TASCAM
TEAC Professional Division

IF-SM/DM

Surround Monitor Card

ANALOG OUTPUTS

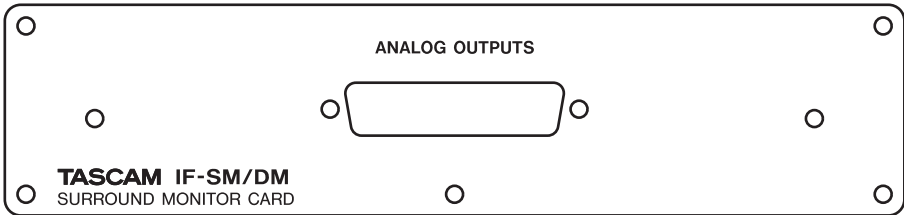**TASCAM IF-SM/DM**
SURROUND MONITOR CARD

OWNER'S MANUAL

This appliance has a serial number. Please record the model number and serial number and retain them for your records.

Model number _____

Serial number _____

Contents

Table of figures

The IF-SM/DM card allows the connection of one or two surround monitoring systems. It provides flexible setup capabilities, routing, downmix capabilities, bass management, and monitor setup, etc. from within the IF-SM/DM's interface.

Installation

You should not install or remove cards yourself, but should refer installation to a qualified TASCAM distributor. Otherwise, the warranty will be voided.

1   **Turn off the main unit and disconnect it from the power supply. Disconnect all other equipment connected to it.**

WARNING

The above step is most important. If you do not do this, there is a risk that you may cause damage to the main unit as well as to other equipment.

2   **Use a screwdriver to remove the blanking panel from the slot into which you will fit the interface card. Keep the retaining screws in a safe place.**

If you are installing more than one card, we suggest that you start from the top slot (slot 1) and work downwards.
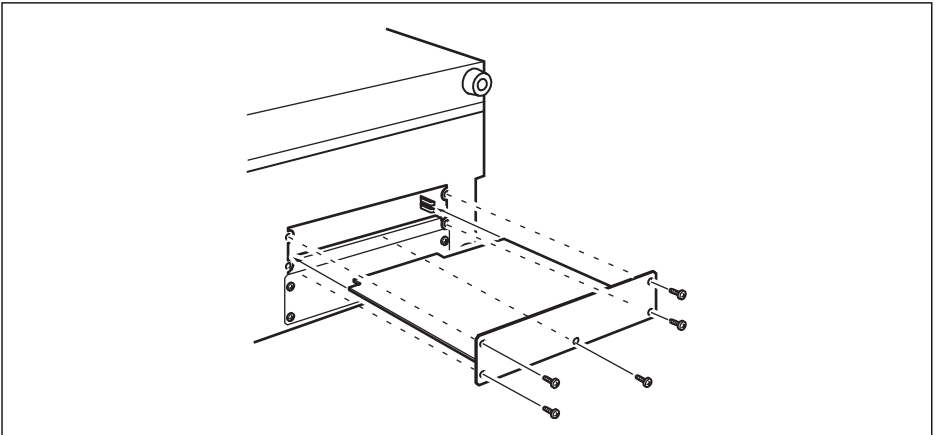
Figure 1.1: Fitting the card

Take care, if you are removing a previously-fitted interface card, that you are removing the retaining screws, and not the smaller screws which fix the card to the rear plate. Also, if you are removing a previously-fitted card, use the binding posts on the rear plate to help remove the card.

3   **Remove the interface card from the anti-static protective bag. Hold the**

card by the edges, and insert it, component side upwards, into the slot.

Insert the card between the guide rails and slide it all the way into the slot, as shown. You may have to push firmly to plug the card into the internal connector.

4   **Locate the card into the connector inside the main unit. Push the card firmly, without forcing, so that the connector grips the end of the card.**

1 – Introduction : Connections

A new unit's card slot and/or new card may be a little stiff. Make sure that the card is pushed as far as it will go (so that the card rear connector plate touches the rear panel of the unit).

5 Use the screws supplied with the card to attach the rear panel of the interface card to the rear panel of the unit.

6 Repeat the installation process for all the interface cards that you are fitting.

• When removing a card, unscrew the five retaining screws and use the "pull posts" on the rear panel of the card to remove it from the unit. There are no rules governing which interface cards may be fitted in any of the slots, except for the IF-FW card, which must be fitted in slot 1—any other interface card may be fitted in any expansion slot.

Connections

The D-sub 25-pin connector allows the connection of up to eight balanced analog connections at +4dBu levels (the impedance is 100Ω).

Pin	1	2	3	4	5	6	7	8	9	10	11	12	13'
Signal	8+	8Gnd	7–	6+	6Gnd	5–	4+	4Gnd	3–	2+	2Gnd	1–	NC
	8–	7+	7Gnd	6–	5+	5Gnd	4–	3+	3Gnd	2–	1+	1Gnd	
Pin	14	15	16	17	18	19	20	21	22	23	24	25	

Table 1.2: Pin assignments of the IF-SM/DM analog outputs

Suitable cables can be obtained from most professional audio suppliers.

Monitor alignment

The card allows each channel to have an individual delay time set in milliseconds, as well as a trim level.

This is set using the MONITOR ALIGNMENT screen, and the procedure is described later in this manual ("MONITOR ALIGNMENT option" on page 14).

The overall SPL level can be set (on the OPERATION screen), along with the LFE gain.

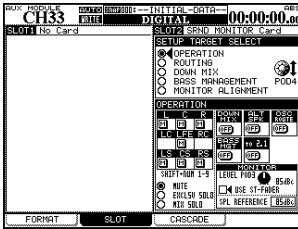You can access the card's functions by pressing the **DIGITAL** key and selecting the SLOT sub-screen.

Figure 2.1: The main surround monitor screen

The surround monitor card is here shown installed in slot 2.

The top half of this part of the screen shows the different options (referred to as SETUP TARGETs), and the lower half shows the settings for these options.

Use the POD 4 encoder[1] to highlight the different options available, and the **ENTER** key to select the option.

1. Throughout this manual, we assume that the card is fitted in slot 2. If the card is fitted in slot 1, any reference to POD 4 should be interpreted as referring to POD 2, and any reference to POD 3 should be interpreted as referring to POD 1.

OPERATION option

The OPERATION option allows the following operations to be carried out:

Figure 2.2: The OPERATION option

- Muting of individual channels
- Soloing (exclusive or mixed) of individual channels
- Switching downmix on and off
- Switching alternative speakers on and off
- Routing the internal oscillator on and off
- Turning bass management on and off
- Instant downmix to a 2.1 setting
- Setting the monitoring level
- Setting SPL reference level

Muting channels

Use the cursor and **ENTER** keys to select the MUTE option. Mute the monitoring of individual channels using the **SHIFT**ed number keys as described here:
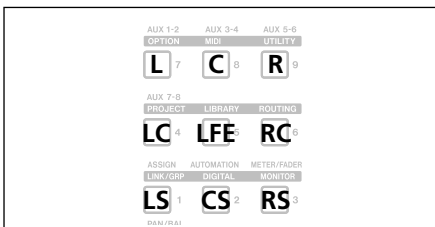
Figure 2.3: SHIFTed number keys used for channel control

When a channel is muted, it appears with an inverse M on the display. Unmuted channels show an on-screen "button".

Note that you can also use the cursor and **ENTER** keys to change the mute status.

Soloing channels

This works with the same **SHIFT**ed number keys as for muting (see Figure 2.3, *SHIFTed number keys used for channel control*) as well as the cursor and **ENTER** key options.

There are two solo options—one for an exclusive solo mode, where only one channel at a time is active, and one for a mixed solo mode, where selected channels are active.

The on-screen solo marks are shown by an S button, in the same way as the mute buttons are shown by an M (they invert when active, etc.).

Downmix on/off

Use the on-screen DOWN MIX button to turn downmixing on and off (as set up in the DOWN MIX option) — ignored when the alternative speaker switch, 2.1 switch or oscillator switch are on.

Bass management

Use the on-screen BASS MGT button to turn bass management on and off (as set up in the BASS MANAGEMENT option) — ignored when the alternative speaker switch, 2.1 switch or oscillator switch are on.

Alternative speakers

This routes the signal when downmixed to stereo, to the speakers connected to the LC and RC channels, which are not used in the surround patterns.

This allows the use of a pair of "large" stereo speakers together with smaller surround monitors, without the need for repatching.

Naturally, downmix is not possible with this switch on.

Oscillator routing

Allows the routing of the mixer's internal oscillator to the surround card outputs.

When the oscillator is routed in this way, soloing is automatically changed to exclusive soloing (it reverts to the previous setting when the oscillator is not routed in this way).

Note that downmix and bass management are not available when the oscillator is routed in this way.

To 2.1

When on and the current surround mode is 5.1 or 6.1, this setting automatically overrides the current downmix setting (of course, downmix is not possible when this switch is on).

When this setting is deactivated, the original downmix and mode are restored, as is the mute status of the LFE channel.

USE ST-FADER

If you check "USE ST-FADER", you can adjust the Monitor level settings by the Stereo fader.

SPL reference and level

Note that the SPL REFERENCE setting and monitor level settings are made on this page. These are explained further in "MONITOR ALIGNMENT option" on page 14.

Notes on other hardware controls

MONO key When the card is being used for monitoring in surround mode, the **MONO** key on the control surface is used to turn downmix on and off (as set up in DOWN MIX).

DIM key The **DIM** key on the control surface can be used in the usual way to dim the outputs from the card. The dimming level is set in the mixer.

ROUTING option

There are two main functions here. The first allows you to set up the monitoring keys, and the second allows assignment of the outputs to the different channels.
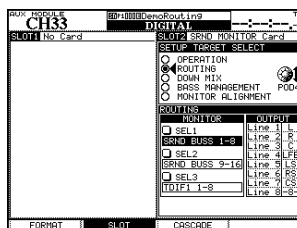

Figure 2.4: ROUTING option screen

Monitoring keys

The three assignable monitor selection hardware keys in the mixer's monitoring section can be set here.

The following can be selected as monitor sources (stereo):

- Individual Aux busses
- Pairs of Aux busses
- Individual busses
- Pairs of busses
- Digital inputs (1 or 2)
- 2 TR analog inputs
- The TDIF signals (1 through 3)

- The ADAT signal
- The signal of any card in a slot other than the surround monitor card

In LRCS, 5.1 or 6.1 modes:

- Surround buss 1–8
- Surround buss 9–16
- Digital inputs (1 or 2)
- The TDIF signals (1 through 3)
- The ADAT signal
- The signal of any card in a slot other than the surround monitor card

Output routing

When a "Line" is referred to in this screen, it is referring to the analog output line from the IF-SM/DM card (as shown in Table 1.2, *Pin assignments of the IF-SM/DM analog outputs*)..

The lines can be assigned to the different channels used by the surround pattern currently selected, differing from the default assignments made when the surround pattern is selected.

These channels are shown as L, R, C, etc. If a line output is unused by the pattern, as output 8 is unused in Figure 2.4, *ROUTING option screen*, it is shown with the number and dashes (-8-).

Note that loopback routing is not possible in this case (see Figure 3.2, *Level diagram*).

DOWNMIX option

Downmixing is the process of folding a surround mix into a formats using fewer channels. This is done for the purpose of checking compatibility.

The patterns available depend on the source format currently in use:

Source pattern	Available downmix targets
6.1	5.1
	2.1
	Stereo
	Mono
5.1	LRCS (rear phantom center)
	LRCS (rear hard center)
	2.1
	Stereo
	Mono
LRCS	LRCS (rear phantom center)
	Stereo
	Mono
Stereo	Mono

Depending on the value picked here, the other values (that is, the amount by which the

source busses are attenuated before they are folded into the target busses) may be changed.

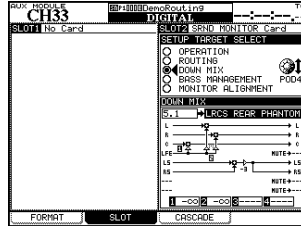**Figure 2.5: Example downmix screen showing attenuation points**

Attenuation In the on-screen display, the attenuation points are shown as inverted numbers.

At the bottom of the screen, the values of these points can be viewed and set using the cursor keys, dial, and **ENTER** key.

NOTE
Note that some busses may pass through more than one attenuator before reaching their destination.

6.1 format

6.1 > 5.1 In the 6.1 to 5.1 downmix, the attenuation values are:

Source > Target	Values in dB (default underscored)
CS (LC)>LS,RS	<u>−3</u>, −4.5, −6
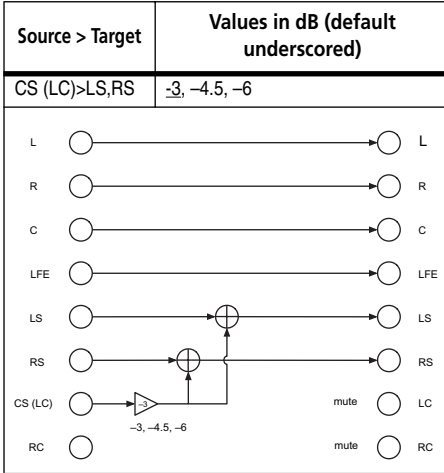
Table 2.6: 6.1 to 5.1 downmix pattern

6.1 > 2.1 In the 6.1 to 2.1 downmix, the attenuation values are:

Source > Target	Values in dB (default underscored)
C > L,R	0, −1.5, <u>−3</u>, −4.5, −6
LS,RS>L,R	0, <u>−3</u>, −6, −∞
CS (LC)>L,R	−3, <u>−6</u>, −9, −∞
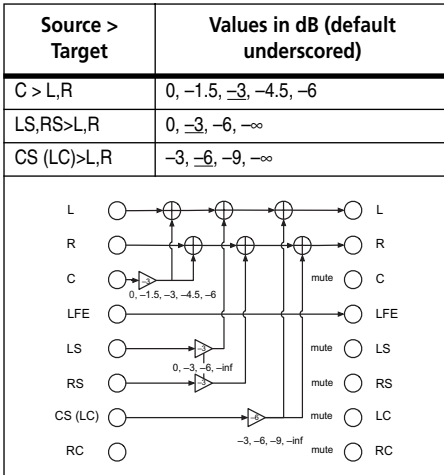
Table 2.7: 6.1 to 2.1 downmix pattern

6.1 > stereo In the 6.1 to stereo downmix, the attenuation values are:

Source > Target	Values in dB (default underscored)
C > L,R	0, −1.5, <u>−3</u>, −4.5, −6
LFE>L,R	−3, −6, −9, <u>−∞</u>
LS,RS>L,R	0, <u>−3</u>, −6, −∞
CS (LC)>L,R	−3, <u>−6</u>, −9, −∞
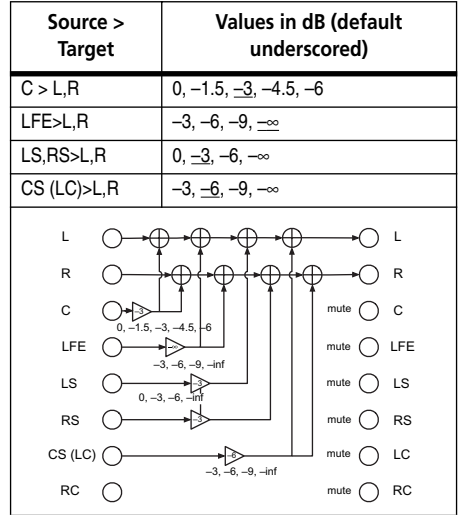
Table 2.8: 6.1 to stereo downmix pattern

6.1 > mono In the 6.1 to mono downmix, the attenuation values are:

Source > Target	Values in dB (default underscored)
C > L+R	0, −1.5, <u>−3</u>, −4.5, −6
LFE>L+R	−3, −6, −9, <u>−∞</u>
LS,RS>L+R	0, <u>−3</u>, −6, −∞
CS(LC)>L+R	−3, <u>−6</u>, −9, −∞
L > L	summed and attenuated (−3)
R > R	
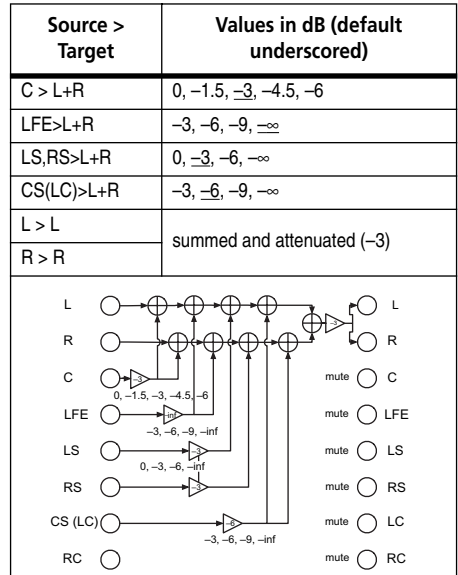
Table 2.9: 6.1 to mono downmix pattern

5.1 format

5.1 > LRCS (rear phantom) In the 5.1 to LRCS downmix with a phantom rear speaker, the attenuation values are:

Source > Target	Values in dB (default underscored)
LFE >C	−3, −6, −9, <u>−∞</u>
LFE>L,R	−3, −6, −9, <u>−∞</u>
LS>LS	summed and attenuated (−3)
RS>RS	

Table 2.10: 5.1 to phantom rear LRCS downmix pattern

5.1 > LRCS (rear hard) In the 5.1 to LRCS downmix with a hardware rear speaker, the attenuation values are:

Source > Target	Values in dB (default underscored)
LFE >C	−3, −6, −9, <u>−∞</u>
LFE>L,R	−3, −6, −9, <u>−∞</u>
LS>S	summed
RS>S	

Table 2.11: 5.1 to hard rear LRCS downmix pattern

5.1 > 2.1 In the 5.1 to 4.1 downmix, the attenuation values are:

Source > Target	Values in dB (default underscored)
C >L,R	0, −1.5, <u>−3</u>, −4.5, −6
LS, RS> L, R	0, <u>−3</u>, −6, −∞

Table 2.12: 5.1 to 2.1

5.1 > stereo In the 5.1 to stereo downmix, the attenuation values are:

Source > Target	Values in dB (default underscored)
C >L,R	0, −1.5, <u>−3</u>, −4.5, −6
LS,RS>L,R	0, <u>−3</u>, −6, −∞
LFE > L,R	−3, −6, −9, <u>−∞</u>

Table 2.13: 5.1 to stereo downmix pattern

5.1 > mono In the 5.1 to mono downmix, the attenuation values are:

Source > Target	Values in dB (default underscored)
C > L+R	0, –1.5, <u>–3</u>, –4.5, –6
LFE>L+R	–3, –6, –9, <u>–∞</u>
LS,RS>L+R	0, <u>–3</u>, –6, –∞
L > L	summed and attenuated (–3)
R > R	

Table 2.14: 5.1 to mono downmix pattern

LRCS format

A control room set up for 5.1 can be set up to use an LRCS configuration without repatching the speakers. This is possible, since the LS and RS speakers are assigned the same signal, thereby creating a "phantom" CS speaker (attenuated by 3 dB).

The default is the LRCS rear hard speaker configuration, where the LS(S) signal is assigned to the CS speaker of a 6.1 configuration (not shown above).

LRCS > stereo In the LRCS to stereo downmix, the attenuation values are:

Source > Target	Values in dB (default underscored)
C >L,R	0, –1.5, <u>–3</u>, –4.5, –6
S(LS)>L,R	0, <u>–3</u>, –6, –∞

Table 2.15: LRCS to stereo downmix pattern

LRCS > mono In the LRCS to mono down-mix, the attenuation values are:

Source > Target	Values in dB (default underscored)
C >L+R	0, –1.5, <u>–3</u>, –4.5, –6
S(LS)>L+R	0, <u>–3</u>, –6, –∞
L > L	summed and attenuated (–3)
R > R	

Table 2.16: LRCS to mono downmix pattern

LRCS > LRCS (phantom) In the LRCS to LRCS with a phantom center rear speaker, the attenuation values are:

Source > Target	Values in dB (default underscored)
S (LS) > LS+RS	<u>–3</u> (fixed)

Table 2.17: LRCS to LRCS with phantom rear downmix pattern

Stereo format

Stereo > mono In the LR to mono down-mix, there are no parameters (changeable attenuation values).

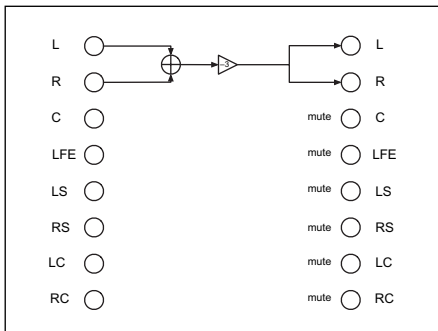The left and right signals are summed, and attenuated by 3 dB.

Figure 2.18: Stereo to mono downmix

BASS MANAGEMENT option

The BASS MANAGEMENT screen allows the selection of one of two bass management techniques, Type 1 and Type 2.

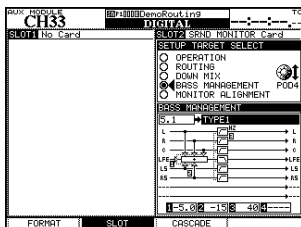These are illustrated graphically below as they are implemented in 5.1 surround mode.
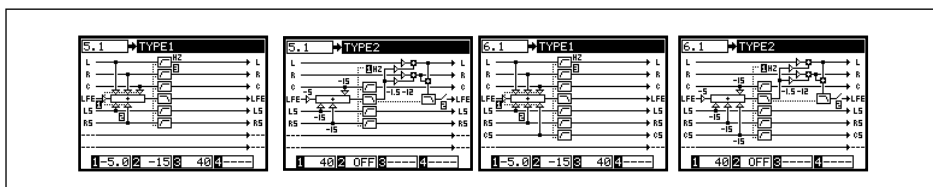

Figure 2.19: BASS MANAGMENT option screen

Figure 2.20: Type 1 and Type 2 bass management for 5.1 and 6.1 settings

Type 1 bass management

There are three parameters:

1 The amount of attenuation supplied to the LFE channel before bass management occurs, either –5dB (default) or 10dB.

2 The amount of attenuation applied to the surround-LFE feed, either –15dB (default) or 0dB.

3 The crossover frequency of the high-pass filters applied to all channels except the LFE, and the low-pass filter applied to the LFE. From 40Hz (default) to 130Hz in 10Hz steps.

Type 2 bass management

There are two parameters:

1 The crossover frequency of the high-pass filters and the low-pass filter in the system. From 40Hz (default) to 130Hz in 10Hz steps.

2 Turns the LFE ON or OFF (default).

MONITOR ALIGNMENT option

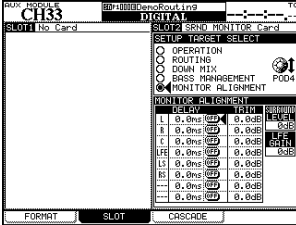This allows the setup of the surround speakers and levels.

Figure 2.21: MONITOR ALIGNMENT option screen

Trimming the levels

When monitoring in surround mode, it is important that the perceived level of each channel (as perceived from the monitoring position) is equal, in order to achieve a satisfactory mix.

NOTE

Before proceeding further with these operations, it is important that you ensure that the input mode of the card reflects the setup you are using and the output channels so that the channels correspond to the actual channels that you have set up in your system (if the channel meant to be driving the LFE is actually driving one of the surround channels, you will have severe problems!).

Use the "ROUTING option" on page 7 for this.

Use the mixer's oscillator set up to supply pink noise to allow you to set up and calibrate your monitoring system for optimal results.

You will also need an SPL (sound pressure level) meter. Absolute accuracy in this case is not of prime importance—relative levels are what are being set up here.

There are two standard weightings that are commonly used, and may be selected from most SPL meters: the "C" weighting, providing an almost uniform response from 32 Hz to 10 kHz, and the "A" weighting, which is concentrated on the 500 Hz to 10 kHz range. For full-range music productions, use the "C" weighting.

TIP

When you make the measurements described here, either stand the SPL meter on a tripod (ideal), or hold it to one side of your body, to avoid reflections, etc. caused by your body which can affect the final results.

Generating the pink noise

Make sure that your monitoring system is turned on, and adjusted to a reasonable working level.

1 Use the MONITOR / OSC/COM **screen to set up the oscillator to produce pink noise.**

2 **Set the level. If you are working to the SMPTE standard,** -20 **corresponds to the analog nominal level (the EBU equivalent is** -18**).**

3 **Route the oscillator to the surround busses ("Oscillator routing" on page 6).**

   Solo (exclusive solo is set by default when the oscillator is routed this way) the first channel using the solo controls on the OPERATION **screen ("Soloing channels" on page 6).**

When working with 5.1, start the procedures using the C (dialog) channel.

4 **Read the level on the SPL meter.**

5 **Solo another channel. Read the level on the SPL meter, and adjust the** TRIM **value shown on the** MONITOR ALIGNMENT **screen, if necessary, so that it matches the first.**

   Trim levels can be adjusted ±9.9dB in 0.1dB steps.

6 **Repeat this process until the levels of all channels, as measured by the SPL meter, are within a few dB of each other.**

7 **Turn off the oscillator.**

Setting the surround speaker level

It is also possible to adjust the level of the subsidiary speakers on this MONITOR ALIGNMENT screen using the SURROUND LEVEL control. The speakers adjusted in this way are:

LRCS S speaker only

5.1 LS, RS

6.1 LS, RS, CS

These can be adjusted from 0dB to +10dB in 1dB steps.

Adjusting the LFE GAIN

The gain of the LFE channel relative to the other channels can be adjusted using the LFE GAIN control on this screen. This is independent of the surround mode selected.

The adjustment is either 0dB (no adjustment) or +6dB to +10dB in 1dB steps.

Channel delay

To allow for placement, etc. and to prevent phase distortion, etc., channels can be delayed relative to each other.

Channel delays can be set from 0ms to 50.0ms in 0.1ms steps.

The exact technique of measurement and correction procedures is a little beyond the scope of this manual.

Setting the overall surround level

This is set on the OPERATION screen after the channels have been aligned. For movie work, this is standardized at 85 dBC, and for television at 82 dBC[1]. Musical program material may use a higher reference level.

1   **Turn down the level of the monitoring system.**

2   **Set the value of the desired reference level on the SPL REFERENCE field of the OPERATION screen.**

3   **Use POD 3 (or POD 1, as explained earlier) to set the level to the desired reference level.**

4   **Route the oscillator (pink noise) at nominal level through the surround system (all channels).**

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1.   The term "dBC" refers to the "C" weighting average mentioned earlier.

5   **Adjust the amplification system so that the SPL meter located at the listening position reads 85 dB.**

Now the POD 3 control can be used to reduce the monitoring level. Only increase the level if the material permits.

• The monitor level can be set from 0 dbC to 65 dBC in 5 dB steps, and from 65 dBC to 109 dBC in 1 dB steps.

• The SPL reference level can be set from 65 dBC to 109 dBC in 1 dB steps.

NOTE

At SMPTE standards, there is 20 dB of headroom, so the SPL can be at 105 dB before distortion occurs.

Block diagram

Figure 3.1: Block diagram
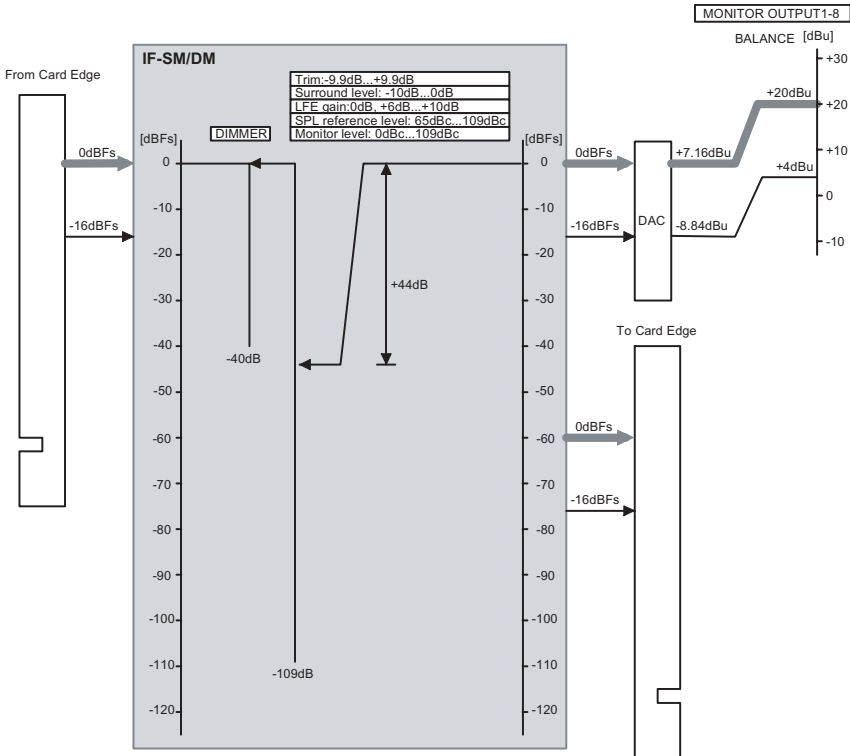
Level diagram

Figure 3.2: Level diagram

Audio performance

Maximum level	+20dBu	-
Nominal level	+4dBu	-
Output impedance	100 Ω	-
S/N	< −100 dB	2TR IN to MONITOR OUTPUT 1-8, Fs=48kHz
Frequency response	±0.5 dB	20Hz - 20kHz LINE IN to MONITOR OUTPUT 1-8 @ Nominal level, Fs=48kHz
	+0.5 dB/–1.5 dB	20Hz ñ 40kHz LINE IN to MONITOR OUTPUT 1-8 @ Nominal level, Fs=96kHz
THD	<0.008%	1 kHz, Input module [Mixer internal oscillator] to MONITOR OUTPUT 1-8 @Level max
Signal delay	< 1.5 ms	Fs = 48.0kHz, LINE to MONITOR OUTPUT 1-8
	< 0.75 ms	Fs = 96.0kHz, Mixer internal oscillator to MONITOR OUTPUT 1-8
X talk	> 90 dB	1kHz, Mixer internal oscillator to MONITOR OUTPUT 1-8 @ 0dBFs, Fs=48kHz

TASCAM
TEAC Professional Division

IF-SM/DM