



MuSLIC

Multichannel Subscriber
Line Interface Concept

PEB 3465 V1.2

PEB 31666/31665/31664 V1.3

PEB 4166/4165/4164 V2.3

Coefficient Handling of MuSLIC
Chipset

Wired
Communications



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Never stop thinking.

PEB 4166/4165/4164 V2.3

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Abstract

This application note gives an introduction about programming and assigning the individual coefficient sets for the MuSLIC chipsets MuSLIC, MuSLIC -E and MuSLIC -S.

The MuSLIC chipsets are a multichannel solution for analog linecards. To program the individual channels, coefficient sets are used for adjusting the DC and AC transmission characteristic and the two integrated tone generators.

The coefficient sets can be assigned to each channel. The integrated CRAM (coefficient RAM) of the MuSLIC contains a total of 4 DC coefficient sets and 8 or 16 AC and TG (tone generator) coefficient sets, depending on the chosen mode.

1 Coefficient Assignment with FIXC = 1

After reset or if FIXC is set to 1 (XR2, bit 4) all 16 channels are assigned to fixed coefficients. This coefficient set is hardwired within the MuSLIC and therefore cannot be changed. There is one DC, one AC and one TG hardwired coefficient set containing reasonable default values, which allow basic telephone service. It is not possible to use fixed coefficients for some of the channels and operate some of the channels with programmed coefficients. It is either all 16 channels with fixed coefficients or all 16 channels with programmed coefficients. In case of bit XR2.FIXC = 1, there is a fixed coefficient set assignment as shown in **Figure 1**.

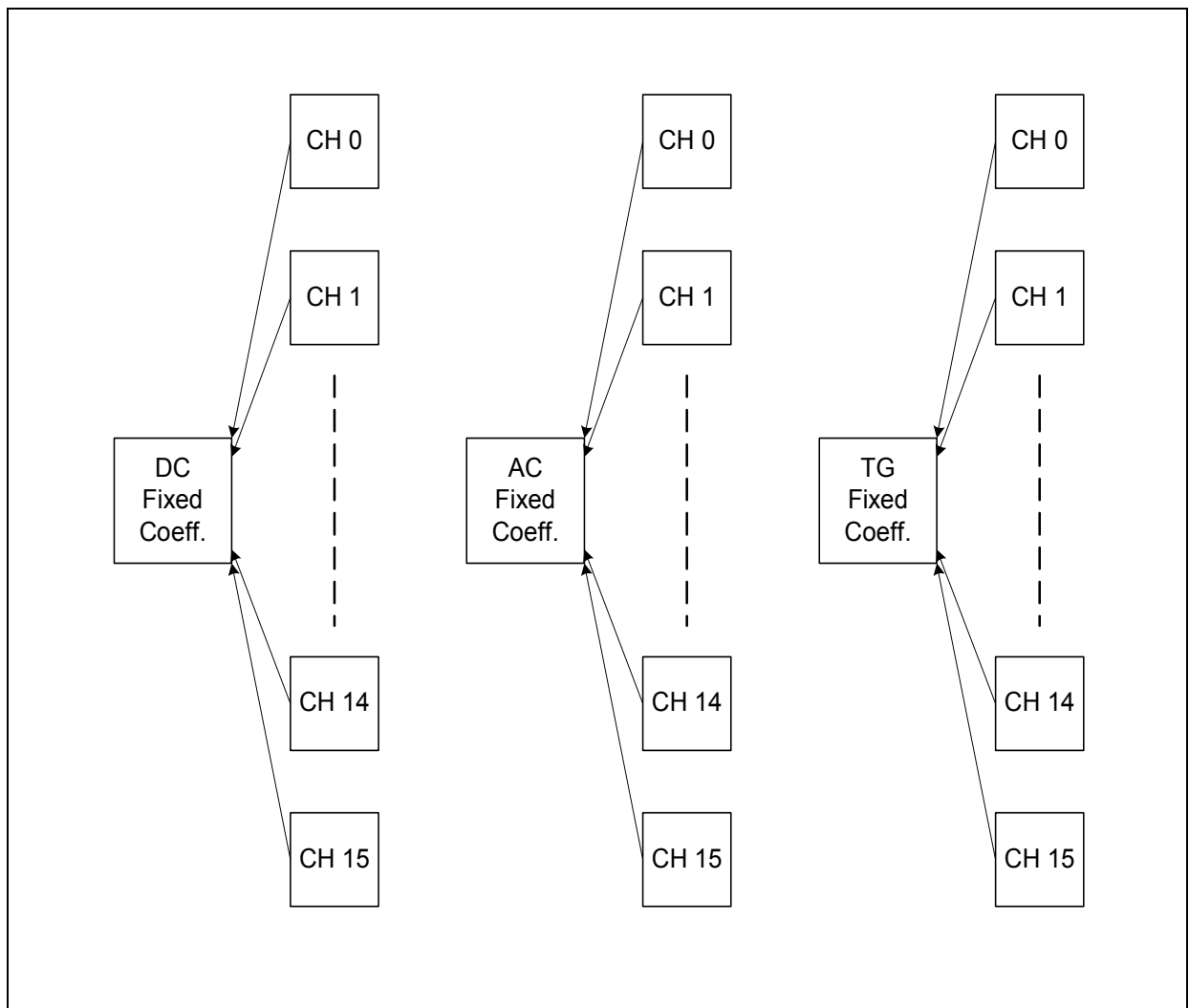


Figure 1 Fixed Coefficient Set Assignment with bit XR2.FIXC = 1

2 Coefficient Assignment with FIXC = 0

Before switching from fixed coefficients to programmed ones the coefficient sets have to be loaded with data reflecting the DC and AC requirements of the application.

While the coefficient sets are updated, bit XR2.FIXC should be kept to 1. Updating of the coefficient sets is done with COP commands.

There are 4 DC coefficient sets and 8 or 16 AC and TG (tone generator) coefficient sets (depending on bit XR2.FIX-CHAN) per 16 channels. Each of the individual channels can be assigned to each of the coefficient sets by COPI command. The different coefficient sets allow that different DC, AC and TG coefficients can be loaded and each of the channels can be assigned to the most appropriate one. Assignment of DC, AC and tone generator coefficient can be done independently from each other.

The handling of DC coefficient sets is independent of bit XR2.FIX-CHAN. The DC coefficient set assignment in case of bit XR2.FIXC = 0 is shown in [Figure 2](#) below.

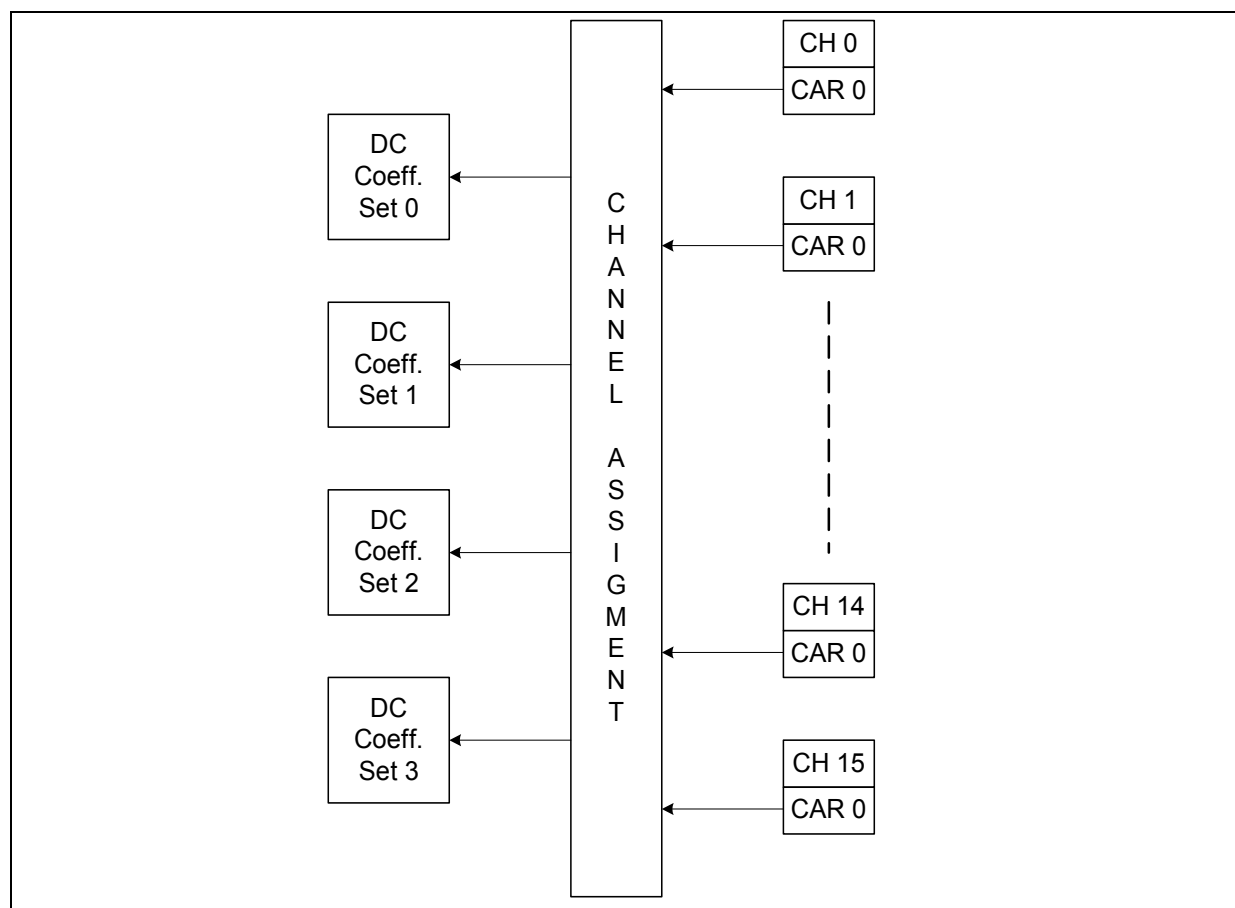


Figure 2 DC Coefficient Set Assignment with bit XR2.FIXC = 0

Coefficient Assignment with FIXC = 0

Each of the channels has to be assigned to one of the DC coefficient sets DC0 - DC3. This is done with a COPI command by setting register CAR0 (bits 7,6) accordingly. The switching from fixed to programmed values is done by setting bit XR2.FIXC from 1 to 0.

If one coefficient set is reprogrammed for a different characteristic, all channels assigned to this set will be affected.

For the handling of AC and TG coefficients the MuSLIC chipsets offer two different modes, controlled by bit XR2.FIX-CHAN:

FIX-CHAN = 0	FIX-CHAN = 1
8 AC and TG coefficients available; assignment done by CAR0/1	16 AC and TG coefficient sets available; fixed assignment

2.1 Handling with FIX-CHAN = 0

Assignment of the individual channels to one of the eight AC or TG coefficient sets is done similarly to the assignment of DC coefficient sets (COPI command; register CAR0 bit 5-3 for AC and register CAR1 bit 7-2 for TG). If a coefficient set is reprogrammed, all channels assigned to this set are affected. The AC and TG coefficient set assignment in case of bit XR2.FIX-CHAN = 0 is shown in [Figure 3](#) below.

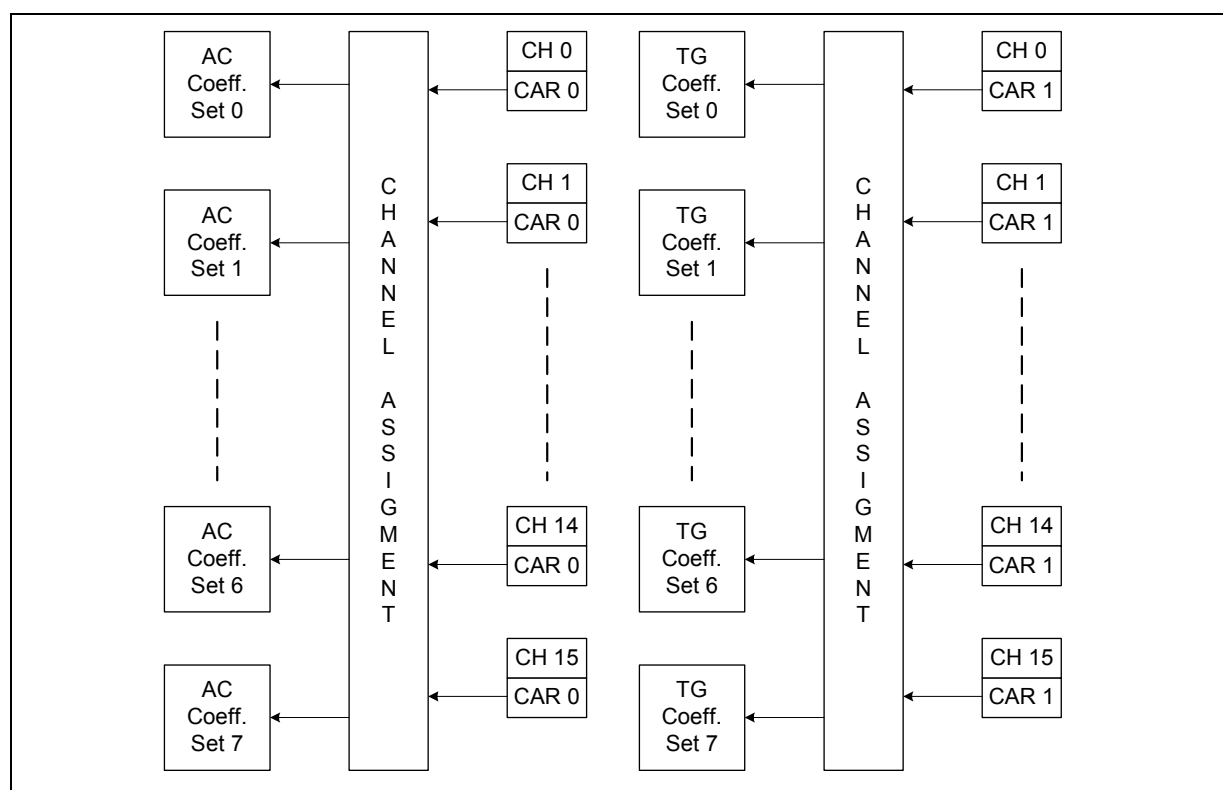


Figure 3 AC and TG Coefficient Set Assignment with bit XR2.FIX-CHAN = 0

2.2 Handling with FIX-CHAN = 1

If bit XR2.FIX-CHAN is set to 1, 16 AC and TG coefficient sets are available. The assignment of the individual channel to a coefficient set is fixed, this means channel 0 is assigned to coefficient set 0, channel 1 to coefficient set 1 and so on. The coefficient sets are programmed by using the COP command. With FIXCHAN = 1, the COP command becomes channel specific. Prior to the COP command the appropriate channel has to be selected (writing to channel register). The bits SET2 to SET0 in the COP command word have to be set to the corresponding channel number (only 3 least significant bits). If coefficients for channel 13, for example, should be programmed, then following bit combination is valid: SET0 = 1, SET1 = 0, SET2 = 1. This programming is identical with the programming for channel 5, but the differentiation is done by the selection of channel 13 prior to the COP command.

Note: Before an AC or TG coefficient set becomes effective for the respective channel, it is necessary to assign a DC coefficient set to this channel. This is done with a COPI command by setting register CAR0 (bits DC0,DC1) accordingly.

The AC and TG coefficient set assignment in case of bit XR2.FIX-CHAN = 1 is shown in **Figure 4** below.

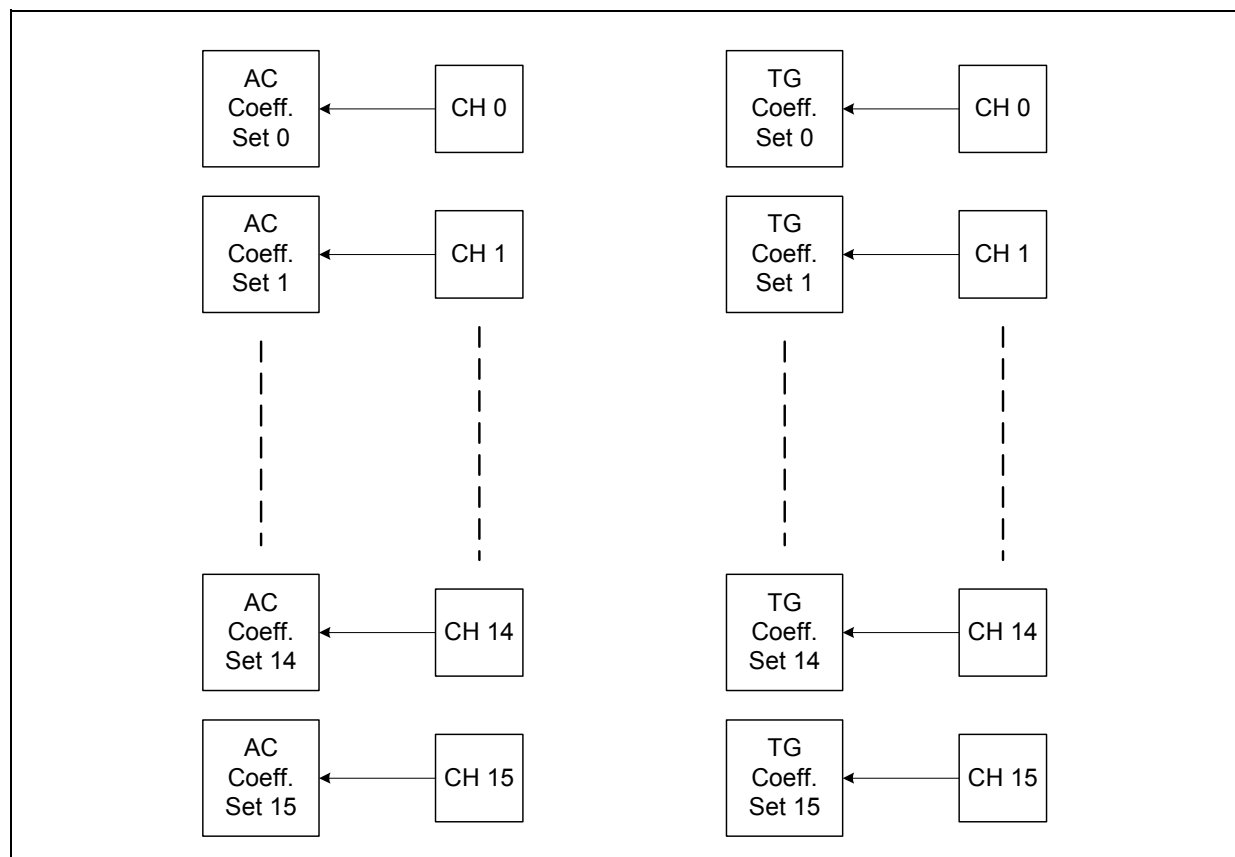


Figure 4 AC and TG Coefficient Set Assignment with bit XR2.FIX-CHAN = 1

3 Changing of Coefficient Sets

In case of bit XR2.FIX-CHAN set to 0, there are 4 DC, 8 AC and 8 tone generator coefficient sets for 16 channels. For line testing purposes it is recommended to reserve 1 DC, 1 AC and 1 TG coefficient set to be dynamically reprogrammed when line testing and levelmeter functions are performed.

The remaining coefficient sets should be loaded with values, which allow adapting the individual channels to different requirements. This is done by reassigning channels to different coefficient sets (COPI command).

In case the provided coefficient sets are not enough, it would be also possible to reprogram a coefficient set to the required characteristic. It should be noted that all channels assigned to that coefficient set are affected.

The recommended procedure for reprogramming a coefficient set is:

- Reassigning the channels in such a way that the coefficient set to be changed is not used by any channel (COPI command)
- Reprogramming the coefficient set with the new characteristic (COP command)
- Assigning the channel to the updated coefficient set (COPI command)

Even if it is not recommended to reprogram coefficient sets during normal operation, this could be done. If possible, reprogramming should be done during line idle state. If coefficient sets (especially DC coefficients) are reprogrammed during an active conversation, undesired effects may happen (audible clicking etc.).

If only dedicated parameters are supposed to be changed, this must be done very carefully, because some of the coefficients influence each other. For example changing of ringing frequency implies that also filter values must to be changed, because the corner frequencies of the filters depends on the ringing frequencies.

Therefore it is recommended to calculate a complete coefficient set using the coefficient calculation program *MUSLICOS* from Infineon Technologies.

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Dr. Ulrich Schumacher

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