

Functional description of and additional information on band modules with variable bandwidth.

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Description of band modules with variable bandwidth

1 Functional description

The band module with variable bandwidth can be set to a desired centre frequency and to a desired bandwidth.

The explanation how it works is made with reference to the following figures and exemplary values for frequencies, bandwidths and levels.

There are two filters in one link (UL or DL) in series in the band module which can be set to a defined centre frequency. In the example we have two filters with a bandwidth of 25 MHz each and for demonstration purposes the frequency range is 870 to 940 MHz.

In figure 1 we see that filter 1 and filter 2 are both set to a centre frequency (CF) of 900 MHz. The resulting overall response of the module is thus a 25 MHz band with a centre frequency of 900 MHz ($\Rightarrow$ frequency range from 887.5 MHz to 912.5 MHz). The attenuation in the stop band of one filter was assumed to be 40 dB.

Thus, the overall attenuation of the module is 80 dB.

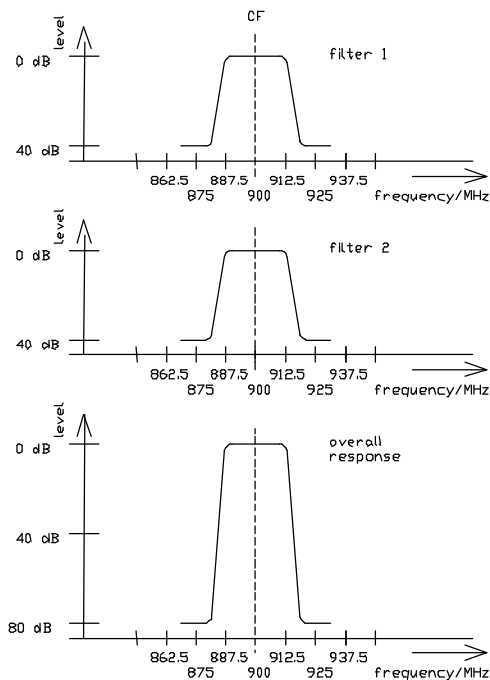


figure 1

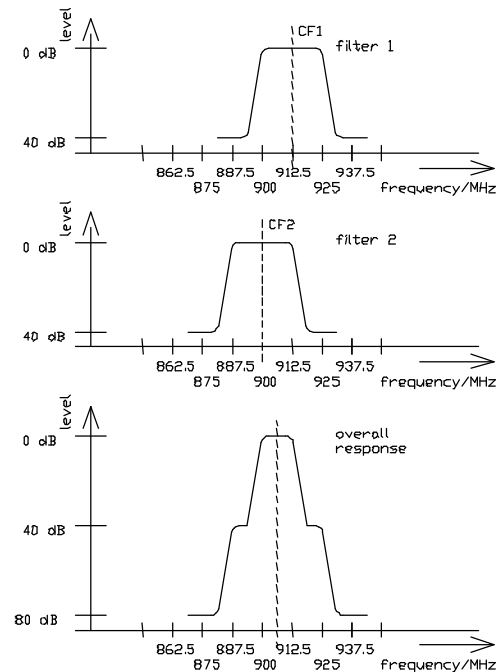


figure 2

Description of band modules with variable bandwidth

In figure 2 we have the same filters but this time with different centre frequencies. The centre frequency of filter 1 is this time 912.5 MHz and the centre frequency of filter 2 is again 900 MHz. Consequently, we get another overall response of the module as can be seen in figure 2. Filter 1 limits the frequency range towards lower frequencies and filter 2 towards higher frequencies. The resulting response is thus an attenuation of 80 dB up to 881.25 MHz, 40 dB up to 893.25 MHz, 3 dB bandwidth is 12.5 MHz from 900 MHz to 912 MHz, 40 dB attenuation from 918.75 MHz and 80 dB from 931.25 MHz. (Values exemplary!)

It is shown in the following how the centre frequency and the bandwidth of the module can be set to desired values.

2 Integrating a conversion module and programming communication bus address

☞ **Note:** Do not use conversion modules with variable bandwidth together with conversion modules with fixed bandwidth on the same mother board.

2.1 What you have to know of your system before the setting

Prerequisite for the adjustment is to know the bandwidth of the filters used in the module. (See the label on the conversion module.) With this bandwidth and the desired values the start frequency and stop frequency (and thus the bandwidth and centre frequency) of the band can be set. The following formula shows how to calculate the values that have to be entered.

$$CF1 = f_{Start} + \frac{BW_{filter}}{2} \quad CF2 = f_{Stop} - \frac{BW_{filter}}{2};$$

where

CF1 is the centre frequency of the first filter (to be entered)

CF2 is the centre frequency of the second filter (to be entered)

f_{Stop} is the stop frequency of the desired band (upper frequency): $f_{Stop} = CF_{des} + BW_{des}/2$

f_{Start} is the start frequency of the desired band (lower frequency): $f_{Start} = CF_{des} - BW_{des}/2$

(CF_{des} and BW_{des} are the desired center frequency and bandwidth of the desired band)

BW_{filter} is the bandwidth of the two filters of the module

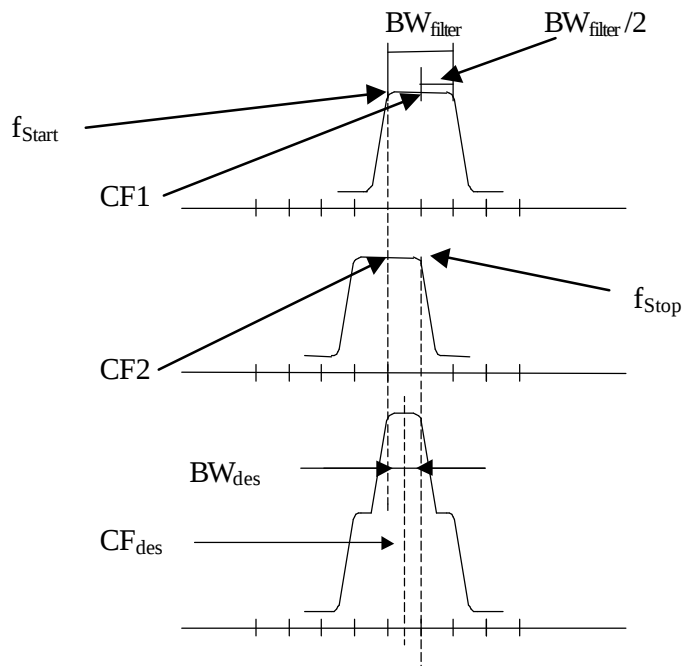


figure 3

Description of band modules with variable bandwidth

2.2 Setting the bus address of the module

Another thing to know is the allocation of the filters to the respective links. Each filter is allocated to a link and a filter number by means of hex-coded rotary switches. Each rotary switch can be set to positions from 0 to F (16 positions) by means of a small screw driver.

This adjustment is important if you want to replace a module or upgrade your system. If the module was inserted in factory you don't have to care about that.

The following figure shows where the hex-coded rotary switches are located and the table shows the allocation.

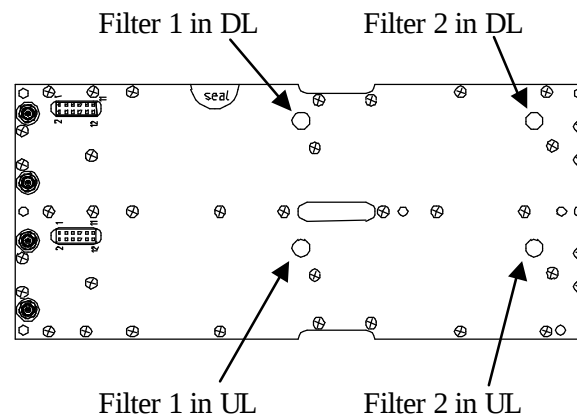


figure 4 Position of rotary switches at bottom side of the module

Rotary switch positions:

	Filter 1		Filter 2	
	UL	DL	UL	DL
Socket one	0	1	0	1
Socket two	2	3	2	3
Socket three	4	5	4	5
Socket four	6	7	6	7

table 1: Rotary switch positions

Note: Depending on the constructional style (G-cabinet or D-/F-cabinets) of your Repeater system the conversion modules are mounted in different cabinets. For further information refer to the manual of your Repeater.

See next page for exceptions!

Description of band modules with variable bandwidth

If your Repeater system is equipped with conversion modules with variable bandwidth with one of the following Identnumbers, the settings for these conversion modules have to be according to the table besides.

Identnumber
148714
148945
149225
151053
151322
151323
151324
151325

	Filter 1		Filter 2	
	UL	DL	UL	DL
Socket one	0	1	2	3
Socket two	4	5	6	7
Socket three	8	9	A	B
Socket four	C	D	E	F

table 3: Rotary switch positions

table 2: Identnumbers of modules with different settings

2.3 Which CF to set?

When setting the centre frequency the software queries for a band module (1-8). This number has to be considered carefully because the band module with variable bandwidth contains two filters that can be shifted independently whereas in the standard band module only one centre frequency can be shifted. That means that one band module with variable bandwidth requires two band module numbers to be set. The following exemplary figure and the table shall explain what band module number has to be entered.

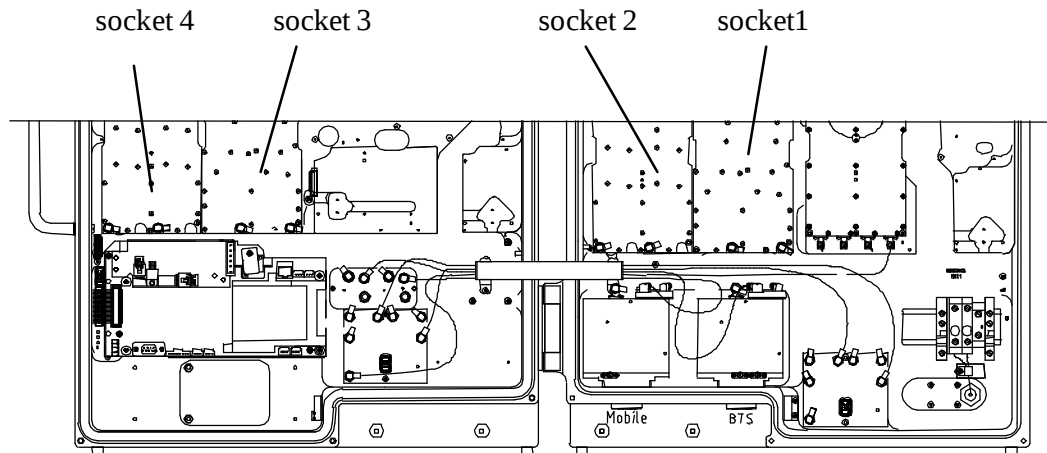


figure 5 Band modules with variable bandwidth

Description of band modules with variable bandwidth

	Socket 1	Socket 2	Socket 3	Socket 4
Filter 1	1	3	5	7
Filter 2	2	4	6	8

table 4: Band module numbers

☞ **Note: Socket 2 can also be in Extension Unit 1 (D-/F-cabinets). See Repeater manual.**

2.4 Attenuation setting

One band module with variable bandwidth needs to be addressed as if there were two modules (see also chapter 2.2).

This means for the attenuation setting that, theoretically, there are two different attenuations that can be set in one module. This is, however, wrong. Only one attenuation setting can be done. This setting has always to be done in the even module number (Filter 2). Thus, attenuation settings can only be done in module numbers 2, 4, 6 and 8.

If settings on the odd module numbers are executed the software will not allow to do so (Response: VALUE ERROR).

Example: If you want to set the attenuation of the band module with variable bandwidth in the second socket, you have to set the attenuation via software in the band module no. 4. See also table 4 in chapter 2.3.

2.5 Required software commands

The software command to set the centre frequency (CF1 and CF2) of the filters and the attenuation is given in the following.

With the SET CF command the centre frequency of a filter can be set with an accuracy of 10 kHz in GSM900 and 100kHz in GSM1800. The SET CFO (centre frequency offset) command is for correction purposes only and should be avoided if possible. SET CFO can be set in steps of 10 kHz from – 1000 kHz to + 1000 kHz. (See also software manual for more details.)

SET CF

Syntax: SET CF ↵
 ENTER BAND MODULE (1-8): ↵
 ENTER CF UL <MHz>: ↵
 ENTER CF DL <MHz>: ↵

SET CFO

Syntax: SET CFO ↵
 ENTER BAND MODULE (1-8): ↵
 ENTER CFO UL <kHz>: ↵
 ENTER CFO DL <kHz>: ↵

SET ATT

Syntax: (ENTER Repeater Number (1-4): ↵) *
 ENTER BAND MODULE (1-8): ↵
 ENTER MODE (UL or DL): ↵
 ENTER ATTENUATION: ↵

* (This is only valid in software up to REP1007!)

Band module number can be found in table 4: Band module numbers.

3 Example

An example shall demonstrate the above statements.

For further details how to perform certain actions please refer also to the Repeater manual.

Assumed we want to replace a module with variable bandwidth (standard, no exception, see 2.2.) in socket 3. The desired bandwidth is 16.2 MHz and the desired centre frequency in the UL is 902.5 MHz and in the DL 947.5 MHz. The attenuation in UL has to be set to 16 dB and 22 dB in the DL.

First thing is to check whether the rotary switches of the module are in the correct position. The rotary switch for filter 1 in UL has to be in position 4, for filter 1 in DL in position 5, for filter 2 in UL in position 4 and for filter 2 in DL in position 5. (See table 1 Rotary switch positions.)

The module has to be inserted. For the bandwidth of the filters in the conversion module check the label on the module. As an example it says the filters have a bandwidth of 25 MHz.

Next thing to do is to calculate the centre frequencies that have to be entered. With the above given formula we get:

UL:

$$CF1 = f_{start} + \frac{BW_{filter}}{2} = (902.5 - 8.1) \text{ MHz} + 12.5 \text{ MHz} = 906.9 \text{ MHz}$$

$$CF2 = f_{stop} - \frac{BW_{filter}}{2} = (902.5 + 8.1) \text{ MHz} - 12.5 \text{ MHz} = 898.1 \text{ MHz}$$

DL:

$$CF1 = (947.5 - 8.1) \text{ MHz} + 12.5 \text{ MHz} = 951.9 \text{ MHz}$$

$$CF2 = (947.5 + 8.1) \text{ MHz} - 12.5 \text{ MHz} = 943.1 \text{ MHz}$$

Description of band modules with variable bandwidth

Having all the values the centre frequencies can be set with the SET CF commands as follows: (Band module number can be found in table 4 Band module numbers.)

```
SET CF ↵  
  ENTER BAND MODULE (1-8): 5↵  
  ENTER CF UL <MHz>: 906.9↵  
  ENTER CF DL <MHz>: 951.9↵
```

```
SET CF ↵  
  ENTER BAND MODULE (1-8): 6↵  
  ENTER CF UL <MHz>: 898.1↵  
  ENTER CF DL <MHz>: 943.1↵
```

And the attenuation can be set as follows:

```
SET ATT  
  ENTER BAND MODULE ( 1-8 ): 6↵  
  ENTER MODE ( UL or DL): UL↵  
  ENTER ATTENUATION: 16↵
```

```
SET ATT  
  ENTER BAND MODULE ( 1-8 ): 6↵  
  ENTER MODE ( UL or DL): DL↵  
  ENTER ATTENUATION: 22↵
```