channel for automatic operation. Direct turns the channel on under all circumstances.

Level Match allows the apparent channel signal level to be increased or decreased by up to 30dB, in 1dB increments. The actual audio signal path gain is unaffected by changes in the Level Match value. The Level Match function is used to minimize variations in sensitivity (and as a result, access to the system) which might result from the use of microphones with different sensitivities in the system. In addition, the Level Match function may be used to give a soft talker access to the system equivalent to louder talkers.

The off attenuation of each channel is also adjustable, from 6dB to 20dB, using the Max Attenuation function. This allows inactive channels to be attenuated to a greater or lesser degree, depending on the application.

The Auto Gain Skew function provides the capability to minimize the interruption of the active microphone by non-speech signals such as coughs, paper rattling, etc. Auto Gain Skew dynamically changes the relative proportion of Pre-VCA to Post-VCA signals which comprise the sense level for a channel. In this way, channels which are active for a significant amount of time will tend to dominate inactive microphones. Auto Gain Skew also helps eliminate "bleed-over" of a talker into adjacent closely spaced microphones.

An AutoSet function is included to simplify the process of setting the important parameters of the DC1. The AutoSet function allows different types of microphones (typically with different sensitivities) to be used with the DC1. AutoSet automatically calculates the sensitivity differences in the microphones and sets internal parameters for optimum operation.

INSTALLATION

Installation of the DC1 is quite straightforward. To use one DC1 by itself, simply plug the microphone cables from up to four microphones into the XLR inputs of the DC1. Connect the XLR outputs of the DC1 to the XLR inputs of the mixing console.

If more than one DC1 is to be used, all but one must be set to the slave mode. Slave mode strapping is accomplished by removing the top cover of the DC1 and moving the two jumpers in the upper right hand corner of the DC1 from the forward position (i.e. toward the front panel) to the rear position (i.e. toward the rear panel). In addition, the DC1's should be connected using 9 pin subminiature D type cables as shown in Figure 3.

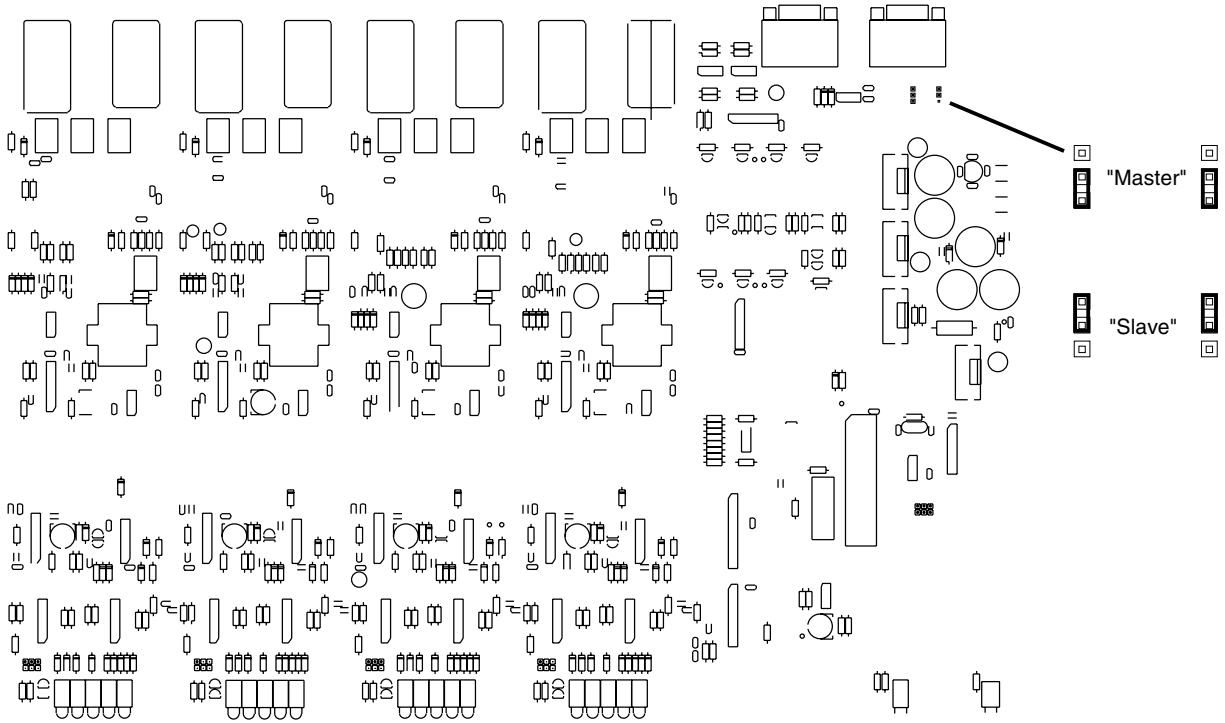


Figure 2 - DC1 Jumper Location and Settings

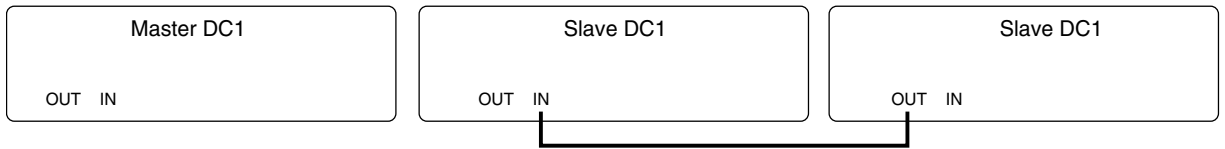


Figure 3 - Master/Slave Connections

FRONT PANEL DESCRIPTION

HEADROOM LED METER - Indicates the instantaneous amount of headroom available in the channel. Internal signals are monitored in each channel, and the Headroom LED meter shows the number of dB before channel clipping occurs. Note that even with no signal, the "40dB" LED is lit, indicating at least 40dB of headroom.

ATTENUATION LED METER - Indicates the instantaneous amount of attenuation for each channel. Note that the "20dB" LED is always lit, as the maximum channel attenuation under any circumstance is 20dB.

OPERATE LED - Indicates that the DC1 is in the Operate mode. In the Operate mode, no settings on the DC1 can be adjusted. Note that the Operate LED will flash when the DC1 is in the Bypass mode.

NEW SETTING LED - Indicates the DC1 is in the New Setting mode. In the New Setting mode, adjustments to the settings on the DC1 can be made and stored as desired.

MODE PUSHBUTTON - Changes the operational mode of the DC1 between Operate, New Setting, and Bypass. Note that a blinking cursor only appears on the LCD display in the New Setting mode. The blinking cursor is another cue that changes can be made to DC1 settings. In the Bypass mode, the Operate LED flashes. If the Mode button is pressed and held while the DC1 is powered up, the DC1 will enter a setup mode whereby the input signal level of each channel will be displayed in real time. From this screen, access may be gained to the AUTOSET function.

UP and DOWN PUSHBUTTONS - Allows the DC1 to be cycled through its function options, as well as enabling the function values to be changed.

SELECT PUSHBUTTON - Selects the area on the LCD display for which the Up and Down pushbuttons are active. The blinking cursor will be placed in the selected area. The first line of the display is the name of the selected function. The second line of the display shows the selected channel, and also the current value of the selected function.

SAVE PUSHBUTTON - Allows all the current values of DC1 functions to be saved to permanent memory.

POWER LED - Indicates the presence of AC power to the DC1.

POWER SWITCH - Turns the DC1 on or off.

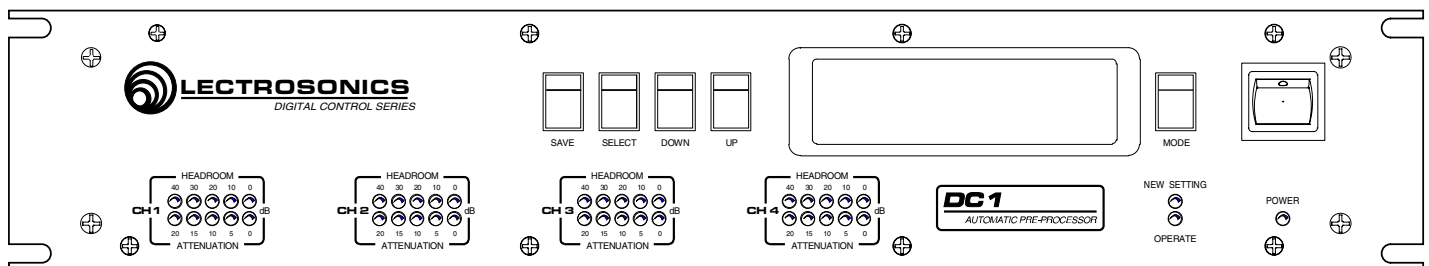


Figure 4 - DC1 Front Panel

REAR PANEL DESCRIPTION

MICROPHONE INPUT - Accepts a balanced microphone signal. Fully balanced differential input, RF filtered, front panel selectable 48 volt phantom supply. XLR type connector, Pin 2 is "+", Pin 3 is "-", and Pin 1 is ground.

MICROPHONE OUTPUT - Feeds the input of a standard mixing console. Transformer balanced, XLR type connector, Pin 2 is "+", Pin 3 is "-", and Pin 1 is ground.

EXPANSION IN/OUT CONNECTORS - provide the capability for more than one DC1 to be used in an installation.

MEMORY PRESETS - Terminal connectors for remote triggering of programmed settings.

CH ON - Terminal connectors for individual channel overrides.

LOGIC - Terminal connectors for signals indicating channel activity. Allows connection to logic controlled devices for speaker zoning, automated video switching, etc.

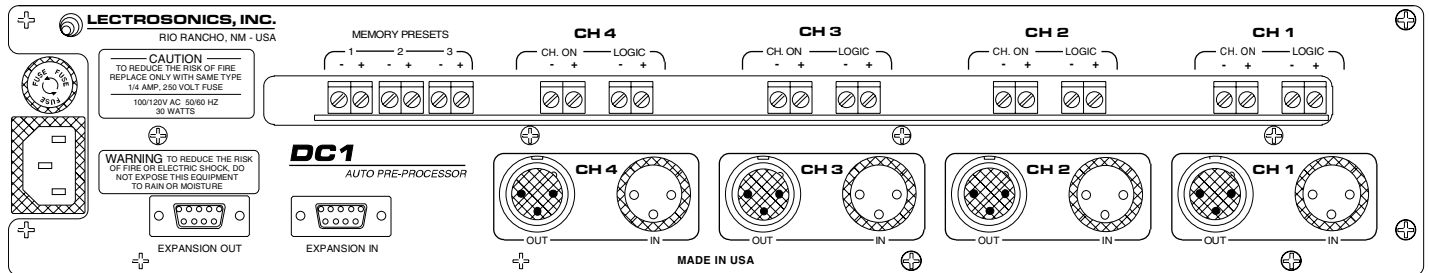


Figure 5 - DC1 Rear Panel

OPERATING INSTRUCTIONS

Before describing the setup procedure for the system, each function available in the DC1 will be explained.

AUTO SKEW DISPLAY

This function displays the instantaneous mix of Pre and Post VCA signals for each channel. The longer the display bar for any given channel, the greater is the proportion of Pre-VCA signal to Post-VCA signal. Except in the Auto Gain Skew "Off" mode, the current active microphone will display the longest bar. Note that this display is the only DC1 function which is active in both the Operate and New Setting modes.

AUTO GAIN SKEW

The Auto Gain Skew function provides the capability to minimize the interruption of the active microphone by non-speech signals such as coughs, paper rattling, etc. Auto Gain Skew dynamically changes the relative proportion of Pre-VCA to Post-VCA channel level signal. In this way, channels which are active for a significant amount of time will tend to dominate inactive microphones. Auto Gain Skew also helps eliminate "bleed-over" of a talker into adjacent closely spaced microphones.

The Auto Gain Skew may be set to one of three speeds, Fast, Medium, or Slow in addition to Off. The Fast setting provides the best operation when the interchange between microphones is lively (e.g. a talk show or panel discussion), at the expense of some noise rejection. The Slow setting provides the maximum noise rejection, and is appropriate for situations where there is less interchange between microphones (e.g. a church or lecture). The Medium setting is a compromise setting. When Auto Gain Skew is Off, all channel signal levels consist of a mix the Pre-VCA and Post-VCA signals, each attenuated 6dB.

Three alternate settings are useful in situations with high background noise: Fast*, Med*, and Slow* (note the asterisks). These three settings will release the Auto Gain Skew if the DC1 determines that there is only noise present on all channels and no valid speech signal.

MAX ATTENUATION

The Max Attenuation adjustment allows the maximum attenuation of each channel to be optimized for both the total number of microphones in use and the specific acoustic situation. The range of the Max Attenuation adjustment is 6dB to 20dB in 1dB steps.

LEVEL MATCH

The Level Match function allows the apparent channel signal level to be increased or decreased by up to 30dB, in 1dB increments. The actual audio signal path gain is unaffected by changes in the Level Match value. The Level Match function is used to minimize variations in sensitivity (and as a result, access to the system) which might result from the use of microphones with different sensitivities in the system. In addition, the Level Match function may be used to give a soft talker access to the system equivalent to louder talkers.

CHANNEL MODE

There are two operational modes for each channel in the DC1, Direct and Auto. In Direct mode, the channel is on regardless of activity on that channel or on any other channel. In Auto mode, the channel operates as an automatic mixer.

PHANTOM POWER

48 volt phantom power is available on a per channel basis. If the microphone requires phantom power, be sure to turn phantom power on for that channel.

INPUT TYPE

The microphone preamp has two gain settings for high and low level microphone sources. These settings are used to match the output levels of all types of microphones. The "High" setting is most appropriate for high output electret microphones. The "Low" setting is better matched to dynamic microphones, which have a lower output voltage. Note that these are only suggestions, and the actual setting depends on other factors as well, like the talkers' distance to the microphone, the talkers average level, etc.

SETUP PROCEDURE

1) Initialize the memory settings to factory defaults (optional.)

If you do NOT want to lose any previously saved settings, proceed directly to step 2) below.

After the DC1 is installed as outlined in the Installation section above, adjustments may be made to optimize the performance. The DC1 is shipped from the factory with all parameters preset. These presets provide a reasonable starting point from which to further optimize the DC1. Note that if the operational parameters are adjusted and saved, but for some reason it becomes necessary to return the DC1 permanent memory to the factory presets, this can be accomplished by simultaneously pressing the UP and DOWN buttons and turning the power on. The LCD display will show the message: " * Memory Initialized * "

THIS WILL ERASE ALL USER ADJUSTMENTS THAT HAVE BEEN PREVIOUSLY SAVED

2) Set the operating mode to NEW SETTING. Press the MODE button until the yellow New Setting LED is lit. Adjustments may now be made to all operational parameters.

CONTROLLING THE SETUP SCREENS:

The MODE button selects the operational mode of the DC1 (i.e. Operate, New Setting, or Bypass).

The UP and DOWN buttons scroll through function options, channel numbers, or function values, depending on the position of the blinking cursor. When the blinking cursor is in the first field of the screen, the UP and DOWN buttons will advance you to the next/previous screen. If the cursor is in any other field, the UP and DOWN buttons will change the setting in that field.

The SELECT button moves the blinking cursor between the function options, channel numbers, and function values of each screen.

The SAVE button stores the current settings of all DC1 functions into the current memory preset.

3) Set phantom power for any microphones that require it. This is accomplished by pressing the UP or DOWN button until "Phantom Power" appears on the first line of the LCD display. The SELECT button is then pressed to move the blinking cursor to the "Channel" position on the second line of the LCD display. The UP or DOWN buttons are again pressed until the desired channel number is reached. The SELECT button is again pressed to move the blinking cursor to the "Value" position and the UP or DOWN button is pressed to set the value to ON. When finished, press SELECT to move the cursor back to the Phantom Power field on the screen. Repeat for all channels.

4) Perform the AutoSet procedure. Refer to page 12, AutoSet Procedure, for step-by-step instructions. Page 11, AutoSet Description, contains a complete description of what AutoSet is and how it works.

5) Select the proper Input Type for the microphone. (Warning: If the AutoSet procedure has already been performed, the Input Type will already be set. If it is changed here, a 20dB error will be generated because the final settings generated by the AutoSet procedure depend on the Input Type in effect at the time.)

Choose the "Input Type" function as above and speak in a normal voice into the microphone from the expected distance of use. Watch the "Headroom" LED display. Set the input type to "HIGH" or "LOW" in order to get the most action on the "Headroom" display without lighting the red 0dB LED on the display. This gives the best signal-to-noise performance while leaving adequate margin against clipping. Typically, dynamic microphones will use LOW and electret microphones will use HIGH. Repeat for all channels.

6) Select the desired Channel Mode for each channel. Press the UP button to advance to the Channel Mode screen. Auto or Direct may be chosen for each channel as appropriate for the application. Repeat for all channels.

- 7) **Set the Level Match for each channel.** Press the UP button to advance to the Level Match screen then press SELECT repeatedly to move the cursor to the Value field. Press the UP and DOWN buttons to set the Level Match to the desired value.

(Note: If the AutoSet procedure has already been performed, the Level Match will already be set and will not require readjustment in most cases. Level Match may be "fine tuned" here if necessary.) Level Match inserts a correction factor to the microprocessor so that the system access of all the channels is the same.

- 8) **Select the maximum attenuation using the "Max Attenuation" function.** The choice of attenuation is made based on the total number of microphones used with the DC1(s). If the total number of microphones is 10 or less, 10dB of attenuation is adequate. 10 to 32 total microphones requires 15dB of attenuation. 33 or more total microphones requires 20dB of attenuation. The exact amount of attenuation necessary may be calculated as $10 * \text{Log}_{10}(\text{Number of Microphones})$ dB. More attenuation than the minimum may be used if desired for the particular application. No ill effects occur if less than the recommended off attenuation is used. Repeat for all channels.

- 9) **Select the Auto Gain Skew value, or OFF if Auto Gain Skew is not desired.**

- 10) **Save the settings.** After all desired selections have been made, push the SAVE button to store all chosen values to non-volatile memory. The following will momentarily be displayed: ***** All Values Saved *****.

Note that the DC1 has 3 memory positions, so three complete setups of all function values may be saved in non-volatile memory. In this way, settings optimized for different applications may be simultaneously saved.

- 11) **Switch the DC1 back to the OPERATE mode.** Press the MODE button until the NEW SETTING LED goes out and the OPERATE LED comes on. Note that on power up, the DC1 will default to the operate mode and the Auto Skew screen.

AUTOSET DESCRIPTION

The AUTOSET function of the DC1 is included to automatically optimize the performance of the DC1. AUTOSET allows any mix of microphones to be used with the DC1, while insuring that all microphones will have equal access to the system. AUTOSET accomplishes this optimization by "listening" to each system microphone in turn for a period of about 5 seconds. When all microphones have been "listened" to, the DC1 calculates the relative sensitivities of the microphones and automatically sets the **Level Match Adjust** parameter for each channel to enable equal system access for all microphones. Note that it is also possible to change the **Level Match Adjust** manually following the AUTOSET procedure for any channel.

The AUTOSET screens on the DC1 can be invoked by pressing the MODE switch on the front panel of the DC1 while simultaneously turning on the power with the main power switch. The first screen is the **Level dB** screen. This screen shows the input level at each channel in real time. The second screen is the **AUTOSET** screen. This screen allows the AUTOSET procedure to be performed.

Level dB Screen

The **Level dB** screen shows the input level of each channel in real time. Since the level shown for any given channel includes the effects of the **Input Type** and **Level Match Adjust** values that are currently stored in memory, the user may select any of the three available memories. The **Level dB** screen may be called both before and after the AUTOSET procedure to assess the results of AUTOSET. In addition, if system circumstances dictate that the Level Match Adjust values generated by the AUTOSET procedure should be changed, the information displayed on the Level dB screen can help the user to determine the amount of change necessary.

AUTOSET Screen

The AUTOSET screen enables the user to initiate the AUTOSET procedure for each channel. The appropriate **Input Type** can be chosen for each channel before AUTOSET is performed. Also, the AUTOSET procedure can be performed for any of the three available memories in the DC1, and the results will be stored in the chosen memory. AUTOSET is initiated on a channel by channel basis. After the desired memory is selected, the channel and Input Type are chosen. With someone speaking in a normal voice at the normal distance from the chosen microphone, press the MODE button on the front panel of the DC1 to initiate AUTOSET. The MODE LEDs on the front panel will flash alternately for about 5 seconds while the DC1 determines the relative sensitivity of the microphone. Repeat this procedure for all channels, and then press the SAVE button. This will calculate and save the **Level Match Adjust** values from the AUTOSET procedure.

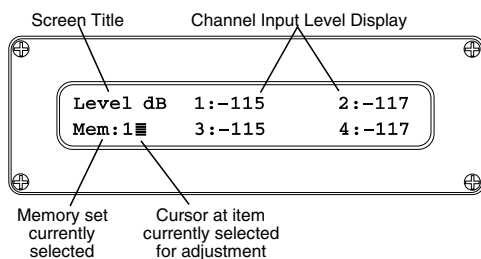


Figure 17 - Level dB Screen; This screen appears when the mode switch is held in during power-up.

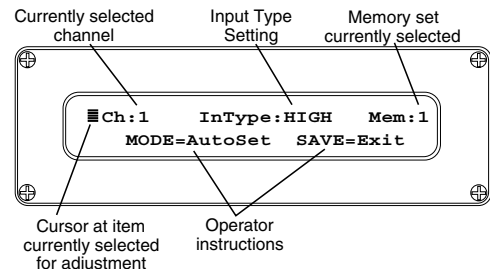


Figure 18 - AutoSet Screen; This screen appears after pressing the MODE button from the Level dB screen.

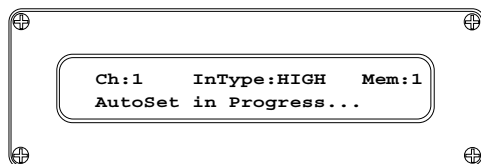


Figure 19 - This screen appears momentarily during the AutoSet Procedure.

AUTOSET PROCEDURE

STEP BY STEP INSTRUCTIONS

- 1) **If the DC1 is used with a sound system, turn the sound system on and set it for a normal listening level.**
- 2) **Activate the auto set up mode:**
 - ▶ Turn the power off;
 - ▶ Hold the MODE switch in and turn power on;
 - ▶ The screen will display the level in dB of all four channels (See Figure 18).
- 3) **Enter the AUTOSET screen:**

Press the MODE switch to enter the AUTOSET screen. CH. 1 will be displayed in the upper left corner of the screen (See Figure 19).
- 4) **Press the SELECT switch to move the cursor to the "InType" position.**
- 5) **Set the input type for HIGH or LOW:**

Start the noise source at the CH. 1 microphone. If a person will be talking into the microphone instead of using a pink noise source, have them begin talking or reading into the microphone at the normal working distance from the microphone. If you are using a noise source such as the Lectrosonics NS1, it should also be placed at the normal working distance from the microphone.

As the noise is being input to CH. 1, observe the HEADROOM LEDs on CH.1. Press the DOWN or UP switch to toggle the input type from HIGH to LOW. If the red "0" LED lights with the input type set to LOW, set the input type back to HIGH. Typically, dynamic microphones will use LOW and electret microphones will use HIGH.

Note: Once the AUTOSET routine has been run, the Input Type should not be changed. If the Input Type is changed for any reason, the AUTOSET routine must be run again.
- 6) **Initiate the sampling and automatic level match action:**

With the noise or voice signal still being fed into CH.1, press the MODE switch to activate the AUTOSET routine (See Figure 20). As the signal is sampled and evaluated, the NEW SETTING and OPERATE LEDs will blink alternately for about 5 seconds. The noise source or talker must continue for the duration of the sample.
- 7) **Press the SELECT switch to return the cursor to the CH.1 position.**
- 8) **Press the UP switch to advance to the next CHANNEL setup screen.**

Repeat steps 5 through 8 until all channels are set up.
- 9) **Save settings and exit or review adjustments made:**

When all channels have been set up, press the SAVE switch to store all adjustments in memory. The screen will flash " ** All Values Saved ** " briefly and then display a two line prompt asking you to return to the "Level dB" screen, or to exit the set up procedure.

If desired, the Level dB settings may be reviewed by pressing the MODE switch to return to the "Level dB" screen. After the settings have been reviewed, press the MODE button again to advance to the AUTOSET screen where you can push the SAVE button to exit or the MODE button to perform the AUTOSET procedure again.

CAUTION When in the AUTOSET screen, pressing the MODE button will initiate the AUTOSET action. This will overwrite any previous AUTOSET settings you may have already done!

DC1 Function Summary and Default Settings

Feature/Function	Range	Factory Default Mem 1	Factory Default Mem 2	User Mem 3
Input Type Channel 1 Channel 2 Channel 3 Channel 4	HIGH/LOW	LOW LOW LOW LOW	LOW LOW LOW LOW	
Phantom Power Channel 1 Channel 2 Channel 3 Channel 4	ON/OFF	OFF OFF OFF OFF	OFF OFF OFF OFF	
Channel Mode Channel 1 Channel 2 Channel 3 Channel 4	AUTO DIRECT	AUTO AUTO AUTO AUTO	AUTO AUTO AUTO AUTO	
Level Match Channel 1 Channel 2 Channel 3 Channel 4	-30dB to +30dB in 1dB increments	0dB 0dB 0dB 0dB	0dB 0dB 0dB 0db	
Max Attenuation Channel 1 Channel 2 Channel 3 Channel 4	6dB to 20dB in 1dB increments	20dB 20dB 20dB 20dB	20dB 20dB 20dB 20dB	
Auto Gain Skew (One setting affects all channels.)	OFF SLOW, MED, FAST SLOW*, MED*, FAST*	MED	MED	

The factory default settings in both MEM 1 and MEM 2 can be customized by the user for each individual installation.

SPECIFICATIONS

Mic Input:

Impedance:	8.1k Ohms balanced
Type:	Electronically balanced and RF filtered
Gain:	Unity
EIN, 20-20kHz	-127dBu at High Gain, -125dBu at Low Gain
Maximum Input Level	-20dBu for "High" Input Type, -40dBu for "Low" Input Type

Mic Output:

Impedance:	Less than 15 Ohms
Type:	Transformer balanced
Maximum Output Level:	-20dBu at Low Gain, -40dBu at High Gain

Phantom Power:

+48 Volts

System THD, 20-20kHz:

Less than 0.1%

System IMD, 60Hz/7kHz:

Less than 0.1%

Power Consumption

30 Watts at 120VAC

SERVICE AND REPAIR

If your system malfunctions, you should attempt to correct or isolate the trouble before concluding that the equipment needs repair. Make sure you have followed the setup procedure and operating instructions. Check out the inter-connecting cords and then go through the TROUBLE SHOOTING section in the manual

We strongly recommend that you **do not** try to repair the equipment yourself and **do not** have the local repair shop attempt anything other than the simplest repair. If the repair is more complicated than a broken wire or loose connection, send the unit to the factory for repair and service. Don't attempt to adjust any controls inside the units. Once set at the factory, the various controls and trimmers do not drift with age or vibration and never require readjustment. **There are no adjustments inside that will make a malfunctioning unit start working.**

LECTROSONICS service department is equipped and staffed to quickly repair your equipment. In-warranty repairs are made at no charge in accordance with the terms of the warranty. Out of warranty repairs are charged at a modest flat rate plus parts and shipping. Since it takes almost as much time and effort to determine what is wrong as it does to make the repair, there is a charge for an exact quotation. We will be happy to quote approximate charges by phone for out of warranty repairs.

RETURNING UNITS FOR REPAIR

You will save yourself time and trouble if you will follow the steps below:

- A. DO NOT return equipment to the factory for repair without first contacting us by letter or by phone. We need to know the nature of the problem, the model number and the serial number of the equipment. We also need a phone number where you can be reached 8 am to 4 pm (Mountain Standard Time).
- B. After receiving your request, we will issue you a return authorization number (R.A.). This number will help speed your repair through our receiving and repair departments. The return authorization number must be clearly shown on the outside of the shipping container.
- C. Pack the equipment carefully and ship to us, shipping costs prepaid. If necessary, we can provide you with the proper packing materials. UPS is usually the best way to ship the units. Heavy units should be "double-boxed" for safe transport.
- D. We also strongly recommend that you insure the equipment, since we cannot be responsible for loss of or damage to equipment that you ship. Of course, we insure the equipment when we ship it back to you.

Mailing address:
Lectrosonics, Inc.
PO Box 15900
Rio Rancho, NM 87174
USA

Shipping address:
Lectrosonics, Inc.
581 Laser Rd.
Rio Rancho, NM 87124
USA

Telephones:
(505) 892-4501
(800) 821-1121
FAX: (505) 892-6243

World Wide Web: <http://www.lectrosonics.com>

email: sales@lectrosonics.com

LIMITED ONE YEAR WARRANTY

The equipment is warranted for one year from date of purchase against defects in materials or workmanship provided it was purchased from an authorized dealer. This warranty does not cover equipment which has been abused or damaged by careless handling or shipping. This warranty does not apply to used or demonstrator equipment.

Should any defect develop, we will, at our option, repair or replace any defective parts without charge for either parts or labor. If we cannot correct the defect in your equipment, we will replace it at no charge with a similar new item. We will pay for the cost of returning your merchandise to you.

This warranty applies only to items returned to us, shipping costs prepaid, within one year from the date of purchase.

This warranty gives you specific legal rights. You may have additional legal rights which vary from state to state.

LECTROSONICS, INC.

**581 LASER ROAD
RIO RANCHO, NM 87124 USA**

July 6, 1999