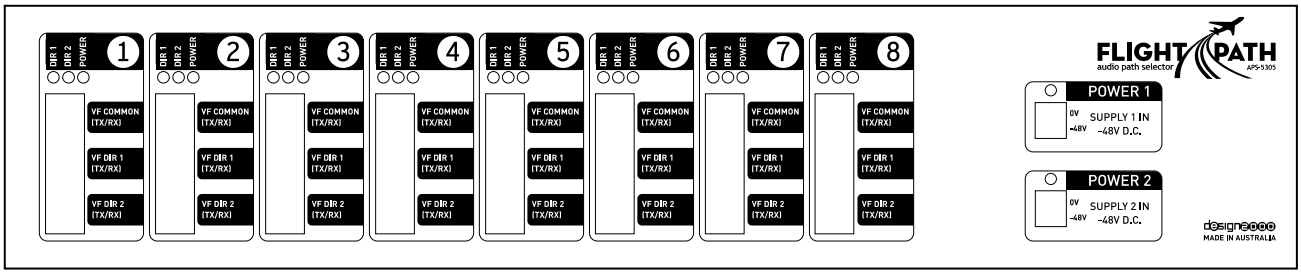

APS-5305
Audio Path Selector

>>>> INSTALLATION HANDBOOK

ACMA Supplier Code N468

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EXCLUSIVELY FOR

Airservices Australia

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Issue 1.3	26/10/2015	Minor updates Monday, 26 October 2015 9:59 AM as suggested by KJ.
Issue 1.4	27/10/2015	Document approved by Technical Authority
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Contents

FLIGHT PATH
audio path selector
APS-5305

1. Introduction

The Flight Path Audio Path Selector (APS) automatically switches between two 300 baud full duplex FSK audio signals for an Instrument Landing System. The system selects the strongest signal for maximum reliability and provides redundancy in the event of a fibre optic or twisted pair copper cable failure, or a power supply failure.

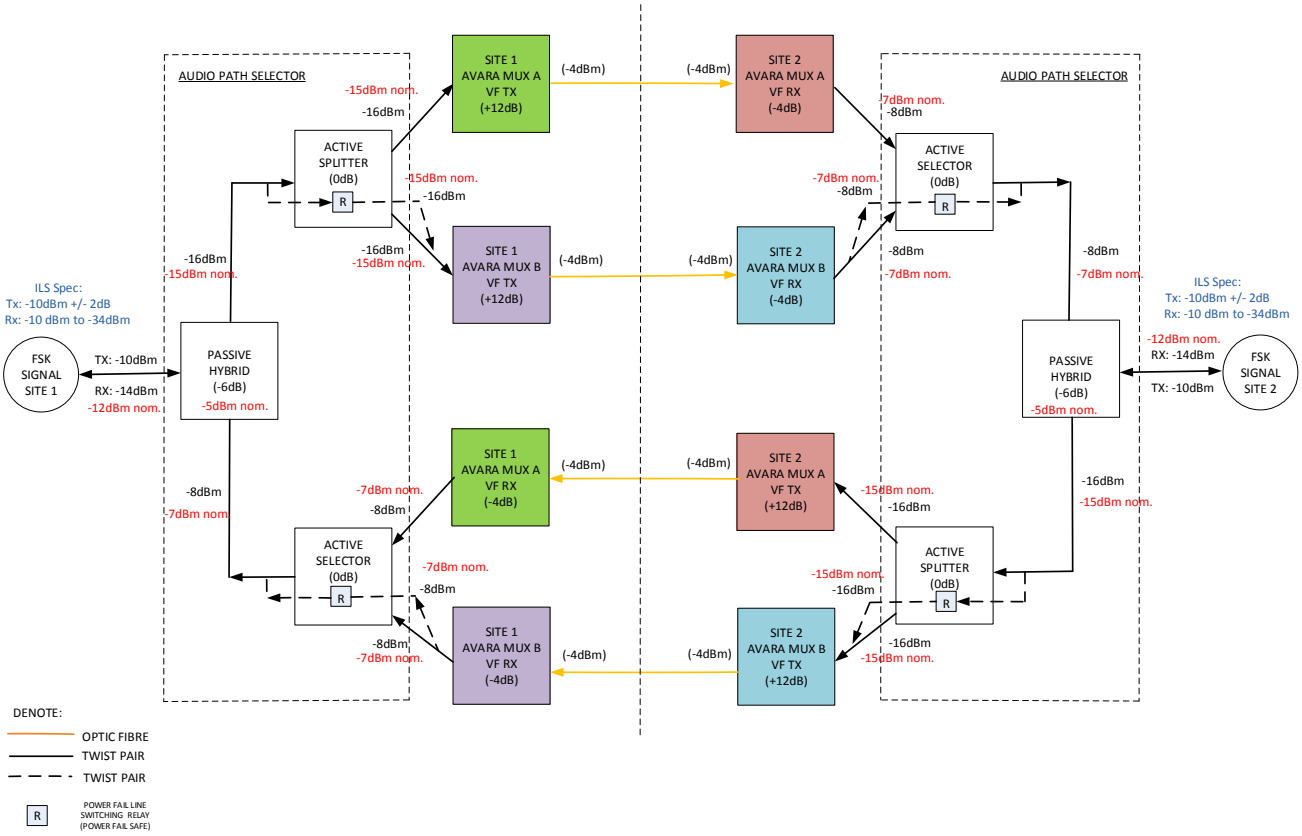


Fig. 1.1 FSK signal flow diagram

Each Line Card (part number PC-5305) combines a passive hybrid, an active splitter, an active selector, adjustable Tx and Rx gain amplifiers, and a digital signal processor (DSP). In a power fail situation the Line Card defaults to Direction 2 with a 6dB hybrid loss.

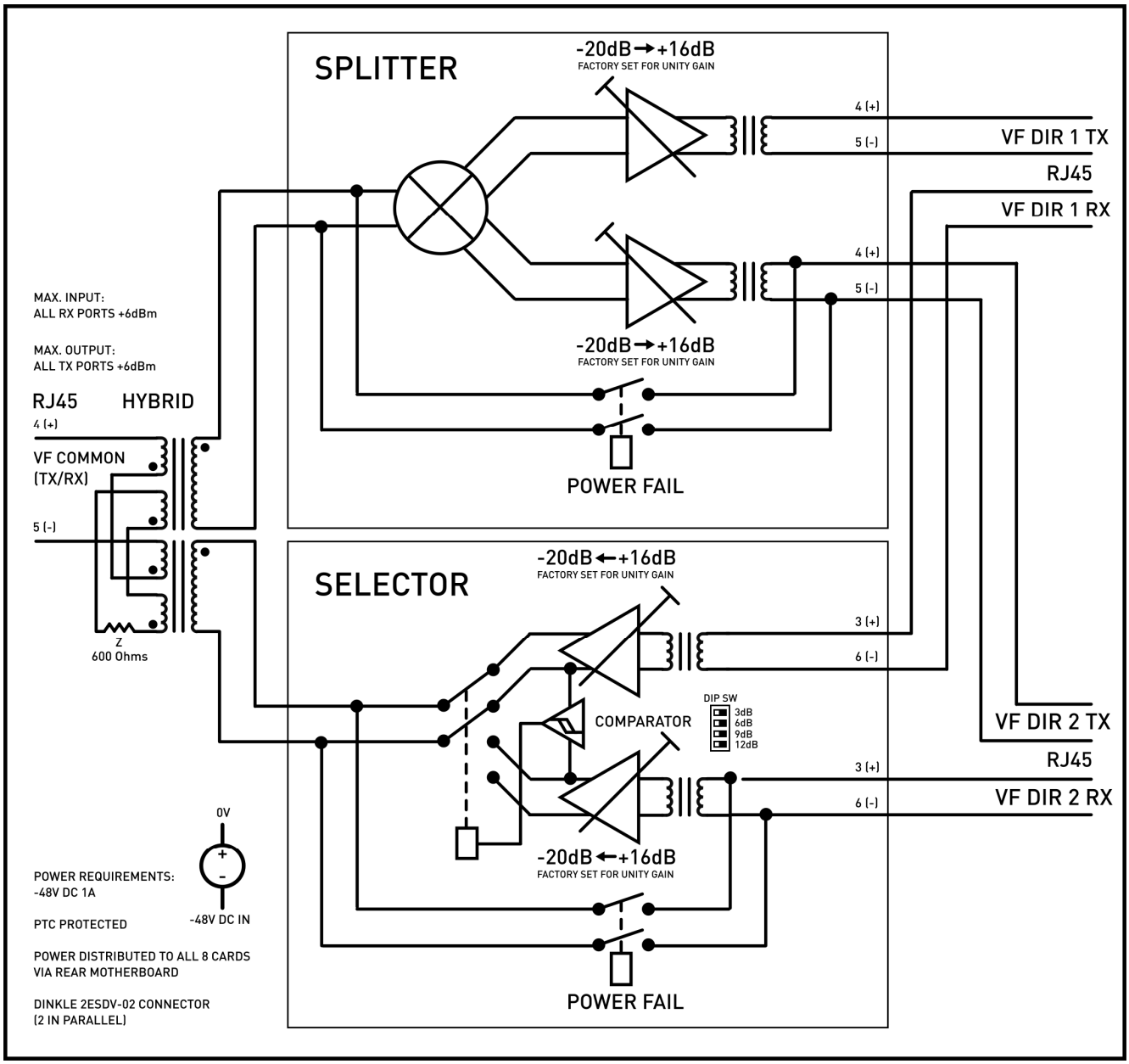


Fig. 1.2 APS block diagram

The Power Supply Card (part number PC-5306) has two (2) 48V to 24V d.c. converters providing power which is distributed via a back plane to each of the Line Cards.

A 2RU rack houses up to 8 Line Cards & the Power Supply Card.

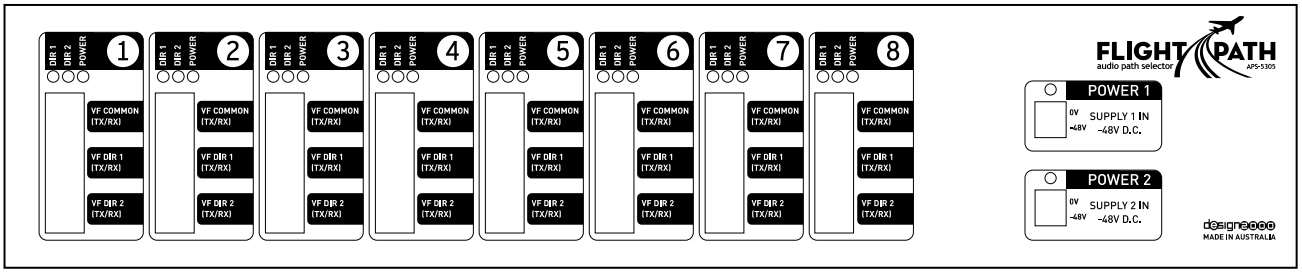
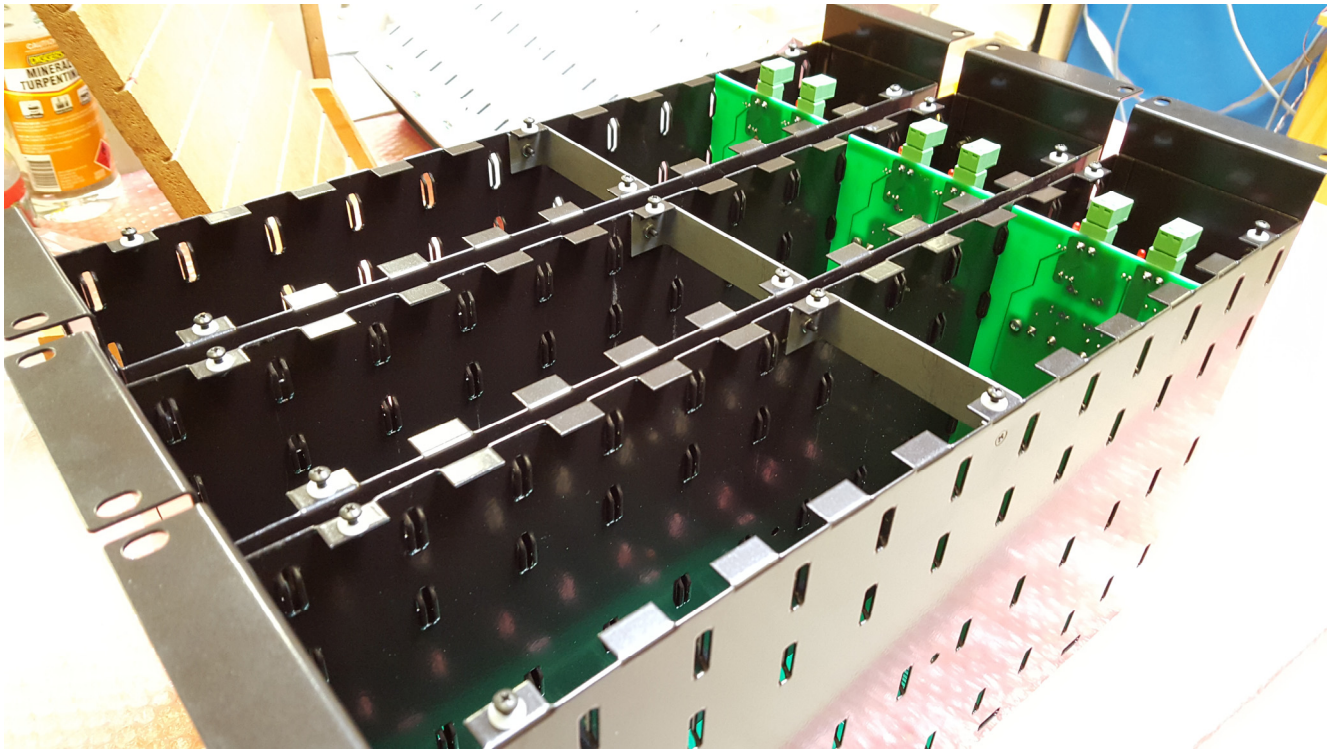


Fig. 1.3 Chassis front panel

2. Installation

2.1 Chassis RA-4757



The APS rack assembly is a 2RU high 19” chassis approximately 250mm deep. It is supplied with 2 mounting brackets which may be located for either front or rear mounting. There are also optional holes in the brackets allowing for the rack face to be set back for cable and connector clearance.

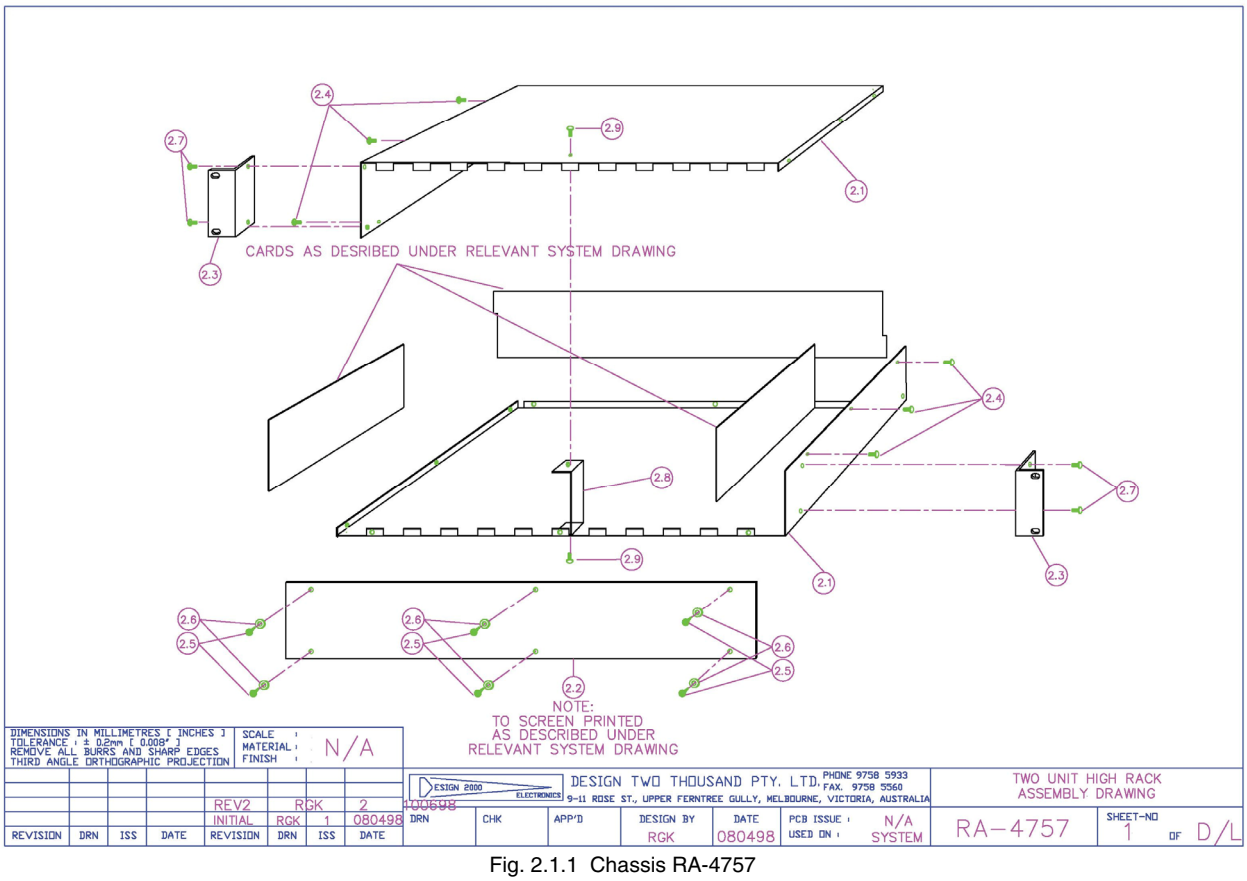


Fig. 2.1.1 Chassis RA-4757

The acrylic front panel attaches via 6 M3 screws & nylon washers. The acrylic front panel retains the cards within the rack and must be removed for card access.

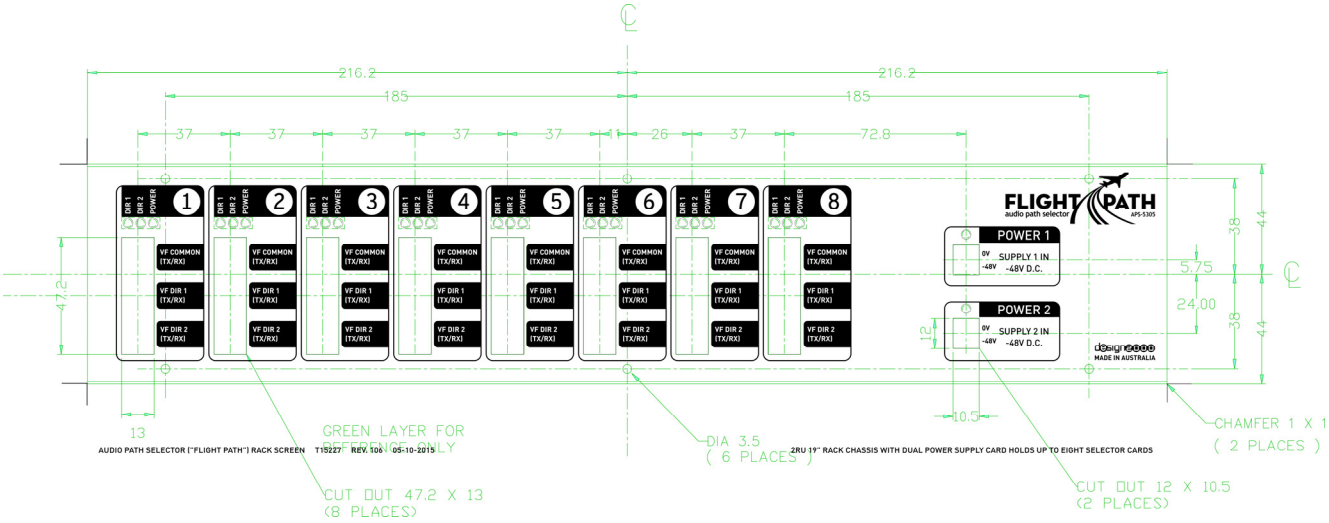
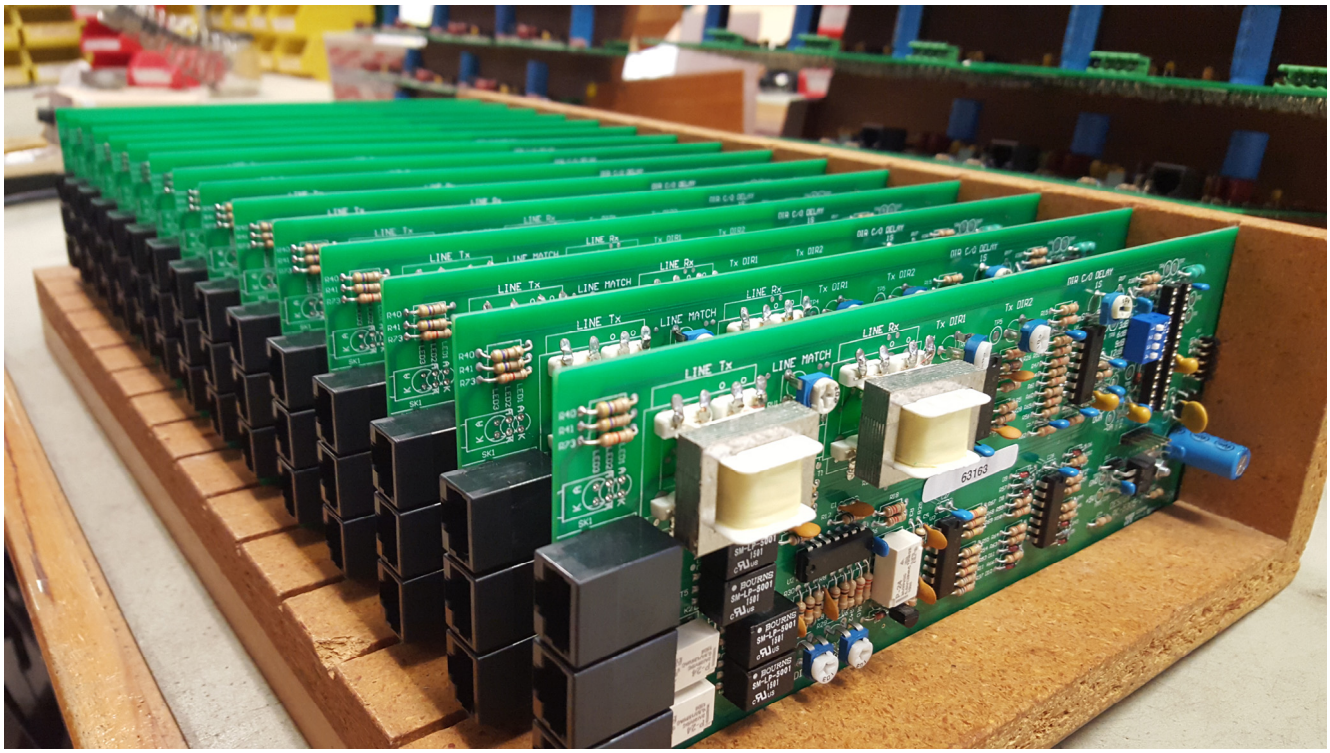
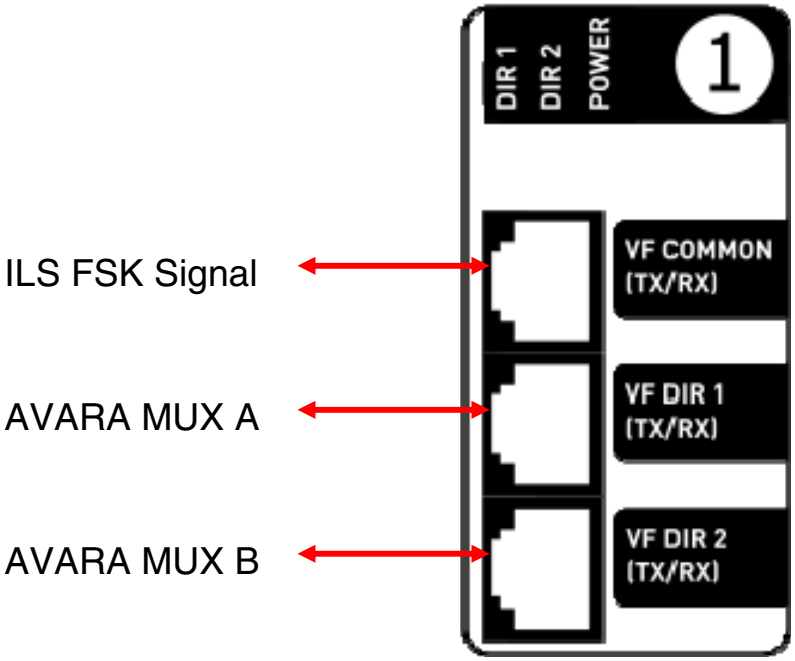


Fig. 2.1.2 Acrylic front panel

2.2 Line Card PC-5305



Connections to the APS Line Card RJ45 connectors are made as follows:



2.2.1 RJ45 Pin-outs

VF COMMON

Pin Number	Description
1	
2	
3	
4	Tx/Rx audio (+) to/from modem
5	Tx/Rx audio return (-)
6	
7	
8	

VF DIR 1

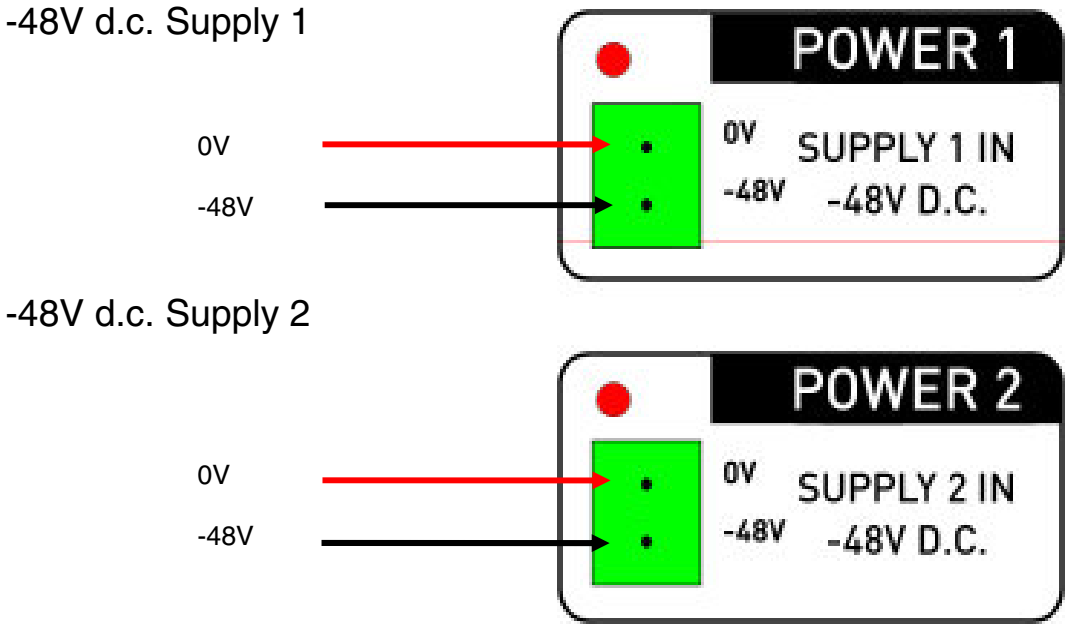
Pin Number	Description
1	
2	
3	Rx audio (+) to selector
4	Tx audio (+) from splitter
5	Tx audio return (-)
6	Rx audio return (-)
7	
8	

VF DIR 2

Pin Number	Description
1	
2	
3	Rx audio (+) to selector
4	Tx audio (+) from splitter
5	Tx audio return (-)
6	Rx audio return (-)
7	
8	

2.3 Power Supply Card PC-5306

The Power Supply Card can be powered from two separate redundant -48V d.c. sources. Two pluggable screw connectors are supplied to make the connections. Care must be taken to ensure **correct polarities are maintained**, as marked on the front panel.



After energisation both LEDs in the Power Supply Card (PC-5306) should illuminate, and the red (POWER) and green (DIR 1) LEDs in each installed Line Card (PC-5305)) should also show. The Line Cards are hot-swappable.

3. Circuit Descriptions

3.1 Line Card – PC-5305

3.1.1 Passive Hybrid

The VF Common port (SK1) is connected directly to a passive hybrid network consisting of a pair of custom wound hybrid coils and an adjustable balance network, in this case a 2k trim pot.

Line matching is achieved by adjusting the 'LINE MATCH' trim pot (RV1) to minimise reflections & maximise the trans-hybrid loss (which means that relatively little of the transmitted audio should appear on the local receive port). This is factory set for an impedance of 600Ω. Provision is made for complex impedance, but these components are normally not fitted.

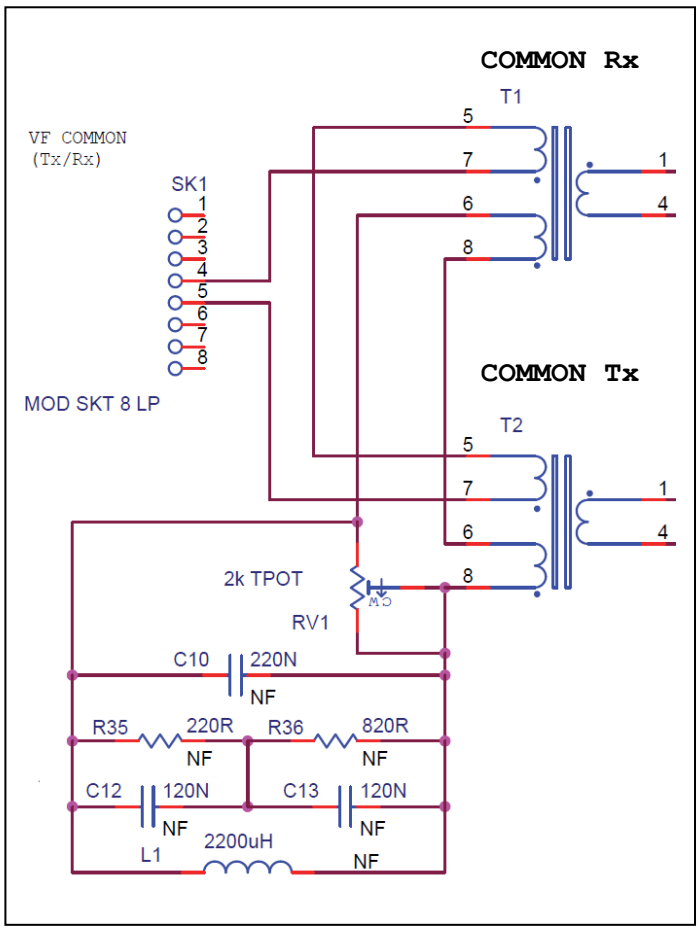


Fig. 3.1.1.1 Hybrid circuit

3.1.2 Power Fail

Should both -48V d.c. inputs or their respective converters fail, two relays (K2 & K3) relax switching both the Tx & Rx signals to VF Direction 2 (SK3). There are no active components, and therefore no gain in this mode of operation, with a 6dB hybrid loss.

Please note that in powered mode the Tx and Rx gains are set to 0dB so that the overall insertion loss is 6dB nominal which approximately equals the unpowered insertion loss.

3.1.3 Splitter

The incoming signal – Common Rx is received from the passive hybrid specifically T1 (via relay K2) and split to two adjustable gain sections. Each section is output to either VF Direction 1 (SK2) or VF Direction 2 (SK3). Each section consists of a buffer amplifier, an adjustment trim pot, 2 driver amplifiers, & an isolation transformer. The gain is adjustable between -20dB & +16dB. The adjustment for VF Direction 1 Tx (SK2 pins 4&5) is made with a trim pot RV4, labelled on the board 'Tx DIR1', VF Direction 2 Tx (SK3 pins 4&5) is adjusted by RV5 labelled 'Tx DIR2'. **The gains are factory set to 0dB**.

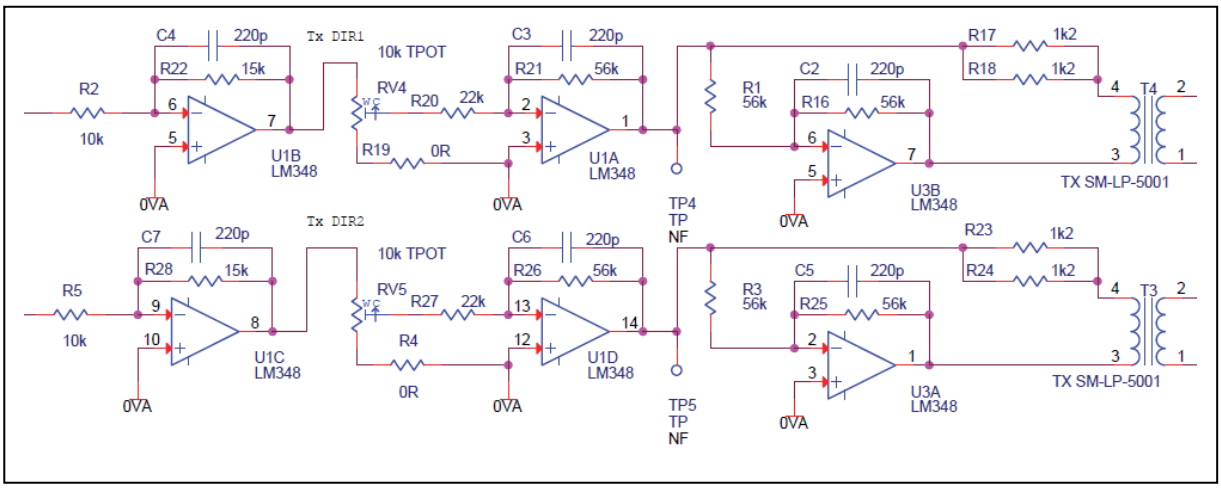


Fig. 3.1.3.1 Splitter circuit

3.1.4 Selector

The signals received (Rx) from both VF Direction 1 Rx (SK2 pins 3 & 6) and VF Direction 2 Rx (SK3 pins 3 & 6) via isolation transformers and passed to buffer amplifiers and gain adjustment trim pots to the selector relay K1. The gain is adjustable between -20dB & +16dB. The Rx gain for Direction 1 is adjusted by RV3 and Direction 2 by RV2. **The gains are factory set to 0dB**.

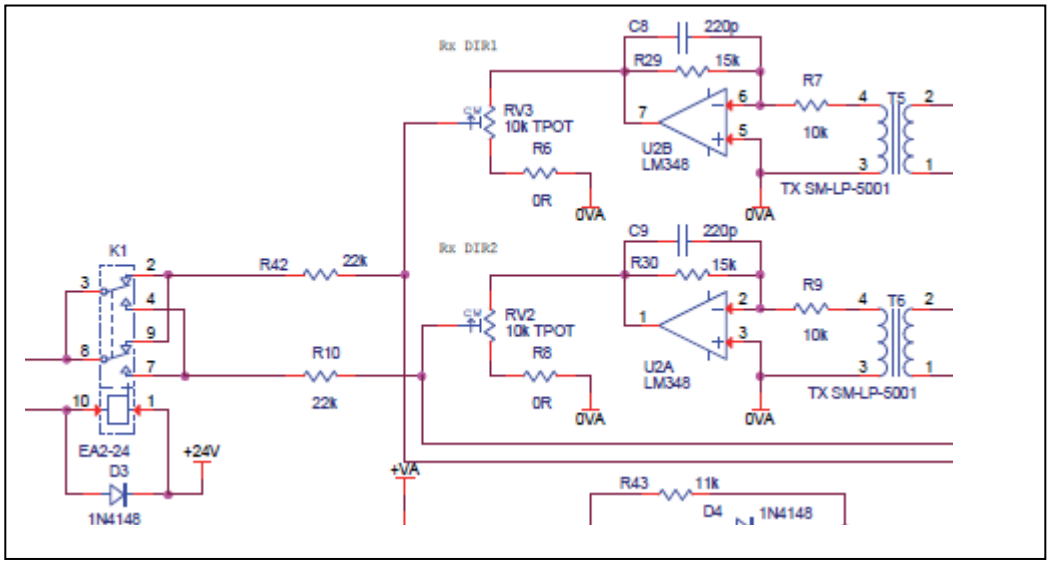


Fig. 3. 1.4.1 Selector circuit

The received signals (Rx) are also split off to buffer amplifier / filter networks to be passed to the DSP micro-processor U5. The circuit below shows the buffer / filter arrangement.

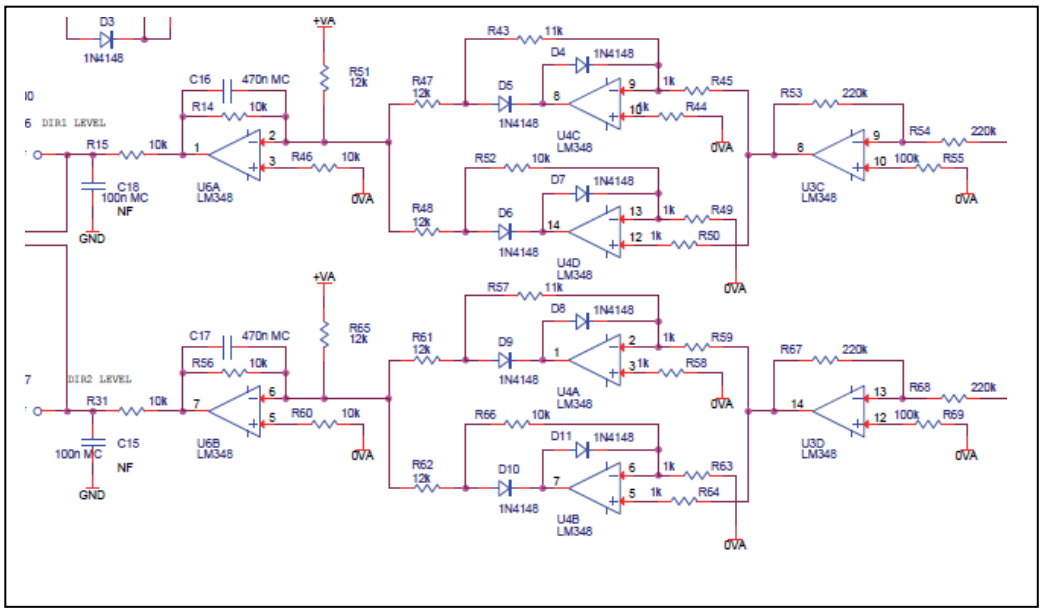


Fig. 3.1.4.2 Filter circuit

The received signals, after filtering, are constantly monitored by the processor, for signal level. If there is a variation between the signal levels (dipswitch selectable, default 6dB), the processor switches the stronger signal via relay K1 to be output via a driver amplifier to the passive hybrid (T2) and out to VF Common (SK1). The following circuit shows the output amplifier network.

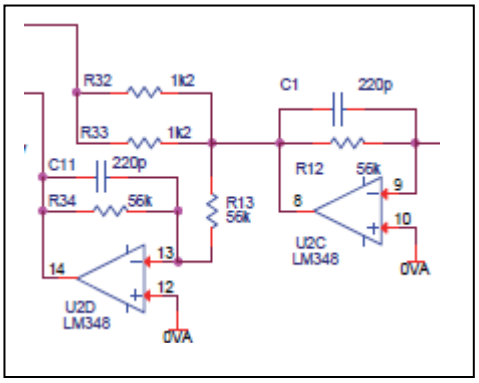


Fig. 3.1.4.3 Output op-amp circuit

3.1.5 The Digital Signal Processor switches between signals according to the following rules:

- When there is no Rx audio signal on either VF Direction 1 or VF Direction 2 the APS defaults to VF Direction 1. No audio is defined as less than -36dBm measured at the VF Common port.
- When the Rx VF Direction 1 audio signal drops below the VF Direction 2 audio signal by the dip switch (SW1 labelled “THRESH”) selectable amount (3dB, 6dB, 9dB, or 12dB), the APS switches to VF Direction 2. **The default setting is 6dB**
- When the VF Direction 1 signal rises to **within 1dB** of VF Direction 2, the APS switches to VF Direction 1
- The changeover delay from VF Direction 1 to VF Direction 2 (and vice versa) is **pre-set to 100ms**. This can be varied by adjusting RV6 labelled “DIR C/O DELAY”

There are 3 LED’s on the board. The green LED indicates VF Direction 1 is active, and the yellow LED indicates that VF Direction 2 is active. The red LED indicates power on the Line Card.

3.1.6 Line Card Power

The Line Card has 24V d.c. input from the back plane via PL1, a protective diode bridge, and a PTC resettable fuse. There is a local storage capacitor to assist with peak demands. A 5V d.c. regulator provides a digital supply for the DSP microprocessor. An Operational Amplifier is used to split the supply rails & provide a reference 0VA for the various analogue circuits. As previously mentioned, a red LED is used to indicate power to the Line Card.

3.2 Power Supply Card – PC-5306

The Power Supply Card consists of 2 “half brick” 48 to 24V d.c. converter modules (MEANWELL PSOMHB75-48S24), and associated circuitry.

Each module has its -48V d.c. input via a DINKLE 2ESDV-02 connector through the front panel. The input passes through a polarity protection diode and EMI filtering to the module. The output of each module is indicated by a red LED near its respective input connector. Each output passes through a steering & load share diode arrangement and output to the back plane.

Each module is capable of supplying the full load to 8 cards, the double arrangement provided for redundancy. Heatsinking (PSOM-C308) is provided as a precaution.

4. Specifications

Enclosure	2RU high, 19” rack mount, 250mm deep
Finish	Dulux metallic charcoal powder coat
Power Requirement	-37 to -75V d.c. (-48V d.c. nominal), polarity sensitive
Power Consumption	21mA @ 48V per card
Initial Inrush Current	120mA @ 48V for <300ms per card on initial power up
Operating Temperature Range	-10 → 60° C.
Storage Temperature Range	-20 → 80° C ambient
Humidity, Storage and Operating	To 98% non condensing
Mean Time Between Failure	> 20 years
Input/output Impedance	600Ω balanced (transformer isolated)
Frequency Response	± 0.2 dB in the range 300 Hz → 3.4 kHz
THD	< 2% @ +6dBm
Max. Input, all Rx ports	+6dBm
Max. Output, all Tx ports	+6dBm
Tx Gain adjustment	Trim pot adjustable -20dB → +16dB (default 0dB into 600Ω)
Rx Gain adjustment	Trim pot adjustable -20dB ← +16dB (default 0dB into 600Ω)
Insertion Loss	6dB nominal (intentionally adjusted to match level in unpowered mode)
Return Loss	Hybrid match trim-pot adjustable >40dB from 300Hz to 3400Hz into 600Ω resistive
Change-over level	DIP Switch switchable 3, 6, 9 or 12dB (default 6dB)
Restore DIR 1 level	Within 1dB of DIR 2 level (firmware adjustable)
Change-over delay	Trim pot adjustable 0 – 2 secs (default 100ms)
ACMA Supplier Code	N468
ERAC Responsible Supplier Number	E1287
Warranty	2 Years

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