
The leading edge of technology

1 Introduction

Studer, a company with a long tradition in audio engineering and design perfection, is now taking a major step toward a completely new technology in the field of digital mixing consoles. Based on long years of experience in the market and the latest scientific achievements, a new product family, the Studer D950, has been created.

1.1 The leading edge

With the D950, Studer introduces a product that sets new frontiers in digital audio. It uses the latest technology and highly flexible DSP power distribution to satisfy all needs of the professional audio industry. The console can be easily reconfigured to suit the specific needs of various applications, all within a few seconds. The investor profits by getting a flexible and versatile product with a clear upgrade path. The operating desk presents itself to the operator in a clearly laid out, simple to learn “analog” design, still allowing an intuitive access to all the fine details of its digital signal processing capabilities. Reliability and highest audio quality, as well as the use of industry’s standard audio formats, are a bonus to the maintenance engineer.

The D950 uses industry’s most modern technology. This has the advantage of having vast amounts of available processing power and fast system re-

sponse to every operator command. In addition, the space requirements and the power consumption are minimized. The flexible desk surface of the D950 mixer has been designed for the rigors of day-to-day work, specially taking into account the live situation. Access to all functions is quick and intuitive.

2 Applications

In all radio, television, film, music production, or postproduction applications where medium or large digital mixing consoles are to be used, the D950 family will offer an interesting new solution. The completely new digital signal processing technique has, among other things, the advantage that the required space for this section of the mixing console is reduced by about one half. This means that installation is also possible in situations where space is at a premium.

Due to the scaleable DSP architecture, the modular design, and the incredibly simplified configuration tools, a system can be easily adapted to a variety of tasks, and its overall power can be distributed between several operator consoles. Even the most diverse requirements (broadcasting, multi-track production, mixdown) can be handled by the same console; reconfiguration takes but a few seconds.

Studer D950

Console versions with different surround formats can be configured for film, TV, and postproduction. The AutoTouch™ dynamic automation is available as an option. The economic aspects are significant: the new DSP components are much less costly to produce than the existing ones, which has a positive effect on the price of the overall system.

3 Concept

3.1 Ergonomics

The user interface of the Studer D950 mixing console is designed for professional users. Particular attention has been given to the requirements of live operation. The access to all functions is fast and simple. As the user interface is similar to an analog mixing console, the time required for familiarization is very short.

Each channel strip contains the control elements for all parameters of the selected channel. All channel strips have the same design, but they can be allocated to different functions (e.g. input, group, master). The main functions, as input selector, processing block selectors, and the AUX section can always be accessed directly. For this reason it is not necessary for the operator to call up “pages” or to use a central control panel. This also enhances the status feedback of the individual channel settings.

The layout of each channel strip is almost identical to a traditional analog strip. Important functions, such as the routing information, input selection, AUX control, and processing selection are laid

out clearly and generously, allowing easy navigation and instant feedback for all channel strips at a glance.

Processing functions can be assigned to the four touch-sensitive rotary encoders that are used to modify the processing parameters.

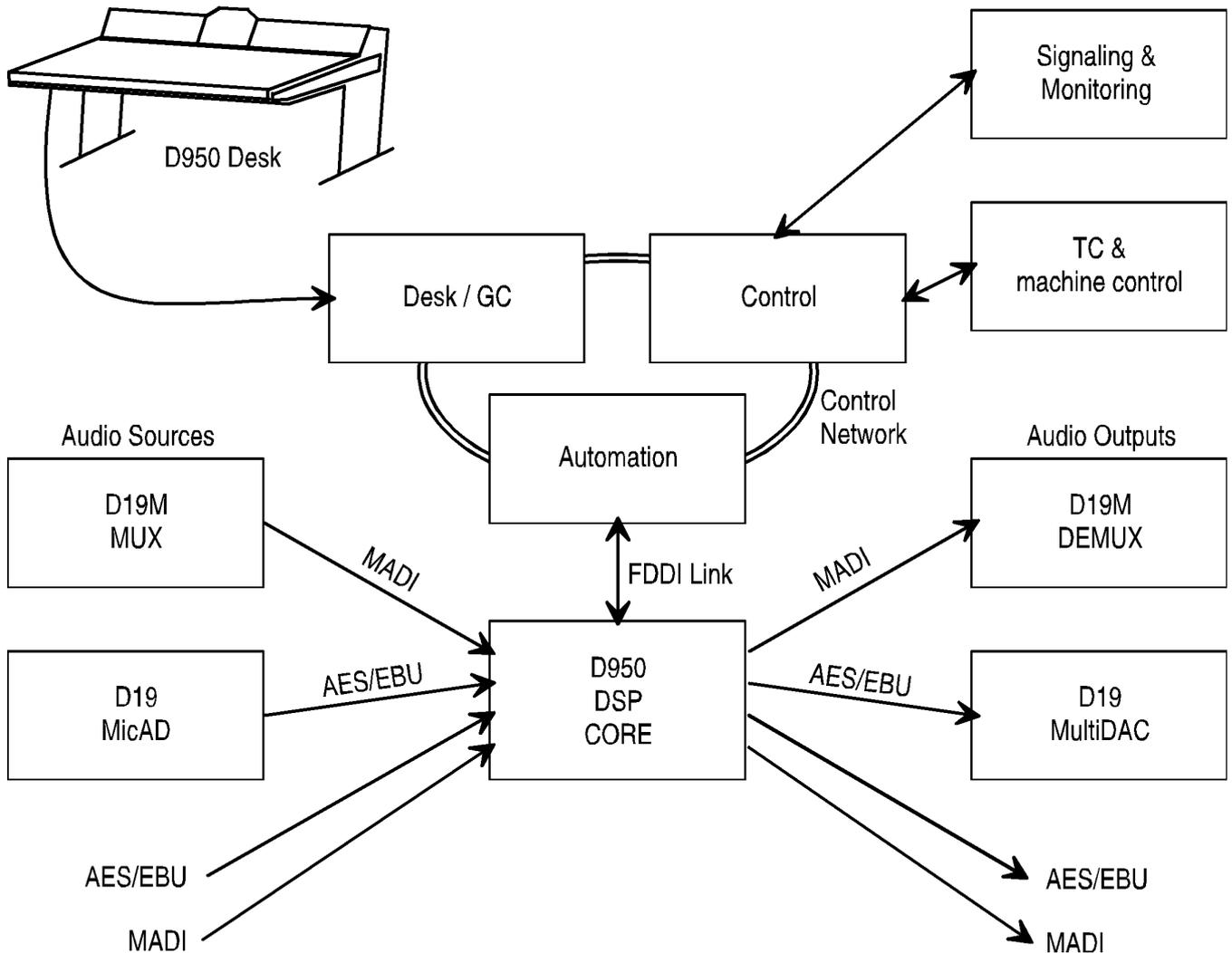
The multi-functionality of the operating surface is achieved by using a simple and intuitive solution: The displays next to the assignable high-resolution rotary encoders describe the assigned function. Once touched, the label changes to display the current value. An intuitive “analog” value is always displayed on an LED bar below the knob.

The operation, and particularly the status feedback, are further enhanced by the visual displays of EQ or Dynamics settings on the Graphic Controller. The surface is fully modular and can be laid out in a variety of ways to suit individual customer specifications.

3.2 Audio quality

The DSP platform of the Studer D950 uses processors with integrated floating point circuitry. The internal word length is 40 bits. This high resolution is responsible for the outstanding signal-to-noise ratio of the D950.

Due to high resolution, the truncation errors, inevitably generated with some kinds of digital signal processing, are kept so small that they have no effect in the result. The possibility to connect MADI and AES/EBU format signals directly to the DSP core is a future-safe investment with linear 24 bit at the inputs and outputs.



Basic D950 system components

3.3 Audio interfaces

Digital audio connections are established directly on the DSP core in MADI or AES/EBU format.

The analog conversion is performed via peripheral devices from the Studer D19 or D19m families. These peripheral devices can also be installed remotely and be connected to the mixing console via optical fiber cables; this minimizes the required cabling and allows A/D conversion near the sound source.

4 Features

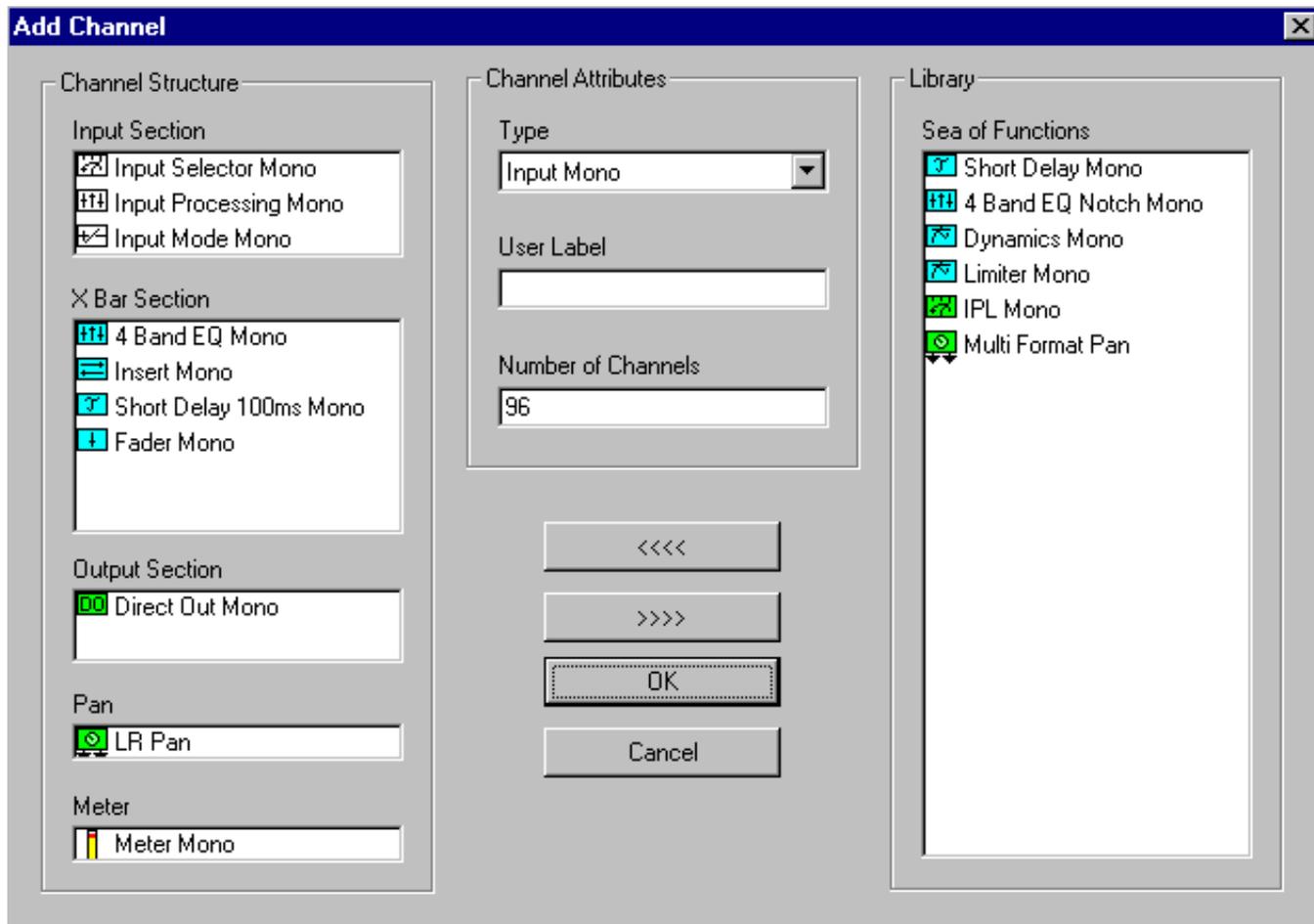
In order to apply the latest high-speed parallel data processing techniques to audio applications, the D950 project was started jointly with researchers of the Swiss Federal Institute of Technology in Zurich. After intensive work a system is now available that uses not only the most powerful SHARC

processors but features also full scaleability of the DSP platform and the control system.

4.1 Safety and reliability – redundancy, hot-swap

The digital signal processing is the core of every digital mixing console. For this reason, any faults occurring in this part of the system can become critical. The core of the Studer D950 monitors all its parts during operation. If a hardware or software error is detected on a particular DSP board, measures are immediately taken to protect the audio information. The processing is immediately assigned to a redundant DSP board (if installed). The operator is notified by a message on the screen. The faulty board can even be hot-plugged and replaced without interfering with the operation of the mixing console.

Studer D950



Example of a session configuration screen

4.2 Session configuration

One of the key features of the D950 is the free configurability. The long-standing Studer standard enabled each customer to configure an analog mixing console tailored to his or her individual requirements. Today, however, this is done with a graphic configuration tool through which the desired specifications can be conveniently entered. After a brief compiler run, the hardware requirements are displayed, and the entire DSP software for the new system is generated automatically. This tool reduces the configuration procedure from several weeks to a few minutes which, in turn, reduces the delivery time.

A step that goes beyond the mixing console configurability in the traditional sense has been taken:

The entire D950 system is so flexible that it is possible to change configurations “on the fly”. With the Graphic Controller the configuration matching the application most closely can be selected from any number of “Session configurations”. The Session Configuration Tool is an option.

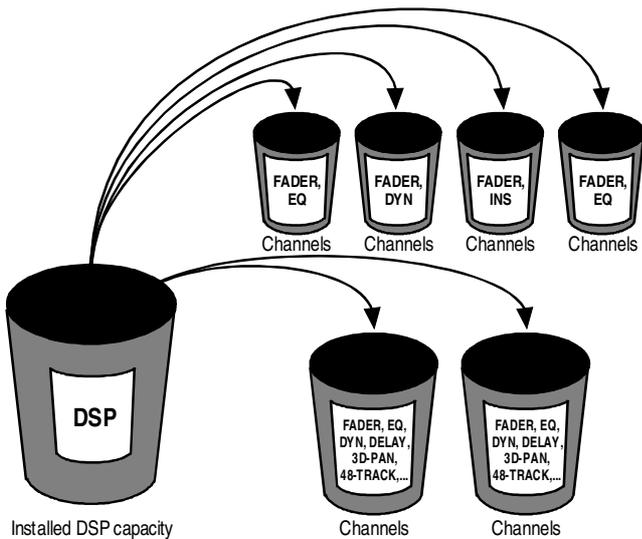
Example: A music configuration may have sophisticated dynamic units in each input channel, but just in the next configuration, these dynamic units should be sacrificed for more auxiliary busses. Within approximately 30 seconds the configured software is changed and a mixing console tailored to the current application is available.

The audio engineer can configure a “different” mixing console for each session, for example:

Day 1	Day 2	Day 3
Live Broadcast configuration	Multitrack Recording configuration	Mixdown configuration
48 Mono Input Channels with - EQ - Delay	48 Inline Channels with - EQ in monitor path - Comp/Lim/Exp/Gate in input path - Delay	96 Mono Input Channels with - EQ - Delay - Comp/Lim/Exp/Gate - IPL
24 Stereo Input Channels with - EQ	4 Stereo Input Channels with - EQ	4 Stereo Input Channels with - EQ
0 Routing busses	48 Routing busses	8 Routing busses
8 Groups with - EQ	0 Groups	16 Groups
2 Master Outputs with - Output Limiter - EQ	4 Master Outputs	8 Master Outputs
8 Mono Auxiliaries	4 Mono Auxiliaries	12 Mono Auxiliaries
2 Stereo Auxiliaries	4 Stereo Auxiliaries	4 Stereo Auxiliaries
12 Clean feed busses	0 Clean feed busses	0 Clean feed busses

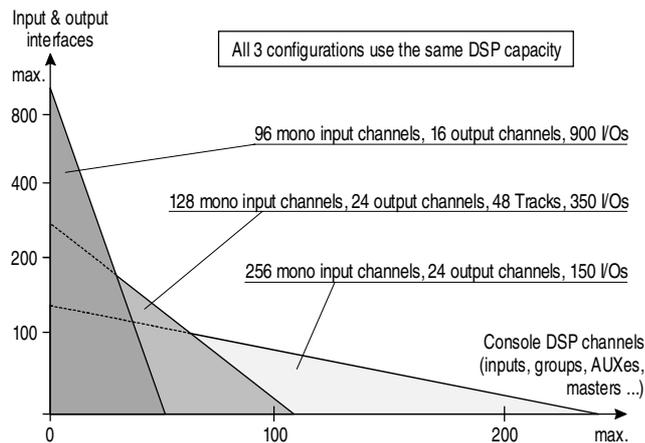
4.3 Channel type and number

Each channel can be defined as mono or stereo. From a central library, individual processing blocks (such as equalizer, delay, limiter/compressor, pan, etc.) can be selected and assigned to the individual channels. It makes no difference whether these are input, group, master, or AUX channels. Just exactly how much DSP power will be used by a channel depends on the number and type of processing blocks that are configured for this channel. The same amount of DSP power may be used to create many channels with only a few processing blocks, or less channels but with full processing.



Distributing DSP power

Many combinations of AUX, Cleanfeed, multitrack selection, group and master busses can be configured. Since the DSP power is shared by the channels, busses, and I/O interfaces, there is no maximum number of channels for a D950 console; this number is a function of the installed DSP power.



Different configurations using the same DSP capacity

4.4 Operating Desk Concept

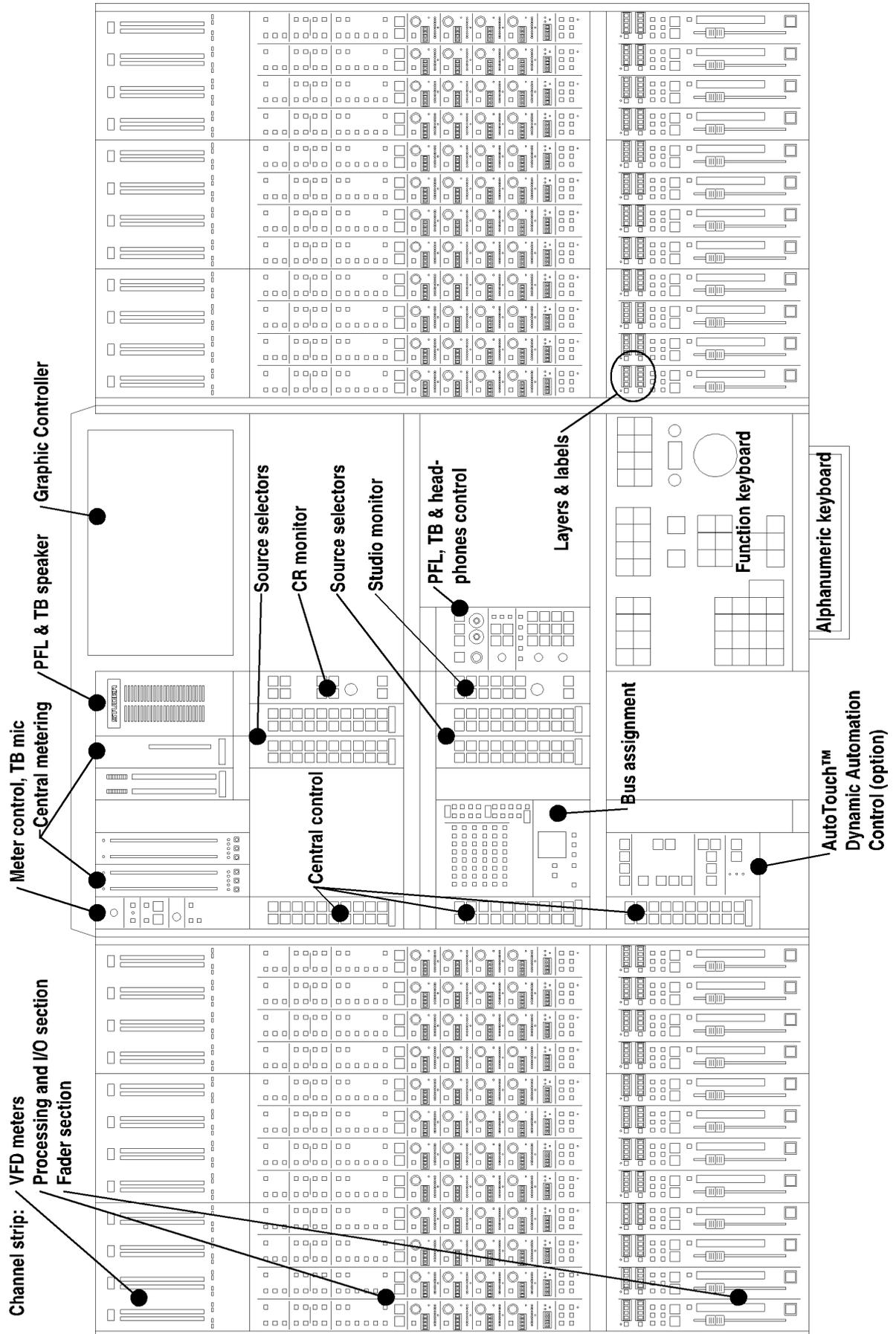
Experience has shown that opinions are divided on how the DSP channels are to be correlated with the channel strips. One philosophy is to install one fader strip for each audio channel; this approach comes close to the analog mixing console, and operating “layers” or assignability are not needed. By contrast, many users prefer smaller operator desks, for example, with 24 fader strips for 48 channels. In this case, simple assignability plays a major role.

The Studer D950 supports both philosophies. It is possible to operate each channel individually or to allocate up to ten physical channels to a fader strip. In an extreme case, for example, 120 channels could be controlled with 12 faders. This strip setup is part of the D950’s data storage system; so it can be stored, modified, and recalled. It is no longer necessary for the customer to define the channel organization at the moment when the order for the mixing console is placed; subsequent changes are possible at any time.

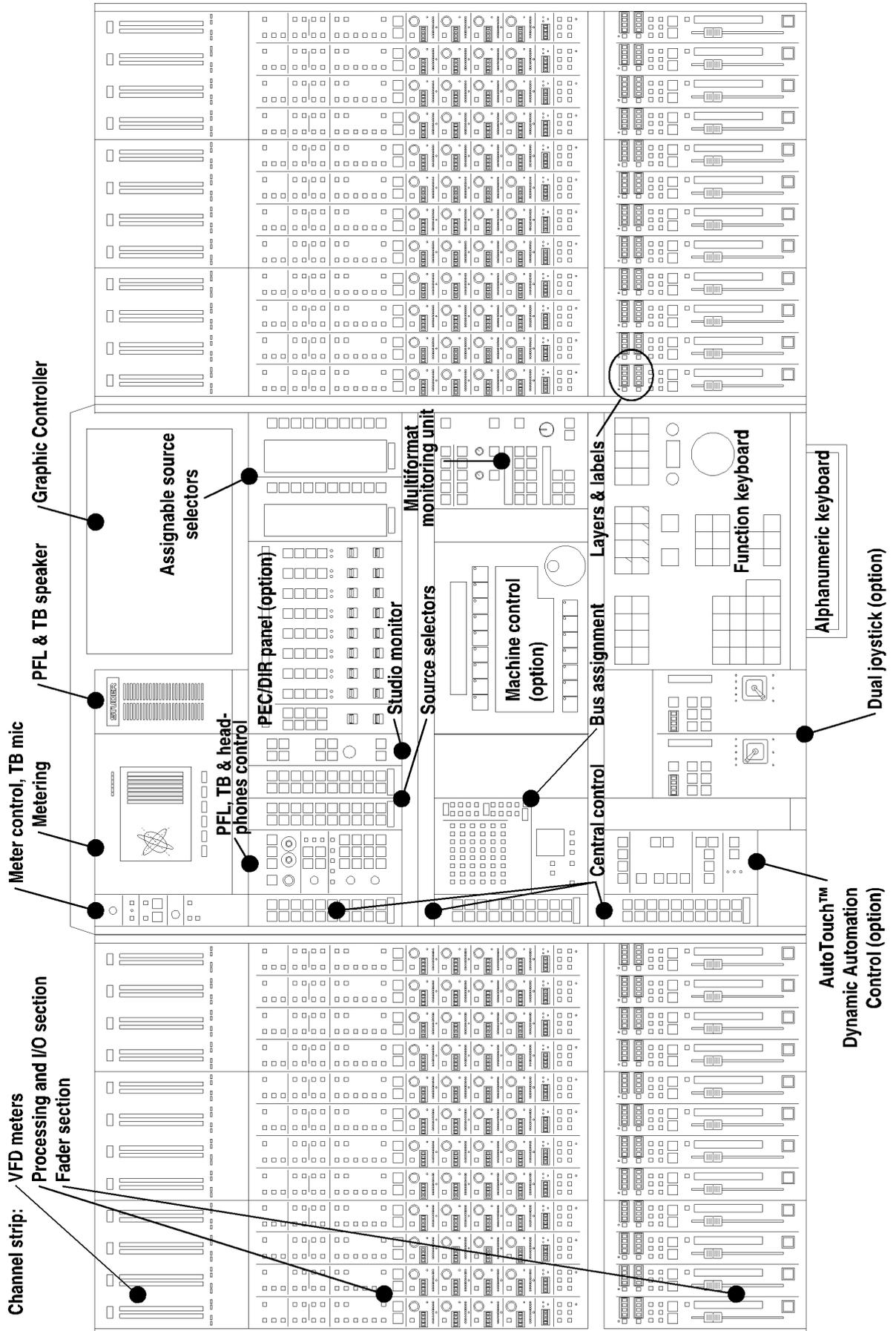
Setting the parameters of a channel located relatively far off the mixing console center is often cumbersome because the audio engineer must move away from the optimum listening zone. On the Studer D950 mixing console the corresponding channel strip can be swapped with a strip located in the middle, just for the duration of the setup, and then be swapped back. In this way, any channel can be the „sweet“ channel.

Studer D950

D950B
Desk
surface
parts:



D950S
Desk
surface
parts:



Studer D950

4.5 Graphic controller (GC)

An important feature of the new D950 is the integrated flat panel display. It serves as the monitor for the Graphic Controller, a Windows program (also referred to as “GC”). This program is used for operating all mixing console functions that go beyond the traditional ones. In particular, this includes the following areas:

- Global and channel-specific router control
- Recall and management of snapshots and cue points
- Saving of desk clipboards
- Assignment of the DSP channels to the fader strips
- Automation control and operation of the time code control
- Production and Title management

Various windows and dialog boxes logically group the individual functions. The visuals are optimized for simple and intuitive operation.

With the help of the easy-to-grasp “Global Patch Page” control, the setup of router crosspoints becomes easy, even in large mixing console configurations. In the snapshot window, all mixing console parameters are accessible with a mouse click. In the pull-down automation tools, the time code, loop points, and mix passes are under control at a glance. This is as simple as mixing console operation will ever get.

The concept of overall system configurability has been also adopted for the GC. As most functions are arranged in overlapping windows of modifiable sizes, the users can set up their work environment to suit their own requirements. These settings can, of course, be saved and recalled at any time. This allows fast and application-oriented operation of the D950.

4.6 Multidesk – multiple operating surfaces

Up to four highly independent Operating Desks can access the same DSP core. They have independent monitor sections, PFL and solo busses, as well as master outputs. The four operators can work in different studios, but they share the capacity of the common DSP core. Depending on the configuration, the individual desks can be independent in terms of their assigned channels, I/O’s, and book-keeping. It is also possible for the different studios to access the same audio signals (e.g. inputs); through the built-in router, as well as peripheral

devices such as converters. For certain applications such as theaters, a configuration can be made that allows multiple access to the same channels in parallel. For film-style mixing, the system can be set up to work in a 3-operator configuration, sharing the same machine control and monitoring system, but working on independent channels. In all cases, all desks use a common timecode base.

5 Automation

5.1 Snapshots

An unlimited number of snapshots per title can be captured, stored, and recalled. All control parameters of the console are stored in the snapshots. When a snapshot is recalled, the console typically requires 50 ms to fully reset itself. Snapshots can be recalled through channel protection filters or function protection filters for safety, e.g. in live operations.

5.2 Clipboard (not in V1.0 software)

The system supports copy and paste of some or all channel settings to one or more other channels. This greatly facilitates setting up the console if you are starting from scratch.

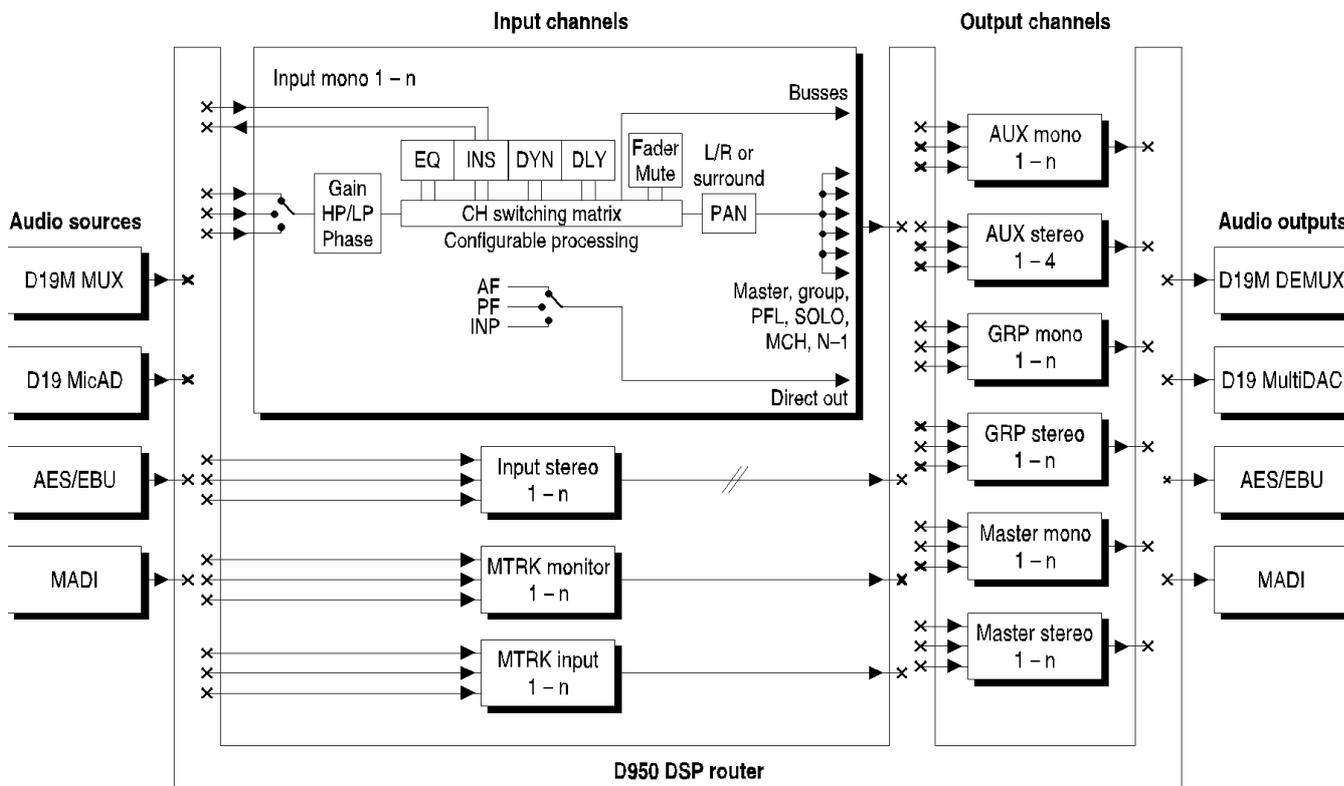
5.3 AutoTouch dynamic automation

Each audio parameter of the mixing console can be stored dynamically and recalled based on a time code information.

The enormous versatility can, of course, be accompanied by a certain operation complexity. For this reason a very simple but, in practice, highly convincing concept has been introduced for the Studer D950: the operator controls used for the automation are touch-sensitive. If any of these controls is touched while an automation pass is being played back, the control immediately switches from “read” to “record”. The modification induced by a change of the control is written immediately into the automation memory. As soon as the control is released, the corresponding parameter returns to the “read” state.

This principle is so convincingly simple that the audio engineer no longer has to worry about automation and can fully concentrate on her or his creative tasks.

The AutoTouch Dynamic automation is an option and may either be integrated when the mixing console is ordered, or it can be retrofitted in the field.



D950 routing system

6 Channels, routing, and busses

The processing blocks such as EQ, dynamics, delay, etc. can be configured for all channel types.

6.1 Input channels

The D950 digital routing matrix is situated between the physical inputs of the console and the actual DSP channels. This means that the physical analog and digital inputs can be assigned to any channel of the console through a Patch Page on the Graphic Controller. The Patch setup is part of each individual snapshot and can be saved, updated, and recalled within the snapshot system.

6.2 Output channels

The same concept as with the inputs applies to the outputs. On the Patch Page, each channel's output can be picked up and sent to any analog or digital output destination.

6.3 Auxiliaries

The number of stereo or mono AUX sends is configurable. The user can configure the number and type of AUX sends he or she would like to use. The AUX master channel can be equipped with the

same selection of processing blocks such as equalizer, dynamics, delay, and more.

6.4 Clean-feeds (N-1)

Clean-feeds or N-1 busses can be stereo or mono and are configurable in number.

6.5 Multitrack routing

Full multitrack routing is available. The destinations selected are displayed in back-lit numbers below the bar-graph level meter of each channel. This gives a continuous overview of the whole console routing.

6.6 Central Assign Panel

This panel is located in the console's center section. It is used for the assignment of masters, groups, auxiliaries, multitrack busses, and mix-minus feeds.

6.7 Solo modes

Each channel features a Solo/PFL Switch. Depending on the mode selected in the center section, a variety of functions can be achieved: Standard Solo, Solo-In-Place, Standard PFL, Broadcast PFL, etc.

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7 Processing blocks

7.1 Equalizers

Four fully parametric bands are at your disposal. Each of these bands works between 20 Hz and 20 kHz and has a ± 18 dB gain range. The EQ has a psychoacoustically corrected frequency response for high frequencies, similar to the well-known analog EQ designs, and the two mid-bands can be switched between constant-Q and constant-range modes. The high and low bands can be switched to shelving mode. In addition, a notch filter can be configured.

7.2 Filters

High pass and low pass filters ranging between 20 Hz and 20 kHz, with variable cutoff frequency and variable slope, are available.

7.3 Dynamics

Two types of dynamics processing are available for the D950:

- **Output limiter:** Specifically developed processing block containing a high-precision output limiter.
- **Full dynamics:** Consists of compressor/limiter/expander/gate processing block.

The dynamics processing features high sampling rate transient detection to avoid pumping and modulation. The distortion artifacts are minimized through the selectable automatic program-dependent attack and release time settings. The dynamics have a side-chain input which is configurable with or without HP/LP filters.

8 Monitoring and communication

8.1 Monitoring

The control room (CR) monitoring section features control of up to three different speaker pairs and a configurable number of source selectors. Analog or digital, internal or external sources can be assigned to any of the source selector keys.

The studio monitor is configurable in the same way as the CR monitor section. Along with the controls on the console, the studio can have remote volume control.

8.2 IPL function

In addition to the normal monitoring facilities of a conventional mixing console, the Studer D950 offers additional monitoring paths, the "IPL" or "In-Place Listening" function. It allows signal monitoring after individual processing blocks within a channel, in particular:

- after the input,
- after the equalizer,
- at the return point of the insert,
- after the compressor/limiter, and
- after the control input of the compressor/limiter (side chain).

This function can be configured for any channel in the same way as other processing blocks.

8.3 Talkback

An extensive talkback system is implemented in the D950. The talkback source can be the built-in or an external microphone. Several destinations, as multitrack bus, direct output, auxiliaries, groups, and master outputs are available. In addition, each channel is fitted with a talkback button that activates talkback to the direct output of the corresponding channel. The talkback return signal can be monitored on the small talkback loudspeaker built into the console.

8.4 Machine control (option)

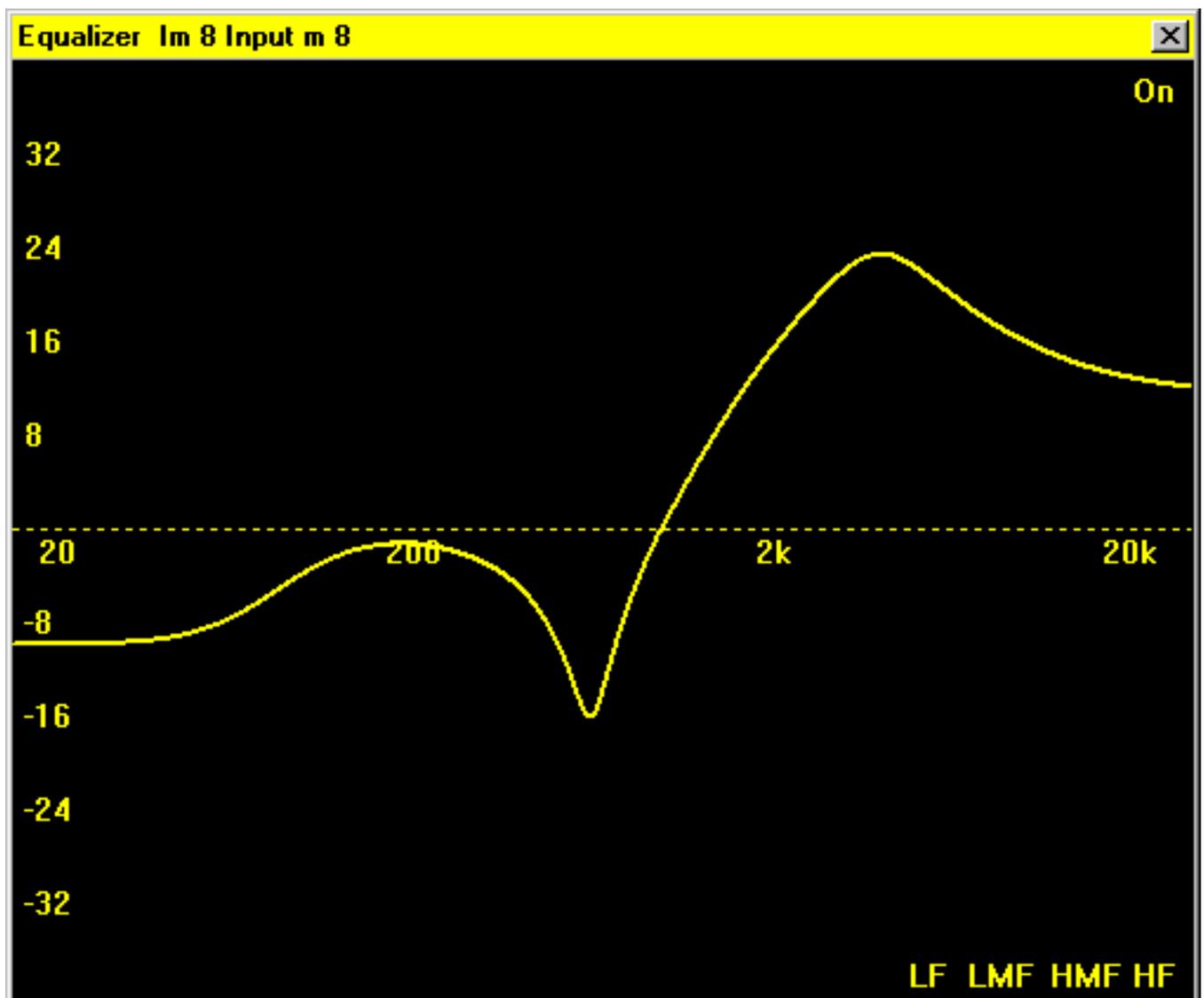
Basic machine control supports one P2 9-pin port and is included in the AutoTouch automation package. An integrated multimachine control system is a further option and can be supplied on request.

9 The Graphic Controller (GC)

The D950 Graphic Controller (GC) is a powerful operating tool for enhanced operation. The GC is an integral part of the D950 control system and uses an SVGA graphic screen to facilitate the use of many sophisticated functions.

9.1 GC functions and screens

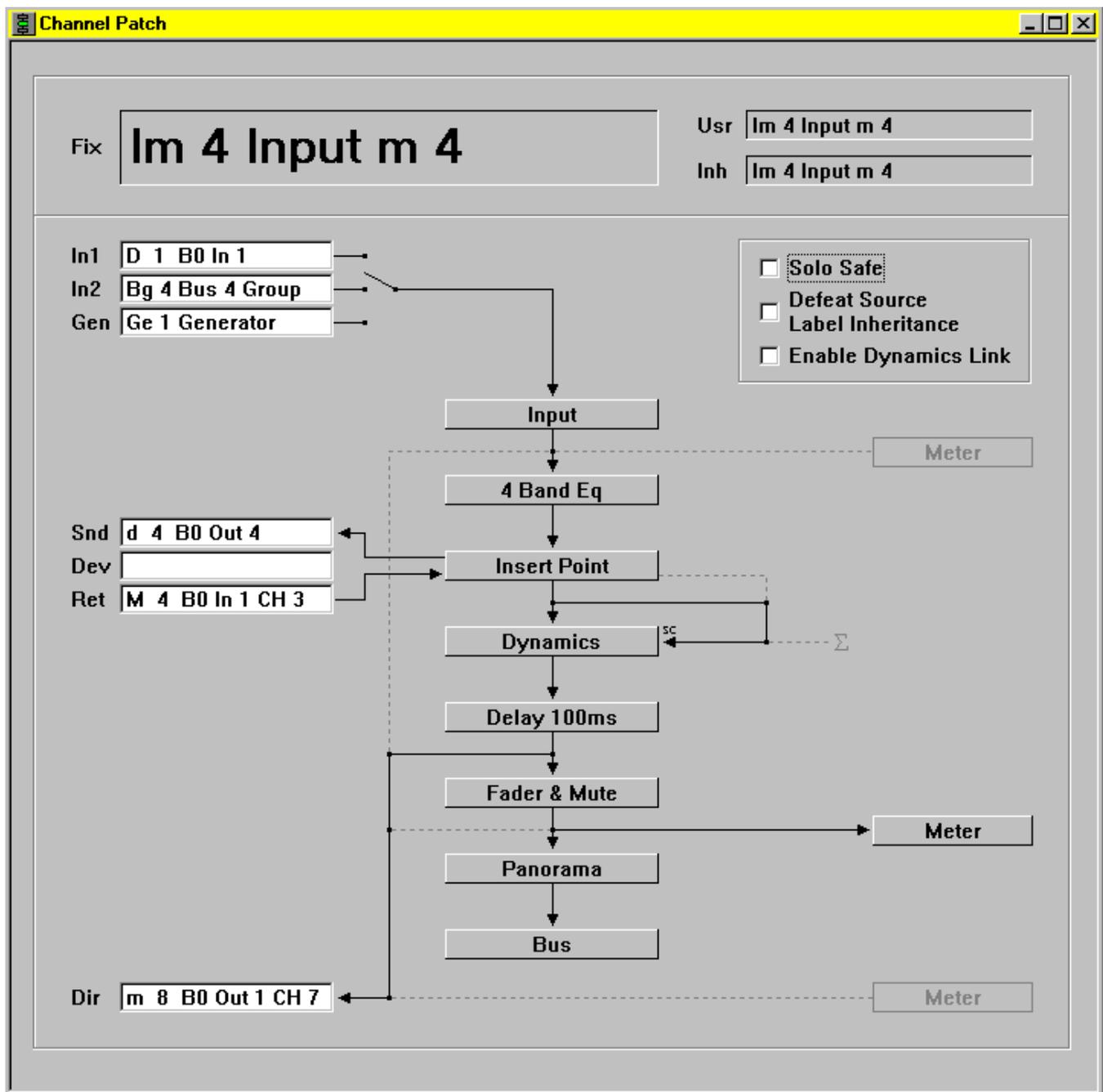
- Strip setup – allows the user to dynamically change and store the layout of the operating desk using the 5 banks with two layers each.
- Tone generator and metering control.
- TC reader/generator and machine control setup.
- Visualization of EQ and dynamics.
- Stem setup (D950S only).
- Mix settings.
- N-1 assignment/setup.



Example: EQ visualization window

Studer D950

9.2 Internal routing matrix control
Channel-oriented view for control of the routing of a channel. This is where the sequence of the channel processing blocks (EQ, Insert, Delay...) in the signal path can be set.



Example: Channel patch

General Patch view for desk oriented signal routing.

The screenshot shows the 'General Patch' window with a grid of signal routing connections. The left sidebar lists modules, and the bottom section shows the source and target labels for the selected connection.

Module	Y-Coordinate	Module	X-Coordinate
D 1 B0 In 1	1	Im 1 Input m 1 In1	1
D 2 B0 In 2	2	Im 2 Input m 2 In1	2
D 3 B0 In 3	3	Im 3 Input m 3 In1	3
D 4 B0 In 4	4	Im 4 Input m 4 In1	4
D 5 B0 In 5	5	Im 5 Input m 5 In1	5
D 6 B0 In 6	6	Im 6 Input m 6 In1	6
D 7 B0 In 7	7	Im 7 Input m 7 In1	7
D 8 B0 In 8	8	Im 8 Input m 8 In1	8
M 1 D0 In 1 CH 0	9	Im 9 Input m 9 In1	9
M 2 B0 In 1 CH 1	10	Im 10 Input m 10 In1	10
M 3 B0 In 1 CH 2	11	Gm 1 Group m 1 In1	11
M 4 B0 In 1 CH 3	12	Gm 2 Group m 2 In1	12
M 5 B0 In 1 CH 4	13	Gm 3 Group m 3 In1	13
M 6 B0 In 1 CH 5	14	Gm 4 Group m 4 In1	14
M 7 B0 In 1 CH 6	15	Gm 5 Group m 5 In1	15
M 8 B0 In 1 CH 7	16	Gm 6 Group m 6 In1	16
M 9 B0 In 1 CH 8	17	Gm 7 Group m 7 In1	17
M 10 B0 In 1 CH 9	18	Gm 8 Group m 8 In1	18
M 11 B0 In 1 CH 10	19	Gm 9 Group m 9 In1	19
M 12 B0 In 1 CH 11	20	Gm 10 Group m 10 In	20
M 13 B0 In 1 CH 12	21	Mm 1 Master m 1 In	21
M 14 B0 In 1 CH 13	22	Mm 2 Master m 2 In	22
M 15 B0 In 1 CH 14	23	Mm 3 Master m 3 In	23
M 16 BU In 1 CH 15	24	Mm 4 Master m 4 In	24
M 17 B0 In 1 CH 16	25	Mm 5 Master m 5 In	25
		Mm 6 Master m 6 In	26
		Mm 7 Master m 7 In	27
		Mm 8 Master m 8 In	28
		Mm 9 Master m 9 In	29
		Mm 10 Master m 10 In	30
		Im 1 Input m 1 In2	31

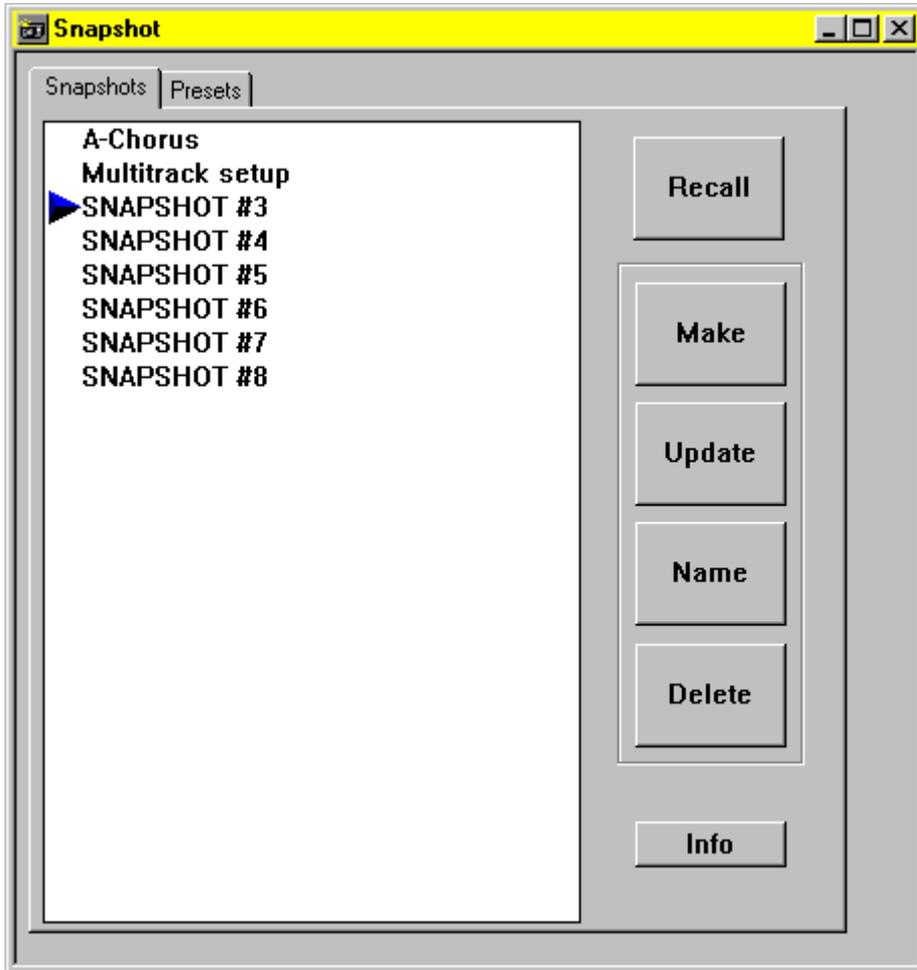
	Fixed Label	User Label	Inherited Label
Source	M 12 B0 In 1 CH 11	M 12 B0 In 1 CH 11	M 12 B0 In 1 CH 11
Target	Gm 7 Group m 7 In1	Gm 7 Group m 7 In1	Gm 7 Group m 7 In1

Example: General patch

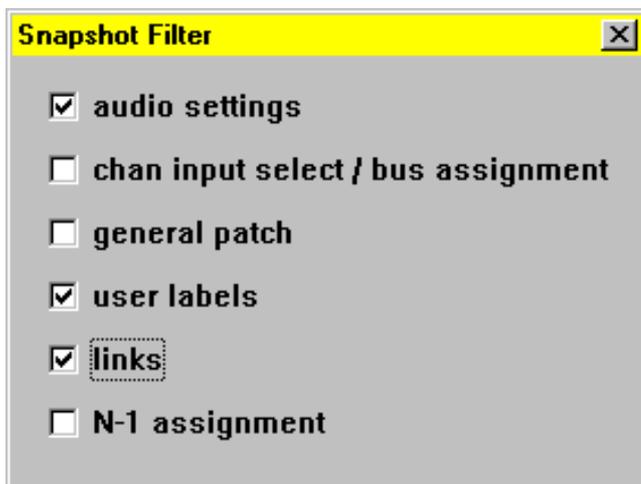
Studer D950

9.3 Snapshot functions

Control of snapshots – “pictures”, and control of presets – basic working templates of the D950.



Example: Snapshot screen



Example: Snapshot filter view

Control of snapshot/preset filters and channel protection.

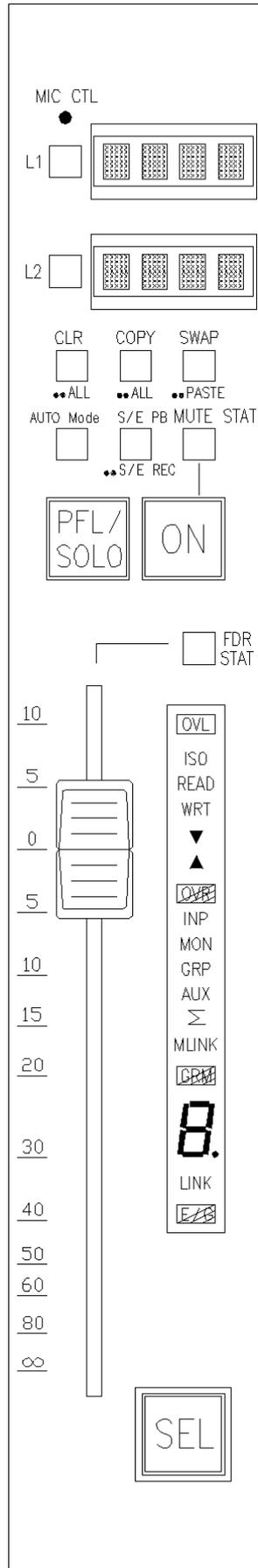
9.4 Dynamic automation control
 AutoTouch Dynamic Automation page – contains setups and bookkeeping for the automation functions. Here, also the basic machine control functions are operated.



The AutoTouch panel

- 9.5 Administration functions
- Title/Mix Management – contains the bookkeeping functions for organizing the studio work.
 - User Preferences administration.
 - Surveyor Control – a quick and simple D950 status report for fault analyses.
 - System Administration – password protected area, enables diagnostics functions.

Studer D950



10 D950 operation

10.1 Fader Unit

The Fader Unit is the essential part of a channel. It is designed as a “4-channel” unit, i.e. four identical fader strips are integrated into one module. Dimensions: 162.5 × 250 mm (the figure shows a 1-channel portion of the unit only).

Operator controls:

MIC CTL LED

This LED indicates that the channel strip is assigned for remote control of the connected microphone preamp.

L1, L2

These keys allow to select which of the two layers from the current bank will be assigned to the channel strip. This selection may be operated at any time.

Display

These displays indicate the label of the corresponding audio channel which is assigned to the strip using the L1 and L2 keys.

CLR/••ALL

Pressing once activates the “parameter clear mode”. Subsequently you may select any of the sections of this channel to be cleared.

A double-click on this key will clear all parameters of this channel, i.e. restore the default values (EQ flat, etc.).

COPY/••ALL

Pressing once activates the “parameter copy mode”. Subsequently you may select any of the sections of this channel to be put into the clipboard.

A double-click on this key copies all parameters of this channel into the clipboard.

SWAP/••PASTE

A single press on this key effects an exchange of the clipboard data and the local channel parameters; this effectively allows to compare two different settings of a channel.

A double-click on this key has the result that the current parameters of this channel are overwritten by the clipboard contents.

AUTO Mode

This key toggles the Automation Mode between ISO, READ and WRT for the whole channel.

••S/E REC

Double-clicking this key switches all functions of this channel (except Fader and Mute) to the active RECORD status of the automation. S/E stands for “switches and encoders”.

S/E PB

Single press on this key does the same as above, but switches back to the PLAYBACK status.

MUTE STAT

This key toggles the status of the Mute automation between PLAYBACK and RECORD, and also indicates the ON key being in REC status.

PFL/SOLO

The selection between PFL and SOLO is done globally using a key in the central section.

ON

ON/OFF control for the audio signal currently assigned to the strip.

FDR STAT

This key allows toggling automation status PLAYBACK and RECORD for the fader, and also indicates the fader being in REC status.

SEL

The SEL key has two main purposes:

- Access of the central audio and control facilities (CAU, ACU, etc.),
- Softkey for channel parameter control (SOLO SAFE, CH SWAP, etc.).

FADER

104 mm motorised fader providing highest reliability and smooth operation.

LED indicators:

OVL

This is a real-time indicator of overloads occurring in the channel. A global HOLD function allows to check also for overloads on “hidden” channels.

ISO/READ/WRT

Indicators for the actual mode of the dynamic automation.

UP/DOWN

These LEDs indicate the offset between actual fader position and playback fader position when automation is active.

OVR

Indicates an out-of-range condition of the fader; this may possibly occur while updating a fader in the automation system.

INP

Channel type indicator: Input channel (mono or stereo).

MON

Channel type indicator: Monitor channel.

GRP

Channel type indicator: Group channel (mono or stereo).

AUX

Channel type indicator: AUX master channel (mono or stereo).

Σ

Channel type indicator: Master channel (mono or stereo).

MLINK

Indicates that this fader strip is a link master.

L/C

Real-time indication of the Limiter/Compressor activity.

Digit display

Indicates the Link number.

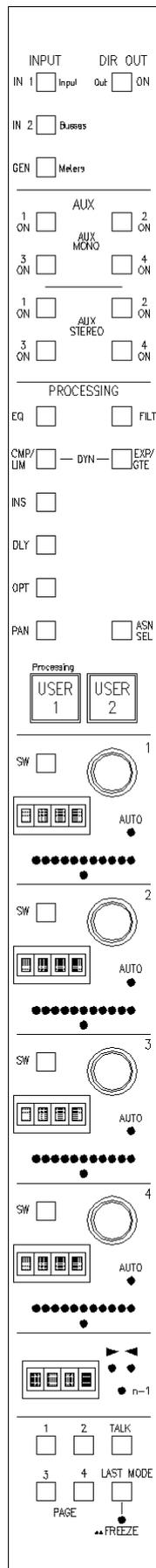
LINK

This LED is on if the fader strip is part of a Link.

DYN

Real-time indication of the Expander/Gate activity.

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10.2 Input/Output Unit

The Input/Output Unit allows a detailed access to channel functions and is used in conjunction with the fader unit. It is designed as a “4-channel” unit with 4 identical input/output strips integrated into one module. Due to the free configurability of the D950, it may happen that any of the functions (EQ, Dynamics, etc.) are not configured for a particular channel. In such cases, the controls listed below will not be active. Dimensions: 162,5 × 420 mm (the figure shows a 1-channel portion of the unit only). The Input/Output Unit is logically divided into:

- A “fixed part”, which contains dedicated controls for audio functions.
- An “assignable part”, which contains general-purpose controls. They may be assigned to the various sections of audio parameters available in the channel. This part is referred to as the “LACP” (= Local Assignable Control Panel).

Controls (fixed part):

IN 1

Selects the first of the three inputs to be used for the channel. The input may be connected via the integrated DSP matrix to any source available in the DSP frame. On GROUP, MASTER, and AUX MASTER channels, the input 1 is automatically assigned to the corresponding summing bus output.

IN 2

Selects the second of the three inputs to be used for the channel. The input may be connected via the integrated DSP matrix to any source available in the DSP frame.

GEN

Selects the third of the three inputs to be used for the channel, usually the “Test Generator” signal, to be used as input source for the channel. The generator is a global resource which may be accessed from all channels. The operator can still connect another signal via the integrated DSP matrix, same as IN 1 and IN 2.

DIR OUT ON

ON/OFF function for the channel's direct output.

AUX MONO

4 keys for ON/OFF control of mono AUX send 1...4 (since there can be more than 4 mono AUX sends, these are the first four mono AUX sends.)

AUX STEREO

4 keys for ON/OFF control of stereo AUX send 1...4.

EQ

In/out control for the 4-band equalizer.

FILT

In/out control for the high pass/low pass filter.

COMP/LIM

In/out control for the compressor/limiter function.

EXP/GATE

In/out control for the expander/gate function.

INS

In/out control for the insert return signal.

DLY

In/out control for the variable delay function.

OPT

Future function.

PAN

In/out control for the channel panorama/direction function.

ASN SEL

Activation of the LACP assignment function which allows to assign a set of functions to the LACP.

Note: Labels printed in lower-case characters indicate that those keys are used to select a certain function not having a fixed button for clipboard editing.

USER 1/2

Reserved for different user- or application-specific functions.

Controls (assignable part, LACP):

The LACP consists of 4 identical control sections 1...4 plus a common area for overall control and display.

Encoder

This endless rotary encoder has a very high resolution, which allows to implement an analog feel for level controls etc. The knob of the rotary encoder is touch-sensitive; this allows a very direct and intuitive operation during automation.

SW

This key is used for various switching functions depending on the current assignment of the LACP, e.g. AUX send PRE/POST.

Display

This 4-character dot-matrix display serves for various purposes:

- Labelling of the encoder parameter, e.g. "PAN", "GAIN", etc.
- Display of the parameter value, e.g. "+ 2" (dB).

LED bar

The LED bar gives a quasi-analog indication of the parameter value; this makes it very easy to scan the whole desk visually and get an idea of the settings, without having actually to read digits and characters.

CENTER LED

Used for centered parameters such as PAN, DIRECTION, etc., or to indicate nominal positions, such as 0 dB gain, etc.

AUTO LED

Two-colour LED for the automation system. This LED indicates the various automation statuses.

◀ / ▶

The two arrow LEDs are used for the automation of the rotary encoders. They indicate precisely the offset between the actual value and the playback value. The LEDs are always assigned to the last touched rotary encoder.

DISPLAY

This display gives an overall label for the currently selected page of the LACP (e.g. "LIM", "PAN" etc.).

n-1 LED

Indicates that this channel has an activated N-1 (or mix-minus) function.

PAGE 1...4

Selection between pages of the currently assigned audio section.

TALK

Activates talkback to the channel's direct output.

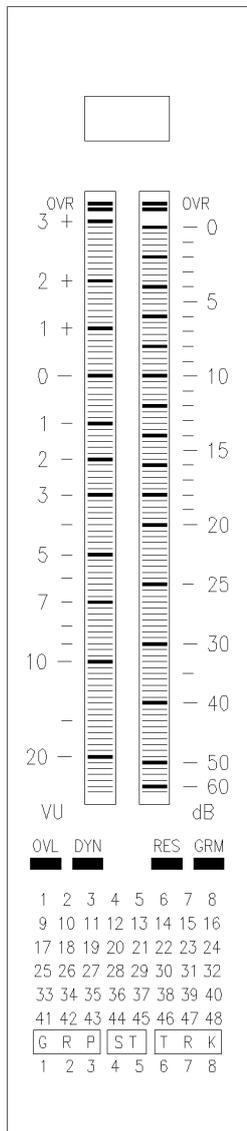
LAST MODE

Calls up the last used LACP audio section

••FREEZE

Double-click activates the FREEZE function. After activation of the FREEZE function the channel is locked out from the global LACP menu selection. Local LACP menu selection is still available.

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10.3 Audio Display Unit

The Audio Display Unit is a general purpose, channel strip-related module.

It is designed as a “4-channel” unit, with four identical display strips integrated into one module.

Dimensions: 162.5 × 190 mm (the figure shows a one-channel portion of the unit only).

If used as a channel-related bargraph, this unit has the following functions:

Meter

2 bars with 100 segments each are used to display the level of the signal which has been selected as the meter source in the corresponding channel. For mono channels both bars have the same display, whereas for stereo channels the left and right level information will be displayed on separate bars.

The meter characteristics may be selected between PPM and VU on a global basis; both bars will always work in the same mode. The meter has an integrated peak-hold function with auto-reset.

Above the two bars, two overload indicators are provided. These refer to the signal which is displayed on the bargraph below. With the global peak-hold function it is possible to memorize overload occurrences, even if the channel is currently not assigned to the strip.

OVL

The red OVL LED below the meter is used to indicate clearly all overload conditions of the corresponding channel. Using the global peak-hold function it is possible to memorize overload occurrences, even if the channel is currently not assigned to the strip.

DYN

The yellow DYN LED is used to indicate the activity of the channel's dynamics unit; if any of the four functions: limiter, compressor, expander, or noise gate is active and working, this LED will be on.

GRM

By using a global function it is possible to change the function of the right display bar from “level” to “GRM” (= gain reduction meter). This change-over only affects those channels which have the dynamics unit configured in the signal path.

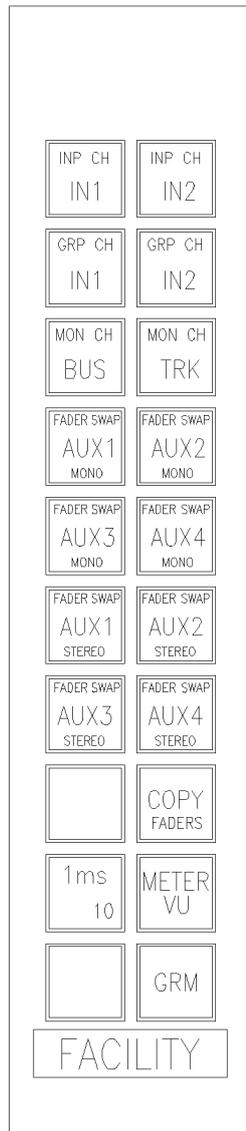
During GRM mode, the left bar will continue to display the level (for stereo channels, the higher of L and R is displayed), whereas the right bar will indicate the current gain change as effected by the dynamics unit.

Bus assign

The bus assign section includes 48 individual LEDs for display of the track or group assignment, plus 8 LEDs for the master assignment from the corresponding channel. The ST LED indicates that stereo master bus assignments are selected for viewing (set on the Central Assign Unit).

Note: Due to the configurability of the system, it is possible that some of the functions described below are not installed on particular consoles.

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10.4 Central Facilities Unit (CFU)

The Central Facilities Unit is used to facilitate some often needed, global operations. This unit is installed in the central area of the console.

Dimensions: 40.6 × 190 mm.

INP CH IN1, INP CH IN2
MON CH BUS, MON CH TRK
GRP CH IN1, GRP CH IN2

This set of pushbuttons switches all channels belonging to a certain channel type from IN1 to IN2 input. The channel types are:

- Input channel mono & stereo: Switched with the INP CH IN1/IN2 pushbuttons.
- Monitor channels: Switched with the MON CH BUS/TRK pushbuttons.
- Group channels: Switched with the GRP CH IN1/IN2 pushbuttons.

For Group channels: Enables switching the inputs of the Groups between Bus (IN1) and the other input (IN2), which can be patched to e.g. recording machine returns, for quick monitoring.

MONO AUX 1-4 FADER SWAP
STEREO AUX 1-4 FADER SWAP

These pushbuttons allow the AUX level control function to be assigned temporarily to the faders, and vice versa. This simplifies e.g. headphone pre-mixes on AUXes, etc. During this time, the original AUX level rotary controllers will control the fader levels.

COPY FADERS

Copy faders to AUX: If a rough mix on the faders has been prepared already, it is very useful being able to copy the fader levels to the AUX level controls for headphone mixes, etc.

When COPY FADERS is on, the Mono/Stereo AUX 1-4 FADER SWAP pushbuttons are used to copy the fader level settings to the selected AUX level settings.

METER VU

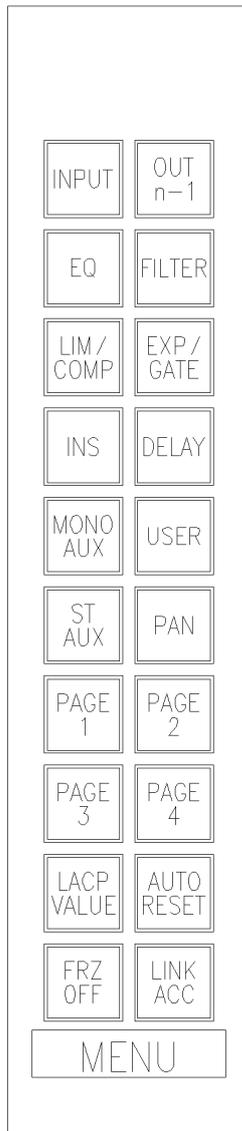
The characteristics of the digital channel-related meters is changed from PPM to VU, and vice versa.

1 ms/10

For selecting the 1 ms meter rise time in PPM mode (if released: 10 ms rise time).

GRM

The display of the gain-reduction meter on the right bargraph is enabled. The GRM will only be displayed if the channel's dynamics unit is active.



10.5 Master Menu Selector (MMS)

The Master Menu Selector is used to globally assign the assignable sections of the channel strips (LACP). This unit is installed in the central area of the console.

Dimensions: 40.6 × 190 mm.

INPUT

Selects the input section including gain, stereo mode, phase, etc.

OUT/n-1

As above, for output section including direct output, meter select, and N-1 assignment.

EQ

As above, for the 4-band equalizer.

FILTER

As above, for the 2-band filter.

LIM/COMP

As above, for the limiter/compressor section of the Dynamics unit.

EXP/GATE

As above, for the expander/gate section of the Dynamics unit.

INS

As above, for the Insert section.

DELAY

As above, for the variable delay.

MONO AUX

As above, for AUX sends mono 1...8.

ST AUX

As above, for AUX sends stereo 1...4.

PAN

As above, for the panorama/direction section.

USER

Via the configuration process it is possible to create special LACP menus, e.g. AUX 1 and 2 + stereo pan and stereo width arranged on one page of the LACP; this key activates such a user menu.

PAGE 1..4

Global selection of pages 1...4 for the LACPs of all strips.

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AUTO RESET

If active, all local LACP assignments will be automatically reset to the global pre-selection after a certain time-out period. This function increases the overview on the desk, as most of the time all LACPs will have the same assignment while maintaining the flexibility of direct local LACP assignment.

LACP VALUE

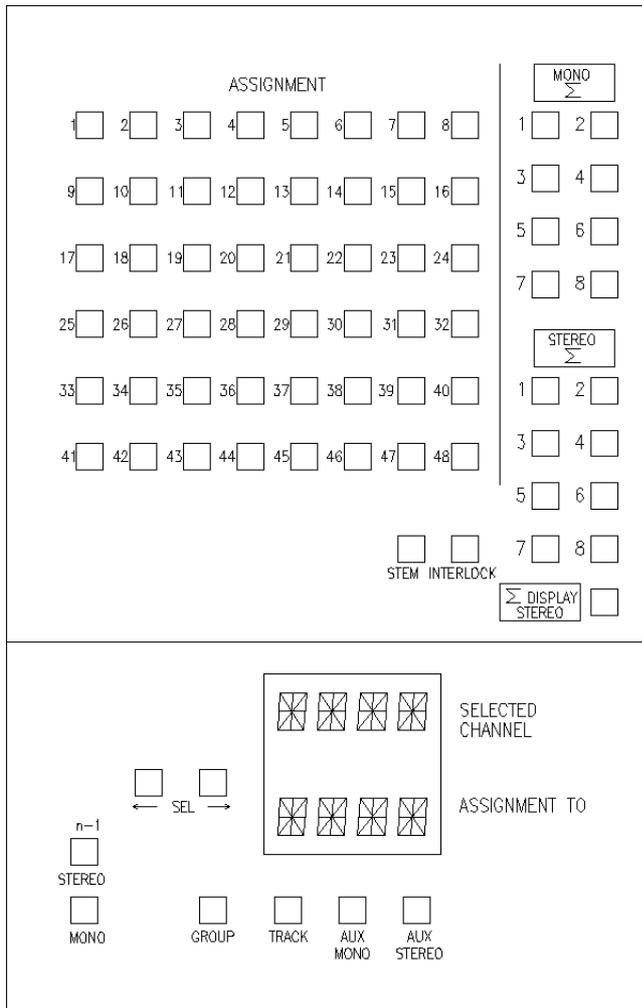
If active, all LACP displays will always show the *parameter values*. If not active, all LACP displays will show the *names of the functions* until touched, and then the parameter values.

FRZ OFF

Resets all “freeze” functions of all channels; this function enables the Master Menu Selector to access all LACPs of all channels again.

LINK ACC

If active, the assignment functions of all strips will be linked. When the user makes a local LACP assignment on one strip, the remaining strips will automatically follow; as a result, all LACPs will always show the same section and page.



10.6 Central Assign Unit (CAU)

This unit is used for controlling the assignment of busses from all channels.

The unit is installed in the central section of the console; dimensions: 121.8 × 190 mm.

The user selects a channel via the channel SEL key or by using the SEL keys on the CAU, and has access to all bus contributions of this channel on the CAU. The selected channel is indicated in the "SELECTED CHANNEL" display.

Modifications of the bus assignment may be effected using the keys on the CAU. The actual bus assignment is displayed on the CAU, and at the same time on the channel related audio display unit (if installed).

n-1 STEREO
 n-1 MONO
 GROUP
 TRACK
 AUX MONO
 AUX STEREO

Selects the function of the 48 LED/key array to display and control the bus assignment for N-1, group, track, and AUX busses. The selected bus type is indicated in the "ASSIGNMENT TO" display.

MONO Σ

Bus assignment for up to 8 mono master busses.

STEREO Σ

Bus assignment for up to 8 stereo master busses.

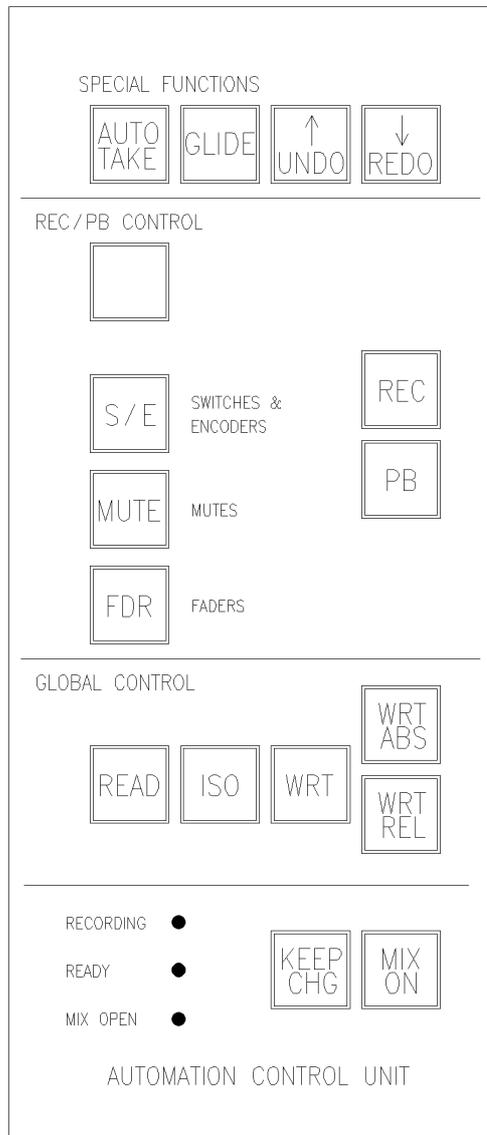
Σ DISPLAY STEREO

Switches the LED array on the bargraph meters over to "ST", to indicate bus assignment to stereo master busses instead of mono busses.

← SEL →

Keys used to select the channel to be modified.

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10.7 Automation Control Unit (ACU)

The Automation Control Unit (ACU) controls the basic functions related to the automation system of the D950. It is used to quickly access and activate the most often used automation statuses and modes. More automation features are available on the Graphic Controller (GC) or on the channel strip itself.

The ACU is a panel unit with 80 × 190 mm (2U) size, usually mounted in the fader level of the desk, to the right of the Bank Select Unit.

The ACU centrally controls:

- Global automation modes (READ, ISOLATE, WRITE, WRITE ABSOLUTE, and WRITE RELATIVE),
- Automation statuses (PLAYBACK, RECORD), as well as special modes (AUTO TAKEOVER and GLIDE),

down to the level of a strip section.

The channel strips are equipped with LEDs for indicating the current modes/statuses of the controls. These are active during automation and always serve as feedback to the operator's actions. The ACU therefore does not have to contain comprehensive mode/status indications.

The ACU is switched off if the (optional) dynamic automation system is not installed. It is also switched off for as long as the dynamic automation system is not activated by loading a mix via the Graphic Controller.

The ACU is divided into four operational areas:

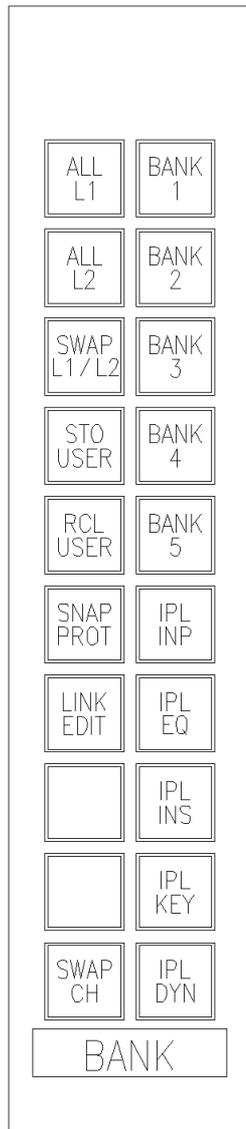
- the SPECIAL FUNCTIONS control area
- the RECORD/PLAYBACK control area
- the GLOBAL control area
- the DISPLAY/MIX control area.

For most of the time, the basic operating modes of the automation are set automatically by the system. If the whole console is to be used in one of the three WRITE modes, no more keystrokes on the ACU are needed. For READ mode, the READ key has to be pressed. If only several channels or some channel strip sections are to be modified, the ACU can be used to select those.

Should a detailed automation setup be desired, the flow of keystrokes during operation starts at the bottom of the ACU (with the MIX ON) and continues upward to the global modes. After one of the global modes is selected (if not already set), sec-

tions of the channel strips or several channels can be individually put to record using the REC/PB CONTROL area of the ACU. Finally, the topmost part of the ACU can be used to select the special modes which then are valid for the whole of the console.

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10.8 Bank Select Unit (BSU)

The Bank Select Unit is designed to support the easy use of the layered console structure.

In the configuration process of the D950, one assignment of channels to channel strips is automatically created. During operation, the user can modify this assignment and make several assignments using the Strip Setup page on the GC. The console supports up to 10 layers, organised in 5 banks with 2 layers each.

On the BSU, the bank setups may be activated and recalled at any time by using the BANK 1...BANK 5 keys.

In addition, the BSU holds the following useful functions:

ALL L1

All strips will be assigned to layer L1 of the current bank.

ALL L2

All strips will be assigned to layer L2 of the current bank.

SWAP L1/L2

The current L1/L2 selection setup will be inverted; this allows easy change-over to those channels which currently are not available on the strip with quick recovery of the previous situation.

STO USER

For each bank, one user memory is available. It stores an L1/F2 strip setup for the currently selected bank.

RCL USER

The user memory of the currently selected bank may be recalled at any time.

When changing to a different bank, the system will automatically recover the L1/F2 setting which was active when the bank has been left; in addition, the corresponding user memory of that bank will be available again.

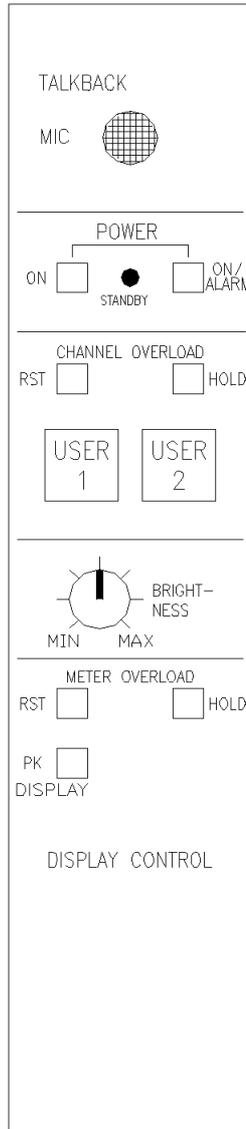
SWAP CH

On-line channel swap: Activates a mode where by pressing the SEL buttons, desk strip assignments of any two channels can be swapped on the desk. This is useful to temporarily bring a particular channel near to the centre of the desk for tuning of audio functions.

IPL INP
IPL EQ
IPL INS
IPL KEY
IPL DYN

These pushbuttons activate the “In Process Listen” (IPL) function, if configured. The IPL function allows to monitor the signal of the selected channels after the input section, after EQ, after Insert return, after dynamics, as well as the key signal of the dynamic sidechain.

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10.9 TB Mic / Display Control Unit

This unit contains a range of functions:

TALKBACK MIC

A flush-mounted electret microphone used for console talkback..

POWER

By means of these two keys the desk can be switched on and off without accessing the power supply units. Both keys must be pressed simultaneously to prevent undesired operation.

CHANNEL OVERLOAD

RESET and HOLD functions of the channel overload indication can be performed here.

USER 1/2

Keys and indicators for custom functions.

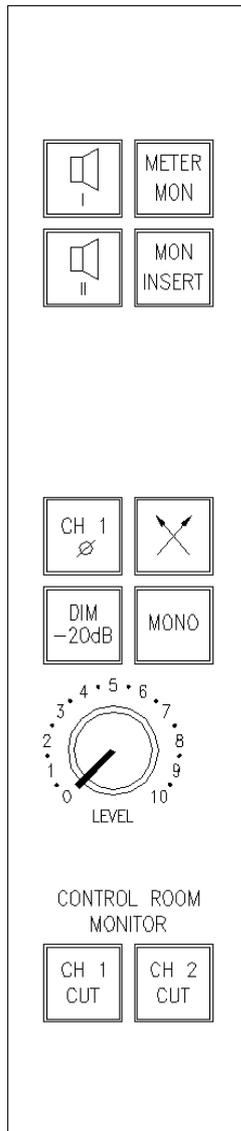
BRIGHTNESS

This potentiometer enables dimming of all LEDs and bargraph indicators.

DISPLAY CONTROL

This set of controls is used to control the channel bargraph meters.

Functions, such as RESET and HOLD of the meter overload indication, are included. PK DISPLAY activates the peak indication.



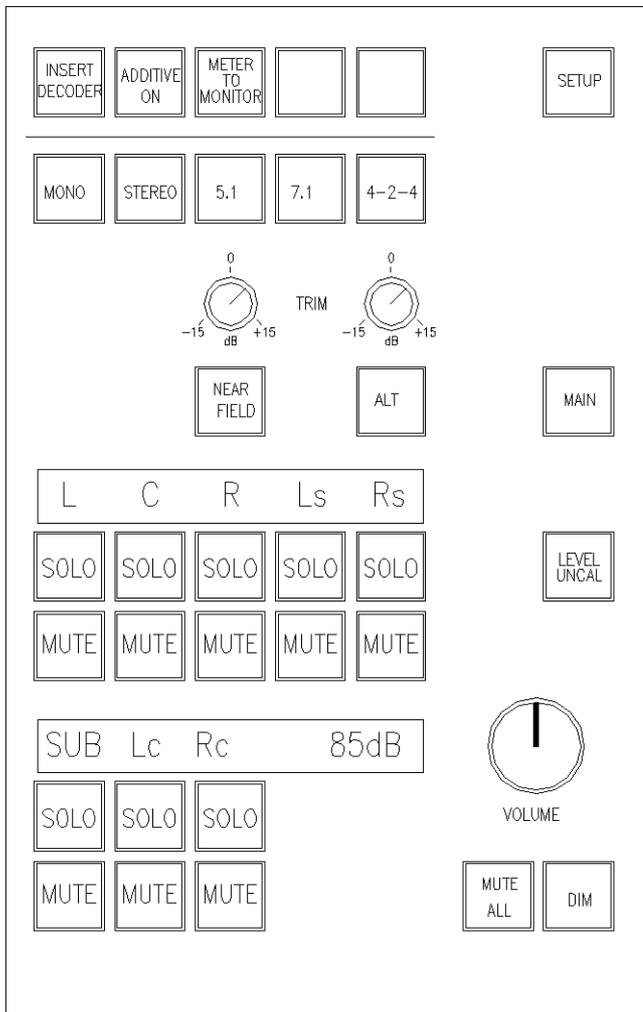
10.10 Control Room Monitor Unit
 The stereo Control Room Monitor panel has controls for the conditioning of the monitor signal, which is selected by means of the 20-pushbutton source selector panels. This unit is used with the D950B for all stereo applications.

The Control Room Monitor Unit offers the following functions:

- Selection of two loudspeaker pairs
- Meter selector: $\Sigma \leftrightarrow \text{MON}$
- Monitor insert function
- Phase reversal of the left channel (CH 1 \emptyset)
- Channel flip L \leftrightarrow R
- Mono summing
- DIM function (-20 dB)
- CUT function, separate for both channels
- DCA controlled level

All monitoring outputs are electronically balanced.

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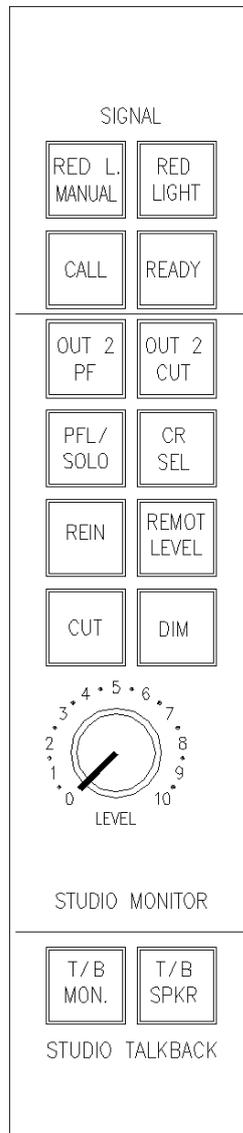


10.11 Multifformat Monitor Unit

The Multifformat Monitor Unit is used for the D950S in all surround applications. Up to 8 monitoring channels can be controlled from this unit simultaneously.

The unit includes the following functions:

- Selection of three loudspeaker systems. MAIN and ALT are two different surround systems, and NEARFIELD is stereo.
- Individual trim of the two alternate loudspeaker levels.
- Selection of special functions, such as Surround Decoder insertion, additive or exclusive source selection modes, and switching of metering source signals.
- Selection of the monitoring format: MONO, STEREO, 4-2-4, 5.1, and 7.1 .
- Individual SOLO and MUTE keys for each loudspeaker.
- Display indicating the activated loudspeakers and the listening level.
- Setup key for calibrating all loudspeaker outputs.
- Uncal key for activation of the rotary encoder level control in uncalibrated mode.
- Rotary encoder level control.
- MUTE ALL and DIM keys.



10.12 Studio Monitor Panel

The Studio Monitor Panel houses the controls for studio monitors, talkback controls, and the studio signalization system, thus uniting all studio communication controls in one panel.

Depending on the studio configuration, a 950 console can have one or more Studio Monitor Panels, or none at all.

Signalization:

- Red light control (automatic and manual).
- CALL key and light.
- READY signal (switchable).

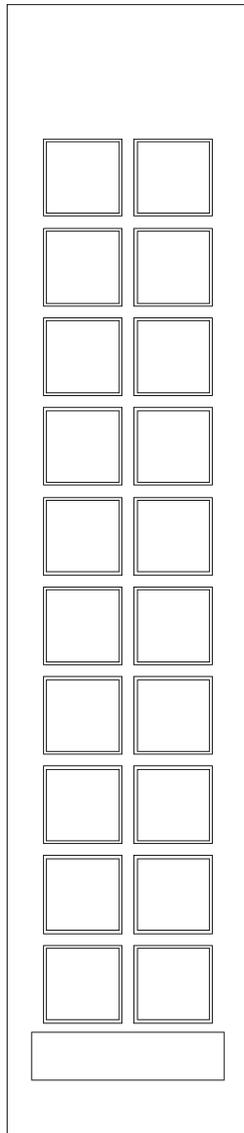
Studio monitor functions:

- OUT 2: A second studio output can be controlled with the OUT 2 CUT function and OUT 2 PF function.
- Two source select keys, per default configured as PFL SOLO and CR SEL.
- Switch for external monitor level control.
- CUT and DIM keys.
- REIN – “Reinjection”; deactivation of the automatic CUT function.
- Level control.

Talkback:

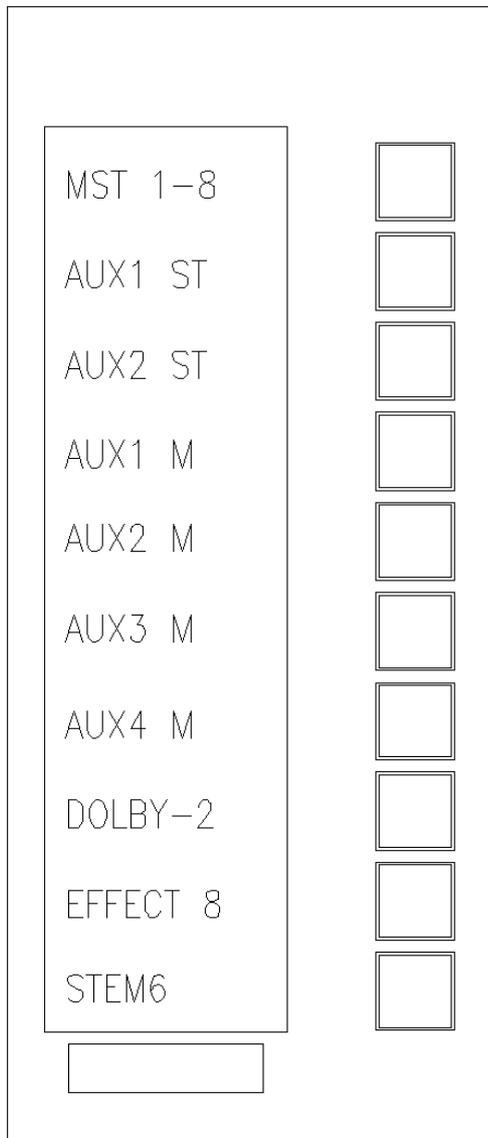
- Talkback to the studio monitor output.
- Talkback to a separate output (studio communication speaker, etc.).

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10.13 20-Pushbutton Source Selector

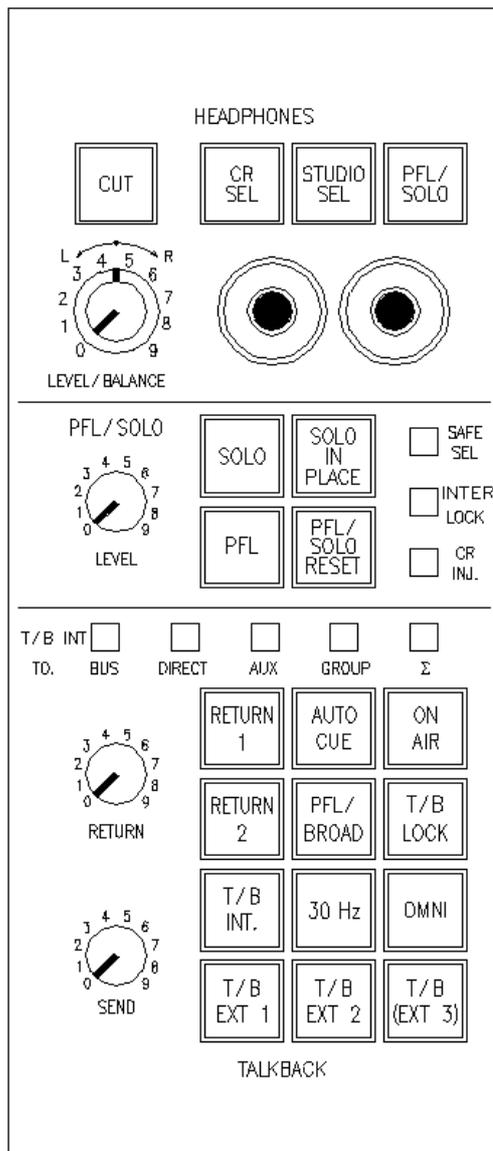
A number of these selectors can be specified for the Control Room Monitor Unit and the Studio Monitor Unit for selection of sources to be monitored. The sources to be monitored are configured onto the buttons within a configuration file. The source labels are inscribed using transparent inlays.



10.14 Assignable Source Selector

This unit is intended for use with the Multiformat Monitor Unit for monitoring selection of surround sources. A number of these 10-key selectors can be specified. It can also be used with the stereo CR Monitor Units and the Studio Monitor Units if desired. The sources to be monitored are configured onto the buttons within a configuration file, and the source labels are displayed on the 8-character display near each button.

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10.15 PFL, Talkback, Headphones

The PFL, Talkback, and Headphones Panel holds the controls necessary for central operation and control of the following functions:

Headphones:

3 source select keys, CUT key, level and balance controls, 2 headphone jacks.

PFL/SOLO functions:

SOLO IN PLACE

Turns standard “positional SOLO” into “SOLO-IN-PLACE”.

PFL/SOLO MODE

Toggles the PFL or SOLO mode.

PFL/BROAD

Turns off any channel PFL when the fader is opened, if activated.

PFL/SOLO RESET

Indication and cancelling of PFL/SOLO status.

SAFE SEL

Programming key for the SOLO SAFE function.

INTERLOCK

Enables INTERLOCK mode. Newly activated PFL and SOLO keys release previously activated PFL and SOLO keys.

CR INJ.

Enables PFL and SOLO signals to the control room monitors.

Talkback functions:

RETURN 1/2

Two switchable talkback returns.

AUTO CUE

Activation of talkback system, controlled by an external logic signal.

ON AIR

Secure mode activation: SOLO IN PLACE and Talkback to masters are disabled.

T/B LOCK

Talkback keys can be switched over from momentary action to latching function.

T/B INT.

Desk-internal talkback, can be routed to the following: BUS, DIRECT, AUX, GROUP, Σ, using the appropriate keys.

T/B EXT 1/2

Talkback to a separate dedicated output (expandable to three separate destinations).

30 Hz

Allows adding a 30 Hz tone to the internal talkback.

OMNI

Activates all configured talkback send destinations.

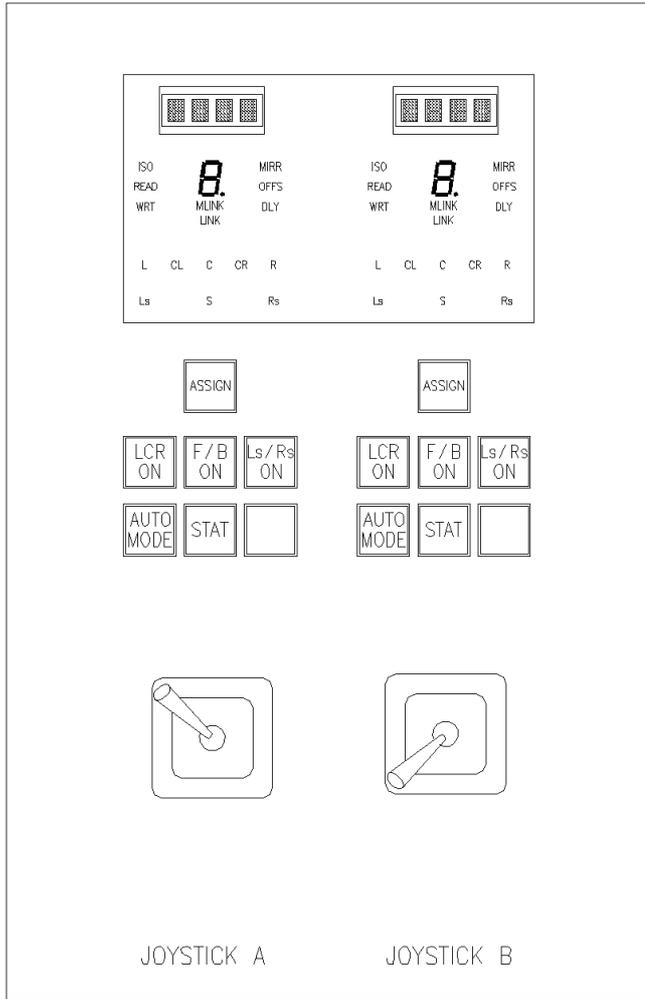
SEND

Level adjust for talkback send

RETURN

Level adjust for talkback return

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10.16 Multifformat Panning Unit

The Multifformat Panning Unit is an optional unit used for easier control of the panning in the D950S. Up to 4 units with dual joysticks can be installed in the system. Using the ASSIGN key, the joystick can be assigned to any channel to control the panning. The joysticks are motorised and fully automated within the AutoTouch automation.

11 D950 Surround capabilities with VirtualSurround™ panning Surround sound, or, as it is more generally known, “multiformat sound”, has played an important role in film and TV feature film for some time. With the advent of DVD, more and more projects will be done in a variety of surround formats. In addition, old stereo releases are being remixed for surround in preparation for DVD releases. The general trend is to utilise the enhanced spatial experience that is made possible by using more than two loudspeakers for sound reproduction, now that the appropriate medium is available. Obviously, more reproduction channels impose new requirements on the mixing console used for surround productions.

11.1 The multiformat world
The following is a list of current formats used in various surround applications (only main formats are listed):

Type	CH	Channels	Total	Application
Mono	1		1	S/TV/F
Stereo	2		2	S/TV/F/DVD
Dolby Stereo	2 (matrixed)	L/C/R/S	4	F
Dolby Surround	2 (matrixed)	L/C/R/S	4	TV
DTS Stereo	2 (matrixed)	L/C/R/S	4	F
Dolby Digital SR.D	5.1	L/C/R/Ls/Rs/SUB	6	F
DTS	5.1	L/C/R/Ls/Rs/SUB	6	F
Proposal HDTV 1	5	L/C/R/Ls/Rs	5	TV
Proposal HDTV 2	5.1	L/C/R/Ls/Rs/SUB	6	TV
Proposal DVD 1	5.1	L/C/R/Ls/Rs/SUB	6	TV, DVD
Proposal DVD 2	7.1	L/Lc/C/Rc/Ls/Rs/SUB	8	TV, DVD
SDDS	7.1	L/Lc/C/Rc/R/Ls/Rs/SUB	8	F
IMAX	6	L/C/R/Tc/Ls/Rs	6	F

S = Stereo
TV = Television
F = Film
DVD = General DVD Application
SUB = Low frequency channel, also called LFE (low frequency enhanced)

11.2 Configurability

It is shown that a great variety of formats exists. There is a solid chance of new formats being added to this list, so the D950 multiformat monitoring and panning is configurable, in order to allow for easy future expansion. This is the natural consequence of the session configuration and scalability concepts of the D950.

11.3 Surround production components
The D950 can be equipped with a variety of panning and monitoring components. Panning, monitoring, machine control, REC/PB and TAPE/BUS control, as well as sophisticated stem bus assignments all play a part in the surround production.

11.3.1 Panning

With VirtualSurround™ Panning (VSP), a revolutionary tool for 3-dimensional audio source positioning, Studer crosses the virtual reality barrier for digital mixing consoles. Owing to the exceptionally flexible DSP platform of the D950, it is now possible to introduce a library of software panning functions that allow the operator to easily and naturally place sound sources in virtual 3-D rooms. The positioning is calculated within the DSP of the D950 using newly developed algorithms (patent pending) and is optimised for all current surround formats. The operator will find at her or his disposal all the usual intensity panning functions such as L-C-R pan, front/back pan, Ls-Rs pan, divergence, etc., but the package includes some really exciting new functions:

11.3.2 Frequency-dependent pan pot
Variable panning filters allow intensity-based and delay-based panning. In this way it is possible to position a conventionally recorded source as though it were recorded with a special stereo or surround microphone. So even old stereo recordings can conveniently be re-mixed for DVD.

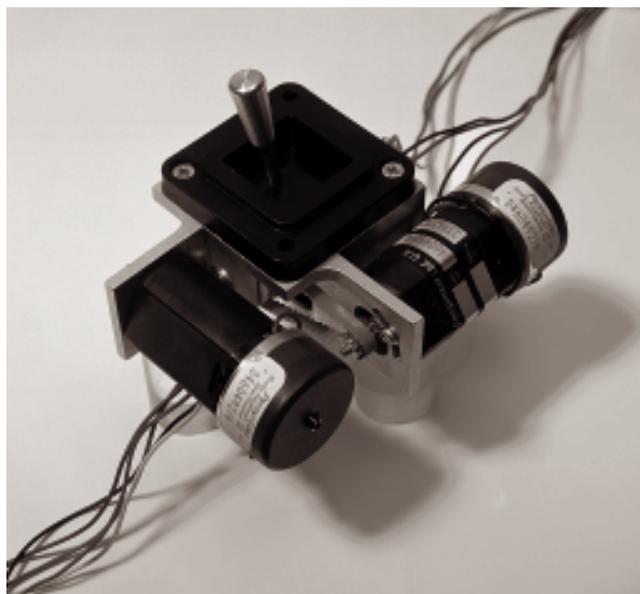
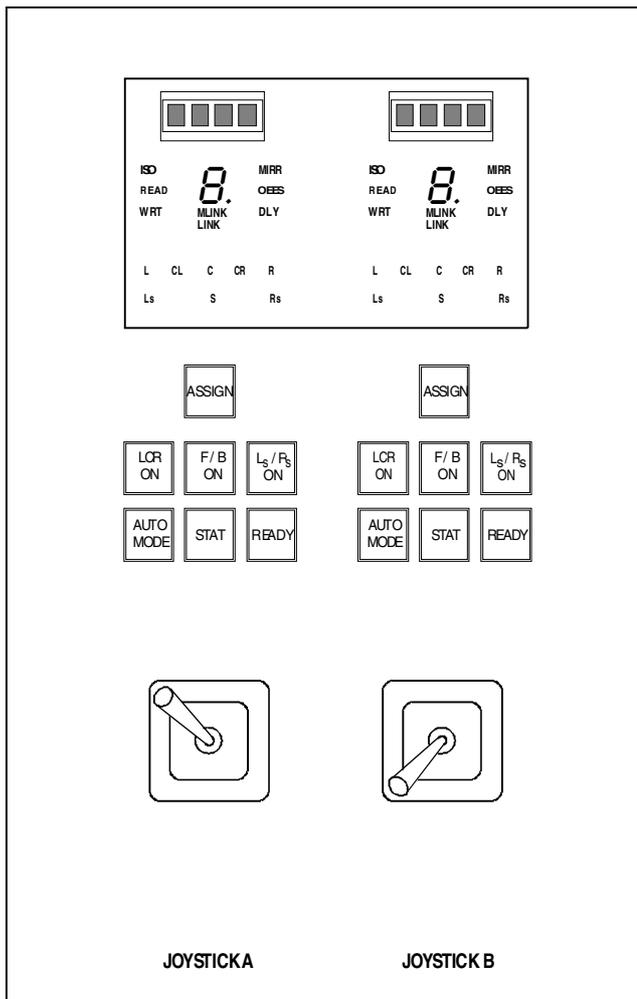
11.3.3 Automatic echo generation

An adjustable number of discrete realistic echoes can be produced and routed as non-correlated, diffuse signals to the surround loudspeakers from any console channel. The echoes are controlled using a number of perceptive adjustments such as ambience, source distance, and room size. This allows natural reproduction of audio sources from various distances and positions within a virtual room, without the need to revert to external effect processors. Special dynamic effects, such as gradual

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disappearing of a near sound object into the diffuse room, can be easily achieved by accentuating the spatial components of the sound. Even a realistic simulation of Doppler's effect is included. In addition, all the VSP parameters are dynamically automated within the console's AutoTouch automation system.

In order to facilitate the panning itself, the D950 can be equipped with one or more Multiformat Panning Units (MPU). The MPU features two motorised and automated joysticks that can be assigned to any of the D950's channels. Although the channel strips themselves contain the necessary rotary encoders and switches to operate all surround features, it is much more convenient to use the joysticks for the panning.



Motorized P&G joystick

From stereo to 8-channel with free format selection per channel and additional functions, such as frequency-dependent panning, ambience, distance, or room size, the engineer is now equipped with enhanced and creative tools for surround work.

Multiformat Panning Unit (MPU)

The surround panning can be configured for any channel in the same way as other processing blocks. The panner can be configured as:

- basic amplitude pan
- extended pan with frequency-dependent response
- full VSP pan with room simulation.

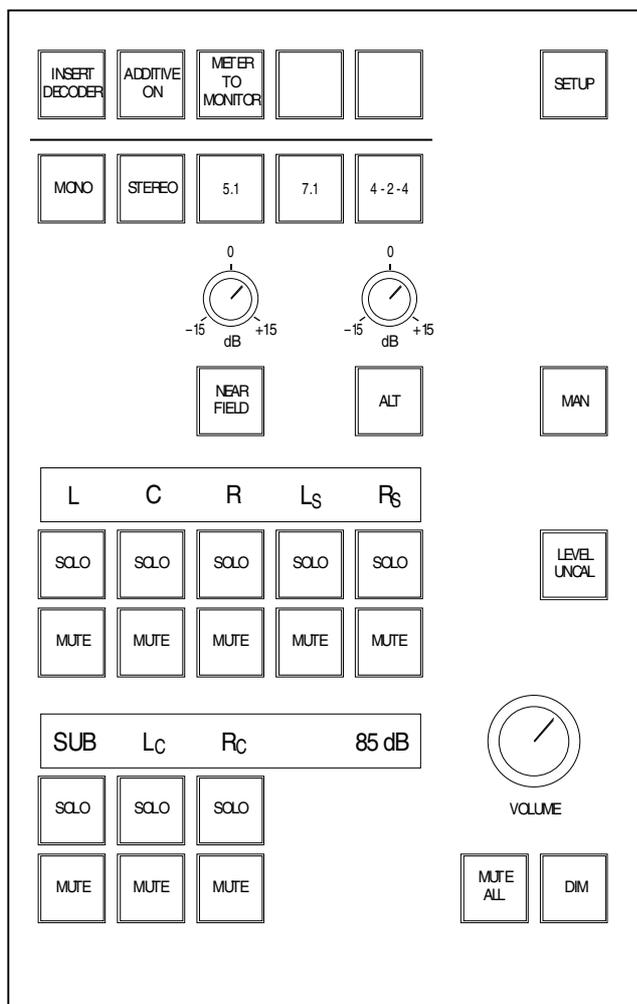
11.3.4 Multiformat monitoring

The Multiformat Monitoring Unit (MMU) is a software-aided monitor controller.

The features of the MMU include:

- Monitor format selection with loudspeaker designation display
- Pre/post decoder monitoring
- Meter-to-monitor switch
- Additive mode selector

Depending on the format selected, the display shows the names of the loudspeaker channels. Loudspeakers are turned on automatically with the format selection. Each speaker output can be SOLOed or MUTEd individually. The loudspeaker outputs can be calibrated (usually used in film mixing), and the dot matrix display can show the volume level in dB.



Multiformat Monitoring Unit (MMU)

Assignable source selection keys with associated displays enhance the MMU's capabilities. Since it is reconfigurable, the source keys may be labelled to show which sources are currently assigned to the keys. The number of source selector keys can be varied, depending on the application.

11.3.5 Dynamic stem control

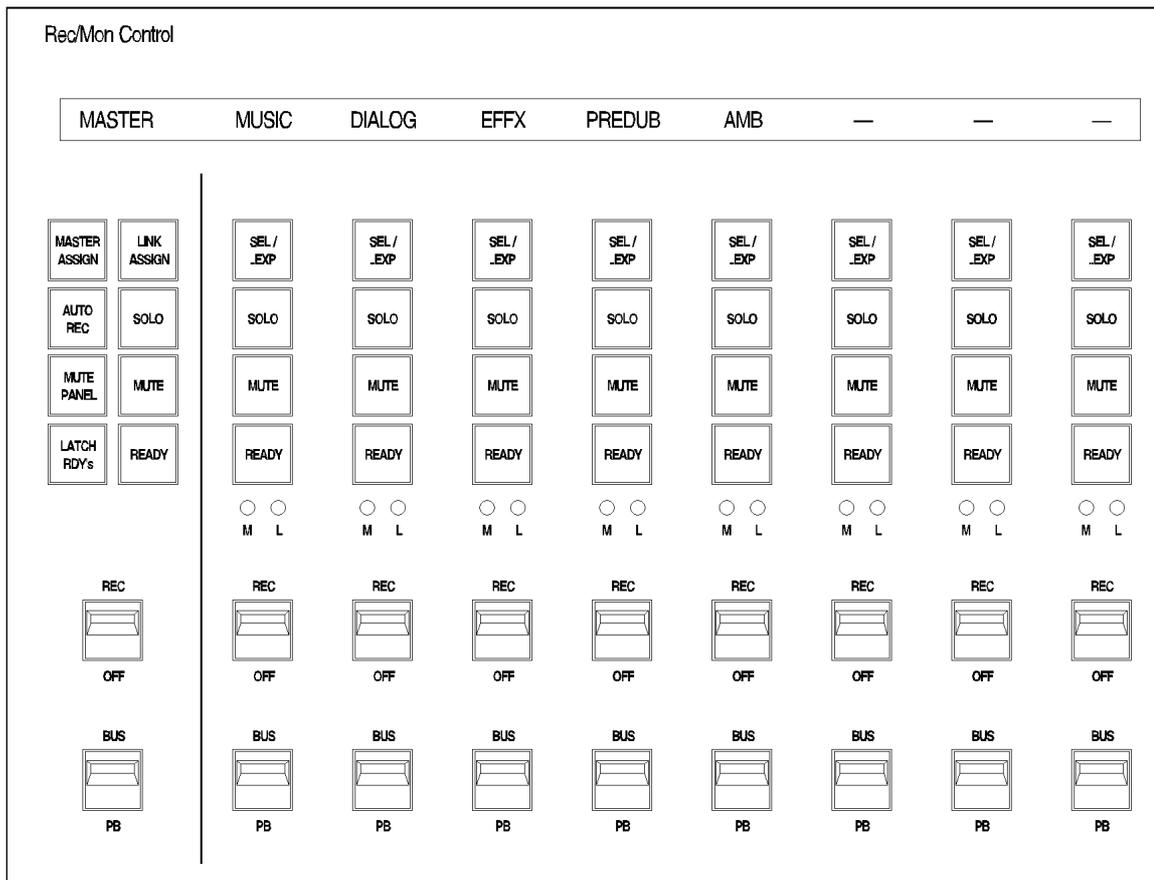
For film style mixing, bits and pieces of film sound are put together from a variety of surround formats ranging from mono to 8-channel. Very often, there may be hundreds of audio sources that need to be mixed together and put into the right spatial image. To bring some order to such a vast number of sources and formats, the concept of stems is often used.

A stem is a group of sounds (i.e. audio summing busses) that belong together. Stems can be 1-channel to 8-channel wide. For example, a console may be configured to have:

- Two stereo stems for music,
- three LCR stems for simple effects,
- one 5.1 stem for spatial effects,
- one stereo stem for dialogue, etc.,
- two 8-CH stems for effects,
- two Dolby Surround (4-CH) stems for predubs.

Since the stems often need to be reconfigured as different sound sources are processed, the D950S features what we call "Dynamic Stems". Using the Session Configuration tool, stems may be configured and re-configured as the need arises. There is no restriction to the stem number, width or name, except the number of available group and track busses at any time (total 96).

Studer D950



PEC/DIRECT Panel (RCU)

11.3.6 Machine control

Most studios working in surround use a number of playback and record machines on which source material and the final product are played back or recorded. Such setups may be simple, two or three machine arrangements, but can also involve several dozen machines, as is the case in large film mixing studios. The D950 features an optional modular machine control system that may be expanded and adapted to match the application requirements.

A simple, one-machine control interface is basically included in the AutoTouch Dynamic Automation system. As an alternative, an expandable multi-machine control system can be specified.

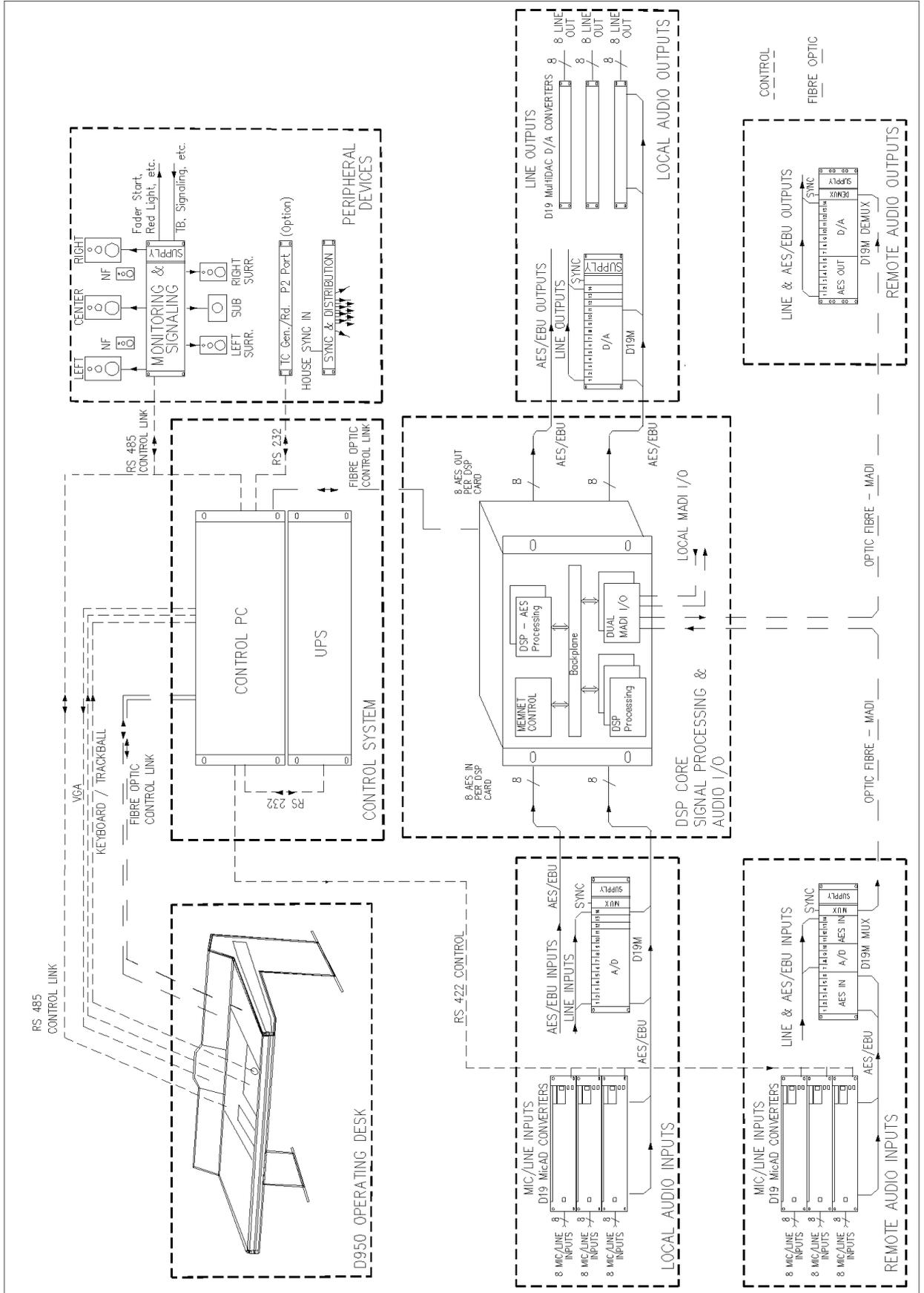
11.3.7 Film-style monitor features

Film mixing studios generally require a complex multi-machine setup to cater for all the sound sources and predubs usually used in a large film production. As an option, the D950 can be equipped with the Record/Monitor Control Unit (RCU). The RCU allows direct access to important machine and

monitoring functions.

The RCU works in conjunction with the machine control system and in fact controls recorder track arming as well as the record status of each machine track. Up to 64 machine tracks can be interfaced to the panel and controlled individually or in groups using the grouping facility of the RCU.

In addition, the RCU is equipped with switches for control of the monitoring paths and allows easy switching between console's send (Bus) and recorder returns (PB), so it is also interfaced to the D950's monitoring system. Up to 4 RCUs can be defined in a system, in order to allow multi-operator arrangements that are common in film mixing. In the film industry, BUS is also sometimes called DIR for direct console signal. PB is sometimes called PEC, which stands for Photo Electric Cell and is related to the return of the optical film machines which were traditionally used as players in film dubbing stages, so very often the BUS/PB function is referred to as the PEC/DIRECT function.



Studer D950

12.2 D950 versions

There are two basic version of the D950 console:

- D950B, stereo version, suited for live broadcast and production work.
- D950S, surround version suited for broadcast production, postproduction, and all other applications requiring surround facilities.

Note: Any D950B console can be upgraded to D950S by adding the surround monitoring facilities and the panning software.

12.3 D950 options

In addition to the modular construction allowing both D950 types to be finely tuned in size, there is an extensive list of options. Currently available are:

12.3.1 AutoTouch Dynamic Automation

Automation of audio channel controls, including:

- Automation Control Unit
- TC2 Timecode Reader/Generator
- 1 serial P2 9-pin machine control port
- AutoTouch Dynamic Automation Software with support of the Graphic Controller and the Automation Control Panel.

12.3.2 Redundant DSP + AES/EBU card

Allows automatic failsafe of DSP functions and hot-plugging.

Application subject to free space within the DSP frame.

12.3.3 D950 configuration software

Allows reconfiguration of the D950 based on the installed DSP power. Included are the software package and the licences. Configuration software can be installed on

- a separate PC (not included); requires a compatible PC with Pentium processor under Windows NT or Windows 95, minimum 133 MHz and 32 MB RAM, or on
- the D950's control computer.

12.3.4 Surround upgrade for D950B

Consisting of:

- Multiformat Monitoring Unit, source selector cards, and 2 × 10 Source Selector Key Units.
- Inserts for Dolby encoder/decoder (encoder/decoder not included).
- Necessary electronics and wiring.
- VirtualSurround™ DSP Library Panning Function to be used with channel rotary encoders and/or joysticks (subject to the available DSP power).
- Stem Setup Configuration Tool in the D950 Graphic Controller.

12.3.5 Joystick upgrade for D950B

Consisting of:

- Multiformat Panning Unit with 2 assignable joysticks. The joysticks are motorised and automated within the AutoTouch Automation System.
- Necessary electronics and wiring.

12.3.6 Multimachine Motion Controller

Studer/CB integrated machine control system including:

- Studer Machine Control Panel.
- 3 serial machine control ports (P2/9-pin).
- Integrated into the D950 AutoTouch Automation System.

12.3.7 PEC/DIRECT Control Unit

for use in film applications, including:

- Control panel with 9 switch banks.
- REC/PB control of recorder tracks.
- PEC/DIRECT (return/bus) monitoring switching.
- Must be used together with the Multimachine Motion Controller.

13 Dimensions,
basic technical specifications

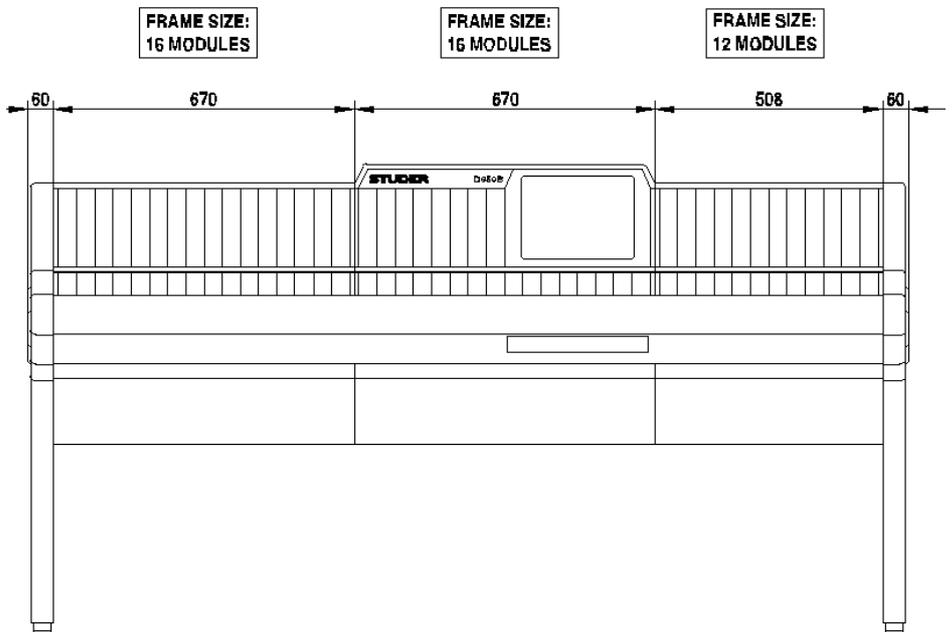
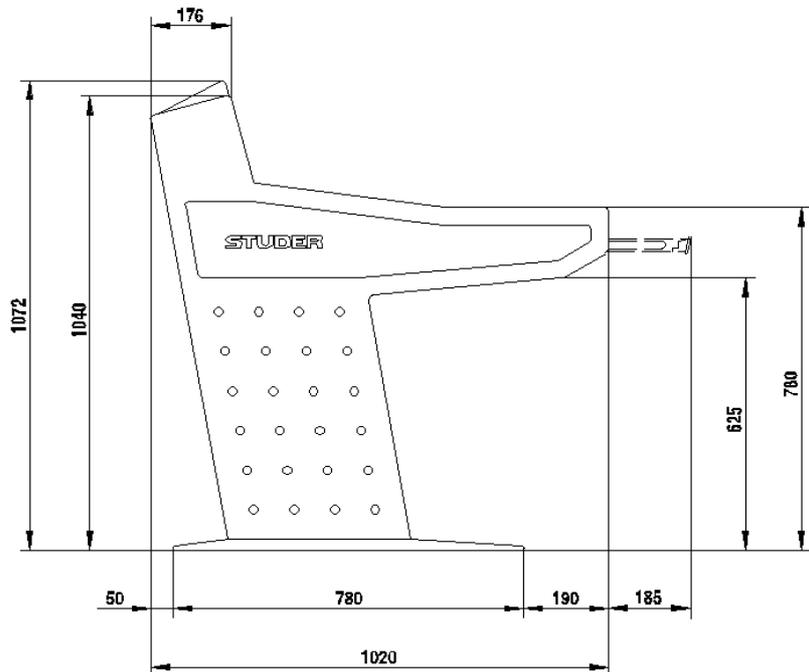
Compliant to the following technical standards:
IEC 721-3-3: 1994 + Amendment 1:1995 and EN
60721-3-3:1995

Environmental Class:
Combination SET IE 32 (3K3/3Z2/3Z4/3B1/3C1/3S1/
3M1)

Conditions during initial phase of fire:
3T2/3P3/3F2/3V3/3H3

13.1 Operating desk
The operating desk is a modular construction consisting of a combination of 12 and/or 16 module frames, the basic module width being 40 mm. The fader and input/output blocks come in widths of four modules (160 mm), and they can be equipped in any multiple of four channel strips. So any console can have from 4 up to 96 or more channel strips. The central section is basically 16 or 12 modules wide and houses the GC cockpit.

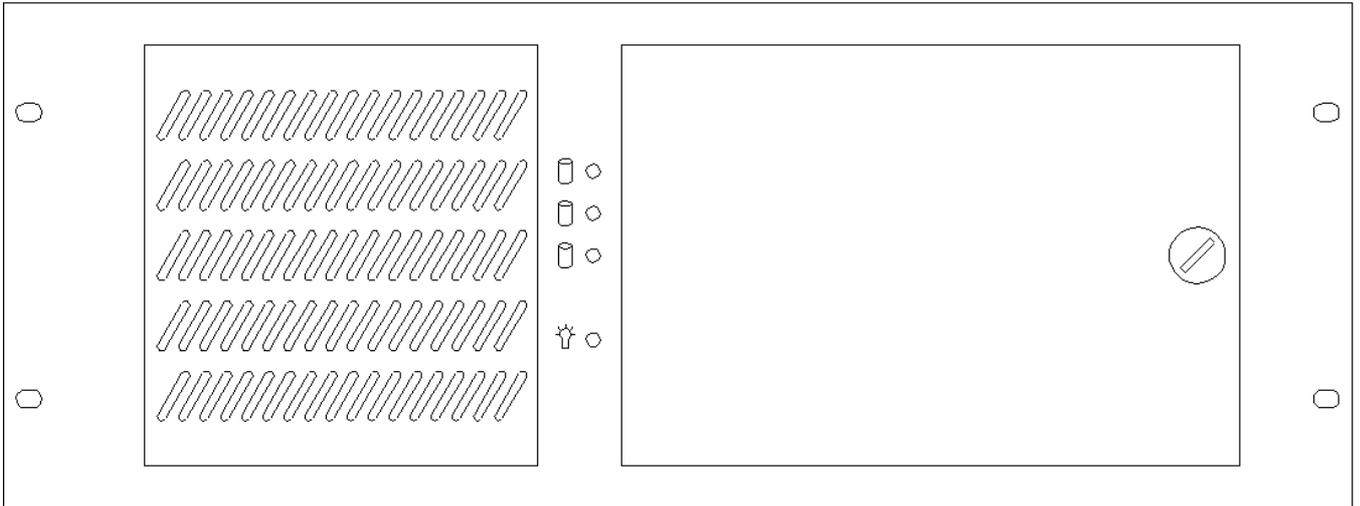
Typical power requirements:
100...110 V or 220...240 V,
50/60 Hz, 150...600 W, depending on the number of channel strips.



Studer D950

Calculation of the desk size:

Customer:			
D950 type:		Serial No.:	
Frame No:	12U/19" (508 mm)	16U (670 mm)	Frame width (mm)
1 (left)			
2			
3			
4			
5			
6			
2 Side panels (60 mm each)			120 mm
Total width of mixing console			
Depth of mixing console			1020 mm
Height of mixing console			1072 mm



13.2 Control PC

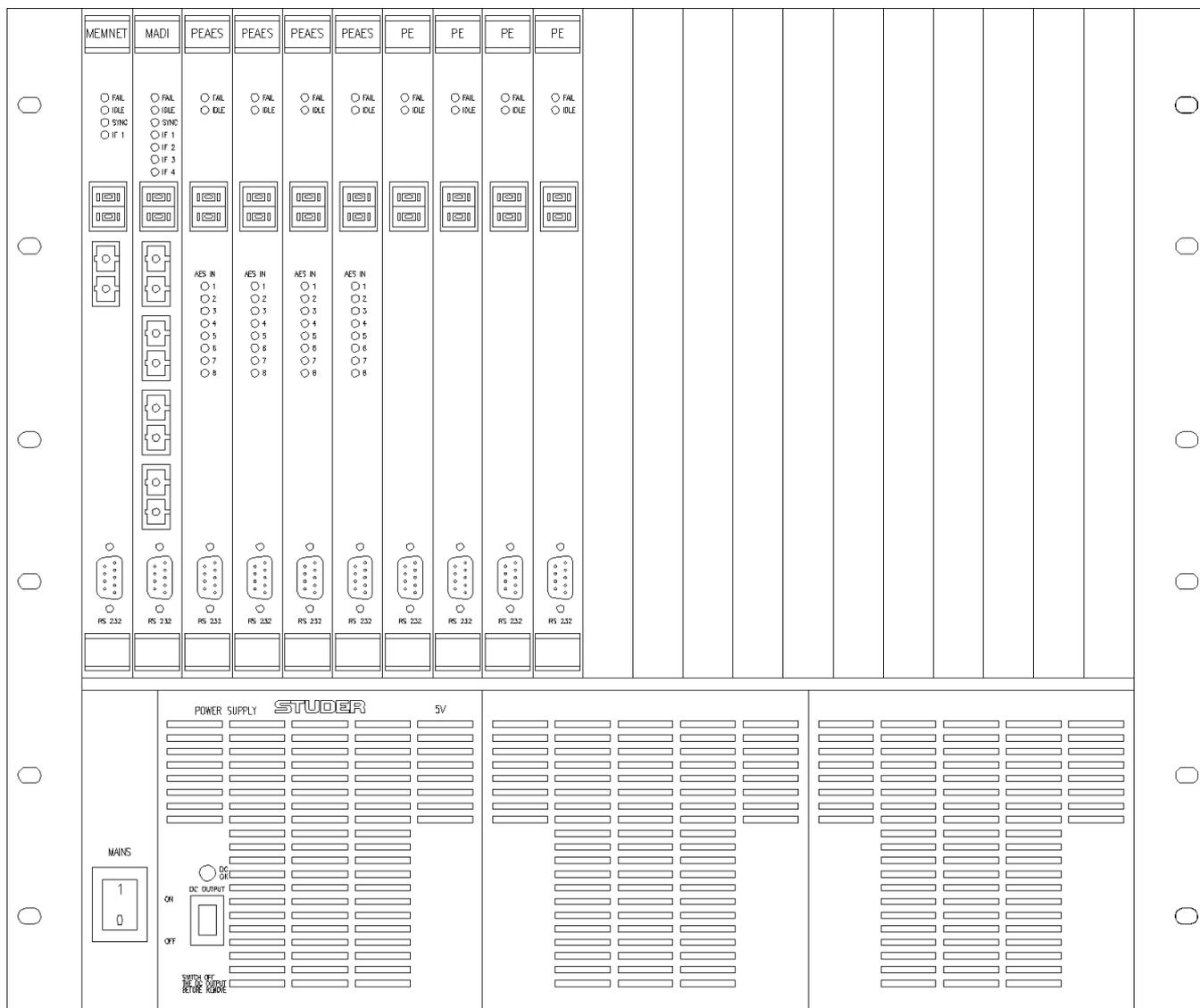
The control PC is an IBM compatible 19"/4U industrial PC running Windows NT, with a redundant power supply and a mirrored main hard disk. All control PCs are equipped with a backup drive, a 100 MB ZIP drive as a rule. Each D950 is also equipped with a 19"/3U uninterruptible power supply (UPS) which will keep the PC running for approximately 10...15 minutes in case of a power failure.

Typical power requirements:

100...110 V or 220...240 V, 50/60 Hz, 250 W

Studer D950

Front view:



13.3 DSP core

The D950 DSP core is housed in a 19"/9U frame, containing all the DSP cards, the power supply, and the digital audio connections. In standard cases, a 1U air deflector panel mounted on the top of the DSP frame is supplied. This arrangement, together with the built-in fans, is sufficient for the ventilation of the DSP frame in the specified environmental conditions. The DSP cards are hot-pluggable. The available cards are:

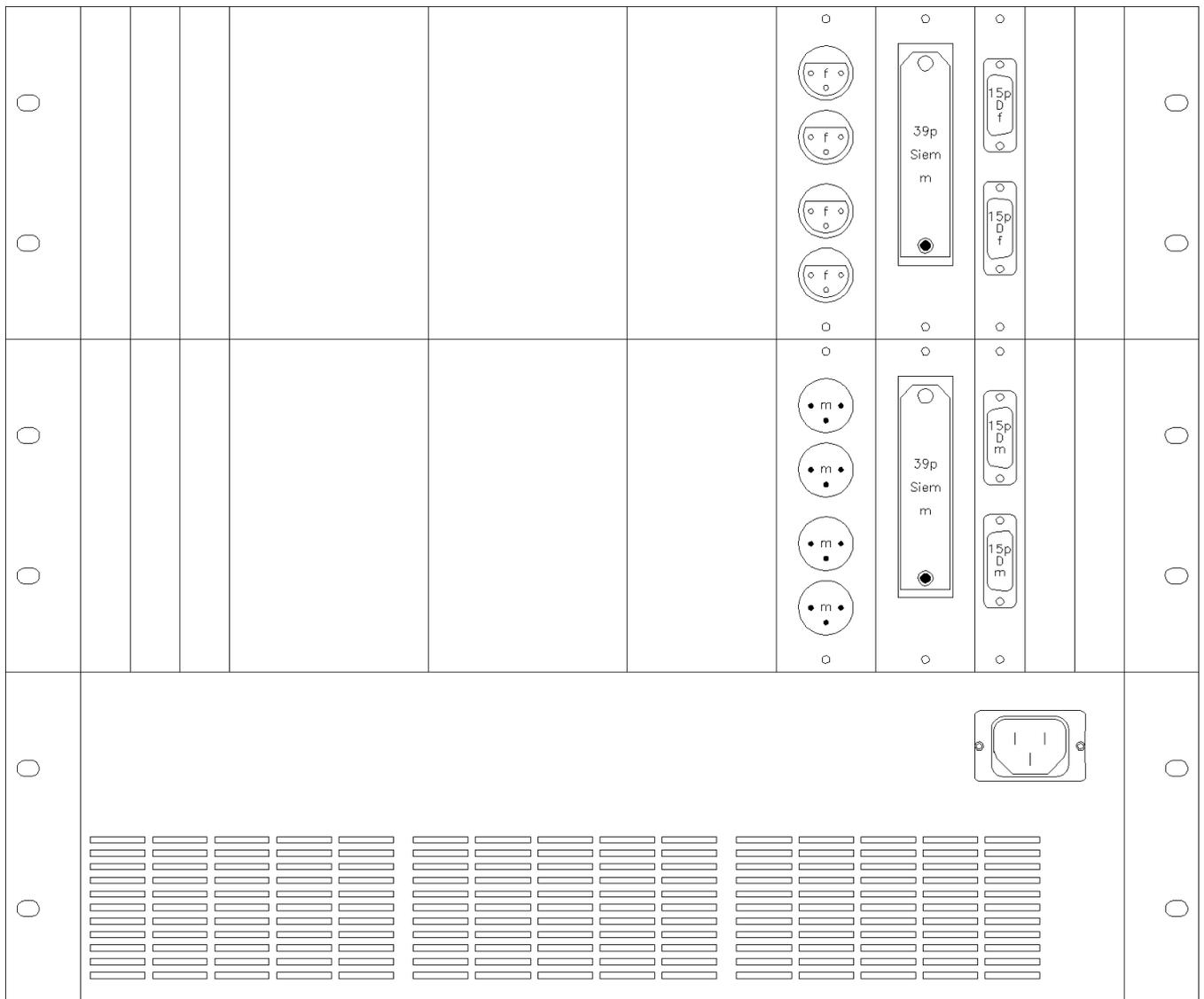
- DSP card with 8 AES/EBU inputs and 8 AES/EBU outputs (PEAES).
- DSP card (PE).
- Twin MADI card with 2 optical MADI inputs and 2 optical MADI outputs on SC connectors.
- MEMNET communication card for the connection to the control PC via SC connectors.

The DSP core is powered by one or two universal 5 V power supplies, depending on the number of cards. The power supply chassis has 3 slots so that a third power supply can optionally be installed for redundancy, if required.

All optical connections to the DSP frame are done on the front of the rack directly onto the cards, and the optical cables are fed through the air deflector panel to the back of the frame. The AES/EBU inputs and outputs are all located at the back of the DSP frame on a selection of connection panels:

- One Siemens 39 pin connector per panel.
- One or two D-type 15 pin connectors per panel.
- 4 XLR connectors per panel.

Rear view:



The exact number and type of DSP boards and connection panels depends on actual project specification. The MEMNET card also features one external digital audio DARS sync input and 4 DARS outputs.

Configurable DSP channel processing blocks:

Available channel processing blocks: Input selector, input processing & filters, input mode, 4-band EQ, 4-band EQ with notch, insert, variable delay, C/L/E/G dynamics, output limiter, PAN, stereo PAN, multiformat PAN, direct out, IPL.

Typical power requirements:

100...240 V, 50/60 Hz, 100...600 W, depending on the number of DSP cards.

I/O interfaces:

8 balanced AES/EBU inputs on PEAES DSP card (compliant to AES3-1992/ANSI S4.40-1992), two of those inputs with SFC.

8 balanced AES/EBU outputs on PEAES DSP card (compliant to AES3-1992/ANSI S4.40-1992).

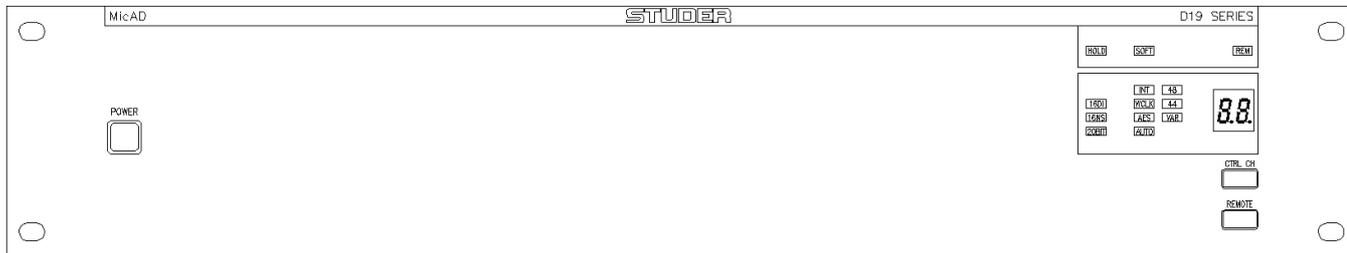
Fibre optic MADI inputs and outputs (2 each) on SC connectors on Twin MADI card (compliant to AES10-1991/ANSI S4.43-1991).

Studer D950

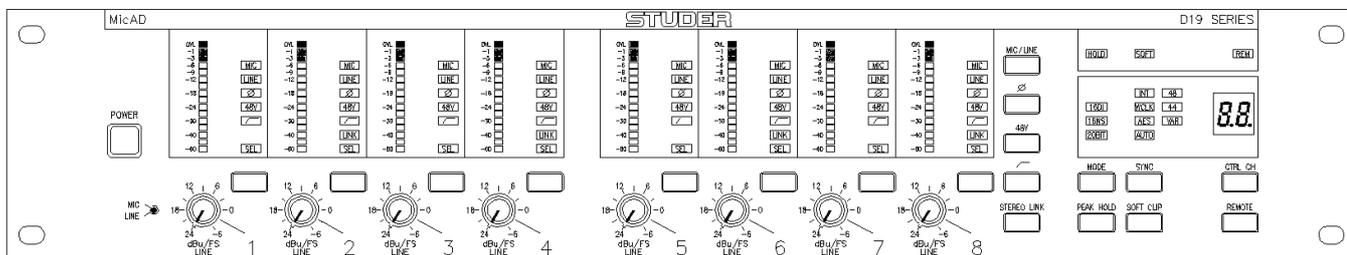
13.4 D19 and D19M audio interfaces

13.4.1 D19 MicAD

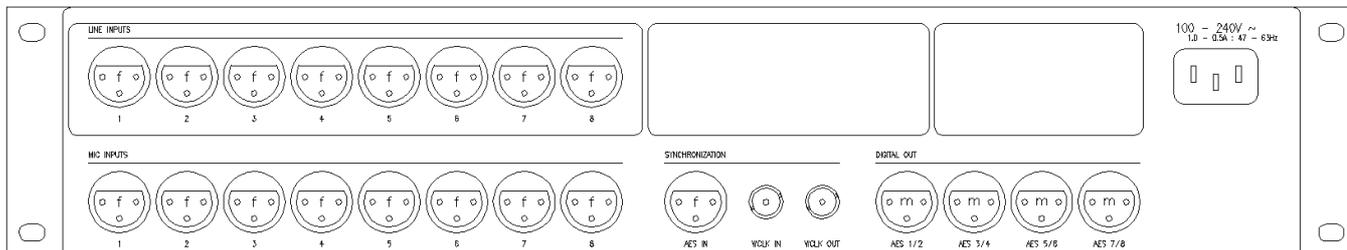
D19 MicAD STAGE front view:



D19 MicAD front view:



Rear view:



The D19 MicAD Stage (top) or the D19 MicAD (center) can be used as a mic/line preamplifiers with A/D converters for 8 channels. The mic/line channels can be remotely controlled from a D950 desk.

Typical power requirements:

100...240 V, 50/60 Hz, 40 W

Converter technology:

20 bit delta-sigma converter;

Remote control mic/line sensitivity:

in 1 dB steps

Input impedance, mic input:

1 kΩ, balanced, floating

Input impedance, line input:

11 kΩ, balanced, floating

Input level, mic in:

-58 to +11 dBu @ 9 dB headroom

Input level, line in:

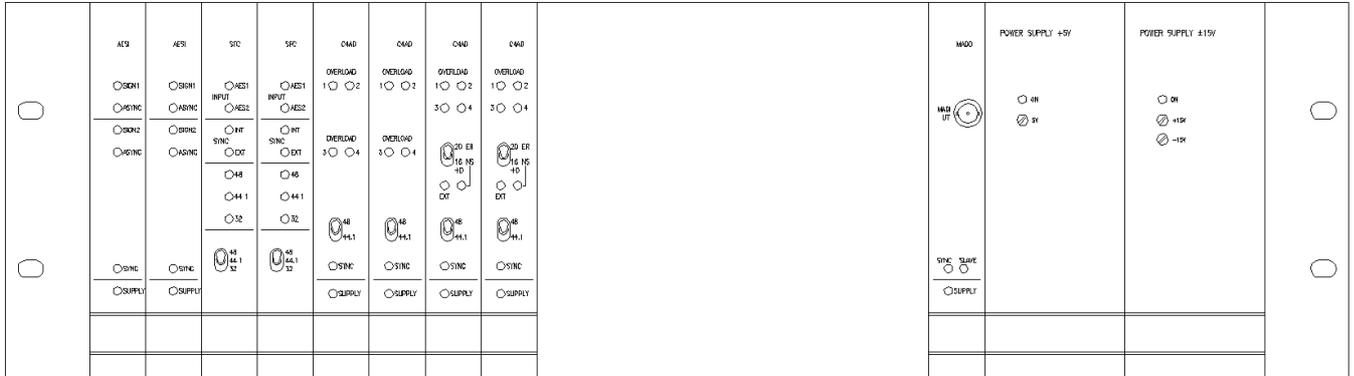
-14 to +15 dBu @ 9 dB headroom

S/N ratio, A/D converter:

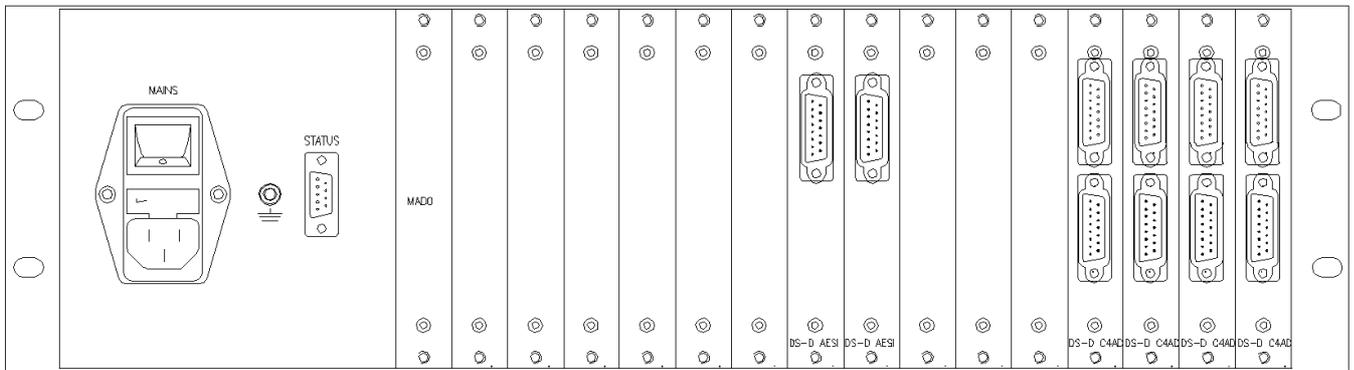
>106 dBFS, CCIR 468-3

13.4.2 D19M series MUX

Front view:



Rear view:



For analog line or digital AES/EBU inputs, the D19M series converters are used. The frame can be used in multiplexer mode with a MADI output containing all converter outputs, or in individual mode with AES/EBU outputs from the converters. The MADI optical connections are done on the front of the rack directly onto the MADO card, and the optical cables are led through a suitable cable duct to the back of the frame. The analog inputs and the AES/EBU outputs are all located at the back of the D19M frame on a selection of connection panels:

- One Siemens 39 pin connector per panel.
- One D-type 15 pin connector per panel.
- 4 XLR connectors per panel.

The exact number and type of the connection panels depends on actual project specification.

D19M MUX frame:

Typical power requirements:

100...110 V or 220...240 V, 50/60 Hz, 100...200 W, depending on the number of cards.

Analog line input on D19M C4AD card:

4 inputs per card, 20 bit delta-sigma converter
Input impedance: >10 kΩ, balanced, floating
Input level @ 0 dBFS: 16 dBu or 22 dBu fixed, or 0...26 dBu adjustable
Frequency response, -0.2 dB: 20 Hz...20 kHz
THD+N, @ 1 kHz, -30 dBFS: <-103 dBFS
Crosstalk, @ 1 kHz: <-110 dB
Sampling frequency range: 28...55 kHz

AES/EBU input on D19M AESI card (alternately to AES/EBU inputs on the DSP cards):

2 balanced AES/EBU inputs per card, compliant to AES3-1992 (ANSI S4.40-1992).

Optional: D19M AESI card with sampling frequency converter.

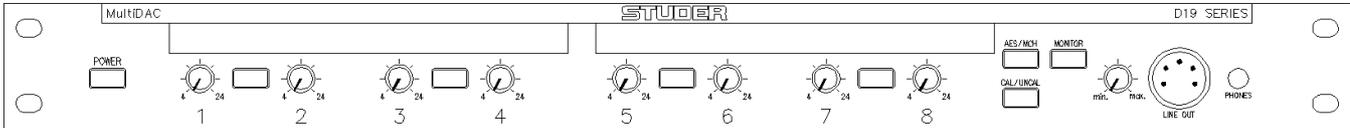
MADI output on D19M MADO card:

Fibre optic MADI output on ST connector, compliant to AES10-1991 (ANSI S4.43-1991).

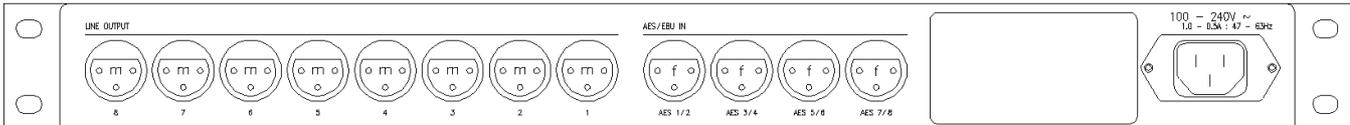
Studer D950

13.4.3 D19 MultiDAC

Front view:



Rear view:



The D19 MultiDAC 8CH D/A converter is used as an alternative for 8 channels of D/A conversion. It features 23 bit linear converter technology.

Typical power requirements:

100–240 V, 50/60 Hz, 40 W

Output impedance: typ. <40 Ω, balanced, floating

Output level: 4...24 dBu calibrated,
or 4...24 dBu adjustable

Frequency response, -0.1 dB: 20 Hz...20 kHz

S/N ratio, Auto Mute OFF: >115 dB, @+24 dBuFS

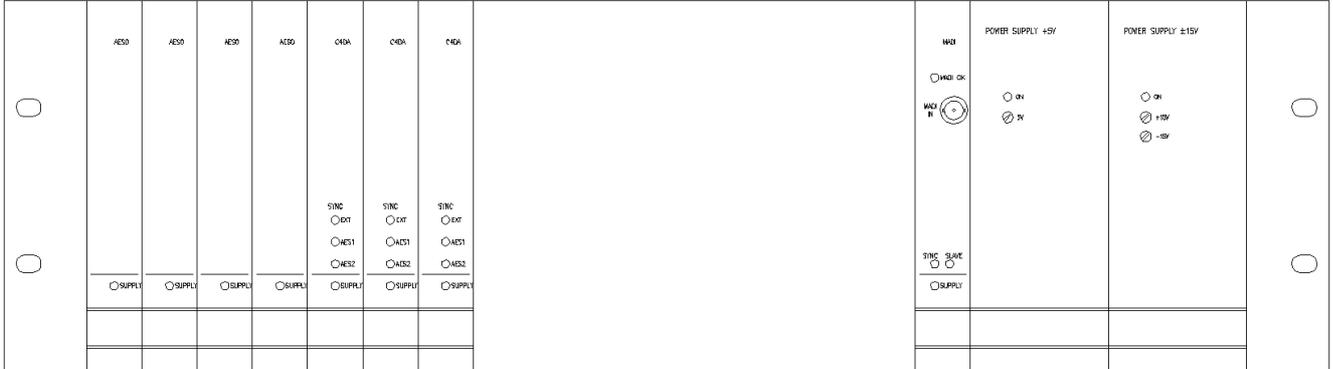
S/N ratio, Auto Mute ON: >119 dB, @+24 dBuFS

THD + N, @ 1 kHz, -30 dBFS: <-110 dBFS

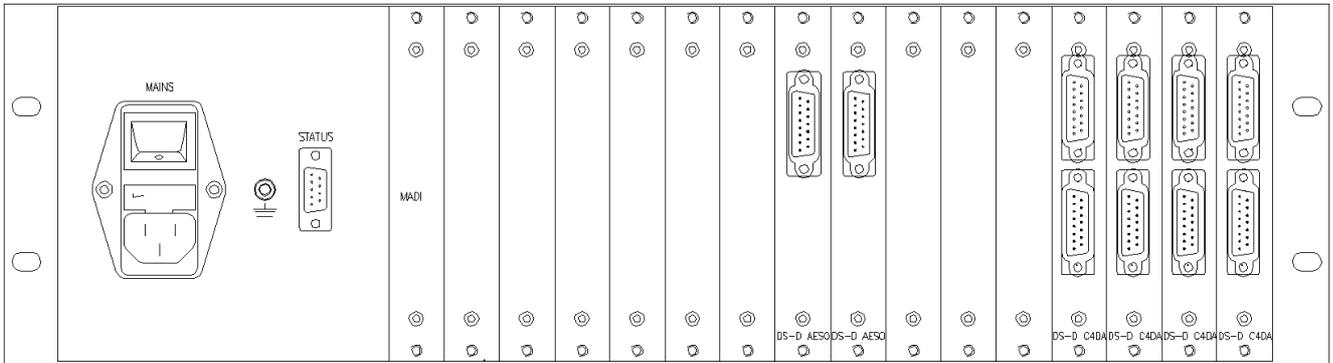
Crosstalk @ 1 kHz: <-110 dB

13.4.4 D19M series DEMUX

Front view:



Rear view:



For analog line or digital AES/EBU outputs, the D19M series converters can alternatively be used. The D19M DEMUX frame can be used in the demultiplexer mode with a MADI input containing all the individual converter inputs, or in the individual mode with AES/EBU inputs to the converters. The MADI optical connections to the D19M frame are done on the front of the rack directly onto the MADI card, and the optical cables are guided through a suitable cable duct to the back of the frame. The analog outputs and the AES/EBU inputs are all located at the back of the D19M frame on a selection of connection panels:

- One Siemens 39 pin connector per panel.
- One D-Type 15 pin connector per panel.
- 4 XLR connectors per panel.

The exact number and type of the connection panels depends on actual project specification.

D19M DEMUX frame:

Typical power requirements:

100...110 V or 220...240 V, 50/60 Hz, 100...200 W, depending on the number of cards

Analog line output on D19M C4DA card:

4 outputs per card, 22 bit delta-sigma converter

Output impedance: <40 Ω, balanced

Output level @ 0 dBFS: 16 dBu or 22 dBu fixed, or 0...26 dBu adjustable

Frequency response, -0.2 dB: 20 Hz...20 kHz

THD + N, @ 1 kHz, -30 dBFS: <-105 dBFS

Crosstalk @ 1 kHz: <-110 dB

Sampling frequency range: 28...55 kHz

AES/EBU output on D19M AES0 card (alternately to AES/EBU outputs on the DSP cards):

2 balanced AES/EBU outputs per card, compliant to AES3-1992 (ANSI S4.40-1992)

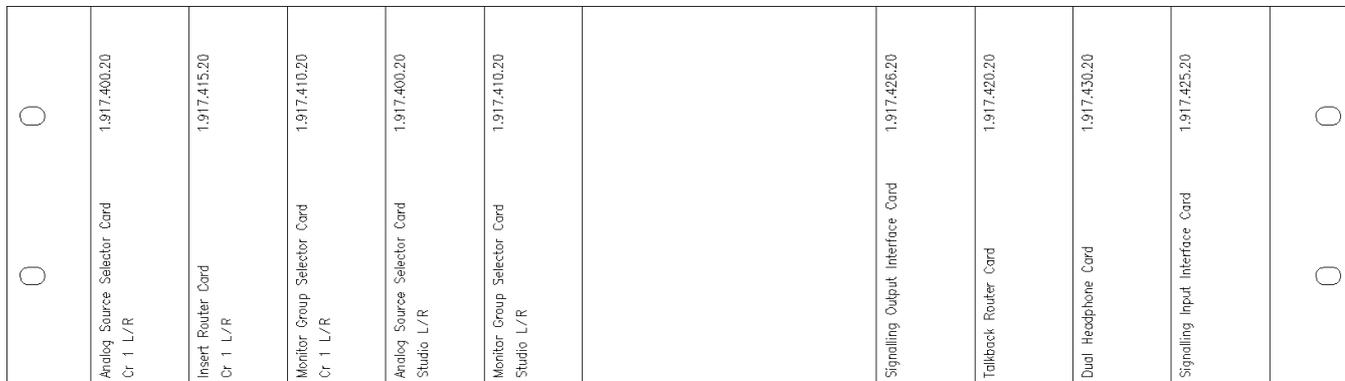
MADI input on D19M MADI card:

Fibre optic MADI input on ST connector, compliant to AES10-1991 (ANSI S4.43-1991)

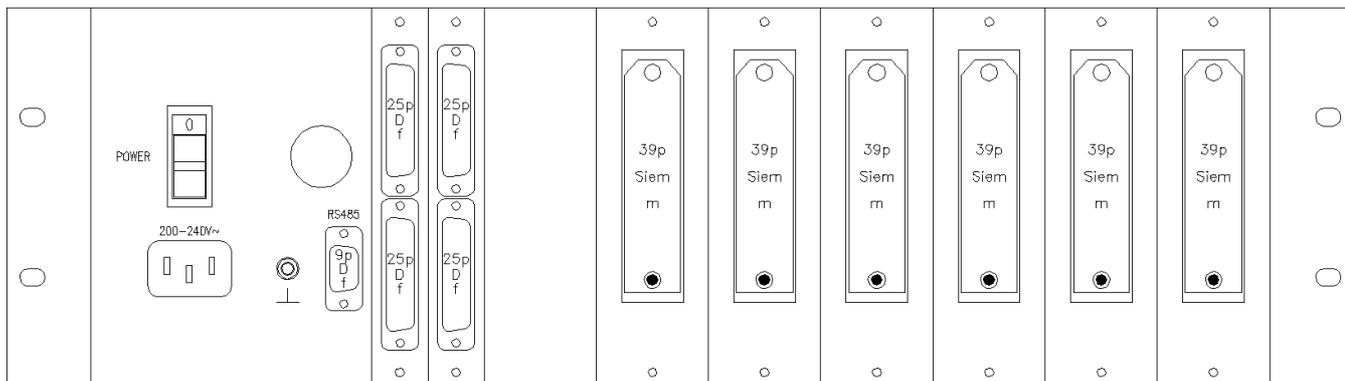
Studer D950

13.4.5 Monitoring/signaling frame

Front view:



Rear view:



The monitoring and signaling cards are housed in one or more 19"/3U frames. All audio monitoring, talkback, and signaling functions of the D950 system are contained in this frame. The operating desk contains panels such as CR monitor or Studio controls, source selectors, talkback panels, etc., which only serve as remote controls. The number and type of cards depends on the actual system configuration.

The audio connections of external monitoring sources, talkback, and signaling are all located at

the back of the monitoring and signaling frame on a selection of connection panels:

- One Siemens 39 pin connector per panel.
- Two D-Type 25 pin connectors per panel.

The exact number and type of the connection panels depends on actual project specification.

Typical power requirements:

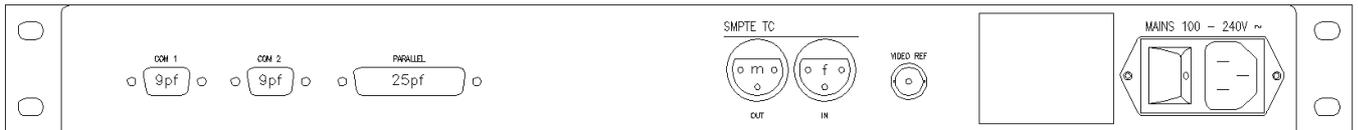
100...110 V or 220...240 V, 50/60 Hz, 50...150 W, depending on the number of cards.

13.4.6 TC2 Timecode reader/generator

Front view:



Rear view:



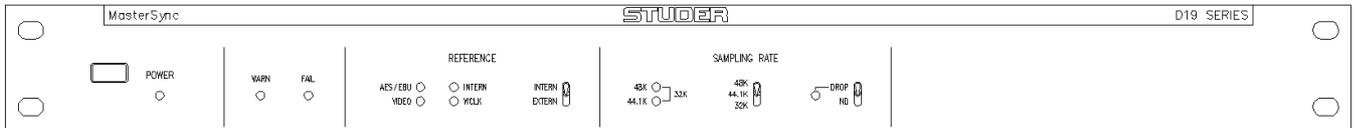
The TC2 timecode reader/generator is a 19"/1U unit. It is equipped together with the Autotouch Dynamic Automation. It's main function is to read external timecode, generate a re-shaped TC output and house the P2 9-pin controller for simple machine control.

Typical power requirements:

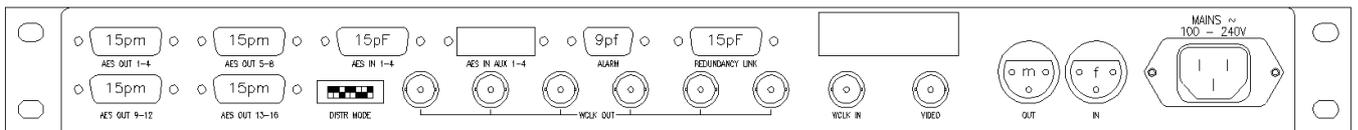
100...110 V or 220...240 V, 50/60 Hz, 50 W

13.4.7 D19 MasterSync generator

Front view:



Rear view:



The D19 MasterSync generator/distributor is a 19"/1U unit. The generator part can be slaved to an external video clock, word clock or AES/EBU input. Should the external reference signal fail, the generator automatically switches over to an internal 1 ppm reference.

The unit distributes one word clock signal to 6 outputs, and the AES/EBU input to typically 16 outputs each. The AES/EBU distribution can be configured as 1 to 16, 2 to 8, or 4 to 4 distribution by means of a DIP switch on the back panel.

The generator can be set to 32 kHz, 44.1 kHz, 44.056 kHz, 48 kHz, and 47.952 kHz. When synchro-

nizing to an external video reference, the generator rate can be set by means of switches.

One MasterSync generator is supplied with the D950 system as standard. Two generator/distributor units can optionally be linked together by means of a redundancy cable. In this case, one unit takes over the supply, the AES/EBU reference, and the word clock reference of both units, should the power supply of the other unit fail. Both units are always synchronized in normal operation, so that no phase shift can occur if one unit fails.

Typical power requirements:

100...110 V or 220...240 V, 50/60 Hz, 50 W

Studer D950

14 Configuration examples

Since the D950 is fully modular and freely configurable, there are many combinations in which the console can be supplied. Two examples of such configurations follow.

14.1 D950B

Studer D950B Digital Mixing Console – full size broadcast application with integrated digital routing matrix.

D950 DSP configuration (full size broadcast application with integrated digital routing matrix)											
Total no. of channels: 60											
Total no. of busses: 32											
Total no. of MEQ channels:72											
Channels:		Control group: None									
Type:		Input mono	Input stereo	Mtrk input mono	Mtrk monit. mono	Group mono	Group stereo	AUX mono	AUX stereo	Master. mono	Master stereo
	Qty:	24	12	0	0	8	0	8	4	4	0
Functions:	Inp. sel.	x	x	x	x	x	x	x	x	x	x
	Inp. proc.	x	x								
	Input mode	x	x								
	4-band EQ	x	x								
	4-band EQ notch										
	Dynamics										
	Dynamics + SC filter	x									
	Delay 100 ms										
	Delay 240 ms										
	Outp. lim.					x				x	x
	Insert	x	x	x	x	x	x	x	x	x	x
	Fader	x	x	x	x	x	x	x	x	x	x
	L/R pan	x		x	x	x					
	Bal						x				
	Bal+Width		x								
	IPL										
	Direct Out	x	x	x	x	x	x	x	x	x	x
	Meter	x	x	x	x	x	x	x	x	x	x
Busses:											
Name:	Qty:	Access to:									
Master	4	x	x	x	x	x	x				
Group	8	x	x	x	x						
MTRK	0	x	x	x							
AUX mono	8	x	x	x	x	x	x				
AUX stereo	4	x	x	x	x	x	x				
N-1 mono	0	x	x								
N-1 stereo	0	x	x								
Solo 1	2	x	x	x	x						
PFL 1	2	x	x	x	x	x	x	x	x	x	x

Fitted with:

- 16 MIC/LINE inputs on Studer D19 MicADs
- 12 analog line inputs
- 8 AES/EBU stereo inputs
- 8 AES/EBU stereo inputs with SFC
- 2 analog mono inserts
- 4 analog master outputs
- 16 analog AUX outputs
- 2 digital AES/EBU stereo master outputs
- 4 digital AES/EBU stereo group outputs
- 8 digital AES/EBU stereo AUX outputs
- 4 digital AES/EBU stereo line outputs
- 24 channels in MADI optical output link – MCR
- 1 D19 MasterSync generator with WCLK and video in + distribution 1/16

Operating desk with:

- 24 channel strips with motorized faders
- 24 dual bargraph meter in input channel strip
- 2 dual digital bargraph meters for master channels
- 1 dual bargraph meter for CR monitor
- 1 correlator
- 40 keys for stereo CR monitor source selection
- 40 keys for stereo studio 1 monitor source selection
- 1 signaling and fader start interface

- 1 UPS for the Central Computer
- 1 19"/42U rack for the equipment

Master Menu Selector, Central Facilities Unit and Bank Selector included.

Graphic Controller for the Static Automation System, routing, and bookkeeping included.

Prepared for installation of the Dynamic Automation System.

Option: AutoTouch Dynamic Automation System

Automation of channel audio controls

Support of the Graphic Controller and the Automation Control Panel

Includes 1 serial 9-pin machine control port.

Studer D950

14.2 D950S

Studer D950B Digital Mixing Console – 56/48 track production/postproduction application with integrated digital routing matrix.

D950 DSP configuration (56/48 track production/postproduction application with integrated digital routing matrix)												
Total no. of channels: 130												
Total no. of busses: 72												
Total no. of MEQ channels: 140												
Channels: Control group: None												
Type:		Input mono	Input stereo	MTRK input mono	MTRK monit. mono	Group mono	Group stereo	AUX mono	AUX stereo	Master. mono	Master stereo	
	Qty:	0	12	56	48	0	0	8	4	0	2	
Functions:	Inp. sel.	x	x	x	x	x	x	x	x	x	x	
	Inp. proc.	x	x	x	x							
	Input mode	x	x	x								
	4-band EQ	x	x	x	x							
	4-band EQ notch											
	Dynamics											
	Dynamics + SC filter	x				x						
	Delay 100 ms					x						
	Delay 240 ms											
	Outp. lim.						x				x	x
	Insert	x	x	x	x	x	x	x	x	x	x	x
	Fader	x	x	x	x	x	x	x	x	x	x	x
	L/R pan	x			x	x	x					
	Bal							x				
	Bal+Width			x								
	IPL											
	Direct Out	x	x	x	x	x	x	x	x	x	x	x
Meter	x	x	x	x	x	x	x	x	x	x	x	
Busses:												
Name:	Qty:	Access to:										
Master	4	x	x	x	x	x	x					
Group	0	x	x	x	x							
MTRK	48	x	x	x								
AUX mono	8	x	x	x	x	x	x					
AUX stereo	4	x	x	x	x	x	x					
N-1 mono	0	x	x									
N-1 stereo	0	x	x									
Solo 1	2	x	x	x	x							
PFL 1	2	x	x	x	x	x	x	x	x	x	x	

Fitted with:

- 72 MIC/LINE inputs on Studer D19 MicADs
- 8 AES/EBU stereo inputs
- 6 AES/EBU stereo inputs with SFC
- 2 digital AES/EBU stereo inserts
- 48 channels in MADI optical input link – MCH recorder
- 4 analog master outputs
- 16 analog AUX outputs
- 20 analog line or N–1 outputs
- 2 digital AES/EBU stereo master outputs
- 8 digital AES/EBU stereo AUX outputs
- 4 digital AES/EBU stereo line outputs
- 48 channels in MADI optical output link – MCH recorder
- 1 D19 MasterSync synch generator with WCLK and video in + distribution 1/16

Operating desk with:

- 24 channel strips with motorized faders
- 24 dual bargraph meter in input channel strip
- 1 DK-Audio 8 CH bargraph and phase meter
- 20 assignable keys for stereo CR monitor source selection
- 40 keys for stereo Studio 1 monitor source selection

- 1 UPS for the Central Computer
- 1 19"/42U double rack for the equipment

Surround Monitoring, Panning and Dual Joystick Module fitted.

Machine Control Panel fitted.

PEC/DIRECT unit fitted.

Master Menu Selector, Central Facilities Unit, and Bank Selector included.

Graphic Controller for the Static Automation System, routing, and bookkeeping included.

Dynamic Automation System including 1 serial 9-pin machine control port installed.

Studer D950

Disclaimer:

The functions and features described herein cover the software version V1.0, unless otherwise stated. The information in this bulletin has been carefully checked and is believed to be accurate at the time of publication. However, no responsibility is taken by us for inaccuracies, errors, or omissions, nor is any liability assumed for any loss or damage resulting either directly or indirectly from use of the information contained within it.

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