received via SMS, the recipient can access the alarm details on the Alarm Status page via the web browser GUI interface.

Customised SNMP Alarm "North Bound" traps and/or an intermediary Alarm System Manager (AMS) can be made available in a firmware revision. Should you wish to discuss this further, please contact our offices.

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By loading any product related Firmware you agree without reserve with all the conditions as detailed in this RF Industries Firmware License Agreement.

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9. Maintenance

9.1 Access

Access to the DSPbR should be restricted and access notification (door contact) can be generated via an SMS using one of the external alarm interfaces. Refer to Figure 22 – Alarm Interface circuit diagram and the Alarm Configuration page in the GUI.

9.2 Module Replacement

The CSC will auto configure RFFE or RFBE modules of the same type if replaced into the same slot as a previous RFFE or RFBE module. If the type / band is different, a manual configuration will be required. The DSP module can also be replaced whilst the DSPbR is powered, however all communications will be interrupted until such time as the DSP module is connected back into service within the sub rack frame.

9.3 Module replacement self check

To confirm connection and operation of a replaced or new DSP, RFFE or RFBE module, connect to the DSPbR via the required web browser log in and navigate to the hardware configuration page under the status tab.

For quick reference, the LCD panel on the front of the CSC module will indicate modules detected and enabled through the sequence described under Chapter 5.4

9.4 PSU Resettable circuit breaker and replaceable fuses

For detailed information on replacing the internal replaceable PSU fuses, please refer to Chapter 3.3.2 of this manual

An AC mains supply resettable circuit breaker is mounted on the front of the DSPbR between the two fans. There is no fuse replacement required. Should this AC resettable circuit breaker "pop-out" under operational conditions; a PSU failure alarm will be activated. It is strongly recommended that before the circuit breaker is reset, an investigation be made as to the possible reasons why the circuit breaker was activated.

9.5 Fans and Fan filters

Both front mounted cooling fans have removable dust filters, which will require periodic cleaning. These filters are accessible from the front of the DSPbR buy carefully levering off the plastic fan covers by hand.

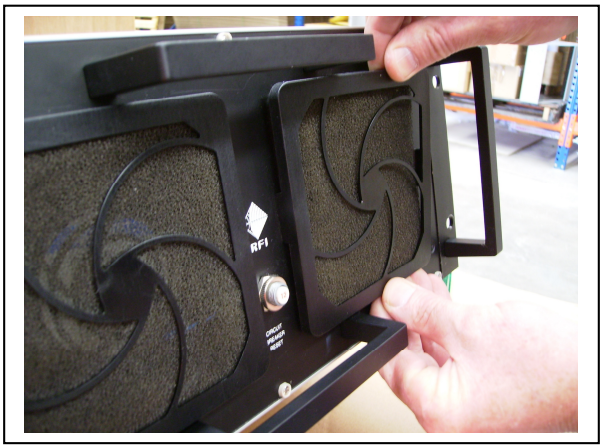

Figure 28 – Fan cover removal

No special tools are required to remove the plastic fan covers and dust filters. A mild soap wash and dry should be sufficient to clean the dust filters. Should they be perished in any way, please replace them. The fan dust filter part number is located under the part number section of this user manual.

9.6 RF input and output port identification

It is very important to identify and mark for future reference the input ports on the BPF / RFFE modules and output ports of the RFBE / BPFM's.

These ports are allocated during the uplink and downlink channel configuration procedure via the GUI; refer to the Individual uplink and downlink channel configuration pages. A better understanding of the configuration options in terms of slot architecture is detailed in examples given in annexure A.

The configured port allocations can be viewed on the Individual channel status pages.

Removable yellow plastic label cards are inserted into recessed apertures at the rear of the DSP, BPFM's attached to the RFFE and RFBE modules. This marking system has also been made available on the TLM modules where they are used in the place of BPFM's for the RFBE's.

Use a black fine tipped permanent marker to write the respective port allocations on the yellow plastic label cards. It is advisable to do this only after a successful configuration upload.

The upper port is on the left hand side of the BPFM module is Side "A" (looking at the back of the DSPR from the rear) and the lower port on the right hand side of the module is Side "B"

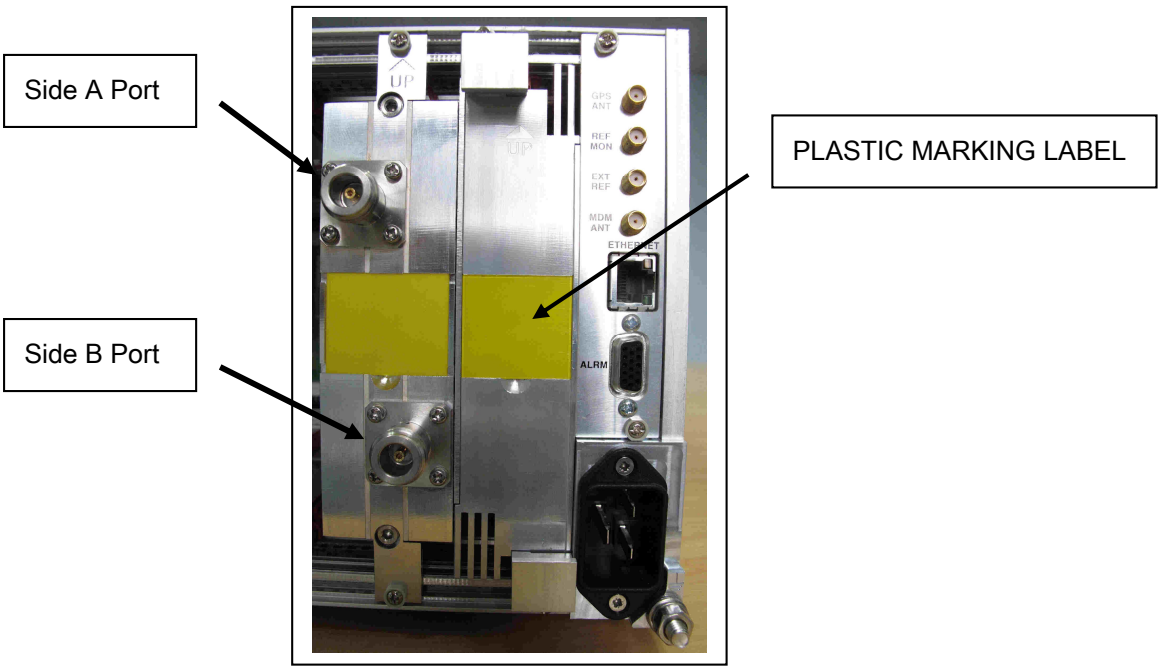

Figure 29 – User Defined Yellow Label Marking System

10. DSPbR ancillary equipment and spares part numbers

Item	Description	Part Number
1	Dust Filter – Fan (pair)	DR1011A
2	Plastic Cover – Fan (pair)	DR1012A
3	Mains Power Cord 110VAC IEC320-C19. (USA)	DR1063A
4	Mains Power Cord 240VAC IEC320-C19. (Australia)	DR1062A
5	Jumper Cable – Standard Ethernet 2m, 2 x RJ45 Conn	DR1051A
6	Cell Modem Kit - Multi-band.	DR1031A
7	Fuse – 10A Med delay 20x5mm AC PSU	DR1074A
8	Blanking Panel – Open Slot	DR1013A
9	Label Kit - Yellow Reusable labels (pkt 12)	DR1014A
10	Antenna GPS Active	DR1032A
11	Antenna Multi-Band Cell Modem 800-2100MHz	DR1033A
12	User Manual CD	DR1091A
13	Jumper Cable RG142 50Ohm 500mm RG142. 2 x SMA (M)	DR1034A
14	Jumper Cable 500mm 2 x RJ11	DR1052A

Table 5 - Ancillary Equipment and Spare Part Numbers

Recommended spares listing

For a single sub rack DSPbR system, the recommended spares will be as follows;

1	4RU Sub Rack Frame Assembly (common for all PSU and band options)
2	PSU inlet module DC 48V AC110V AC240V
3	PSU 48V DC 110-240VAC Mains
4	CSC Master
5	DSP 4 Ch 8 Ch
6	RF Gen + Aux RF Gen + Aux + Modem
7	RFFE

	410+410: 400-420MHz Side A and Side B 460+460: 450-470MHz Side A and Side B 480+480: 470-490MHz Side A and Side B 815+815: 805-825MHz Side A and Side B 860+860: 850-860MHz Side A and Side B 815+860: Side A 805-825MHz Side B 850-860MHz
8	RFBE 410+410: 400-420MHz Side A and Side B 460+460: 450-470MHz Side A and Side B 480+480: 470-490MHz Side A and Side B 815+815: 805-825MHz Side A and Side B 860+860: 850-860MHz Side A and Side B 815+860: Side A 805-825MHz Side B 850-860MHz
9	BPFM 410+410: 400-420MHz Side A and Side B 460+460: 450-470MHz Side A and Side B 480+480: 470-490MHz Side A and Side B 815+815: 805-825MHz Side A and Side B 860+860: 850-860MHz Side A and Side B 815+860: Side A 805-825MHz Side B 850-860MHz
10	TLM
11	8-Ch Combiner & Filter Unit C410 (400-420MHz Band) C460 (450-470MHz Band) C480 (470-490MHz Band) C815 (805-825MHz Band) C860 (850-870MHz Band)

Table 6 – Recommended Spares Listing

Note: Only one RFFE or RFBE replacement module per band is recommended where more then one module is used.

Please note: RF Industries has a broad duplexer, external combining and antenna product range to support the DSPbR. Refer to our on-line product information www.rfi.com.au or contact our sales office directly

11. FAQ's

Connectivity:

TCP/IP Ethernet connection

Q: Is a standard or crossed Ethernet jumper cable used to connect a laptop/notebook directly to the DSPbR?

A: A standard Cat 5, 5e or 6 jumper cable terminated both ends with RJ45 termination connectors is required to connect between the laptop/notebook Ethernet port and either Ethernet ports (front or back) on the DSPbR. RFI provide a 2 metre jumper cable in the packing box with the DSPbR.

GUI Interface

Compatible Web browser programs

Q: What web browser programs are compatible with the on-board web server?

A: All standard web browsers used on OS platforms such as Windows, Linux and Mac.

Q: In an expanded sub rack frame configuration, will the Master GUI interface communicate and configure modules within the added Slave sub rack frames?

A: Yes, this is the intention but the current Baseline 1.0 GUI cannot manage multiple sub rack frames. A GUI firmware upgrade to enable multi-sub rack configuration will be an upgradable feature into this Baseline 1.0 version when available.

RS232 and USB Interface

Q: What is the RS232 and USB interface on the front panel of the DSPbR CSC used for?

A: Currently, only Command Line Interface (CLI) is available through the RS232 and USB connection interfaces. It is planned to provide the GUI (Web Server) interface through the RS232 and USB interfaces, which will be an upgradable feature into this Baseline 1.0 version.

SNMP Interface

Q: Will the DSPbR be able to send SNMP traps?

A: The current generation of DSPbR (baseline 1.0) will not have SNMP Agent functionality and therefore not be able to send North Bound SNMP traps, which will be an upgradable feature into this baseline version when available. SNMP traps can however be generated from an AMS which receives the SMS messages and converts them to SNMP traps. The server (agent) for the SNMP trap generation sits on the customers IP Network. This bridging feature however requires a fair amount of customisation.

Cellular Modem

Q: Is the internal battery back-up supply located in the CSC, used to provide back up power to the cellular modem or will this require an additional dedicated battery back up?

A: The single backup battery supplies power to both the controller and the cellular modem.

Configuration via SMS

Q: Can the DSPbR be configured using SMS messaging?

A: No. This feature is not available in Baseline 1.0.

Modules

General

Removing and inserting RFBE and RFFE modules into the respective slots when the DSPbR is "on".

Q: What will happen if either an RFFE and/or RFBE is removed or re-inserted whilst the DSPbR is on?

A: The RFFE's and RFBE's are designed to be removed and inserted whilst the DSPbR is "on", hence the term "Hot Swappable". Once inserted the module will communicate with the controller and establish its identity. The CSC will then auto configure the new or replaced module based on the previous module's configuration if it is the same type of module and same slot.

Q: What will happen if either the DSP or Ref Gen + Aux modules are unplugged and re-inserted?

A: When you unplug the Ref Gen + Aux module, the system will lose reference and go into stand-by and then go back live when you plug the Ref Gen + Aux back in. Similarly, when you unplug the DSP module the system will go quiet and resume normal operation about a minute after you have the DSP module back in.

RFFE

Q: Can an RFFE module be configured for a single band / single board only?

A: Yes. Simply installing only one side, Side "A", of the RFBE module with a single band RFFE board will provide functionality for either a single uplink or downlink band or in rare cases provide both up and downlink RX paths through the same board.

Q: Can Uplink and Downlink RFFE boards in different bands be paired within the same RFFE module?

A: Yes, this is possible, however providing a back-to-back BPFM's is more the challenge and therefore this option is not currently available.

RFBE

Q: Can an RFBE module be configured for a single channel?

A: Yes. Simply installing only one side, Side "A", of the RFBE module with a single channel RFBE board. Side "B" will be void of a channel. The disadvantage of this is should you wish to increase the number of repeated channels in the future, either the RFBE module it returned to factory for retrofit of the second RFBE board into Side "B" or a second module with both sides populated is purchased and installed. The second more economical approach is to install a module with both sides installed and disable the second channel, leaving it as a back-up channel.

Q: Can uplink and downlink RFBE boards be paired within the same module?

A: Yes, this is possible, not only in the same band but in two different bands, i.e. where frequency translating is used. Please note that the bolted on BPFM has to correspond.

Setting the Uplink and Downlink RFBE RF output power levels

Q: Can the RF output power levels of any channel be set within a dB?

A: Yes! The incremented RF output power levels on any channel can be adjusted in 1dB steps from +30dBm to +45dBm. When an internal 8-Ch Combiner Filter Unit is fitted, this power level is adjusted according to the provided table under Chapter 3.3.7 RFBE Back End Module of this User's Manual

Q: Is the indicated level in dBm via the GUI, the actual output power level at the external connector at the rear of the DSPbR?

A: No! This indicated power level is the output from the RFBE module within a +/- 0.5dB margin. This level is then fed either via the TLM (Through Line Module) or BPFM (Band Pass Filter Module) with the respective losses, which have to be added to estimate the output power at the rear of the DSPbR.

TLM approximate loss – 0.25dB, BPFM approximate loss – 1.2dB. Should an internal combiner module be used, this would add an additional +/- 11dB of loss to the RFBE output figure.

Ref Gen + Aux

GPS Receiver

Q: How can it be ascertained whether the GPS clock reference disciplining has been activated and locked?

A: When an active GPS antenna is connected to the appropriate SMA (F) port on the Ref Gen + Aux module, the connection is auto-sensed. Should there be no GPS disciplining of the reference clock, a minor alarm will be raised.

Q: Is it possible to locate the DSPbR's position in the field via the GPS Receiver.

A: This facility has not been facilitated within the current DSPbR version.

External 10MHz clock reference:

Q: How is the external 10MHz clock reference initiated and checked to see if it is locking the clock reference?

A: The external 10MHz signal reference is enabled via the Web browser GUI interface on the Systems Configuration page. Should the tick box be ticked and a locked signal not evident, then a minor alarm will be raised.

Q: How is the 10MHz clock reference carried to the Ref Gen + Aux modules of additional "Slave" sub rack frames?

A: Using a 50 Ohm coaxial jumper cable +/- 500mm in length terminated with SMA Male connectors. These are daisy chained Ext Ref input to output.

CSC

Front mounted LCD Display

Q: Is there a backlight on the LCD display for dark environments?
A: Yes.

Q: How is the backlight activated?
A: By pressing the Mode Button located immediately underneath the LCD.

Q: What happens to the LCD display and backlight if the AC or DC power is turned off,
A: The LCD display, backlight and information is powered by the backup battery for as long as it provides sufficient power.

Q: What are the functions of the LCD display?
A: When the DSPbR is switched on the RFI Logo is displayed with a backlight on for up to 45 seconds.
After this initial period, the logo stays on and the backlight turns off. Pressing the Mode Button once will activate the backlight. With sequential Mode Button pressing, the following real time current information is written and displayed within the 4 lines of the LCD screen

Second Press: Current IP Address/Subnet /Gateway/MAC address
Third: Set Date and Time
Fourth: PSU rail voltage / battery voltage
Fifth: Modules detected and enabled
Sixth: Module temperatures
Seventh: RSSI levels per channel

Q: In which module are the back-up batteries located?
A: In the CSC module.

Q: How can the condition of the internal back up battery be checked?
A: The internal backup battery voltage reading is currently available through the front panel LCD screen.

Q: Would the back-up batteries require periodic replacement?
A: The back-up batteries are trickle charged when in service and meant to last the lifetime of the unit. They are not considered field replaceable.

Q. How is the back up power supply in the CSC module enabled once the unit is installed in the field?
A: Via a tick box on the system configuration page of the GUI interface

Q: How is the CAN bus connected between the respective sub rack frames in a multi rack configuration?

A: Via an RJ11 connector jumper cable from the CSC–Master to the CSC-Slave modules in the preceding racks.

Q: Are the CSC-Master and Slave modules connected using the RJ11 jumper from the front of the sub rack frame?
A: Yes. Only the CSC–Master has a single RJ11 termination connector. The CSC-Slave units have 2 x RJ11 connectors to allow for daisy chaining.

DSPbR Slot Architecture

Please refer to appendix "A" the section of the DSPbR User's Manual, illustrating slot architecture configuration possibilities.

Q: Is there a preferred order in which the slots are populated into the DSPbR
A: There is a preferred order for populating the available slots within the DSPbR. This is however dictated to by whether the DSPbR has been configured to use either "internal" uplink or downlink RFBE output combining and prepared for single or multiple channel operation.

Q: Will all slots take any module?
A: No. Not all slots accommodate any module. Slots 1 to 8 accommodate RFBE's and Slots 9, 8 or 7 accommodate RFFE's in that order and Slot 10 accommodates the DSP module. Slot 9 only accommodates and RFFE module.

DSPbR Channel / Band Expandability

Q: Is it possible to expand past the single band 8-Channel configuration maximum of one DSPbR sub rack frame?
A: Yes, a second, or third Slave DSPbR sub rack frame can be added to a Master DSPbR sub rack frame. This is achieved by extending the CAN bus of the Master CSC Controller via a RJ11 terminated jumper cable connector at the front of each sub rack frame. This in turn is daisy chained between the Slave CSC modules in the respective extension sub rack frames.

Q: What minimum module configurations are required for the Master and Slave DSPbR sub rack frames when utilising CAN bus extended connectivity?
A: Each band RFFE extended into the Slave sub rack frames must be duplicated within the respective sub rack frames feeding the RFBE's. The PSU, DSP and REF GEN modules are also duplicated within each sub rack frame.

Q: When a slave (2nd DSPbR) unit is used to add additional channels to the first 8 channels on a DSPbR, does the second unit have its own MAC address?

A: Only the master CSC module has an Ethernet controller and therefore IP and MAC address.

Q: In as much as the slave CSC will not be communicated to directly via a TCP/IP interface when additional sub racks are daisy chained, can we assume full functionality of master and slave units through the Master CSC TCP/IP interface?

A: Yes.

Alarm Communication and Management

Interface for internally and externally generated alarms;

Q: How are the DSPbR internal alarm conditions presented?

A: Internally generated alarms are presented via galvanically isolated N/O , N/C and C/P relay contacts via the DB15 socket connector at the rear of the DSPbR on the Ref Gen + Aux module. There are two relay's, one allocated critical alarms, the other minor alarms.

Q: How are external alarms interfaced into the DSPbR and how are they communicated?

A: External alarm high impedance input requires grounding to trigger the alarm, which is hardwired via the DB15 socket connector at the rear of the DSPbR on the Ref Gen + Aux module. A change in this state triggers an alarm condition which is indicated via the GUI interface and when a cell modem is fitted, via an SMS to appointed recipients. There are four available external alarm inputs.

Temperature measurement and front mounted cooling fans:

Front mounted cooling fans

Q: Do the front mounted cooling fans require any maintenance?

A: There are washable dust filter elements located under the front plastic covers at the opening aperture of both fan assemblies. The plastic filter covers can be removed by hand.

These filters can be periodically removed and washed in warm, mild soapy water, rinsed thoroughly, dried and replaced. Should the filter elements be torn or degraded in any way, they will require replacing. Please do not replace these filters with any other filter type. This may inhibit airflow and significantly increase the operating temperature.

Q: What are the replacement part numbers for the plastic fan covers and dust filters?

A: Refer to chapter 10. DSPbR ancillary equipment and spares part numbers, where these parts are listed.

Q: can the DSPbR measure the ambient room or enclosure temperature?

A: There is no specific ambient temperature sensor provisioned for the DSPbR, however the Ref Gen + Aux temperature sensor would be the most representative of the ambient air temperature.

Q: Where are the temperature measurement points within in the DSPbR

A: Within each RFBE, RFFE, in each PSU Inverter, at either end of the PSU heat sink, DSP module and Ref Gen + Aux module.

Q: If the temperature within an inverter goes too high, will the inverter automatically shutdown?
A: Yes

Q: What temperature sensor or sensors drive the fan speeds?
A: The fans' speed is dependent on the hottest module (RFBE or DSP) in their corresponding corner.

Q: Does the DSP, CSC and Ref Gen + Aux modules have temperature-sensing capability?
A: All modules except the CSC have temperature sensors.

Q: Is there there a minimum temperature consideration that is measured and alarmed?
A: No, however low temperatures can be measured and if required could be alarmed past pre-determined limits. As the unit when on will be generating a certain amount of heat and the operational temperature range exceeds –30 deg C it is very unlikely a functional unit will go below a minimum temperature.

Q: What thermal protection is provided to the PSU?
A: There is a thermal shut down capability within each rail voltage inverter within the PSU.

AC Mains Power Supply

Front mounted AC circuit breaker.
Q: Is there a specific alarm raised when the front mounted resettable AC Circuit breaker is tripped?
A: Yes, this would trigger a major fault alarm as the AC mains power would be disconnected.

Q: What would the maximum current draw be when powering the DSPbR from a 110V AC power source?
A: 14 Amps fully loaded and operating at max power (no internal combiner) on all channels.

Q: What would the maximum current draw be when powering the DSPbR from a 240V AC power source?
A: 7 Amps fully loaded and operating at max power (no internal combiner) on all channels.

Q: What is the part number and length of the recommended 110VAC mains cord?
A: AP9872, 8.2-Ft (2.5 meter) AC Power Cord IEC 320 C19 to NEMA 5-15P

Q: What is the part number and length of the recommended 240VAC mains cord?
A: K3744-315 3.0 metre 2.5 x 1.50mm^2 Black15 Amp.
Note: The Mains power cord is commonly referred to as an IEC320-C19 Power cord.

Q: Is a special wall mount socket required for the 240VAC mains cord to plug into?

A: Yes, a 15Amp flat earth rated socket is required, fed from a 15 Amp circuit breaker. Note: In Australia, the standard mains wall socket is rated at 10 Amps and has a smaller flat earth socket insert then the 15 Amp rated version.

Q: Is the primary mains power supply fused and are the fuses changeable?
A: Yes, the primary mains AC power supply is fused for both 110VA and 240VAC versions. Essentially the PSU is the same for both 110V AC and 240VAC primary voltage versions, however the Power Inlet Module is different. Three AC fuses are located on the PSU module, which in turn is mounted into the 19" rack front mounting panel. The fuses are marked as "Inverter fuse 1", 2 and 3. All three fuses are accessible by loosening the relevant six front panel mounting screws as illustrated in the photograph and sliding the PSU unit out far enough to disconnect the power cable and remove the PSU unit in order to safely inspect and replace where necessary any of the fuses.

Q: What alarm condition would be expected should any one of the three PSU fuses blow?
A: Primary AC PSU Inverter 1 / 2 or 3 failed.

Q: What is the specification for the replacement fuses?
A: All three replaceable fuses are the same, Refer to RFI Spare parts listing within this DSPbR's User's Manual. Alternative fuse specification – Littelfuse Part no 0234010.P Cartridge 10A medium delay 20mm x 5mm OD ceramic fuse.

Q: How should the DSPbR be connected to an AC power source?
A: In Australia, it is recommended that the provided 3 metre IEC320-C19 power chord is plugged into a dedicated 15 Amp rated flat earth and switched AS/NZ 3112 specified mains socket, and that this mains socket is fed via an independent 15 Amp rated "D" curve circuit breaker.

A: In the USA, it is recommended that the provided 2.5 metre IEC320-C19 to 5-15P power cord is plugged into a dedicated 15 Amp rated and switched mains socket, and that this mains socket is fed via an independent 15Amp rated "D" curve circuit breaker.

Q: Is there an ON/OFF power switch on the DSPbR?
A: No, the DSPbR has no ON/OFF switch either on the front, nor the rear, it is recommended that the DSPbR is powered up and down via the wall socket mains switch into which the power cord is plugged. Alternatively via a circuit breaker, which feeds only the DSPbR repeater mains wall socket.

Q: Should the RFBE or RF combiner output connectors be terminated prior to switching the DSPbR on?
A: Yes. It is important, although there is an isolator in circuit, to protect the RFBE PA's (RF Power Amplifiers) that the outputs are all terminated into either the desired coax cable and antenna or 50 Ohm termination load.

Q: Is it necessary to terminate the RFFE (RF Front End) prior to switching the DSPbR on?
A: No, this is not necessary.

Q: Once the repeater has been connected and AC or DC power is supplied to the unit how long will it take to boot-up and initiate the RFBE's (RF Back End RF power amplifiers)
A: Approximately 45 seconds

DC Power Supply

Connecting the DSPbR Repeater to a DC power source

Q: How should the DSPbR be connected to a DC power source?
A: Via the 85Amp rated Phoenix HDFK 16A connector block situated at the rear of the DSPbR sub rack frame underneath the Ref Gen + Aux module using 6AWG gauge +ve / -ve identifiable cable for a 24VDC source and 10AWG cable for a 48VDC source.

Q: What is the estimated current draw using a primary 48V DC supply with all downlink RFBE's set to +45dBm and uplink +40dBm?
A: 2 Channel Bi-directional DSPbR – 9 Amps, 4 Channel Bi-directional DSPbR – 15 Amps, 6 Channel Bi-directional DSPbR – 23 Amps, 8 Channel Bi-directional DSPbR – 30 Amps

Earthing

Q: What earthing facility is provided on the DSPbR?
A: A dedicated M6 earthing stud is provided on the bottom right hand side looking at the DSPbR from the rear. We recommend the use of a 16mm² green and yellow sheathed copper cable terminated with a crimped 16mm² / M6 hole cable crimp lug.

12. Appendix

Appendix A – DSPbR Slot Architecture – Typical Configurations