

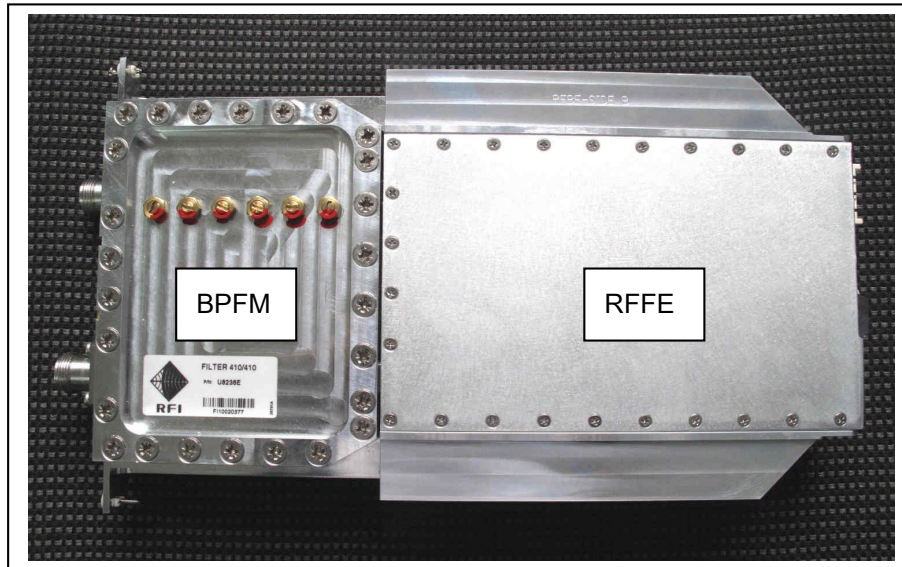


Figure 9 – RFFE & BPFM bolted together

### Channel programmability

Channel programming is done via the web browser GUI interface – Refer to chapter 5.2.7

Level 1: User name and password access via the web browser GUI interface displays only status of the channel configuration.

Level 2: User name and password access via the web browser GUI interface facilitates status display and channel configuration capability.

### Typical hardware configuration examples

RFFE 410-410 module is configured with an RFFE 400-420MHz board in side “A” and the same 400-420MHz RFFE board in side “B”.

An RFFE 815-860 module is configured with an RFFE 805-825MHz board in side “A” and an 850-870MHz RFFE board in side “B”.

### 3.3.7 RFBE – RF Back End Module

An RFBE module is partitioned into side “A” and side “B”. Two RFBE boards are fitted into an RFBE module. The RFBE boards can be in different bands, however the BPFM fastened to them must have the corresponding side “A” and side “B” band pass filters.

The motherboard architecture accommodates up to sixteen RFFE boards (eight modules).

A DSP board in side “A” takes inputs from RFFE boards in slots 9 & 8 and drives RFBE boards in slots 1, 2, 5 & 6. A DSP board in side “B” takes inputs from RFFE boards in slot 7 and drives RFBE boards in slots 3, 4, 7 & 8.

The slot allocations for the DSPbR reflect the DSP architecture where the first four RFFE channels (2 modules) are allocated to slots 1 and 2. The next four RFFE channels, which correspond to RFBE modules 3 and 4, will be accommodated in slots 5 and 6. Correspondingly; in a bi-directional configuration the RFBE modules for the alternative direction will accommodate slots 3 and 4 and then 7 and 8.

The illustration of form and the bolting together of the BPFM to the RFFE in Figure 9 is the same for the RFBE.

Although the individual channel frequency and its characteristics within an RFBE band is adjustable, the RFBE band is fixed. RFBE modules are band specific.

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Level 2: User name and password access via the web browser GUI interface facilitates status display and channel configuration capability.

### **Typical configuration examples**

An RFBE 410-410 module is configured with an RFBE 400-420MHz board in side “A” and the same 400-420MHz RFBE board in side “B”.

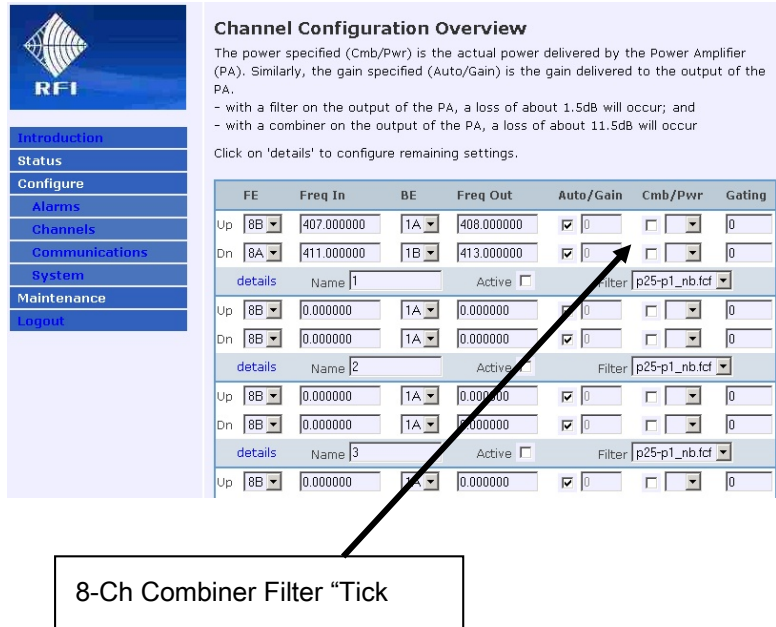
An RFBE 815-860 module is configured with an RFBE 805-825MHz board in side “A” and an 850-870MHz RFBE board in side “B”.

### **Output power level settings**

When configuring the RFBE via the GUI, the adjustable RF output power level is referenced to dBm and is the output level of the RFBE only and not the output power level at the external connector at the rear of the DSPbR. The level is adjustable in 1dB increments from +30dBm to +46dBm (+/- 0.5dB) for frequencies from 400 to 490MHz and +30 to +43dBm in 1dB increments for the 805 to 870MHz Frequency Range. Although the drop

down menu will indicate a level of up to +46dBm the level remains constant at +43dBm as the maximum. Refer to Table 3.

### GUI Channel Configuration Overview page



#### Channel Configuration Overview Help

**FE:**  
Front end (LNA). Only detected front ends are shown.

**Freq In:**  
Input frequency in MHz.

**BE:**  
Back end (PA). Only detected back ends are shown.

**Freq Out:**  
Output frequency in MHz.

**Auto/Gain:**  
If check box is ticked, then set to 'auto', where maximum possible gain is applied.  
If not ticked, then maximum gain is specified.

**Cmb/Pwr:**  
If check box is ticked, then an internal combiner is assumed to be present. Maximum power (allowing for an internal combiner) can then be specified.

When an 8-Ch combiner filter unit has been fitted in either the uplink or downlink or both, the provided tick box needs to be activated “per channel” feeding through the 8-Ch combiner filter unit in order for the maximum output power to be auto-adjusted. This will effectively reduce the maximum output power setting of the RFBE to + 40dBm from +46dBm which will cater for up to 6 combined channels.

Should the user wish to manually adjust the maximum output power level, Table 3 will indicate the MAXIMUM output power level setting permissible without causing damage to the 8-Ch Combiner Filter Unit.

| Number of carriers | RFBE Max Output power setting via GUI<br>400-490MHz Freq Range | RFBE Max Output power setting via GUI 805-870MHz Freq Range |        | Approx Output Power at output of 8Ch combiner filter unit<br>Filter tick box activated |            |
|--------------------|----------------------------------------------------------------|-------------------------------------------------------------|--------|----------------------------------------------------------------------------------------|------------|
|                    |                                                                | Indicated                                                   | Actual | 400-490MHz                                                                             | 806-870MHz |
| 2                  | 46dBm                                                          | 46dBm                                                       | 43dBm  | 34.5dBm                                                                                | 31.5dBm    |
| 3                  | 46dBm                                                          | 46dBm                                                       | 43dBm  | 34.5dBm                                                                                | 31.5dBm    |
| 4                  | 44dBm                                                          | 43dBm                                                       | 43dBm  | 32.5dBm                                                                                | 31.5dBm    |
| 5                  | 42dBm                                                          | 42dBm                                                       | 42dBm  | 30.5dBm                                                                                | 30.5dBm    |
| 6                  | 40dBm                                                          | 40dBm                                                       | 40dBm  | 28.5dBm                                                                                | 28.5dBm    |
| 7                  | 39dBm                                                          | 39dBm                                                       | 39dBm  | 27.5dBm                                                                                | 27.5dBm    |
| 8                  | 38dBm                                                          | 38dBm                                                       | 38dBm  | 26.5dBm                                                                                | 26.5dBm    |

Table 3 – 8-Ch Internal Combiner Filter, per Carrier Max Power Settings

- Notes: 1) Approximate loss through combiner filter unit for all bands is 11.5dB  
 2) Duty Cycle assumption per channel 100%  
 3) All carriers are to be set to the same level

As indicated in Table 3, an additional 11.5dB of loss has to be added to the RFBE RF output power figure to get an indication of the output of the 8-Ch combiner filter unit.

The output power level has then to be adjusted negatively by 0.25dB if it is fed through a TLM or 1.2dB through the standard BPFM.

| <b>dBm</b> | <b>Watts</b> | <b>dBm</b> | <b>Watts</b> | <b>dBm</b> | <b>Watts</b> |
|------------|--------------|------------|--------------|------------|--------------|
| 0          | 1.0 mW       | 16         | 40 mW        | 32         | 1.6 W        |
| 1          | 1.3 mW       | 17         | 50 mW        | 33         | 2.0 W        |
| 2          | 1.6 mW       | 18         | 63 mW        | 34         | 2.5 W        |
| 3          | 2.0 mW       | 19         | 79 mW        | 35         | 3.2 W        |
| 4          | 2.5 mW       | 20         | 100 mW       | 36         | 4.0 W        |
| 5          | 3.2 mW       | 21         | 126 mW       | 37         | 5.0 W        |
| 6          | 4 mW         | 22         | 158 mW       | 38         | 6.3 W        |
| 7          | 5 mW         | 23         | 200 mW       | 39         | 8.0 W        |
| 8          | 6 mW         | 24         | 250 mW       | 40         | 10 W         |
| 9          | 8 mW         | 25         | 316 mW       | 41         | 13 W         |
| 10         | 10 mW        | 26         | 398 mW       | 42         | 16 W         |
| 11         | 13 mW        | 27         | 500 mW       | 43         | 20 W         |
| 12         | 16 mW        | 28         | 630 mW       | 44         | 25 W         |
| 13         | 20 mW        | 29         | 800 mW       | 45         | 32 W         |
| 14         | 25 mW        | 30         | 1.0 W        | 46         | 40 W         |
| 15         | 32 mW        | 31         | 1.3 W        | 47         | 50 W         |

Table 4 – dBm to RF Power in Watts - Cross Reference.

### 3.3.8 BPFM – Band Pass Filter Module

The DSPbR BPFM (Band Pass Filter Module) is band specific across the pre-determined bandwidth of the respective RFBE or RFFE. The BPFM is fitted and bolted into the output of the RFBE and input of the RFFE and is considered as an extension to the respective RFFE or RFBE module. Prior to assembly into a nominated slot, the BPFM has to be bolted into the respective RFFE or RFBE.

A 2.5mm Allen Key (Hex) tool is required to unfasten or fasten the two modules together as illustrated in Figure 10.

BPFM's are used to filter the input to the RFFE's and filter the output of the RFBE's. They are factory tuned to provide a 20MHz pass band and NOT considered field tuneable. No attempt should be made to tune or optimise tuning of this filter.

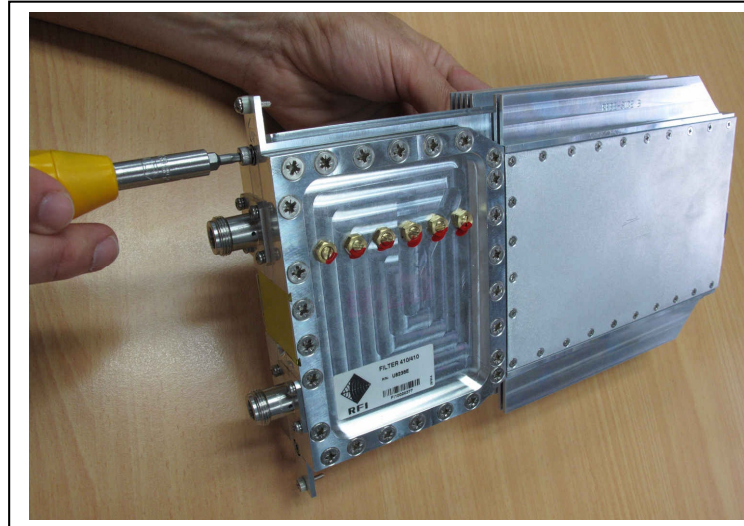


Figure 10 – Bolting RFFE or RFBE onto BPFM

An arrow with the letters “UP” on the rear face indicates the module orientation.

### 3.3.9 Cxxx-8 - 8 Ch Internal Combiner Filter Unit.

The 8-Ch combiner filter unit footprint is across all 8 contiguous RFBE channels, effectively covering 4 slots. The combiner incorporates built in isolators, a hybrid coupler combiner and a 20MHz wide band pass filter. Typical insertion loss figure for the 8-Ch combiner inclusive of internal filter is 11.5dB. Although the combiner is not frequency sensitive within the full 20MHz fixed bandwidth, the combiner is frequency band specific and must be ordered accordingly.

A single sub rack frame can accommodate two x 8-Ch combiner filter units, one for uplink and one for downlink.

The 8-channel combiner filter unit fits within the spatial confines of the 4RU sub rack frame. The combiner output connector is an N female.

Please refer to the maximum output power settings of the RFBE when using an 8-Ch combiner filter unit as detailed under chapter 3.3.7 and illustrated in Table 3.