

Intercom Tuning Parameters

A strategy to adjust the Tuning parameters in Comfort to optimise the performance of the various intercom functions; Line to Keypad or Door Station, GSM Module to Keypad or Door Station, and Keypad to Door Station is presented here.

Applicable Firmware Versions

This applies to Comfort II firmware 5.145 and above with additional Tuning parameters to improve Intercom performance. Those who have older versions of Comfort firmware MUST UPGRADE their firmware to the latest version. Comfort versions before 5.100 can be upgraded in the form of MPU01-ULT, which is a plug in module containing Flash firmware which can be upgraded by Configurator download in future. Comfort firmware 5.100 or above are already Flash based so these can be upgraded by Configurator download using UCM/232, UCM/USB or UCM/Ethernet. The firmware file ULT5.xxx.CBF can be found at www.cyttech.biz/upgrades.html

Trimmer Adjustments

The hardware adjustments which were made in various trimmers on Comfort, the keypad and door stations and the DM02 door station module have been fixed and removed as they complicate the process of tuning adjustment. For older products, where the trimmers are still present on the circuit boards, the position of these trimmers shall be provided. Setting the trimmers to approximately the correct position shall be sufficient as the Intercom is adaptive in operation. The trimmers may also be locked to the correct position in the factory using locking adhesive so that they cannot be adjusted.

Comfort PCB

VR51 (KP Mic Trimmer): midpoint of the adjustment

VR53 (DP Mic Trimmer): midpoint of the adjustment

DM02

VR1 470 ohms to Ground (10K full scale) or turn clockwise fully and turn back 1/10 of the way

VR2 3.3 Kohms to Ground (10K full scale) or turn clockwise 2/3 of the way

DP03

VR1 3K to Ground (10K full scale). Turn Clockwise 2/3 of the way

DP03X

VR1 1.3K to Ground (10K full scale). Turn Clockwise 4/5 of the way

KP03/KP04

Volume Control 3K (10K full scale). Set to 1/3 of the way from the top of the adjustment

Keypad Voice Menu Volume

In Comfort firmware 5.145 onwards the volume of the Voice menu on each keypad can be set by the user using the keypad via User Menu 7 for Volume. This is introduced so that the user need not turn the volume control to get the desired volume of the voice menu and messages on the keypad. Vocabulary 28 is required for the new firmware. To access the keypad volume menu, select 7 for Volume on the User menu. The menu says "Volume , 50 enter new number 0 to 100 and # key". Enter a number where 50 is the default volume. The volume control will have an effect on the volume of all voice menu and messages on the keypad, but it will not affect the volume of the Intercom on the keypad. It should be set at a suitable level according to the recommendations here ie 1/3 of the maximum, and the software controlled volume should be used to adjust for Volume of voice menu.

Keypads and Door Stations

The most important issue in getting a good intercom performance is the acoustic isolation provided by the housings of the keypads and Door stations. This is a compromise due to the limited size of the keypads and door stations. KP03, KP04, and DP03 require special internal sponges inserted during assembly to try to limit or reduce the amount of echoes from the internal speaker to microphone. The keypads and door stations produced from June 2008 have additional sponges for this purpose to improve performance. The DS01 and DS02 metal Door Station performs very well in terms of acoustic isolation compared to KP03/KP04/DP03/DP03X. This is

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because it has a larger enclosure so allowing the microphone and speaker to be further apart, and also the microphone has a special compartment with a rubber gasket outside the main compartment containing the speaker.

Block Diagram

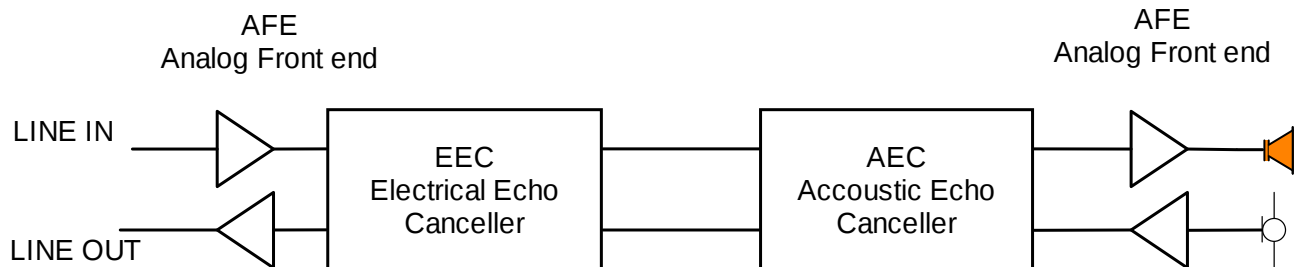


Figure 1 - EEC and AEC Block Diagram

The block diagram of the intercom system is shown above

The Echo Cancellers try to prevent echoes from the speaker on each side from going back into the microphone to cause howling. There are two echo cancellers, the Electrical Echo Canceller (EEC) which works on the telephone line side, and Acoustic Echo Canceller (AEC) which works on the Keypad or Door Station side. These two blocks work independently based on their tuning parameters.

The Analog Front Ends on the Telephone line and Keypad/door station side are gain blocks with software adjustable gains as part of the tuning parameters.

The following sections discuss the tuning parameters as applied to the configurations

- Line to Keypad/Door Station
- UCM/GSM to Keypad/Door Station
- Keypad to Door Station
- Answering Machine/Dialout or Voice/Dialing Module

The default set of parameters in Configurator Configuration > Tuning Parameters has been optimised for most system connections. Note that each installation may have differences in performance because of the distance of the site from the telephone exchange, hence attenuation and delay to voice signals on the telephone line, the sensitivity and volume of telephone handsets used in remote and local intercom, and distance and type of cables used in the MIC and voice cables to the keypads and Door stations. Mobile phone networks also sometimes have large delays which make it more difficult to achieve an ideal intercom performance. Some installers compare Comfort intercom with normal local intercoms and ask why these do not need any adjustments. If they think deeper they will realise that normal intercoms do not connect with the telephone line and are not subject to the delays inherent in the telephone or mobile network connection. Furthermore they supply their own handsets which have a fixed characteristic and are not able to use any telephone in the home. Comfort is an entirely different proposition which may need some effort to achieve a good result.

Tuning Parameters in Configurator

If the Tuning Parameter in the ccl file is set to value 255, it is a place holder for the built-in default value in Comfort firmware. Comfort firmware 5.122 and older should have tuning parameters with certain values set to 255 as programmed in the various .cct default templates. If the values of these parameters are not 255 it may cause the voice to be lost until the default 255 values of the parameters are downloaded. To use this tuning guide, the Comfort firmware should be upgraded to 5.145 or later.

The file newtuning.cct in the Configurator/config folder has the default tuning parameters which have been optimised to work with Comfort. Configurator 3.1.8 and above will have these tuning parameters in the default templates, but if you have an older cclx file, you should load the new tuning parameters from newtuning.cctx Do Selective write to Comfort of the tuning parameters, or do a File > Import of Tuning parameters from the newtuning.cctx file into your working cclx file.

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Tuning Strategy

This document contains more information than most people need. It is not necessary to read and understand the whole document, but it is a resource which is available if needed.

The basic strategy is to use the default parameters, and test the performance of the following connections

1. Remote Phone to Door Station (DP03. DP03X, DS01,DS02)
2. Keypad to Door Station (DP03. DP03X, DS01, DS02)
3. Remote Phone to Door Station (DP03. DP03X, DS01, DS02) via UCM/GSM (if applicable)
4. Local Phone to Keypad or Door station (DP03. DP03X, DS01, DS02)

Local phone to KP/DP will have the best volume followed by Phone to KP/DP and Keypad to Door station will have lower achievable volumes.

Two people are needed to do this test, one on each end of the intercom.

During the intercom mode, if the volume of voice on both sides is acceptable, then leave the Tuning Parameters unchanged. If not acceptable, the parameters to adjust should be the AFE In parameters in the EEC and AEC blocks. These are;

Local Phone to KP/DP (Figure 2 and 3)

Local Phone AFE IN (Parameter 83) Range = 00 (min) 20 (max). Default 4

Local Phone AFE Out (Parameter 84) Range = 0 (max) to 4 (min) Default 4

KP/DP Mic AFE IN (Parameter 85) Range = 00 (min) 20 (max). Default 7

KP/DP Speaker AFE Out (Parameter 86). Range = 0 (max) to 4 (min) Default 2

Remote Phone to KP/DP (Figure 2 and 3)

Remote Phone AFE IN (Parameter 87) Range = 00 (min) 20 (max). Default 13

Remote Phone AFE Out (Parameter 76) Range = 0 (max) to 4 (min) Default 2

KP/DP Mic AFE IN (Parameter 85) Range = 00 (min) 20 (max). Default 7

KP/DP Speaker AFE Out (Parameter 86). Range = 0 (max) to 4 (min) Default 2

Remote Phone via UCM/GSM to KP/DP (Figure 2 and 3)

GSM AFE IN (Parameter 52) Range = 00 (min) 20 (max). Default 9

GSM AFE Out (Parameter 78) Range = 0 (max) to 4 (min) Default 4

KP/DP Mic AFE IN (Parameter 85) Range = 00 (min) 20 (max). Default 7

KP/DP Speaker AFE Out (Parameter 86). Range = 0 (max) to 4 (min) Default 2

Keypad to Door Station (Figure 4 and 5)

KP Mic AFE IN (Parameter 79) Range = 00 (min) 20 (max). Default 8

KP Speaker AFE Out (Parameter 80). Range = 0 (max) to 4 (min) Default 3

DP Mic AFE IN (Parameter 81) Range = 00 (min) 20 (max). Default 3

DP Speaker AFE Out (Parameter 82). Range = 0 (max) to 4 (min) Default 1

True Full duplex

True Full duplex for Phone to KP/DP is parameter 43 (1 for ON, 0 for OFF)

True Full duplex for KP to DP is parameter 44 (1 for ON, 0 for OFF)

It is recommended to set these two parameters to 1.

AFE IN is the gain of the input path from the microphone side. AFE Out is the gain of the output path to the speaker side. The main means of adjustment should be the AFE IN parameter, rather than the AFE Out, as the latter is a much coarser control (0 to 4) than the former (0 to 20).

Note that for Local phone, Remote phone to Keypad or Door station intercom, the KP/DP AFE In (Mic) gain and KP/DP AFE Out (Speaker) Gain are the same parameters for all 3 intercom paths.

However for the Phone side of the intercom, each of the Local Phone, Remote Phone and Remote Phone by GSM have individual AFE IN and AFE Out parameters.

This means that the KP/DP AFE In and AFE Out parameters should be set using Remote Phone to KP/DP Intercom or Remote Phone by GSM to KP/DP Intercom, before testing Local Phone to KP/DP which is easier to adjust as there are few delays and echoes in that path.

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For Keypad to Door station intercom, all 4 parameters are dedicated, so can be tuned independently from the Phone to KP/DP intercom.

The above defaults will work adequately in most situations. However due to different lengths and types of cable and telephone network performance, the following problems may be encountered;

1. Howling due to positive feedback
2. Volume suddenly increases and decreases
3. Volume too soft in one direction of the intercom

Howling due to positive feedback is due to too high gain on one or both directions of the Intercom path, or the two ends are very physically too close to each other so that for example the Door station speaker sound can be heard by the keypad microphone. The solution is to reduce the AFE IN gain on one or both the directions until howling is not heard.

Volume suddenly increases and decreases. This is also due to the same reason as howling, i.e. too high gain on one or both directions. The system tries to reduce howling by decreasing the volume of one direction of the intercom depending on which side is louder, hence producing this effect. This may also be due to the True Fullduplex parameter not set to 1.

Volume too soft in one direction of the intercom. This can be improved by increasing the AFE IN gain of the direction which is too soft. It may also be necessary to reduce the AFE IN gain of the other direction in order to maintain an adequate loop gain.

Do not try to increase the volume of any one side beyond what is comfortably audible because the system will try to compensate by reducing the volume of the other direction resulting in insufficient volume.

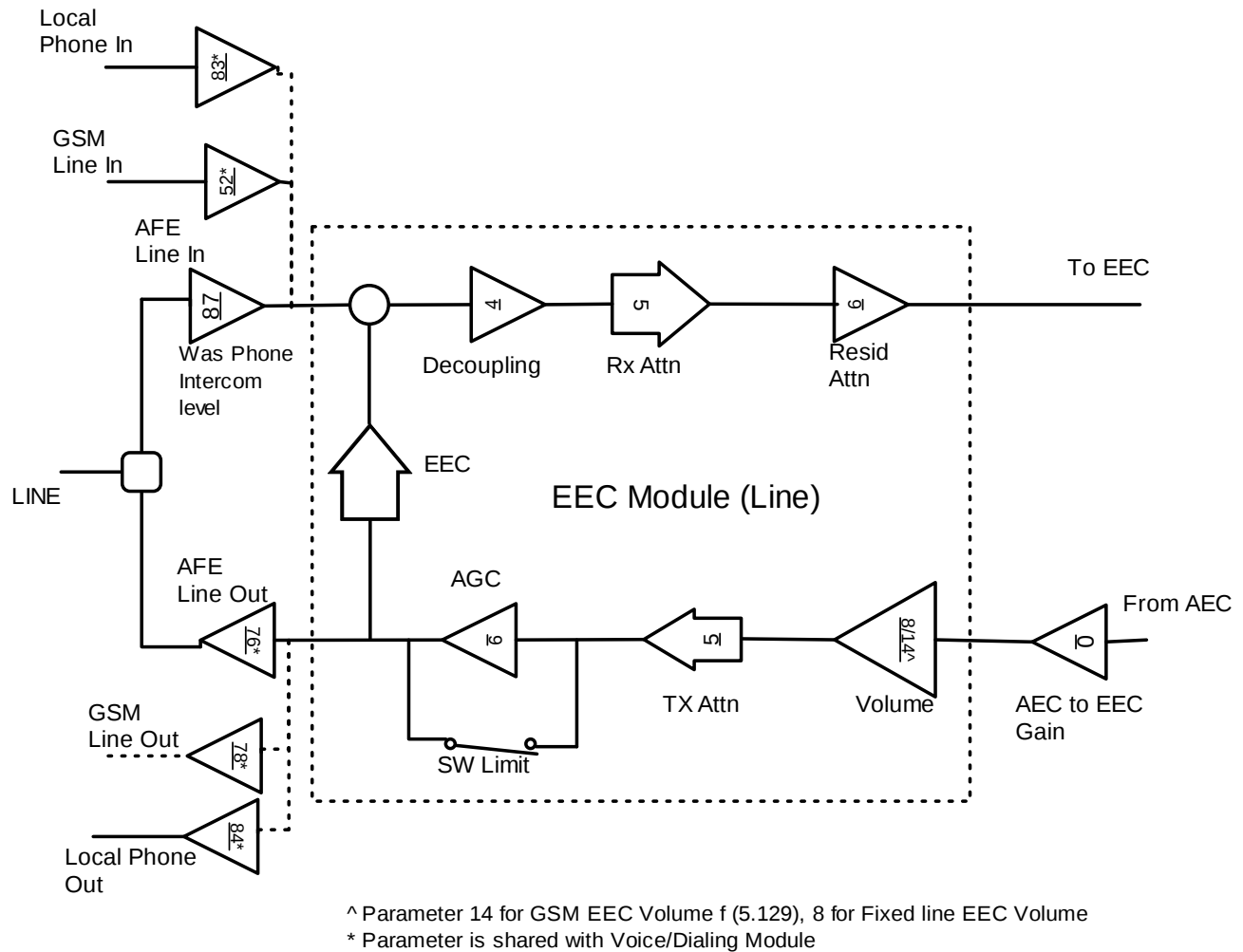
The loudness of the conversation that can be achieved depends on the acoustic isolation achieved by the Door station and keypad housings. The better the acoustic isolation preventing echoes from the speaker from reaching the microphone in the housing, the louder the volume which can be achieved without causing howling. This is why the DS01/DS02 which has better acoustic isolation compared to the KP03/KP04/DP03 will be able to support better volume of intercom conversation. The Local Phone to KP/DP intercom can achieve better volume than Remote Phone to KP/DP intercom because the local phone has less delays and echoes compared to the remote phone which can be many kilometers away.

These are the important parameters to be adjusted if necessary. The other intercom parameters should not be changed in most situations.

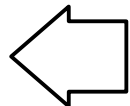
Technical Reference - Tuning Parameters

This section is a technical reference for a deeper understanding of the Tuning parameters and is not normally necessary for getting a good working performance from the Intercom system

Line to KP/DP Intercom



Number is Tune Parameter index



This means gain parameter that is automatically set by DSP during Intercom convergence

AFE = Analog Front End

Figure 2 - EEC Block Diagram for Line to KP/DP Intercom

The numbers within the triangles are the appropriate Tune Parameter numbers for the gain block.

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On the EEC external side, the connection is either to the Telephone Line, the UCM/GSM or Local Phone depending on the mode initiated by the user.

EEC (Electrical Echo Cancellation Module) for Line to KP/DP Interface

The above diagram describes the EEC Module for Line to KP/DP intercom. The parameters are described below;

AFE Line In Gain - Line IN (87), GSM (52), Local Phone In (83)

The AFE (Analog Front End) Line In Gain is the gain from the Line IN to the EEC module ranging from 00 = -4 dB to 20 = 36 dB.

For the EEC Module there are 3 independent settings for this parameter; for Remote Line, Local Phone, and GSM Line In corresponding to how the incoming line is connected.

Note that the Remote Line In Gain was "Phone Intercom Voice Level" in Configurator Voice Settings, but it has been changed to Tuning Parameter 87 in firmware 5.126 and above, because AFE parameters should not normally be changed for tuning intercom.

Line In Gain (87) is only for remote phone to KP/DP and not for Voice/Dialing module (which uses the Record Level Slider in Voice Settings). Hence this can be changed without affecting the recording level and DTMF detection.

GSM Line In Gain (52) is common to the Voice/Dialing module so may affect DTMF detection and recording.

Local Phone In Gain (83) is common to the Voice/Dialing Module. This may also affect DTMF detection!

AFE Gain changes require Reset.

These values should not be adjusted in general unless there is a problem with DTMF Detection on Local or remote phones or in CMS Dialout generation of digital tones.

AFE Line Out Gain - Line Out (76), GSM (78), Local Phone Out (84)

The AFE Line Out Gain is the gain from the EEC Module to Line Out ranging from 00 = 0 dB to 4 = -24 dB. There are 3 independent settings for this parameter, for Remote Line, Local Phone, and GSM Line Out corresponding to how the telephone line is connected.

Remote Line OUT Gain (76) is common to the Voice Processor so it may affect telephone voice volume and dialing out. It should be fixed

GSM Line out is common to Voice/Dialing so it may affect telephone voice volume and dialing out. It should be fixed

Local Line Out Gain is common to Voice/Dialing so it may affect local telephone voice volume

AFE Gain changes require Reset

AEC to EEC Gain (0)

This is the inter module gain from AEC Module from 00 = +20dB to 41 = -20 dB. This is common to KP to DP Intercom.

EEC Volume - Fixed Line (8/14)

This is the volume of the voice to Line Out for Fixed Line Intercom to KP/DP ranging from 00 = +20 dB to 40 = -20 dB, 41 = Mute. This is the main parameter that should be used for adjustment to optimise the intercom. This is independent of the EEC Volume for KP to DP intercom.

Parameter 8 applies for Line to KP/DP Intercom while Parameter 14 is for GSM to KP/DP Intercom, i.e. when a phone connects via the UCM/GSM Module to go into Intercom mode.

EEC Volume - GSM (14)

This is the volume of the voice to Line Out for GSM intercom to KP/DP ranging from 00 = +20 dB to 40 = -20 dB, 41 = Mute. This is the main parameter that should be used for adjustment to optimise the intercom. This is independent of the EEC Volume for KP to DP intercom or Parameter 8.

EEC

This cancels the LINE OUT signal at the LINE IN path in the opposite sign to the LINE out Volume.

EEC Decoupling (4)

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This adds attenuation (or gain) to the echo at the LINE IN Path temporarily while the LINE OUT path is dominant (i.e. louder) and the learning is not completed. The compensator is deactivated when the echo Canceller is trained. The value ranges from 00 = 0 dB to 20 (-20 dB). Increase this value when the echo level is high e.g. for mobile phone intercom. Increase the parameter to introduce a greater attenuation. This is common to the EEC Decoupling parameter for Kp to DP Intercom.

EEC TX and RX Attenuation / Target Loop Attenuation (5)

When starting intercom mode, the echo cancellers are not trained. The loop attenuation is set to +12 dB more than the Target loop attenuation. Loop attenuation is the sum of gains on the EEC (or AEC) block including the echo gain. A gain of less than 0 dB is necessary to prevent howling. The Target Loop attenuation (Parameter 5) ranges from 0 = 0 dB to 7 = 27 dB. Hence if Target Loop attenuation is - 8 dB, the initial loop attenuation is -20 dB, which is reduced to the target when the echo cancellers are trained. If the DSP is unable to provide sufficient echo cancellation it will introduce an additional attenuation of 4 to 8 dB to prevent howling and reduce this as a function of convergence and time.

If actual Loop attenuation is more than 0 dB (ie howling occurs) the DSP dynamically distributes the additional loop attenuation rapidly between RX and TX attenuation depending on which side is speaking, providing natural uninterrupted conversation.

This parameter is common to EEC Module for KP to DP intercom.

Volume should be changed using the Tuning parameters only and not via any external amplification.

EEC Residual Attenuation (6)

This introduces an attenuation at the Line IN path to the other module, values from 00 = 0 dB to 15 = -30 dB. It should make it easier to achieve Target loop attenuation at a lower resulting volume to the AEC Module.

This is common to the EEC Module for KP to DP intercom.

EEC AGC/Limiter (9)

If the parameter is set to AGC (value = 192) , the signal from the other module (AEC or EEC) will be adjusted depending on the level, so as to equalise the incoming signal level. The AGC parameters are not available for adjustment at this time.

If AGC is disabled (value = 64), then a Software Limited is used to limit the signal level. This limiter level is not adjustable at present. AGC can be independently enabled for each module EEC or AEC.

EEC RT (2) and TR (3) ratios

These ratios provide hysteresis in deciding which side is speaking, internal (AEC) or external (line).

EEC Vox Sensitivity (7)

This is the sensitivity to the Mic and Line IN levels to determine that the side is speaking, related to the RT and TR Ratios. These should not be adjusted Common to EEC module for KP to DP Intercom.

True Full duplex Phone to KP/DP (Parameter 43) and KP to DP (Parameter 44)

In full duplex mode both sides are able to talk at the same time, whereas in half duplex mode, only one side the dominant side can talk at any time, while the other side is muted. Full Duplex requires very good acoustic coupling between the speaker and microphone in the keypad and door station, i.e. the sound from the speaker should be prevented as much as possible from being picked up by the microphone. And if acoustic coupling is not good, the DSP tries to reduce the gains of the microphone and speaker until howling is eliminated, but if it fails then howling may occur. The result is that volume is low on one or both sides.

True Full duplex mode can be selected in the tuning parameters 43 for Phone Intercom to keypad or door station and 44 for Keypad to Door station intercom.

If True fullduplex mode is not selected, a modified full duplex mode or Quasi fullduplex mode is applied where the non-dominant side (ie the side which less loud) is attenuated by having a lower volume (Parameter 11, Halfduplex Idle Speaker volume). The dominant side operates at the normal volume parameter. The dominant side is determined by the DSP algorithm, and control is switched rapidly between sides according to which side is talking louder so as to appear natural. The parameters RT and TR ratios provide hysteresis to the switching so as to prevent unnecessary switching when only one side is talking (can be heard as rapid intervals of silence and speech when one side is talking).

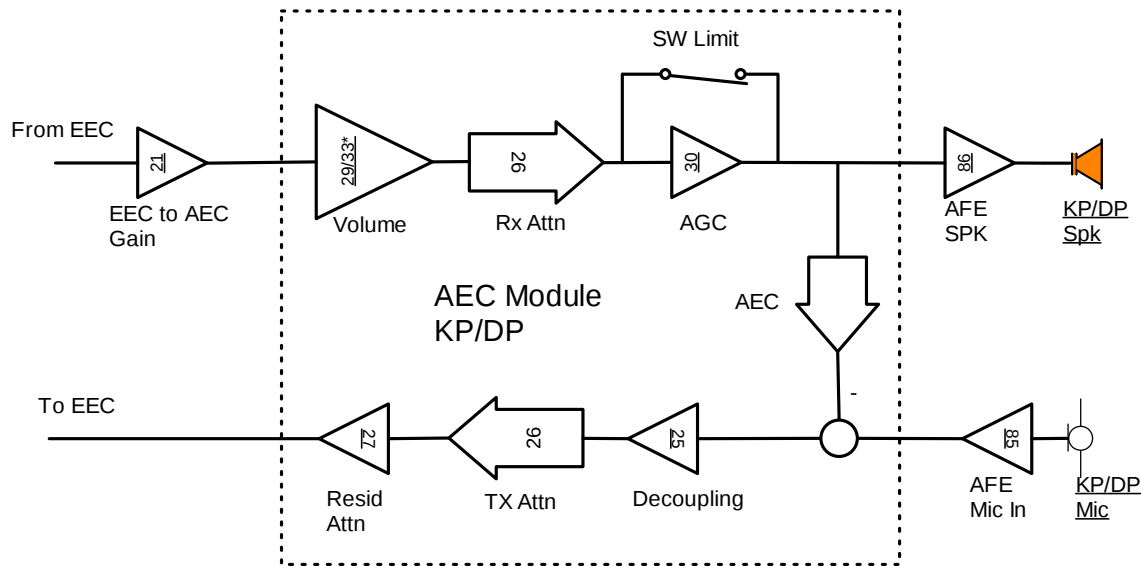
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True Full duplex is not selected as default. The possibility of using full duplex depends on the keypad or door station enclosure and the length of wiring from keypad or door station to Comfort. If the DS01 which has a separate microphone enclosure is used, the True full duplex setting can be tested.

Halfduplex Idle Speaker Volume (Parameter 11)

This parameter is when True Full Duplex is NOT selected, and is the volume setting for the inactive side or non dominant side or the side that is not speaking. This allows the volume of each side to be changed depending on which side is speaking so the value should be lower than the other volumes. The firmware is attempting to attenuate the non-dominant side to help the DSP.

AEC (Acoustic Echo Cancellation Module for Line to KP/DP Intercom)



* Parameter 29 for Fixed Line AEC Volume, 33 for GSM AEC Volume

Figure 3 - AEC Block Diagram for Line to KP/DP Intercom

The above diagram shows the AEC Module for Line to KP/DP Intercom.

The meaning of the parameters is similar to what was described above for the EEC Module. The differences are described below;

AFE KP Mic In Gain (85)

The AFE (Analog Front End) Line In Gain is the gain from the Line IN to the AEC module ranging from 00 = -4 dB to 20 = 36 dB (HW manual 109/151).

This parameter is independent of the KP Mic Gain for recording (51).

AFE Gain changes require Reset.

AFE KP SPK Out Gain (86)

The AFE SPK Out Gain is the gain from the EEC Module to KP/DP Speaker ranging from 00 = 0 dB to 4 = -24 dB. AEC to EEC Gain.

AFE Gain changes require Reset.

EEC to AEC Gain (21)

This is the inter module gain from EEC Module from 00 = +20dB to 41 = -20 dB.

This is common to that for KP to DP Intercom.

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AEC Volume Fixed Line (29)

This is the volume of the voice to AEC KP/DP Spk Out for Fixed Line Intercom to KP/DP ranging from 00 = +20 dB to 40 = -20 dB, 41 = Mute. This is the main parameter that should be used for adjustment to optimise the intercom.

This is independent of the AEC Volume for KP to DP Intercom (22).

AEC Volume GSM (33)

This is the volume of the voice to AEC KP/DP Spk Out for GSM Intercom to KP/DP ranging from 00 = +20 dB to 40 = -20 dB, 41 = Mute. This is the main parameter that should be used for adjustment to optimise the intercom. This is independent of the AEC Volume for KP to DP Intercom (22). This is a new parameter for 5.129 to allow GSM Intercom independent adjustment.

AEC Decoupling (25)

This adds attenuation (or gain) to the echo at the MIC IN Path temporarily while the SPK OUT path is dominant (i.e. louder) and the learning is not completed. The compensator is deactivated when the echo Canceller is trained. The value ranges from 00 = 0 dB to 20 (-20 dB). Increase this value when the echo level is high e.g. for mobile phone intercom. Increase the parameter to introduce a greater attenuation. This is common to the AEC Decoupling parameter for KP to DP Intercom.

AEC TX and RX Attenuation / Target Loop Attenuation (26)

See EEC Module for details. This is common to the AEC module for KP to DP Intercom.

AEC Residual Attenuation (27)

This introduces an attenuation at the MIC IN path to the other module, values from 00 = 0 dB to 15 = -30 dB. It should make it easier to achieve Target loop attenuation at a lower resulting volume to the EEC Module. This is common to the AEC Module for KP to DP intercom.

AEC AGC/Limiter (30)

Similar to EEC AGC Module. This parameter is common to the KP to DP Intercom mode.

AEC RT (23) and TR (24) ratios

These ratios provide hysteresis in deciding which side is speaking, internal (EEC) or external KP/DP Mic.

AEC Vox Sensitivity (28)

Similar to EEC mode, this parameter is common to AEC module for KP to DP intercom.

Keypad to Door Station Intercom

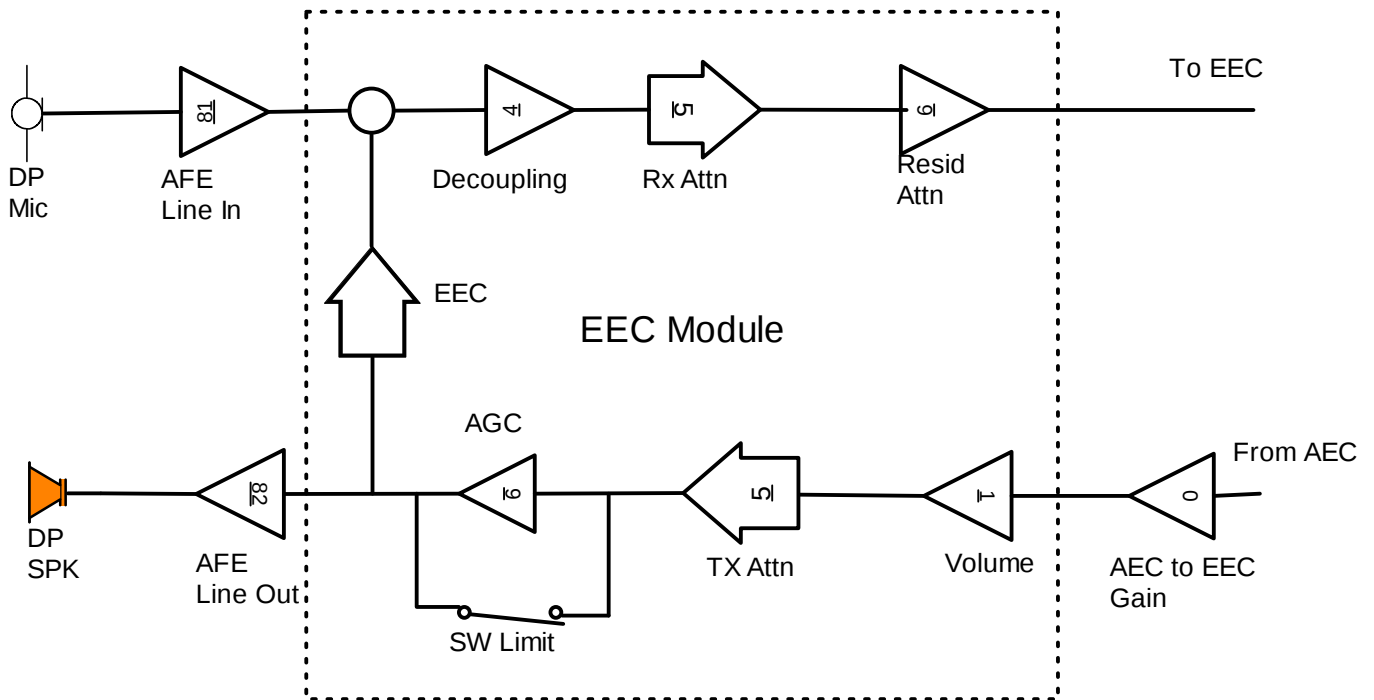


Figure 4 - EEC Block Diagram for KP to DP Intercom

EEC Module for Keypad to Door Station Intercom

For KP to DP Intercom, the Door station is connected to the EEC rather than the telephone line. The parameters are similar to the EEC module for Phone to KP/DP intercom except what is described below;

AFE DP Mic In Gain (81)

The AFE (Analog Front End) Line In Gain is the gain from the DP Mic IN to the AEC module ranging from 00 = -4 dB to 20 = 36 dB (HW manual 109/151). This is a different Tune parameter from the Line In AFE gain. This parameter is independent of other AFE gains.

AFE Gain changes require Reset.

AFE DP SPK Out Gain (82)

The AFE DP SPK Out Gain is the gain from the EEC Module to DP Speaker ranging from 00 = 0 dB to 4 = -24 dB. AEC to EEC Gain.

This is the inter module gain from AEC Module from 00 = +20dB to 41 = -20 dB. This is a different Tune parameter from the Line Out AFE gain.

This parameter is independent of other AFE gains.

AFE Gain changes require Reset.

EEC DP Volume (1)

This is the volume of the voice to AEC DP Spk Out ranging from 00 = +20 dB to 40 = -20 dB, 41 = Mute. This is the main parameter that should be used for adjustment to optimise the intercom.

This is independent of other volumes.

EEC RT (12) and TR (13) ratios

These ratios provide hysteresis in deciding which side is speaking, internal (AEC) or external DP Mic.

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AEC Module for KP to DP Intercom

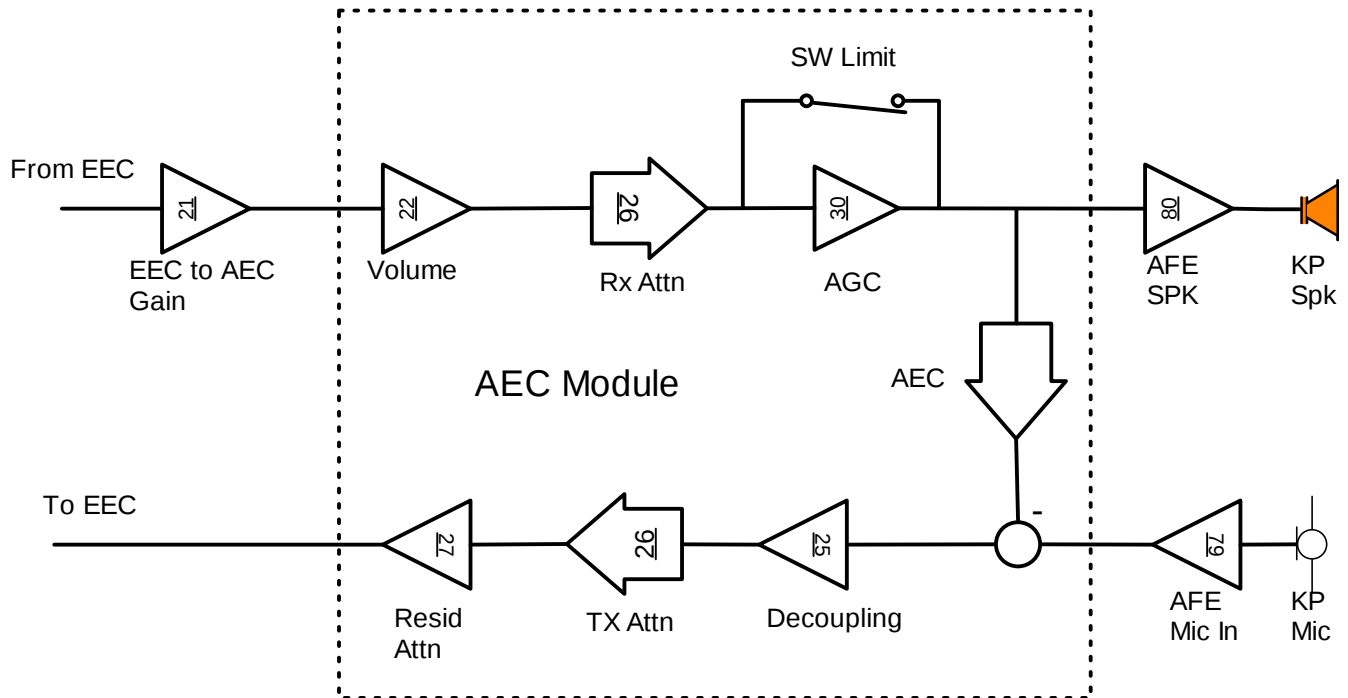


Figure 5 - AEC Block Diagram for KP to DP Intercom

The parameters are similar to the Phone to KP Intercom except for the following

AEC KP Mic In Gain (79)

The AFE (Analog Front End) Line In Gain is the gain from the Line IN to the AEC module ranging from 00 = -4 dB to 20 = 36 dB (HW manual 109/151). This is different from the Line to KP/DP parameter to allow independent settings for each.

AEC Gain changes require Reset.

AEC KP SPK Out Gain (80)

The AFE SPK Out Gain is the gain from the EEC Module to KP/DP Speaker ranging from 00 = 0 dB to 4 = -24 dB. AEC to EEC Gain.

This is the inter module gain from AEC Module from 00 = +20dB to 41 = -20 dB. This is different from the Line to KP/DP parameter to allow independent settings.

AEC Gain changes require Reset.

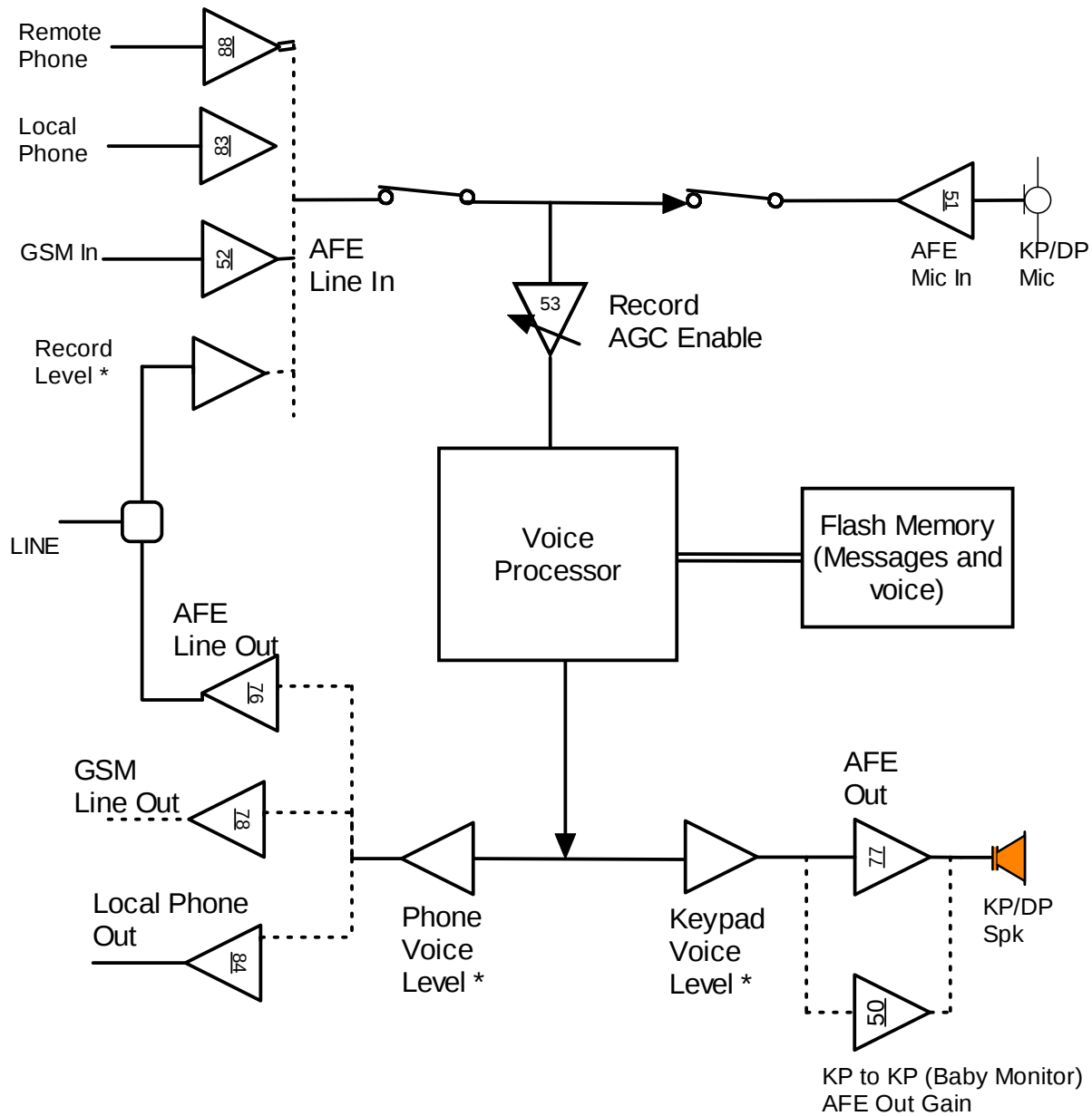
AEC KP Volume (22)

This is the volume of the voice to AEC Spk Out to KP ranging from 00 = +20 dB to 40 = -20 dB, 41 = Mute. This is the main parameter that should be used for adjustment to optimise the intercom. This is different from the Line to KP/DP parameter to allow independent settings.

AEC RT (23) and TR (24) ratios

These ratios provide hysteresis in deciding which side is speaking, internal (EEC) or external KP Mic.

Voice/Dialing Module



Number is Tune Parameter index

AFE = Analog Front End

"Record Level", "Keypad Voice Level" and
"Phone Voice Level" are on Voice Settings Sliders

Figure 6 - Voice/Dialing Module

The above block diagram shows the operation of the Voice/Dialing module which announces sentences and words, records and plays messages and dials out and detects voice and DTMF tones.

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AFE Line In Gain

The AFE (Analog Front End) Line In Gain is the gain from the Line IN to the DSP module ranging from 00 = -4 dB to 20 = 36 dB (HW manual 109/151).

There are 4 settings for this parameter; for Remote Phone (88), Local Phone (83), GSM Line In (52) and RECORD level corresponding to how the incoming line is connected.

The RECORD LEVEL is the "Record Level" Slider on Voice Settings and applies only when doing remote phone recording.

Local Phone applies when connected by local phone.

AFE IN Remote applies when connected when dialing in or dialing out and is independent of Record level from 5.142 firmware.

GSM IN applies when connected via UCM/GSM.

AFE Gain changes require Reset.

AFE Line Out Gain

The AFE Line Out Gain is the gain from the DSP Module to Line Out ranging from 00 = 0 dB to 4 = -24 dB. There are 3 independent settings for this parameter, for Remote Line (76), Local Phone (84), and GSM Line Out (78) corresponding to how the telephone line is connected.

AFE Gain changes require Reset.

AFE Mic In Gain (51)

The AFE (Analog Front End) Line In Gain is the gain from the Line IN to the DSP module ranging from 00 = -4 dB to 20 = 36 dB (HW manual 109/151). This applies to KP to KP intercom modes ie F8 and Baby Monitor (user menu 5).

AFE Gain changes require Reset.

AFE SPK Out Gain (77)

The AFE SPK Out Gain is the gain from the EEC Module to KP/DP Speaker ranging from 00 = 0 dB to 4 = -24 dB. AEC to EEC Gain.

AFE Gain changes require Reset.

AFE SPK OUT Gain for KP to KP Intercom for Baby Monitor (50) - V5.141

This parameter determines the Speaker gain in Keypad to Keypad Intercom mode, i.e. Baby Monitor (KP User Menu 5) or F8 Intercom to keypads. The Keypad to Keypad intercom mode, is not a duplex mode, as only one side can talk at a time so there is no echo cancellation. High gains for the speaker are possible without getting howling or feedback. The AFE MIC IN Gain applies also in KP to KP intercom mode.

Phone Voice Level

This is the volume control for the voice to line Out. It is the "Phone Voice Level" slider on Voice Settings. Note that volume is NOT Applicable to the Intercom Modes.

Keypad Voice Level

This is the volume control for the voice to KP Speaker Out. It is the "Keypad Voice Level" slider on Voice Settings. Note that volume is NOT Applicable to the Intercom Modes.

In Firmware 5.126, each keypad has an independent Volume applicable for voice menus and playback of message. KP User Menu 7 to hear the current voice level and set a new level ranging from 0 to 100. A value of 50 corresponds to Keypad volume level of 80. If there is no value entered, then the "Keypad Voice Level" setting is used as a default for the keypad. The Keypad Voice Level also applies to broadcast announcements to the keypads which overrides the individual keypad volume levels.

Record Level (V5.142)

This is the AFE IN gain only when doing remote recording on the telephone line (NOT local phone). This is independent from AFE LINE IN gain. In practice the Record Level slider does not make much difference to the recorded voice level.

Intercom Tuning Parameters

AGC

The AGC tries to equalise the speech levels at the recording input so that low level signals are amplified and high level signals are attenuated. This is useful for remote phone recording where the voice levels may depend on distance from the exchange and connections.

AGC for Record Mode

The AGC parameters are for recording only. These technical details are for reference only. These parameters should not be changed

AGC Enable

Location 109

0 = NO AGC

1 = AGC enabled

Parameter	Default	Min	Max.
AGC Enable	Enabled	0 = disabled	>0 = enabled
Attack Slope	0x7098	0x2000	0x7fff
Decay Slope	0x8020	0x8001	0xaf00
Optimum Level	0x1388	0x100	0x1fff
Max. Gain	0x11	0	0x11
Noise Suppression Hold Time	0x1f4	0	0xffff
Noise Suppression Attack Time	0x7d0	1	0xffff
Noise Suppression Attack Slope	0xffbe	0x800	0xffff
Noise Suppression Decay Slope	0x47d0	0x4100	0xffff
Energy Vox Level	0x7d0	0	0x2000
AGC Gain G1	0	0	0x11
Vox Sensitivity	0x2000	0	0x7fff

Each parameter is stored in two consecutive locations, with the least significant byte followed by the most significant byte. If the value in the EEPROM locations is not valid, i.e. less than minimum or greater than maximum, then the default value is used.

Attack Slope (28824)

This is the max slope dB/ms for increasing gain 0 to 7FFF. Calculation is $[4 * 20 \text{ LOG } (X/32768)]$. Max. 7FFF is 0 dB/ms i.e. no slope, min 0 is - infinity i.e. large slope. This is the max attenuation rate of change applied to an increasing signal level.

Decay Slope (32780)

This is the max slope dB/ms for decreasing gain values 8001H to AF00. Calculation is $[4 * 20 \text{ LOG } (X/32768)]$. The min value 8001H is a small +ve slope, while max AF00 is 10.87 dB/ms. It is the limit of increasing gain applied to a decreasing signal level. Too high a level will result in "breathing" noise in the gaps between words. Use small values to reduce this effect. It should be kept below 32800.

Optimum Level (7000)

This is the optimum level in samples max 32768 that the AGC will try to achieve. Range 256 to 8191. A higher value will mean louder volume on playback.

Max. Gain (10)

This is the maximum gain that the AGC will use to increase low level signals. Too high a value may result in noise being amplified when there is no voice being recorded Range 0 to 17 (34 dB).

NS Hold Time (2000)

Intercom Tuning Parameters

This may be the time in milliseconds that the AGC will hold after the attack before the decay part Range 0 to FFFF i.e. 65.536 seconds, default is 500 ms. Set to 2000 ms reduces the noise when there is a gap between words.

NS Attack Time (2000)

This may be is the time in milliseconds that the AGC will allow before the gain is reduced Range 0 to FFFF i.e. 65.536 seconds, default is 500 ms.

NS Attack Slope (65470)

$4 * 20 \text{ LOG } 10 (X/65536)$ dB/ms. Range 0x800 to 0xFFFF. The value in dB/ms is always -ve with max value = 0.

NS Decay Slope (18384)

$4 * 20 \text{ LOG } 10 (X/16384)$ dB/ms. Range 0x4100 to 0xFFFF. Min 0x4100 = 0.5 dB/ms, max = 48 dB/ms. The value in dB/ms is always +ve with min value = 0.5dB/ms.

Energy Vox Level (2000)

This is believed to be the energy level of white noise, which is not amplified by the AGC.

AGC Gain G1 (0)

This is the initial gain of the AGC, set to 0.

Vox Sensitivity (8192)

NOTE: AGC parameters must be FFFF (blank) for Firmware < 5.145, otherwise Voice is lost.

Intercom Tuning Parameters

EEPROM (U4) Programmable Parameters

Locations from Firmware 5.129 (May 2008)

Name	Loc	No	Range	Default	
VOICE SETTINGS					
Keypad Volume (NOT AFE) No Reset	54				
Record Compression	1,704		Was 99		
Message Playback Speed No Reset	1,705		Was 100	3	
Line Volume (NOT AFE) No Reset	1,706		Was 102		
"Record Level" AFE Line In Gain (remote)	1,699		Was 106	3	
AFE LGC Line In Gain remote phone for Full Duplex Intercom to KP/DP Replaced by param 87 29/3/08	1,700		Was 143		
Voice Menu Speed	1,698			3	
EEC Parameters					
AEC to EEC Gain	56	0	41 to 0	16	
DP SPKR Volume for KP to DP intercom	57	1	41 to 0	30	
EEC R/T Ratio (Line to KP/DP)	58	2	0 to 10	5	
EEC T/R Ratio (Line to KP/DP)	59	3	0 to 10	7	
EEC Decoupling	60	4	20 to 0	0	
Target Loop Attenuation Rx/Tx	61	5	0 to 7	2	
EEC Residual Attenuation	62	6	7 to 0	0	
EEC Vox Sensitivity	63	7	0 to 7	3	
EEC Volume Out (KP/DP to Fixed Line)	64	8	41 to 0	8	
EEC Intercom AGC	65	9	64 /192	192	
Dial Tone Threshold	66	10	3 to 0	1	
Halfduplex Mute Speaker Volume	67	11	41 to 0	35	
EEC RT ratio for KP to DP Intercom	68	12	0 to 10	5	
EEC TR Ratio for KP to DP Intercom	69	13	0 to 10	7	
EEC Volume Out (KP/DP to GSM)	70	14	41 to 0	8	
AEC Parameters					
EEC to AEC Gain	77	21	41 to 0	20	
AEC KP Volume for DP to KP Intercom	78	22	41 to 0	17	
AEC R/T Ratio (Line to KP/DP and KP to DP)	79	23	0 to 10	6	
AEC T/R Ratio (Line to KP/DP and KP to DP)	80	24	0 to 10	7	
AEC Decoupling	81	25	20 to 0	0	
AEC Target Loop Attenuation Rx/Tx	82	26	0 to 7	2	
Residual Attenuation	83	27	7 to 0	0	
Vox Sensitivity	84	28	0 to 7	3	
AEC Volume Out Fixed Line to KP/DP	85	29	41 to 0	28	
AEC Intercom AGC	86	30	64/192	192	
AEC RT ratio for KP/DP Intercom NOT USED	87	31	0 to 10	6	
AEC TR ratio for KP/DP Intercom NOT USED	88	32	0 to 10	7	
AEC Volume Out GSM to KP/DP	89	33	41 to 0	28	
DTMF Low Group Twist (FW Pg 118)	95	39	15 to 0	4	
DTMF High Group Twist	96	40	15 to 0	0	
DTMF Master Gain (also for CMS DTMF)	97	41	15 to 0	4	
CMS Single Tone gain (CMS Pulse)	98	42	15 to 0	3	

Intercom Tuning Parameters

Name	Loc	No	Range	Default	
True Fullduplex (Phone to KP/DP)	99	43	0/1	1	
True Fullduplex (KP to DP)	100	44	0/1	0	
DTMF Sensitivity	101	45	0 to 31	18	
Vox Sensitivity	103	47	0 to 31	5	
CPT Sensitivity	104	48	0 to 31	2	
CAS Sensitivity	105	49	0 to 31	16	
AFE OUT Gain KP Spk (KP to KP)	106	50	0 to 4	1	
AFE IN Gain KP Mic (Recording)	107	51	0 to 20	16	
AFE GSM Line In Gain	108	52	0 to 20	9	
Record AGC Enable	109	53	0 to 1	1	
AGC Attack Slope	110	54	8192 - 32767	28,824	
AGC Decay Slope	112	56	32769 - 44800	32,780	
AGC Optimum Level	114	58	256 - 8191	7,000	
AGC Max. Gain	116	60	0 to 3	10	
AGC Noise Suppression Hold Time	118	62	0 - 65535	2,000	
AGC Noise Suppression AttackTime	120	64	1 - 65535	2,000	
AGC Noise Suppression Attack slope	122	66	2048 - 65535	65,470	
AGC Noise Suppression Decay slope	124	68	16640- 65535	18,384	
AGC Vox Energy	126	70	0 to 8192	2,000	
AGC Gain G1	128	72	0 to 3	0	
AGC Vox Sensitivity	130	74	0 to 65535	8,192	
AFE Line Out Gain Remote phone	132	76	4 to 0	2	
AFE Out Gain KP SPK (not intercom)	133	77	4 to 0	2	
AFE GSM Line Out Gain	134	78	4 to 0	4	
AFE In Gain KP MIC (KP-DP Intcom)	135	79	0 to 20	8	
AFE Out Gain KP (KP-DP Intcom)	136	80	4 to 0	3	
AFE In Gain DP Mic (KP-DP Intcom)	137	81	0 to 20	3	
AFE OUT Gain DP SPK (KP-DP Intcom)	138	82	4 to 0	1	
AFE LINE IN GC for Local Phone	139	83	0 to 20	4	
AFE LINE OUT GC for Local Phone	140	84	4 to 0	4	
AFE MIC Gain for phone-KP/DP intercom	141	85	0 to 20	7	
AFE KP SPK Gain for phone-KP/DP intercom	142	86	4 to 0	2	
AFE LINE IN for Remote phone to KP/DP Intercom Replace location 1700 Phone Intercom Voice Level 29/3/08	143	87	0 to 20	13	
AFE LINE IN GAIN for Remote Phone (Not Record Level) 2/7/08	144	88	0 to 20	4	

The Settings column marked Voice means this can be adjusted in the Voice Settings Screen of Configurator

Note: For firmware < 5.126, EEC and AEC parameters from RT Ratio onwards are wrong. AFE LINE IN Gain (52) was not working

DTMF Master Gain (97)

Value	Gain (dB)
0	6
1	4
2	2
3	0
4	-2
5	-4
6	-6

Intercom Tuning Parameters

10 (max)	-14
14	-22
15	-24
Others	Default

Location 132 = 2, 97 = 5 TWIST = 3 and 0 gives DTMF -8, -10 on telephone analyser

Twist Low and High Group (95,96)

Value	Gain (dB)
0 (High Group)	0
1	-0.5
2	-1
3	-1.5
4 (Low Group)	-2
10 (max)	-5
14	-7
15	--7.5
Others	Default

Location for High Group (86) seems to have no effect 18/1/06

CMS Tone Master Gain (98)

Value	Gain (dB)
0	6
1	4
2	2
3	0
4	-2
..	..
14	-22
15	-24
Others	Default

Line Volume(1706) / Keypad Volume (Location 54)

Line Volume is "Phone Voice Level" in Voice Settings. It is the volume to the line, local and remote.

Keypad Volume is "Keypad Voice Level" in Voice Settings.

Convert value -45 to +28 in EEPROM to values for DTAD.

This is a Set Volume value not an AFE setting.

The Volume is on the TAD Data Flow path (VC0), **and does not apply to the speakerphone.**

Keypad Volume Level (location 54) controls the Default volume of the keypad voice menu, playback and announcements without affecting the intercom voice volume. This can be used to replace the trimmer on the keypad. Each keypad (using user Menu 7 for Volume) can set an individual volume level 0 to 73 volume level (0 for mute) which is stored in EEPROM. If the Volume for a keypad is not set (i.e. FF) then the default value of keypad volume level (Location 54) is used for the keypad. **Announcements (which are broadcast) will use default value of Keypad Volume level and not individual level on keypad.**

Note (8/2/2010) : There is a BUG up til firmware 5.182 where the Keypad Volume Level has no effect on announcements. This is fixed in later versions.

AFE Out Gain (Tune Parameter 77) has a similar effect to Keypad volume levels but it sets the reference volume for all keypads. This means that the individual keypad volume and default keypad volume are all affected by Tune parameter 77.

Parameter Value	Volume (dB)	Keypad Volume
34H	28	78

Intercom Tuning Parameters

Parameter Value	Volume (dB)	Keypad Volume
35H	27	77
36H	26	76
..	..	..
4AH	6	56
4BH	5	55
4CH	4	54
4DH	3	53
4EH	2	52
4FH	1	51
50H (default)	0	50
51H	-1	49
52H	-2	48
53H	-3	47
54H	-4	46
..	..	..
7CH	-44	6
7DH	-45	5
7EH	Mute	4
7FH	Mute	3

Line Volume and Keypad Volume are programmable as Voice Settings

Record Compression (1704)

Value	Compression
000	High Compression
001	Mid Compression
010	Low compression
Others	Default - High Compression

Voice Menu (1698) / Message Playback Speed (1705)

Value	Speed Factor
000	1
001	0.5
010	0.7
011	1
100	1.3
101	1.5
110	1.75
111	2
Others	Default

CPT Sensitivity (104)

Value	Sensitivity
5 bits 00000 to 11111	
0	-16
1	-14
2	-12
3	-10
..	..
..	..
26	36
27	38
28	40

Intercom Tuning Parameters

Value	Sensitivity
29	42
30	Disabled
31	Disabled
Others	Default

Warning: If the AFE gain is too high (e.g. 36 dB) and sensitivity is -16dB, CPT will not be detected. 24DB has been tested.

DTMF Sensitivity (101)

Value	Sensitivity
5 bits 00000 to 11111	dB
0	-16
1	-14
2	-12
3	-10
..	..
18	20
27	38
28	40
29	42
30	Disabled
31	Disabled
Others	Default

Notes: 10/6/05

Lower sensitivity numbers are more sensitive i.e. can detect lower levels of DTMF.

For AFE LINE IN Gain of 8, 8 is the minimum DTMF sensitivity value that can work with the Panasonic Master phone through PABX. DTMF sensitivity of 26 does not work well for Mobile Phone detection for number 4. Local phone DTMF can be detected from 8 to 26.

For AFE Line gain of 13, the Panasonic phone via PABX cannot be detected even if sensitivity number is increased, as the signal may be saturated. For Fullduplex intercom, line in gain needs to be higher in order to get good volume.

Vox Sensitivity (103)

Value	Sensitivity
5 bits 00000 to 11111	
0	-16
1	-14
2	-12
3	-10
4	-8
5	-6
..	36
27	38
28	40
29	42
30	Disabled
31	Disabled
Others	Default

AEC to EEC Gain (56)

This is the inter module gain from AEC to EEC values 00 = +20 dB, 41 = -20 dB, 42 = Mute. Refer to Table 44 in DSP Firmware page 164/199 Speakerphone (14) command CMD 6. See figure 3 and 4 page 32,33 for Block diagrams. Not used at present.

Intercom Tuning Parameters

DP Intercom Volume from KP (57)

This is the volume to DP speaker when used with KP.

Line (EEC) Intercom Volume (64)

This is the speaker volume of the EEC Module for KP/DP to line intercom. values 00 = +20 dB, 41 = -20 dB, 42 = Mute.

EEC to AEC gain (77).

This is the inter module gain from EEC to AEC. values 00 = +20 dB, 41 = -20 dB, 42 = Mute.

DP to KP Intercom Speaker volume (78)

This is the speaker volume of the AEC Module for DP to KP (not muted). values 00 = +20 dB, 41 = -20 dB, 42 = Mute.

AEC Speaker Volume default (85)

This is the speaker volume of the KP/DP (AEC) for line to KP/DP intercom. values 00 = +20 dB, 41 = -20 dB, 42 = Mute.

½ duplex Mute Speaker Volume (67)

This is the muted volume for ½ duplex for non-active side.

For ½ duplex settings, the dominant side is not attenuated, the other non-active side volume setting is set according to Halfduplex Mute speaker volume (param 1, Loc 67). Eg when talking from phone to DP, the DP to phone side is dominant when both sides are quiet, and the phone to DP side is set to a lower volume according to (67). When the Phone starts to talk, then the phone to DP side is active and the DP to phone is set to a lower volume according to (67).

Value	Gain (dB)	Value	Gain (dB)
6 bits 000000 to 101001		16	4
0	20	17	3
1	19	18	2
2	18	19	1
3	17	20	0
4	16	21	-1
5	15	22	-2
6	14	23	-3
7	13	24	-4
8	12		
9	11	..	..
10	10	38	-18
11	9	39	-19
12	8	40	-20
13	7	41	MUTE
14	6	Others	Default
15	5		

Fullduplex (99)

1 means Fullduplex, 0 means ½ duplex. For Fullduplex the volume in each direction are set according to 64, 57, 85 and there is no switching of gain.

EEC and AEC RT and TR Ratio

EEC RT Ratio (58)

EEC TR Ratio (59)

AEC RT Ratio (79)

AEC TR Ratio (80)

Intercom Tuning Parameters

EEC RT Ratio KP/DP (68)

EEC TR Ratio KP/DP (69)

AEC RT Ratio KP/DP (87)

AEC TR Ratio KP/DP (88)

Value	ratio
4 bits 0000 to 1010	
0	0.5
1	0.75
2	0.8
3	1
4	1.2
5	1.5
6	2
7	2.5
8	3
9	3.5
10	4
Others	Skip

The TR and RT ratios are used to determine which side is dominant for each of the EEC and AEC modules. The RT and TR ratios provide Hysteresis to the system.

For the EEC, fig 18, the RT ratio determines the switching from External (LINE) to Internal side (AEC). The TR ratio determines the switching from Internal (AEC) to External side ((LINE). Switch to Internal is when Internal VOX > RT ratio * Line Vox and switch to External side is when Line Vox > Internal Vox * TR Ratio.
Eg for EEC If RT is 0.75 and TR is 0.75, that means switch to Internal when Internal vox > 0.75 (ie RT) * Line vox and switch to External (Line) is when External (Line) vox > 0.75 (ie TR) * internal Vox.
This means that R means Vox from Internal and T means Vox from External (Line).

For the AEC, fig 17, the RT ratio determines the switching from Internal (EEC) to External side (MIC). The TR ratio determines the switching from external (MIC) to Internal side ((EEC). Switch to External is when External (MIC) VOX > RT ratio * Internal Vox and switch to Internal side is when Internal Vox > External vox (Mic) * TR Ratio.

For AEC if RT is 2 and TR is 2 it means that switch to internal is when Internal Vox (from EEC) > 2 (ie TR) * external Vox (Mic). Switch to External is when External Vox (Mic) > 2 (ie RT) * internal Vox (from EEC).
This means that R means Vox from External (Mic) and T means Vox from Internal.

(NOTE for tech staff The interpretation of R and T is different from FW28/199 which says that Receive should mean Vox from Line and T means Transmit to Line but the table 54 and Figures 17 and 18 indicate the reverse.)

The EEC and AEC have independent decisions about the dominant direction.

The default values of TR and RT for EEC and AEC in the system at reset is 1 (ie 0.75).

For KP to DP intercom, RT and TR ratios for EEC and AEC are set separately from phone to KP and DP intercoms.

EEC Decoupling (60) & AEC Decoupling (81)

Value	Attenuation (dB)
5 bits 00000 to 10100	
0	0
1	-1
2	-2
3	-3

Intercom Tuning Parameters

Value	Attenuation (dB)
..	..
19	-19
20	-20
Others	Default

EEC (61) and AEC (82) Loop Attenuation

Value	Attenuation (dB)
3 bits 000 to 111	
0	0
1	4
2	8
3	12
4	16
5	20
6	24
7	28
Others	Default

EEC (62) and AEC (83) Residual Attenuation

Value	Attenuation (dB)
4 bits 0000 to 1111	
0	0
1	-2
2	-4
..	..
13	-26
14	-28
15	-30
Others	Default

EEC (63) and AEC (84) Vox Sensitivity

Value	Attenuation (dB)
3 bits 000 to 111	
0	2
1	4
2	6
3	8
4	10
5	12
6	14
7	16
Others	Default

EEC Dial Tone Threshold (66)

Value	Threshold (dB)
0	-6 less sensitive
1	0
2	3
3	6 more sensitive
others	Default

AFELGC LINE IN

Intercom Tuning Parameters

These are AFE Input gains for the LINE IN for various modes.

LIN0GC Line IN Gain for Remote Phone NOT full duplex - Location 1699.

Line IN Gain for DP Mic (KP-DP Intercom) -Location 137.

LINE IN Gain for Local Phone - 139 (Default 4) - Changed from 6 - difficult to detect DTMF local phone.

LINE IN Gain for Remote Phone for full duplex to KP/DP - Location 1700.

Voice Setting > Remote Phone to Intercom Input Gain (renamed from Phone Intercom Voice Level).

LIN0GC Value	Gain (dB)	LIN0GC Value	Gain	LIN0GC Value	Gain	LIN0GC Value	Gain
0	-4	8	12	16	28	24	Reserved
1	-2	9	14	17	30	25	Reserved
2	0	10	16	18	32	26	Reserved
3	2	11	18	19	34	27	Reserved
4	4	12	20	20	36	28	Reserved
5	6	13	22	21	Reserved	29	Reserved
6	8	14	24	22	Reserved	30	Reserved
7	10	15	26	23	Reserved	31	Ext Gain

LIN0GAIN value is automatically increased by 6 steps (12 dB) for monitoring CMS, Voice and pager frequencies using the FREQ hardware during remote dial out

AFELGC LINE OUT

These are AFE Output gains for Line out in various modes.

LOUT0GC LINE OUT gain for Remote phone - Location 132 **AFE LINE OUT Gain Remote Phone.**

Line OUT Gain for DP SPKR (KP-DP Intercom) - Location 138.

Line OUT Gain for Local Phone - Location 140.

LOUT0GC Value	Gain (dB)
0	0
1	-6
2	-12
3	-18
4	-24
5	Reserved
6	Reserved
7	Reserved

AFEHSGC In

These are the AFE Input gains from the KP Mic in various modes. Valid range 0 to 20 (loud).

HSINGC KP Mic gain for recording - Location 107.

HSINGC KP Mic Gain for phone-KP intercom - Location 141.

HSINGC KP Mic Gain for KP-DP Intercom - Location 135.

HSINGC Value	Gain (dB)	HSINGC Value	Gain (dB)	HSINGC Value	Gain (dB)	HSINGC Value	Gain (dB)
0	-4	8	12	16	28	24	Reserved
1	-2	9	14	17	30	25	Reserved
2	0	10	16	18	32	26	Reserved
3	2	11	18	19	34	27	Reserved
4	4	12	20	20	36	28	Reserved
5	6	13	22	21	Reserved	29	Reserved
6	8	14	24	22	Reserved	30	Reserved
7	10	15	26	23	Reserved	31	Reserved

AFEHSGC Out

These are the AFE gains to KP speaker in various modes in 6 dB steps so rather crude.

Intercom Tuning Parameters

HSOUTGC KP Speaker Gain for Voice menu/playback - Location 133.

HSOUTGC KP Speaker Gain for Phone-KP Intercom - Location 142.

HSOUTGC KP Speaker Gain for KP-DP Intercom - Location 136.

HSOUTGC Value	Gain (dB)
0	0
1	-6
2	-12
3	-18
4	-24
567	Reserved

AFE Out Gain (Tune Parameter 77 or Location 133)) has a similar effect to Keypad volume levels but it sets the reference volume for all keypads. This means that the individual keypad volume and default keypad volume are all affected by Tune parameter 77.

AFESPGC SP IN, OUT

SPINGC (Location 108)

This is the AFE input gain from the LINE IN of the GSM

MICINGC Value	Gain (dB)	MICINGC Value	Gain (dB)	MICINGC Value	Gain (dB)	MICINGC Value	Gain (dB)
0	-4	8	12	16	28	24	Reserved
1	-2	9	14	17	30	25	Reserved
2	0	10	16	18	32	26	Reserved
3	2	11	18	19	34	27	Reserved
4	4	12	20	20	36	28	Reserved
5	6	13	22	21	Reserved	29	Reserved
6	8	14	24	22	Reserved	30	Reserved
7	10	15	26	23	Reserved	31	Reserved

SPOUTGC (Location 134)

This is the AFE gain of the GSM out to the Line out

SPOUTGC Value	Gain (dB)
0	0
1	-6
2	-12
3	-18
4	-24
5	Reserved
6	Reserved
7	Reserved

History

20 July 2005 - new locations for Voice Settings. Added location 95, 96 for DTMF Twist

21 August 2005 - Added LCD Keypad download data

4 Sept 2005 - variable number of number tables in IVS. Word 8 2 bytes has the identification for tables or LCD

20 October 2005 - added Intercom EEC, AEC AGC locations, KP to DP speaker volume locations

23 October 2005 - added Half Duplex writeup

24 October 2005 - added RT and TR for KP/DP locations

9 December 2005 - Master DTMF gain from 2 to 5. Removed Dial VC Gain, not effective

Intercom Tuning Parameters

24 April 2006 - changed Tune parameters defaults after PSB verification
29 July 2006 - added flash memory size info to IVSINFO at Sector 0, Page 0 Word 32
6 August 2006 - added DC ADC for Low Battery, battery disconnect and AC Fail detection
29 March 2008 - Created Tuning Parameters doc added EEC., AEC and Voice/Dialing block diagrams and explanations
20 May 2008 - added parameter 14 EEC Volume KP/DP to GSM, and parameter 33 AEC Volume GSM to KP/DP, independent of parameter 8 (Volume KP/DP to Line) and 29 (AEC Volume Line to KP/DP)
28 June 2008 - added descriptions
30 June 2008 - Added Parameter 50 for AFEOUTHS1W fo KP to KP baby monitor
2 July 2008 - Added Parameter 88 for AFE Line IN Gain for Remote Phone, separated from RECORD LEVEL
8 Feb 2010 - explanation about difference between Keypad volume level and Tune Parameter 77
20 April 2010 - New Tuning Strategy, Numbered the figures