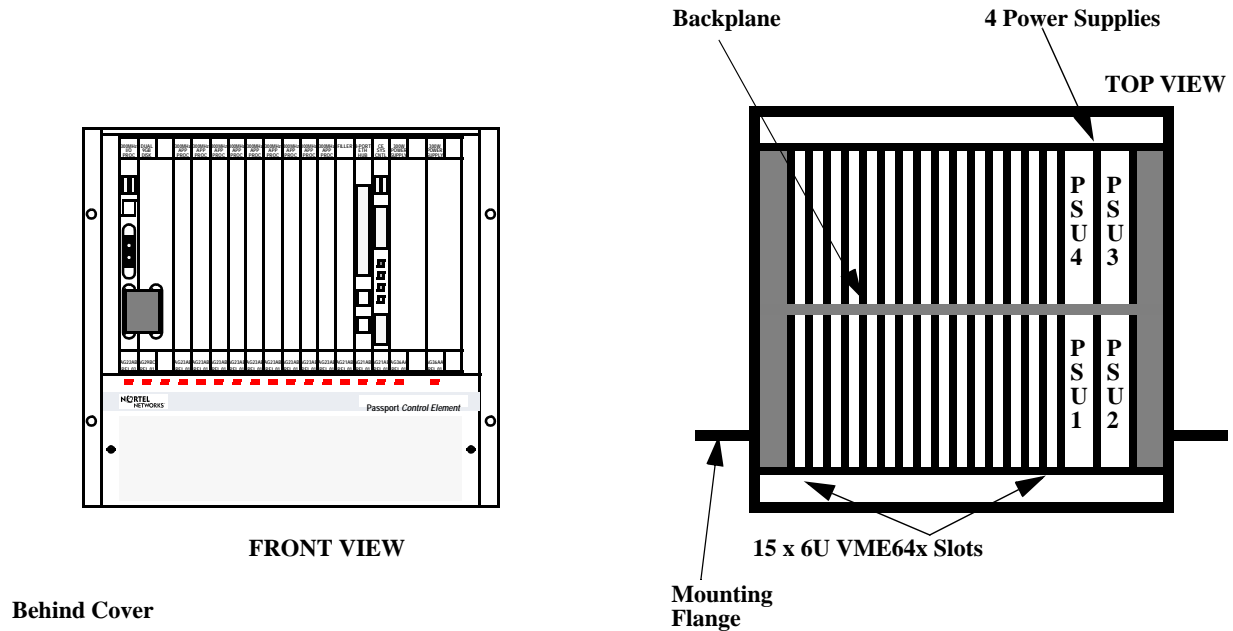

1. Backplane Power Distribution

1.1 Backplane Attributes

Figure 1: Overview of Shelf Architecture



Behind Cover

1.1.1 Overview

The backplane has the following attributes:

- Fifteen VME64 Extensions (ANSI/VITA 1.1) slots with P1, P2, and P0 and active terminators
- Transition module connectors are shrouded as per ANSI/VITA 1.1
- All P0 connectors are pinned-out as per ANSI/VITA 1.1 (a 5 x 19 matrix of User Defined pins with two outer rows of shielding pins in a standard 2mm HM connector)
- All non-User Defined pins are pinned out as per ANSI/VITA 1.1 — see section *1.1.2.1 Primary (-48Vdc/-60Vdc nom.) Supplies* for information on +V/-V slot power requirements
- All User Defined pins on slots 1 through 13 are left unconnected
- Slots 14 and 15 have backplane connections to their User Defined I/O
- Two double wide slots are dedicated to power converters — two in the front and two in the rear
- The backplane has three primary feeds: A, B, and Common. Each feed has a 20Adc max. rating (and therefore must be designed to carry 200% or 40A of current as per section *1.1.3 Power Distribution Safety Requirements*). Also see section *1.1.2.1 Primary (-48Vdc/-60Vdc nom.) Supplies* for more information
- Provides redundant primary power feeds (A and B) to the Fan Unit power modules (2A max.)

1.1.2 Backplane Power Distribution

1.1.2.1 Primary (–48Vdc/–60Vdc nom.) Supplies

In all VME64x slots, the primary voltages are brought to P1 as per ANSI/VITA 1.1; however, both the A and B feeds are brought to each card. In specific:

- Row D, pin 3 (+V1) is to be connected to Battery Return A
- Row D, pin 4 (+V2) is to be connected to Battery Return B
- Row D, pin 6 (–V1) is to be connected to Battery In A
- Row D, pin 7 (–V2) is to be connected to Battery In B

Each of these traces must be capable of carrying up to 1A; therefore, as per section *1.1.3 Power Distribution Safety Requirements*, they must be designed to 200% of that rating (2A). All primary voltage traces must also adhere to the the safety rules in section *1.1.3 Power Distribution Safety Requirements*.

The A and B feed power connections to the backplane are only rated to supply 20A max. (designed to handle 200% of 20A as per section *1.1.3 Power Distribution Safety Requirements*) — including all VME64x cards and the connections to the Fan Unit’s power modules. The design implication is that the A and B feed (–48Vdc/–60Vdc nom.) distribution traces on the VME64x portion of the backplane must be designed to carry 200% of 15A each (15 slots x 1A each); and the power distribution to the Fan Unit must be designed to handle 200% of whatever it is rated for (however, not to exceed 200% of 5A).

The connection to the power supplies is through a dedicated diode-ORed feed derived from the A and B feeds called the “Common” feed, and is independent of the above feeds. This feed is rated for 20A max. and must be designed to handle 40A as per section *1.1.3 Power Distribution Safety Requirements*. The only other connection for this feed is to Slot 15’s User Defined I/O for monitoring (no current carrying necessary).

Since the chassis itself is rated to 20A max. on each of the feeds, this means that both the common and the total on the A and B feeds can add up to 20A max. Nortel Networks’ choice of pack fill will ensure that the current ratings are not violated under worst-case conditions. Our preliminary investigations indicate that the Fan Unit will not draw more than 2A max., so the total worst case at –36Vdc will be under 20A for the chassis.

1.1.3 Power Distribution Safety Requirements

In order to meet the proper Bellcore safety requirements for power distribution it is necessary that the primary power input tracks (–36Vdc to –75Vdc In and –36Vdc to –75Vdc Return) comply with the following spacings and design parameters:

- Primary input voltage to logic ground or any secondary voltage must be spaced at a minimum of 0.060” on the primary and secondary surfaces/layers
- Primary input voltage to logic ground or any secondary voltage must be spaced at a minimum of 0.020” on inner layers
- All of the primary input tracks should be designed such they can handle 200% of the shelf’s nominal current rating to prevent overheating and track fusing during a fault condition
- Any layer that contains a primary voltage track should be separated from secondary voltage layers by a minimum of three layers of prepreg material to prevent an arc-over during the 1500V Bellcore safety test should an air bubble inclusion occur in a single layer

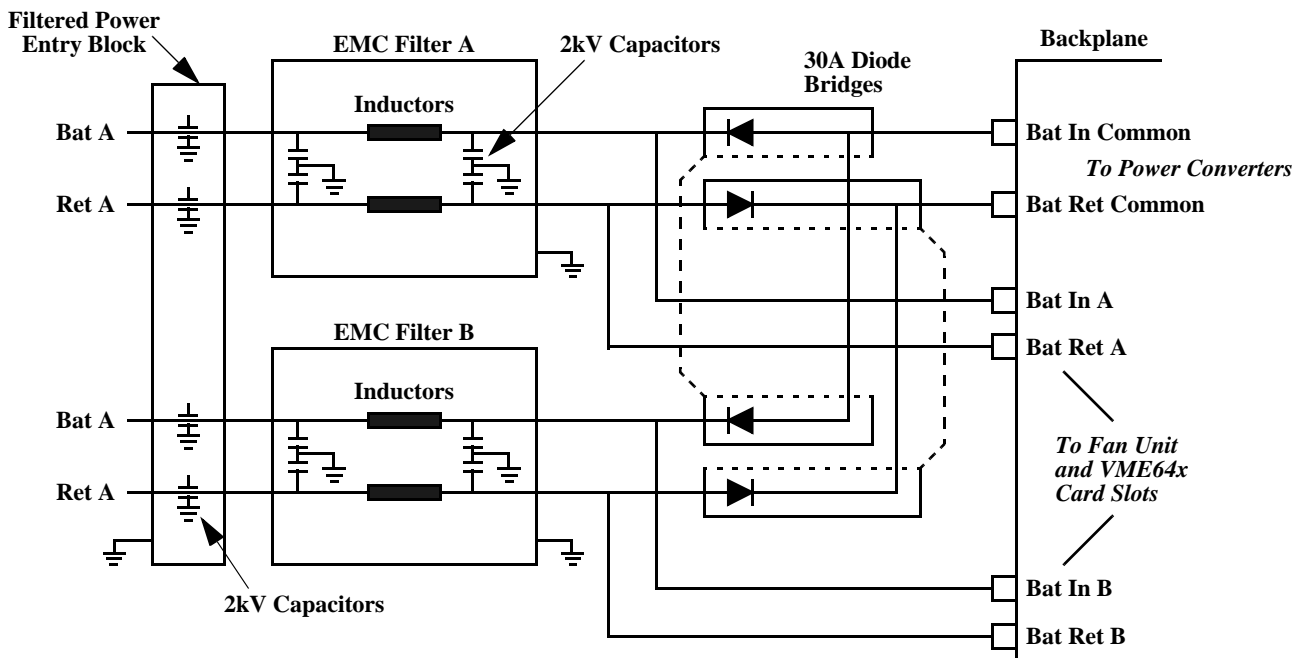
1.1.4 Conducted Emissions

Figure 2: Power Connectivity Schematic to Backplane illustrates placement of shelf level EMC filters and diodes relative to the backplane. It is assumed that all power supplies connected to the $-48\text{Vdc}/-60\text{Vdc}$ nominal power feeds employ an adequate level of filtering to control conducted emissions back to the battery. The filters being proposed are intended to allow the chassis to pass all relevant ETSI and Bellcore global requirements.

The Filtered Power Entry Block is a four-post block used for controlled power entry into the chassis and the control of high frequency conducted noise. For this filter to be effective, it must make good ground contact with the chassis — a BeCu wavy-style or functionally equivalent gasket between the block and the chassis is preferred to ensure all-over contact (as opposed to point contact). “Back of the envelope” calculations have suggested that a 1000pF value for the capacitors would provide an appropriate level of filtering. N.B. Bellcore requires 1500Vdc dielectric isolation between all primary voltage circuits and the chassis, thus the capacitors must be rated to 2kV or greater. This filter is intended to suppress E-field emissions in the 30MHz to 350MHz range.

The EMC Filters are intended to control conducted emissions especially in the 10kHz to 30MHz region as per Bellcore requirements. As with the Filtered Power Entry Block, these filters must have good ground contact with the chassis, and have 2kV dielectric isolation between the power feeds and the chassis. N.B. The EMC Filters should be located as close as possible to the Filtered Input Block.

Figure 2: Power Connectivity Schematic to Backplane



1.2 Chassis Power Distribution

All primary power circuits must be rated to carry 20A dc — both the A and B feeds, and Common feed to backplane. Also, all components should isolate the primary voltage circuits from the chassis ground to withstand at least 2kV . See section *1.1.2 Backplane Power Distribution* and *1.1.3 Power Distribution Safety Requirements* for more information on primary voltage power distribution in the system. However,

in summary, the A and B feeds are routed to the VME64x backplane and the Fan Unit, and the Common feed is routed to the four PPS-300D power supplies that plug into the backplane.

Figure 3: Chassis -48Vdc/-60Vdc Input Power Cabling

