

# **Audio System Components**

*Product Information*

Prepared and edited by  
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## **1 INTRODUCTION**

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The individual descriptions and application notes contained in this brochure are intended to acquaint designers and project engineers with the Studer Audio System Components. They allow to realize custom-tailored signal distribution, signal switching and amplifying systems to satisfy almost any individual requirement.

**Euro-Cards (1.915....)** The backbone of the system is the so-called Euro-card, a circuit board measuring 100 × 160 mm, which comes in a great variety of different circuit configurations.

**Modular Sub-Cards (1.914....)** Furthermore, there are the Modular Sub-Cards, small plug-in cards. Four of them can be accommodated on one Euro-size motherboard, allowing to make up a system which provides the ultimate in flexibility.

**Racks, Frames (1.918....)** Matching 19" mounting frames and 19" sub-racks for Euro-cards with or without power supply are available as well as installation hardware.

For prices please consult your local Studer distributor or contact:

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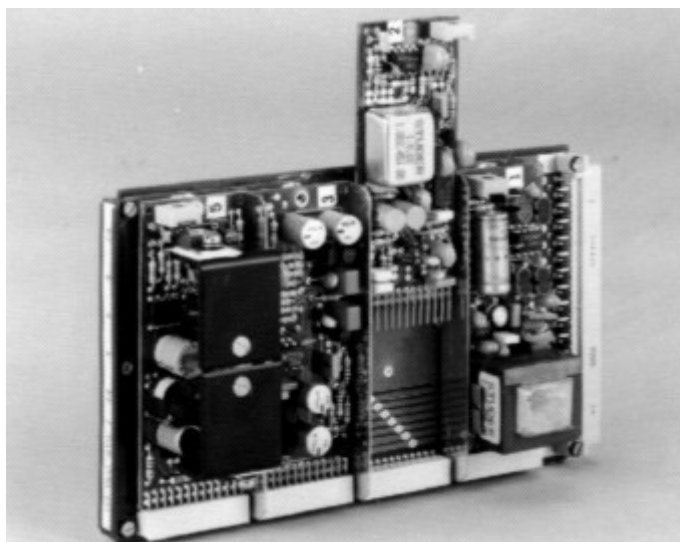
We reserve the right to change the design and the performance specifications of the products listed here as technical progress may warrant.

## 2 MSC SYSTEM

To provide highest possible flexibility for the designer of professional sound systems, Studer engineers have pursued a completely new concept.

The Euro-card is a convenient circuit board as far as its size and its plug-in features are concerned. However, it often offers excess space for a particular circuit. This has triggered the idea to utilize the Euro-card simply as a carrier (“motherboard”, order no. 1.915.770) for four smaller plug-in circuit boards, the “Modular Sub-Cards” (MSC).

The 32 connections of the Euro-card are divided into 6 supply lines common to the modular sub-cards, and  $4 \times 6$  individual lines joining the plug-in sockets for each sub-card. The remaining 2 connections are used as separate bus lines, one of them leading to sub-cards 1 and 2, the other one to sub-cards 3 and 4, resulting in a total of 13 connections to each MSC. A small motherboard for only one MSC is available as well (order no. 1.914.500).



A great variety of different circuits is available in form of MSCs, such as

- Balancing amplifiers
- Microphone pre-amplifiers
- Speaker amplifiers
- $0-\Omega$  input amplifiers
- Limiters
- Voltage controlled amplifiers (VCAs)
- Relay sub-cards
- High level input amplifiers
- Line output amplifiers
- 1900 Hz signal generator/decoder
- $90^\circ$  filter, stereo/mono
- Flip-flop
- Breadboarding card (0.1"/2.54 mm grid)

To meet the requirements of a system concept, a designer will be able to build individual circuits similar to working with a construction set: He either selects from the available circuits on Euro-cards or makes up his own Euro-card by simply arranging the most suitable combination of Modular Sub-Cards on the motherboard.

## 2.1 Modular Sub-Cards (MSCs)

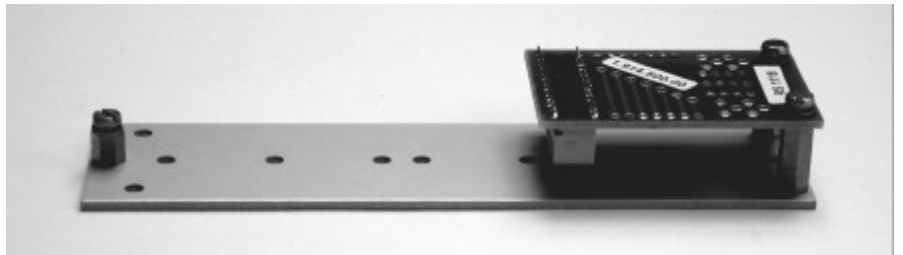
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### 2.1.1 Motherboard for 1 MS-Card

1.914.500

If only one MS-card is used, this motherboard is helpful for both mechanical and electrical interfacing. It consists of an aluminium mounting base (135 × 36 mm) and a small PCB with a connector for the MS-card; for wiring, this PCB contains solder terminals.

**Note:** For installation of up to four MS-cards, there is a second, Euro-card format motherboard available (1.915.770) that can be installed into an Euro-card rack. Please refer to chapter 2.2.1.

**Ordering Information**

Motherboard for 1 MS-card

1.914.500.xx

### 2.1.2 Breadboarding Card

1.914.529

This experimental board is an empty plug-in PCB compatible with the MSC system. It offers a punched 0.1" grid (2.54 × 2.54 mm) for individual component placement.

**Ordering Information:**

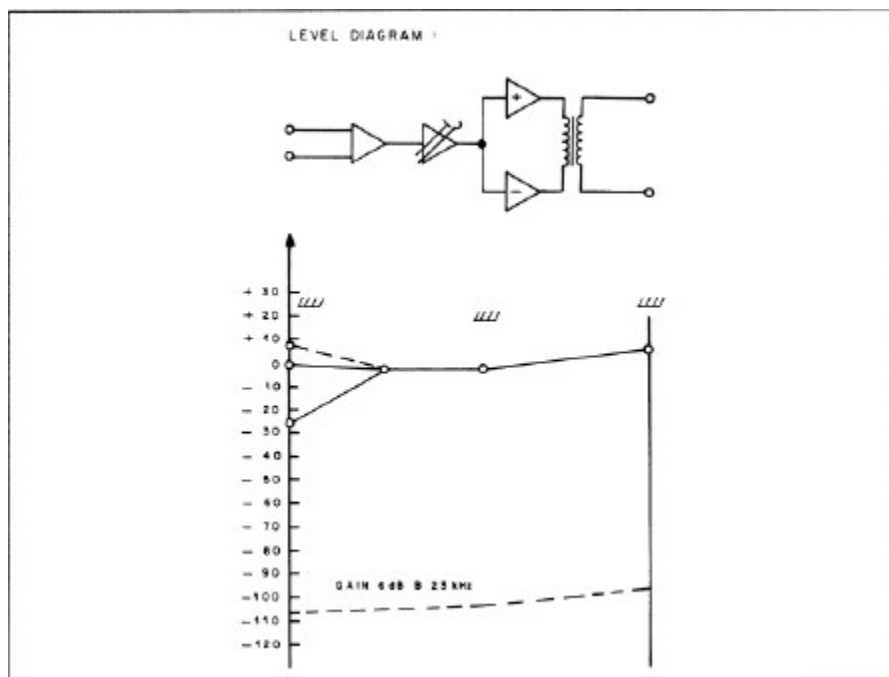
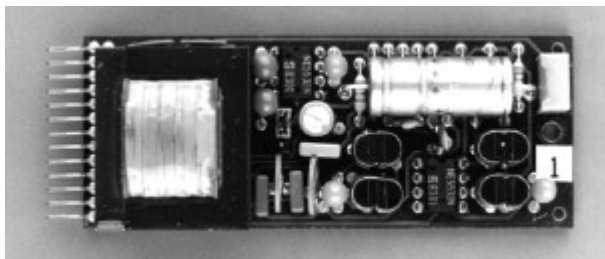
Breadboarding card

1.914.529.xx

### 2.1.3 Line Output Amplifier

1.914.501

Designed for operation at a nominal line level of +6 dBu (1.55 V<sub>rms</sub>), this amplifier can handle levels of up to +24 dBu (12.3 V<sub>rms</sub>), providing an excellent overload margin without the risk of clipping. A unique circuit around the primary of the amplifier's output transformer ensures excellent frequency response performance throughout the audible range. Fine and coarse gain adjustment is provided which allows to accommodate input levels in the range from -22...+8 dBu for a nominal +6 dBu output.





**Technical Specifications**

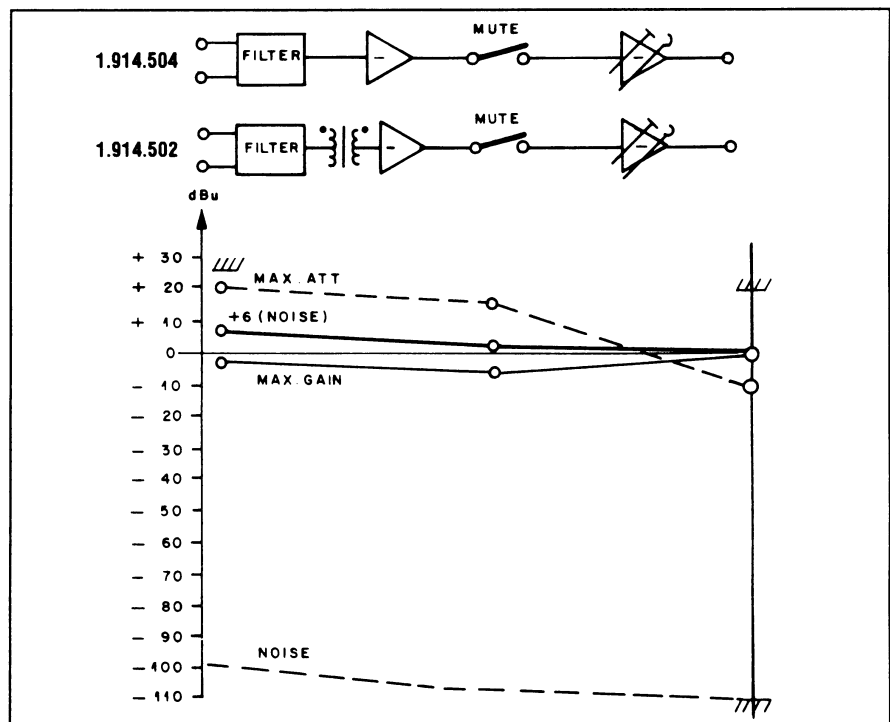
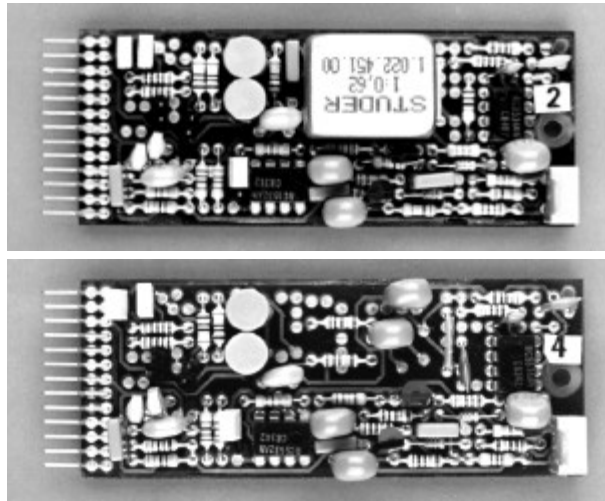
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<b>Input:</b>	Impedance	> <b>10 kW</b> , electronically balanced (transformerless)
	Overload point	<b>+24 dBu</b>
<b>Output:</b>	Impedance	< <b>50 W</b> , balanced and floating
	Minimum load	<b>200 W</b>
	Maximum level	<b>+24 dBu</b>
	Gain	<b>-2 dB...+28 dB</b> ; adjustment: coarse 0 or 15 dB/fine -2 dB...+13 dB
	Frequency response	<b>±0.2 dB</b> , 30 Hz...16 kHz
	THD	< <b>0.01%</b> , 30 Hz...16 kHz
	Equivalent input noise	< <b>-106 dB</b> , linear, at 6 dB gain
<b>Supply:</b>		<b>±15 V</b> (25 mA idling; max. 170 mA at +24 dBu into 200 Ω)
<b>Dimensions:</b>		<b>MS-card</b> , 34 × 85 mm
<b>Ordering Information:</b>	Line output amplifier	1.914.501.xx

**2.1.4 High-Level Input Amplifier**

1.914.502/504

Basically, this is an amplifier with near 0 dB gain for high-level applications, yet with additional features, such as remote muting facility, RF input filter, and choice of two input and output impedances. The input configuration is balanced, whereas the output is unbalanced. Jumpers in the primary of the input circuit permit selection of either high-impedance operation with RF filter or a 0-Ω input without filter, for summing-bus applications. The combining (mixing) resistors have to be added externally. By switching pin3 of the amplifier's 13-pin plug to ground (via a corresponding connection on the motherboard) the amplifier may be muted from a remote point. If only 20 dB level reduction is desirable instead of muting, this can be programmed by connecting a resistor across two solder points.



The amplifier may be used, for example, to work into a 600  $\Omega$  load, or into the input of a 0- $\Omega$  input amplifier of another summing circuit.

If transformerless yet balanced input configuration is desired, an MSC amplifier with basically the same performance characteristics is available as well. Refer to the ordering information below.

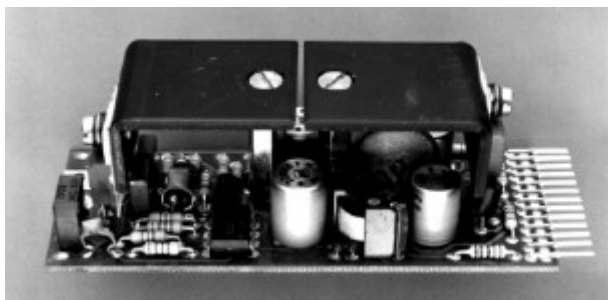
## Technical Specifications

<b>Input:</b>	Impedance	> <b>10 kW</b> (transformer- or electronically balanced versions available; input with RF filter; 0- $\Omega$ input selectable with jumpers)	
	Common mode rejection	> <b>50 dB</b>	
	Overload point	<b>+24 dBu</b> (12.3 V <sub>rms</sub> )	
<b>Output:</b>	Impedance	<b>33 W</b> (pin1), unbalanced	
	Minimum load	<b>600 W</b>	
	Maximum level	<b>+20 dBu</b> (7.75 V <sub>rms</sub> )	
	Impedance	<b>3.3 kW</b> (pin2), unbalanced, for 0- $\Omega$ operation	
	Maximum gain	<b>1 dB</b>	
	Maximum attenuation	<b>30 dB</b>	
	Frequency response	<b><math>\pm 0.3</math> dB</b> , 30 Hz...16 kHz	
	THD	<b>&lt; 0.03%</b> , 30 Hz...16 kHz	
	Equivalent input noise	<b>-100 dBu</b> , unweighted, at 6 dB attenuation	
	Programmable attenuation	<b>20 dB</b> (resistor 33 k $\Omega$ across muting circuit)	
<b>Supply:</b>		<b><math>\pm 15</math> V</b> (11 mA idling)	
<b>Dimensions:</b>		<b>MS-card</b> , 34 $\times$ 85 mm	
<b>Ordering Information:</b>		High level input amp with transformer-balanced input	1.914.502.xx
		High level input amp with electronically balanced input	1.914.504.xx

**2.1.5 Loudspeaker Amplifier**

1.914.505

This low-power amplifier on a modular sub-card is designed to drive a 10...15  $\Omega$  speaker. Power output is about 2...3 W. As can be concluded from this specification, the amplifier is not intended for high-quality monitoring. It will be ideally suited, however, for pre-fader listening and similar applications. The amplifier's input is balanced and floating, with adjustable gain.

**Technical Specifications**

Input impedance	> <b>10 kW</b> , balanced and floating (with transformer)
Nominal power output	<b>2 W</b> into 15 $\Omega$
Power output	<b>25 mW...2.5 W</b> into 15 $\Omega$ , with 0 dBu input
Distortion	< <b>0.5%</b> at 2 W < <b>0.15%</b> at 500 mW
S/N	<b>99 dB</b> , ref. to 2 W at max. gain
Frequency response	<b>-0.5 dB</b> at 15 kHz
High pass filter	<b>150 Hz</b> , 12 dB/oct.

**Supply:** -24 V (40 mA idling, max. 220 mA fully driven)

**Dimensions:** **MS-card**, 34 × 85 mm

**Ordering Information:** Loudspeaker amplifier

1.914.505.xx

**2.1.6 Microphone Pre-Amplifiers**

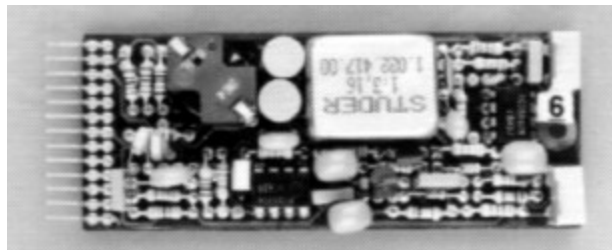
1.914.506/507

Two different microphone pre-amplifiers are available, for dynamic or condenser microphones, and for electret microphones. Both offer high gain and low noise, as is required for microphone pre-amplification.

1.914.506 features a balanced and floating input. It is designed for dynamic or condenser microphones with a source impedance of 200 Ω or less. An RF filter is incorporated at the input transformer's primary. Furthermore, the input is equipped with the resistors required for phantom powering of condenser microphones.

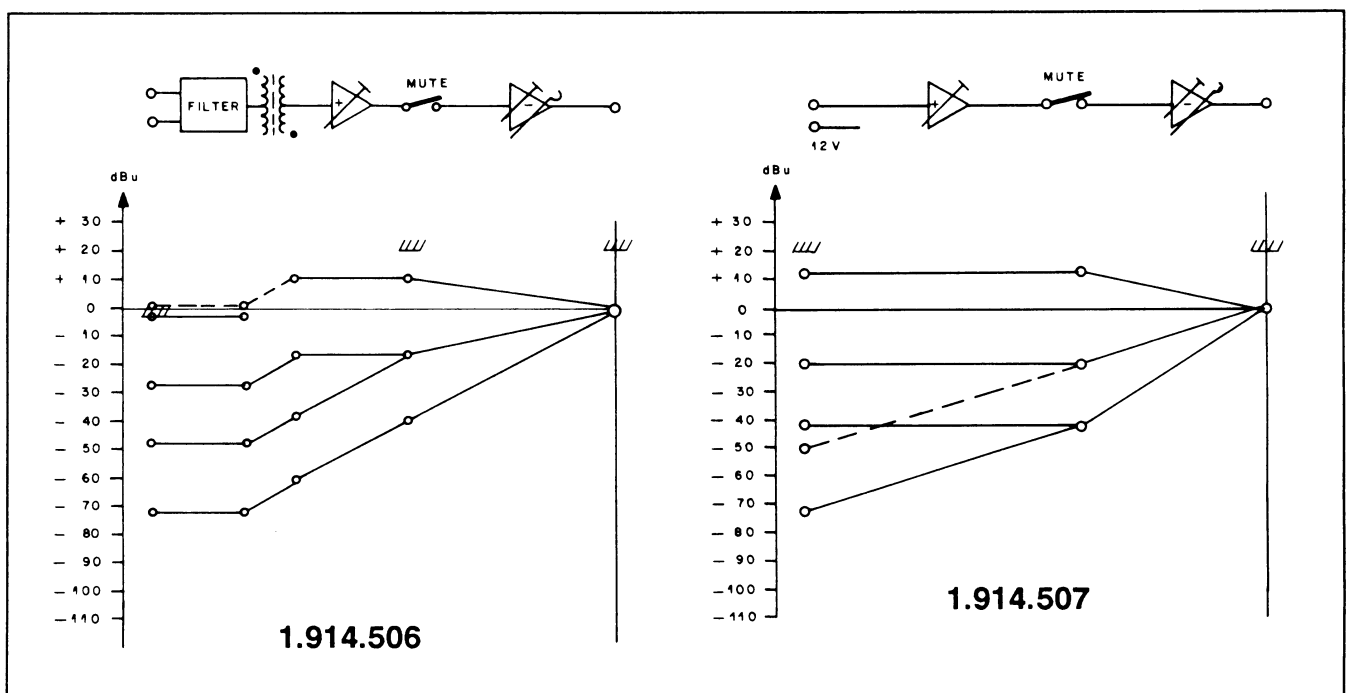
1.914.507 is designed for unbalanced electret microphones requiring a 12 V supply.

A wide range of input levels can be accommodated (see level diagram).



By using the same solid-state switching circuit as can be found in the line and high-level amplifiers, remote muting or activation of a fixed amount of attenuation are possible as well.

The amplifier's two outputs are unbalanced, with impedances of 3.3 kΩ or 33 Ω, respectively.



**Technical Specifications**

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<b>Input:</b>	Transformer-balanced and floating, with RF filter	(1.914.506)
	Unbalanced, with RF filter and electret supply	(1.914.507)
Impedance	> <b>1 kW</b> , for microphones with an impedance of 200 $\Omega$ or less.	
Max. input level	-2 <b>dBu</b> (615 mV <sub>rms</sub> ); THD at 30 Hz: approx. 1%	
Common mode rejection	> <b>60 dB</b> , unbalanced, to ground	
<b>Output:</b>	Max. level	+20 <b>dBu</b> (7.75 V <sub>rms</sub> )
	Nominal level	0 <b>dBu</b> (0.775 V <sub>rms</sub> )
	Impedance	33 <b>W</b> (pin1)
		3.3 <b>kW</b> (pin2; to a 0- $\Omega$ amp.)
	Minimum load	600 <b>W</b>
	Max. gain	71 <b>dB</b> (see level diagram)
Frequency response	$\pm$ 0.5 <b>dB</b> , 30 Hz...16 kHz	
THD	< 0.3%, 30 Hz...16 kHz at 20 dB gain	
Noise figure, linear	< 4.5 <b>dB</b> , input terminated with 200 $\Omega$	
<b>Supply:</b>	$\pm$ 15 <b>V</b> (11 mA idling)	
	+48 <b>V</b> (1.914.506, only if phantom powering required)	
<b>Dimensions:</b>	<b>MS-card</b> , 34 $\times$ 85 mm	
<b>Ordering Information:</b>	<ul style="list-style-type: none"><li>• Microphone pre-amplifier for dynamic microphones</li><li>• Microphone pre-amplifier for electret microphones</li></ul>	1.914.506.xx 1.914.507.xx

**2.1.7 VCA with Electronically Balanced Connections**

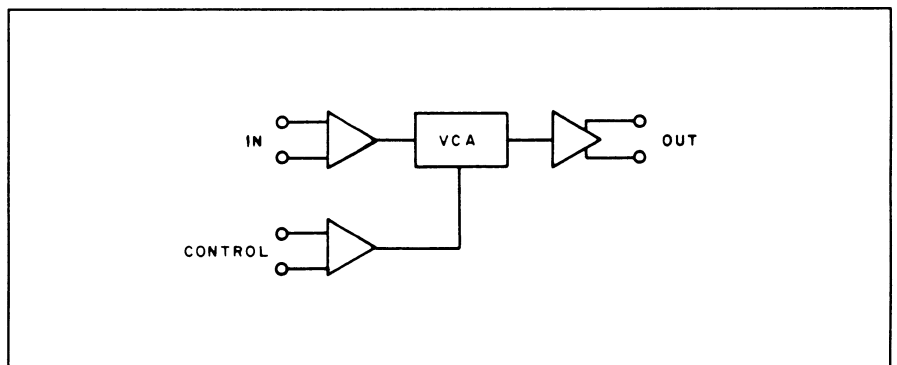
1.914.515

In contrast to the VCA 1.914.518/528 (chapter 2.1.8), this assembly features an electronically balanced input and output.



It is intended for use in balanced audio systems for a variety of applications, especially when gain is to be controlled from a remote point. It will be useful in audio-video post-production work where suitable DC ramps can control cross-fades, voice-overs, etc. Its high overload margin and its exceptionally low noise and distortion performance make it the perfect choice for high-quality audio applications.

By connecting the gain control terminals of a number of VCAs to a common potentiometer or fader, several audio channels may thus be controlled simultaneously.



Two control inputs provide VCA gain control from two different remote points

**Technical Specifications**

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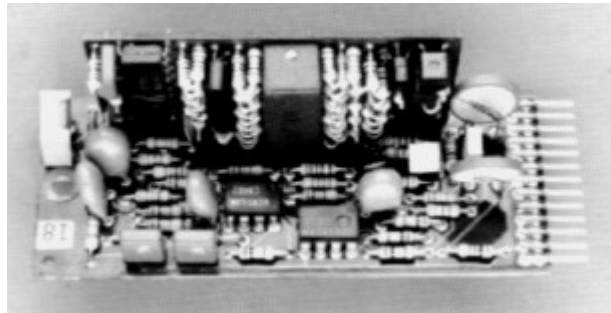
<b>Input:</b>	Impedance	<b>≈ 10 kW</b> , electronically balanced
	Clipping point	<b>+24 dBu</b>
<b>Output:</b>		Electronically balanced
	Recommended load	<b>≈ 2 kW</b>
	Maximum level	<b>+24 dBu</b>
	Frequency response	<b>-0.5 dB</b> , 30 Hz...15 kHz
	Gain/attenuation range	<b>+40...-100 dB</b> , with ext. control
	Control input: pin1; gain tracking	<b>0 V = unity gain;</b> <b>1 dB/μA</b> ; jumper 1-2 <b>20 dB/V</b> ; jumper 2-3 <b>10 dB/V</b> ; jumper 3-4
	Control input: pin10; gain tracking	<b>10 dB/V</b>
	THD	<b>&lt; 0.1%</b>
	Equivalent input noise	<b>-93 dBu @ unity gain</b>
<b>Supply:</b>		<b>±15 V (25 mA)</b>
<b>Dimensions:</b>		<b>MS-card</b> , 34 × 85 mm
<b>Ordering Information:</b>	VCA with electronically balanced input and output	1.914.515.xx



**2.1.8 VCA with 1 or 3 Control Ports**

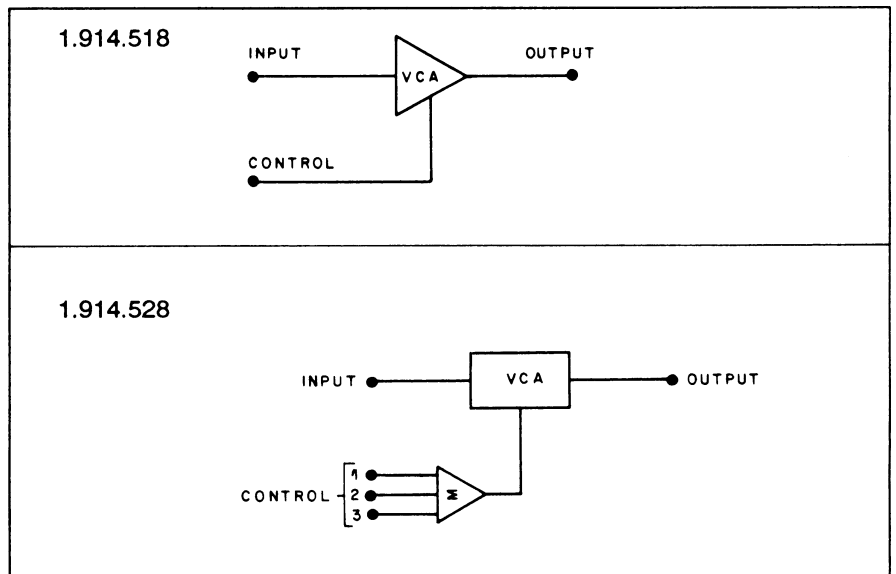
1.914.518/528

Within the range of modular sub-cards, two more VCAs are available. Voltage controlled amplifiers are ideally suited for applications such as remote level control, level limiting (in combination with the voltage processor 1.914.519) or for automatic “voice-over” circuits, when driven by suitable ramp generators. These VCAs offer outstandingly low noise and harmonic distortion.



For best performance, they should be operated at a level of 0 dBu. Gain pre-selection is possible on the 1.914.518 version, allowing gain/attenuation ranges either from +10 to -90 dB or from +40 to -70 dB, using an external potentiometer.

The 1.914.528 VCA card differs in that it is equipped with three external control inputs, providing gain control from three different locations.



**Technical Specifications**

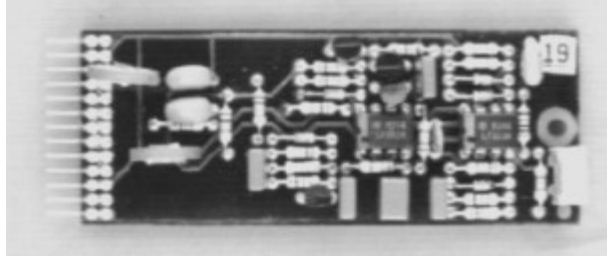
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<b>Input:</b>	Impedance	> <b>3 kW</b>	
	Clipping point	<b>+20 dBu</b>	
<b>Output:</b>	Impedance	<b>33 W or 3.3 kW</b> , selectable	
	Max. level	<b>+20 dBu</b>	
	Recommended load	<b>≈ 2 kW</b>	
	Frequency response	<b>-0.5 dB</b> , 30 Hz...16 kHz	
	External gain control	<b>+40...-90 dB</b> (1.914.518.xx) <b>+40...-100 dB</b> (1.914.528.xx)	
Gain/attenuation range (pot. meter)		<b>+40...-60 dB / +10...-70 dB / +10...-90 dB</b> (1.914.518.xx only, jumper-selectable)	
	Gain tracking	<b>10 dB/V</b>	
	THD	<b>&lt; 0.1%</b>	
	Equivalent input noise	<b>-102 dBu</b>	
<b>Supply:</b>		<b>±15 V</b> (40 mA)	
<b>Dimensions:</b>		<b>MS-card</b> , 34 × 85 mm	
<b>Ordering Information:</b>	Voltage controlled amplifier with 1 control port		1.914.518.xx
	Voltage controlled amplifier with 3 control ports		1.914.528.xx

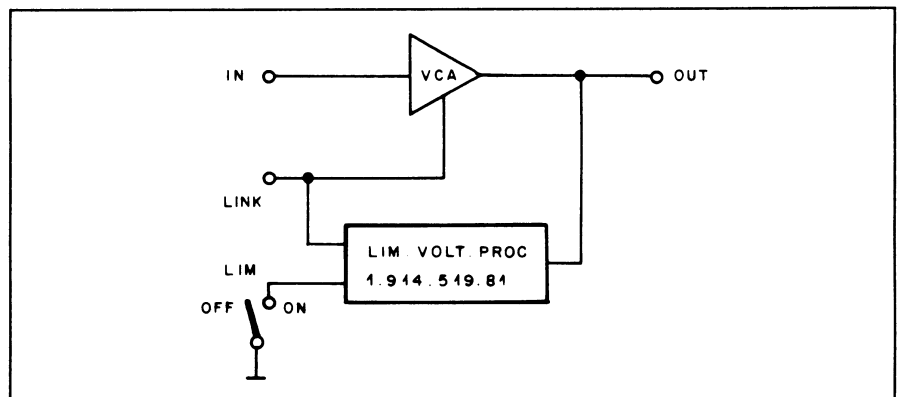
## 2.1.9 Limiter Voltage Processor

1.914.519

Together with this voltage processor, the VCAs 1.914.518/528 can perform as signal level limiters.



The processor's threshold can be set within a wide range of levels, so that limiting action becomes effective at a desired level within a range of  $-15$  to  $+15$  dBu. Limiting action attacks within 1 ms, whereas release can vary from 50 ms to 5 s, depending on the program's energy content. This means that no audible "pumping" action – which is often associated with such a device – will occur. After the cessation of loud passages, amplification will recover only slowly. For stereo applications, a two-channel set-up (VCAs and voltage processor) can be linked, so that identical amounts of gain reduction will take place simultaneously in both channels.



The input of the voltage processor has to be wired to the output of the VCA. The processor's output, when connected to the VCA's control terminal, will effect the necessary gain reduction so that a limiting characteristic is obtained. The limiting threshold is adjustable in a wide range. Remote on/off switching of the limiter function is possible.

**Technical Specifications**

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<b>Limiter:</b>	Input impedance	<b>≥ 10 kW</b>	
	Max. input level	<b>+20 dBu</b>	
	Frequency range	<b>30 Hz...16 kHz</b>	
	Output voltage	<b>0...-13 V<sub>DC</sub></b>	
	Threshold level	<b>-15 dBu...+15 dBu</b>	
	Attack time	<b>1 ms</b>	
	Release time	<b>50 ms...5 s, program-dependent</b>	
	Compression ratio	<b>20:1, in conjunction with a VCA</b>	
<b>Supply:</b>		<b>±15 V (10 mA)</b>	
<b>Dimensions:</b>		<b>MS-card, 34 × 85 mm</b>	
<b>Ordering Information:</b>	Limiters voltage processor		1.914.519.xx

**2.1.10 1900 Hz Signal Generator**

1.914.520

This signal generator produces a stable frequency of 1900 Hz to establish communication on outside broadcast lines, as specified in the EBU/CCIR recommendations.

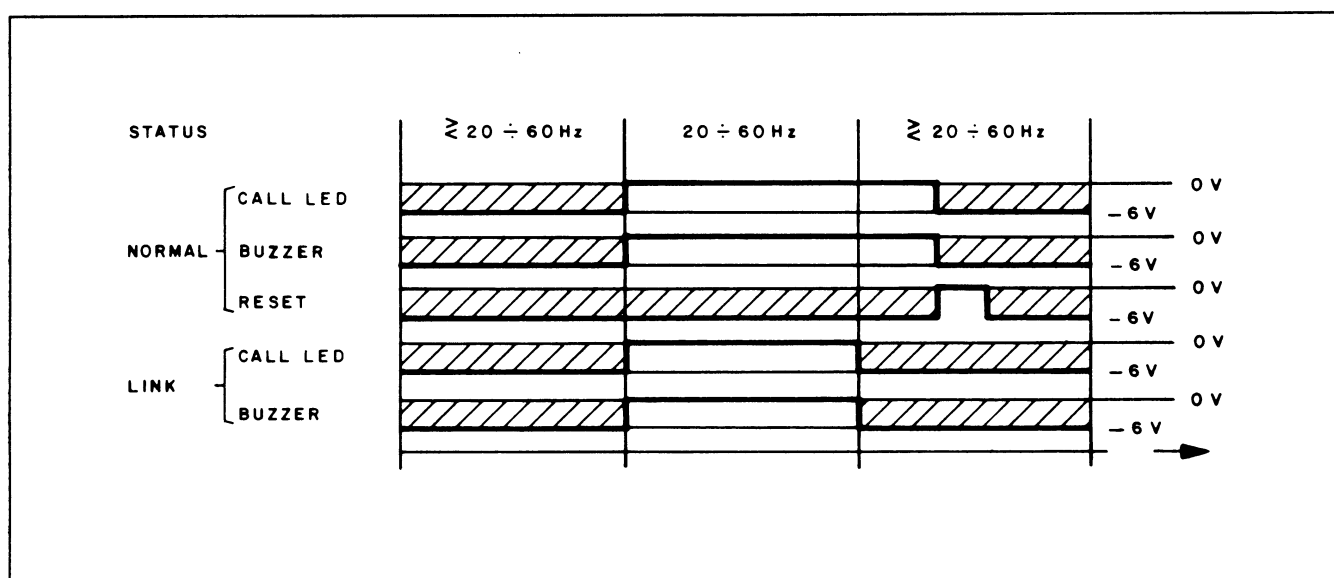
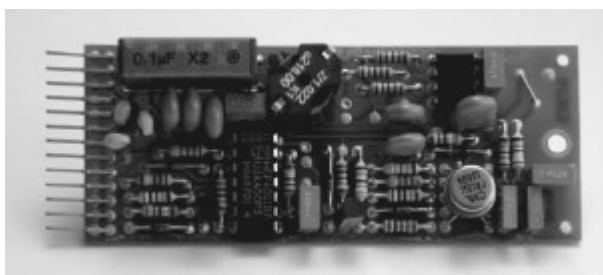
**Technical Specifications**

Frequency	<b>1900 Hz</b> (adjustable)	
Distortion	<b>&lt; 1%</b>	
Output level	<b>-15...+6 dBu</b> (adjustable)	
Output	<b>balanced and floating</b>	
Output Impedance, out 1	<b>&lt; 15 W</b>	
out 2	<b>600 W</b>	
Minimum load	<b>200 W</b>	
<b>Supply:</b>	<b>±15 V</b> (20 mA)	
<b>Dimensions:</b>	<b>MS-card</b> , 34 × 85 mm	
<b>Ordering Information:</b>	1900 Hz signal generator	1.914.520.xx

**2.1.11 Call Decoder 20...60 Hz**

1.914.521

This assembly features a call receiver for the ringing frequency on telephone lines (20...60 Hz). The receiver can activate an optical and/or an acoustical signal generated by an external buzzer (not supplied). In normal mode the buzzer will be on until reset. In linked mode the signal lasts only as long as a call is detected.

**Technical Specifications**

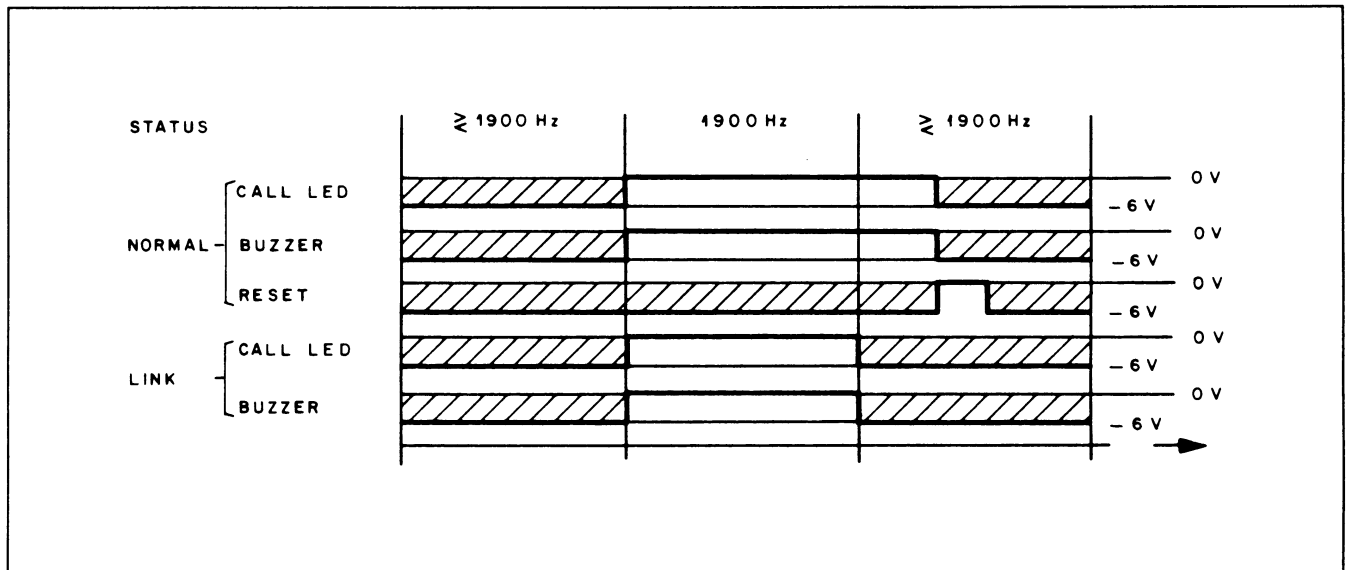
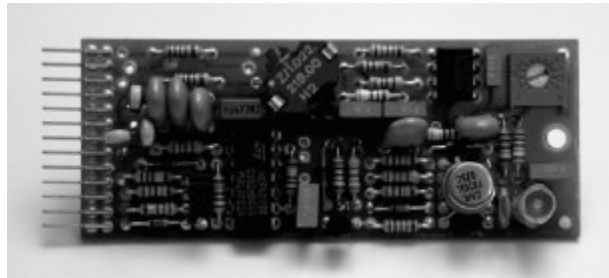
<b>Input:</b>	<b>balanced, floating; no DC</b>
Impedance	<b>&gt; 20 kW</b>
Frequency	<b>20...60 Hz</b>
Min. level	<b>17 V<sub>rms</sub></b>
Nominal level	<b>70 V<sub>rms</sub></b>
<b>Supply:</b>	<b>+15 V (5 mA); -15 V (10 mA); -6 V (2 mA)</b>
<b>Dimensions:</b>	<b>MS-card, 34 × 85 mm</b>
<b>Ordering Information:</b>	<b>Call decoder 20...60 Hz</b>

1.914.521.xx

**2.1.12 Call Decoder 1900 Hz**

1.914.522

This card contains a call receiver for the standardized 1900 Hz call frequency on OB lines. It is tuned to respond to 1900 Hz  $\pm 1\%$ . The receiver can be switched either to activate an optical or an acoustical signal for the duration of the 1900 Hz call (linked mode), or the acoustical signal can be selected to remain activated until reset (normal mode). The acoustical signal can be generated by an external buzzer (not supplied).



**Technical Specifications**

- Input:** **balanced, floating; no DC**  
 Frequency **1900 Hz,  $\pm 1\%$**   
 Impedance **> 10 kW**  
 Min. level **-30 dBu**  
 Nominal level **+24 dBu**
- Supply:** **+15 V (5 mA); -15 V (10 mA); -6 V (2 mA)**  
 Insulation rating **500 V<sub>DC</sub>**
- Dimensions:** **MS-card, 34 x 85 mm**

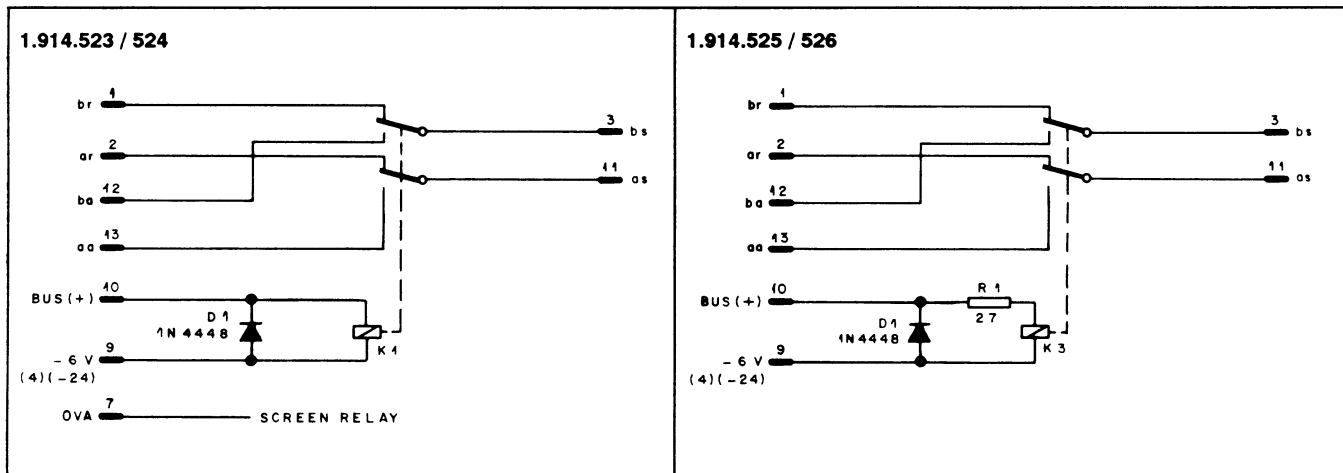
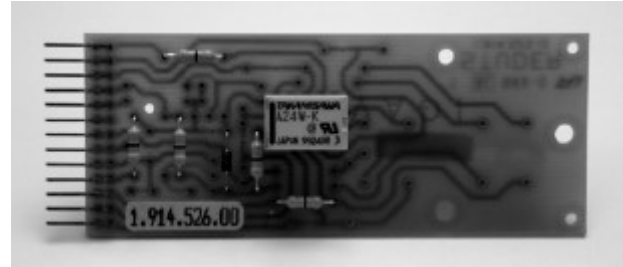
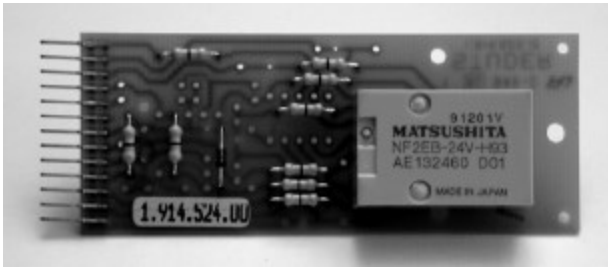
**Ordering Information:** Call decoder 1900 Hz

1.914.522.xx

**2.1.13 Relay Sub-Cards**

1.914.523/524/525/526

Audio signal routing or enabling/disabling of certain circuit sections is often effected best using relays. The Modular Sub-Card System, therefore, offers a selection of four relays on individual circuit boards. Because only one relay can be accommodated on one MS-Card, several cards (or a card from the Euro-card range) will be required if more complex switching has to be realized.



The relays offer double pole/double throw switching with non-shorting contacts, and coils rated for either 6 V<sub>DC</sub> or 24 V<sub>DC</sub> operation. A diode is wired across the relay coil in all versions to suppress interfering back-EMF when de-energizing the relay.

For studio applications where the mechanical click produced by the relay's armature is objectionable, a low-noise type is available.

No.	Coil	Contact Rating	
1.914.523	6 V <sub>DC</sub> / 137 Ω	220 V / 2 A / 60 W	
1.914.524	24 V <sub>DC</sub> / 2.0 kΩ	220 V / 2 A / 60 W	
* 1.914.525	5 V <sub>DC</sub> / 135 Ω	100 V / 0.5 A / 30 W	(R1 = 27 Ω for 6 V operation)
* 1.914.526	24 V <sub>DC</sub> / 2.6 kΩ	100 V / 0.5 A / 30 W	(R1 = 0 Ω)
* Low-noise relays			

**Dimensions:**

**MS-card, 34 × 85 mm**

**Ordering Information:**

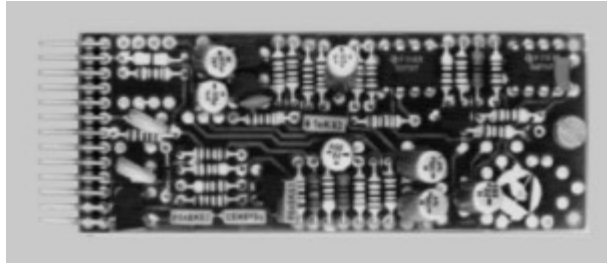
MSC relay 6 V <sub>DC</sub>	1.914.523.xx
MSC relay 24 V <sub>DC</sub>	1.914.524.xx
MSC relay 6 V <sub>DC</sub> ; low-noise	1.914.525.xx
MSC relay 24 V <sub>DC</sub> ; low-noise	1.914.526.xx



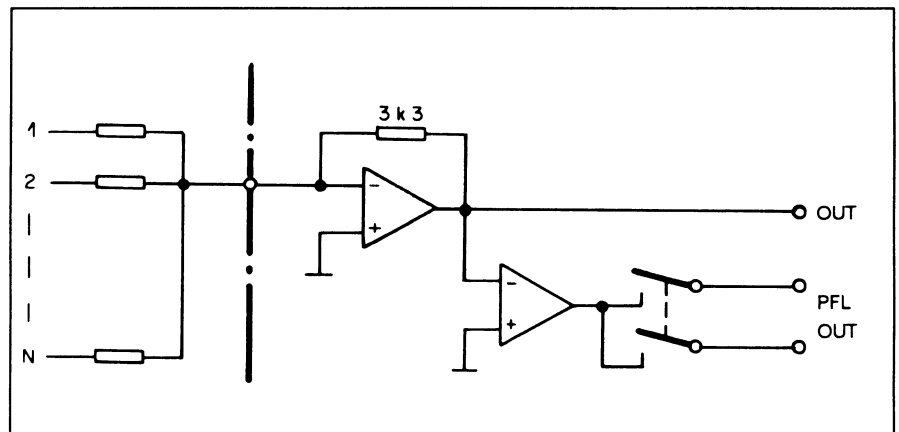
**2.1.14 0-Ω Input Amplifier with PFL Facility**

1.914.530

This amplifier with its characteristic input impedance of less than  $1\ \Omega$  finds its application as a summing amplifier. A multitude of unbalanced sources can thus be mixed with a high degree of effective isolation between the individual inputs.



When using  $3.3\ \text{k}\Omega$  resistors as combining (mixing) resistors in series with each source feeding the summing bus, gain will be unity (0 dB), i.e., the amplifier's output level will be equal to the level of the signal source ahead of the combining resistor. The amplifier's output is unbalanced, with low impedance. Additional outputs for monitoring (or pre-listening) can be activated via solid-state switches by remote control.

**Technical Specifications**

<b>Input:</b>	Max. current	<b>2.5 mA<sub>rms</sub></b> for max. output swing
	Current for 0 dBu	<b>234.2 μA</b> ; 0 dBu output ( $\approx 3.3\ \text{k}\Omega$ at the input for unity gain)
<b>Output:</b>	Impedance	<b>33 W</b>
	Max. output swing	<b>+20 dBu</b>
	Load	<b><math>\approx 600\ \text{W}</math></b> @ max. output swing
	Frequency response	<b><math>\pm 0.3\ \text{dBu}</math></b> , 30 Hz...16 kHz
	THD	<b>&lt; -75 dB</b> , 30 Hz...16 kHz
	Noise voltage at the output	<b>-110 dBu</b> , input terminated with $3.3\ \text{k}\Omega$ , bandwidth 23 kHz
	Noise figure, 12 inputs	<b>F &lt; 2 dB</b> $\approx R_S = 275\ \Omega$
<b>Supply:</b>		<b>+15 V</b> (11 mA idling); <b>-15 V</b> (7 mA idling)
<b>Dimensions:</b>		<b>MS-card</b> , 34 × 85 mm

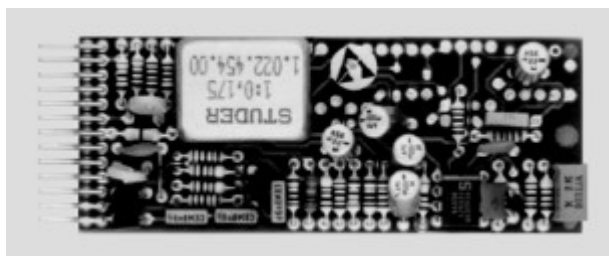
**Ordering Information:** Zero-Ω input amplifier (PFL facility)

1.914.530.xx

**2.1.15 High-Level Input with PFL Facility**

1.914.531

This compact high-level input amplifier features a balanced and floating input stage. The output is unbalanced, with low impedance and low distortion up to +24 dBu. An additional PFL monitoring facility is electronically switchable (FET).

**Technical Specifications**

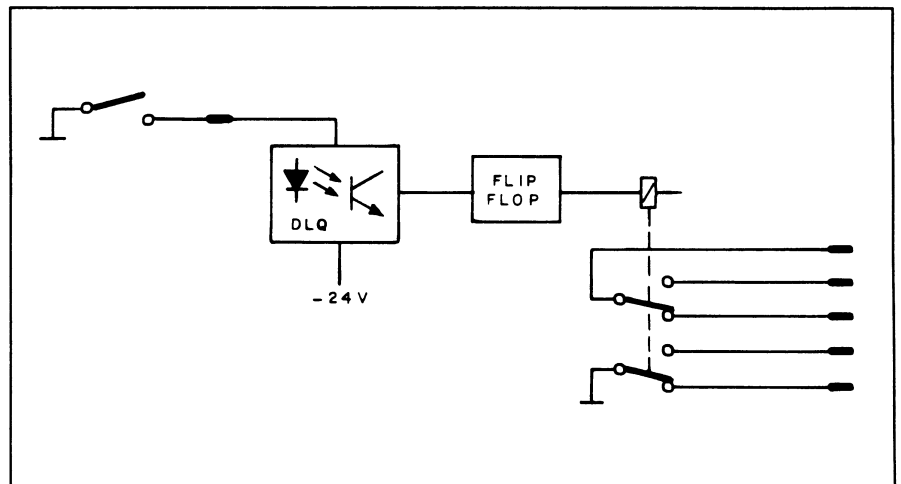
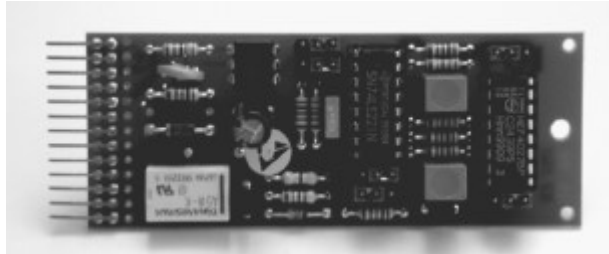
<b>Input:</b>	Balanced and floating
Impedance	> <b>10 kW</b>
Max. level	<b>+26 dBu</b>
CMRR	> <b>110 dB @ 50 Hz</b> > <b>110 dB @ 16 kHz</b>
<b>Output:</b>	Unbalanced
Impedance	<b>33 W</b>
Load	<b>≈ 600 W @ max. output swing</b>
Max. output swing	<b>+20 dBu</b>
Gain	<b>-1.4...-17.8 dB</b>
Frequency response	<b>±0.3 dB, 30 Hz...16 kHz</b>
THD	<b>&lt; -85 dB, 30 Hz...16 kHz</b>
Noise voltage	<b>&lt; -107 dBu, gain -6 dB, bandwidth 23 kHz</b>
<b>Supply:</b>	<b>±15 V (10 mA idling)</b>
<b>Dimensions:</b>	<b>MS-card, 34 × 85 mm</b>
<b>Ordering Information:</b>	HL input with PFL

1.914.531.xx

**2.1.16 Flip-flop Unit**

1.914.532

The Flip-flop Unit consists of a relay with two DPDT contacts and a flip-flop circuit with a control input (opto-coupler). A ground pulse from a non-latching switch applied to the input activates the relay. A next ground pulse will deactivate it again.

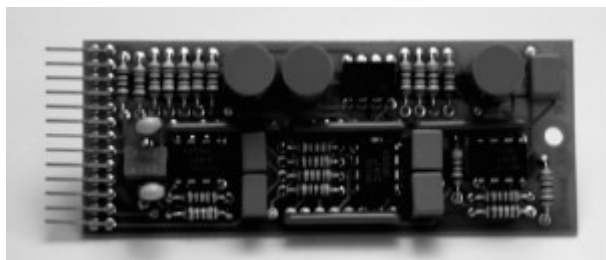
**Technical Specifications**

<b>Input:</b>		<b>floating</b> , with opto-coupler	
<b>Relay contacts:</b>	Max. rating	<b>100 V/0.5 A/30 W</b>	
<b>Supply:</b>		-6 V for logic -24 V for opto-coupler	
<b>Dimensions:</b>		<b>MS-card</b> , 34 × 85 mm	
<b>Ordering Information:</b>		Flip-flop unit	1.914.532.xx

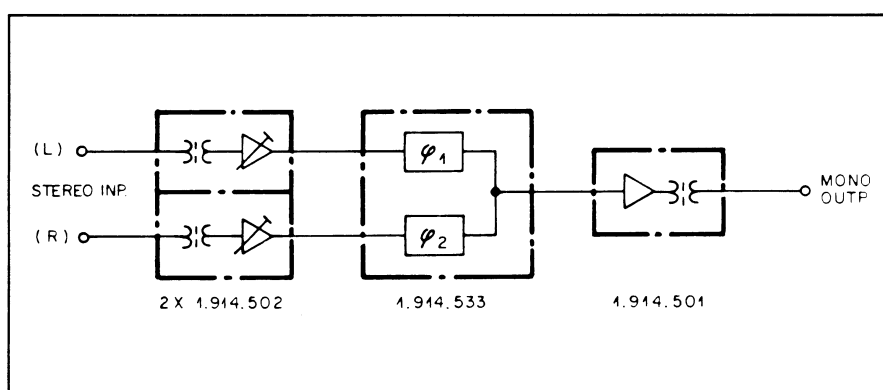
**2.1.17 90° Filter**

1.914.533

This active 90° filter is used to form a monophonic signal from the left and right channel of stereo signals. Simple mixing of the left and right channel will not produce a mono signal of satisfactory quality, but results in an emphasis of the center information. By summing the stereo signals in a 90° phase-shifted manner, this undesirable effect can be avoided.



The 90° filter consists of two all-pass filter chains, producing a uniform 90° phase difference across the whole audio range. The left and the right stereo signals are each passed through one of these filters and added at the filter's output. Doubling of equally-phased signal components as well as canceling of opposite-phased components is thus avoided.



The filter circuits are of unbalanced configuration. For this reason a summing circuit usually consists of two high-level amplifiers with balanced inputs (1.914.502), one 90° filter, and one high-level output amplifier (1.914.501), all accommodated on one MSC motherboard, as shown in the diagram above.

The gain of this combination can be adjusted. A correlated stereo input of equal level in both channels will provide a mono signal of identical level. With only one input channel (left or right), the mono output level will be lower by 3 dB.

Since the 90° filter with its input and output cards can be realized on a single, Euro-card size MSC motherboard, it can possibly be combined with other Audio Components, such as limiters and isolation amplifiers. Such stereo-to-mono combinations are in use at various radio stations to feed the stereo programs to the monophonic AM-transmitter in a correctly summed manner.

**Technical Specifications**

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<b>Input:</b>	Max. level	<b>+20 dBu</b>
	Impedance	<b>4 kW</b>
<b>Output:</b>	Max. level	<b>+20 dBu</b>
	Impedance	<b>6.8 kW</b>
	Frequency response	<b>30 Hz...16 kHz, ±0.3 dB</b>
	Phase	<b>90° ±3°; 30 Hz...16 kHz</b>
	THD	<b>£ -80 dB</b>
	Noise	<b>&lt; -95 dBu</b>

**Supply:** ±15 V (18 mA idling)

**Dimensions:** MS-card, 34 × 85 mm

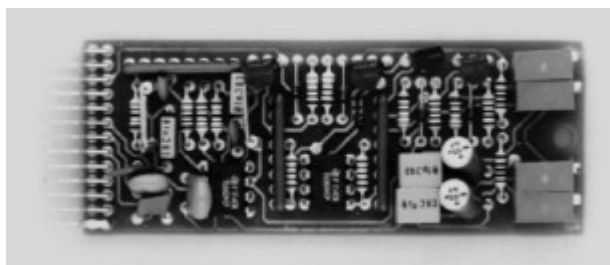
**Ordering Information:** 90° filter stereo/mono

1.914.533.xx

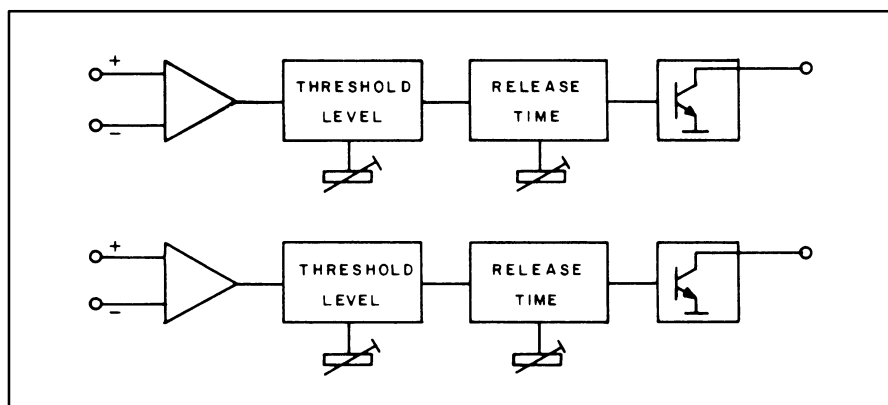
**2.1.18 Dual Vox Detector**

1.914.534

The Dual Vox Detector card contains two adjustable threshold level detector circuits. Threshold level ( $-22$  dBu... $+16$  dBu) and release time ( $0.2$  s... $10$  s) are separately adjustable for two audio channels. These adjustments are effected very precisely with multi-turn trimmer potentiometers.



The high-impedance audio input is balanced. The open-collector output is prepared to activate a relay or an alarm device. A possible application of this card would be to detect incoming modulation.

**Technical Specifications****Inputs:**

	<b>Electronically balanced</b>
Impedance	$\approx 10$ kW
Max. level	$+24$ dBu ( $0$ dBu $\hat{=}$ $0,775$ V <sub>rms</sub> )
Frequency response	$75$ Hz... $12$ kHz, $-3$ dB
Threshold level	$-22$ dBu... $+16$ dBu
Attack time	$100$ ms
Release time	$200$ ms... $10$ s
Hysteresis	$\pm 1$ dB

**Outputs:****Open-collector;**  $U_{CE} \leq +45$  V;  $I_{max} \leq 100$  mA**Supply:** $\pm 15$  V ( $\leq 15$  mA /  $4$  mA idling)**Dimensions:****MS-card**,  $34 \times 85$  mm**Ordering Information:**

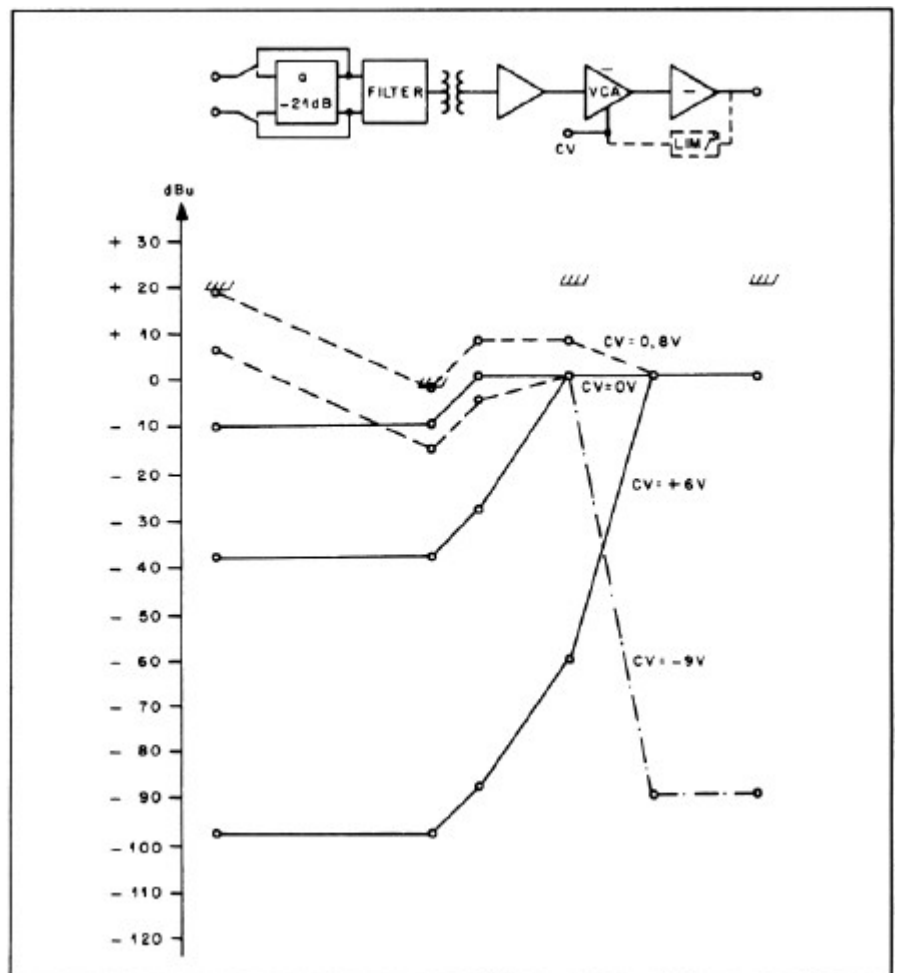
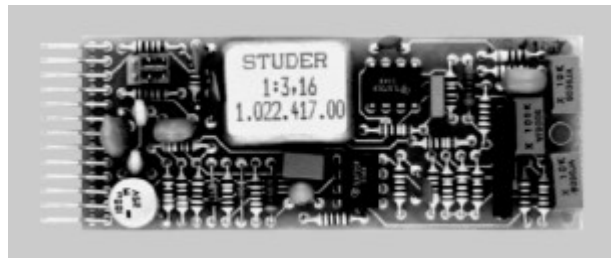
Dual vox detector

1.914.534.xx

**2.1.19 Microphone Amplifier with Limiter**

1.914.539

This assembly combines a microphone amplifier and a VCA limiter circuit with adjustable threshold level and program-depending release time. The input is balanced and floating, the output is unbalanced and with low impedance. Gain control is effected internally with a trimmer potentiometer, or externally with a gain-control DC voltage. A jumper-selectable pad reduces the input level by 21 dB.



The operation of the limiter circuit can be monitored at the gain reduction output, if an appropriate instrument (GRM) is connected.

This card is ideally suited for talkback applications.

**Technical Specifications**

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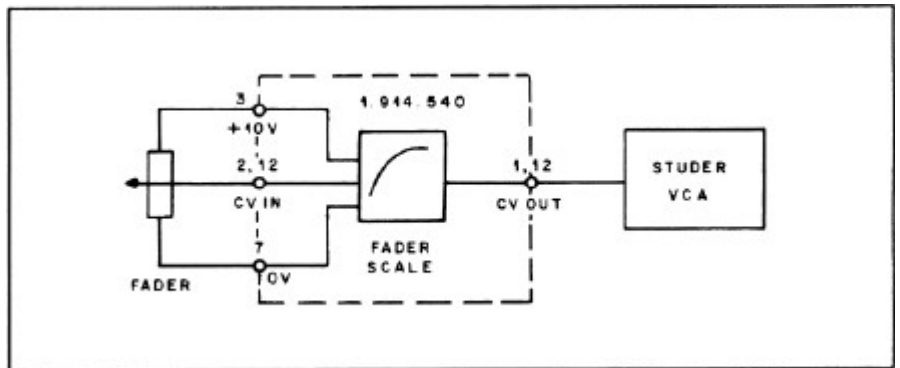
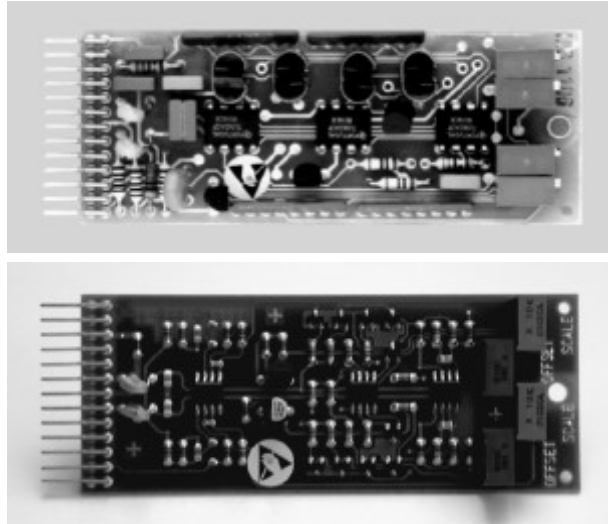
<b>Input:</b>	Impedance	> <b>1 kW</b> , balanced, floating	
	Max. level	<b>-2 dBu</b> (THD at 30 Hz $\leq$ 1%) <b>+19 dBu</b> , pad on	
	Pad (attenuation)	<b>-21 dB</b> , jumper-selectable	
	CMRR	> <b>60 dB</b> @ 16 kHz	
	Source impedance	<b>£ 200 W</b>	
<b>Output:</b>	Max. level	<b>+20 dBu</b>	
	Impedance	<b>33 W</b>	
	Load	<b>≈ 2 kW</b>	
	Gain adjust ( $v_1$ )	<b>min. +10 dB</b> , VCA = 0 dB; pad off	
		<b>max. +37 dB</b> , VCA = 0 dB; pad off	
		<b>min. -11 dB</b> , VCA = 0 dB; pad on	
		<b>max. +16 dB</b> , VCA = 0 dB; pad on	
	Gain control characteristics ( $v_2$ )	<b>10 dB/V</b>	
		DC range	<b>-10...+6 V</b> , pin3: gain control input
		Total gain	<b><math>v_{tot} = v_1 + v_2</math></b>
Max. attenuation		> <b>90 dB</b>	
<b>General:</b>	Frequency response	<b><math>\pm 0.5</math> dB</b> , 30 Hz...16 kHz	
	THD	<b>£ -50 dB</b> , 20 dB gain; 30 Hz...16 kHz	
	Noise voltage	<b>-95 dBu</b> , pad on; 0 dB gain	
	Noise figure	<b>F ~ 10 dB</b> , bandwidth = 23 kHz; 60 dB gain; $R_s = 200 \Omega$ ; pad off	
<b>Limiters:</b>	Threshold level	<b>-7...+20 dBu</b>	
	Attack time	<b>0.5 ms</b>	
	Release time	<b>50 ms...1 s</b> , program-dependent	
	Compression ratio	<b>10:1</b> @ 1 kHz	
<b>Supply:</b>		<b><math>\pm 15</math> V</b> (25 mA)	
<b>Ordering Information:</b>	Microphone amplifier with limiter	1.914.539.xx	



**2.1.20 Dual Fader/VCA Control Voltage Interface**

1.914.540 /541

These interfaces are used to convert the voltage of a linear fader to the non-linear dB scale of a Studer VCA. One card processes two channels. It is available in two versions: 540.xx (0...+10 V<sub>DC</sub> control voltage), and 541.xx (+5...0 V<sub>DC</sub> control voltage). A regulated +10 V<sub>DC</sub> reference voltage is generated on-board. The DC from the fader's wiper is connected to the input. Offset and scale alignment is performed with on-board trimmer potentiometers for matching the VCA gain to the dB scale of the fader.



**Technical Specifications**

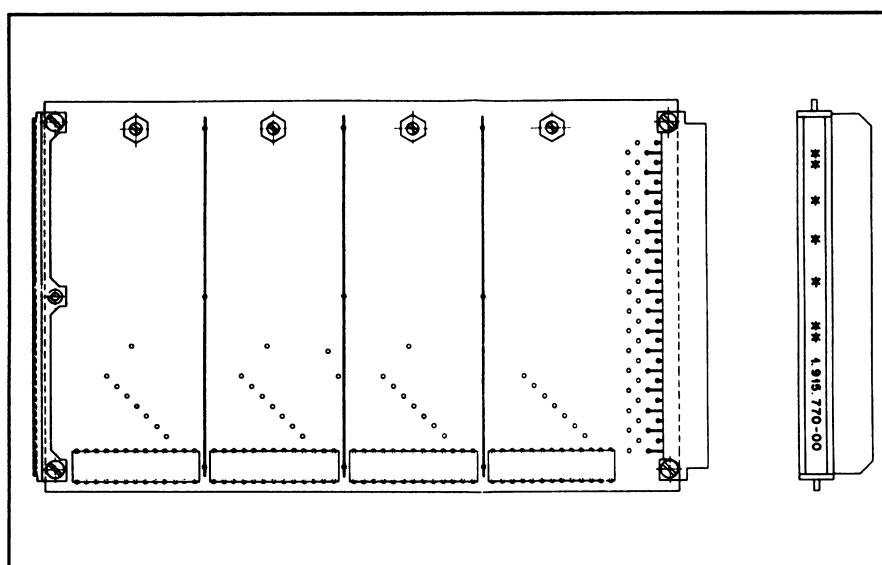
		<b>1.914.540.xx</b>	<b>1.914.541.xx</b>
<b>Input:</b>	Impedance	> 1 MW, unbalanced	100 kW, unbalanced
	Level range	0...+10 V	+5...0 V
<b>Output:</b>	Impedance	33 W, unbalanced	33 W, unbalanced
	Control range	+1 V...-10 V	+1 V...-10 V
<b>Supply:</b>		±15 V (15 mA)	
<b>Dimensions:</b>		MS-card, 34 × 85 mm	
<b>Ordering Information:</b>	Fader/VCA control interface		1.914.540.xx
	Fader/VCA control interface		1.914.541.xx

## 2.2 Euro-Cards

### 2.2.1 Motherboard for 4 MS-Cards

1.915.770

The Modular Sub-Cards require a mounting base for mechanical and electrical installation. This motherboard for four MS-cards in standard Euro-card size easily integrates into the Studer audio components system; it carries 32 printed tracks from its edge connector to four small plug-in sockets. Each socket has 13 contacts; six of them are common supply lines, while another six are individual to each socket. Then there is a separate bus line for circuits 1 and 2, and another bus line for circuits 3 and 4. A motherboard for only one MS-card is available as well, refer to chapter 2.1.1.



**Dimensions:** Euro-card **100 × 160 mm**

**Connectors:** 1 × Euro connector **32-pin, DIN 41612**  
 4 × CIS connector **13-pin, plug-in socket for MSC**

**Ordering Information:** MSC motherboard

1.915.770.xx

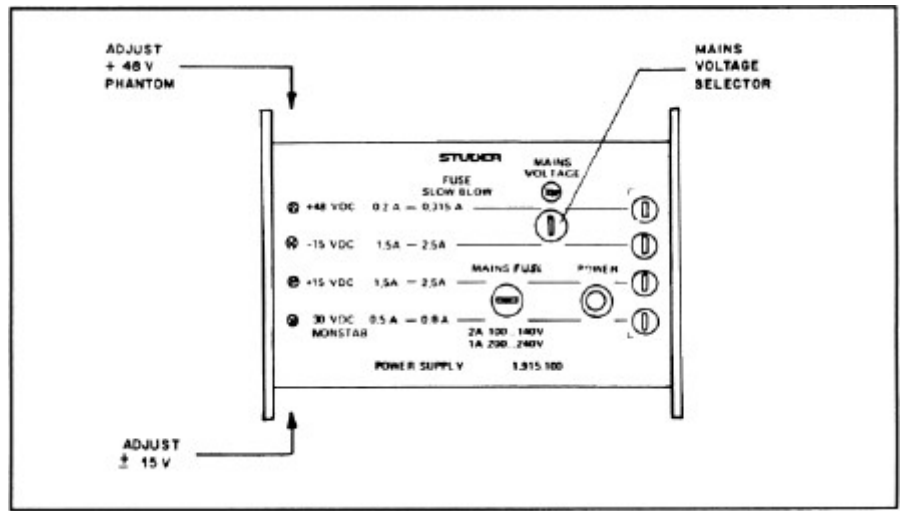
**2.2.2 Power Supply**

1.915.100

This power supply provides a regulated output of  $\pm 15\text{ V}_{\text{DC}}$  at a maximum load of 1.5 A for audio circuits, plus a regulated 48  $\text{V}_{\text{DC}}$  output for the phantom powering of microphones. In addition, 30 V of unregulated DC are available as well.

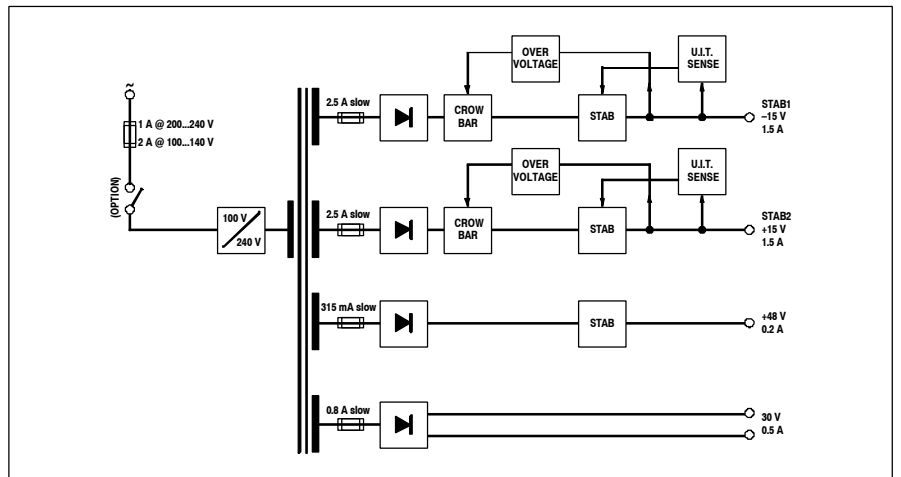
If a regulated 24  $\text{V}_{\text{DC}}$  supply is required, the stabilizer card 1.915.105.xx can be connected to the 30  $\text{V}_{\text{DC}}$  output.

Each of the output voltages is derived from a separate secondary winding of the mains transformer and can be fine-adjusted.



The  $\pm 15\text{ V}_{\text{DC}}$  supply is fully short-circuit proof and is protected against overvoltage and excess temperature. Short-circuit-protection is also effective in the 48  $\text{V}_{\text{DC}}$  section.

The power supply has no on/off switch in the primary circuit. Such a switch, if needed, will have to be fitted separately.



Mains transformer and regulator electronics are housed in one rectangular unit fitting into the 19" Euro-card frame (1.918.318/319), occupying the space of 28M widths. For this purpose, a mounting kit 1.918.316 is recommended (see chapter 2.3.4).

**Technical Specifications**

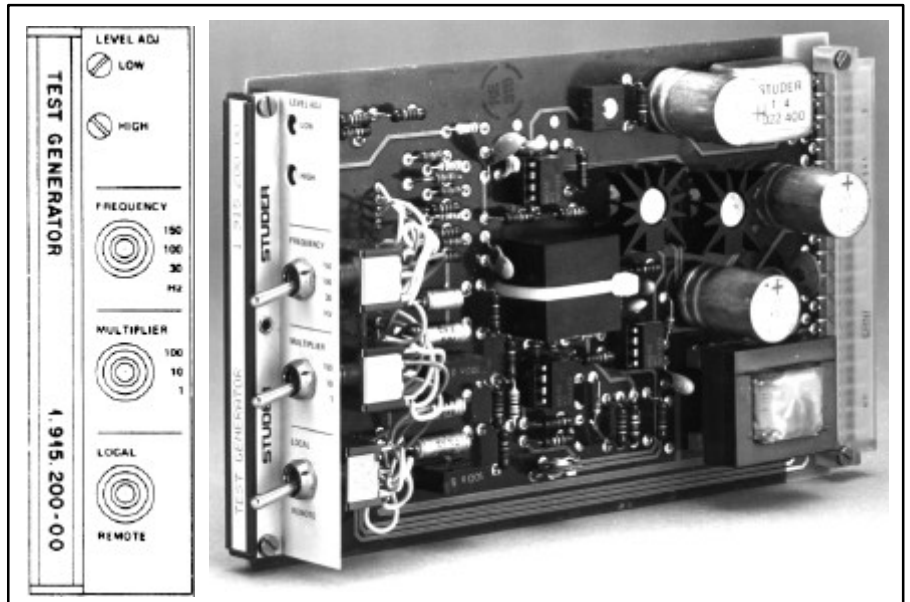
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<b>Primary:</b>	Voltage selector	<b>100/120/140/200/220/240 V<sub>AC</sub> ±10%</b>	
	Fuse	<b>T 2 A (slow), 100...140 V</b>	
		<b>T 1 A (slow), 200...240 V</b>	
	Power consumption	<b>&lt; 120 W (190 VA)</b>	
<b>Secondary:</b>	<b>Audio supply:</b>	<b>±15 V/1.5 A max., regulated voltage</b>	
	Ripple	<b>100 µV</b>	
	Fuses	<b>2 × T 2.5 A (slow)</b>	
	<b>Phantom supply:</b>	<b>48 V/200 mA max., regulated voltage, according to DIN 45596</b>	
	Ripple	<b>100 µV</b>	
	Fuse	<b>T 315 mA (slow)</b>	
<b>Unregulated DC:</b>	<b>30 V/0.5 A max.</b>		
	Fuse	<b>T 0.8 A (slow)</b>	
<b>Dimensions:</b>	W × H × D	<b>140 × 100 × 160 mm, Euro-card/28M units</b>	
	Weight	<b>2.75 kg</b>	
<b>Ordering Information:</b>	Power supply		1.915.100.xx
	Mounting kit for installation in ELMA frame (1.918.318)		1.918.316.xx

**2.2.3 Audio Generator**

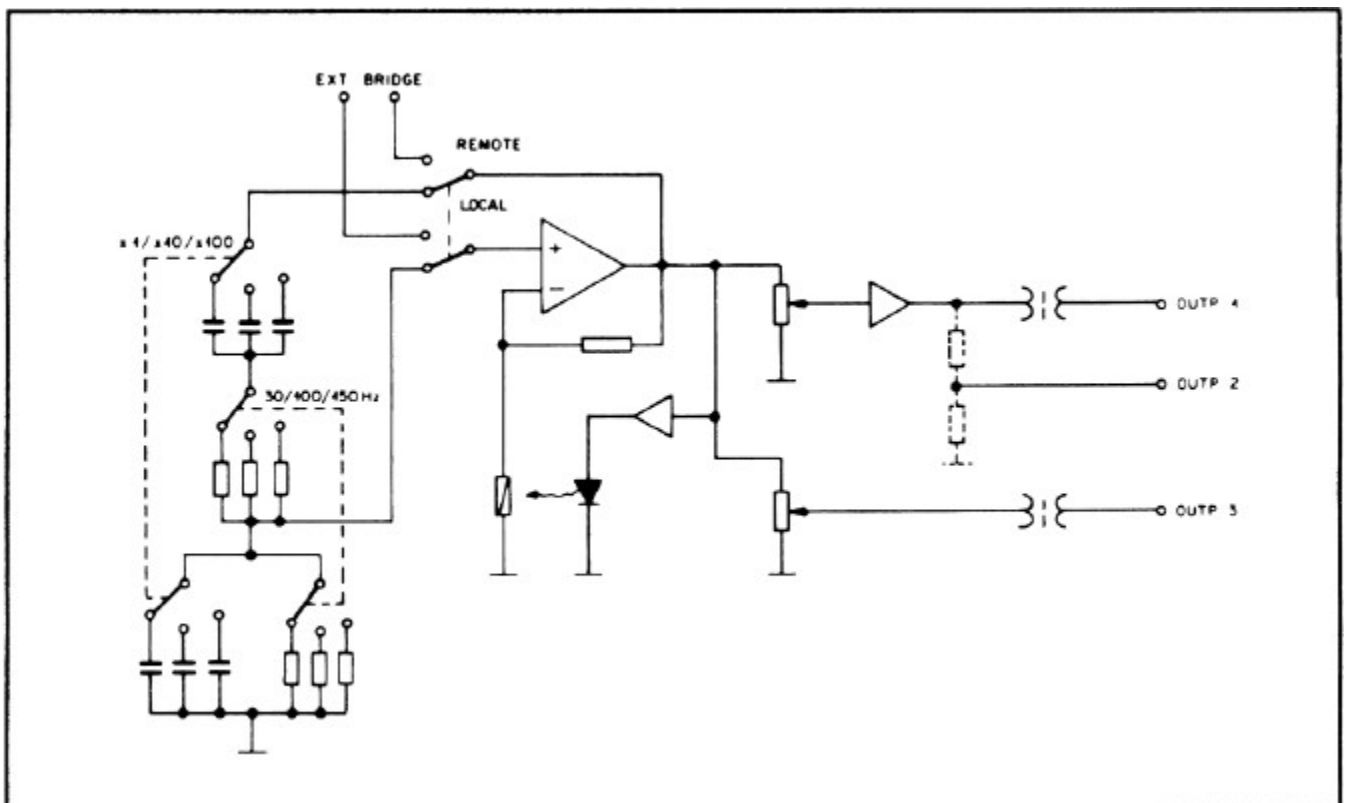
1.915.200

This oscillator circuit provides a convenient source of 9 fixed audio frequencies with stable signal level, accommodated on one Euro-card. It is well suited for quick frequency-response measurements or for other calibration work in an audio system.



Two three-position rocker switches allow the selection of the 9 frequencies, a third switch permits changeover to an external Wien-bridge, if external frequency control should be desired.

An output amplifier with level control on its input is also implemented, providing three different outputs, as far as levels and balanced/unbalanced configurations are concerned.



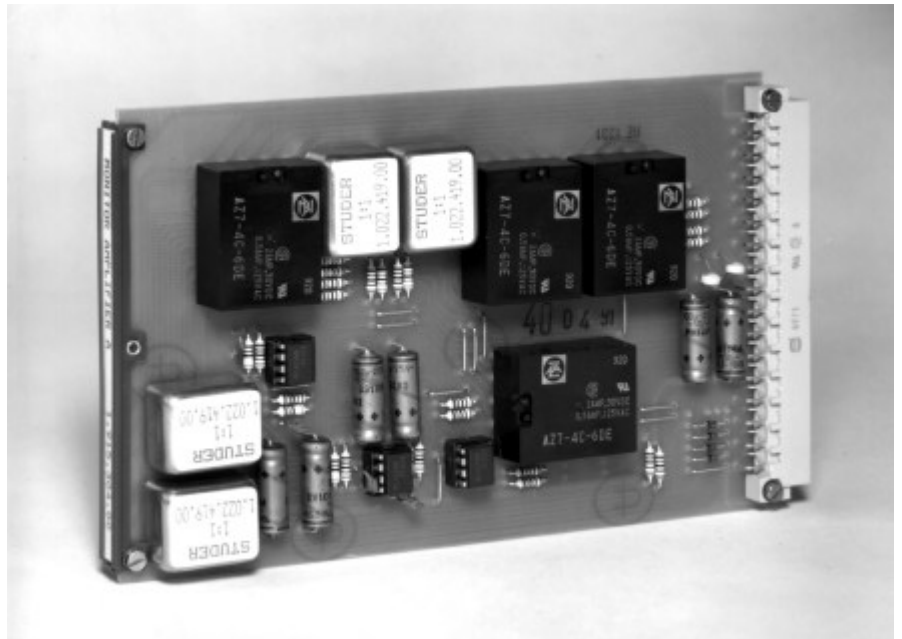
**Technical Specifications**

<b>General:</b>	Frequencies	<b>30 / 100 / 150 / 300 Hz / 1 / 1.5 / 3 / 10 / 15 kHz</b> , fixed (accuracy $\pm 5\%$ )
	Settling time	<b>&lt; 5 s</b> (30 Hz) <b>&lt; 1 s</b> (1 kHz)
	Level accuracy	<b>+0.1/-0.2 dB</b> (0...50° C)
	Operating temperature	<b>-10...+55° C</b>
	Supply	<b><math>\pm 15</math> V</b> , regulated within $\pm 0.2$ V (< 25 mA)
<b>Output 1:</b>	balanced and floating	<b>separately adjustable</b>
	Output level range	<b>-<math>\infty</math>...+10 dBu</b> (0...2.45 V <sub>rms</sub> )
	Level uniformity vs. frequency	<b><math>\pm 0.1</math> dB</b> (20° C)
	THD	<b>&lt; 0.25%</b> , 30 Hz...15 kHz <b>&lt; 0.1%</b> , 100 Hz...10 kHz
	Output impedance	<b>&lt; 30 W</b>
	Minimum load	<b>200 W</b>
<b>Output 2:</b>	unbalanced	<b>separately adjustable</b>
	Output level range	<b>-<math>\infty</math>...+15 dBu</b> (0...4.4 V <sub>rms</sub> )
	Level uniformity vs. frequency	<b><math>\pm 0.2</math> dB</b> (20° C)
	THD	<b>&lt; 0.15%</b> , 30 Hz...15 kHz <b>&lt; 0.1%</b> , 100 Hz...10 kHz
	Minimum load	<b>200 W</b>
<b>Output 3:</b>	balanced and floating	<b>separately adjustable</b>
	Output level range	<b>-<math>\infty</math>...-50 dBu</b> (0...2.5 mV <sub>rms</sub> )
	Level uniformity vs. frequency	<b><math>\pm 0.2</math> dB</b> (20° C)
	THD	<b>&lt; 0.2%</b> , 30 Hz...15 kHz
	Output impedance	<b>12 W</b>
	Minimum load	<b>200 W</b>
<b>Dimensions:</b>	Euro-card	<b>100 × 160 mm, 7M units wide</b>
	Weight	<b>approx. 350 g</b>
<b>Ordering Information:</b>	Audio generator 30 Hz...15 kHz	1.915.200.xx

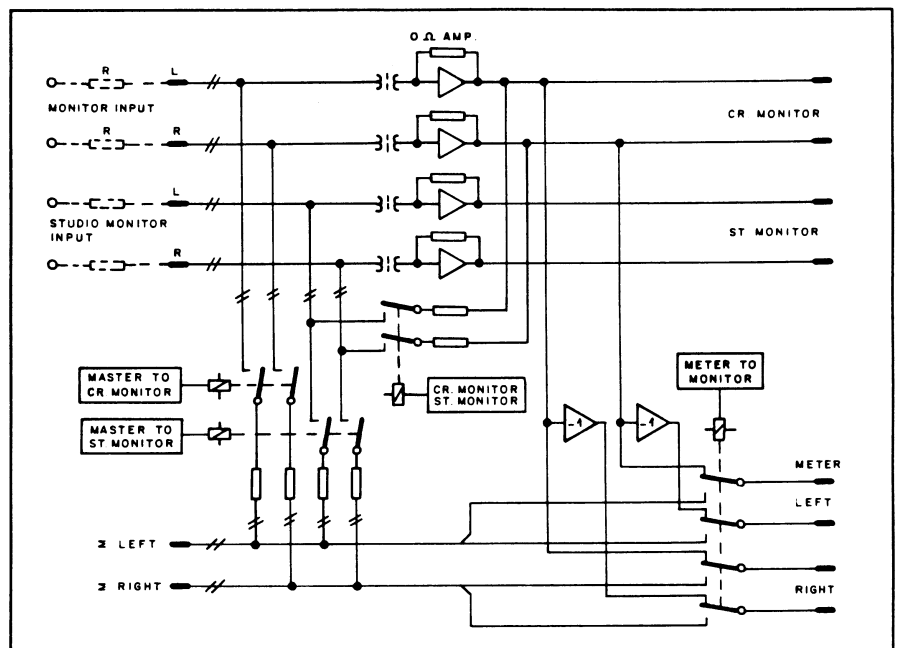
**2.2.4 Monitor Amplifier and Switching Relays (Studio/CR)**

1.915.304

The circuit on this Euro-card is designed to form part of an audio monitoring system. The card is narrower than most others, i.e., 4 M units only. It contains four amplifiers, each presenting a 0-Ω input impedance, two metering amplifiers, and four relays for audio switching.



Two stereo signal inputs from a combination of sources (with suitable isolation resistors at the output of each source) can thus be summed for Control Room (CR) and Studio Monitoring, for example. In addition, the signal from the stereo master can be assigned to either monitor line and, if needed, CR monitoring and studio monitoring can be paralleled. A further circuit permits switchover of level meters from the master bus to the CR monitor line. The relays are designed for 6 V<sub>DC</sub> operation.



**Technical Specifications**

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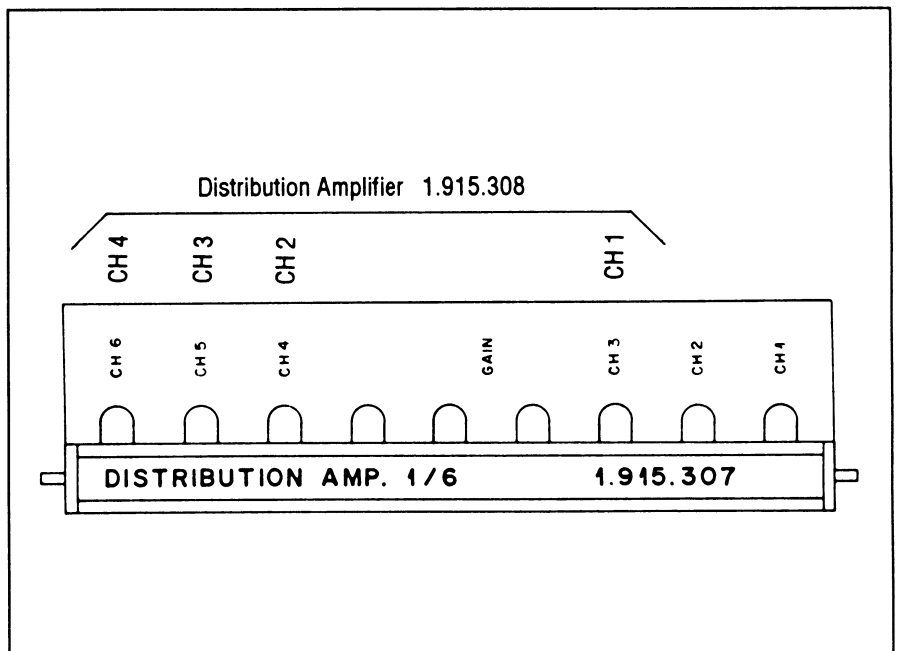
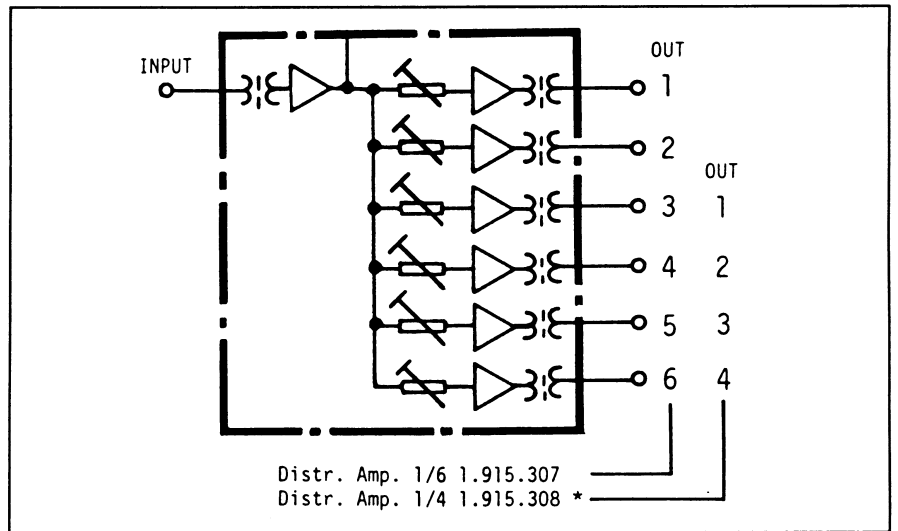
<b>Inputs:</b>		<b>balanced and floating</b> (for CR monitor and studio monitor)
	Impedance	<b>&gt; 10 kW</b>
	Maximum level	<b>+24 dBu</b>
<b>Outputs:</b>		<b>unbalanced</b> (for CR monitor and studio monitor)
	Impedance	<b>&lt; 3 W</b>
	Maximum level	<b>+20 dBu</b> into 1 k $\Omega$
	Maximum load	<b>1 kW</b>
<b>Meter outputs:</b>		<b>push-pull</b>
	Maximum level	<b>+24 dBu</b>
	Frequency response	<b><math>\pm 0.5</math> dB</b> , 30 Hz...16 kHz
	THD	<b>&lt; 0.1%</b> , @ +6 dBu input, 30 Hz...16 kHz
	S/N	<b>105 dB</b> , 20 Hz...23 kHz
<b>Supply:</b>		<b><math>\pm 15</math> V</b> (20 mA)
<b>Dimensions:</b>	Euro-card	<b>100 <math>\times</math> 160 mm, 4M units wide (19 mm)</b>
	Connector system	<b>DIN 41612, type B</b>
	Weight	<b>approx. 270 g</b>
<b>Ordering Information:</b>		Monitor amplifier and switching relay
		1.915.304.xx



**2.2.5 Distribution Amplifier**

1.915.307/308

The distribution amplifier cards offer splitting of one input to four or six individually adjustable outputs (versions 1.915.308 or 1.915.307, respectively). The input and all outputs are transformer-balanced and floating. These cards satisfy any complex requirement of signal routing and distribution.



**Technical Specifications**

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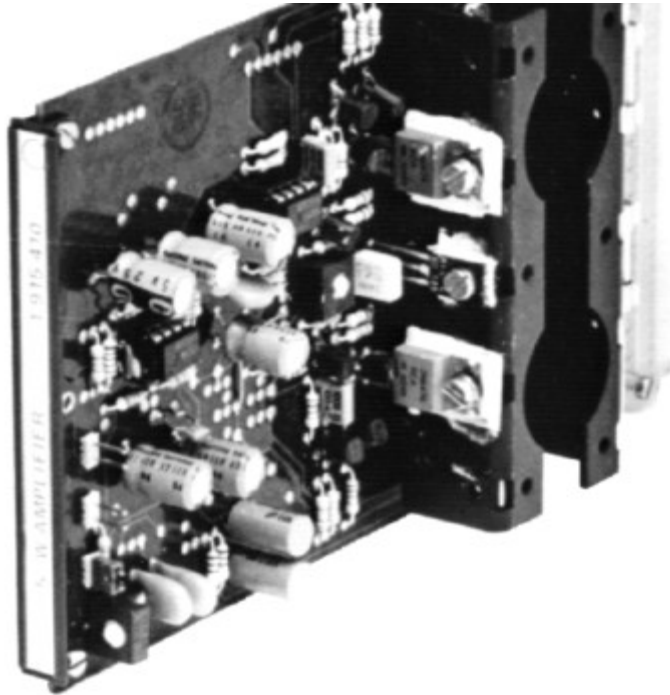
<b>General:</b>	Frequency range	<b>31.5 Hz...16 kHz</b>	
	Frequency response	<b>+0.2/-0.5 dB, <math>R_L = 300 \Omega</math></b>	
<b>Input:</b>		<b>balanced and floating</b>	
	Impedance	<b><math>\approx 10 \text{ kW}</math></b>	
	Symmetry	<b><math>\approx 60 \text{ dB}</math></b>	
	Gain, adjustable	<b>-20...+10 dB (Jumper 2-3: +6 dB Gain)</b>	
<b>Outputs:</b>		<b>balanced and floating</b>	
	Impedance	<b><math>\approx 40 \text{ W}</math></b>	
	Maximum level	<b>+24 dBu, <math>R_L = 600 \Omega</math>/THD &lt; 1%</b>	
		<b>+21 dBu, <math>R_L = 200 \Omega</math>/THD &lt; 1%</b>	
	THD	<b><math>\approx 0.02\%</math>, +6 dBu/300 <math>\Omega</math></b>	
	Output noise voltage	<b>-100 dBu, 0 dB gain</b>	
<b>Supply:</b>		<b><math>\pm 15 \text{ V}_{\text{DC}}</math></b>	<b>(90 mA, all outputs +6 dBu, without load; 180 mA, all outputs +24 dBu into 300 <math>\Omega</math>)</b>
<b>Dimensions:</b>	Euro-card	<b>100 × 160 mm, 7 M units wide</b>	
	Weight	<b>500 g (1.915.308)</b>	
		<b>600 g (1.915.307)</b>	
<b>Ordering Information:</b>			
<b>Euro-cards:</b>	•	Distribution amplifier 1 to 6	1.915.307.xx
	•	Distribution amplifier 1 to 4	1.915.308.xx
<b>19"/1U standard products:</b>	•	Distribution unit 2 × 1 in/4 out on XLR	75.700.89301
	•	Distribution unit 3 × 1 in/4 out on XLR	75.700.89302
	•	Distribution unit 2 × 1 in/6 out on XLR	75.700.89303

### 2.2.6 5 W Power Amplifier

1.915.410/415

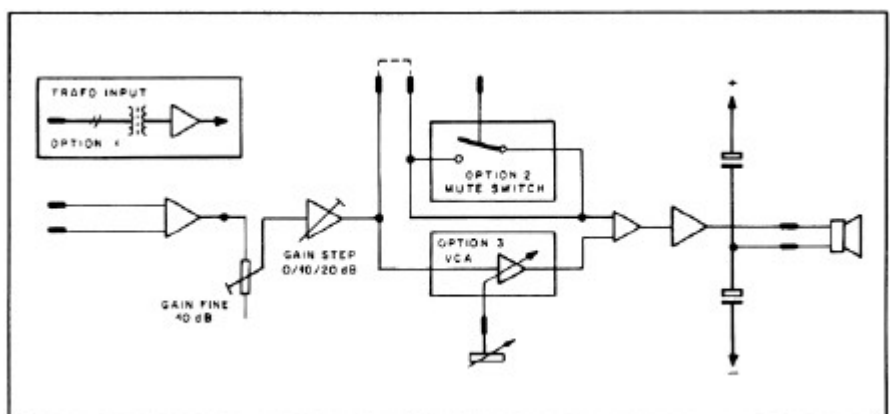
This amplifier on one Euro-card is designed for operation on a  $\pm 15$  V supply. It is capable of providing a power output of 5 W into a load of  $8 \Omega$ .

With its low-to-medium power level, this amplifier is ideally suited for applications such as pre-listening or talkback speaker operation. Its output stage is protected by instantaneous output power limiting.



The standard version has an electronically balanced (transformerless) input. It is also available with the following options:

- Input balancing transformer
- Remote muting
- Remote gain control (VCA)
- Input balancing transformer plus remote muting
- Input balancing transformer plus remote gain control (VCA).



**Technical Specifications**

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<b>Audio:</b>	Power output	<b>4 W/15 W</b> <b>5 W/8 W</b> <b>2.5 W/4 W</b> , continuous, sine wave
	THD	<b>&lt; 0.1%</b> @ rated output, 30 Hz...16 kHz
	Frequency response	<b>±0.5 dB</b> , 30 Hz...16 kHz
	Input impedance	<b>10 kW</b> , balanced
	Sensitivity	<b>-17...+16 dBu</b> (0.11...4.9 V <sub>rms</sub> ) for rated output
	Maximum input level	<b>+24 dBu</b> (12.3 V <sub>rms</sub> ) clipping point
	S/N	<b>100 dB</b> , linear to 23 kHz at normal operating gain (input +6 dBu) <b>85 dB</b> , at maximum gain
<b>Supply:</b>		<b>±15 V DC</b> (40 mA idling; 400 mA @ 5 W/8 Ω)
	Output stage quiescent current	<b>23 mA</b>
<b>Dimensions:</b>	Euro-card	<b>100 × 160 mm, 7M units wide</b>
	Weight	<b>approx. 210 g</b>

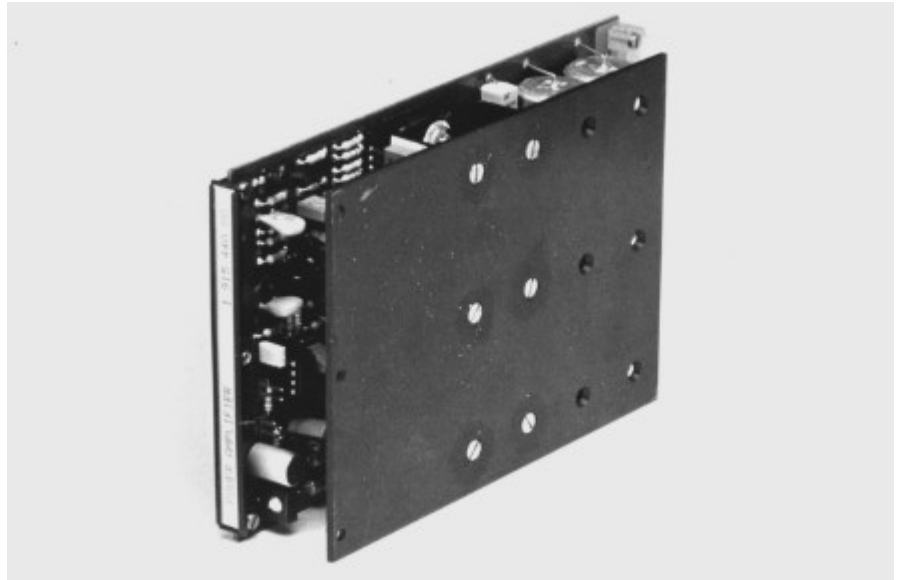
**Ordering Information:****5 W amplifier with**

• transformerless input	1.915.410.xx
• input transformer	1.915.411.xx
• transformerless input and remote muting facility	1.915.412.xx
• input transformer and remote muting facility	1.915.413.xx
• transformerless input and remote gain control (VCA)	1.915.414.xx
• input transformer and remote gain control (VCA)	1.915.415.xx

## 2.2.7 40 W Power Amplifier

1.915.440/441

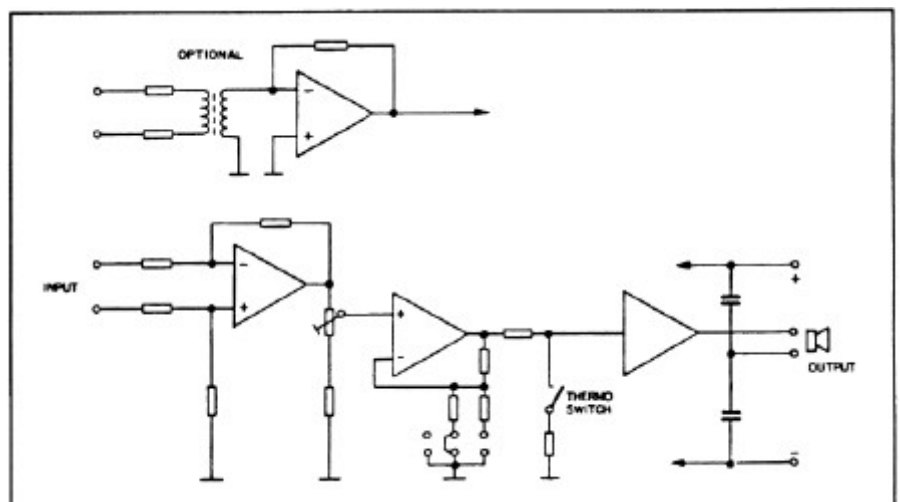
For applications where higher power level is needed, a 40 W amplifier has been realized on a Euro-card. Its width is 32 mm, which equals 7M widths approximately.



Power is supplied from a separate 45 V<sub>DC</sub> source, as is contained in the 19" mounting frame 1.918.120.xx. Two amplifier cards will fit into that frame, making it suitable for applications where stereophonic monitoring is required.

### Special Features

- Transformerless version with electronically balanced inputs standard
- Version with balanced and floating inputs available
- Output stage protected from overload by momentary power limiting
- Temperature sensing avoids thermal overload
- High-end frequency response limited to prevent transient intermodulation distortion
- Low distortion performance, even at low power output
- Operation with output transformer possible



**Technical Specifications**

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<b>Audio:</b>	Power output	<b>40 W/4 W</b> , continuous, sine-wave,
	THD	< <b>0.1 %</b> , 30 Hz...15 kHz (up to rated output)
	Output impedance	<b>0.1 W</b>
	Input impedance	<b>10 kW</b>
	Common mode rejection	> <b>50 dB</b> , 30 Hz...16 kHz (with input transformer)
	Input sensitivity	<b>-12...+18 dBu</b> (0.195...6.2 V <sub>rms</sub> ) for rated output (adjustable with jumper in three 10 dB-increments, plus fine-trim range of 12 dB)
	Frequency response	<b>+0.5/-1 dB</b> , 30 Hz...15 kHz
	S/N	<b>105 dB</b> @ maximum gain <b>90 dB</b> @ minimum gain

**Supply:** **45 V<sub>DC</sub>** (70 mA idling, 1.5 A @ 40 W/4 Ω)

**Dimensions:** Euro-card **100 × 160 mm, 7M units wide**

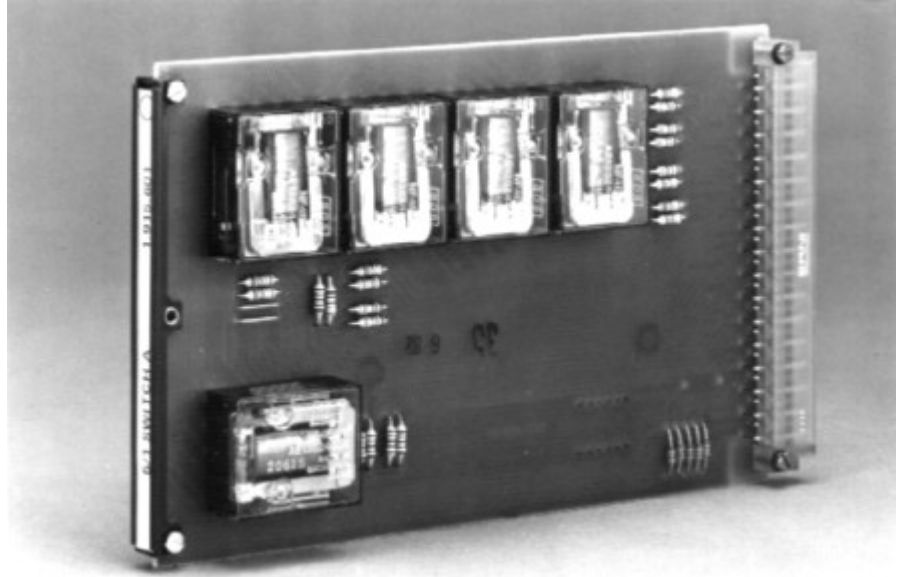
**Ordering Information:**

<b>Euro-cards</b>	• 40 W power amplifier with transformerless input	1.915.440.xx
	• 40 W power amplifier with input transformer	1.915.441.xx
<b>19"/1U standard products</b>		
<b>40 W power amplifier</b>	• Mono version, 19"/1U	75.700.80311
	• Stereo version, 19"/1U	75.700.80322
	• 19"/1U mounting frame (without amplifier cards)	1.918.120.xx

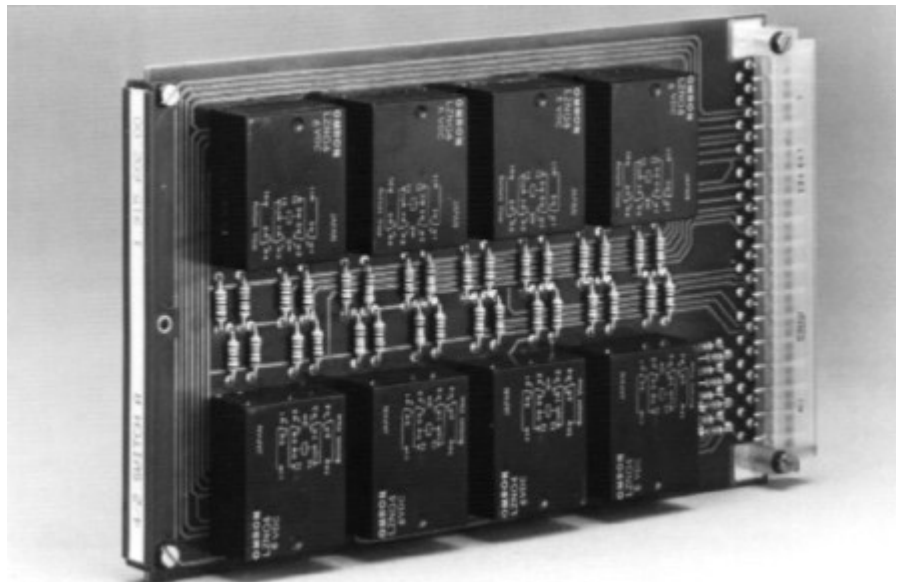
## 2.2.8 Monitor Switching Relays

1.915.601/602

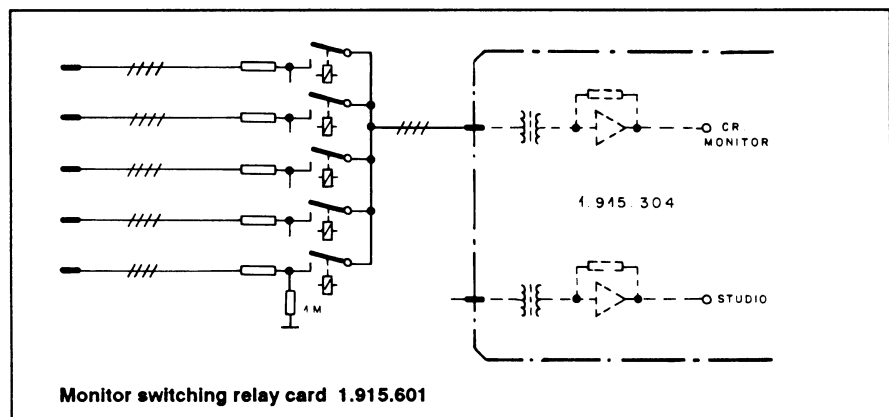
Two different monitor circuit switching cards are available. They are equipped with either five or eight relays for switching of a corresponding number of stereo sources to one or two stereo outputs in monitor circuits.



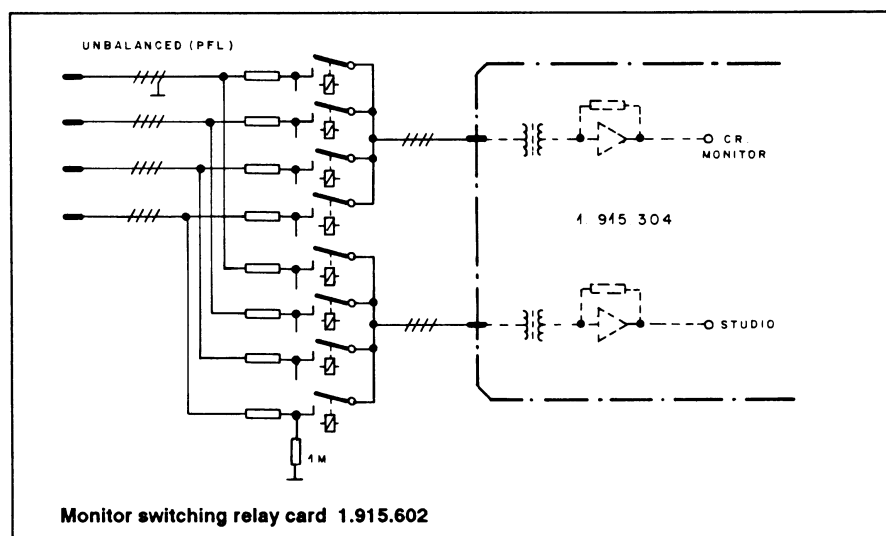
The relays are available with coil ratings of  $6V_{DC}$  or  $24V_{DC}$ , depending on the user's requirement. Click-suppressing diodes are wired across each relay coil. The relays are equipped with four double throw (change-over) contacts each.



Isolation of the monitor lines from external circuitry is achieved by  $5.6k\Omega$  resistors in the "a" and "b" legs of each stereo line, thus a high impedance (bridging) load is presented to the outside source, even in de-energized (non-selected) status, when the respective pair of relay contacts shorts the lines after the respective isolation resistors. With a relay energized, the corresponding stereo pair is routed to a stereo bus available on four pins of the 32-contact edge connector (in case of the 5-input card 1.915.601.xx).



Card 1.915.602.xx features a similar circuit configuration with eight relays, to switch one unbalanced and three balanced stereo inputs. Two stereo buses appear on eight pins of the edge-connector; in this way, the four inputs can be switched to either one or to both outputs, such as may be the case with separate monitor circuits in the control room and in the studio.



**Dimensions:** Euro-card **100 × 160 mm, 4 M units wide**  
**Weight** **approx. 250 g**

**Ordering Information:**

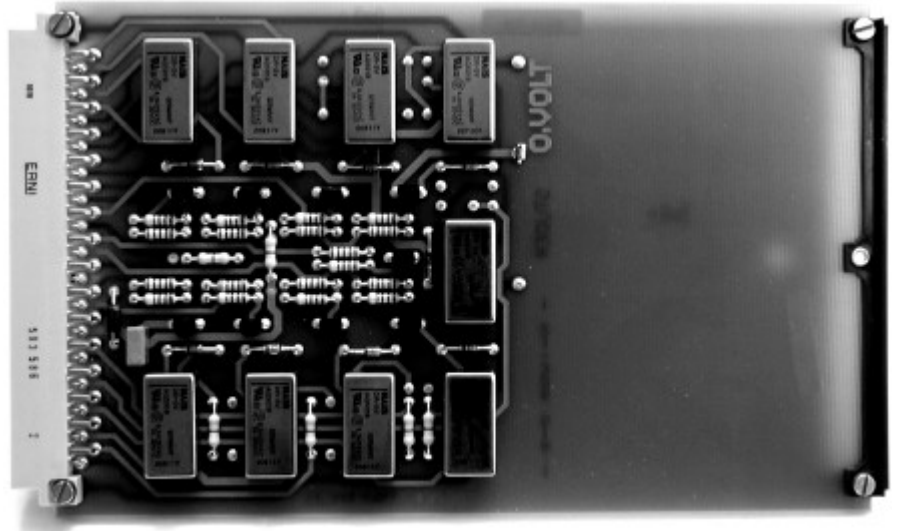
- Relay card, 5 IN/1 OUT 1.915.601.xx
- Relay card, 4 IN/2 OUT 1.915.602.xx



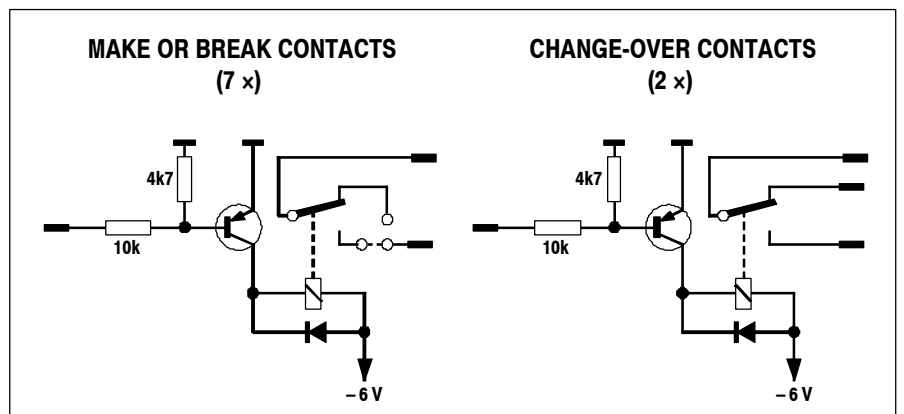
**2.2.9 Transistor-Driven Relays (7+2)**

1.915.603

This Euro-card is supplied with nine transistor-driven relays with single-pole, double-throw (SPDT) contacts. For two of the relays, both normally-open and normally-closed contacts are routed to the edge connector; for the remaining seven it is jumper-selectable whether the normally-open or the normally-closed contact is used.



The relays are designed for operation on 6 V<sub>DC</sub>, and each relay coil is bridged with a click-suppressing diode. PNP transistors in series with the coils are blocking the current flow, because each transistor is normally bi-ased off. By applying the output from the gate of an external control logic to the base of a transistor, it is switched into saturation, thereby energizing the respective relay. This arrangement of nine relays was designed for use in signaling systems within a studio installation; however, it may find its use for other applications as well.



Polarity of the relay's supply voltage must be observed when utilizing this circuit.

**Technical Specifications**

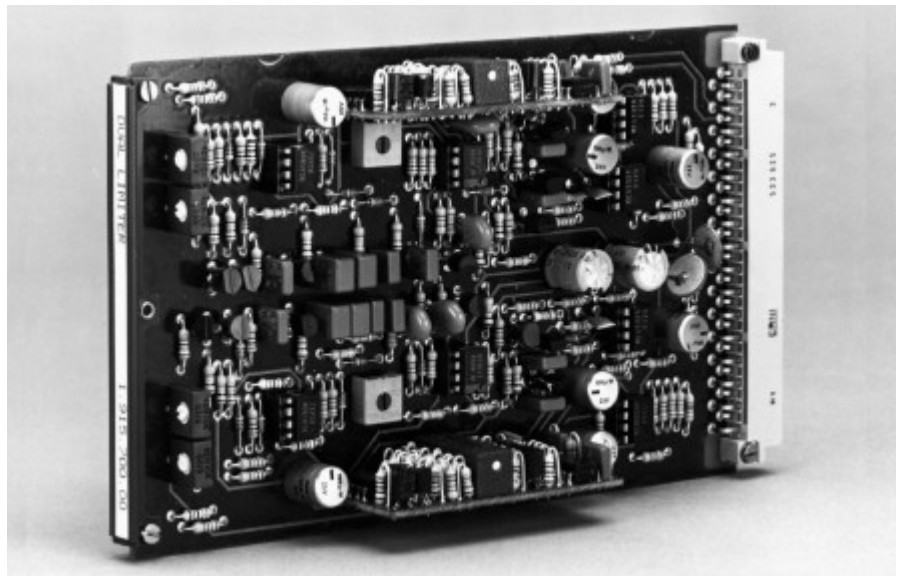
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<b>Contact Ratings:</b>		<b>max. 1 A/30 V<sub>DC</sub> or 0.3 A/125 V<sub>AC</sub></b>	
	<b>Note:</b>	<i>In this application 48 V must not be exceeded to avoid shock hazard.</i>	
	Switching power	<b>60 VA (AC)</b>	
		<b>100 W (DC)</b>	
<b>Dimensions:</b>	Euro-card	<b>100 × 160 mm, 4 M units wide</b>	
<b>Ordering Information:</b>	Transistor-driven relays		1.915.603.xx

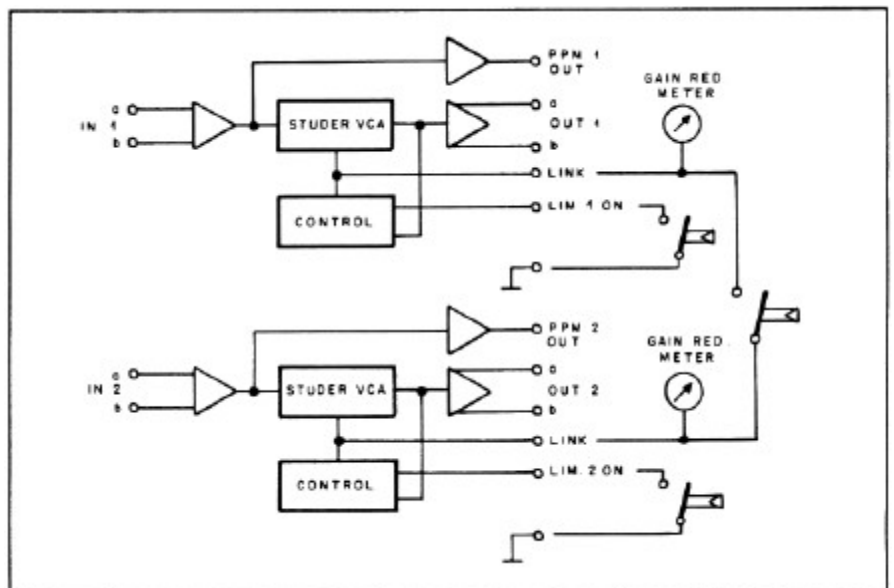
### 2.2.10 Dual Limiter

1.915.700

In sound work there are numerous situations where the signal amplitude has to be limited to a pre-determined level in order to prevent overloading of succeeding equipment, such as light modulators in film work, or radio transmitters. With this limiter, excessive levels are automatically reduced to a preset level, and, since regulation is controlled by the program's energy content, the performance of this limiter is free of any "pumping" effects. Gain reduction is achieved with a Studer Voltage Controlled Amplifier (VCA) which ensures low noise performance and negligible distortion.



Two identical, independent limiter circuits are contained on one Euro-card, plus additional, separate gain stages to drive peak program meters. The perfect tracking of the two VCAs makes this Dual Limiter suitable for stereo work as well, in which case a simple electrical connection is needed to link the units.



**Note:** Gain reduction meters (*not supplied*) can be connected to the LINK outputs as well, if required.

**Technical Specifications**

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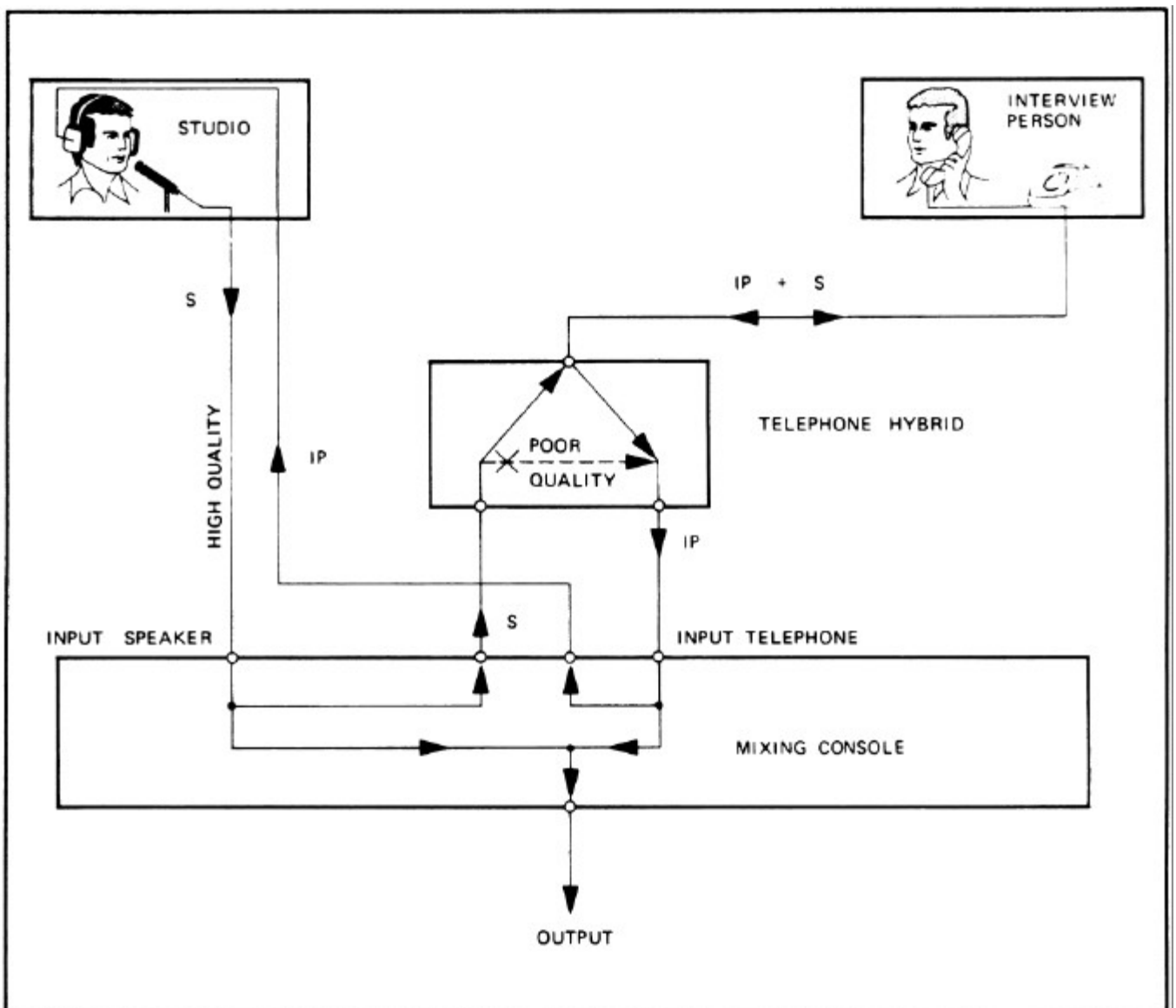
<b>Input:</b>	Impedance	<b>5.4 kW</b> , balanced configuration <b>2.7 kW</b> , unbalanced configuration
	Overload point	<b>+20 dBu</b> (7.75 V <sub>rms</sub> )
<b>Output:</b>	Impedance	<b>&lt; 50 W</b> , unbalanced
	Frequency response	<b>+0/-0.5 dB</b> , 30 Hz...15 kHz <b>+0/-3 dB</b> , 2 Hz...200 kHz
	Gain	<b>0 dB</b> , limiter off
	Output noise level	<b>-102 dBu</b> , Limiter on <b>-106 dBu</b> , Limiter off
	Limiting ratio	<b>20:1</b>
	Threshold	<b>-15 dBu...+3 dBu</b> , adjustable
	Limited output level	<b>-14 dBu...+4 dBu</b> , depending on threshold setting
	Attack time	<b>1 ms</b>
	Release time	<b>50 ms...5 s</b> , program-dependent
<b>PPM Section:</b>	Output impedance	<b>&lt; 50 W</b> , unbalanced
	Maximum output level	<b>+20 dBu</b>
	Gain	<b>2.5 dB...27 dB</b> , adjustable
	Frequency response	<b>+0/-3 dB</b> , 2 Hz...200 kHz
<b>Supply:</b>		<b>±15 V</b> (100 mA)
<b>Dimensions:</b>	Euro-card	<b>100 × 160 mm</b> , 7 M units wide
<b>Ordering Information:</b>	Dual limiter	1.915.700.xx

### 2.2.11 Telephone Hybrid

1.915.760/764

In order to record or transmit a conversation between the announcer in the studio and a person outside the studio being interviewed by telephone, the telephone line must be connected to the mixing console.

In such a case, the full conversation is transmitted, since both voice signals are carried on normal 2-wire telephone lines. However, also the voice of the announcer in the studio is then transmitted in telephone quality (300... 3400 Hz). By mixing the microphone signal of the announcer (in studio quality) to the conversation, the addition of the “good” and “poor” signals results in a distorted and untrue signal.

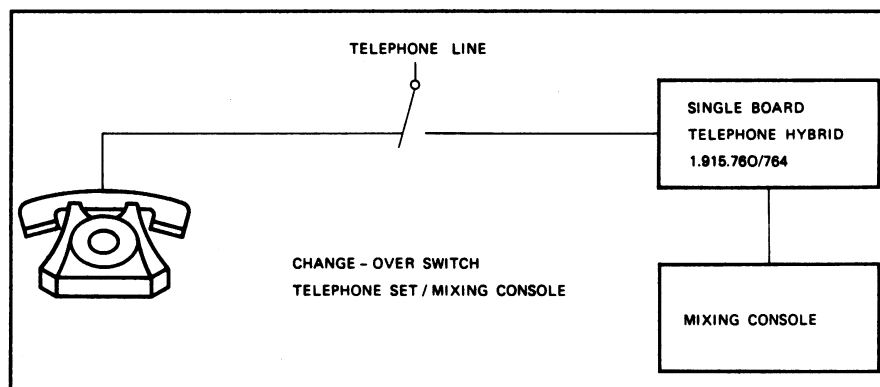


Principle of a telephone transmission via a mixing console

The telephone hybrid allows to greatly improve the quality of a telephone transmission by selectively suppressing the undesired “poor” announcer signal (side-tone attenuation). This side-tone attenuation is done in principle by a hybrid circuit which is a familiar feature in telephony.

The Studer telephone hybrid permits high-quality transmission of telephone conversations with the announcer in the studio. Apart from connecting it to the telephone line, the hybrid works automatically.

Maximum side-tone attenuation of the studio voice signal in the receiver line is achieved by automatically constituting a dummy load for the telephone line. This adjustment is performed electronically, the real (resistive) and imaginary (capacitive) components of the telephone line impedance being matched as near as possible. This automatic matching process begins as soon as an announcer signal is present.



Operation with a single Telephone Hybrid Board

The telephone set is used to establish a telephone connection (call). After switching over to the mixing console, the holding current for the subscriber's relay is maintained by a resistor on the hybrid board.

#### Versions:

A variety of 19" Telephone Hybrid units with one or two channels is available, consisting of the following versions:

- Standard version (ST) – 19"/1U Telephone Hybrid unit for direct connection to the telephone line and a relay to switch the telephone line from the telephone set to the hybrid.
- Noise gate version (NG) – same as standard version, equipped with a noise gate
- Current-adjustable version (CA) – same as standard version, but additionally featuring adjustable holding current for the telephone line.

#### Ordering Information:

##### Euro-cards:

- Telephone hybrid card 1.915.760.xx
- Telephone hybrid card with noise gate 1.915.764.xx

##### 19" standard products:

- Telephone hybrid 1CH-ST 75.700.89118
- Telephone hybrid 2CH-ST 75.700.89228
- Telephone hybrid 1CH-NG 75.700.89114
- Telephone hybrid 2CH-NG 75.700.89224
- Telephone hybrid 1CH-CA 75.700.89116
- Telephone hybrid 2CH-CA 75.700.89226
- Telephone hybrid 1CH-CA/NG 75.700.89117
- Telephone hybrid 2CH-CA/NG 75.700.89227

**2.2.12 Line Equalizer**

1.915.776/777/779

The Line Equalizer Euro-card is the ideal component to cope with situations as inadequate frequency response or excessive level loss on long-haul audio lines. Special effects equalization may be another application.

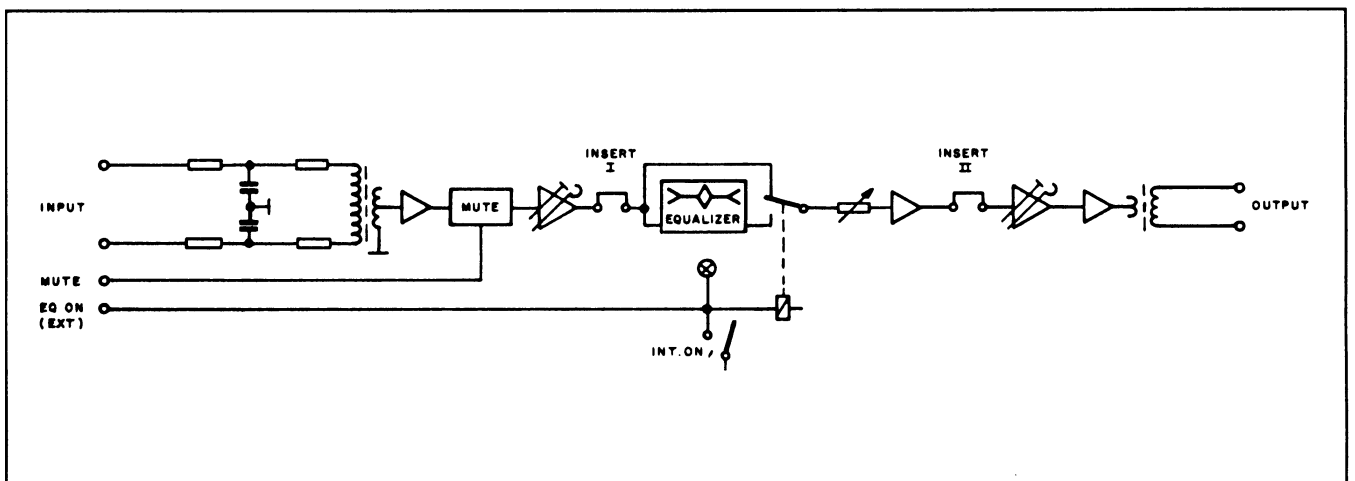
The frequency response can be varied in three bands over a  $\pm 15$  dB range, as shown by the respective graphs below. Gain is normally set to unity, with 10 dB of continuously variable gain or attenuation available. Remote controlled muting or bypassing is possible.

The equalizer cards are supplied with a choice of different front panels for either horizontal recessed, vertical recessed, or vertical flush installation into suitable mounting frames.



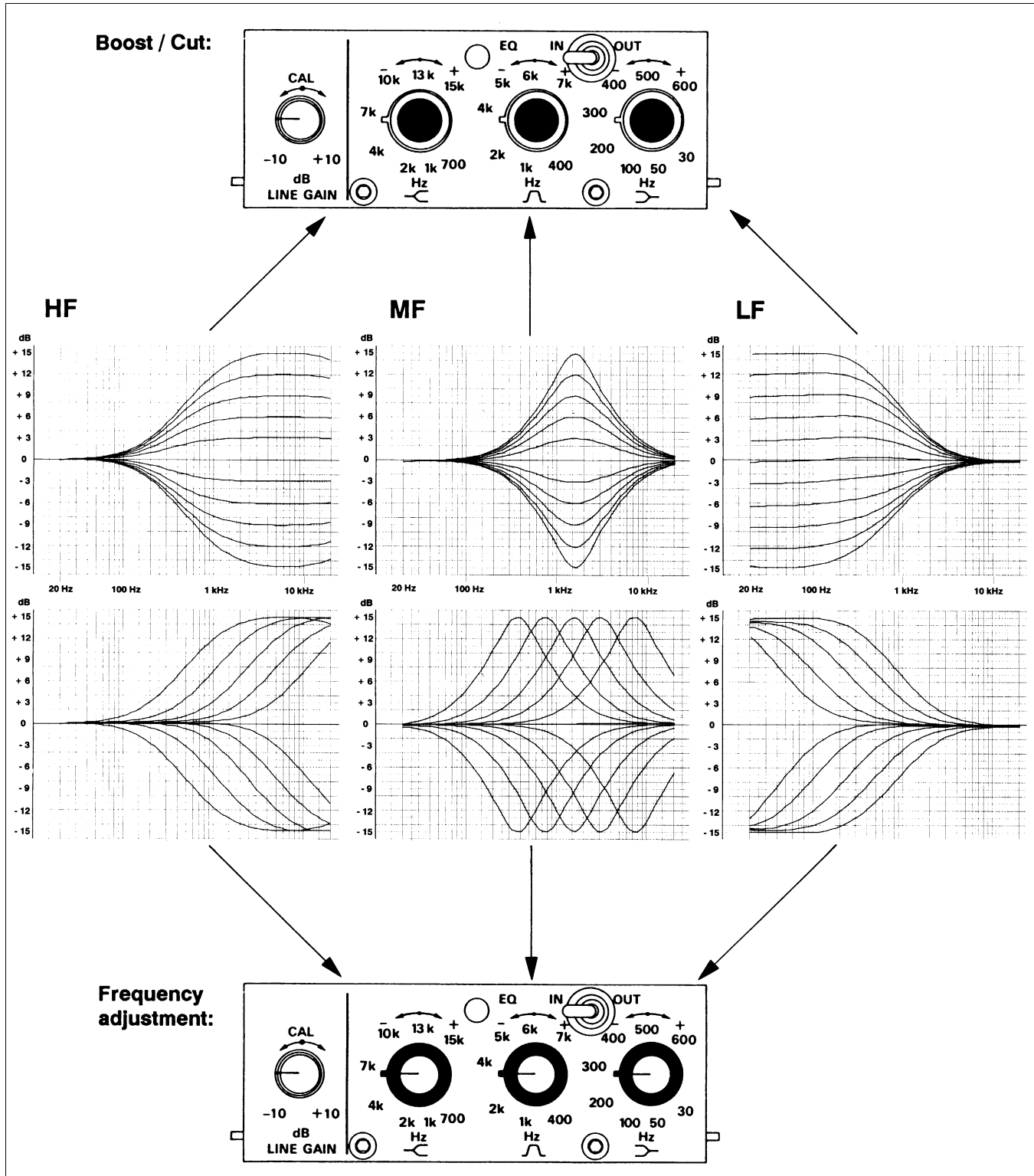
When installed vertically, each equalizer occupies 8 M units.

A 19" mounting frame for three equalizer cards plus the required power supply is described below.



**Parametric filter diagrams:**

- HF shelving equalizer: Treble filter 700 Hz...15 kHz,  $\pm 15$  dB
- MF bell-shaped equalizer: Center frequency 400 Hz...7 kHz,  $\pm 15$  dB; Q approx. 1
- LF shelving equalizer: Bass filter 30 Hz...600 Hz,  $\pm 15$  dB





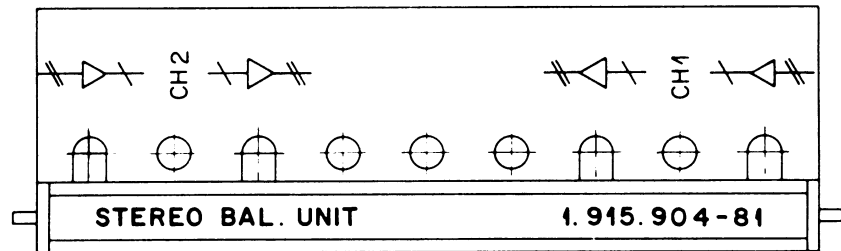
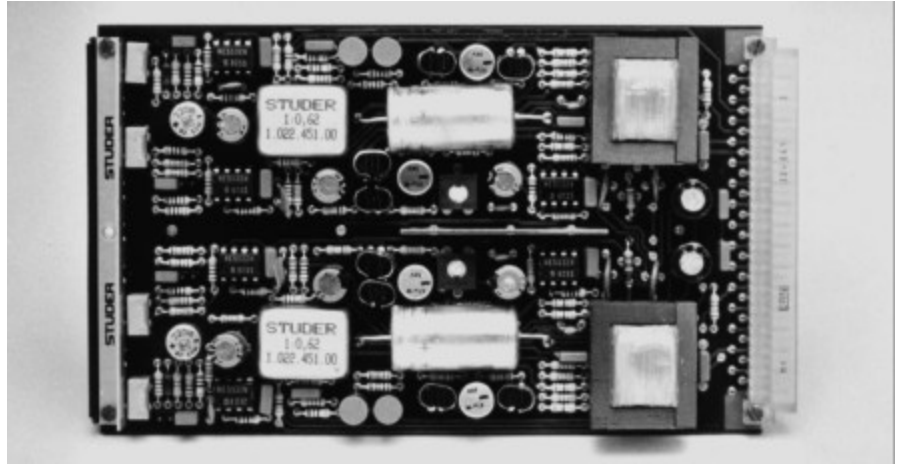
**Technical Specifications**

<b>Input:</b>		<b>balanced and floating</b> , with RF filter	
	Impedance	> <b>10 kW</b>	
	Clipping point	<b>+24 dBu</b> (12.3 V)	
	Common mode rejection	> <b>50 dB</b> , unbalanced to ground	
<b>Output:</b>		<b>balanced and floating</b>	
	Minimum permissible load	<b>200 W</b>	
	Maximum output level	<b>+24 dBu</b> (12.3 V)	
	Frequency response	<b>±0.2 dB</b> , 30 Hz...60 kHz, equalization off	
	THD	< <b>0.01%</b> , at nominal level	
<b>Equalization:</b>	Characteristics	<b>see diagram</b> , referred to +6 dBu in/out	
	S/N	> <b>96 dB</b> , equalizer off	
		> <b>93 dB</b> , equalizer on (linear)	
<b>Supply:</b>		<b>±15 V</b> (80 mA idling, 170 mA @ +24 dBu into 200 Ω)	
<b>Dimensions:</b>	Euro-card	<b>100 × 160 mm, 8 M units wide</b>	
<b>Ordering Information:</b>			
<b>Euro-cards:</b>		<ul style="list-style-type: none"> <li>• Line equalizer, horizontal, for recessed mounting 1.915.776.xx</li> <li>• Line equalizer, vertical, for recessed mounting 1.915.777.xx</li> <li>• Line equalizer, vertical, for flush mounting (ELMA) 1.915.779.xx</li> </ul>	
<b>19" standard product</b>		<ul style="list-style-type: none"> <li>• Mounting frame (19"/1U) with power supply and front panel, wired for three equalizer cards 1.915.776 (not incl.) 1.918.117.xx</li> </ul>	

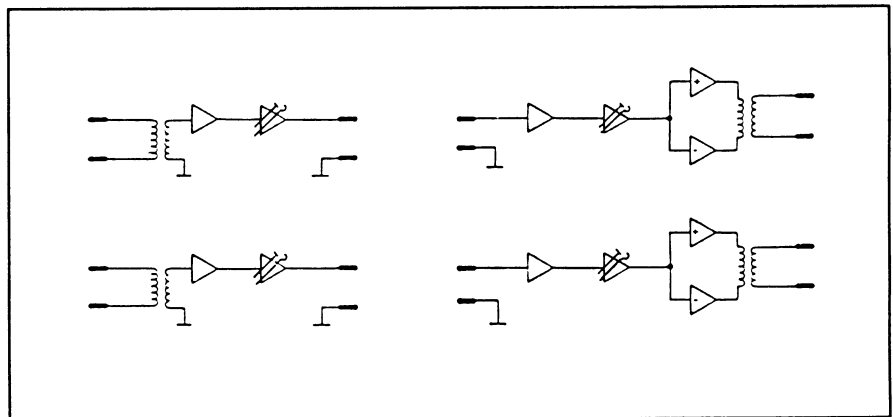
**2.2.13 Dual Balancing Unit/Dual Line Amplifier**

1.915.904

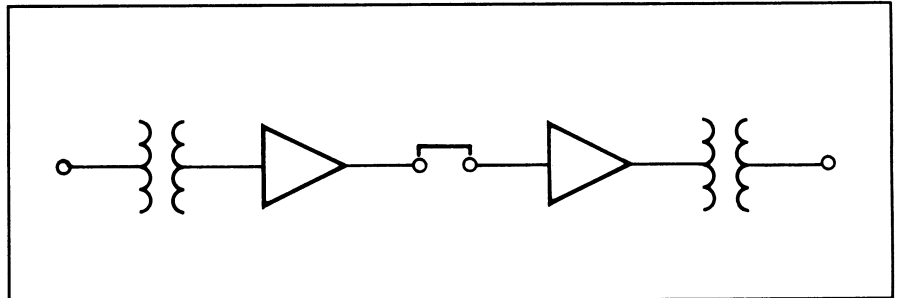
In professional audio work it is not uncommon that equipment with unbalanced input or output configuration must be connected to a system that is based on a strictly balanced design. The Dual Balancing Unit is the ideal component if the requirement of matching unbalanced to balanced equipment or vice versa has to be satisfied.



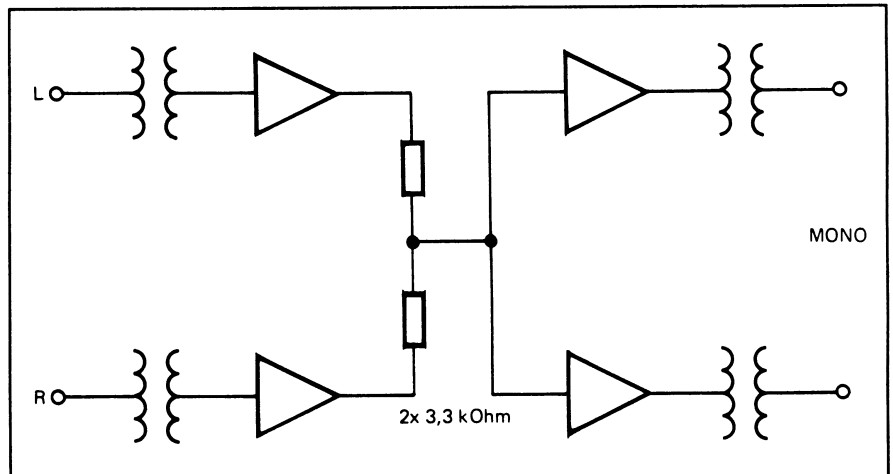
The Dual Balancing Unit consists of one Euro-card which contains four separate circuits to accommodate unbalanced-to-balanced or balanced-to-unbalanced matching in a stereo system. It is the ideal choice for applications in which consumer-type stereo equipment has to be integrated into a professional audio system, where balanced audio lines are a must. The Dual Balancing Unit will also be used in situations where balanced auxiliary units must be connected to unbalanced insert points on a mixing desk.



The use of the balancing unit is not restricted to matching of balanced and unbalanced audio system components, because it can also be utilized as a (line) booster amplifier or as a stereo-to-mono mixer. By simply connecting the unbalanced outputs and inputs together and by adjusting again within the available ranges, two booster amplifiers with a maximum gain of 30 dB and a maximum output capability of +24 dBu\*) can be realized.



For stereo-to-mono mixing, the unbalanced sides of the amplifier sections simply are connected by means of combining (mixing) resistors, as shown in the diagram below.



- \*) To avoid signal clipping, a system should always be designed in such a way that signal peaks stay well below an amplifier's maximum output capacity. Alignment procedures and level settings depend to a large degree on the type of metering used in an audio system. When making measurements with a steady-state signal, a margin of 6 dB below a system's clipping point and the PPM deflected to "zero volume", or a margin of 15 dB (for programs with extreme crest factors, even 20 dB) when utilizing a VU-meter, is considered good engineering practice.

**Technical Specifications**

---

**Balanced to unbalanced (Section 1):**

Input impedance	<b>≥ 10 kW</b> , balanced/floating
Maximum input level	<b>+24 dBu</b>
Output impedance	<b>&lt; 100 W</b> , unbalanced
Maximum output level	<b>+20 dBu</b>
Minimum load	<b>600 W</b>
Frequency response	<b>±0.2 dB</b> , 30 Hz...16 kHz
Attenuation	<b>0/15 dB</b> ; two fixed steps <b>0...15 dB</b> ; variable
S/N	<b>&gt; 100 dB</b> ; attenuation set to 6 dB, line level +6 dBu

**Unbalanced to balanced (Section 2):**

Input impedance	<b>5 kW</b> , unbalanced
Maximum input level	<b>+20 dBu</b>
Output impedance	<b>£ 50 W</b> , balanced/floating
Minimum load	<b>200 W</b>
Maximum output level	<b>+24 dBu</b>
Frequency response	<b>±0.2 dB</b> , 30 Hz...16 kHz
Gain	<b>14/30 dB</b> ; two fixed steps <b>0...17 dB</b> ; variable
S/N	<b>&gt; 100 dB</b> ; gain set to 6 dB, line level +6 dBu

**Supply:** ±15 V (70 mA, idling; 170 mA, each channel +24 dBu into 200 Ω)

**Dimensions:** Euro-card **100 × 160 mm, 7 M units wide**

**Ordering Information:**

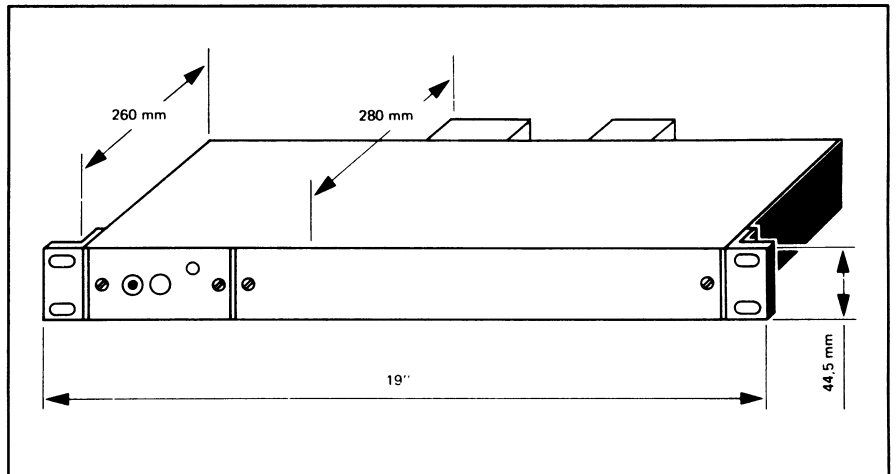
<b>Euro-card:</b>	• Dual balancing unit	1.915.904.xx
<b>19"/1U standard products:</b>	• 2CH balancing unit (1 × 1.915.904)	75.700.89212
	• 4CH balancing unit (2 × 1.915.904)	75.700.89422
	• 6CH balancing unit (3 × 1.915.904)	75.700.89632

**2.3 Racks and Frames**

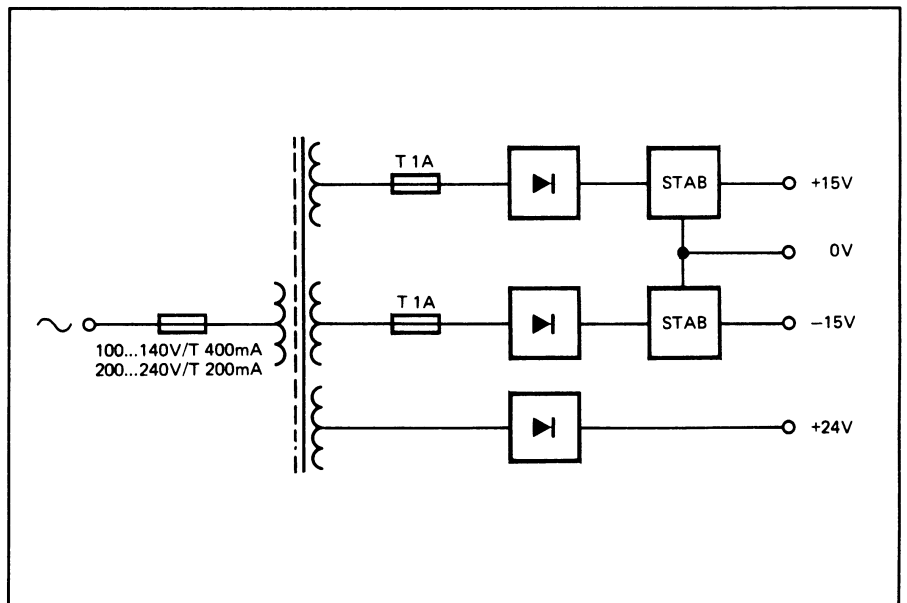
**2.3.1 19" Mounting Frame for 3 Euro-Cards**

1.918.100

This 19" mounting frame (height: 44.5 mm/1U) offers space for three Euro-cards next to the power supply. The power supply provides  $\pm 15\text{ V}_{\text{DC}}$  (regulated) and  $24\text{ V}_{\text{DC}}$  (unregulated).



The frame comes equipped with three edge connectors to accommodate three Euro-cards horizontally, side by side. A blank back panel of anodized aluminium is provided and permits the installation of input and output connectors as required, depending on the application.



## Technical Specifications

**Primary:** Voltage selector for **100, 120, 140, 200, 220, 240 V<sub>AC</sub>**  
 Fuse (slow-blow) **400 mA** (for 100...140 V<sub>AC</sub>)  
**200 mA** (for 200...240 V<sub>AC</sub>)

**Secondary:** Regulated voltage **±15 V<sub>DC</sub>**, 0.5 A max.  
 Unregulated voltage **24 V<sub>DC</sub>**, 0.2 A max. (for signaling)  
 Fuses (slow-blow) **2 × 1 A**

### Ordering Information:

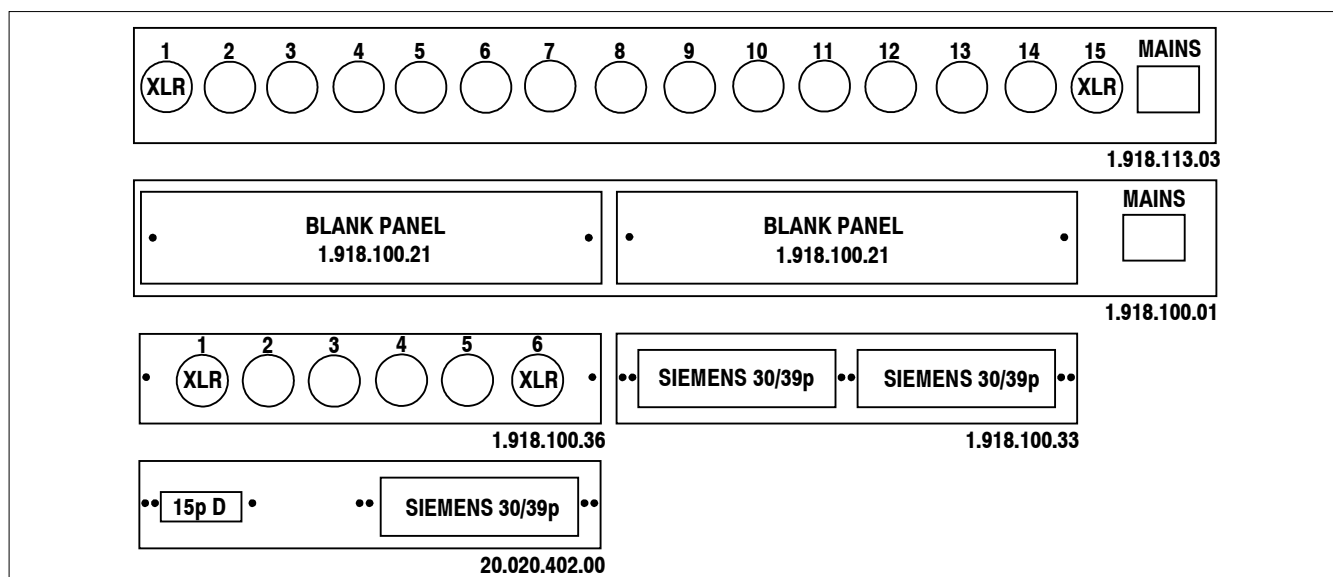
**19"/1U standard product**

- Mounting frame for three Euro-cards with power supply and stabilizer PCB, with two blank aluminium back panels (1.918.100.21)

1.918.100.xx

### Alternative Back Panels:

The mounting frame 1.918.100.xx can be equipped with the following back panels:



### Ordering Information:

#### Alternative Back Panels for Mounting Frame 1.918.100

- Steel back panel for 15 × XLR sockets (Neutrik) 1.918.113.03

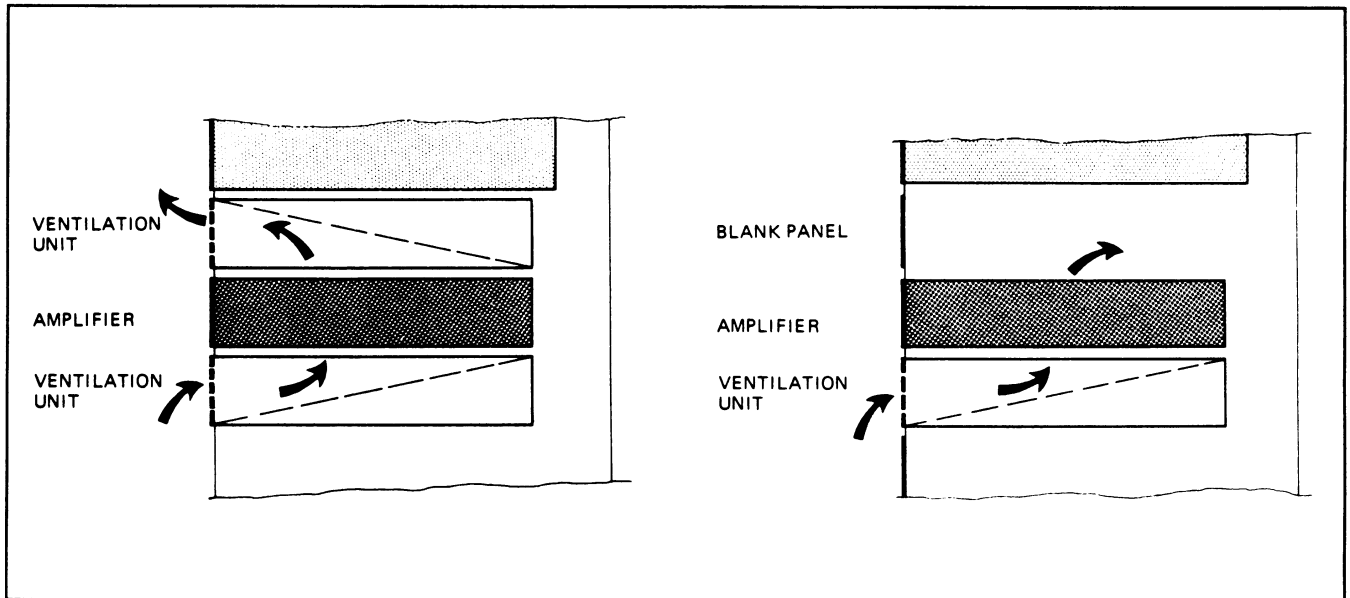
#### Alternative Back Panels for Blank Panels 1.918.100.21

- Aluminium back panel for 6 × XLR sockets (Neutrik) 1.918.100.36
- Aluminium back panel for 1 × Siemens 30/39 pin and 1 × 15pin D-type sockets 20.020.402.00
- Aluminium back panel for 2 × Siemens 30/39 pin sockets 1.918.100.33
- *Mechanical interface Siemens panel → D-type connector: see chapter 2.3.4.*

### 2.3.2 19" Ventilation Unit/19" Blank Panels

1.918.119/0XX

When filling a cabinet rack with various electronic equipment, considerable heat may be generated, which could be harmful to other nearby components. To provide for sufficient convection cooling, the use of ventilation units above and below the heat-generating equipment is strongly recommended.



A ventilation unit consists of a 19" wide and 1U high sheet metal structure, which extends about 340 mm into the rack. The unit's front section is perforated, with a slanting metal panel mounted inside. By installing the ventilation unit with that panel either slanting upwards or downwards, the air flow can be directed as desired.

If only moderate heat problems have to be coped with, it may be sufficient to use one ventilation unit above or below the heat source, and to provide sufficient spacing from adjacent equipment by installing a 1U blank panel on the opposite side.

#### Ordering Information:

##### 19" Ventilation Units

- Ventilation unit 19"/1U 1.918.119.xx
- Ventilation unit without air guide panel 1.918.119.09

##### 19" Blank Panels

- Blank panel 19"/1U high, anodized finish 1.918.001.xx
- Blank panel 19"/2U high, anodized finish 1.918.002.xx
- Blank panel 19"/3U high, anodized finish 1.918.003.xx
- Blank panel 19"/1U high, plastic coated, grey 1.918.001.09
- Blank panel 19"/2U high, plastic coated, grey 1.918.002.09
- Blank panel 19"/3U high, plastic coated, grey 1.918.003.09
- Blank panel 19"/1U high, paint finish, grey 1.918.011.xx
- Blank panel 19"/2U high, paint finish, grey 1.918.012.xx
- Blank panel 19"/3U high, paint finish, grey 1.918.013.xx

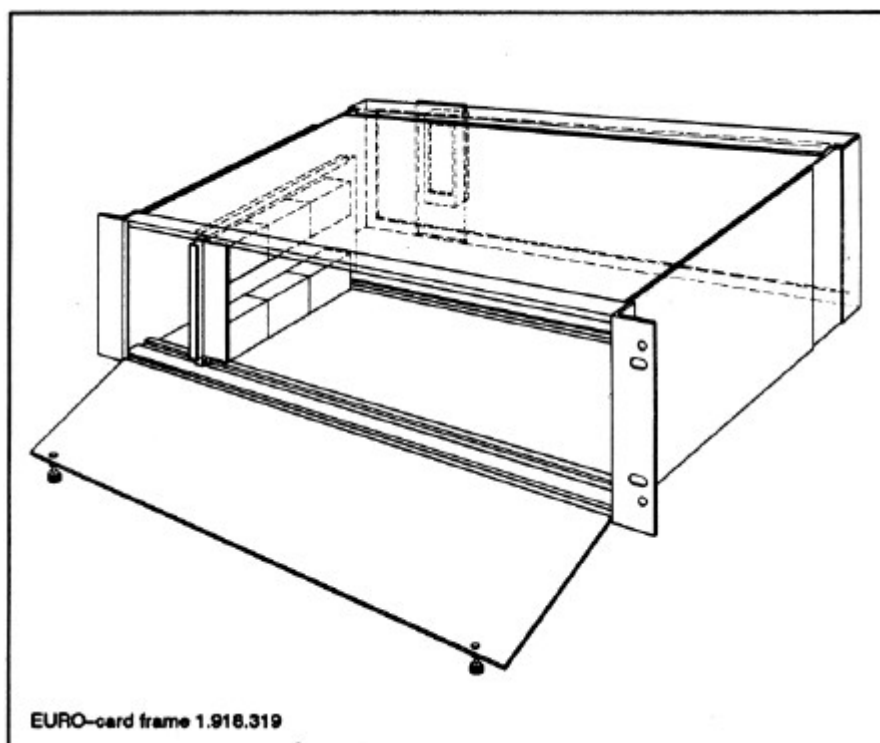
### 2.3.3 19" Euro-Card Mounting Frames

1.918.318/319

The Euro-card mounting frame (sometimes also referred to as 19" Sub Rack) is an empty structure which fits into any standard 19" rack. It is intended to accommodate PCBs of the Euro format vertically, side by side. The available space within the sub rack is divided into 84 Modular Widths, each measuring 5.08 mm (0.2 inches). One Euro-card usually occupies 7 M (Module) widths, thus up to 12 Euro-cards may be installed.

The Euro-card frame is supplied as a kit for assembly by the user. Assembly instructions are included with each kit.

Supplied with the kit is a hinged front panel of anodized aluminium, providing quick access to the plug-in PCBs if required. This front panel and its hinges are available separately in case a damaged panel or hinge needs to be replaced.



Separate edge connectors and slide rails are required for each Euro-card and power supply unit installed into the Euro-card frame. Mounting kits containing the slide rails, edge connectors, and other accessories are described below (1.918.315/316).

To provide for convection cooling within an equipment rack, the Ventilation Unit 1.918.119.xx is recommended.

#### Euro-Card Racks, Ordering Information:

- Euro-card frame (19"/3U, ELMA), direct access to 32pin connectors on back panel 1.918.318.xx
- Euro-card frame (19"/3U, ELMA) with additional rear panel, for max. 10 freely assignable connector panels 1.918.319.xx



**2.3.4 19" Euro-Card Mounting Accessories**

**Euro-Card Mounting Kit**

For installing Euro-cards and/or a power supply unit into a Euro-card frame 1.918.318/319, suitable edge connectors and guide rails are required.

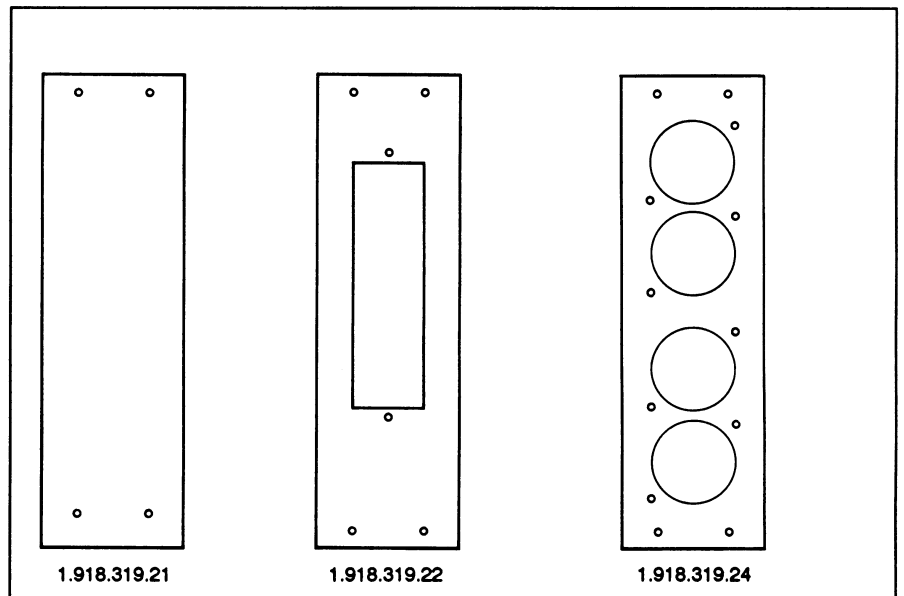


**Euro-Card Mounting Kit, Ordering Information:**

- Mounting kit for 1 Euro-card (ELMA rack); see photograph 1.918.315.xx
- Mounting kit for power supply 1.915.100 1.918.316.xx

**Connector Panels:**

The connector panels fit into the Euro-card frame with back panel (1.918.319). Please order the suitable panels separately.

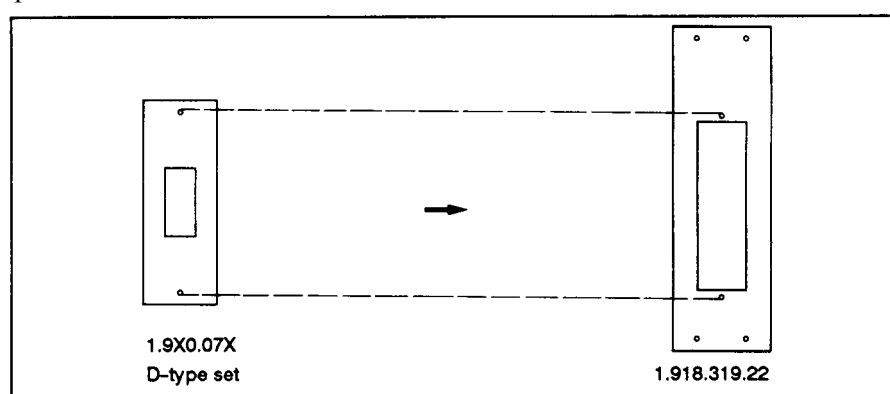


**Connector Panel (3U high) Ordering Information:**

- |  |              |
|--|--------------|
| • Blank panel  | 1.918.319.21 |
| • Panel for Siemens connector (cut out 18 × 67 mm) * | 1.918.319.22 |
| • Panel for mains inlet and 2 banana sockets         | 1.918.319.23 |
| • Panel for 4 XLR sockets                            | 1.918.319.24 |

- \* **Siemens Connector Sets:** Including male and female connector:
- |  |              |
|--|--------------|
| – Siemens 30pin, without connector panel | 1.900.080.xx |
| – Siemens 39pin, without connector panel | 1.900.081.xx |

- \* **D-Type Adapter Panels:** The Siemens connector panel can be used as a base for mounting a D-type connector adapter panel. The adapter sets listed below include male and female connectors, connector cover, bolting spring, clamp, and adapter panel:

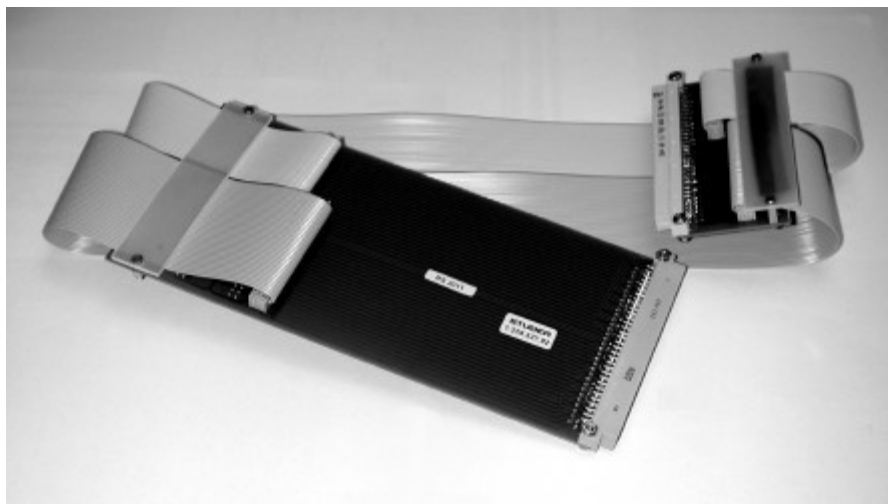
**Adapter Panel Ordering Information:**

The adapter kits consist of male and female D-type connector, metal or plastic connector cover, adapter panel, and mounting hardware, to fit on the Siemens connector panels 1.918.319.22 (for 3U frames) or 1.918.100.33 (for 1U frames):

- |  |              |
|--|--------------|
| – D-type set, 9pin, metal connector cover    | 1.900.075.xx |
| – D-type set, 15pin, metal connector cover   | 1.900.076.xx |
| – D-type set, 25pin, metal connector cover   | 1.900.077.xx |
| – D-type set, 37pin, metal connector cover   | 1.900.078.xx |
| – D-type set, 50pin, metal connector cover   | 1.900.079.xx |
| – D-type set, 9pin, plastic connector cover  | 1.970.075.xx |
| – D-type set, 15pin, plastic connector cover | 1.970.076.xx |
| – D-type set, 25pin, plastic connector cover | 1.970.077.xx |
| – D-type set, 37pin, plastic connector cover | 1.970.078.xx |
| – D-type set, 50pin, plastic connector cover | 1.970.079.xx |

**Extension Board:**

For alignment and repair, a Euro-card may have to be operated outside the mounting frame. To facilitate any service work that has to be performed on individual cards, extending the card's 32 electrical connections is possible by means of a flexible extension board.



**Ordering Information:** Extension PCB for Euro-cards, 2 × 32pin, flexible

1.228.327.82

