SMARTSPEAKER™

DSS MC11 & PRO

INSTALLATION GUIDE

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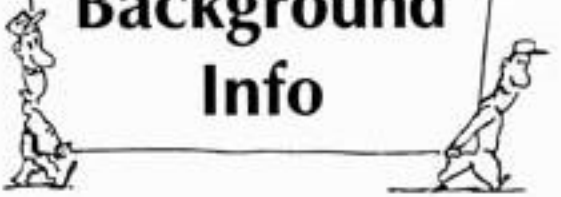
Chapter 1
Background Info



Chapter 1 Background Info

When ambient noise (environmental noise) gets in the way of effective public address communications the following situations can arise:

Situation 1: Signal strength is much greater than the background noise

Situation 2: Signal strength is almost equal to the background noise

Situation 3: The background Noise is much greater than the Signal strength

Using SmartSpeaker™ technology all of these situations are easily handled making PA speech intelligible and music clear and audible.

Using a proprietary technology called Intelligibility Compensation in Ambient Noise—ICAN™, SmartSpeaker responds to environmental noise variations seamlessly, without sudden, annoying increases or decreases in volume level. Most of the time, the listener will be completely unaware of the automatic adjustments being made. The result is a system that always delivers crystal clear sound at an optimum level to maximize intelligibility and audibility without being intrusively loud.

Chapter 1 Background Info

Questions & Answers

What is ambient noise?

This is any noise in the environment. It can be the voices of a crowd, the noise from a plane passing overhead, background factory noises, etc.

What is an ambient noise compensation device?

This is an electronic device which responds to changes in environmental noise and automatically adjusts the PA system so that it always sounds clear. An example: a department store where music and announcements need to be heard. The device keeps the signal from the PA higher than the noise in the environment so that the signal (voice or music) can be heard clearly. When there are more people in the store (i.e. more background ambient noise) the signal will have to be higher and when there are fewer people the signal will have to be quieter.

What makes SmartSpeaker different from other ambient noise compensation devices?

All other devices require a calibration process which must be rerun each time any part of the sound system or the acoustic environment is changed (such as amplifier settings, number of loudspeakers, in-store displays, installation of new factory equipment, location of the sensing microphone, crowd size, etc.) In contrast, SmartSpeaker continually monitors PA system intelligibility/audibility conditions as determined by the environmental noise and calibrates itself if required.

Chapter 1 Background Info

What's the difference between audibility and intelligibility?

Intelligibility is the measure of the human ability to comprehend a speech signal in any given environment. It is expressed as a percentage of the number of words understood correctly to the total number of words heard. That is to say that if an announcement containing 20 words came over the PA and you heard only 10 of those words then the intelligibility would be measured at 50%. You might have heard the other words but couldn't quite make them out. Those words were audible but not intelligible. Where the comprehension of delivered speech is important, intelligibility - not audibility - defines the efficiency of a PA system. Overall, less than 85% intelligibility is generally considered to be inadequate for most PA applications. And all of this works for music too!

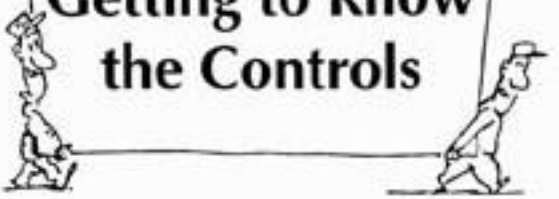
What causes Loss of Intelligibility?

In public environments, the most important cause of intelligibility loss is the interference caused by ambient noise. The impact of ambient noise on speech intelligibility depends in a complex way on several statistical properties of the noise, such as its average amplitude, amplitude fluctuation, frequency spectrum, etc. SmartSpeaker takes care of all of this stuff!

How does SmartSpeaker work?

The core of SmartSpeaker is a DSP (Digital Signal Processing) chip. It continually monitors the background noise and the PA signal strength and calculates the optimal sound level setting based on the interaction of the background noise and the PA signal. It rides the background noise up and down and adjusts the sound level of the PA system. And it does this seamlessly, without ever needing any fiddling!

Chapter 2
Getting to Know the Controls



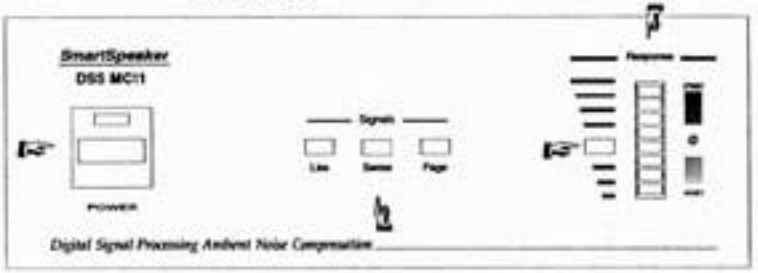
Chapter 2 Getting to Know the Controls

The Front Panel

The RESPONSE of the DSS MC11 is indicated by the vertical LED bargraph to the extreme right on the front panel. The bargraph indicates the amount of gain being applied to the input signal. Just left of the bar graph there is an overload LED that goes ON when either the line or the sense microphone signal is overloaded.

DSS MC11 D
Desktop Model

On the extreme left is the POWER Switch. When the unit is on the LED above the switch lights up.



To the right of the power switch is a horizontal row of three LEDs indicating the status of the AUDIO INPUT (marked Line), the status of the SENSE MICROPHONE (marked Sense), and the status of the PAGE INPUT (marked Page).

DSS MC11 PRO
19" Rack Mount Model

Both, the rack-mount and desktop configurations are identical in operation!

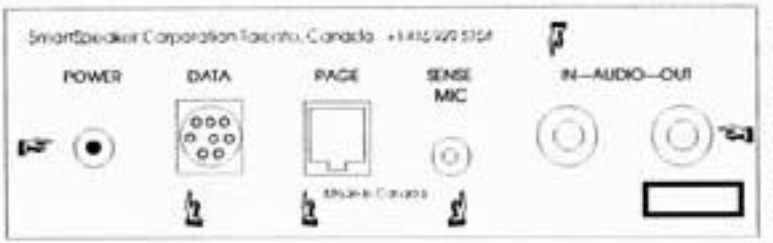
Chapter 2 Getting to Know the Controls

The Rear Panel

DSS MC11 D
Desktop Model

The AUDIO IN connector is a female RCA connector. It may be connected to any line level sound source such as a tape deck, CD player, satellite receiver, etc.

On the extreme left is the POWER Input.

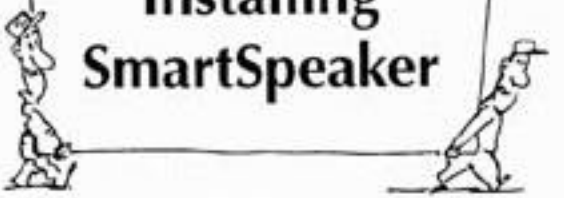


The AUDIO OUT connector is a female RCA connector and is connected to the P.A. amplifier.

The PAGE and DATA options are not used for most applications. For more information see Appendix B.

The SENSE MIC connector is where the sensing microphone is plugged in. It is a stereo mini headphone jack. A length of SHIELDED stereo microphone cable is supplied with DSS MC11. If this is inadequate, a microphone extension wire with a male stereo mini headphone jack at both ends can be constructed or purchased. Note that a mono extension cord will not work.

Chapter 3
Installing SmartSpeaker



SmartSpeaker Setup - Quick Overview

THE SENSE MICROPHONE is SmartSpeaker's "ear". The mix of signal and noise at the sense microphone determines the adjustments that SmartSpeaker makes. Therefore, for SmartSpeaker to work properly the mix of signal and noise at the microphone must be representative of what the the listener will actually hear.

PROPER PLACEMENT of the sense microphone is the first KEY to setting up SmartSpeaker.

SETTING UP the input signal level is the OTHER KEY because the computer inside SmartSpeaker 'shuts off' when the signal is either too low or too high.

Chapter 3 Installing SmartSpeaker

Step 1 - Plugging in Power and Audio

DSS MC11 comes factory configured for most common operating conditions. However, to ensure optimum performance, the settings may be reconfigured to reflect different operating conditions. (If you think that this will be necessary in your installation, please refer to Appendix A: Configuring DSS MC11 BEFORE you move on to steps 1 - 14.)

1. PLACE the DSS MC11 box on top or beside the PA system amplifier. If you have purchased the 19" rack mount version, attach it to the component rack. Make sure that the Mic is NOT connected at this point.

2. TURN OFF the amplifier.

3. PLUG IN the DSS MC11 power adapter to an AC outlet and then plug in the adapter to the back of the DSS MC11 into the POWER socket but don't turn it on yet. If the POWER light comes on, press the POWER switch to turn it off.

4. CONNECT the audio signal source (tape deck, CD player, tuner, satellite feed etc.) to the AUDIO IN connector on the DSS MC11 back panel.

5. TURN ON DSS MC11 (press the POWER Switch on the front panel, the power indicator light will come on). Only the bottom light on the vertical RESPONSE bargraph on the DSS MC11 front panel will be lit.

Step 2 - Setting the Audio Levels

1. TURN ON the audio signal source. NOTE: the power amplifier(s) must still be off and the sense microphone must NOT be connected.

2. ADJUST the audio signal level to ensure that the LINE LED is on, but that the OVERLOAD LED is off. The LED bargraph will begin climbing.

3. DECREASE, if necessary, the audio signal level while the bargraph is rising so that OVERLOAD LED does not stay on (intermittent flashing is okay.) Please refer to the diagnostic chart on the next page for a complete explanation of the use of the LED indicators in establishing the correct volume setting for the audio signal source.

4. CONNECT the amplifier input to the AUDIO OUT connector on the DSS MC11 back panel.

5. TURN ON the amplifier and with all LED's in the bargraph remaining on (from Step 2) adjust the amplifier's volume control until you have reached the maximum volume that you want from the PA system's loudspeakers. This step will establish the upper limit for the audio signal level - DSS MC11 will never allow the PA system to get louder than this preset maximum.

6. TURN OFF the audio signal source and turn off the amplifier.

Step 2 (contd.) - Setting the Audio Levels

AUDIO SIGNAL INPUT CHART (IMPORTANT: Do this when all LED's in the response bargraph are on)

LINE LED	Overload LED	Diagnosis	Remedy
Normal function: LED on, steady glow but blinks off at signal breaks and occasionally flickers on/off at signal peaks.	Normal function: LED off most of time but flashes occasionally at signal peaks (at same time as LINE LED flickers on/off at signal peaks).	Good. Audio signal input level is optimum.	No action required.
LED flickers more frequently and not just at signal peaks.	LED flashes on more often with longer "on" periods.	Audio signal input level is too high.	Turn down signal volume at signal source.
LED on, steady glow but blinks off occasionally at signal breaks. No on/off flickering at signal peaks.	No LED response at all.	Audio signal input level is too low. You are wasting dynamic range.	Turn up signal volume at signal source.

With the bargraph at maximum the audio signal may occasionally 'tickle' the OVERLOAD LED on at its peaks. Once you have achieved the optimum, do not alter the volume control on the audio signal source. (You may want to mark the setting for future reference.)

Step 3 - Microphone Placement and Connection

DSS MC11 can be set up in any listening area where there is a problem with ambient noise (retail store, shopping mall, subway station, factory, restaurant, church, airport etc.)

1. FIND a position near a loudspeaker where the audio signal and background noise are representative of the listening area. This speaker becomes the 'dominant loudspeaker'. For normal ceiling speaker applications, the Mic is typically placed between 3 and 6 feet from this loudspeaker (see installation diagram in Appendix C.)

2. INSTALL the Mic facing down towards the floor, using the velcro patch provided or adhesive tape. (Do not tape over the Mic cartridge or LED.) You will require additional cable to connect the Mic in the listening area to the DSS MC11. Use ONLY SHIELDED STEREO cable with a male stereo mini headphone jack at both ends. (A mono extension cord will NOT work!)

3) BEFORE connecting the Mic to SmartSpeaker

a. TURN OFF SmartSpeaker (press the POWER switch and the LED should go off).

b. CONNECT the Mic to the SENSE Mic plug on the back panel.

c. TURN DSS MC11 back on. The SENSE LED on the front panel should glow steadily. Check that the LED on the Mic box is also on - indicating that the Mic is receiving power.

Step 3 (contd.) - Microphone Placement and Connection

If the LED on the MIC box is not on, there may be a connection problem. Switch off DSS MC11 immediately, disconnect the Mic, check the wiring and reconnect. Switch DSS MC11 back on.

Once installed, if the SENSE LED on the DSS MC11 front panel flashes rapidly and the overload LED comes on, there is an overload at the Mic. This will require a simple adjustment (please see Appendix A.)

4. TURN ON the audio signal source (the CD player, tape deck, tuner etc.) turn on the amplifier and turn on DSS MC11. Play a signal (music or speech) through the system and watch the vertical bargraph on DSS MC11. Within 30 seconds the system gain will settle to a point that reflects the ambient noise of the environment measured at the Mic and the response required by DSS MC11 to ensure optimum intelligibility of the audio signal.

5. NEXT, walk into the listening area and listen to the audio signal. How does it sound?

a. If the signal level in the listening area is not loud enough (i.e. if you want to make the audio signal LOUDER relative to the ambient noise) physically move the Mic further away from the dominant or nearest loudspeaker.

b. If the signal is louder than you want, then to make the audio signal QUIETER (relative to the ambient noise), move the Mic closer to the dominant/nearest loudspeaker.

6. Each time you move the Mic, allow 30 seconds for DSS MC11 to adapt to its new setting. You have now set the desired signal to noise ratio and SmartSpeaker DSS MC11 will maintain it for you automatically.

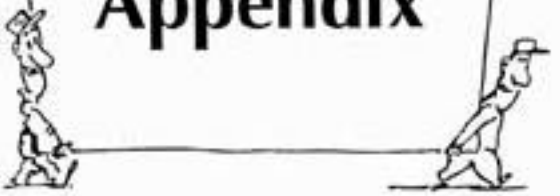
REMEMBER

1. The sense microphone  is SmartSpeaker's "ear". 

2. The mix of signal  and noise  at the sense microphone determines the adjustments  that SmartSpeaker makes.

3. Therefore, for SmartSpeaker to work properly the mix of signal  and noise  at the microphone  must be representative of what the the listener will actually hear.

Appendix



Appendix A Configuring DSS MC11

There are three parameters to configure for the optimum operation of SmartSpeaker DSS MC11:

1. Input signal

DSS MC11 can take input signals in three different ranges: +4dB, 0dB and -10dB.

The DSS MC11 unit is factory configured for a 0 dB input signal level (normally suitable for tape decks). To change this, remove the cover to expose the main circuit board. Locate the jumper JG0 on the main board and move it to JG4 to change the input to +4 dB (normally suitable for a satellite feed). For a signal level of -10 dB (normally suitable for CD player output) move the jumper to JG1.

SIG: Input signal level

MIC: Mic gain level

2. Mic gain level

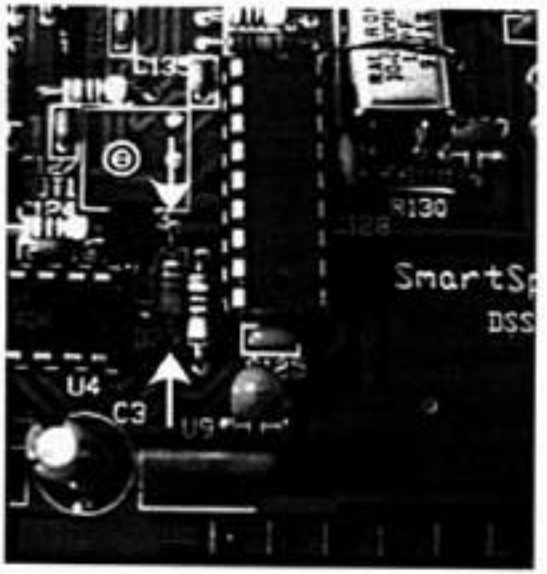
The DSS MC11 Mic is factory configured to have the Mic signal overloaded at 85 dB. If the Sense LED on the DSS MC11 front panel

(contd.)

flashes rapidly and the overload LED comes on there is an overload. This can be corrected by increasing the overload threshold from 85dB to 95dB or 105dB. To do this, carefully remove DSS MC11's cover and look for the jumper with the numbers 85, 95, and 105 next to it (approximately in the middle of the main board.) Move the jumper to the position desired and replace the cover.

3. Control range

DSS MC11 can have a control dynamic range of 12dB and 22dB. It is factory configured to 12dB. This range can be extended to 22dB by cutting the resistor to the right of diode D7 on the main circuit board (as seen from the front of the unit.)



Turn power off and open enclosure.

Cut resistor leads shown by arrows.

Clean board of debris afterwards before turning power on.

Appendix B Special Options

The Paging Option

This option adds paging capability over music to SmartSpeaker DSS MC11, extending ambient noise compensation benefits to paging inputs.

The Paging Option is a small circuit board that fits inside DSS MC11. When installed, it is able to detect if a signal is present at the PAGE input (RJ11 connector on the back panel), and if so, override the normal audio input with the paging signal. The paging circuitry also incorporates dynamic range compression to maximize intelligibility by compensating for varying voice levels.

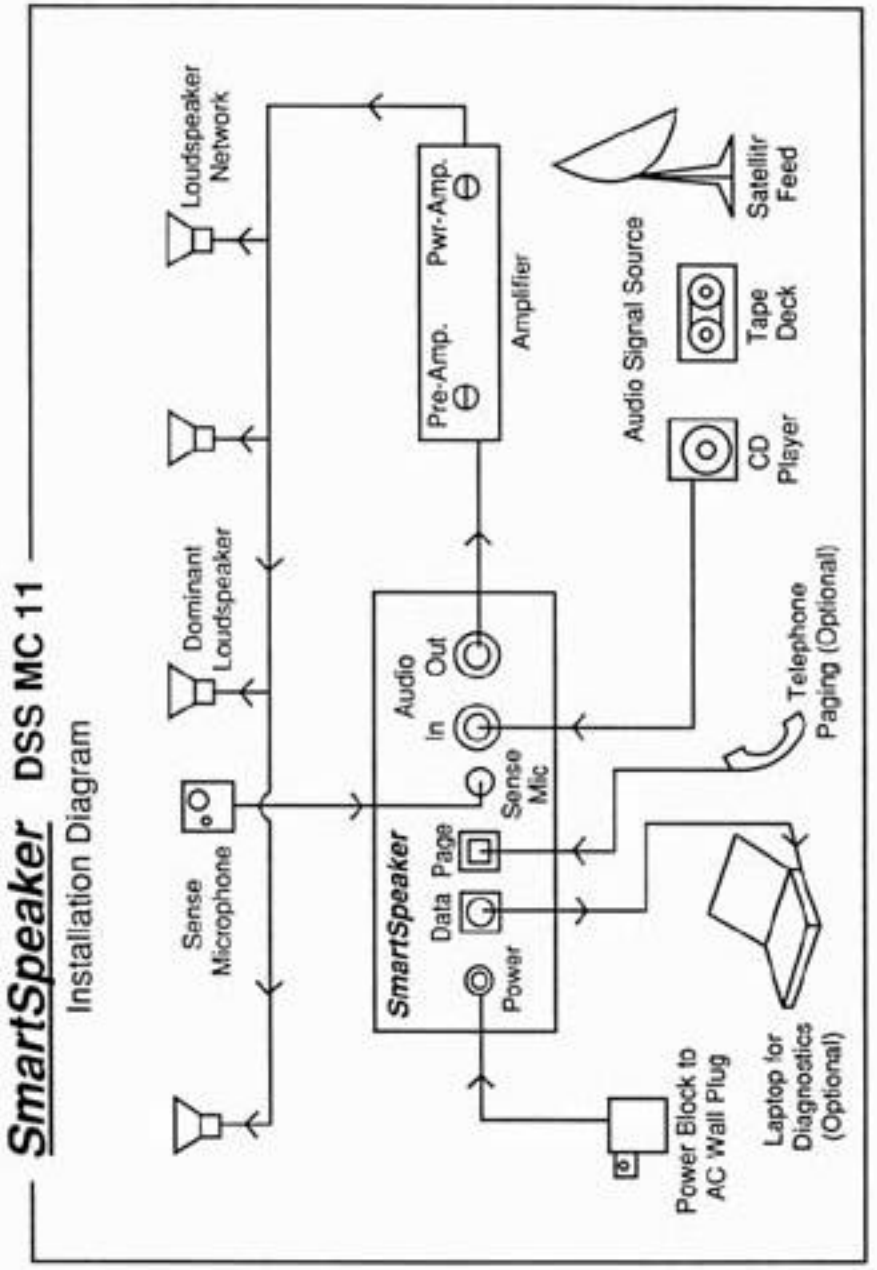
At the end of a page, DSS MC11 seamlessly switches back to the audio programme.

The Data Port

The DATA connector is a standard Mini DIN-8 serial connector. With a standard Null-Modem cable and optional DSSComm software the data port can be used to continuously download the operating parameters from DSS MC11, which can be useful in noise profile studies.

Please call your distributor or SmartSpeaker Corporation directly if you want to learn more about these options.

Appendix C Installation Diagram



Appendix D Specifications

DSS MC11 Specifications

Control dynamic range	8dB, 12dB, 22dB selectable
Signal-to-noise plus distortion ratio	better than 80 dB unweighted
Frequency Response	25 Hz - 100 kHz (+0dB/-3dB) 48Hz - 100 kHz (+0dB/-0.5dB)
Line Input - type	switchable single-ended or balanced (differential)
Line Input - impedance	≥62 kΩ single ended ≥24 kΩ differential
Line Output - type	one line, single-ended
Line Output - load impedance	>10kΩ
Line Output - level	+6 dBu maximum

Sense Microphone Specifications

Directivity	Omnidirectional
Output Impedance	Low impedance line level (amplified)
Frequency	20 - 16,000Hz
S/N Radio	More than 40dB
Outside Dimensions	Approx. 2" x 2" x 5/8" (55mm x 55mm x 15mm)
Weight	Approx. 2oz (50gms)

Appendix E Sound Level Chart

The Table below lists typical noises and their approximate decibel (dB) sound pressure levels (SPL)[1].

Sound Source	Sound Level (dB)
Jet Engine at 10m	over 140
Chain saw at 1m	100
City Traffic at 15m	70
Shopping Mall	55-75
Normal Speech at 1m	60
Suburban Residence	50
Library	40
Breathing	10
Wasp on a window pane	less than 5

Note that signals above 90 dB cause discomfort, and, if endured for sufficient time, can cause permanent hearing damage. The decibel scale is a logarithmic scale, which means that every 10 dB increase in sound level is a ten times increase in sound intensity.

1. Some of the above data are taken from *The Audio Engineering Handbook*, Ed. K. Blair Benson, McGraw Hill, 1988.