

Ghost

USER GUIDE

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This equipment complies
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89/336/EEC

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GHOST

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GHOST

1

Introduction

Introduction

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Thank you for purchasing the Soundcraft Ghost Music Production console. It has been designed to give you many years of trouble-free service. Please read this entire guide before using the console and then retain it for future reference. The terms console, mixer, and board are used interchangeably throughout this guide.

This guide covers two versions of the Ghost console, namely Ghost (with a CPU section containing a Timecode reader/generator, MIDI Machine Control, MIDI Mute Automation, and MIDI Controller Faders) and Ghost LE (with no CPU section). Both Ghost and Ghost LE are identical, except that Ghost LE does not have a CPU section above the Group faders. The top panel views in this guide sometimes show Ghost and sometimes Ghost LE. Except for the sections dealing with the CPU, which applies to Ghost only, everything else in this guide applies to both Ghost and Ghost LE.

This guide is composed of a Table of Contents, 12 chapters, 5 appendices, and an index. Following is an overview of the guide:

Chapter	Title	Description
-	Table of Contents	Allows you to find broad topics easily.
1	Introduction	What you are currently reading. Contains basic information about Ghost.
2	Installation	Contains information about installing Ghost and modifying some of its default settings. Also has detailed hookup and connections diagrams.
3	Quick Start	Allows you to quickly get up and running Guide with Ghost.
4	Block Diagram	Contains a standard pictorial block diagram, as well as a plain English signal flow explanation of that diagram.
5	Back and Rear	Contains a detailed description of all of Panel Description Ghost's back and rear panel jacks.
6	Functional Description	Contains a detailed description of all of Ghost's controls.
7	Tutorial	Explains in detail how to use Ghost for tracking, overdubbing, monitoring, adding effects and processors, punching in/out, bouncing tracks, and mixing down.
8	Application Notes	Explains some of Ghost's more advanced uses.
9	CPU Application Guide	Explains how to use the CPU section of Ghost. (Not Applicable to Ghost LE.)

10	Troubleshooting	Contains some common problems, causes, and solutions.
11	Specifications	Lists complete specifications of Ghost.
12	Glossary	Contains some common audio terms and their definitions.
-	Appendices A through E:	Contain information on MIDI Machine Control, Controller Numbers, Note Numbers, MIDI Implementation Chart, and upgrading Ghost's software.
-	Index	Contains a detailed index, which allows you to find a specific topic.

It is suggested that you read this entire manual. If you're the type that doesn't like to read manuals, then we suggest the following:

For Advanced Users: Read the Introduction (up to "The Basics of In-Line Consoles"), Installation, Block Diagram, Back and Rear Panel Description, and Functional Description chapters, and the Appendices.

For Intermediate Users: Read the Introduction (up to "The Basics of In-Line Consoles"), Installation, Quick Start Guide, Block Diagram, Back and Rear Panel Description, Functional Description, and Application Notes chapters, and the Appendices.

For Beginning Users: You should read the entire manual, but at the very least you should read the entire Introduction, Installation, Block Diagram, Back and Rear Panel Description, Functional Description, Tutorial, Application Notes chapters, and the Appendices. Refer to the Troubleshooting and Glossary chapters, as needed.

For All Users: If you have the Ghost console with the CPU (not Ghost LE), then you should also read the CPU Application Guide chapter.

Features of Ghost and Ghost LE

Ghost is a professional 8-bus mixing console, primarily designed for multitrack recording and music production applications. It is an In-Line console, having a main input path and a secondary Mix B input path on each channel. This doubles the number of inputs at mixdown, yet the console remains compact. Following are some of Ghost's features:

- Soundcraft's ProMic ultra-low-noise mic preamp, with +60dBu input sensitivity, is included on every channel.
- Every channel features a mic input, a line input, individually switched phantom power, mic/line switch, phase reverse, and 100Hz Low-Cut Filter.
- Multi-busing on every channel allows Direct Outs on each channel to also be used as Group Outs, allowing you to send a signal from any channel to any of 32 tape tracks (24 tape tracks with 24 channel Ghost).
- Powerful 4-band "British" EQ, featuring high/low shelving EQ and two fully-parametric mid EQs, with continuously variable Q (bandwidth) control and EQ In/Out switch.
- 6 mono (4 usable at once per channel) and 2 stereo auxiliary sends. Sends 1/2 are switchable as a pair between pre-fader and post-fader. Sends 3/4 can be routed as a pair to Sends 5/6.
- 100mm faders and inserts for channels, groups, and main L/R mix.
- Variable brightness Signal Present LED for each channel.
- Peak LED for each channel.
- Automated/Manual Mutes (Cut) for each channel. (Mutes cannot be automated on Ghost LE.)
- Solo (either PFL or Solo-in-Place) for each channel.
- Mix B section on each channel features a line input, source select (tape or channel), rotary fader, pan, PFL Solo, and automated/manual Mutes (Cut). (Mutes cannot be automated on Ghost LE.)
- Tape Input Trim pot for the Mix B line input.
- High/Low shelving EQ and Auxs 3/4 (5/6) may be switched into the Mix B path.
- Reverse switch allows you to route the channel input to the Mix B path and the Mix B input to the channel path.
- 8 Group buses with AFL solo and routing to the L/R bus.
- 4 stereo effects returns, each with PFL Solo and routing to the L/R bus or any of the group buses.
- 2 separate Studio Foldback monitoring sections with AFL Solo.
- Control Room monitoring section with headphone jack, mono check, provisions for two stereo line inputs (DAT deck, two-track deck, CD player, etc.), and two sets of control room monitors.
- A 2-frequency oscillator.
- Talkback section with built-in mic.
- 8 Aux Send Master pots with AFL Solo.

- Mix B Master pot with provision for routing Mix B to the L/R bus.
- PFL/AFL Trim pot with Solo LED and Solo-in-place switch with LED.
- 12-segment vertical peak LED meters for the 8 Groups and for the Control Room/Solo outputs.
- By using the channel inputs, Mix B inputs, and 4 stereo FX returns at mix-down, you have a total of 56 inputs from the 24 channel Ghost and a total of 72 inputs from the 32 channel Ghost.
- Optional 24 channel expander module is available.
- Optional meterbridge is available.

Additional features of Ghost (Not Found on Ghost LE)

- MIDI In/Out/Thru jacks.
- SMPTE timecode In/Out jacks and Sony 9-pin connector.
- SMPTE/MTC timecode reader/generator/converter.
- MIDI Machine Control transport control buttons with jog/shuttle wheel for controlling external tape machines, video machines, hard disk recorders, and MIDI sequencers.
- 4 mute groups.
- 128 snapshots for MIDI muting, which may be recalled manually, from timecode, or from MIDI Program Change Messages.
- Dynamic Mute Automation (with an external MIDI sequencer).
- 4 MIDI Controller Faders for controlling external MIDI effects and other MIDI parameters by transmitting MIDI Control Change data.

Frame Sizes & Expander Module

Ghost is available in two frames sizes:

- 24 Input Channels
- 32 Input Channels

There is also an optional 24 channel expander module available, which allows you to expand Ghost to 48 channels or 56 channels. With the 4 stereo FX returns, this will give you either 104 or 120 inputs at mixdown.

Meterbridge

There is an optional meterbridge for each console size and for the expander module. The meterbridge contains a vertical 12 segment peak LED meter for each channel, which can be internally configured to show either the Mix B (tape) inputs or the channel inputs. It also includes two 20-segment LED VU meters for the Control Room/Solo outputs.

Power Supply

Use only the power supply that comes with the console and make sure it is configured for the country you will be using it in.

Contact Information

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Nashville, Tennessee 37217	

The Basics of In-Line Consoles

When using a console for traditional multitrack recording, it is necessary to be able to record the console's channel inputs to tape, while at the same time monitoring previously recorded tape tracks. When you're finished recording, you must be able to play the finished multitrack master tape through the console, make adjustments to the tape tracks, and then record your mix to your 2-track mixdown deck. This means that the outputs of the mixer (group outs or direct outs) have to be connected to the inputs of the multitrack deck for recording purposes, while at the same time the outputs of the multitrack deck have to be connected to the inputs of the mixer (tape returns) for monitoring and mixdown purposes. However, the requirements for simply monitoring tape tracks while overdubbing are different than what is needed when mixing down those tracks.

Before in-line consoles, split console designs were used. Since this is not a primer on split consoles, just the basics will be given here. With split consoles the channel strips and the tape returns were split, with the channels on the left side and the tape returns located above the group masters on the right side of the board. While tracking and overdubbing, the channel outputs were routed to the multitrack inputs and the multitrack outputs were routed to the tape returns. The channels were used for recording and the tape returns were simply used to monitor previously recorded tape tracks. This meant that if you wanted to monitor 32 tape tracks, you had to have 32 separate tape returns located apart from the channel strips. And those returns might have only provided level and pan controls for each track. Since the tape returns didn't offer all the features of the channel strip (such as EQ and Aux Sends), and didn't provide a way to route the tape tracks to the mixdown deck, when it came time for mixdown, the multitrack outputs had to be repatched from the tape returns to the channel strip inputs. This allowed you to use all of the features of the channel strip and to route the tape tracks to the 2-track deck during mixdown. While this is an oversimplification of the process, it is sufficient to illustrate the point.

The drawbacks of a split console design are as follows: the console usually has to be very wide to accommodate all the tape returns; as the number of tape returns increases on a console, so do the number of channel strips, so if you need 32 tape returns, you might have to buy a console with 64 or more channel strips; you have to repatch when you want to mixdown and then repatch again when you want to track and overdub; while mixing down, the tape returns are unused; and split console designs cost more than an equivalent in-line design.

An in-line console solves these problems, while remaining compact and affordable. With today's digital multitrack recorders, hard disk recorders, and MIDI sequencers, many studios have 24 or more tracks (whether tape, disk, or sequenced) that need to be monitored, yet not as many channel inputs are needed for recording purposes. With an in-line console, the tape return controls are physically located right in the channel strip, or "in-line" with the channel strip, hence,

the name. You have as many tape returns as you have channel strips, yet no extra width is added to the console regardless of the number of returns, although there is a slight increase in the depth of the console.

As mentioned, Ghost is an in-line console. There are 2 separate inputs for each channel strip. The main channel input is called "Channel" and the tape return input is called "Mix B." Note that you can connect any line level source to Mix B; it doesn't have to be the output of a tape deck. Normally, whatever is connected to the mic or line input on the rear panel is routed to the channel strip and you use the channel strip's controls to process that input. And whatever is connected to the Mix B/Tape Ret jack on the rear panel is routed to the Mix B section, located within the same channel strip, and you use Mix B's controls to process the Mix B input separately from the channel input.

Generally speaking, while recording basic tracks and overdubbing, you connect the sources you want to record to the channel inputs and you connect the sources you want to monitor to the Mix B inputs. You'll usually want to monitor previously recorded tape tracks, hard disk tracks, and MIDI sequenced tracks. At mixdown, you'll press the Reverse switch on each channel, which will route the Mix B inputs to the channel strip and the channel inputs to Mix B. You'll also be able to route all of the Mix B outputs as a group to the L/R bus for mixdown to a 2-track recorder. This is how you double the number of inputs at mixdown. By doing this, all of your tape tracks are now routed to the channel strips, with the full complement of channel strip controls available to the tape tracks for mixdown, while at the same time allowing you to connect sources, such as MIDI tracks, that don't need as much processing, to the Mix B inputs, which can also be recorded to the 2-track deck. This means that Mix B, which is normally used as a tape return, can also be used for recording during mixdown. In addition, Mix B has access to some of the channel EQ and Aux Sends.

Complete descriptions of all the features, a Quick Start Guide, and a Tutorial follow later in this guide.

GHOST

2

Installation

Installation

Ghost is designed for reliability and high performance, and is built to the highest standards. Care taken during installation and setup will insure long life and reliable operation of the console.

Wiring Considerations

- A** For optimum performance it is essential for the earthing (grounding) system to be clean and noise-free, as all signals are referenced to this earth. A central point should be decided on for the main earth point, and all earths should be "star-fed" from this point. It is recommended that an individual earth wire be run from each electrical outlet, back to the system star point to provide a safety earth reference for each piece of equipment.
- B** Install separate mains (AC) outlets for the audio equipment, and feed these independently from any other equipment.
- C** Avoid locating mains (AC) distribution boxes near audio equipment, especially tape recorders, which are very sensitive to electromagnetic fields.
- D** Where possible ensure that all audio cable screens and signal earths (grounds) are connected to ground only at their source.
- E** Avoid crossing mains (AC) power cables over audio cables, and if they must cross, make sure they do so at right angles.

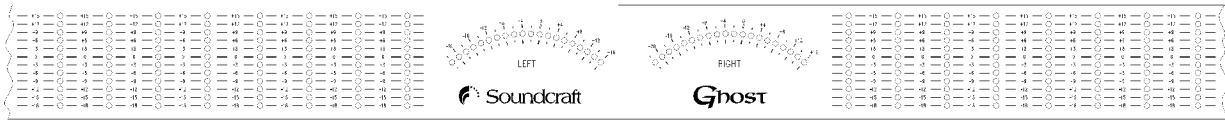
Power Supply

Always ensure that you use the correct PSU for your mixer. Ghost uses a CPS275 power supply for both the 24- and 32-channel input frames.

Warning

Before switching on your Ghost console, check that the mains (AC) voltage selectors on the power supply unit is set to the correct mains (AC) voltage for your area, and that the fuse is of the correct rating and type. This is clearly marked on the case of the power supply. Do not replace the fuse with any other type, as this could become a safety hazard and will void the warranty.

Optional Meterbridge



Warning

Ensure that the power supply is switched off before connecting or disconnecting the meterbridge.

Note

The meter source for the meterbridge may be changed by the user. If you want to change the source, it is suggested you do so before installing the meterbridge. How to change the source is described in the next section, "User Modifications to Ghost."

To attach the optional meterbridge to the console proceed as follows:

- Remove the two countersunk screws at each side of the connector panel at the rear of the console. Retain the screws in case they are needed in the future.
- Place the meterbridge on top of the rear connector panel and locate it so that the screw holes on its supports line up with the newly-vacated holes on the rear connector panel, where the countersunk screws were just removed. There should be two holes on each side of the panel.
- Secure the meterbridge to the rear connector panel with the 4 pan-head screws which are provided with the meterbridge.
- Plug the D-type connector on the meterbridge into the connector on the rear connector panel that is labelled "To Meterbridge."

User Modifications to Ghost

Ghost comes from the factory with certain input/output levels set up by default. If desired, some of these levels may be changed by the user. The meter source for the optional meterbridge may also be changed. All the user-approved modifications to Ghost are listed here. Although these modifications will not void the warranty, they are all internal changes that require you to remove the bottom cover of Ghost. If you do not feel comfortable making any modification described here, then refer the modification to your dealer or other qualified service personnel. Performing any other modifications to Ghost, other than those described here, will void the warranty.

All modifications require removing the bottom cover of Ghost. It's easier to make the modifications if no cables are attached to the back or rear connector panels and the optional meterbridge is not installed. Place Ghost on a flat, sturdy surface and either turn it upside down or lift the front panel straight up and lean it against the wall, so the back connector panel is resting on the flat surface and the bottom of Ghost is facing you. Then remove all the screws that hold the bottom metal panel in place. Carefully lift off the bottom panel a few inches and then stop. Locate the headphone jack located on Ghost's front panel. You'll notice that the headphone jack comes off with the bottom panel. There is a wire from the headphone jack that is connected to Ghost, so this wire needs to be disconnected from Ghost before you can remove the bottom panel. Follow the wire and you'll see that the end of it plugs into Ghost. Make a note of where it is plugged into and then carefully unplug the wire from Ghost. At this point, the other end of the wire should still be connected to the headphone jack, which is located on the bottom panel you are about to remove. When the other end of the headphone jack cable is unplugged from Ghost, then carefully lift off the bottom panel from Ghost and put it in a safe place.

You'll notice that the interior of Ghost contains many printed circuit boards (PCBs). PCBs are green boards with soldering traces on them and look like the boards that are inside a computer. All of the PCBs are numbered. In the modifications below, the PCBs that require the modification will be referenced by their number, which is printed right on the PCB. So the first step is to locate the proper PCB inside Ghost.

There are two types of modifications. The first involves jumpers on the PCB. If you've ever changed the jumpers on a computer card, the procedure is the same here. Somewhere on the PCB there will be 3 or 4 gold or silver pins that stick up from the surface of the PCB. The group of pins themselves are labelled to describe their function and the individual pins are numbered. Over these pins is a tiny plastic piece with holes in it, called a jumper. The holes in the jumper are placed over some of the pins and then the jumper is gently pressed over the pins so the pins stick through the holes in the jumper and the jumper itself comes in contact with the surface of the PCB. Placing the jumper over different pins changes the configuration of Ghost.

To change a jumper, you first have to find the jumper you need by looking for its label on the PCB. Then using a small needlenose pliers or your fingernails, gently lift the jumper off the pins. Then place it over the numbered pins that the modification specifies and gently press down. So for instance, if a jumper was over pins 1 and 2 by default, you might change the configuration by placing it over pins 3 and 4. When changing jumper settings, you can return to the default configuration simply by moving the jumpers back to their default pins.

The other modification involves resistors on the PCB. Again, locate the PCB by number, then locate the resistors by their numbers. To perform the modification you have to take a small cutting pliers and cut out the small metal wire that connects the resistors to the PCB and remove the resistors. The drawback to this modification is that if you change your mind and want to set it back to its default settings, you have to solder the resistors back on the PCB. For this reason, you should think twice before you perform the resistor cutout modification.

To sum up, to perform a modification you must first remove the bottom panel of Ghost, remembering to disconnect the headphone jack cable from the PCB inside Ghost. Next, locate the proper PCB by its number. Then you must locate the proper jumper or resistor on the PCB, either by its label or number. Finally, you perform the modification either by moving the jumper over the numbered pins specified in the modification or by cutting out the resistors specified in the modification.

Note that the modifications listed here require that you make the changes to more than one PCB. If you're modifying something for a channel, then you have to make the changes to the PCB for each channel. Since there is one PCB for each channel, you would have to modify either 24 or 32 PCBs, depending on which frame size of Ghost that you own. If you feel uncomfortable doing this, then refer the modification to your dealer or qualified service personnel.

Following are the user modifications for Ghost:

Tape Return Levels

Tape returns (MIX B/TAPE RET jacks on rear panel) are configured from the factory for +4dBu nominal input level. This means that the tape outputs or other line level sources that you plug into these jacks should ideally have a +4dBu output level. However, since the Tape Trim control on the top panel channel strip allows a gain adjustment of +/- 15dB, the Mix B/Tape Ret jacks will also accept sources with -10dBV levels. So it is recommended that you do not modify this setting, unless you have a very good reason for doing so, since the default setting will work with both +4dBu and -10dBV output levels.

If desired, you can configure the tape returns for -10dBV nominal input level. First, find Input PCB numbered SC3620. There is one SC3620 PCB for every channel in Ghost. You must make the modification to each PCB that you wish to reconfigure to -10dBV levels. Next, locate resistors numbered R112 and R113. They are located in the bottom left hand section of the PCB. Finally, cut out, remove, and save both of these resistors on each PCB. If you want to revert to +4dBu input level, you must solder both resistors back on each PCB.

Stereo Inputs and Group Master Outputs

The Group outputs [GRP 1-8 jacks and DIR/TAPE SND jacks (when the accompanying button is in the GRP n position) on the rear panel] are configured from the factory for +4dBu nominal output level. This means that the tape inputs or other line level inputs that you plug into these jacks should ideally have a +4dBu input level.

The Group Output level is jumper-selectable between +4dBu and -10dBV. First, find Group Master PCB numbered SC3625. There are 4 PCBs for the 8 Groups. Each PCB affects 2 Groups. Next, locate the Group Output jumper on the PCB. The pins are labelled 1 to 4. The legend on the PCB shows how to position the jumpers for +4dBu and -10dBV output. Position the jumpers over the pins indicated in the legend to select the Group nominal output level.

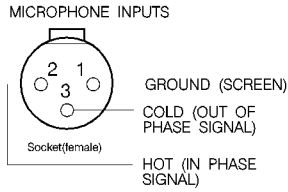
Optional Meterbridge Source Select

This modification only applies if you have the optional meterbridge. By default, the meterbridge will monitor tape returns. This means that whatever you have plugged into the MIX B/TAPE RET jacks on the rear panel will be monitored by the meterbridge, regardless of the position of the REVERSE switch on the top panel. You can change this so the meterbridge monitors the channel inputs and monitors them after the REVERSE switch. Therefore, the meterbridge will monitor whatever is plugged into the MIC I/P or LINE Input on the rear panel, when the REVERSE switch is not pressed; and will monitor whatever is plugged into the MIX B/TAPE RET jack on the rear panel, when the REVERSE switch is pressed. With this modification, you can monitor the channel inputs while recording, and then by pressing the REVERSE switch during mixdown, you can monitor your recorded tape tracks that are connected to the tape returns.

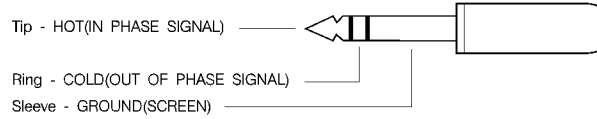
To change the meter source from Tape Return to Channel Input, first find Input PCB numbered SC3619. There is one PCB for every channel, so you must move the jumpers on the PCB for every channel. Next, locate the Meter Source jumper on the PCB labelled JP1. The pins are labelled 1 to 3. The jumper will be over pins 1-2 for the default Tape Return monitoring. Move the jumper over pins 2-3 for Channel Input monitoring.

When you are through with the modifications, place the bottom metal panel you removed over the bottom of Ghost. Lift up the front edge of the panel and connect the headphone jack cable from the panel to the connector on the PCB that you removed it from. Put the panel in place and replace all the screws that you removed. Turn the Ghost right side up and attach the optional meterbridge, if you have it, and then connect all of your cables and the PSU.

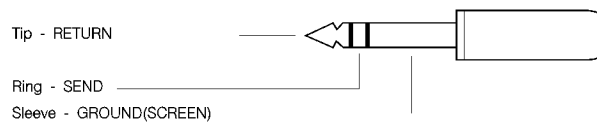
Connections



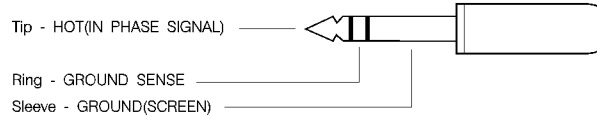
1/4" 'A' Gauge Stereo Jack Plug used as balanced inputs,
i.e. Line Inputs, Tape Returns, FX Inputs, 2-Track Inputs
and SMPTE Timecode In



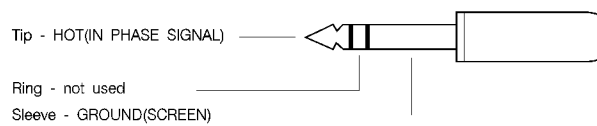
1/4" 'A' Gauge Stereo Jack Plug used as insert points,
i.e. Channel Inserts, Group Inserts and Mix Inserts



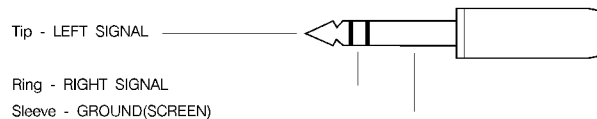
1/4" 'A' Gauge Stereo Jack Plug used as ground-compensated outputs,
i.e. Mix Outputs, Mix B Outputs, Group Outputs, Aux Outputs,
Studio Outputs A and SMPTE Timecode Out



1/4" 'A' Gauge Stereo Jack Plug used as unbalanced outputs,
i.e. Studio Phones B, C/Room Outputs and Alt Outputs



1/4" 'A' Gauge Stereo Jack Plug used as stereo output for
Headphones



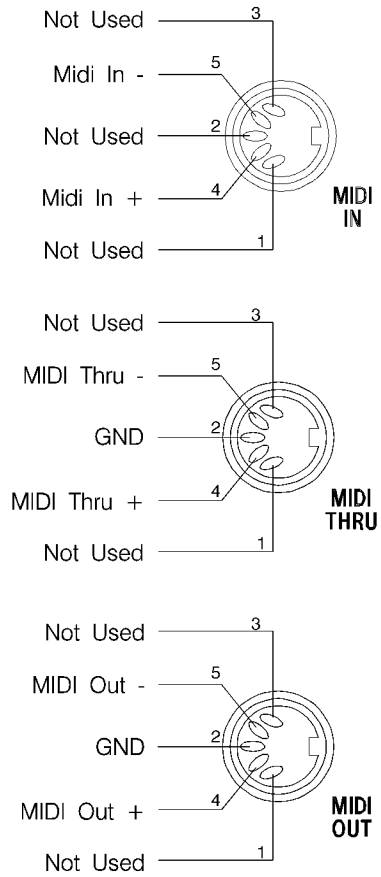
Connections

DIN Connectors

The MIDI IN signal is buffered by an opto-isolator.

MIDI THRU

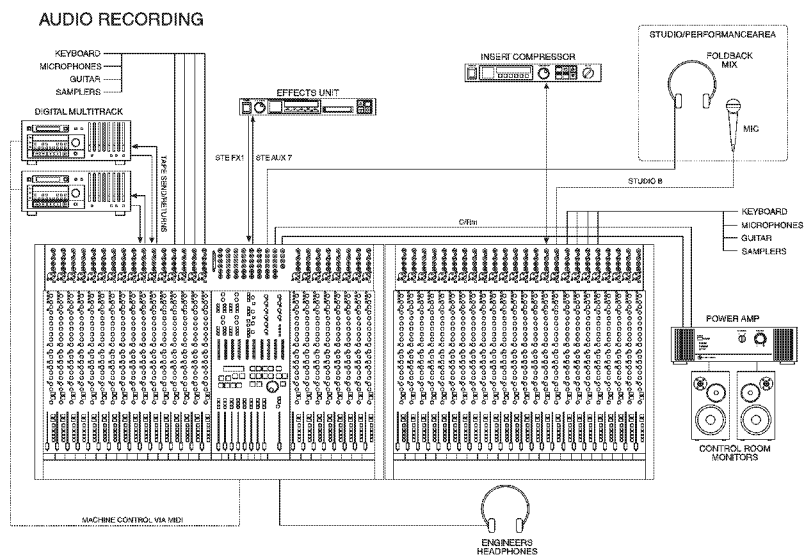
MIDI OUT



Hookup Diagrams

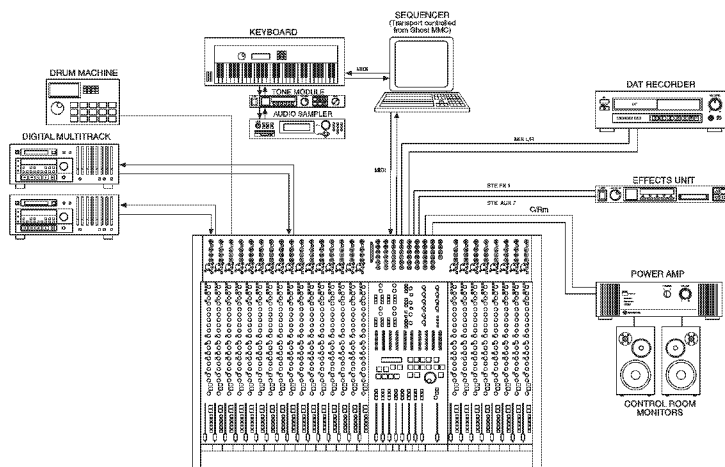
Multitrack Recording

Ghost is designed to connect to multitrack tape machines via dedicated send and return jack sockets, avoiding the need to repatch. Ghost's transport buttons will control tape transports via a number of protocols. Sound sources are connected to channels as required and input processors, such as compressors or gates, can be inserted into the channel path. Effects units are fed from auxiliary outputs in the stereo return inputs. Multiple outputs are possible, including the main monitor mix and secondary mixes for separate performance space headphones.



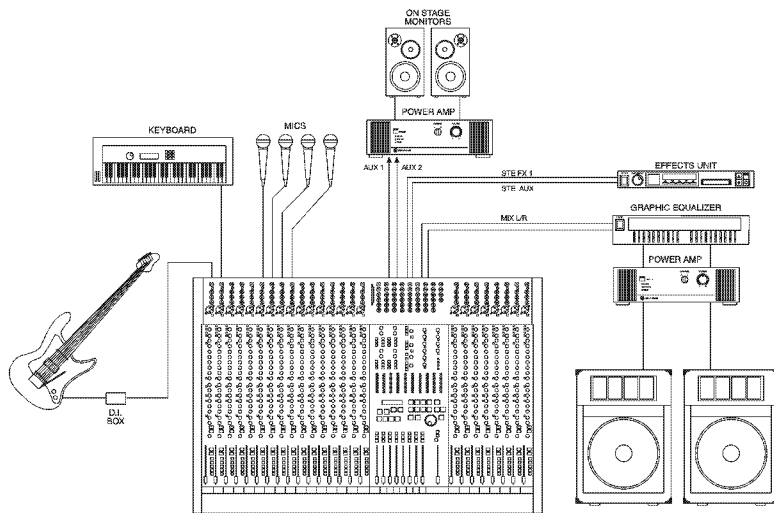
Playback/Mixdown

At this stage, it is likely that the Main and MixB inputs will be swapped over so that the multitrack machines become the main sound source. additional sound sources required at mixdown can also be connected via extra channels or via MixB paths. it is likely that a sequencer will still be controlled from Ghost, via MIDI, to generate input from sound modules. The end result is a stereo mix, recorded onto DAT or some other high quality mastering medium.



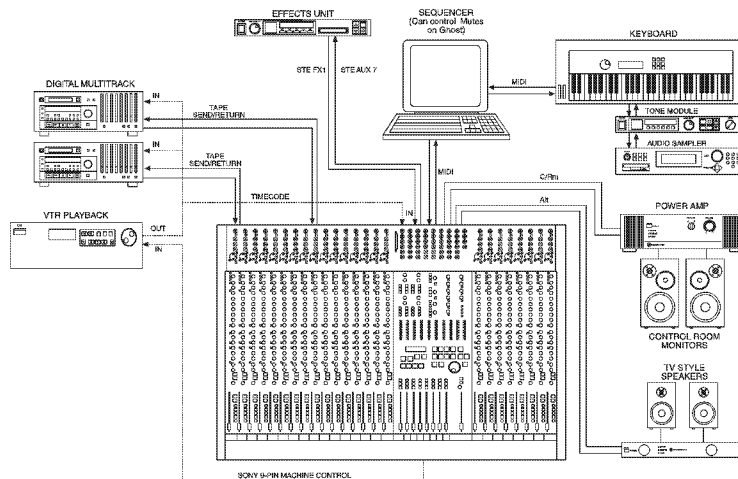
Live Public Address

Ghostcan also be used for live PA work. Live sound sources are input in the usual way, treated as necessary by effects and dynamics processors connected to inserts and auxiliaries, and then output via a graphic equaliser to the main front of house speakers. Auxiliary mixes, switched pre fade, can be used to provide monitor mixes to the musicians on stage - up to four separate mixes if using MixB as a pre fade stereo bus. The 4 mute groups, controlled from Ghost's onboard computer, are particularly useful in a live situation.

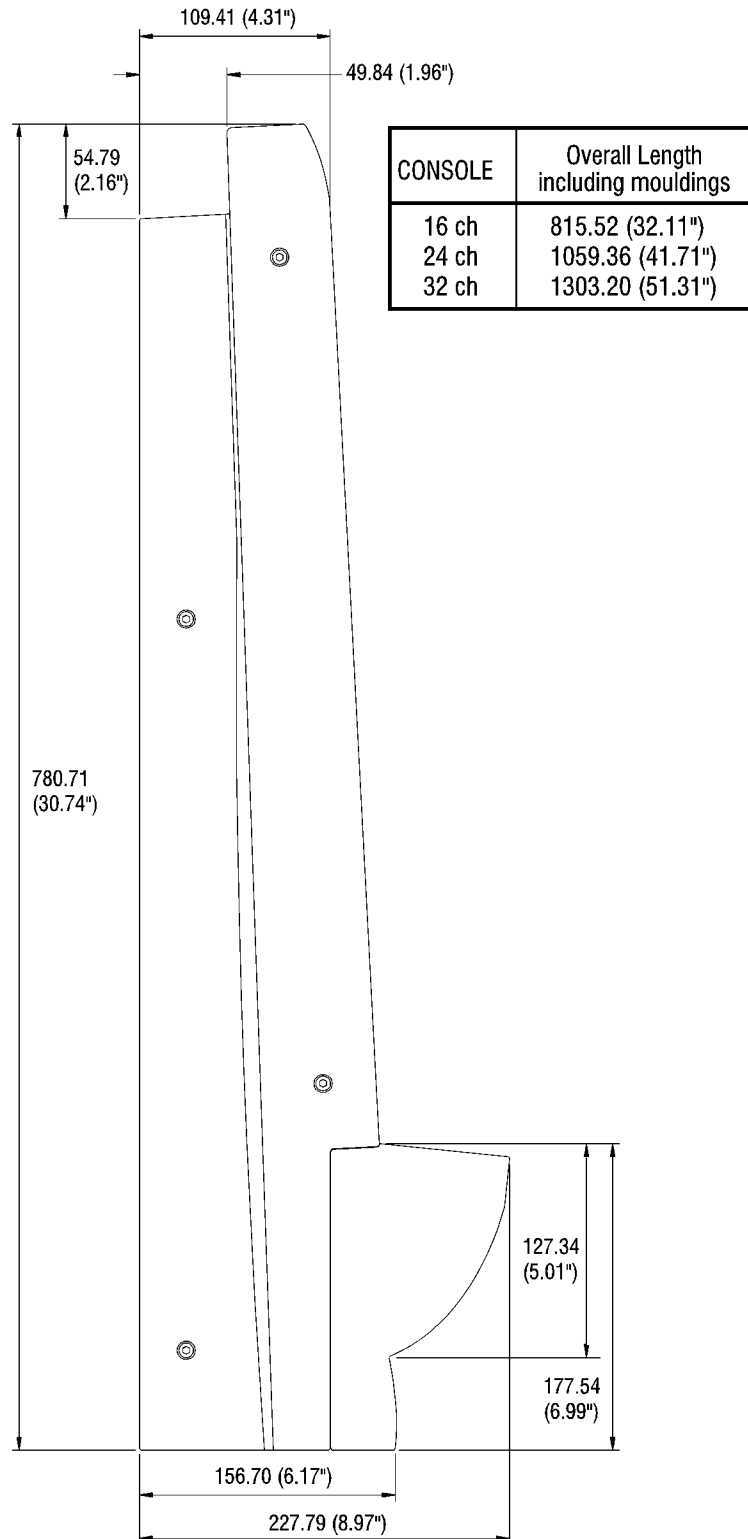


Composing to Picture

Many of the same machines and sound sources will be connected to Ghost as in the previous example. However, it is likely that these will include an external MIDI sequencer, which drives a number of sound modules and can also control the automatic mutes on Ghost. Additionally, there will be a VTR player, which will follow Ghost's Sony 9 pin protocol transport messages. Multitrack tape machines can be set to chase the VTR's timecode generator.



Dimensions



GHOST

3

Quick Start Guide

Quick Start Guide

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We suggest that you read this entire manual before using Ghost; but for those who want to get started right away, we have provided this QUICK START GUIDE. This will get you up and running quickly. The basic procedures given here are taken from the TUTORIAL chapter, which contains much more detailed information. If you don't understand something in this chapter, then refer to the TUTORIAL. However, to get the full benefit of Ghost's many features, it is suggested that at some point you read this entire manual.

Recording Basic Tracks (Tracking)

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Procedure:

1. **Reset Console.** "Zero Out" or reset the console. That means to set all controls to their off or neutral positions.
2. **Connections.** Connect your input sources to the channel MIC and LINE inputs.
3. **Select Inputs.** Use the MIC/LINE switch to select the appropriate input for each channel. Press the 48V switch for condenser mics, where required. Make sure the REV switch is not depressed.
4. **Recording methods.** There are 3 methods you can use to send the channel signal to a multitrack tape recorder (MT), and they are outlined below:
 - a. **Using the Group Output jacks.** Use this method if the GRP 1-8 output jacks are connected to the inputs of your multitrack recorder. The group number should match the tape input number. In the channel strip, press the assign switch for the tape track(s) you want to record on. Next, use the pan pot to send the signal to the Group output jack for the track(s) you wish to record on. Pan left for odd-numbered tracks; right for even-numbered tracks; and centre for both tracks. Then, turn up the channel fader to its nominal position, as indicated by the fader marking 3/4 of the way up. Finally, turn up the appropriate Group fader(s) to its nominal position.
 - b. **Using the DIR/TAPE SND jack as a Group Output.** Use this method if the DIR/TAPE SND jacks are connected to the inputs of your multitrack recorder, and you wish to use the Groups for recording. The channel number should match the tape input number.

First, press the DIR/GRP n switch (on the rear connector panel) on the channel that represents the tape track you wish to record on. Then note the GRP n number on the switch. For instance, both channels 2 and 10 will have a switch that reads DIR/GRP 2. This means that the channel 2 and channel 10 DIR/TAPE SND jacks will act as Group 2 output jacks, when their DIR/GRP 2 switches are pressed.

Next assign all the inputs you're recording to the appropriate Group number(s) and use the pan pot to send the signal to the appropriate Group bus. Pan left for odd-numbered groups; right for even-numbered groups; and centre for both groups.

Then, turn up the channel fader to its nominal position, as indicated by the fader marking 3/4 of the way up. Finally, turn up the Group fader(s) to its nominal position.

- c. **Using the DIR/TAPE SND jack as a Direct Output:** Use this method if the DIR/TAPE SND jacks are connected to the inputs of your multitrack recorder, and you wish to record directly from the channel outputs. The channel number should match the tape input number.

This method differs from method (b), above, because you're using the DIR/TAPE SND jack as a Direct Output from the channel and the Group buses are not involved at all. The channel signal, post-fader and post-mute, will be routed to this jack for direct recording to your multitrack.

To use this method, first make sure the DIR/GRP n switch (on the rear connector panel) is in the DIR (UP) position for all channels that you wish to record. Then, turn up the channel fader to its nominal position, as indicated by the fader marking 3/4 of the way up. The pan pot and assign switches will have no effect on the Direct Output signal.

Select one of the above three recording methods and then proceed to step 5.

5. **Setting Up The MT.** On the MT, insert a tape, wind to where you wish to begin recording, set the counter to zero, put the appropriate tracks into RECORD-READY mode, and set the recording level controls of the MT, if any, to their nominal positions.
6. **Monitoring.** To learn how to listen to the sound you are recording, see the section below entitled, "Control Room Monitoring." To learn how to send the sound you are recording to the musicians in the studio, see the section below entitled, "Studio Monitoring."

With the musicians playing, set up preliminary monitor mixes for the Control Room and Studio.

7. **Gain Structure.** If you have the optional meterbridge and it's set for channel input monitoring, then gradually turn up the Input Sensitivity knob until the meterbridge channel input meter indicates 0.

In all other instances, press the channel SOLO switch. Make sure the SIP switch in the master section is off. This will display the channel signal on the CRM/SOLO-L/R meters in the master section. Gradually turn up the Input Sensitivity knob until the meters indicate 0, then turn the SOLO switch off.

In either case, the Signal Present LED should be brightly lit, and the PK LED should light only occasionally, if at all.

- 8) **LCF & Phase.** Use the Low-Cut Filter (LCF) switch to get rid of low frequency noise. The Phase switch should be in the up position, unless you know your input cables are wired incorrectly or if you're employing M-S recording techniques.
9. **EQ.** If you want to add EQ to the channel inputs, first press the EQ IN switch and make sure the EQ MIX B button is up. Then apply the EQ as needed. The HF/LF shelving EQ can be boosted or cut 15dB. The HMF/LMF EQ are true parametrics and allow you to select the centre frequency, the bandwidth of that frequency (with the Q control), and apply boost or cut of 15dB.
10. **Effects & Processing.** If you want to add effects or processing, then see the section below, entitled, "Adding Effects and Processors."
11. **Adjust Faders.** Adjust the channel and group faders, as required, so that the multitrack's meters display the desired recording level.
12. **Recording.** Set up your final monitor mixes, and then have the musicians stop playing. Put the MT into RECORD mode and have the musicians play the song. When the song is over, STOP the multitrack and rewind the tape to zero.
13. **Playback.** Play back the tracks you have just recorded. To let the musicians in the Studio hear the take, select CRM as the Source in the appropriate Studio Foldback section.

14. **Record Another Take.** If dissatisfied, record over the first take or add another take after it. Before recording again, remember to unselect CRM and select AUX 1-2 as the Studio Foldback Source, if necessary.
15. **Proceed With Overdubbing.** When you are satisfied with the take of the basic tracks, you can proceed to "Overdubbing," below.

Overdubbing

Procedure:

1. **Tape Channels.** On all channels that contain the outputs of previously recorded tape tracks, press the REV switch and set the MIX B SRCE switch to CHAN. This routes the Tape Returns to both the Channel and MIX B paths. These are your Tape channels and are for monitoring purposes only.
2. **Connections.** Connect your input sources for the overdub to the channel MIC and LINE inputs. Do not connect them to any Tape channels. These are your Input channels.
3. **Select Inputs.** On the Input channels, use the MIC/LINE switch to select the appropriate input for each channel. Press the 48V switch for condenser mics, where required. Make sure the REV switch is not depressed and set the MIX B SRCE switch to TAPE.
4. **Select Recording Method.** Select one of the 3 recording methods, from above, and follow the directions for signal routing and channel/group fader positioning for each Input channel.
5. **Setting Up The MT.** On the MT, rewind the tape to the beginning of the song, or to a point before the overdub will be recorded, set the counter to zero, and put the appropriate track(s) into RECORD-READY mode. Make sure that all previously recorded tracks are not in RECORD-READY mode. Then set the recording level controls of the MT, if any, to their nominal positions and start playing the tape.
6. **Monitoring And Gain Structure.** With the musicians playing along with the tape, set up Control Room and Studio preliminary monitor mixes of the overdub being recorded and of previously recorded tape tracks. (See Control Room/Studio Monitoring, below.) Then use the INPUT SENSITIVITY knob to set your input gain structure for the overdub, using the optional meterbridge or the CRM/SOLO-L/R meters, and the SIG and PK LEDs. (See "Recording Basic Tracks," above.)
7. **LCF & Phase.** Use the LCF and PHASE switches, as required. (See above.)
8. **EQ.** Apply EQ, as required. (See above.)
9. **Effects & Processing.** If you want to add effects or processing, then see the section below, entitled, "Adding Effects and Processors."
10. **Adjust Faders.** Adjust the channel and group faders, as required, so that the multitrack's meters display the desired recording level.
11. **Recording.** Set up your final monitor mixes, of both the live signal and of previously recorded tape tracks, and then have the musicians stop playing. Put the MT into RECORD mode and have the musicians play the overdub. When the overdub is over, STOP the multitrack and rewind the tape to zero or to a point right before the overdub.
12. **Playback.** Play back the overdub you have just recorded. To let the musicians in the Studio hear the take, select CRM as the Source in the appropriate Studio Foldback section.

13. **Record Another Take.** If dissatisfied, record over the first take of the overdub. Before recording again, remember to unselect CRM and select AUX 1-2 as the Studio Foldback Source, if necessary.
14. **Proceed With Overdubs & Mixing Down.** When you are satisfied with the take of the overdub, proceed to record the next overdub. When you're satisfied with all the tracks on the tape, you can proceed to "Mixing Down", below.

Mixing Down

Procedure:

1. **Inputs.** "Zero Out" the console and then press the REV switches to route all your tape tracks to the channel path. Channel inputs on those channels will be routed to the MIX B path. If you have additional input sources, such as MIDI tracks, and extra channels available (that are not being used for tape tracks), then route the additional sources to the channel path. If you have more input sources than channels, then connect some to the channel inputs and some to the MIX B inputs. Then decide where best to route those extra sources, between the channel and MIX B paths. You can also use the Effects Returns as line level source inputs, but remember that you'll probably also need inputs for the outputs of your effects devices. Make sure the MIX B SRCE switch is set to TAPE (UP) on all channels, unless you wish to use it as a pre-fader send for the channel path.
2. **Assignment & Master Levels.** Assign all channels and Effects Returns that are in use to the L/R MIX by pressing the L/R assign switch on the channels and the MIX assign switch on the Effects Returns. Press the MIX B TO MIX switch in Ghost's MIX B master section and set the MIX B rotary master fader about 75% up. Set the MIX L/R master fader to the top of its travel.
3. **Using Groups.** If you're grouping some sources, assign them to the appropriate Group buses and then assign the Group buses to the L/R MIX, using the TO MIX- L, R, and L+R switches in the Group master section. Turn the appropriate Group faders about 75% up.
4. **Monitoring.** Set the CRM SRCE to monitor MIX A only, turn up the level control, and make sure MONO CHECK is off. To send the mix to the studio, select CRM as the source in the appropriate Studio Foldback section and turn up its level control.
5. **Input Gain.** Adjust the INPUT SENSITIVITY and TAPE TRIM knobs, if needed. (See above.)
6. **Setting Up The MT.** Rewind the MT tape, set the counter to zero, and start playback. If the MT has an output level control, set it to its nominal position. If you're syncing a sequencer to the tape, make sure it's set up properly, so that the MIDI tracks are also playing.
7. **Practice The Mix.** As the tape plays, set the relative levels of the tape/MIDI tracks using the channel and MIX B faders, (and the FX level controls, if they are being used as inputs). Use the PAN and BAL controls to set the stereo perspective. USE EQ, effects, and processors, as needed. (See "Effects and Processors," below.) Use the MUTE Automation system, as needed. (Not Ghost LE). (See the "CPU Application Guide" in this manual.) Use the MONO CHECK switch periodically to check for mono compatibility. Listen to the mix through your main speakers, your alternate speakers, if any, and headphones. Keep practicing the mix, until you're happy with it, then rewind the MT tape to the beginning of the song.

8. **Setting Up The 2-Track.** Insert a new tape in your 2-track recorder and rewind it to the beginning. Roll about one minute into the tape and use the TO TAPE switches in the Talkback and Oscillator sections to record any announcements and tones that are needed. Allow the tape to roll a bit past the tones, stop the 2-track, and set the counter to zero. Then, set the deck to RECORD-READY mode and set its input level control to its nominal position.
9. **Setting Levels.** Play the MT tape again, and adjust the MIX L/R Master fader, MIX B Master fader, and Group Master faders, to retain the proper balance of your mix, while at the same time, achieving the proper level on your 2-track recorder's meters. The proper recording level should be achieved with the 2-track's input control at its nominal position. Then rewind the MT tape to the beginning of the song.
10. **Recording The Mix.** To commit your final mix to tape, start the 2-track in RECORD mode and then start playback of the MT tape. Make any mix moves that are necessary and when the song is completed, stop the 2-track, then stop the MT. Press the appropriate 2-TK switch in the CRM SRCE section, unselect MIX A, and then rewind and play back the 2-track tape. If you're not satisfied with the final mix, then unselect the 2-TK CRM SRCE switch, select MIX A, and try the mix again. If you are satisfied with the mix, then make a dub of the 2-track master and play the dub on as many systems as you can. If you're not satisfied, then mix it again. If the mix meets with your approval on these other systems, then make a backup copy of the 2-track master and label everything. This final 2-track stereo master tape is now ready for mastering and/or duplication.

Control Room Monitoring

CRM Signal Monitoring

Procedure:

1. Follow the procedures under "Recording Basic Tracks" to send your live signals to the MT for recording.
2. On Ghost, make sure all CUT and SOLO/PFL/AFL switches are off, and that the REV switch is OFF (UP) in the MIX B channel(s) you will use for monitoring.
3. On the MT, press the RECORD-READY switches for the track(s) you wish to record on and set the record level control, if any, to its nominal position.
4. In the CRM SRCE section, make sure that only MIX B is pressed and that MONO CHECK is off. Turn the CRM LEVEL knob about 75% up.
5. Turn the MIX B master fader in Ghost's master section about 75% up.
6. On the appropriate MIX B section that corresponds to the track you are recording on, make sure the SRCE switch is set to monitor TAPE (UP Position).
7. With the performers playing their parts, (there should be a reading on the MT's meters for the track(s) you are recording), adjust the TAPE TRIM knob in the appropriate channel strip's input section, if necessary. Then turn up the appropriate MIX B level control to attain the volume you want and use its pan pot to determine the stereo placement. You will now be monitoring all signals sent to the appropriate tape track.
8. The Channel faders, Group faders (if you're recording with the Group buses), TAPE TRIM knob, MIX B master fader, MIX B level control, CRM LEVEL knob, and the MT record level control, if any, will all affect the volume of the monitored signal.

CRM Tape Monitoring

Procedure:

1. On Ghost, make sure all CUT and SOLO/PFL/AFL switches are off, and that the REV switch is ON (Down) in the MIX B channel(s) you will use for monitoring tape playback.
2. In the CRM SRCE section, make sure that only MIX B is pressed and that MONO CHECK is off. Turn the CRM LEVEL knob about 75% up.
3. Turn the MIX B master fader in Ghost's master section about 75% up.
4. On the appropriate MIX B section that corresponds to the tape track you wish to monitor, make sure the SRCE switch is set to monitor CHAN (DOWN Position). You are really monitoring TAPE, since the channel and MIX B paths have been reversed.
5. Set the output level control on the MT, if any, to its nominal position, and with the MT tape playing, adjust the TAPE TRIM knob in the channel strip's input section, if necessary. Then turn up the appropriate MIX B level control to attain the volume you want and use its pan pot to determine the stereo placement. You will now be monitoring the tape playback of the appropriate track.
6. The TAPE TRIM knob, MIX B master fader, MIX B level control, CRM LEVEL knob, and the MT output level control, if any, will all affect the volume of the monitored signal.

Studio Monitoring

Studio Signal Monitoring

Procedure:

1. Follow the procedures under "Recording Basic Tracks" to send your live signals to the MT for recording.
2. On Ghost, make sure all CUT and SOLO/PFL/AFL switches are off, and that the REV switch is OFF (UP) in the channel(s) that you are going to monitor.
3. In the STUDIO FOLDBACK section, decide whether you are using STUDIO A or STUDIO B/PHONES and make sure that only AUX 1-2 is pressed. Turn the STUDIO LEVEL knob about 75% up.
4. Turn the AUX 1 and AUX 2 master fader pots in Ghost's master section about 75% up and make sure their AFL switches are off.
5. On the appropriate channels that correspond to the channel inputs you are about to record, make sure the AUX 1-2 PRE switches are depressed, so that you are monitoring Pre-Fader.
6. With the performers playing their parts, turn up the AUX 1-2 level controls, on all channels whose signals you want to monitor, to attain the volume (and balance) you want. AUX 1 will be sent to the left headphone (speaker) and AUX 2 will be sent to the right headphone (speaker). You will now be monitoring all channel input signals.
7. The AUX 1-2 master faders, AUX 1-2 level controls, and STUDIO LEVEL knob, will all affect the volume of the monitored signal.

Studio Tape Monitoring

Procedure:

1. On Ghost, make sure all CUT and SOLO/PFL/AFL switches are off, and that the REV switch is ON (Down) in the channel(s) you will use for monitoring tape playback.
2. In the STUDIO FOLDBACK section, decide whether you are using STUDIO A or STUDIO B/PHONES and make sure that only AUX 1-2 is pressed. Turn the STUDIO LEVEL knob about 75% up.
3. Turn the AUX 1 and AUX 2 master fader pots in Ghost's master section about 75% up and make sure their AFL switches are off.
4. On the appropriate MIX B sections that correspond to the tape tracks you wish to monitor (in the control room), make sure the SRCE switch is set to monitor CHAN (DOWN Position). You are really monitoring TAPE, since the channel and MIX B paths have been reversed. This has no effect on Studio Tape Monitoring, but must be done in order to use MIX B for CRM Tape Monitoring.
5. On the appropriate channels that correspond to the tape tracks you wish to monitor, make sure the AUX 1-2 PRE switches are depressed, so that you are monitoring Pre-Fader.
6. Set the output level control on the MT, if any, to its nominal position, and with the MT tape playing, adjust the TAPE TRIM knob in the appropriate channel strip's input section, if necessary. Then turn up the AUX 1-2 level controls, on all channels that correspond to the tape tracks you want to monitor, to attain the volume (and balance) you want. AUX 1 will be sent

to the left headphone (speaker) and AUX 2 will be sent to the right headphone (speaker). You will now be monitoring the tape playback of the appropriate tracks.

7. The TAPE TRIM knob, AUX 1-2 master faders, AUX 1-2 level controls, STUDIO LEVEL knob, and the MT output level control, if any, will all affect the volume of the monitored signal.

Monitoring Summary

To sum up, if tracks 1 and 2 were already recorded and you were currently recording on track 3 through the channel 10 input, then for control room monitoring, you would use the MIX B sections of channels 1 and 2 to monitor the tape playback of tracks 1 and 2, and you would use the MIX B section of channel 3 to monitor what you were currently recording to track 3. For studio monitoring, you would use AUX 1-2 of channels 1 and 2 to monitor the tape playback of tracks 1 and 2, and you would use AUX 1-2 of channel 10 (where the input is located) to monitor what you were currently recording to track 3.

Adding Effects and Processors

1. **External Treatment.** With this method you alter the signal before it reaches Ghost. It is commonly used by guitarists, when using "stomp boxes." For example, you connect a guitar cable to the input of a delay box, then you connect the output of the box to one of Ghost's LINE inputs. You use the effect's mix control to determine the balance of wet and dry signals that enters Ghost. External treatment does not require using any of Ghost's controls. You simply plug the treated signal into one of Ghost's inputs.

2. **Using Processors.** Outboard processors are connected to Ghost using a send/return Y-cable connected to one of Ghost's Insert jacks. The signal from Ghost is sent to the outboard device, processed, and then the processed signal is returned to Ghost. You use this method when you want to treat the entire signal, as opposed to blending the wet and dry signals. You'll generally use outboard EQ or dynamics processors with the Inserts.

Ghost has Inserts on all Channels, Groups, and the L/R Mix. Using processors with Ghost just requires that you connect them properly to Ghost's Insert jacks. It does not require using any of Ghost's controls.

3. **Using Effects.** To use effects with Ghost, you can use the AUX system. This method involves sending a copy of a channel/MIX B signal to the outboard effect, processing it, and then returning it to Ghost. This wet signal is then combined with the dry signal within Ghost.

Note about Studio Monitoring and Effects

The FX Returns were designed to add effects during mixdown, or while multi-tracking in the control room and only using the control room monitor section. When using the FX Returns, you cannot monitor the wet signal in the Studio Foldback sections. However, you can record the wet signal to the multitrack or the mixdown deck and you can monitor it in the Control Room. If you're recording the effect and the performers don't care if they hear the effect while performing, then you can use the FX Returns. However, if the performers want to hear the effect while recording, or if you want to record dry, but monitor wet, then you should not use the FX Returns. You should connect the stereo outputs of your effects device to 2 channel inputs and use those channels to route the wet signal to the Group or L/R buses for recording, if desired, and to the Control Room and Studio monitoring sections.

For connecting effects devices to the FX Returns. Studio Monitoring is not possible

Procedure:

1. First, select which AUX Send you wish to use, based on whether you wish to use it with a Channel or MIX B input and whether your effect has mono or stereo inputs. Let's say you want to use AUX 1. (If you use AUX 1 or 2, make sure the PRE switch is not pressed.) Connect the AUX 1 output jack to the input of your effects device. Connect the L/R outputs of your effects device to the FX 1-L/R jacks. (Note that you can use any FX RETURN.)
2. On the effects device, set the input level and output level controls to their nominal positions. Make sure the effects unit is set for 100% wet output and select the effect you wish to use.
3. Turn the AUX 1 rotary master fader control about 75% up. With a signal present, turn the AUX 1 Send controls about 75% up on all channels that you wish to be treated with the effect. This sends the channel signals to the effects device.

- 4) There should be a reading on the input meter of the effects device, showing that there is a signal present. If you're recording to a multitrack deck, then set the Control Room Source to MIX B. If you're mixing down, then set the Control Room Source to MIX A. Turn the Control Room Level knob 75% up. You cannot monitor the effect in the Studio Foldback sections.
5. Use the Channel ASSIGN switches and PAN Pots to route the dry signals to the appropriate buses, as usual. Use the FX I ASSIGN switches and BAL knob to route the wet signal to the appropriate buses. You can record the wet signal on the same tape tracks as the dry signals or on their own tape tracks. Turn the appropriate Group Faders about 75% of the way up (if multitracking) and set the MIX fader to the top of its travel (if mixing down). This sends the wet and dry signals to the buses.
6. In the control room, to monitor the effect while you're recording to a multitrack deck, you use the MIX B section in the channel strip that represents the tape track the effect is being recorded on. To monitor the effect while mixing down, you should assign the FX Return to the L/R Mix by pressing the MIX switch, and then monitor MIX A in the control room, as usual. To record dry and monitor wet, assign the FX Return to the L/R Mix by pressing the MIX switch, but don't assign it to the Groups. Set the Control Room Source to monitor both MIX A and MIX B. MIX B is what you normally use for control room monitoring and MIX A would be used to monitor the effect.
7. Turn the FX I level control about 75% up. This returns the wet signal from the effects device to Ghost.
8. With a signal present in the channels you're using, you should be able to hear the effect. Adjust the AUX I Send controls to determine how prevalent the effect will be for each channel. For instance, all other things being equal, if the AUX I Send control is turned 75% up for one channel and 50% for another channel, you will hear the effect more for the former channel.
9. After setting the AUX I Send levels for all the channels, press the AUX I Master Fader AFL switch. This will send all AUX I levels, post-AUX I master fader, to the CRM/SOLO-L/R meters. Adjust the AUX I Master Fader so that the meters read 0, then turn AFL off.
10. Adjust the input level of the effects device to achieve the meter reading on the effects device, suggested by the device's manual.
11. Then press the PFL switch in the FX I section. This will display the effects signal returned to Ghost, pre-FX I level control, on the CRM/SOLO-L/R meters. Adjust the output level of the effects device so that the meters read 0, then turn PFL off.
12. Finally, adjust the FX I level control, together with the channel faders, to achieve the blend of wet/dry signals that you desire. The channel faders control the dry signal and the FX I level knob controls the wet signal. The Group/MIX faders control the overall signal sent to the Group/MIX buses. Remember that the individual AUX I Send knobs and AUX I master fader determine the level of the signal sent to the effects device and the FX I level knob determines the level of the signal returned to Ghost.

For connecting effects devices to 2 Channel LINE Inputs (Channel Returns).

Studio Monitoring is possible.

Procedure:

1. First, select which AUX Send you wish to use, based on whether you wish to use it with a Channel or MIX B input and whether your effect has mono or stereo inputs. Let's say you want to use AUX 1. (If you use AUX 1 or 2, make sure the PRE switch is not pressed.) Connect the AUX 1 output jack to the input of your effects device. Connect the L/R outputs of your effects device to any 2 adjacent Channel LINE inputs. Make sure their REV switches are not engaged and set their MIX B SRCE switches to CHAN (Down).
2. On the effects device, set the input level and output level controls to their nominal positions. Make sure the effects unit is set for 100% wet output and select the effect you wish to use.
3. Turn the AUX 1 rotary master fader control about 75% up. With a signal present, turn the AUX 1 Send controls about 75% up on all channels that you wish to be treated with the effect. This sends the channel signals to the effects device.
4. There should be a reading on the input meter of the effects device, showing that there is a signal present. If you're recording to a multitrack deck, then set the Control Room Source to MIX B. If you're mixing down, then set the Control Room Source to MIX A. Turn the Control Room Level knob 75% up. For multitrack recording, select AUX 1-2 as the Studio Foldback Source and turn its level control 75% up.
5. Use the Channel ASSIGN switches and PAN Pots to route the dry signals to the appropriate buses. If you want to record the wet signal, then using the Channel Returns, set their ASSIGN switches and PAN Pots to route the wet signals to the appropriate buses. You can record the wet signals on the same tape tracks as the dry signals or on their own tape tracks. Turn the appropriate Group Faders about 75% of the way up (if multitracking) and set the MIX fader to the top of its travel (if mixing down). This sends the wet and dry signals to the buses.
6. In the control room, to monitor the effect while you're recording to a multitrack deck, you use the MIX B section in the channel strip that represents the tape track the effect is being recorded on. To monitor the effect while mixing down, you should assign the Channel Returns to the L/R Mix by pressing the L/R switch, and then monitor MIX A in the control room, as usual. To record dry and monitor wet, don't assign the effect to the Groups and use the MIX B sections in the Channel Returns to monitor the effect.
7. Set the Channel Return Faders to their nominal positions. This returns the wet signal from the effects device to Ghost.
8. With a signal present in the channels you're using, you should be able to hear the effect. Adjust the AUX 1 Send controls to determine how prevalent the effect will be for each channel. For instance, all other things being equal, if the AUX 1 Send control is turned 75% up for one channel and 50% up for another channel, you will hear the effect more for the former channel.
9. To send the effect to the performers in the Studio, whether or not you are recording the effect, use the AUX 1-2 Sends on the Channel Returns. These AUX 1-2 controls should be set up as Pre-Fader Sends by pressing the PRE switch.

10. After setting the AUX 1 Send levels for all the channels, press the AUX 1 Master Fader AFL switch. This will send all AUX 1 levels, post-AUX 1 master fader, to the CRM/SOLO-L/R meters. Adjust the AUX 1 Master Fader so that the meters read 0, then turn AFL off.
11. Adjust the input level of the effects device to achieve the meter reading on the effects device, suggested by the device's manual.
12. Then press the SOLO switches (with SIP Off) in the Channel Returns. This will display the effects signal returned to Ghost, pre-channel fader, on the CRM/SOLO-L/R meters. Adjust the output level of the effects device so that the meters read 0, then turn SOLO off.
13. Finally, adjust the Channel Faders and Channel Return Faders for the wet and dry signals, to achieve the wet/dry recording mix that you desire. Adjust the MIX B level controls and AUX 1-2 Sends to achieve the wet/dry monitoring mix that you desire for the control room and studio, respectively. The Channel Faders that contain the signal sources control the dry signal and the Channel Return Faders control the wet signal. The Group/MIX faders control the overall signal sent to the Group/MIX buses. The MIX B controls are used for control room monitoring and the AUX 1-2 controls are used for studio monitoring. Remember that the individual AUX 1 Send knobs and AUX 1 master fader determine the level of the signal sent to the effects device and the 2 Channel Return Faders determine the level of the signal returned to Ghost.

GHOST

4

Block Diagram

Block Diagram Explanation

A Block Diagram of Ghost appears on the previous page. What follows is a plain English explanation of that diagram. It is primarily intended for those who are unfamiliar with how to read a Block Diagram, but can also be useful for the more experienced user. You can follow the diagram as you read the explanation, but just reading the explanation alone will also be helpful.

The Basics

If you want to follow along, first position the diagram so that the top of the page is facing to the right. The diagram is read from left to right, but not necessarily from top to bottom. The diagram is a pictorial representation of Ghost's signal flow. Generally, the inputs are on the left and the outputs are on the right. You'll notice vertical lines in the middle of the diagram. These represent the various buses in Ghost. A bus is a signal path that can contain many signals.

The pictures in the diagram represent all the controls and the input/output jacks of Ghost, as well as some internal circuits. Most of the pictures and the buses are labeled. We won't discuss the unlabeled pictures, such as summing amplifiers (which appear as unlabeled triangles), but will concentrate instead on the labeled pictures. For instance, if a connection is actually to a summing amplifier and then to a control, we will describe the connection as being to the control and not to the summing amplifier. This should not present a problem in understanding Ghost's signal flow.

The other lines with the black dots represent the signal flow within Ghost. The black dots indicate a connection with either a control, a jack, another signal flow line, or a bus. If a line crosses a control, a jack, a signal flow line, or a bus in the diagram, but is not connected by a black dot, then there is no connection between them.

Generally, the signals enter Ghost through the input diagrams on the left, travel to the buses in the middle, and then continue to the output diagrams on the right. There are exceptions, however. For instance, the Direct Output jacks appear on the left of the diagram and the 2-Track Inputs appear on the right, because it is clearer to represent them in this fashion.

To save space when there are a number of identical controls, the diagram usually only shows the signal flow for one of them and makes a note that the other controls are similar (meaning that they function in an identical manner). For instance, the diagram only shows the signal flow for one channel and for one FX Input, but all channels are the same and all FX Inputs are the same.

The Buses

Note

To read the labels for the buses, you should temporarily turn the diagram so the top of the page is facing up.

Ghost has 31 buses represented by the 31 lines in the middle of the diagram. They are labeled on the left. A bus is a circuit where similar signals are sent to, so that these signals can be sent as a group to their next destination within Ghost. For instance, all signals assigned to Group 1 are sent to the GRP 1 bus. Usually, the buses are connected on both the input side and output side of the diagram. Most buses carry audio signals, but some buses are used for other purposes.

Following is a brief description of each bus, starting from the bottom of the diagram. The input side and output side of the buses are described separately. Note that some buses are described together, such as the GRP buses and any L/R buses, even though they are labeled separately in the diagram.

Solo Cut

Input: This bus is connected to the channel mute circuits and operates only when SIP is engaged. When SIP is on, if a channel SOLO switch is engaged, it mutes all channels that don't have their SOLO switches engaged.

Output: This bus is connected to the SIP switch.

Solo Detect

Input: This bus is connected to the channel SOLO switches and it detects when the switch has been engaged.

Output: This bus is connected to the SIP switch, the Master SOLO LED in the Master section, and to the AFL/PLF Override circuit.

PFL Detect

Input: This bus is connected to all PFL/AFL switches and it detects when the switch has been engaged. (It is more accurately called PFL/AFL Detect.)

Output: This bus is connected to the Master SOLO LED in the Master section and to the AFL/PLF Override circuit.

PFL/AFL L/R. (2 buses)-

Input: These buses are connected to all channel SOLO switches and to all PFL/AFL switches. Whenever any PFL/AFL switch is engaged, its signal is sent to this stereo bus. If SIP is off, then whenever any channel SOLO switch is engaged, its signal is also sent to this stereo bus. If SIP is on, then the channel SOLO switches operate in conjunction with the SOLO CUT bus.

Output: These buses are connected to the AFL/PFL TRIM control in the Master section.

AUX 1-2: (2 buses)-

Input: These buses are connected to the AUX Send 1 and AUX Send 2 level controls. Turning up these controls, respectively, sends signals to these buses. They are also connected to the AUX 1-2 routing switch in the TALKBACK section.

Output: These buses are respectively connected to the AUX 1 and AUX 2 Master level controls in the Master section. They are also connected to the AUX 1-2 Source Select switches in the STUDIO A and STUDIO B sections.

AUX 3-6: (4 buses)-

Input: These buses are connected to the 5-6 switch which is connected to the AUX Send 3 and AUX Send 4 level controls. If the 5/6 switch is not engaged, then the AUX Send 3 and AUX Send 4 level controls send the signal to the AUX 3 and AUX 4 buses. If the 5/6 switch is engaged, then the AUX Send 3 and AUX Send 4 level controls send the signal to the AUX 5 and AUX 6 buses.

Output: These buses are respectively connected to the AUX 3-6 Master level controls in the Master section.

AUX 7 L/R: (2 buses)-

Input: These buses are connected to the AUX 7 (Stereo) level control. Turning up this control sends signals to both buses simultaneously.

Output: These buses are connected to the AUX 7 (Stereo) Master level control in the Master section.

AUX 8 L/R: (2 buses)-

Input: These buses are connected to the AUX 8 (Stereo) level control. Turning up this control sends signals to both buses simultaneously.

Output: These buses are connected to the AUX 8 (Stereo) Master level control in the Master section.

GRP 1-8: (8 buses)-

Input: These buses are connected to the 1/2, 3/4, 5/6, 7/8 Routing Matrix switches in the channel fader section and in the effects return section. They are also connected to the TO TAPE switches in the OSCILLATOR and TALKBACK Routing sections.

Output: These buses are respectively connected to the Group 1-8 Insert jacks in the Master section rear connector panel and to their respective Group Master Faders.

MIX L/R: (2 buses)-

Input: These buses are connected to the L/R Routing Matrix switches in the channel fader section and to the MIX Routing Matrix switches in the effects return section. They are also connected to the following switches: the TO TAPE switches in the OSCILLATOR and TALKBACK Routing sections; the MIX B TO MIX switch in the MIX B Master section; and the TO MIX-L and TO MIX-R switches in the GROUP MASTER FADER section. They represent the MAIN MIX or MIX A.

Output: These buses are respectively connected to the MIX L/R Insert jacks in the Master section rear connector panel and to the Stereo MIX Master Fader.

MIX B L/R: (2 buses)-

Input: These buses are connected to the pan controls in the MIX B section. They represent MIX B.

Output: These buses are connected to the MIX B Rotary Master Fader in the MIX B Master section. They are also connected to the MIX B SOURCE SELECT switches in the Studio A and Studio B sections.

GRP OP BUS (1-8): (2 buses)-

Input: Signal is sent to these buses from a point directly before the GRP 1-8 Output Jacks.

Output: These buses are connected to the DIR/GRP n switches located above the DIR/TAPE SND jacks on the Input rear connector panel.

CPU MUTE BUS A: (Not Ghost LE)-

Input: This bus is connected to Ghost's CPU and controls the Mute Automation for the channel mutes.

Output: This bus is connected to the channel mute circuits.

CPU MUTE BUS B: (Not Ghost LE)-

Input: This bus is connected to Ghost's CPU and controls the Mute Automation for the MIX B mutes.

Output: This bus is connected to the MIX B mute circuits.

Signal Flow

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We will now trace the signal flow through Ghost. You'll see that in many places the signal branches off to a number of destinations. If we were to discuss all the signal branches in detail as they appeared in the signal flow, you might lose sight of the main signal path. So instead, we will mention when the signal branches off, but continue with the main signal path flow. Then we will go back and trace the branches in detail.

We will trace the input sides and output sides separately. For the inputs, we will trace the Channel inputs, MIX B inputs, and Effects Returns inputs separately, tracing them from their input jacks to the buses. For the outputs, we will trace them from the buses to the output jacks. Then at the end, we will provide a quick overview of the complete signal path from input to output. There are also some items in the diagram that don't fit neatly into input/output categories, so we will discuss them at the most appropriate points. Two of those items are the CUT switches and the SOLO/PFL/AFL switches, so we will start with them, since they are very common throughout Ghost. Then, when we encounter a CUT or SOLO/PFL/AFL switch in a signal path, we will mention it, but not have to trace its path each time.

Signal Flow

Mute and Solo

CUT Switches

There is one Cut (Mute) switch for each channel and each MIX B section. All of them are connected to a Mute Circuit. The channel Mute Circuits are connected to CPU Mute Bus A and the MIX B Mute Circuits are connected to CPU Mute Bus B. Both Mute Buses are connected to Ghost's CPU, which controls the automation. (Not Ghost LE). In addition, the channel Mute Circuit is connected to the Solo Cut Bus.

Engaging any Cut switch will mute the signal beyond the Mute Circuit. You engage the Cut switch manually, by pressing it, or automatically, either with Solo-In-Place (SIP) or by using Ghost's Mute Automation. With Automation, the CPU will send signals to the Mute Circuits, via the Mute Buses, to automatically engage the Cut switches. Solo-In-Place is discussed below.

SOLO/PFL/AFL Switches

All channels have Solo switches and all MIX B sections have PFL (Pre-Fader-Listen) switches. There are also numerous other PFL and AFL (After-Fader-Listen) switches throughout Ghost. The channel Solo switches will function as Solo-In-Place (SIP) switches (if SIP is on) or as PFL switches (if SIP is off). PFL switches come before the fader or level control, so that the faders have no effect on the switches, and signal will be sent, even if the fader is at its minimum level. AFL switches come after the fader or level control, so that the faders will have an effect on the switches, and no signal will be sent, if the fader is at its minimum level.

On the channels only, if SIP is on, it sends a signal to the Solo Detect bus, telling Ghost that when a channel Solo switch is engaged, the Solo Cut Bus should engage the mute circuits for all channels that do not have their Solo switches engaged. For the rest of this discussion, we will assume that SIP is off. If SIP is off, then Ghost treats the channel Solos as PFL switches.

The channel Solo switches are connected to the Solo Detect and PFL/AFL-L/R buses. The MIX B PFL switches and all other PFL/AFL switches are connected to the PFL Detect bus and to the PFL/AFL-L/R buses. When SIP is off, the Solo Detect bus functions identically to the PFL Detect bus. (For the rest of this section, we will use the term solo to refer to all SOLO, PFL, and AFL switches.)

Both Detect buses are connected to the Global Solo LED in the Master section and when either bus detects that a solo switch has been pressed, it lights the LED.

Both of the detect buses are connected to the AFL/PFL Override Circuit, which in turn, is connected to the CRM/SOLO-L/R meters and then the CRM level control. The PFL/AFL-L/R signal buses are connected to the AFL/PFL Trim Control, which is also connected to the AFL/PFL Override Circuit. The Control Room section will be covered in more detail below, but the point to note here is that whenever any solo switch is depressed, the detect circuit sends a notice to the override circuit telling it to mute the selected Control Room Source, and in its place, send the signals from the AFL/PFL Trim Control to the Control Room Outputs.

What all of this means is that if you press any solo switch, the Global Solo LED will light and all soloed signals (from the PFL/AFL-L/R bus) will be sent to the solo Trim Control, where you can adjust the level of the soloed signals, and then to the control room meters and headphones/control room outputs.

Inputs

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Channels

The channel has 2 inputs: an XLR mic input and a 1/4" line input. (They are located in the upper-left of the diagram). The Mic input is connected to the 48V (phantom power) switch and then to the Mic/Line switch. The line input is connected to the Mic/Line switch. The Mic input has the 48V option and then you select the channel input with the Mic/Line switch. From that point on, both inputs are treated identically.

The channel signal then goes to the Phase switch, the Input Sensitivity knob, and the Low-Cut Filter (LCF) switch and circuit. The last switch determines whether the signal goes through the LCF circuit or not.

The signal continues to the Signal Present LED, the Peak Detect LED, and the Reverse switch. This switch determines whether the signal continues down the channel path or MIX B path. Note that even if Reverse is pressed, the channel signal will still have passed through all the pre-Reverse points above. If Reverse is pressed, then the channel signal will follow the MIX B path that comes after the switch, as explained in the MIX B section below. We will continue tracing the channel path, as if Reverse was not pressed.

The signal continues to the Channel Insert jack. If a send/return plug is inserted, the signal will be sent to the outboard device, processed by it, and then returned to the Insert jack. If nothing is connected, the signal proceeds from the Insert jack. If you have the optional meterbridge and it's set to monitor channel inputs, then from the Insert jack the signal goes to the meterbridge input meter.

Next, the signal goes to the EQ MIX B switch, to the LF/HF EQ and LMF/HMF EQ circuits, and to the EQ In/Out switch. If MIX B is pressed, the LF/HF EQ is switched into the MIX B path and is not available to the channel. The EQ In/Out switch is used to switch all 4 bands of EQ in or out of the signal path and it affects the LF/HF EQ, whether that EQ is in the channel path or MIX B path. The outputs of the 2 separate EQ circuits also go to the Peak Detect LED.

From this point, the pre-fader signal goes to the following 3 places: the channel Solo switch, the Pre switch in the Aux 1/2 section, and the Source switch in the MIX B section. These signals will be routed to the above destinations, regardless of the level of the channel fader. This is the signal that will appear if you use the channel Solo as a PFL, if you press the Pre switch in the Aux 1/2 section, or if you select channel as the Source in the MIX B section.

The signal also travels to the channel fader, which will affect its level, and to the mute circuit. Now the signal is a post-fader signal. If you press the Cut switch, the signal will be muted beyond this point. If not muted, the signal goes to the following 5 places: the Dir/Grp n switch (which is connected to the Dir/Tape Snd jack), the channel pan knob, the Pre button in Aux 1/2, the Mix B button in Aux 3/4 (5/6), and the Peak Detect LED. If the Dir/Grp n switch is up, then the signal continues to the Dir/Tape Snd jack as a Direct Output. If the Pre switch in Aux 1/2 is not depressed, then it is this post-fader signal that is routed there. If the Mix B switch in Aux 3/4 is not pressed, then it is this post-fader signal that is routed there.

Regardless of the above switch settings, the signal passes to the channel pan knob, which is used to route the signal to the L/Odd signal path, R/Even signal path, or both signal paths. These signal paths then go to the channel Routing Matrix (Assign) switches and to the stereo Aux 7 level control. The signal from the Aux 7 control goes to the Aux 7 L/R buses and the signal flow from the Routing Matrix switches is as follows: the L/R switch goes to the Mix L/R buses, the 1/2 switch goes to the Grp 1/2 buses, the 3/4 switch goes to the Grp 3/4 buses, the 5/6 switch goes to the Grp 5/6 buses, and the 7/8 switch goes to the Grp 7/8 buses.

The pan control determines to which bus or buses the signal is routed. The signals from the L/Odd path go to the Aux 7 L, Mix L, and Grp 1, 3, 5, 7 buses. The signals from the R/Even path go to the Aux 7 R, Mix R, and Grp 2, 4, 6, 8 buses. That is, if you pan full left, the signal goes to the left buses and odd groups and if you pan right, it goes to the right buses and even groups. If the pan control is at its

centre detent position, the signal goes to the L/R buses and Odd/Even groups equally. You can also select intermediate settings with the pan knob. You turn up the Aux 7 level knob or press the assign switches to route the signals to the appropriate buses.

At this point you have the channel input signal available as a source for the MIX B section, and it is also available at Aux 1-4 (5/6) and Aux 7, the Solo switch, the Dir/Tape Snd output jack, and the Mix L/R and Group 1-8 buses.

MIX B

MIX B has a ¼" line input jack. If you have the optional meterbridge and it's set for tape monitoring, then the signal goes from the input jack to the meterbridge input meter. It also goes to the Tape Trim knob and then the Reverse switch. If depressed, the Reverse switch can send MIX B to the channel path and the channel to the MIX B path. If you reverse the signal, the MIX B input is still monitored by the meterbridge, as described above, and controlled by the Tape Trim knob. We will assume Reverse has not been pressed.

Next, the signal goes to the MIX B Source switch. As described above, the pre-fader signal from the channel also appears here. The source switch determines if the MIX B signal is routed to the MIX B path, or if the pre-fader channel signal is routed there.

If the LF/HF EQ has been assigned to MIX B, then the signal is routed there and then to the PFL switch. Note that the EQ In/Out switch must be engaged for the EQ to function. This is where the MIX B pre-fader signal ends.

The signal is also routed to the MIX B rotary fader and the mute circuit. From this point on, it is a post-fader signal. If you press the Cut switch, the signal will be muted beyond this point. If not muted, the signal goes to the MIX B switch in Aux 3/4 (5/6). Pressing the switch makes Aux 3/4 (5/6) available to the MIX B path.

The signal continues to the MIX B pan knob and from there it goes to the MIX B L/R buses and to the stereo Aux 8 Send knob. From the knob it's routed to the Aux 8 L/R buses.

At this point you have the MIX B input signal available as a source for the MIX B section, and it is also available at Aux 3-4 (5/6) and Aux 8, the PFL switch, and the MIX B L/R buses.

Effects Returns

There are 4 stereo effects returns. The output from an effects device is usually connected to an FX L and FX R ¼" line jack. From there the signal goes to the PFL switch and to the effects return level control and balance knob. It is then sent to the effects return routing matrix (assign) switches. The balance knob works just like the channel pan knob, described above, and sends the signal to the L/Odd signal path, the R/Even signal path, or both. The Mix switch sends signals to the MIX L/R buses, the 1/2 switch to the Grp 1-2 buses, the 3/4 switch to the Grp 3-4 buses, the 5/6 switch to the Grp 5-6 buses, and the 7/8 switch to the Grp 7-8 buses. As with the channel, you press an assign switch to send the effects return signal to the appropriate Group buses or to the MIX L/R bus.

At this point the effects return signal is available to the MIX L/R buses and to the Group 1-8 buses.

2-Track

The 2-Track inputs are located to the right of the buses in the diagram, near the centre of the page. There are 2 pairs of stereo inputs. The inputs are on ¼" line jacks. You normally connect the outputs of your 2-Track recorders here, but you can connect any line level signal. The 2-Track A L/R inputs are routed directly to the 2TK A Control Room Source Select switch and the

2-Track B L/R inputs are routed directly to the 2TK B Control Room Source Select switch. You press either switch to hear its signal in the headphones/control room monitors.

Other Inputs

While not technically inputs (there are no input jacks), Ghost has some controls that send signals to the buses. They will be covered here. For our purposes, we are generally treating signals sent to the buses as inputs. In the next section (Outputs), we will trace the signal flow from the buses to Ghost's outputs.

Talkback

The TB MIC is connected to the Talkback level control, which sets the level of the signal, and then to the Talkback routing switches. There are switches for TO TAPE, TO AUX 1-2, and TO STU. When you press the TO TAPE switch, the signal from Ghost's mic passes through the Oscillator's TO TAPE switch, and if that switch is not depressed, the signal is sent to the MIX-L/R and GRP 1-8 buses. The Oscillator TO TAPE switch takes precedence over the Talkback TO TAPE switch. When you press the TO AUX 1-2 switch, the signal is sent to the AUX 1/2 buses. When you press the TO STU switch, the signal goes to a point directly after the Studio source select switches and before the Studio level control, so that the TB signal can be monitored in the Studio outputs. Note that whenever any Talkback switch is engaged, it automatically engages the DIM circuit, which is located directly after the Control Room level control. This will attenuate the level of the control room outputs.

Oscillator

The Oscillator is connected to the 1k/10k switch, which allows you to select the frequency of the oscillator. The selected frequency is then routed to the OSC LEVEL control, which sets the level of the signal, and then to the TO TAPE switch. When you press the Oscillator's TO TAPE switch, the signal from the oscillator is sent to the MIX-L/R and GRP 1-8 buses. Pressing this switch takes precedence over the TO TAPE switch in the Talkback section. This means that if both switches are pressed simultaneously, only the signal from the oscillator goes to the MIX and Group buses.

Outputs

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Groups

The block diagram only shows the outputs of Groups 1 and 2, using 1 as representative of the odd Groups and 2 as representative of the even Groups. However, the signal paths of both the odd and even Groups are the same. The only difference is the TO MIX- L or R switch in the Group Master Output section. They route the odd Groups to the Mix L bus and the even Groups to the Mix R bus. Therefore, we will discuss the odd and even Group buses together.

The Group buses are routed to the Group Insert jacks for onboard processing and then to the 100mm Group Fader. From there, the signal is sent to the L+R switch, the To MIX- L switch (for odd buses) or the To MIX- R switch (for even buses), and to the AFL switch, in the Group Master Output section. The L+R switch affects both the AFL and the Mix routing. If AFL is pressed and the L+R switch is not pressed, then the post-fader Group signal is sent to the PFL/AFL-L bus for odd groups and the PFL/AFL-R bus for even groups. If AFL is pressed and the L+R switch is pressed, then the post-fader Group signal is sent to the PFL/AFL-L+R buses. For Mix routing, for odd groups, if Mix L is pressed, the signal is sent to the Mix L bus, and if both Mix L and L+R are pressed, the signal is sent to the Mix L/R buses. For even buses, if Mix R is pressed, the signal is sent to the Mix R bus, and if both Mix R and L+R are pressed, the signal is sent to the Mix L/R buses. The signal is also sent to the Group output meters in Ghost's Master section. Then, the signal is sent to the GRP OP BUS (1-8) (more on that below) and finally to the Group Output jack. Whatever is connected to the Group Output jack will receive all the signals that have been sent to that Group bus. These jacks can be connected to the inputs of a multitrack tape machine for recording purposes. However, if you have more than 8 tracks on your recorder, you might want to connect your recorder's inputs to the channel DIR/TAPE SND jacks.

Dir/Tape Snd

These output jacks can carry either the Direct Output of the channel or function as a Group Output. You decide which by using the DIR/GRP n switch. The GRP OP BUS (1-8), mentioned above, should not be confused with the regular Group 1 through Group 8 buses. Those buses send signals to the Group Output jacks on Ghost's Master Rear Connector Panel. The GRP OP BUS (1-8) are 2 buses that carry all 8 Groups and send them to the DIR/GRP n switch. The switch is connected to the DIR/TAPE SND output jack. The post-fader channel signal is also connected to the DIR/GRP n switch. If the switch is up, then the jack is used as a Direct Output for the post-fader channel signal. If the switch is depressed, then one of the 8 Group Bus signals (from the GRP OP BUS (1-8)) is sent to the jack. The Group Bus 1 signal is only sent to the 1, 9, 17, 25 DIR/TAPE SND jacks; Group Bus 2 signal is only sent to 2, 10, 18, 26; Group Bus 3 signal is only sent to 3, 11, 19, 27, etc.

The GRP 1-8 output jacks and the DIR/TAPE SND jacks, when used as Tape Sends, carry the same signals. For instance, if you press the DIR/GRP 8 switch for channel 8, then its DIR/TAPE SND jack will output all signals that are on the Group 8 bus. The Group 8 bus signals will also be sent to the GRP 8 output jack. Or to look at it another way, if you want to use one of the DIR/TAPE SND jacks as the Group 8 output, then you can press the DIR/GRP 8 switch for either channel 8, 16, 24, or 32, and its DIR/TAPE SND jack will carry the Group 8 output. You might use this method if the DIR/TAPE SND jacks were connected to the inputs of a multitrack recorder and you wanted to send a number of signals to one track of that recorder. In this example, you would press the DIR/GRP 8 switch on the channel that matched the tape track you wanted to record on: channel 8 for track 8; channel 16 for track 16; channel 24 for track 24; or channel 32 for track 32.

Main Mix

The Mix L/R buses are sent to the MIX Left Insert and MIX Right Insert jacks, and then to the 100mm MIX Master Fader on the top panel. It is one fader that controls both the Left and Right MIX buses. From there, the signal is sent to the MIX A Control Room Source Select switch and also to the MIX Left Output and MIX Right Output jacks.

MIX B

The MIX B L/R buses are sent to the rotary MIX B Master Fader on the top panel. It is one rotary fader that controls both the Left and Right MIX B buses. From there, the signal is sent to the MIX B Control Room Source Select switch and also to the MIX B TO MIX switch in the MIX B Master section and to the MIX B Left Output and MIX B Right Output jacks. The MIX B TO MIX switch, if depressed, will combine the MIX B L/R signals with the MIX L/R signals right before the MIX Left Insert and MIX Right Insert jacks and from that point on the MIX B L/R signals will be combined with the MIX L/R signals and appear at the MIX L/R output jacks.

The MIX B L/R buses are also sent directly to the MIX B Source Select switches for Studio A and Studio B, without passing through the MIX B master fader.

Normally, the MIX B signal path is separate from the Main MIX signal path, and each has its own stereo output jacks. The Main MIX outputs are normally connected to a stereo recorder, such as a DAT deck, for mixdown purposes. If you also want to record the MIX B signals to the DAT recorder during mixdown, then you press the MIX B TO MIX switch and now all channel inputs and MIX B inputs can be recorded to DAT. The MIX B signals will also be able to use the Mix L/R Insert jacks and will pass through the MIX L/R Master Fader before appearing at the MIX L/R Output jacks. Even if the MIX B TO MIX switch is depressed, the MIX B signals will also appear at the MIX B-L/R output jacks.

Auxiliaries

The mono AUX buses 1-6 are sent to the same-numbered AUX Master level control in Ghost's Master section. They are then sent to the Master AUX AFL switch and then to the same-numbered AUX output.

The stereo AUX buses 7-L/R and 8-L/R are sent to the same-numbered AUX Master level control in Ghost's Master section. The level control is one knob that controls the L/R buses. The signal is then sent to the Master AUX AFL switch and then to the same-numbered AUX-L/R outputs.

The AUX outputs are normally connected to the inputs of outboard effects devices. The outputs of the effects devices are then connected to the effects returns or to the channel inputs. Generally, the channel AUX Sends are used to send and balance all the signals that are going to the same-numbered AUX bus, and the AUX Master level control is used to set the overall level going to the effects device.

Control Room/Headphones

This section is used to provide monitoring for the engineer (recordist) in the control room. The Headphones jack, the CRM O/P L/R jacks, and the ALT O/P L/R jacks all carry the same signals. What is heard in these outputs is determined by the Control Room Source Select switches. There are Source Select switches for MIX A, MIX B, 2 TK A, and 2 TK B. As explained previously, the appropriate buses are connected to the MIX A and MIX B switches and both pairs of 2-Track stereo input jacks are connected directly to the 2 TK switches. More than one switch can be depressed at once, and you will hear a combination of all your selections.

The combined output of the Control Room Source Select switches is sent to the Studio A and Studio B CRM Source Select switches. (Pressing the CRM switch sends the Control Room output to the Studio outputs.) The combined output is also sent to the AFL/PFL Override Circuit. Whenever any AFL/PFL switch on Ghost is pressed, it will override what you have selected with the Control Room Source Select switches, and the AFL/PFL signal will be heard in the headphones/control room monitors instead. From the Override Circuit the signal continues to the CRM/SOLO-L/R meters in Ghost's Master section. (If you have the optional meterbridge, the signal is also sent to its L/R Master meters.)

The signal continues to the CRM level control, the DIM circuit, the MONO switch, the headphones jack, and the ALT switch. The ALT switch is connected to the CRM L/R outputs and the ALT L/R outputs. The level control sets the output level, the MONO switch sums the output to mono, and the ALT switch sends the signal to the ALT L/R outputs, instead of the CRM L/R outputs. Normally you connect the CRM L/R outputs to one set of studio monitors (such as your main monitors), and you connect the ALT L/R outputs to a second set of studio monitors, such as nearfields. By using the ALT switch you can select which monitors you wish to hear. If headphones are plugged into the headphones jack, it disconnects the signal beyond that point. This means there will be no output in the CRM or ALT monitors, if headphones are plugged in. Make sure the headphones are unplugged, when you want to listen to the CRM or ALT monitors.

The DIM circuit is connected to the TALKBACK Routing switches. Whenever one of those switches is pressed, the DIM circuit dims (lowers the volume of) the signal sent to the headphones/control room monitors.

Studio

This section is used to provide monitoring for the musicians in the studio (performing space). Ghost has two stereo Studio outputs, called Studio A and Studio B/Phones. They are identical, except that the Studio A outputs are ground compensated and the Studio B outputs are unbalanced and suitable for driving headphones, with the proper cable. Normally, you connect one set of outputs to a headphone amp in the studio or directly to a set of headphones. The other Studio outputs are connected to a power amp/monitor setup in the studio.

What is heard in these outputs is determined by the Studio Source Select switches. There are Source Select switches for AUX 1-2, MIX B, and CRM. As explained previously, the appropriate buses are connected to the AUX 1-2 and MIX B switches and the output of the Control Room Source Select switches is sent to the CRM switch. More than one switch can be depressed at once, and you will hear a combination of all your selections.

The combined output of the Studio Source Select switches is sent to the Studio level control and then to the Studio AFL switch and the Studio Output L/R jacks.

Overview of Main Signal Paths

As a summary, below is an overview of Ghost's main signal paths, without the explanations.

Inputs

Channels: Signal Connections

MIC I/P to 48V switch to LINE switch.

LINE I/P to LINE switch.

LINE switch to PHASE switch to Input Sensitivity knob to LCF switch.

LCF switch to SIGNAL DETECT LED and PEAK DETECT LED.

LCF switch to REV switch.

REV switch (UP) to Channel INSERT JACK.

Channel INSERT JACK to optional meterbridge INPUT METER (if channel input monitoring is selected).

Channel INSERT JACK to EQ MIX B switch to LF/HF EQ to LMF/HMF EQ to EQ IN switch.

LF/HF EQ to PEAK DETECT LED.

LMF/HMF EQ to PEAK DETECT LED.

EQ IN switch to SOLO switch.

EQ IN switch to AUX 1-2 PRE switch.

EQ IN switch to MIX B SOURCE switch.

EQ IN switch to Channel FADER to Channel CUT switch.

Channel CUT switch to DIR/GRP n switch to DIR/TAPE SND jack.

Channel CUT switch to PEAK DETECT LED.

Channel CUT switch to AUX 1-2 PRE switch.

Channel CUT switch to AUX 3-4 MIX B switch.

Channel CUT switch to Channel PAN POT.

Channel PAN POT to AUX 7 stereo SEND knob.

Channel PAN POT to Channel ROUTING MATRIX switches (L-R, 1-2, 3-4, 5-6, 7-8).

Bus Connections

CUT switch to SOLO CUT bus and CPU MUTE BUS A.

SOLO switch to SOLO DETECT bus and PFL/AFL L/R bus.

DIR/GRP n switch to GRP OP BUS (1-8).

ROUTING MATRIX switches:

L-R to MIX L/R bus.

1-2 to GRP 1/2 bus.

3-4 to GRP 3/4 bus.

5-6 to GRP 5/6 bus.

7-8 to GRP 7/8 bus.

MIX B: Signal Connections

MIX B/TAPE RET jack to optional meterbridge INPUT METER (if tape input monitoring is selected).

MIX B/TAPE RET jack to TAPE TRIM knob to REV switch.

REV switch (UP) to MIX B SOURCE switch to EQ MIX B switch.

EQ MIX B switch to MIX B PFL switch.

EQ MIX B switch to MIX B FADER to MIX B CUT switch.

MIX B CUT switch to AUX 3-4 MIX B switch.

MIX B CUT switch to MIX B PAN POT.

MIX B PAN POT to AUX 8 stereo SEND knob.

Bus Connections

CUT switch to CPU MUTE BUS B.

PFL switch to PFL DETECT bus and PFL/AFL L/R bus.

PAN POT to MIX B L/R bus.

Auxs: Signal and Bus Connections

Pre-fader channel signal and post-fader channel signal to AUX 1-2 PRE switch to AUX 1-2 SEND knobs to AUX 1/2 buses.

Post-fader channel signal and post-fader MIX B signal to AUX 3-4 MIX B switch to AUX 3-4 SEND knobs to AUX 3-4 "5-6" switch.

AUX 3-4 "5-6" switch to AUX 3/4/5/6 buses.

Channel post-fader, post-pan signal to AUX 7 stereo SEND knob to AUX 7 L/R buses.

MIX B post-fader, post-pan signal to AUX 8 stereo SEND knob to AUX 8 L/R buses.

Effects Returns

Signal Connections

FX L/R jacks to FX PFL switch.

FX L/R jacks to FX stereo LEVEL knob to FX BALANCE knob to FX ROUTING MATRIX switches (MIX, 1-2, 3-4, 5-6, 7-8).

Bus Connections

ROUTING MATRIX switches:

MIX to MIX L/R bus.

1-2 to GRP 1/2 bus.

3-4 to GRP 3/4 bus.

5-6 to GRP 5/6 bus.

7-8 to GRP 7/8 bus.

Outputs

.....

MIX A

MIX L/R buses to MIX INSERT jacks to MIX MASTER FADER.

MIX MASTER FADER to MIX A Control Room Source Select switch.

MIX MASTER FADER to MIX L/R outputs.

MIX B

MIX B L/R buses to MIX B Studio A and B Source Select switches.

MIX B L/R buses to MIX B MASTER FADER.

MIX B MASTER FADER to MIX B Control Room Source Select switch.

MIX B MASTER FADER to "MIX B TO MIX" switch.

MIX B MASTER FADER to MIX B L/R outputs.

AUX 1-6

AUX 1-6 buses to AUX 1-6 MASTER FADERS.

AUX 1-6 MASTER FADERS to AUX 1-6 AFL switches.

AUX 1-6 MASTER FADERS to AUX 1-6 outputs.

AUX 7-8

AUX 7 L/R and AUX 8 L/R buses to AUX 7-8 stereo MASTER FADERS.

AUX 7-8 stereo MASTER FADERS to AUX 7-8 AFL switches.

AUX 7-8 stereo MASTER FADERS to AUX 7-8 L/R outputs.

GROUPS

GRP 1-8 buses to Group 1-8 INSERT jacks to Group 1-8 MASTER FADERS.

Group 1-8 MASTER FADERS to Group 1-8 AFL switches.

Group 1-8 MASTER FADERS to Group 1-8 L+R switches.

Group 1, 3, 5, 7 MASTER FADERS to Group 1, 3, 5, 7 TO MIX-L switches.

Group 2, 4, 6, 8 MASTER FADERS to Group 2, 4, 6, 8 TO MIX-R switches.

Group 1-8 MASTER FADERS to Group 1-8 OUTPUT METERS.

Group 1-8 OUTPUT METERS to GRP OP BUS (1-8).

Group 1-8 OUTPUT METERS to GRP 1-8 outputs.

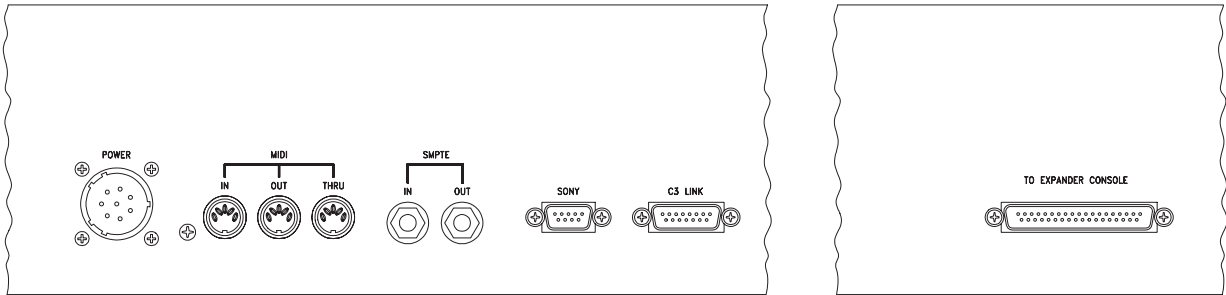
GHOST

5

Back and Rear Panel Description

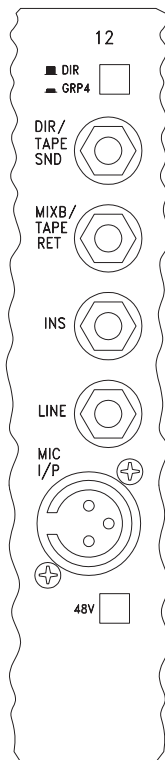
Back and Rear Panel Description

Back Panel



1. **Power Connector.** Used to connect the Power Supply Unit (PSU) to Ghost. Place the PSU away from the console, preferably in a rack. Make sure the voltage and fuse are correct for the country you will be using it in. Connect one end of the supplied PSU cable to the PSU by lining up the pins in the cable with the holes in the PSU and pushing in. Then hand-tighten the ring around the cable. Connect the other end of the cable to the power connector on back of Ghost, using the same procedure. Then attach one end of the supplied AC cable to the back of the PSU and plug the other end into a mains (AC) outlet. Use the power switch on the front of the PSU to turn Ghost's power on and off.
2. **MIDI Jacks.** (Not Ghost LE). Used to connect Ghost to a tape recorder for MIDI Machine Control (MMC) and MIDI TimeCode (MTC) or to connect Ghost to a computer MIDI sequencer via a MIDI interface.
 - A. **MIDI IN** is connected to MIDI Out of another device. You can connect it to MIDI Out of a tape recorder to provide Ghost with tallyback confirmation of the recorder's transport status and to send MTC messages to Ghost. You can also connect it to MIDI Out of a MIDI sequencer in order to send MTC, MIDI messages, such as program change and MIDI Mute data, to Ghost, and to load the contents of Ghost's snapshot memory into Ghost after you have saved it to a sequencer.
 - B. **MIDI Out** is connected to MIDI In of another device. You can connect it to MIDI In of a tape recorder in order to control the recorder's transport controls via MMC and to send MTC messages to the recorder. You can also connect it to MIDI In of a MIDI sequencer for MTC purposes; to send MIDI Mute data to the sequencer for dynamic mute automation; and to save the contents of the Ghost's snapshot memory to the sequencer.
 - C. **MIDI THRU** simply echoes whatever is plugged into Ghost's MIDI In jack. For instance, if you plug MIDI Out from a tape recorder into Ghost's MIDI In, you can then connect Ghost's MIDI Thru jack to the MIDI In of a sequencer, so that the MIDI Out of the recorder will send the same messages to Ghost and the sequencer.
3. **SMPTE IN/OUT Jacks.** (Not Ghost LE). Used to send SMPTE timecode to and from Ghost. Connect SMPTE In of Ghost to the SMPTE Out of your timecode source and connect SMPTE Out of Ghost to SMPTE In of the receiving device.
4. **SONY Jack.** (Not Ghost LE). Used to connect Ghost to a video tape recorder or other device that uses the standard Sony 9-pin protocol.
5. **C3 Link & TO EXPANDER CONSOLE Jacks.** Used to connect the optional 24-channel expander module to Ghost. Further instructions are included with the expander module.

Input Rear Connector Panel



The Input Rear Connector Panel is located directly above the channel strips, behind the optional meterbridge, if installed. This panel contains the main inputs and outputs for each channel of the console. The top and bottom of each panel is numbered with the channel number that it represents and is directly above its associated channel. For instance, if you plug a microphone into input panel 7, then you use the controls of channel strip 7 to control that signal source.

1. **48V.** When this switch is depressed it applies +48V phantom power to its associated MIC I/P. Use this switch for condenser microphones that require phantom power. Make sure this switch is in the up position for microphones, such as dynamics, that do not require phantom power.
2. **MIC I/P.** This XLR jack provides a balanced microphone input to its associated channel. Microphones and direct boxes should be connected here and will be routed to the channel, if the REV(ERSE) switch is not pressed. If the REV switch is pressed, then this input will be routed to MIX B. Regardless of the position of the REV switch, the input gain is controlled by the INPUT SENS knob on the top panel.

The XLR jack is wired as follows:

- Pin 1: Gnd
- Pin 2: Signal +
- Pin 3: Signal -

3. **LINE.** This 1/4" jack provides a balanced line level input to its associated channel. Line level inputs, such as synths and samplers, should be connected here and will be routed to the channel, if the REV switch is not pressed. If the REV switch is pressed, then this input will be routed to MIX B. Regardless of the position of the REV switch, the input gain is controlled by the INPUT SENS knob on the top panel.

Note that while you can have both the MIC I/P and LINE I/P connected at the same time, only one input will be active and pass its signal to the channel. The LINE switch on the top panel channel strip determines which of the two inputs is active.

The 1/4" jack is wired as follows:

- Tip: Signal +
- Ring: Signal -
- Sleeve: Gnd

4. **INS.** This 1/4" jack provides an unbalanced line level Insert Point for its associated channel. It is used (instead of the Aux Send/Return system) when you want to process just one channel and you want to process the entire signal (instead of having a wet/dry mix of the signal). Line level inputs and outputs, such as compressors/limiters and outboard EQ, should be connected here. The INS jack is located after the REV switch. The channel input signal will be routed to this jack, if the REV switch is not pressed. If the REV switch is pressed, then the MIX B input signal will be routed to this jack.

The jack acts as a send and return, which are normalled together. If nothing is plugged into the jack, the input signal continues uninterrupted through the Ghost's circuitry. You normally use an Insert Y-cable, readily available at most electronics stores, with this jack. This Y-cable consists of one TRS (Tip-Ring-Sleeve) 1/4" plug connected to two TS (Tip-Sleeve) 1/4" plugs. The TRS 1/4" plug should be connected to Ghost's Insert Jack, the Send 1/4" TS plug should be connected to the input of the outboard device, and the Return 1/4" TS plug should be connected to the output of the outboard device. You can also use a regular TS cable, if you want to use this jack as a line level input to the channel.

The 1/4" Insert jack is wired as follows:

Tip: Return
Ring: Send
Sleeve: Gnd

5. **MIX B/TAPE RET.** This 1/4" jack provides a balanced line level input to its associated channel's MIX B path. You normally connect the outputs of your multitrack recorder to these jacks, but any line level outputs, such as synths and samplers, can be connected here. This input will be routed to the MIX B path, if the REV switch is not pressed. If the REV switch is pressed, then this input will be routed to the channel path. Regardless of the position of the REV switch, the input gain is controlled by the TAPE TRIM knob on the top panel.

Just as the MIC I/P and LINE jacks serve as inputs for the channel path, the MIX B/TAPE RET jacks serve as the inputs for the MIX B path. The reason for the dual designation for this jack is that normally you would connect your Tape Returns (outputs of your multitrack recorder) here. However, you can connect any line level source here, such as virtual tracks from a MIDI sound module, and it will be routed to the MIX B path.

Also note that since Ghost is an in-line console, two inputs per channel can be active at the same time; one channel input (controlled by the channel strip) and the MIX B input (controlled by the MIX B controls for that channel). The LINE switch on the top panel channel strip determines which of the two channel inputs, MIC I/P or LINE, is active for the channel, while at the same time, whatever is plugged into the MIX B/TAPE RET jack is the active input for the MIX B path, if REV is not pressed.

The 1/4" jack is wired as follows:

Tip: Signal+
Ring: Signal-
Sleeve: Gnd

6. **DIR/TAPE SND.** This 1/4" jack provides either a Direct Output from its associated channel or acts as a Group Output 1-8, depending on the setting of the DIR/GRP n switch, described below. This jack should be connected to the input of another device. In a common scenario, 8 or more of these jacks would be connected to the inputs of a multitrack recorder and the outputs of that recorder would be connected to the MIX B/TAPE RET jacks of Ghost.

When used as a Direct Output (DIR/GRP n switch in the up position), the channel input (either MIC I/P or LINE) will be routed to this jack, if the REV switch is not pressed. If the REV switch is pressed, then the MIX B input will be routed to this jack. In both cases, the Direct Output is post-channel fader, post-channel mute.

Instead of a Direct Output, this jack can also be used as a Group Output, when the DIR/GRP n switch is in the down position. The "n" represents a Group number from 1 to 8, and when the switch is depressed its associated jack will carry the output of Group n. In that case, any channel that is routed to Group n will appear at this jack, in addition to appearing at the separate GRP n jack on the Master Section Rear Connector Panel.

When used as a Group Output, this jack has no relationship to its associated channel's input. The channel input will only be routed to its associated Group Output jack if it is assigned to the Group indicated by the DIR/GRP n switch for that jack and the switch is depressed. Since there are only 8 Group Buses, one reason to use this method, known as multi-busing, is if you want to record on more than 8 tracks without repatching. You could connect all 32 (or 24) DIR/TAPE SND jacks to 32 (or 24) inputs of a multi-

track recorder or 4 (or 3) digital 8-track recorders. Then, you could send any channel to any of the 32 (or 24) Group Output jacks, for recording onto 32 (or 24) tape tracks.

For instance, if you press the DIR/GRP 2 switch for channel 10, then any channel that is assigned to Group 2 will appear at channel 10's DIR/TAPE SND jack, and that jack will no longer carry the Direct Output of channel 10. More information on multi-busing and on using the DIR/TAPE SND jacks is given later in this manual.

This jack is an unbalanced output when DIRECT is selected, and ground compensated when GROUP n is selected. The 1/4" jack is wired as follows:

	DIRECT	GROUP n
Tip:	Signal	Signal
Ring:	Gnd	Gnd Sense
Sleeve:	Gnd	Gnd

7. **DIR/GRP n.** This switch determines whether its associated DIR/TAPE SND jack functions as a Direct Output from the channel fader (switch up) or carries the Group Output of GRP n (switch down). The letter "n" doesn't actually appear on the switch, but represents a number from 1 to 8, and each switch is labeled from DIR/GRP 1 to DIR/GRP 8. The GRP numbers on the switches start with GRP 1 for channel 1, are numbered sequentially to GRP 8, and then repeat. So on the 32-channel Ghost, GRP 1 appears on Channels 1, 9, 17, 25; GRP 2 appears on Channels 2, 10, 18, 26, etc. More information on using the DIR/GRP n switches and DIR/TAPE SND jacks is given later in this manual.

Following is the Group number for the DIR/GRP n switch and for the Group Output for its associated DIR/TAPE SND jack for each channel:

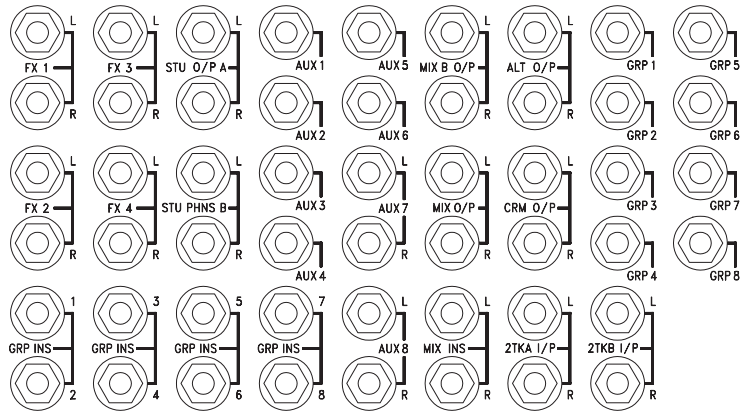
Channel	Group # for DIR/GRP n Switch and DIR/TAPE SND Jack
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1	1
2	2
3	3
4	4
5	5
6	6
7	7
8	8

Channel	Group # for DIR/GRP n Switch and DIR/TAPE SND Jack
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9	1
10	2
11	3
12	4
13	5
14	6
15	7
16	8
17	1
18	2
19	3
20	4
21	5
22	6
23	7
24	8
25	1
26	2
27	3
28	4
29	5
30	6
31	7
32	8

Master Section Rear Connector Panel



1. **TO METERBRIDGE.** This connector is used to connect the optional meterbridge to Ghost. After installing the meterbridge, insert the D-type plug from the meterbridge into this connector.

Note

All jacks on this panel are 1/4" jacks.

INPUTS

2. **FX 1 L/R – FX 4 L/R.** Ghost has 4 identical stereo effects returns, numbered 1 through 4. Generally, you will use the Aux Sends to route signals to your outboard effects devices, such as reverb and chorus, and then connect the outputs of those devices to one of the effects returns inputs. Some effects are mono in/stereo out and others are stereo in/stereo out. In either case, the stereo L/R outputs of the effects device are connected to one of these 4 L/R inputs. Mono output devices can also be used by connecting the output to either the L or R input. It doesn't matter which of the 4 effects returns you use.

Signals connected here are controlled by the same numbered FX 1 – FX 4 controls in the master section on the top panel. That is, if you return a signal to the FX 3 L/R input, it is controlled by the FX 3 controls on the top panel. You can also use these jacks as regular line inputs to the mixer, although you won't have as much control as when using the channel inputs. By using these 4 stereo inputs, together with the channel and Mix B inputs, you can have 72 inputs from a 32-channel Ghost and 56 inputs from a 24-channel Ghost, during mixdown. Note that you don't have to connect the outputs of your effects devices to these effects returns. You can connect them to the channel inputs, while recording or mixing down, or to the MIX B inputs during mixdown.

3. **2TKA I/P L/R – 2TKB I/P L/R.** These 2 pairs of stereo inputs are used to connect the outputs of 2 tape recorders or any other line level stereo devices. You'll usually connect the outputs of a DAT recorder, 2-track analog open reel or cassette deck, or a CD player here. These inputs are sent to the 2 TK A and 2 TK B switches in the CRM SRCE section on the top panel. Pressing either of those switches routes the appropriate input to the control room monitors.

OUTPUTS

4. **GRP 1 – GRP 8.** These jacks carry the outputs of group buses 1–8. You can assign the channel inputs and the 4 effects returns to any of the 8 buses in odd/even pairs. You generally use the group bus outputs for recording, by connecting them to the same-numbered inputs of a multitrack recorder. That is, GRP 1 output to tape input 1, GRP 2 output to tape input 2, etc. For example, if you want to record on tape track 4, you assign a channel input or effects return input to bus 4, pan fully right, and the signal will be routed to the GRP 4 output, which is connected to tape input 4. Note that if you have the DIR/GRP n switch depressed on the input rear connector panel, then all signals assigned to GRP n will be routed to that switch's DIR/TAPE SND jack as well as to the GRP n jack.
5. **AUX 1 – AUX 6.** These jacks carry the outputs of AUX Sends 1-6. They are generally used to send a channel or MIX B signal to the inputs of an out-board effects device for processing. The outputs of the effects device are then returned to Ghost, either via one of the 4 effects returns or via the channel or MIX B inputs, and mixed with the original, dry signal. You use the AUX 1 – AUX 6 level controls in the channel strips and the AUX 1-6 master level controls, in the master section on the top panel, to control the level of these outputs. Note that to use the AUX 5 and AUX 6 outputs, you must press the 5-6 switch on the top panel channel strip for each channel you want to route to these outputs.
6. **AUX 7 L/R – AUX 8 L/R.** These jacks carry the outputs of stereo AUX Sends 7-8. They operate in the same manner as AUX 1-6, except they work with the AUX 7 and AUX 8 controls on the top panel and their outputs are stereo.
7. **MIX O/P L/R.** These are the stereo outputs for the Main Mix (L/R) bus. They are normally connected to the stereo inputs of a mixdown deck, such as a DAT deck, 2-track open-reel deck, cassette deck, hard disk recorder, or CD-R recorder. After you have finished recording all tracks on your multitrack deck, you assign them, together with any hard disk or MIDI virtual tracks, to the L/R bus for mixdown. All channel inputs, Mix B inputs, 4 stereo effects returns, and the 8 group outputs can be assigned to the Main (L/R) Mix. The output of these jacks is controlled by the Stereo MIX master fader on the top panel.
8. **MIX B O/P L/R.** These are the stereo outputs for the Mix B bus. Mix B can be thought of as a separate 32x2 (or 24x2) mixer within Ghost. All Mix B inputs (connected via the MIX B/TAPE RET jacks) are routed here automatically, if the REV switch is not pressed. If the REV switch is pressed on a channel, then that channel's MIC or LINE input is routed here automatically. The Mix B outputs can be used to provide a separate stereo mix of your tape returns, or provide a separate pre-fader stereo mix of your channels, if the SRCE switch in the Mix B section in the channel strip is set to CHAN. You use the Mix B rotary faders in the channel strips and the Mix B master rotary fader in the master section on the top panel to control the level of these outputs.
9. **CRM O/P L/R.** These are the stereo outputs for the main control room monitors. They are connected to the power amp for those monitors. This is generally what the engineer listens to while tracking, overdubbing, and mixing down. You use the CRM SRCE buttons, in the master section on the top panel, to control what is sent to these outputs. If the MONO CHECK button is depressed in the master section, then a mono sum of the L/R control room signals will be sent to these outputs. The CRM LEVEL pot in the master section controls the level of these outputs.

The CRM/SOLO–L/R Meters on the top panel and the Master Meters on the optional meterbridge, monitor the control room signal.

The same stereo outputs also appear at the headphones jack under the front armrest. If headphones are plugged into that jack, then the control room outputs will be disconnected.

10. **ALT O/P L/R.** These are the stereo outputs for the alternate control room monitors. They are connected to the power amp for those monitors. They function identically to the CRM L/R outputs above, but cannot be used simultaneously with them. The ALT switch in the control room section on the top panel switches the control room output from the CRM L/R outputs to these outputs. For instance, you could connect your main monitors to the CRM L/R outputs above, and connect a set of nearfield monitors to the ALT L/R outputs, and then switch between them by pressing the ALT switch.
11. **HEADPHONES.** (Not pictured). The Headphones jack is located underneath the front armrest. It carries the same signal as the CRM L/R outputs. If headphones are plugged in here, the CRM Outputs (or ALT Outputs) are automatically disconnected.
12. **STU O/P A L/R.** These are the stereo outputs for the Studio A Foldback section in the master section on the top panel. The outputs are 1/4" ground compensated outputs, suitable for connection to a power amp/monitors or a headphone amp located in the studio (performing space). They are used to send a different mix than the control room mix to the performers in the studio, while tracking and overdubbing. You use the STUDIO A SRCE buttons, in the master section, to control what is sent to these outputs. The STUDIO A pot in the master section controls the level of these outputs.
13. **STU PHNS B L/R.** These are the stereo outputs for the Studio B/Phones Foldback section in the master section on the top panel. The outputs are 1/4" unbalanced outputs, suitable for connection to an amp, and are also capable of directly driving headphones, with a suitable lead (cable). Details on how to make a lead (cable) for connecting headphones to these outputs are given at the end of this chapter. These outputs are used in the same manner as the STUDIO A Outputs above. You use the STUDIO B/PHONES SRCE buttons, in the master section, to control what is sent to these outputs. The STUDIO B/PHONES pot in the master section controls the level of these outputs.

INSERTS

14. **GRP INS 1-8.** These are the INSERT POINTS for the 8 Group Outputs. They are used in the same manner as the Channel Inserts, described above, but are used to connect outboard processors to the 8 Group Outputs. This makes it easy to process a number of signals at once. For instance, if you have all of your drum inputs assigned to 2 Groups, you can process your drum mix as a whole by using the INSERT POINTS for those 2 Groups. (See 4. INS: under "Input Rear Connector Panel", above, for further details on how to connect the GRP INS 1-8 jacks.)
15. **MIX INS L/R.** These are the INSERT POINTS for the MAIN (L/R) MIX. They are used in the same manner as the Channel Inserts, described above, but are used to connect outboard processors to the MAIN (L/R) MIX. This makes it easy to process the entire MAIN (L/R) MIX during mixdown, and record the processed mix to your mixdown recorder. For instance, you could compress the MAIN (L/R) MIX as you record it to a DAT deck. (See 4. INS: under "Input Rear Connector Panel", above, for further details on how to connect the MIX INS L/R jacks.)

Master Section Rear Connector Panel – Jack Wiring

Inputs

All of the Inputs are **balanced**:

FX1 L & FX1 R
FX2 L & FX2 R
FX3 L & FX3 R
FX4 L & FX4 R
2TKA I/P L & 2TKA I/P R
2TKB I/P L & 2TKB I/P R

The connections are:

Tip Signal +
Ring Signal -
Sleeve Gnd

Insert Points

All of the Insert Points are **unbalanced**:

MIX INS L & MIX INS R
GRP1 INS
GRP2 INS
GRP3 INS
GRP4 INS
GRP5 INS
GRP6 INS
GRP7 INS
GRP8 INS

The connections are:

Tip Return
Ring Send
Sleeve Gnd

Outputs

The following outputs are all **ground compensated**:

STU O/P A L & STU O/P A R
AUX 1
AUX 2
AUX 3
AUX 4
AUX 5
AUX 6
AUX 7 L & AUX 7 R
AUX 8 L & AUX 8 R
MIX B O/P L & MIX B O/P R
MIX O/P L & MIX O/P R
GRP 1
GRP 2
GRP 3
GRP 4
GRP 5
GRP 6
GRP 7
GRP 8

The connections are:

Tip Signal +
Ring Gnd Sense
Sleeve Gnd

The following outputs are all **unbalanced**:

ALT O/P L & ALT O/P R
CRM O/P L & CRM O/P R
STU PHNS B L & STU PHNS B R

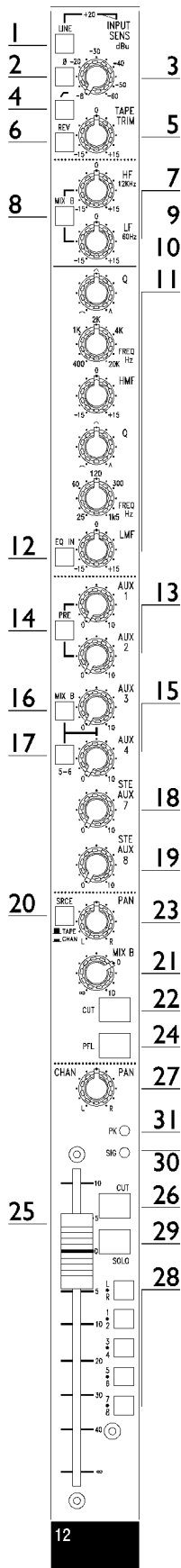
The connections are:

Tip Signal +
Ring Not Used
Sleeve Gnd

GHOST

6

Functional Description



The Mono Input Module

The Mono Input Module, also known as the Channel Strip, is the vertical arrangement of controls on the top surface of Ghost. There is one module for each channel, and the channel number appears below the channel fader. Channels are numbered left to right, with channel 1 on the far left. The Master section of Ghost is between channels 16 and 17.

All channel strips are identical, so if you learn how to operate one strip, you can operate all of them. All channel strips are mono and they are used to process your channel inputs and Mix B inputs. The input/output jacks for the channel strips appear on the Input Rear Connector (Rearcon) Panel. You use the same-numbered channel strip to control the rearcon panel inputs. For instance, if you plug a microphone into MIC I/P 7, then you use channel strip 7 to control it.

When there is only one label on Ghost's surface appearing next to a switch, it indicates the function of the switch when it is depressed. Following is a functional description of the Channel Strip.

Input Section

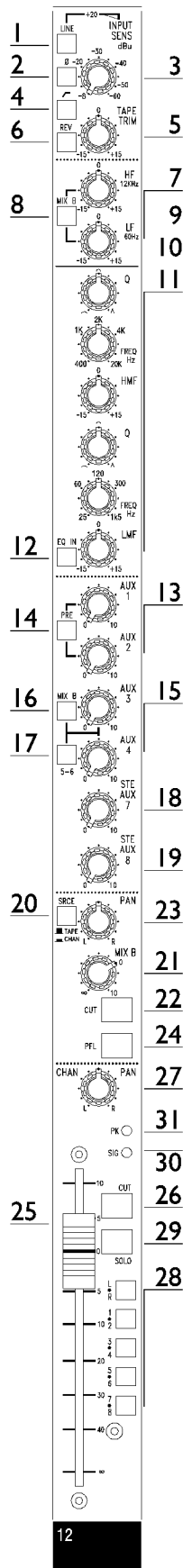
Channel Input

1. **LINE switch:** This is the MIC/LINE switch for the channel input. When the switch is up, the input to the channel is via the XLR MIC I/P jack on the rearcon panel. If the **LINE** switch is depressed, the input will be via the 1/4" LINE jack on the rearcon panel, and +20dBu will be added to the input sensitivity knob. Both of these inputs are balanced. You can have both a MIC and a LINE input connected to a channel at the same time, but only one input can be active at a time. You use the LINE switch to determine which input is active.
2. **φ switch:** This is the **PHASE SWITCH**. When depressed, it reverses the phase of whichever channel input is selected by the LINE switch. This means you can reverse the phase of either the MIC I/P or the LINE input. Technically, you are reversing the polarity of the inputs, but through convention the term "phase reverse" has been used to describe this switch.

This switch should normally be in the up position. Do not depress this switch unless you have a reason to reverse the phase of your inputs. You might want to reverse the phase of an input if its plug has been incorrectly wired. The XLR Mic inputs on Ghost are wired with pin 2 "hot", meaning that Ghost expects a positive signal on pin 2. If your XLR Mic cables are wired with pin 3 "hot", then you might want to reverse the phase of the input. Another reason to reverse the phase is during M/S (Mid/Side) recording. That technique requires that you reverse the phase of one of the Mic inputs. If you know about M/S recording, then you'll know why and when you should reverse the phase.

Both the XLR Mic cables and 1/4" Line cables that are used to connect your sources to Ghost will have positive (+), negative (-), and ground wires connected to their plugs. When the PHASE SWITCH is in the up position, the inputs are unaffected. When the PHASE SWITCH is depressed, you reverse the phase of your inputs. This means you are reversing the positive (+) and negative (-) circuits of the input. It's as if the positive wire was connected to the negative part of the input jack and the negative wire was connected to the positive part of the input jack.

The chart on the next page shows the difference between the input signals when the PHASE SWITCH is not engaged and when it is engaged:



PHASE SWITCH UP

MIC I/P:

Pin 1	Gnd
Pin 2	Signal +
Pin 3	Signal -

LINE I/P:

Tip	Signal +
Ring	Signal -
Sleeve	Gnd

PHASE SWITCH DOWN

MIC I/P:

Pin 1	Gnd
Pin 2	Signal -
Pin 3	Signal +

LINE I/P:

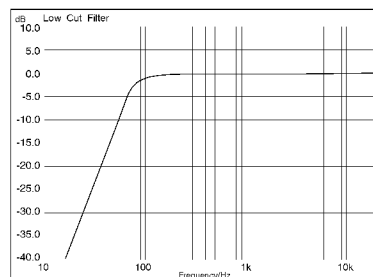
Tip	Signal -
Ring	Signal +
Sleeve	Gnd

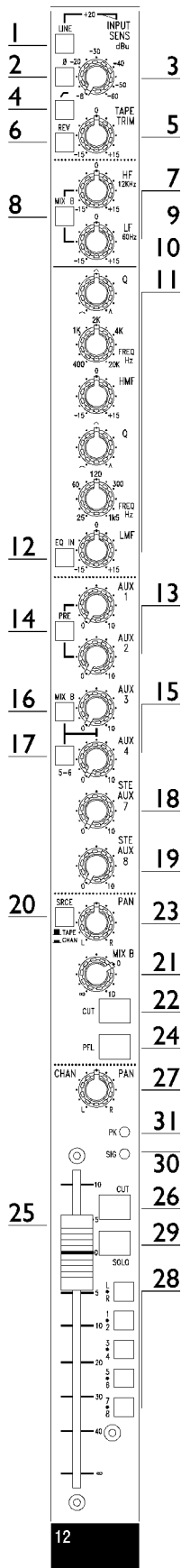
- INPUT SENS knob:** The **Input Sensitivity** knob controls the gain of the channel preamp. It affects both the MIC I/P and the LINE I/P. It has a 52dBu range. For the MIC I/P, the sensitivity range for 0VU output is from -8dBu to -60dBu. For the LINE I/P, the sensitivity range for 0VU output is from +12dBu to -40dBu. Note that +20dBu is added to the range when the LINE switch is depressed.

Note that the legend around the knob does **not** represent the amount of gain added to the input signal. It represents the level of the input signal needed at that marking to attain a 0VU output. That is, for a MIC I/P, if the knob is in the -8dBu position, then a mic signal of -8dBu will produce a 0VU output. If the knob is in the -60dBu position, then a mic signal of -60dBu will produce a 0VU output. When the knob is fully left, the least amount of gain is added to the input signal. When the knob is fully right, the most amount of gain is added to the input signal.

If you have the optional meterbridge and are monitoring channel inputs, you should adjust the gain so that with an input signal present, the meter reads 0. If you don't have the meterbridge, or it's set to monitor Mix B inputs, then first press the SOLO button near the channel fader on the channel strip. Make sure SIP is off. The signal will now appear on the CRM/SOLO-L/R meters on the top panel of Ghost. Then adjust the knob so the channel input signal reads 0dB on the CRM/SOLO-L/R meters. Then press the SOLO button again to disengage it. The Peak LED in the fader section of the channel strip should light up only occasionally, if at all, and the Signal Present LED should be brightly lit. Once the gain has been set properly, further adjustments should be made by the channel faders and not by the Input Sensitivity knob.

- ∩ switch:** This is the **Low-Cut Filter** switch. When depressed, the switch engages the 100Hz Low-Cut Filter (LCF). The filter attenuates (lowers) the frequencies below 100Hz. It affects both the MIC I/P and LINE I/P. Normally the switch should be in the up position. Depress the switch if you want to get rid of unwanted bass frequencies, such as 50/60 cycle hum, air conditioning noise, or room rumble.





MIX B (Tape) Input

5. **TAPE TRIM knob:** The Tape Input Trim control allows a gain adjustment of +/-15dB to the Mix B input. The Mix B Input is via the MIX B/TAPE RET jack on the rearcon panel. This input is balanced. When the knob is fully left, the gain is reduced by 15dB. When the knob is fully right, the gain is increased by 15dB. At the centre detent position, the level of the input signal is unaltered. Although Ghost is shipped with the Mix B inputs set for +4dBu input levels, you can use -10dBV levels, if you increase the gain with this knob.

If you have the optional meterbridge and are monitoring tape inputs, the inputs are monitored before the Tape Trim knob. This means the knob will not affect the meter reading. To adjust the Tape Trim, with or without the meterbridge, first press the PFL button in the Mix B section of the channel strip. The signal will now appear on the CRM/SOLO-L/R meters on the top panel of Ghost. Then adjust the knob so the Mix B input signal reads 0dB on the CRM/SOLO-L/R meters. Then press the PFL button again to disengage it. Once the gain has been set properly, further adjustments should be made by the Mix B rotary fader pot and not by the Tape Input Trim knob.

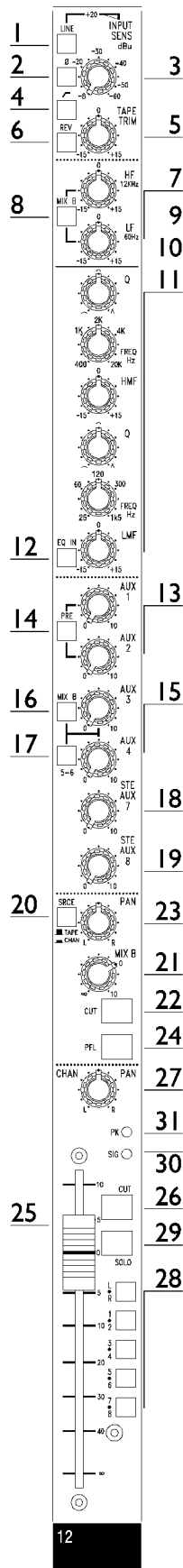
6. **REV switch:** This is the **REVERSE** switch and it should normally be in the up position. When the switch is up, the Mic or Line inputs are routed to the channel path and are controlled by the main channel strip, and the Mix B (Tape Ret) inputs are routed to the Mix B path and are controlled by the Mix B section in the channel strip. When you depress this switch, you reverse the routing of the channel inputs and Mix B inputs; that is, the Mic or Line inputs are routed to the Mix B path and are controlled by the Mix B section in the channel strip, and the Mix B (Tape Ret) inputs are routed to the channel path and are controlled by the main channel strip.

The REV switch comes after the Low-cut filter in the channel path and after the Tape Trim knob in the Mix B path. This means that whether or not the REV switch is pressed, the Phantom Power switch, Mic/Line switch, Phase Reverse switch, Input Sensitivity pot, and LCF will always affect the Mic or Line inputs, and the Tape Trim pot will always affect the Mix B/TAPE RET inputs. If the REV switch is pressed, it is after the above controls that the channel input will follow the Mix B path (and be affected by the Mix B controls) and the Mix B input will follow the channel path (and be affected by the channel controls). For instance, if REV is pressed, then the EQ section will affect the Mix B input and not the channel input, unless the MIX B button in the HF/LF EQ section is pressed, in which case, the HF/LF EQ will now affect the channel input and not the Mix B input.

Generally, you'll keep the REV switch up and connect your input sources to the channel inputs and connect your tape outputs and MIDI virtual tracks to the Mix B inputs, while tracking and overdubbing. This allows you to record from the channel inputs and use Mix B to monitor your tape tracks and MIDI tracks. Then, you'll depress the REV switch during mixdown. This will route your recorded tape tracks and MIDI tracks to the channels, where you'll have more control over them during mixdown, yet the channel inputs will still be available to you, if needed, and they will be controlled by the Mix B section.

Insert Point

The Channel Insert point, which is accessed via the INS jack on the rearcon panel, is located after the REV switch and before the EQ section. If REV is up, then it acts as an insert point for the channel input. If REV is pressed, then it acts as an insert point for the Mix B input.



Equaliser

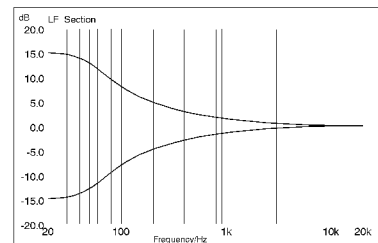
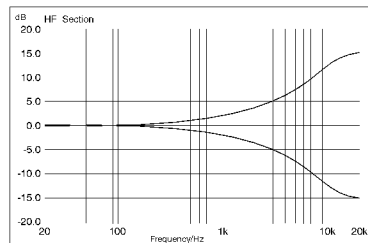
The Equaliser (EQ) in the channel strip consists of two separate sections: a shelving **HF/LF** (High Frequency/Low Frequency) section and a fully-parametric **HMF/LMF** (High Mid-Frequency/Low Mid-Frequency) section. It is used to alter selected frequencies of the signals it processes. Note that the **HF/LF** EQ can be used by either the channel path or the Mix B path, whereas the **HMF/LMF** EQ can only be used by the channel path.

HF/LF EQ

- HF/LF knobs:** These knobs determine how much the fixed frequency is boosted (raised) or cut (lowered) and they are normally centred. The **HF** control operates at 12kHz and the **LF** control operates at 60Hz. Both bands are shelving EQ. Their respective controls give 15dB of boost or cut. If the knob is at the centre detent, then no boost/cut is applied to the signal. If the knob is full left, then the signal is cut by 15dB. If the knob is full right, then the signal is boosted by 15dB. Setting the knob between centre and full left/right will give you values between 0db-15dB boost/cut.

Shelving EQ affects not only the fixed frequency (12kHz or 60Hz), but also the frequencies above and below those frequencies in a gradual manner. One way to think of it is that the HF EQ affects all frequencies at and above 12kHz and the LF EQ affects all frequencies at and below 60Hz. The HF control can be used to add brightness to the sound, when boosted, or to reduce harshness or sibilance, when cut. The LF control can be used to add fullness to the bottom end, when boosted, or to reduce room rumble and 60 cycle hum (from AC lines), when cut.

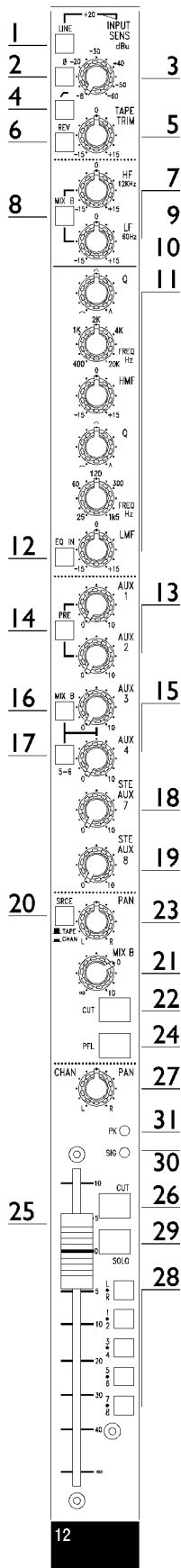
- MIX B switch:** This switch makes the **HF/LF** EQ available to the Mix B path. When the switch is in the up position, the two-band **HF/LF** section is in the channel path and will affect only the channel input. It can be switched into the **MIX B** path by depressing the MIX B switch, in which case the **HF/LF** EQ will only affect the Mix B path and will no longer be available to the channel path. (Note that the **EQ IN** switch must be depressed in order for the **HF/LF** EQ to operate on either path.)



HMF/LMF EQ

The two fully-parametric mid bands each have boost/cut (marked **HMF** and **LMF**), centre **FRE**quency, and **Q** pots. Parametric EQ is a peaking type EQ, and works differently than shelving EQ. With shelving EQ, you just decide how much to boost/cut the fixed frequency, and the boost/cut gradually takes place before and after the fixed frequency, and results in a response graph that looks like a shelf, hence the name. With parametric EQ, you select the centre frequency, then the **Q**, and then you decide how much to boost/cut that frequency. In addition, the boost/cut is centred around the frequency you select, resulting in a peak/dip response graph.

The **HMF/LMF** EQ is only available to the channel path and cannot be used by the Mix B path. If the **MIX B** switch in the **HF/LF** EQ section above is not engaged, then all 4 bands of the **HF/LF** EQ and the **HMF/LMF** EQ will be available to the channel path and no EQ will be available to the Mix B path. If the **MIX B** switch above is depressed, then the 2-band **HF/LF** EQ will be available to the Mix B path only and the 2-band **HMF/LMF** EQ will be available to the channel path only.



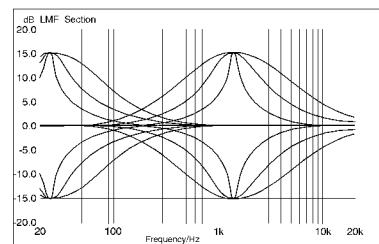
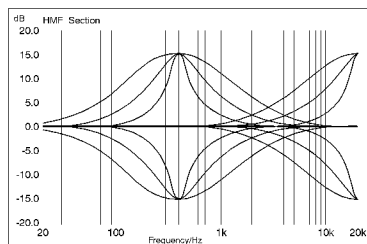
9. **HMF/LMF knobs:** These knobs determine how much the selected frequency is boosted (raised) or cut (lowered) and they are normally centred. The controls give 15dB of boost or cut. If the knob is at the centre detent, then no boost/cut is applied to the signal. If the knob is full left, then the signal is cut by 15dB. If the knob is full right, then the signal is boosted by 15dB. Setting the knob between centre and full left/right will give you values between 0db-15dB boost/cut.

10. **HMF/LMF FREQ knobs:** These knobs select the centre frequency for each EQ band. The centre frequency of the HMF band sweeps from 400Hz to 20kHz, and the centre frequency for the LMF section is adjustable between 25Hz and 1.5kHz. Together, the 2 bands virtually cover the entire audible spectrum from 25Hz to 20kHz, with an overlapping region between 400Hz and 1.5kHz. The frequency you select with this control is the centre frequency that is boosted or cut by using the **HMF/LMF** controls above. The range of frequencies, to the left and right of the centre frequency, which will be affected by the boost/cut is determined by the **Q** knobs.

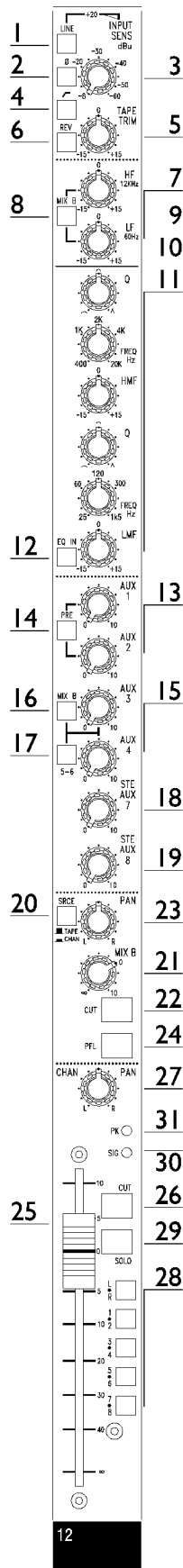
11. **HMF/LMF Q knobs:** These knobs select the Q for each EQ band. Q determines the range of frequencies around the centre frequency that will be affected. The Q of both bands is variable between 0.7 and 6.0. When a Q control is turned fully counterclockwise to its minimum value, the filter's "notch" is wide; i.e., it has an effect on a wide range of frequencies. When the control is turned fully clockwise to its maximum value, the filter's "notch" is narrow; i.e., it has an effect on a narrow range of frequencies.

You generally use a wide notch (control to left of centre), for a more musical EQ and for broad tonal shaping. You generally use a narrow notch (control to right of centre), for a more surgical use of the EQ; for instance, when you want to apply the EQ for corrective measures to only a narrow range of frequencies, such as just one instrument on a track that contains other instruments. (Note that these are just general guidelines for the use of the Q controls.)

Assume you select 400Hz as the centre frequency of the HMF band and boost it by 15dB. If you set the Q control fully clockwise, then it will predominantly affect the centre frequency (400Hz) and have less of an effect on the adjacent frequencies. So, 200Hz and 800Hz would be boosted by about 2.5dB; 300Hz and 600Hz would be boosted by about 7.5dB; and 400Hz would be boosted by 15dB. If you set the Q control fully counterclockwise, then it will have more of an effect on the adjacent frequencies. So, 40Hz and 4kHz would be boosted by about 2.5dB; 100Hz and 1.5kHz would be boosted by about 7.5dB; and 400Hz would be boosted by 15dB.



12. **EQ IN switch:** The **EQ IN** switch turns the Equaliser on and off simultaneously for both the **HF/LF** section and the **HMF/LMF** section. When the switch is in the up position, the EQ is bypassed for both sections. When the switch is depressed, it turns on the EQ for both sections. This switch is useful to bypass the EQ electronics when the EQ is not being used on a particular input or to compare the equalised sound with the unequalised sound, when you are using the EQ.



One method for using the **HMF/LMF** EQ is to first determine which EQ band you want to use. Then, set the level in that band to +15dB (full boost). Next, set the Q fully clockwise (narrow band). Finally, sweep the centre frequency control until you find the frequency you are trying to alter. Then, reset the Q and level to achieve the desired result. Remember that the **EQ IN** switch must be depressed in order for the EQ to have any effect on the sound.

Notes

- a) Keep in mind that when the **Low-Cut Filter** in the channel strip is engaged, it affects all frequencies below 100Hz.
- b) When the **EQ IN** switch is up (EQ is bypassed), although the signal is not affected by the EQ, the outputs of the EQ are still routed to the Peak LED on the channel strip. This means that the EQ settings will be reflected in the Peak LED, although the EQ settings will have no effect on the sound. So even in EQ bypass mode, if you boost an EQ band, the Peak LED may come on, even though there will be no change in the sound.
- c) If the **REV** switch on the channel strip is depressed, then the Mix B input follows the channel path and has all 4 bands of EQ available to it. The channel input follows the Mix B path and will not have the **HMF/LMF** EQ available to it, but can use the **HF/LF** EQ, if the **MIX B** switch in the **HF/LF** section is depressed.

Auxiliary Sends

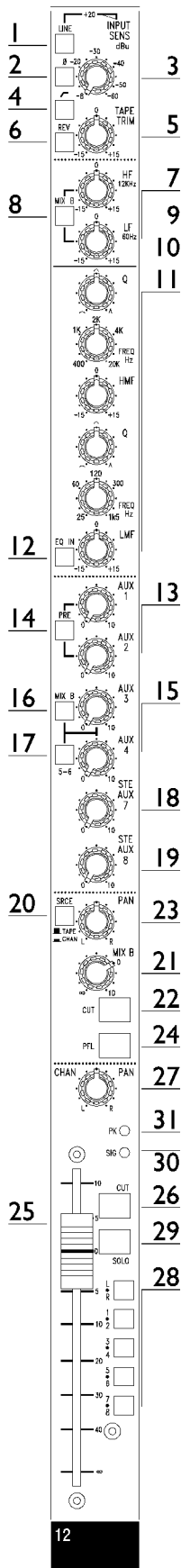
The Auxiliary Sends (AUX Sends) section consists of 6 knobs and 3 switches. A total of 10 AUX buses are provided: six mono sends (four usable at once, per channel) and two stereo sends. The AUX Sends are generally used to add out-board effects to the channel and Mix B inputs. AUX 1/AUX 2 can also be used for studio monitoring purposes.

Note that all the knobs in this section are level controls. They determine the level of the signal sent to the same-numbered AUX bus. When turned fully counter-clockwise, no signal is sent to the bus. When turned fully clockwise, the maximum signal is sent to the bus. The Stereo AUXs use one knob to send signals to their L/R buses. For instance, you turn up the AUX 2 Send knob to send a signal to the AUX 2 bus and you turn up the STE AUX 7 knob to send a signal to the AUX 7-L/R buses. (Note that the same-numbered AUX master fader pot, in the master section, must also be turned up to send signals to the AUX output jacks.)

Post-fader sends are normally used for effects and pre-fader sends are normally used for monitoring. If an AUX Send is pre-fader, then a signal can be sent to the AUX bus, even if the channel fader is off. If an AUX Send is post-fader, then the channel fader or Mix B fader will have an effect on the level of the signal sent to the AUX bus. With post-fader AUX Sends, no signal will be sent to the AUX bus, if the channel or Mix B fader is off, even if the AUX Send is turned up all the way. All post-fader sends are also post-mute, meaning that no signal will be sent to the AUX bus, if the CUT switch is engaged. All pre-fader sends are also post-EQ, meaning that any EQ settings will affect the signal sent to the AUX bus.

Further details on how to use the AUX system are given later in this manual. Following is a description of the AUX Sends controls.

- 13. AUX 1/AUX 2 knobs:** These are the **AUX 1/AUX 2** level controls. They are mono sends available to the channel path only. They are normally post-fader sends, but can be switched to pre-fader sends with the **PRE** switch below.
- 14. PRE switch:** This switch allows you to change **AUX 1/AUX 2** from post-fader sends to pre-fader sends. When in the up position, **AUX 1/AUX 2** are post-fader sends. When this switch is depressed, **AUX 1/AUX 2** are switched as a pair to pre-fader sends.



15. **AUX 3/AUX 4 knobs:** These are the **AUX 3/AUX 4** level controls. They are mono sends available to both the channel path and MIX B path, but not to both simultaneously. They are always post-fader sends and are normally sourced from the channel path, but can be switched into the **MIX B** path, as a pair, with the MIX B switch below. They are also used to send signals to the AUX 5/6 buses, when the **5-6** switch, below, is depressed.

16. **MIX B switch:** This switch allows you to use the **AUX 3/AUX 4** sends with the MIX B path. When in the up position, **AUX 3/AUX 4** are available to the channel path only. When this switch is depressed, **AUX 3/AUX 4** are switched as a pair, to be sourced from the MIX B path only.

17. **5-6 switch:** This switch allows you to use the **AUX 3/AUX 4** knobs to send signals to the **AUX 5/AUX 6** buses. When in the up position, the **AUX 3/AUX 4** knobs function normally, and send their signals to the **AUX 3/AUX 4** buses, respectively. When this switch is depressed, the **AUX 3/AUX 4** knobs send their signals to the **AUX 5/AUX 6** buses, respectively. Note that when the switch is depressed, the signals only appear at the **AUX 5/AUX 6** buses and do not simultaneously appear at the **AUX 3/AUX 4** buses.

This switch allows you to connect Ghost to 6 mono in effects processors (by using AUX outputs 1 to 6) and have the option of using 4 of them at once for each channel. That is, you can use AUXs 1-4 for one channel (if the 5-6 switch is not engaged) and AUXs 1-2 and AUXs 5-6 for another channel (if the 5-6 switch is depressed).

The signal chain for the mono sends is in the following order, from left to right:

Signal ⇒ EQ ⇒ Pre-fader AUX ⇒ Fader ⇒ Cut ⇒ Post-fader AUX ⇒ AUX bus

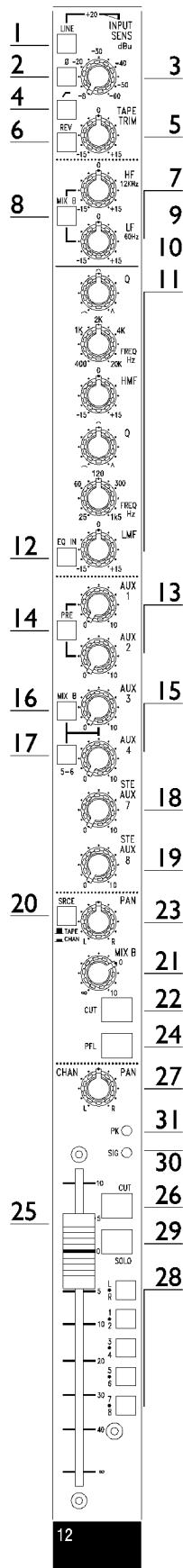
18. **STE AUX 7 knob:** This is the **AUX 7** level control. It is a stereo send available to the channel path only. It is always a post-fader send and is sourced post-pan from the channel path. This knob sets the level for both the **AUX 7-L/AUX 7-R** buses and the channel pan control sets the placement.

19. **STE AUX 8 knob:** This is the **AUX 8** level control. It is a stereo send available to the MIX B path only. It is always a post-fader send and is sourced post-pan from the MIX B path. This knob sets the level for both the **AUX 8-L/AUX 8-R** buses and the MIX B pan control sets the placement.

The signal chain for the stereo sends is in the following order, from left to right:

Signal ⇒ EQ ⇒ Fader ⇒ Cut ⇒ Pan ⇒ Post-fader STE AUX ⇒ AUX L+R buses

To sum up, Ghost has 6 mono sends, 4 of them usable at once, per channel. Two of those sends are only available to the channel path and can be either pre-fader or post-fader. The other 4 mono sends are post-fader only and 2 at a time per channel can be used, as a pair, by either the channel path or MIX B path. The Ghost has 2 stereo sends, both post-fader, with one dedicated to the channel path and the other dedicated to the MIX B path.



The following chart shows the features of each AUX Send:

AUX #	Mono/Stereo	Pre/Post-Fader	Channel/MIX B
1	Mono	Both *	Channel
2	Mono	Both *	Channel
3	Mono	Post-Fader	Both **
4	Mono	Post-Fader	Both **
5	Mono	Post-Fader	Both **
6	Mono	Post-Fader	Both **
7	Stereo	Post-Fader	Channel
8	Stereo	Post-Fader	MIX B

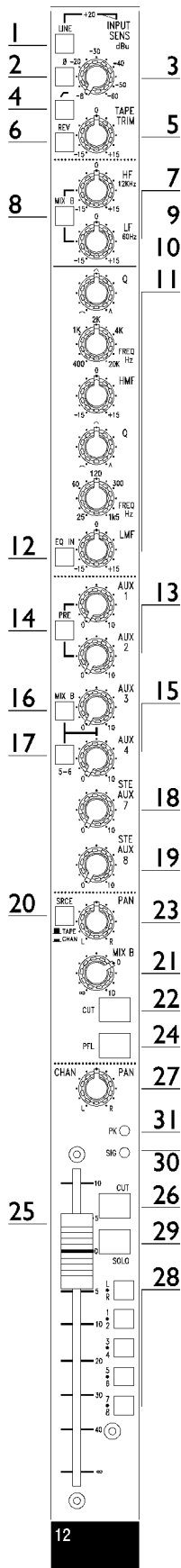
Notes:

* AUX 1/2 switchable as a pair to Pre/Post-fader.

** AUX 3/4 switchable as a pair to AUX 5/6. AUX 3/4 or AUX 5/6 switchable as a pair to Channel or MIX B.

The following chart shows the various combinations of AUX Sends that are available to the Channel and MIX B paths simultaneously:

If these AUX Sends are used with the	Then these AUX Sends are available to
Channel	MIX B
4 mono post-fader sends;	1 stereo post-fader send
1 stereo post-fader send	
2 mono pre-fader sends;	1 stereo post-fader send
2 mono post-fader sends;	
1 stereo post-fader send	
Channel	MIX B
2 mono post-fader sends;	2 mono post-fader sends
1 stereo post-fader send	1 stereo post-fader send
2 mono pre-fader sends;	2 mono post-fader sends
1 stereo post-fader send	1 stereo post-fader send



Mix B Output

The MIX B section of the channel strip is located below the AUX Sends section and consists of 2 knobs and 3 switches. It normally controls the signal connected to the MIX B/TAPE RET jack on the rearcon panel. If the REV switch on the channel strip is depressed, then this section controls the signal connected to either the MIC I/P or LINE input jacks on the rearcon panel.

20. **SRCE switch:** This is the **SOURCE** switch for the MIX B input. When the switch is up, then the **TAPES** Return input is the source. When the switch is depressed, then the **CHANNEL** input is the source. When **TAPES** is the source, this section controls the signal connected to the MIX B/TAPE RET jack on the rearcon panel. This is the more common way to use Ghost and allows it to function as an inline mixer, with 2 inputs per channel available simultaneously (Channel and MIX B). When **CHANNEL** is the source, then the MIX B section derives its signal from the post-EQ, pre-fader point in the channel path. In effect, the MIX B section will function as a stereo pre-fader send for the channel.

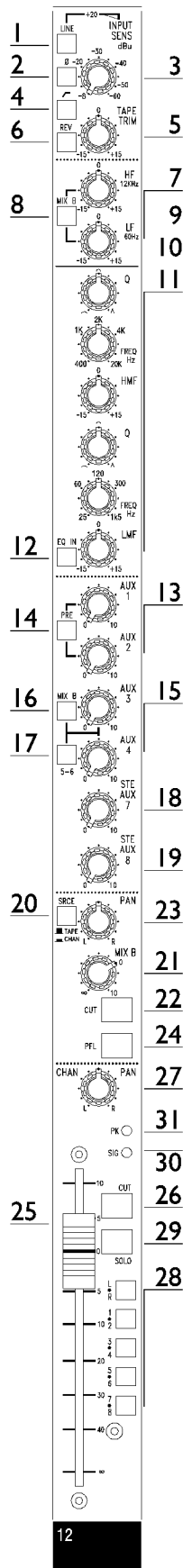
Remember that when the **REV** switch is depressed, all controls (after the input section) are reversed, so that whatever controls normally apply to the channel input, now apply to the MIX B input, and vice versa. For instance, when **REV** is depressed, if you engage the **MIX B** switch in the **AUX 3/4** section, it will make **AUX 3/4** available to the channel and not to MIX B. Also, the **SRCE** switch is reversed, so that selecting **TAPES** actually selects the channel input, and selecting **CHAN** actually selects the TAPES RET input as the source for the MIX B section.

There are two primary uses for the SRCE switch. First, to provide a stereo pre-fader send from the channel, when the MIX B/TAPE RET input is not being used. Without this switch, the MIX B section would go unused if nothing was plugged into the MIX B/TAPE RET jack. With this switch, the MIX B section can be used with the channel input.

For example, let's say you have 24 tape tracks and a 24-channel Ghost console. You would normally connect the 24 tape outputs to the 24 MIX B/TAPE RET inputs of Ghost. You would then connect your microphones and line level sources to Ghost's MIC I/P and LINE input jacks. With the SRCE switch in the TAPES position, the channel fader would control the MIC or LINE input and the MIX B fader would control the TAPES RET input.

However, if you have a 32-channel Ghost and only 16 tape tracks, or any other arrangement whereby you don't need to use up all of the MIX B/TAPE RET inputs of Ghost, it could result in some channels that have their MIC I/P or LINE inputs being used, and their MIX B/TAPE RET jacks going unused. Without the SRCE switch, the MIX B section would also go unused. Instead, you simply depress the SRCE switch on the channels that are not using the MIX B/TAPE RET jacks and the MIX B section will be sourced from (derive its input from) the post-EQ, pre-fader point in the channel path. The normal channel path is unaffected and the channel fader will still control the channel output, as before. However, the MIX B section can now be used as a stereo pre-fader send for the channel path. This can be used to create a stereo mix of the channels that is independent of the mix controlled by the channel faders. You can then use the channel faders to create a mix for a multitrack recorder and use the MIX B rotary faders to create a separate stereo DAT mix of the channel inputs, or for any other purpose that requires a separate stereo mix of the channels.

The secondary primary use of the SRCE switch is for control room monitoring purposes, while overdubbing. Note that the AUX Sends section does not contain any pre-fader sends for MIX B. When you wish to monitor previously recorded tape tracks, while overdubbing, you press the REV switch and the SRCE switch on the channels that contain the tape tracks



you wish to monitor. This will result in the tape tracks being routed to both the channel path and the MIX B path. Then, you can use AUX 1/2 in pre-fader mode to send a mix of the tape tracks to the musicians in the studio and you can use the MIX B section, as a stereo pre-fader send, to send a separate mix of the tape tracks to the control room. Complete details on multitrack monitoring are given elsewhere in this manual.

Following is a chart that shows which inputs the Channel fader and MIX B fader will control for various combinations of the REV switch and the SRC switch:

REVERSE	SOURCE	CHANNEL Fader	MIX B Fader
Off	Tape	Channel	Tape
Off	Channel	Channel	Channel (pre-fader send)
On	Tape	Tape	Channel
On	Channel Tape	Tape (pre-fader send)	

21. **MIX B knob:** This is the **MIX B** rotary fader for the MIX B path. Full left is the minimum setting and full right is the maximum setting. It is an output level control with 10dB of gain at its maximum setting. Nominal level is at its $\frac{3}{4}$ setting, at the large dot corresponding to 7. It controls the output level of the Mix B signal, which is sent to the MIX B pan pot.

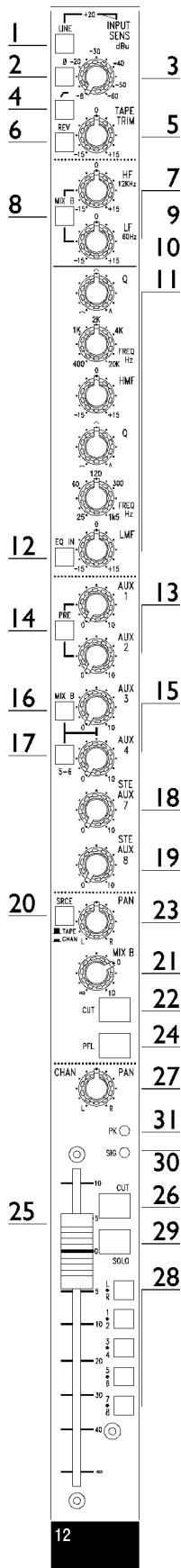
22. **CUT switch:** This is the **CUT** (MUTE) switch for the MIX B signal and it contains an internal red LED to show its status. This switch does not stay down when pressed. Instead, the switch's LED illuminates when the mute circuit is engaged and goes out when it is not engaged. Pressing this switch toggles the mute circuit on and off. You may activate the CUT switches on any number of MIX B sections simultaneously.

The **CUT** switch is used to mute the output of MIX B. Mix B's post-fader signal is routed to a mute circuit. When **CUT** is not engaged, the signal passes to the MIX B pan control. When engaged, the MIX B signal is muted and no sound will be output past the mute circuit. The **CUT** switch may be activated manually, by pressing the **CUT** switch, or automatically, by Ghost's automation system (**not Ghost LE**). In either case, the **CUT** switch's internal LED will illuminate.

23. **PAN knob:** This is the MIX B **PAN** pot (panoramic potentiometer). The post-mute signal is routed to this pot. It controls the stereo image of MIX B and feeds the MIX B L/R buses and AUX 8 level control (#19, above). When the pot is at the centre detent position, the MIX B signal will be sent equally to the MIX B L/R buses. When the pot is full left, the MIX B signal will only be sent to the MIX B Left bus. When the pot is full right, the MIX B signal will only be sent to the MIX B Right bus. Intermediate settings will result in the MIX B signal appearing in various degrees in both of the MIX B L/R buses.

24. **PFL switch:** This is the **PRE-FADER-LISTEN (PFL)** switch for the MIX B signal and it contains an internal yellow LED to show its status. This switch does stay down when pressed and the switch's LED illuminates when **PFL** is engaged (down) and goes out when it is not engaged (up).

The PFL switch is used to solo (listen to by itself) the MIX B signal through the headphones/control room speakers. You might want to do this if, for instance, you hear a buzz or hum in the mix and are trying to determine which MIX B signal is causing it or if you want a meter display of a MIX B signal. You may activate the PFL switches on any number of MIX B sections simultaneously.

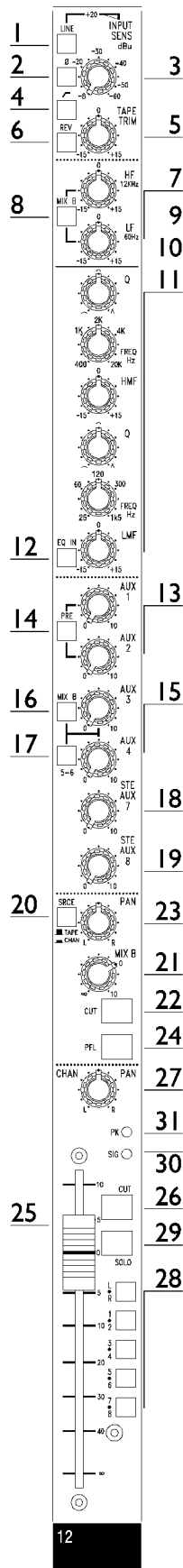


When PFL is not engaged, the headphones/control room speakers will carry whatever signals are selected with the CRM SRCE switches. When engaged, the PFL switch routes the pre-fader MIX B signal to the PFL/AFL L/R buses and activates the PFL/AFL override to the headphones/control room speakers. This means that the sources selected with the **CRM SRCE** switches will be muted, and in their place you will hear all of the MIX B signals that have their **PFL** switches engaged, through the headphones/control room speakers. The PFL signals will also be displayed on the **CRM/SOLO-L/R** meters and on the master L/R meters of the optional meterbridge.

Main Mix Output

- 25. **CHANNEL FADER:** This is the 100mm **CHANNEL FADER** for the Channel **MIC I/P** or **LINE** input. Fully down is the minimum setting and fully up is the maximum setting. It is an output level control with 10dB of gain at its maximum setting. Nominal level is at its $\frac{3}{4}$ setting, indicated by the marking next to the fader. It controls the output level of the Channel signal, which is sent to the Channel pan pot. Below the Channel Faders is a scribble strip with the Channel number. You can use this section to label your Channel inputs.
- 26. **CUT switch:** This is the **CUT (MUTE)** switch for the Channel signal and it contains an internal red LED to show its status. This switch does not stay down when pressed. Instead, the switch's LED illuminates when the mute circuit is engaged and goes out when it is not engaged. Pressing this switch toggles the mute circuit on and off. You may activate the **CUT** switches on any number of channels simultaneously.

The **CUT** switch is used to mute the output of the Channel signal. The Channel's post-fader signal is routed to a mute circuit. When **CUT** is not engaged, the signal passes to the Channel pan control. When engaged, the Channel signal is muted and no sound will be output past the mute circuit. The **CUT** switch may be activated manually, by pressing the **CUT** switch, or automatically, either by the Solo-In-Place system (to be discussed later) or by Ghost's automation system (**not Ghost LE**). In each case, the **CUT** switch's internal LED will illuminate.
- 27. **CHAN PAN knob:** This is the Channel **PAN** pot (panoramic potentiometer). The post-mute signal is routed to this pot. It controls the stereo image of the Channel signal. The signal from the Channel **PAN** pot is sent to the **ROUTING MATRIX SWITCHES** (#28, below) and to the **AUX 7** level control (#18, above). When the pot is at the centre detent position, the Channel signal will be sent equally to the MAIN MIX L/R buses and to both odd and even Group buses. When the pot is full left, the Channel signal will only be sent to the MAIN MIX Left bus and to all odd-numbered Group buses. When the pot is full right, the Channel signal will only be sent to the MAIN MIX Right bus and to all even-numbered Group buses. Intermediate settings will result in the Channel signal appearing in various degrees in both of the MAIN MIX L/R buses and in both odd and even Group buses.
- 28. **L/R - 1/2 - 3/4 - 5/6 - 7/8 ROUTING MATRIX switches:** These are the Assign switches for the Channel. When depressed, they allow you to route the stereo signal from the Channel pan pot to the Main Mix L/R buses, and to Groups 1/2, 3/4, 5/6, and 7/8. The left signal goes to the Main Mix **Left** bus and to odd-numbered groups and the right signal goes to the Main Mix **Right** bus and to even-numbered groups. Any number of switches may be depressed at once. Groups can only be assigned in odd/even pairs, with the Channel pan pot determining if the signal goes to the odd bus, the even bus, or both buses. For instance, if you press the 3/4 switch and pan left, the signal goes to Group 3; pan right, and it goes to Group 4; pan centre, and it goes to both Groups 3 and 4.



29. **SOLO switch:** This is the **SOLO** switch for the Channel signal and it contains an internal yellow LED to show its status. This switch does stay down when pressed and the switch's LED illuminates when **SOLO** is engaged (down) and goes out when it is not engaged (up).

The SOLO switch can function in one of two ways. It can function as a PFL switch, just like the one in the MIX B section, or it can function as a Solo-In-Place switch. You determine the function of the SOLO switch with the SIP switch located in Ghost's master section. When SIP is off, the Channel SOLO switch functions as a PFL switch. When SIP is on, the Channel SOLO switch functions as a Solo-In-Place switch.

When SOLO is used as a PFL switch: (SIP is Off)

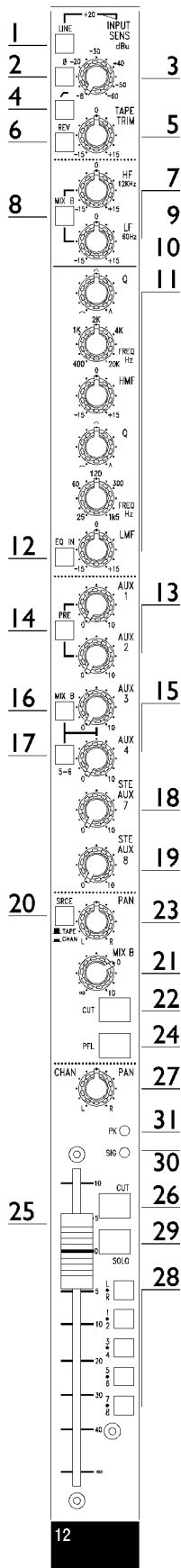
When the **SIP** switch is off, the Channel **SOLO** switch functions as a **PFL** switch and is used to solo (listen to by itself) the Channel signal through the headphones/control room speakers. You might want to do this if, for instance, you hear a buzz or hum in the mix and are trying to determine which Channel signal is causing it or if you want a meter display of a Channel signal. You may activate the **SOLO** switches on any number of Channels simultaneously. When **SOLO** is not engaged, the headphones/control room speakers will carry whatever signals are selected with the **CRM SRCE** switches. When engaged, the **SOLO** switch routes the pre-fader Channel signal to the PFL/AFL L/R buses and activates the PFL/AFL override to the headphones/control room speakers. This means that the sources selected with the **CRM SRCE** switches will be muted, and in their place you will hear all of the Channel signals that have their **SOLO** switches engaged, through the headphones/control room speakers. The **SOLO** signals will also be displayed on the CRM/SOLO-L/R meters and on the master L/R meters of the optional meterbridge.

When SOLO is used as a Solo-In-Place switch: (SIP is On)

When the **SIP** switch is on, the Channel **SOLO** switch functions as a **Solo-In-Place** switch and is used to monitor a Channel signal, either by itself or with other Channels, with its stereo placement and effects intact. (Contrast this with the **PFL** method where signals lose their stereo placement and effects are not heard.) You may activate the **SOLO** switches on any number of Channels simultaneously. When **SOLO** is not engaged, you will monitor all the Channels in the usual manner. When engaged, the **SOLO** switch mutes all other Channels that do not have their **SOLO** switches engaged, so you just hear the soloed Channel by itself. It's as if you manually pressed the CUT switches on all the other Channels. The SOLO signals will **not** display on the **CRM/SOLO-L/R** meters or on the master L/R meters of the optional meterbridge. One use of **Solo-In-Place** is to solo all of your drum tracks, so that you can hear them by themselves, but with their stereo placement and effects intact.

30. **SIG LED:** This is the Signal Present LED for the Channel. The **SIG** LED monitors the Channel signal at the output of the Low-Cut-Filter. It starts to glow at approximately -20dB below nominal level and glows brighter as the signal level increases. Its purpose is to let you know if you are receiving a strong enough signal from the MIC I/P or LINE input jacks past the point of the Low-cut filter and the relative strength of that signal.

For instance, if you have a source connected to the LINE Input of a Channel and the **SIG** LED does not illuminate at all, it might be because you have the MIC/LINE switch in the MIC position or the Input Sensitivity control is set too low. Note that the SIG LED comes before the **REV** switch, so it always reflects the status of the Channel MIC I/P or LINE Input, even if the **REV** switch is engaged.



31. **PK LED:** This is the **PEAK** LED for the Channel. Its purpose is to inform you if the Channel signal is approaching distortion. Ghost has a **PEAK** detector circuit that monitors the Channel signal in the following 4 places: the output of the **LOW-CUT FILTER**, the output of the **HF/LF EQ**, the output of the **HMF/LMF EQ**, and the output of the **POST-FADER/POST-MUTE SIGNAL**. The **PK LED** illuminates when any of the 4 signals are 6dB below clipping.

Note that the output of the **LOW-CUT FILTER** is before the **REV** switch, so it can cause the **PK LED** to illuminate, even if the **REV** switch is engaged. Also note that the **PK LED** can be used by either the Channel or **MIX B** paths. This means that the **PK LED** does not necessarily monitor just the Channel path. Depending on the status of the **REV** switch, the **MIX B SRCE** switch, and the **HF/LF EQ MIX B** switch, the **PK LED** can illuminate when either the Channel path or **MIX B** path is approaching clipping.

Optional Meterbridge Input Meters

The input meters in the optional meterbridge can monitor either the **MIX B/TAPE RET** Inputs (before the **TAPE TRIM**) or the Channel Inputs (after the Channel Insert Point). The factory default is **MIX B/TAPE RET** Input monitoring, but can be changed to Channel Input monitoring via internal jumper **JP1** on Ghost's internal Printed Circuit Boards (PCBs). (See the **INSTALLATION** chapter for further details.)

Output and Master Section

Output Section

Overview: The Output Section is used to set the master output levels of Ghost's various outputs. It consists of the Group Outputs, the MAIN MIX Output, the MIX B Output, and the Auxiliary Outputs. They all work in the same fashion. They derive their inputs from the appropriate buses and use faders (either 100mm faders or rotary knobs) to control the level of the buses sent to the appropriate output jacks. Further details are given below.

Group Outputs

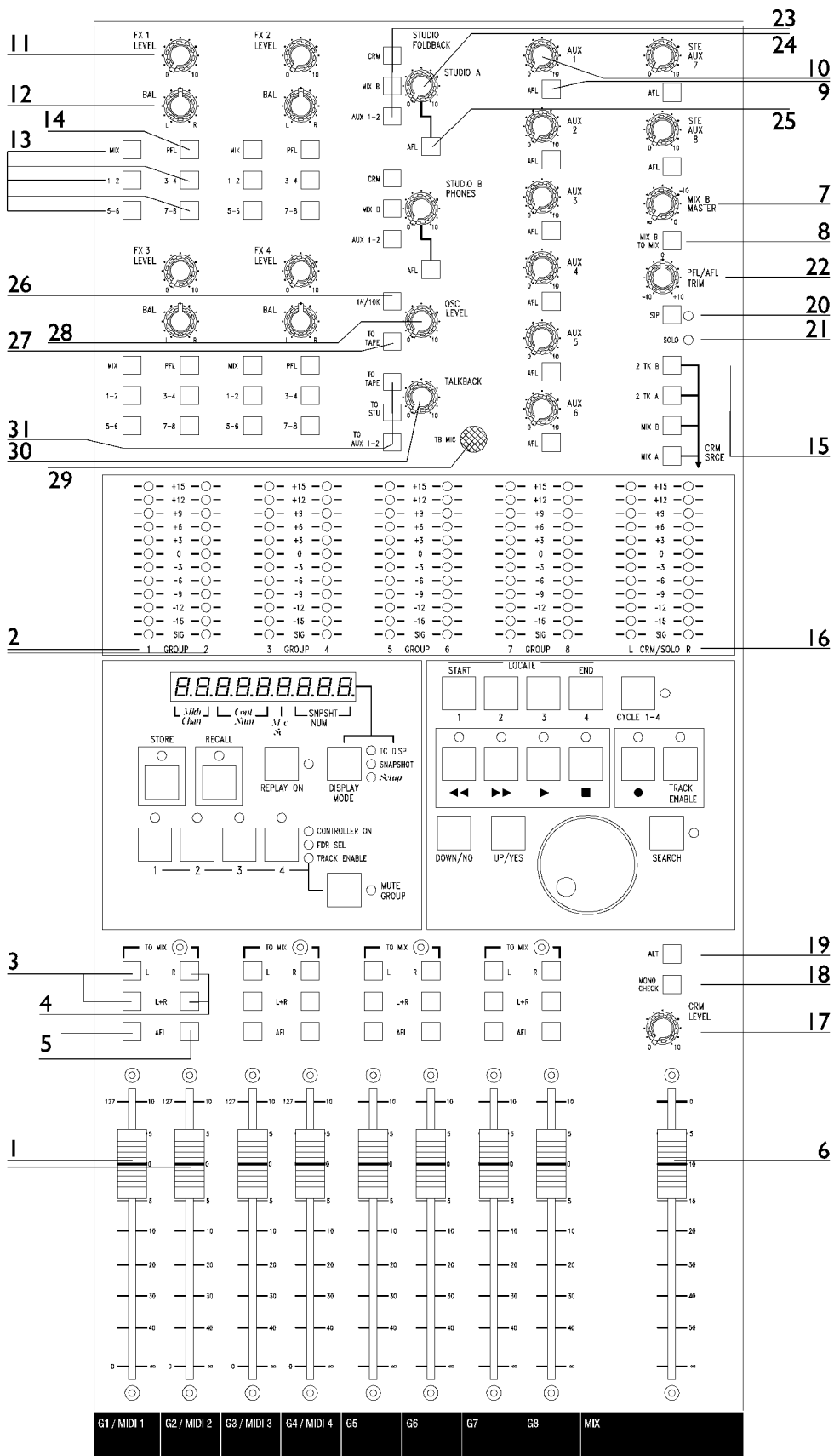
The Group Outputs section is located below the 8 Group meters and consists of eight 100mm faders, 24 switches, 8 meters, and 8 output jacks. (Note that the DIR/TAPE SND jacks on the input modules can also be used as Group outputs.) You use this section when sending channel inputs and FX Return inputs to a multi-track deck for recording. Another use is to assign similar tape or MIDI sources (such as drum tracks) to 1 or 2 Groups, for recording on a 2-track deck during mixdown. You assign the appropriate Groups to the L/R MIX bus and then control the output of the similar sources with the Group Faders.

There are 8 Group Outputs via 1/4" jacks on the Master Section Rear Connector Panel (rearcon panel). Each jack carries the output of its respective Group bus. The Outputs are Ground Compensated and are jumper-selectable between +4dBu and -10dBV. (See the **INSTALLATION** chapter for details.) Changing the jumper selection also affects the output of the DIR/TAPE SND jacks on the input modules, when the DIR/GRP n switch is depressed and those jacks are carrying the group output.

Note

The controls for Groups 1-8 are similar, except that Group Faders 1-4 also double as MIDI controllers and are connected to the CPU. (Not on Ghost LE.) Note that these 4 faders have a legend on their left, indicating MIDI Continuous Controller values of 0 and 127. See the **CPU Application Guide** for further details.

Each Group Output has an **Insert Point**, labeled **GRP INS n**, where n is a Group number from 1 to 8. Connections are made via a 1/4" TRS jack located on the rearcon panel. You use a Send/Return Y-cable with a TRS (Tip-Ring-Sleeve) plug on the Insert end and TS (Tip-Sleeve) plugs on the Y-ends. The TRS plug is connected to the Insert jack and the TS Send/Return plugs are connected to the input and output of the outboard device, respectively. The Insert Send and Insert Return signals are both unbalanced.



Group Outputs

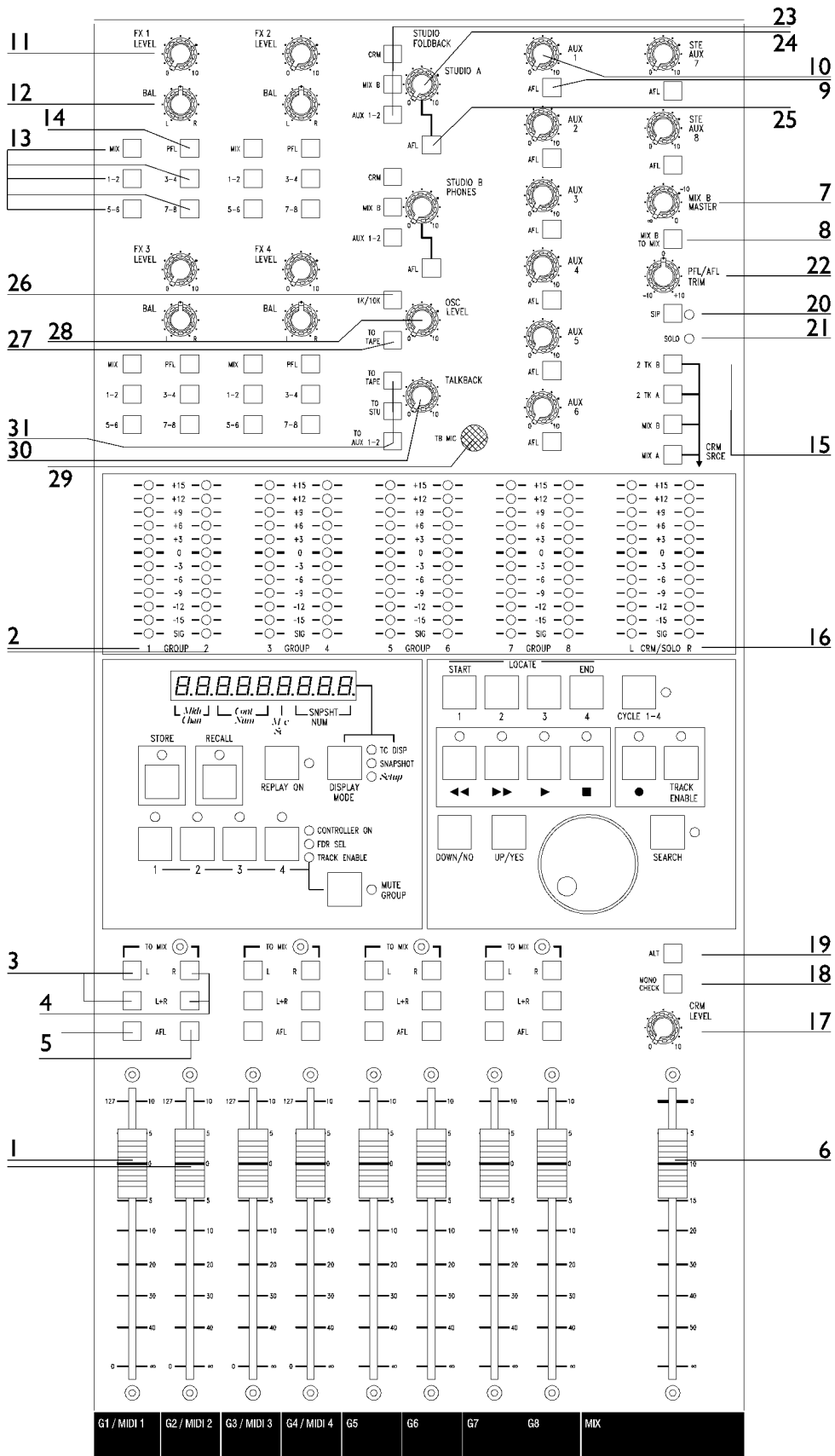
1. **G1 – G8 Group Master Faders:** These faders control the level of the signal fed from each respective Group bus to each respective Group Output. For example, if a signal is assigned to the Group 3 bus, then you use the Group 3 Master Fader to control the signal level at the GRP 3 output jack. They are grouped in stereo pairs. Unity gain (Input=Output) is at the 0 marking 3/4 of the way up and each fader has +10dB of gain at the top of its travel. There is a scribble strip below each fader with the Group number. It can be used to label the Groups.
2. **Group Output Meters 1 - 8:** These meters monitor their respective Group Output signals. They come after the Group Master Faders and reflect the setting of those faders.

During tracking and overdubbing, you can use the Group Master Faders with the Group outputs to record to a multitrack deck. At times, you may want to assign the Groups to the MAIN MIX; for example, when mixing down. The Group post-fader signals may be fed to the MAIN MIX L/R buses as follows:

3. **TO MIX- L switches & L+R switches:** The **L** switch appears for odd-numbered Groups only. When the **L** switch alone is depressed, its respective post-fader Group signal is routed to the Left MAIN MIX bus. If both the **L** switch and its associated **L+R** switch are depressed, the Group signal is routed to both the Left and Right MAIN MIX buses. Pressing the **L+R** switch by itself has no effect on routing to the MAIN MIX.
4. **TO MIX- R switches & L+R switches:** The **R** switch appears for even-numbered Groups only. When the **R** switch alone is depressed, its respective post-fader Group signal is routed to the Right MAIN MIX bus. If both the **R** switch and its associated **L+R** switch are depressed, the Group signal is routed to both the Left and Right MAIN MIX buses. Pressing the **L+R** switch by itself has no effect on routing to the MAIN MIX.
5. **G1 - G8 AFL switches:** Pressing this switch for odd-numbered Groups routes the respective post-fader Group signal to the PFL/AFL Left bus, and to both the Left and Right PFL/AFL buses, if the **L+R** switch is also depressed. Pressing this switch for even-numbered Groups routes the respective post-fader Group signal to the PFL/AFL Right bus, and to both the Left and Right PFL/AFL buses, if the **L+R** switch is also depressed. It then activates the PFL/AFL override and sends the signals from the PFL/AFL bus to the headphones and control room speakers. This means that if you press the AFL switch, and its **L+R** switch is not depressed, you will hear the post-fader Group signal in the left or right headphone/control room speaker, only. If the AFL switch and its **L+R** switch is depressed, you will hear the signal in both the left and right headphones/control room speakers.

Main Mix Output

The MAIN MIX Output section is located to the right of the Group Faders and consists of one stereo Master Fader and a set of stereo output jacks. The Mix Left and Mix Right Outputs are Ground Compensated. Connections are via two 1/4" jacks on the rearcon panel, labeled MIX O/P-L/R. You normally connect these outputs to the inputs of a 2-track mixdown recorder, such as a DAT deck. During mixdown, you assign all your tape/hard disk tracks and virtual MIDI tracks to these outputs for recording your final stereo mix onto the 2-track. This mix is known alternately as the MAIN MIX, the L/R MIX, the MAIN L/R MIX, L/R, MIX, and MIX A.



6. **Stereo MIX Master Fader:** This fader controls the output level of the signal fed from the MIX-L and MIX-R buses to the Main Stereo Mix output jacks. This stereo fader controls the output level of both the L/R buses simultaneously, allowing for easier fades, than that provided by having to use 2 separate master faders. The MIX scribble strip below the fader can be used to label the MAIN MIX.

Mix B Output

The MIX B output section is located in the upper right area of the Master section. It consists of one rotary pot, one switch, and a set of 1/4" stereo output jacks on the rearcon panel, labeled MIX B O/P-L/R. These Outputs are Ground Compensated.

The MIX B bus derives its signals from the MIX B (Tape) section of Ghost and the MIX B Output section controls the output level of that bus. All MIX B sources are automatically assigned to the MIX B bus and no switch assignment is necessary.

You can route the MIX B bus to the Studio or Control Room for monitoring purposes and to the MAIN MIX L/R bus during mixdown (its typical uses). This bus is also automatically routed to the MIX B O/P-L/R jacks. You usually use these jacks when using the Channel MIX B sections as pre-fader sends for the channel path (MIX B SRCE switch in CHAN position).

7. **MIX B MASTER level pot:** This rotary pot controls the output level of the MIX B L & R buses. However, when monitoring MIX B through the Studio outputs, the MIX B bus is sent pre-MIX B master level pot, so the pot doesn't affect the Studio level. The MIX B bus is sent post-fader to the control room monitors, the MAIN MIX bus (when the switch below is pressed), and the MIX B OP-L/R jacks.
8. **MIX B TO MIX switch:** This switch routes the post-MIX B master fader signal to the MAIN MIX L/R busses. The MIX B signal is sent to the MAIN MIX busses before the MAIN MIX Insert point and MAIN MIX L/R master fader. You use this switch to double the number of inputs available to you during mixdown.

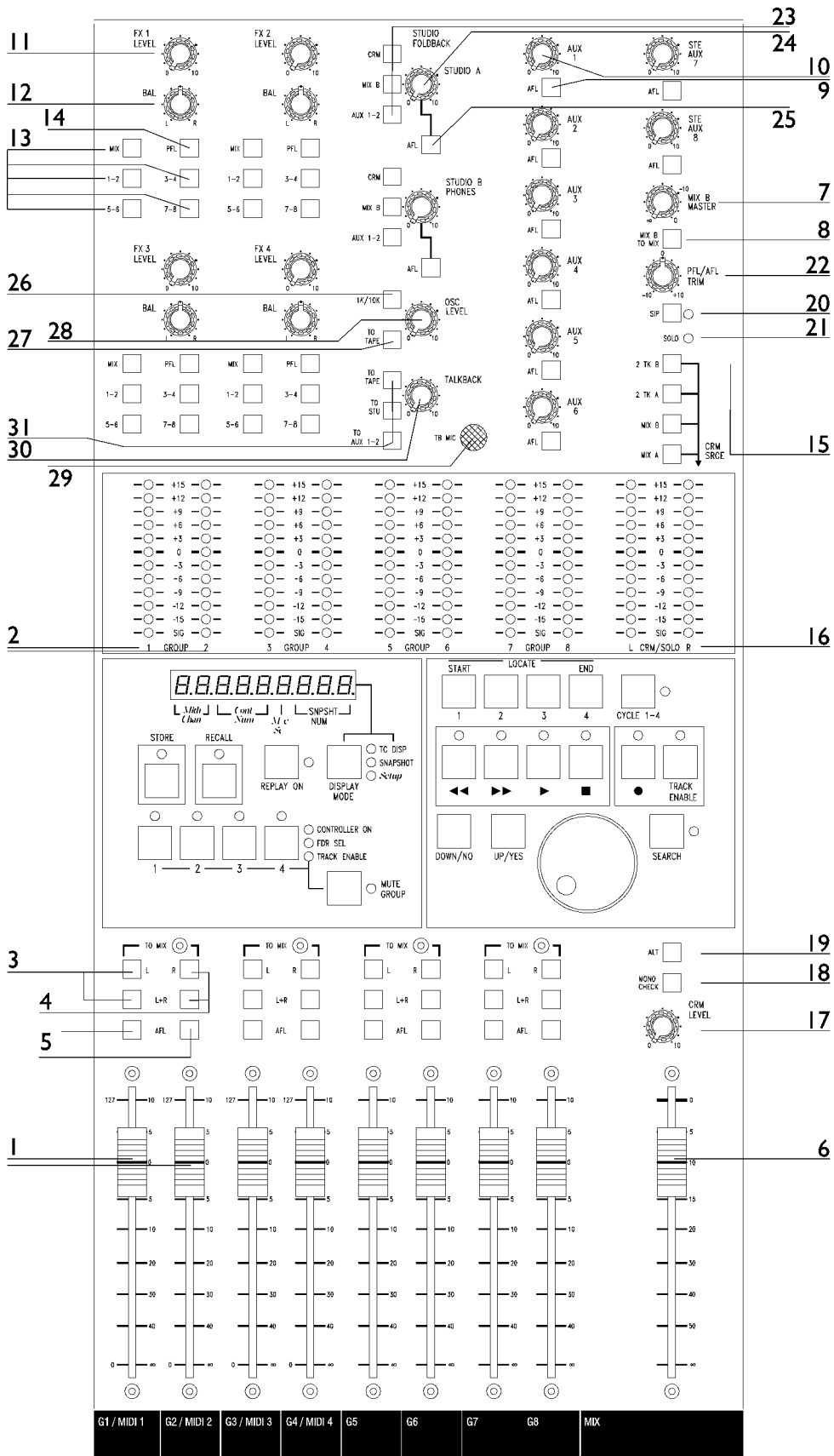
Typically, at mixdown you reverse the channel inputs so that the tape returns follow the channel path and the channel inputs follow the MIX B path. The tape returns are assigned to the MAIN MIX L/R bus using the channel assignment L/R switches. You globally assign the MIX B sections to the MAIN MIX L/R buses by depressing this switch. This will allow you to send 2 inputs per channel to a stereo mixdown recorder. Note that when this switch is depressed, the MIX B signal will still appear at the Studio/Control Room sections and the MIX B output jacks.

Auxiliary Outputs

The Auxiliary Outputs section is located in the top right area of the Master section. It consists of 8 knobs, 8 switches, and 10 output jacks. The 10 Auxiliary Outputs are arranged as follows: 6 mono outputs (Aux 1 to 6) and 2 stereo pairs (Aux 7 L & R, and Aux 8 L & R). The ground compensated outputs are via ten 1/4" jacks on the rearcon panel.

You send signals to the AUX buses by using the AUX Sends knobs on the channel strip. The Auxiliary Outputs section is used to control the output level of the AUX buses. For instance, if you send a signal to the AUX 2 bus with an AUX 2 Send knob, then you use the AUX 2 Master Fader pot to send the signal to the AUX 2 output jack.

The controls for AUX 1 – AUX 8 are identical, except that Aux 7 L & R, and Aux 8 L & R are each controlled by a single dual gang pot. This means that one knob controls the output of both the L and R buses.



9. **AUX 1 – AUX 8 Rotary Master Faders:** These rotary faders control the level of their respective AUX outputs. Unity gain is at the large dot corresponding to 7 on the pot. Note that when the AUX 1-2 buses are sent to the 2 Studio Foldback AUX 1-2 Source Select switches, they are sent pre-AUX 1 and pre-AUX 2 master faders and are not affected by them.
10. **AUX 1 - AUX 8 AFL switches:** These switches route their respective AUX signals, post-master fader, to the PFL/AFL L and R busses, and activate the PFL/AFL override to the headphones/control room speakers. Note that the signals from the mono AUXs (AUX 1 – AUX 6) are split and sent to the PFL/AFL L/R busses, while the signals from the stereo pair AUXs (AUX 7 and AUX 8) are routed in stereo. If you press an AFL switch, you will hear its respective AUX signal in the headphones/control room monitors and its signal will be displayed on the CRM/SOLO-L/R meters.

Master Section

Overview

The Master Section contains all the controls that are not part of the Channel strips or the Output Section. It consists of the Effects Returns, Control Room Section, PFL/AFL Section, Studio Foldback Section, Oscillator Section, and Talkback Section. Further details are given below.

Effects Returns

The Effects Returns section is located in the upper left area of the Master section. It consists of 4 Stereo FX returns, comprising 8 knobs, 24 switches, and 4 pairs of stereo jacks. Inputs are via balanced 1/4" jacks on the rearcon panel, labeled FX 1-L/R through FX 4-L/R.

The outputs of your effects devices are typically connected to these inputs. You send signals to the device with the AUX Sends knobs and then return the signals to Ghost via the FX Return inputs. You can then set the level and balance of the effects and assign them to the buses with this section.

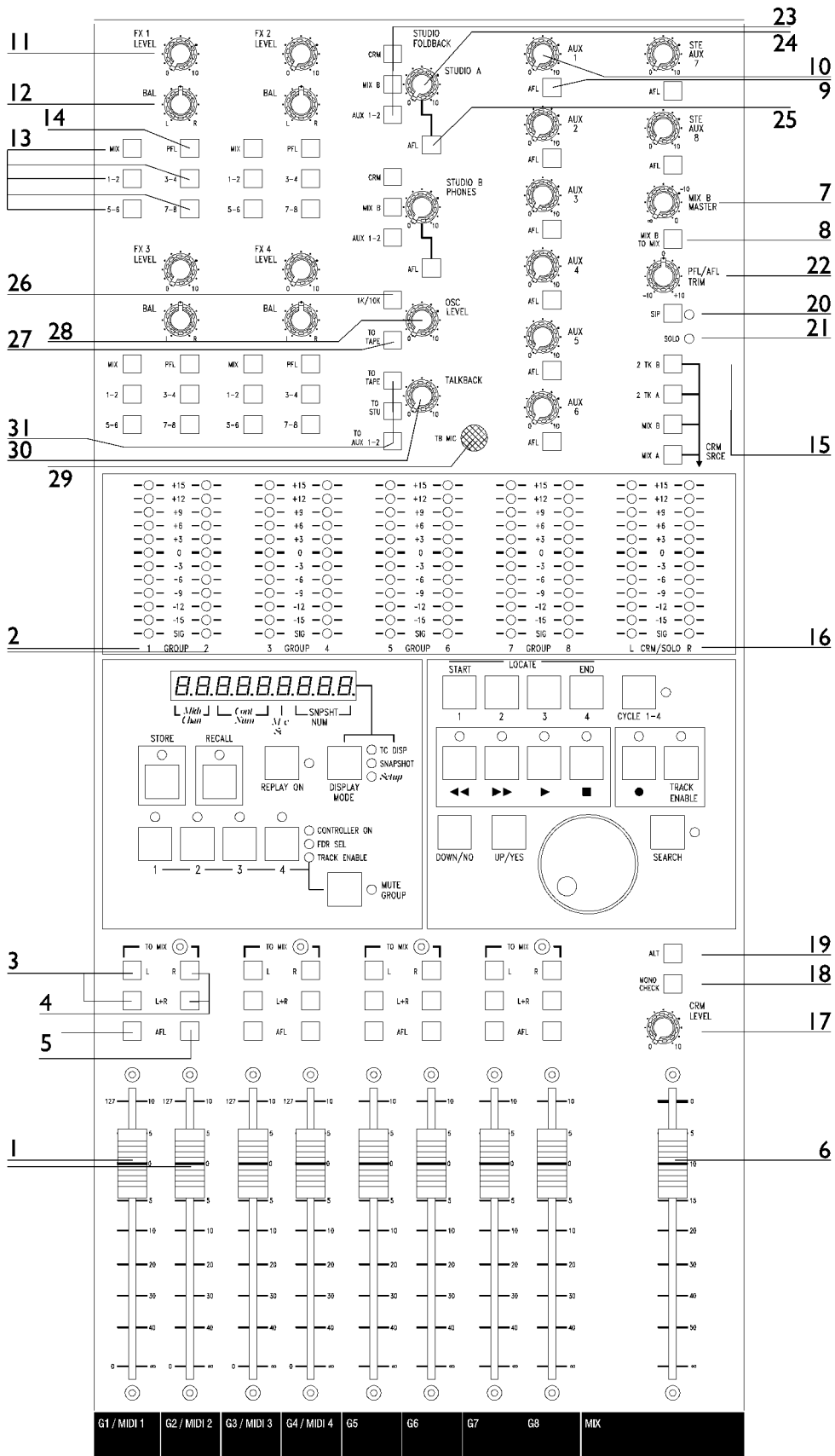
You can also use this section to connect 4 stereo or 4 mono line level input sources to Ghost. With mono sources, you can connect to either the L or R input, but be sure to set the Balance knob full L or R, depending on the input used. For instance, if you connect a mono source to the L input, then set the Balance knob full left.

The controls for FX 1 – FX 4 are identical.

11. **FX LEVEL pot:** This pot controls the levels of the stereo FX Return inputs that are routed to the assigned buses. Unity gain is at the large dot corresponding to 7.
12. **BALANCE pot:** This pot controls the L/R balance of the FX input to the assigned buses. For instance, if you assign the FX Return to 1-2 and turn the Balance knob full left, you will be assigning the Return to the Group 1 bus.
13. **MIX, 1-2, 3-4, 5-6, 7-8 Routing Matrix switches:** These switches route the post-balance signals to the MAIN MIX and Group buses. Odd-numbered buses are fed from the left and even-numbered buses from the right.
14. **PFL switch:** This switch routes the pre-level pot L and R signals (as a stereo pair, not a mono mix) to the PFL/AFL L and R buses, and activates the PFL/AFL override to the headphones/control room speakers. If you press a PFL switch, you will hear its respective FX signal in the headphones/control room monitors and its signal will be displayed on the CRM/SOLO-L/R meters.

Control Room

The Control Room monitor section is located in the middle right area of the Master section. It starts above the CRM/SOLO-L/R meters and continues below them. It consists of 1 knob, 6 switches, 2 meters, and 9 jacks. Two 2-track recorders can be connected to the control room section. The 2-track inputs are balanced stereo inputs and are made via 1/4" jacks on the rearcon panel, labeled 2TK A I/P-L/R and 2TK B I/P-L/R. 2TK A has a nominal input level of +4dBu, and 2TK B has a nominal input level of -10dBV. The Control Room section has 2 sets of 1/4" stereo output jacks on the rearcon panel, labeled CRM O/P-L/R and ALT O/P-L/R. Typically, you connect the CRM outputs to a power amp and a pair of main speakers in the control room, and you connect the ALT outputs to an alternate amp/speaker setup in the control room, such as nearfield monitors. The 1/4" stereo Headphones jack under the front armrest carries the same signal as the control room outputs.



The Control Room section is used for monitoring in the control room, during tracking, overdubbing, and mixdown. It has 4 stereo inputs available to it, which can be freely mixed. These inputs are as follows: MIX A (MAIN MIX), MIX B, 2 TK A and 2 TK B. You simply press a switch to listen to its source. If any PFL or AFL switch is depressed, then its signal will automatically override the source(s) you have selected, and you will hear the signals from the PFL/AFL bus instead. Whatever source you are monitoring, including the PFL/AFL bus, will be displayed on the Control Room meters and on the optional meterbridge's Master L/R meters.

15. **CRM SRCE switches:** These switches are used to select the source for control room monitoring as follows:

MIX A: This switch routes the MAIN MIX L & R outputs (post-MIX master fader) to the control room monitor. It is generally used for monitoring during mixdown.

MIX B: This switch routes the MIX B L & R outputs (post-MIX B master fader) to the control room monitor. It is generally used for monitoring during tracking and overdubbing.

2TKA: This switch routes the 2-Track A L & R inputs to the control room monitor. It is generally used for monitoring the outputs of your 2-track mixdown recorder.

2TKB: This switch routes the 2-Track B L & R inputs to the control room monitor. It is generally used for monitoring the outputs of your dubbing deck.

16. **CRM/SOLO-L/R Meters:** These meters monitor the control room signal. They monitor after the PFL/AFL override, so they will monitor the selected control room input or any PFL/AFL signal. If you have the optional meterbridge, the Master Meters on the meterbridge duplicate this meter.

17. **CRM LEVEL pot:** This pot controls the level of the Control Room Outputs. It affects the level of both the CRM/ALT outputs and the Headphones output.

18. **MONO CHECK switch:** This switch provides a mono sum of the L & R control room signals at the CRM (or ALT) L & R Outputs and at the Headphones output. Use this switch to check for phase problems and to hear if your stereo mix is mono-compatible.

19. **ALT switch:** This switch changes the control room output from the CRM L & R outputs to the ALT(ernate) L & R outputs. Use this switch when you have 2 sets of speakers connected and you wish to switch between them. For instance, to switch between your main monitors and a set of nearfield monitors.

Headphones

The 1/4" stereo **Headphones** jack (not pictured) is located underneath the front armrest. It carries the same signal as the control room outputs. If Headphones are plugged in here, the CRM Outputs (or ALT Outputs) are automatically disconnected. Make sure the Headphones are unplugged when you wish to listen to the speakers.

PFL/AFL, Solo, and Solo-In-Place

The Solo section is located in the middle right area of the Master section. It consists of 1 knob, 1 switch, and 2 LEDs. There is one SOLO switch for each channel, one PFL switch for each MIX B section and each FX Return Level pot, and one AFL switch for each Group Fader, each AUX Master Fader, and each Studio Foldback section. You press one of these switches when you want to hear only its associated signal in the headphones/control room speakers. You can press more than one switch at a time.

PFL stands for Pre-Fader Listen and AFL stands for After-Fader Listen. When a PFL switch is pressed, you hear its signal **before** the fader, so the level of the fader does **not** affect the level of the PFL signal. When an AFL switch is pressed, you hear its signal **after** the fader, so the level of the fader **does** affect the level of the AFL signal.

The SOLO switches, which appear only on the channels, can function as either PFL switches, when SOLO-IN-PLACE (SIP) is not activated, or as SOLO switches, when SIP is activated.

When you press any PFL/AFL switch or a channel SOLO switch (when SIP is OFF), the associated signals are sent to the PFL/AFL L & R buses, then through the PFL/AFL TRIM pot, and then routed to the Control Room by the PFL/AFL Override Circuit. This simply means that if you press one of these switches, you will hear the PFL/AFL signals in the control room, and they will display on the CRM/SOLO-L/R meters, in place of the signal(s) selected with the control room source switches.

When monitoring PFL/AFL signals, the stereo perspective of the signals and any effects used with the signals will not be heard. SOLO-IN-PLACE allows you to hear the channel signals in stereo and with their effects intact. When SIP is ON and you press a channel SOLO switch, then all channels that don't have their SOLO switches depressed will be muted. The end result is you will just hear all Soloed channels by themselves. For instance, during Mixdown when you're monitoring MIX A in the control room, if you press a SOLO switch with SIP activated, you will hear the channel by itself, exactly as it will sound in the final mix.

20. SIP switch & LED: The **SIP** switch is used to turn SOLO-IN-PLACE on and off. The adjacent LED glows to indicate that SIP is on. When SIP is on, the channel SOLO buttons do not function as PFL switches. Instead, when one of the SOLO buttons is pressed all of the other channels will be muted, and only the Soloed channel will be present on the MAIN MIX and/or Group buses. More than one channel at a time may be Soloed. When SIP is off, the channel SOLO switches function as regular PFL switches. Note that the SIP switch only affects the **Channel** SOLO switches and none of the other PFL/AFL switches.

21. SOLO LED: This LED will light up whenever any PFL, AFL, or SOLO switch is pressed. It lights up whether or not SIP is activated. It alerts you that you are currently monitoring and metering the PFL/AFL bus, instead of the control room source selection.

22. PFL/AFL TRIM pot: This pot controls the level of the PFL/AFL signals sent to the Control Room monitor via the PFL/AFL Override Circuit. It allows for a +/- 10dB level adjustment and does not alter the signal when it is in the centre detent position. It is used to adjust the volume of the PFL/AFL signals heard in the control room and any level changes will also be displayed on the CRM/SOLO-L/R meters.

Studio Foldback

The Studio Foldback section, containing 2 identical sections called Studio A and Studio B/Phones, is located in the middle top area of the Master section. It consists of 2 knobs, 8 switches, and 4 jacks. There are 2 sets of 1/4" stereo output jacks on the rearcon panel, labeled STU O/P A-L/R and STU PHNS B-L/R. Studio A has ground compensated outputs, while the Studio B/Phones outputs are unbalanced, and both are capable of driving headphone amps or power amps.

Typically, you connect the Studio A outputs to a headphone amp in the studio and the performers monitor with headphones using that amp. The Studio B outputs are usually connected to a power amp and a set of speakers in the studio, so the performers can evaluate tape tracks and other signals through speakers, without going into the control room. The Studio B outputs are also capable of directly driving headphones, with a special headphones Y-cable. The cable consists of two TS 1/4" plugs connected to a TRS 1/4" jack. You can purchase this cable or make it yourself. Details on how to make the cable are given at the end of this chapter.

The Studio Foldback section is used for monitoring in the studio (performance space), during tracking, overdubbing, and mixdown. It has 3 stereo inputs available to it, which can be freely mixed. These inputs are as follows: AUX 1-2, MIX B, and CRM. You simply press a switch to listen to its source.

The controls for STUDIO A and STUDIO B/PHONES are identical.

23. STUDIO FOLDBACK Source Select switches: These switches are used to select the source for studio monitoring as follows:

AUX 1-2: This switch routes AUX 1 and AUX 2 to the studio monitor. AUX 1 is routed to the Studio A/B left outputs and AUX 2 is routed to the Studio A/B right outputs. It monitors straight from the AUX 1-2 buses and does not pass through the AUX 1-2 master level pots. It is generally used for monitoring during tracking and overdubbing.

MIX B: This switch routes the MIX B L & R outputs to the studio monitor. It monitors straight from the MIX B-L/R buses and does not pass through the MIX B master fader. It is generally not used for multitracking, but is used when you want to monitor the pre-fader MIX B signal, perhaps when using MIX B as a pre-fader channel send.

CRM: This switch routes the control room signal to the studio monitor. It monitors straight from the control room source select switches and before the PFL/AFL override and control room level pot. You will hear whatever signals are being monitored in the control room, except any PFL/AFL signals will not be heard. That is, if any PFL/AFL switch is depressed, you will hear the PFL/AFL signals in the control room monitors, but the Studio Foldback section will continue to monitor the control room source. It is generally used right after recording a take, so the performers can hear the control room playback, while remaining in the studio. It is also used to give the studio performers access to the MIX A bus and the two 2-track inputs.

24. STUDIO level pot: This pot controls the level of the Studio Outputs. It has 10dB of gain at its maximum.

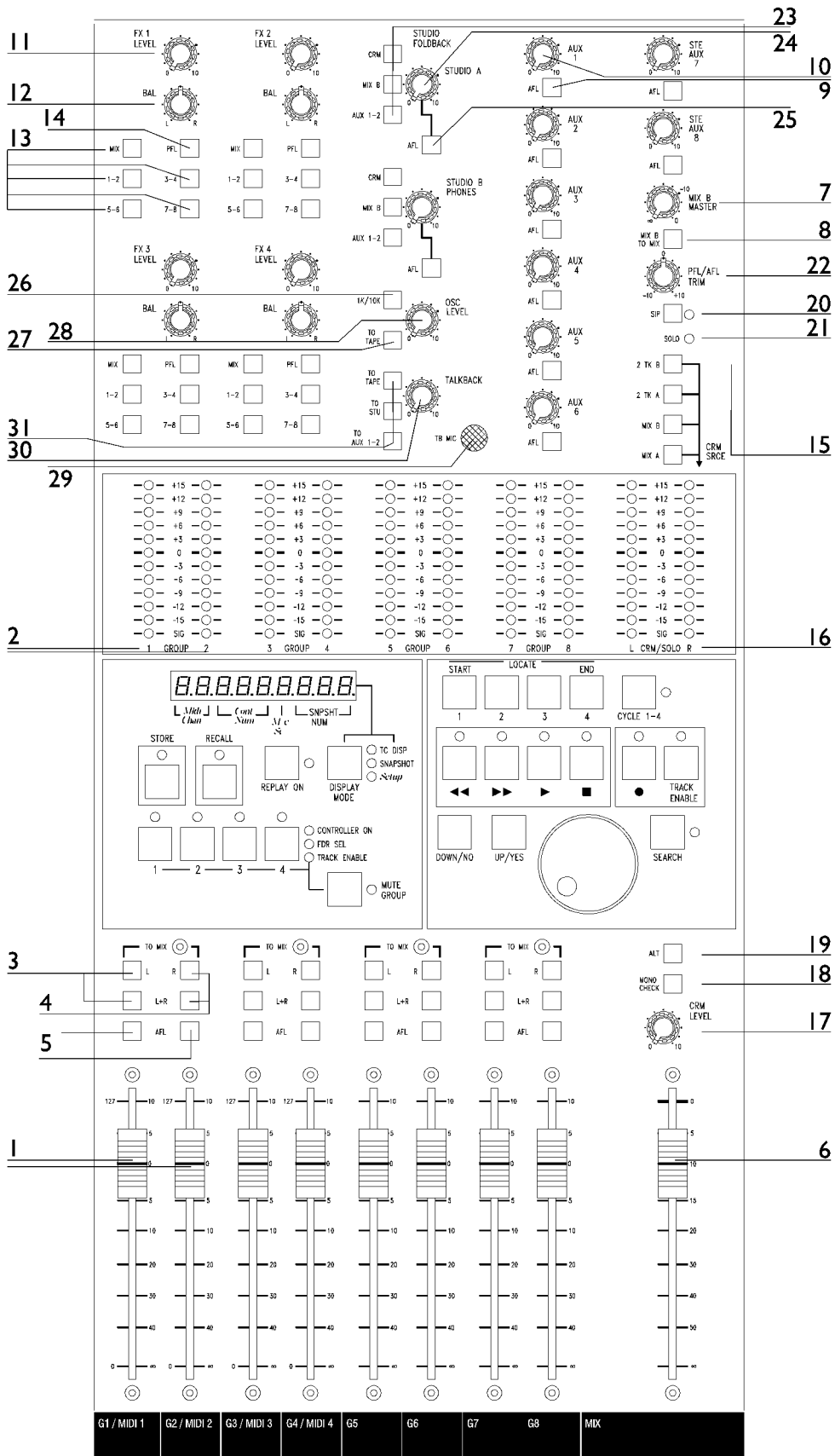
25. AFL switch: This switch routes the studio outputs, in stereo and post-Studio level pot, to the PFL/AFL L and R busses, and activates the PFL/AFL override to the headphones/control room speakers. If you press an AFL switch, you will hear its respective Studio signal in the headphones/control room monitors and its signal will be displayed on the CRM/SOLO-L/R meters. This switch is handy when you are setting up Studio monitoring from the control room. You will be able to hear the signals you are sending to the performers in the studio. After setting up the Studio monitoring, you should unselect this switch so the Control Room Monitor Source will be heard in the Control Room.

Oscillator

The Oscillator Section is located in the lower middle area of the Master section. It consists of 2 switches and 1 knob. It is used to record tones on tape and for general calibration, diagnostic, and level-checking purposes.

26. 1K/10K switch: This switch allows you to set the oscillator's frequency to 1kHz (UP) or 10kHz (DOWN).

27. TO TAPE switch: This switch routes the output of the sinewave oscillator to the MAIN MIX L & R busses and to the 8 Group buses. When depressed, you can record the tone selected with the 1K/10K switch to your 2-track mixdown recorder, connected to the MAIN MIX L/R outputs, and to a multitrack recorder, connected to the Group outputs. Note that this switch overrides the Talkback System's TO TAPE switch (#31, below). This means if the TO TAPE switch is depressed in both sections, only the output of the oscillator will be routed to the MAIN MIX and Group buses.



28. **OSC LEVEL pot:** This pot controls the output level of the oscillator. It varies the oscillator's level, from off to +15dBu, at the MAIN MIX and Group outputs, when their respective faders are set to 0dB gain.

Talkback

The Talkback Section is located in the lower middle area of the Master section. It consists of a built-in microphone, 3 switches, and one pot. It is used to send your voice to AUX 1-2, the studio monitor, and the MAIN MIX and Group buses. This allows the control room to talk to the performers in the studio and let's you record announcements, slates, and count-offs to your multitrack and mixdown recorders. Note that when any Talkback Routing switch is depressed, it automatically dims (attenuates) the level of the control room speakers and headphones.

29. **TB MIC:** The built-in electret Talkback Microphone feeds the Talkback section. You should speak in its direction, but it's not necessary to get too close to it.
30. **TALKBACK pot:** This pot controls the gain of the Talkback Mic amp. As you turn it clockwise, it increases the level of the voice sent to the Talkback Routing switches.
31. **TALKBACK Routing switches:** The Talkback Mic signal is routed by the following switches:

TO AUX 1-2: This switch routes the talkback signal simultaneously to the AUX 1 and AUX 2 buses. It can be monitored in the studio using the Studio Foldback AUX 1-2 source select switch.

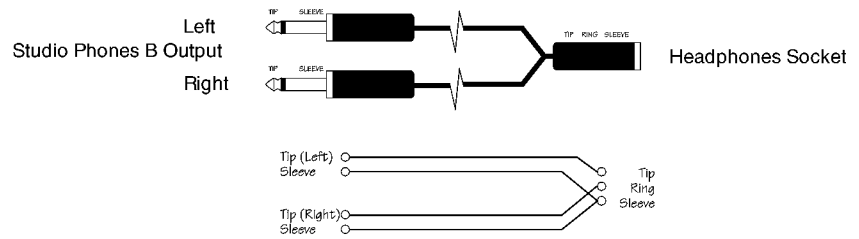
TO STU: This switch routes the talkback signal to the Studio A and Studio B Foldback sections, after their source select switches and before their level pots. The talkback signal will be heard in the studio, together with whatever other sources are currently being monitored there.

TO TAPE: This switch routes the talkback signal to the MAIN MIX L & R buses and to the 8 Group buses. When depressed, you can record the talkback signal to your 2-track mixdown recorder, connected to the MAIN MIX L/R outputs, and to a multitrack recorder, connected to the Group outputs. Note that this switch is overridden by the Oscillator's TO TAPE switch (#27, above). This means if the TO TAPE switch is depressed in both sections, only the output of the oscillator will be routed to the MAIN MIX and Group buses.

Using The Studio Headphones B Outputs To Directly Drive Headphones

You will have to make a flying lead connector as shown in the diagram below.

Studio Phones B Outputs To Headphones Connector



GHOST

7

Tutorial

Multitrack Tutorial

Overview

This Multitrack Tutorial will present step-by-step procedures on how to use Ghost in a multitrack recording environment. See the Installation section in this manual to set up Ghost for multitrack sessions. But first we'll start with an overview of how mixers work.

Overview of Mixers

All mixers, no matter what their size, perform the same basic functions. They accept a number of inputs, allow you to process them in various ways, and then combine and route them to various outputs. Every switch, knob, and fader on a mixer performs at least one of three basic functions, as follows:

1. A control can select where the signal is coming from. These are known as source controls and they determine the input or source of the signal. A MIC/LINE switch is an example of this control since it selects the source of the channel input.
2. A control can process the signal in some way. These are generally described according to the function they perform. EQ and gain controls are examples of this type of control because they alter the frequency response or set the gain of a signal, as opposed to determining its input or output.
3. A control can route where the signal is going to. These are known as assign or routing switches and they route signals to different buses or outputs. Channel ROUTING switches are an example of this type of control because they route the channel signal to the Main Mix or Group buses.

Sometimes a control can perform more than one function. Pan controls determine to which of 2 buses a signal is routed (routing) and the relative level of the signal sent to each bus (processing).

It will make it easier to use Ghost if you ask yourself which of the above 3 functions a control is performing: Is it selecting the signal source, processing the signal, or routing the signal to a bus or output?

Following is a chart showing all of Ghost's controls grouped according to which of the 3 basic functions they perform. The left side indicates the section of Ghost where the control is found and the right side indicates the name of the control.

Source Controls

Ghost Section	Control Name
Channel Input	LINE switches
Tape Input	REV switches
HF/LF EQ	MIX B switches
EQ	EQ IN switches
AUX 1-2 Sends	PRE switches
AUX 3-4 Sends	MIX B switches
MIX B	SRCE switches
Studio Foldback A/B	AUX 1-2/MIX B/CRM switches
Oscillator	1k/10k switch
Talkback	TB MIC
Control Room	MIX A/MIX B/2 TK A/2 TK B switches

Processing Controls

Ghost Section	Control Name
Rearcon Panel	48V switches
Channel Input	Phase-Reverse switches
Channel Input	Low-cut filter switches
Channel Input	INPUT SENS knobs
TAPE Input	TAPE TRIM knobs
EQ	HF/LF/HMF-FREQ-Q/LMF-FREQ-Q knobs
AUX Sends	AUX 1-4/STE AUX 7/STE AUX 8 Level knobs
MIX B	MIX B Rotary Faders/CUT switches
Channel	Channel Faders/CUT switches
FX Returns	FX 1-4 LEVEL knobs
Studio Foldback	STUDIO A-STUDIO B/PHONES Level knobs
Oscillator	OSC LEVEL knob
Talkback	Talkback Level knob
AUX Masters	AUX 1-8 Rotary Master Faders
MIX B Master	MIX B Rotary Master Fader
PFL/AFL Master	PFL/AFL TRIM knob/SIP switch
Control Room	CRM LEVEL knob/MONO CHECK switch
Groups 1-8	Group Master Faders
MIX	Stereo MIX Master Fader

Routing Controls

Ghost Section	Control Name
Rearcon Panel	DIR/GRP n switches
AUX 3-4 Sends	5-6 switches
MIX B	PFL switches
Channel	SOLO switches
Channel	L-R/1-2/3-4/5-6/7-8 switches
FX Returns	MIX/1-2/3-4/5-6/7-8 switches, PFL switches
Studio Foldback A-B	AFL switches
Oscillator	TO TAPE switch
Talkback	TO AUX 1-2/TO STU/TO TAPE switches
AUX Masters	AFL switches
MIX B Master	MIX B TO MIX switch
Control Room	ALT switch
Groups 1-8	TO MIX- L/R/L+R switches, AFL switches

Processing and Routing Controls

Ghost Section	Control Name
MIX B	PAN knobs
Channel	PAN knobs
FX Returns	BAL knobs

Multitrack Recording

Not all of Ghost's users will have a traditional studio with a control room for the recording engineer on one side of the glass and a studio (performance space) on the other side of the glass. Many project and home studios use just one room for both functions. And many times the person performing is also doing the recording. In those instances you might not need all the monitor mixes outlined here. Just choose the methods that work best for your situation. With recording and monitoring, as with many of Ghost's other procedures, there is more than one way to accomplish something. We generally outline one set of procedures throughout this manual, but as you come to understand Ghost's signal flow, you may come up with other procedures of your own.

When we talk about recording to tape, you can use the same procedures for recording to other media, such as a hard disk in a Digital Audio Workstation (DAW). And when we speak of previously recorded tape tracks, for the most part, you can use the same procedures with virtual MIDI tracks. Those are tracks recorded in a MIDI sequencer that are synchronized to the multitrack tape or DAW, while overdubbing, and are not committed to tape until mixdown.

Generally, the multitrack procedure is as follows: You record your basic tracks (backing/rhythm tracks), such as drums, bass, keyboards, and rhythm guitars first. At this time, you only need to monitor the instruments you are recording. Everything you record after this is known as overdubbing. With overdubbing, you not only need to monitor the overdubs, but you also need to monitor previously recorded tape tracks. You will want separate monitor mixes for the musicians in the studio and the engineer in the control room. After you have completed your recording, then you mix all the tape/hard disk/MIDI tracks and record them to a 2-track recorder, such as a DAT deck. This is known as mixdown. While recording or during mixdown, you might want to add effects or processors to the tape/hard disk tracks. You'll also need to know how to configure Ghost when you are punching in/out and when you bounce tracks. All of these procedures are explained below. We'll start with Monitoring, since you need to know how to monitor signals before you begin recording.

Control Room Monitoring

Monitoring Overview

During multitrack recording you have to provide 4 different monitor mixes. You have to monitor both the current inputs you are recording (signal) and previously recorded tape tracks (tape); and you need to provide these mixes to both the control room and the studio. This means you have to provide signal and tape monitoring for the control room (CRM) and separate signal and tape monitoring for the studio.

The purpose of CRM monitoring is to allow the engineer to hear the signal he's sending to tape. If there is a problem with the signal going to tape, the engineer needs to hear it. If the engineer presses the Solo switch, he needs to hear just that signal. If the engineer rides gain (moves the channel faders while recording), he needs to hear its effect on the signal going to tape. In short, the CRM monitor mix may change in level or contain soloed channels. On the other hand, the performers in the studio don't want to hear these changes because it might distract them. They want to hear a consistent monitor mix that helps them perform better and they are not concerned with the actual signal going to tape. And many times the performers want to hear reverb in the headphones, although you're not recording the reverb to tape. In short, the Studio monitor mix has to be tailored to the preferences of the performers in the studio. That's why you need separate monitor mixes for the CRM and Studio.

Control Room Monitoring is covered in this section and Studio Monitoring is covered in the next section. In each section we will detail how to monitor the signals being recorded and then how to monitor previously recorded tape tracks. The bottom line is that you use the MIX B section for CRM monitoring and AUX 1-2 for Studio monitoring.

Overview

This section details how to monitor in the control room, the signals being recorded to tape. You use the CRM section and the MIX B section for this purpose. The outputs of your multitrack recorder (MT) should be connected to the MIX B/TAPE RET jacks of Ghost. There should be a direct correlation between Ghost's channel numbers and the tape tracks. Channel 1 represents tape track 1, channel 2 represents tape track 2, etc. This is the essence of an inline console. You use the MIX B section of the channel to monitor the appropriate tape track. It doesn't matter which of Ghost's outputs are connected to the MT. The signal monitoring method described here applies regardless of which method you use to record. (See "Recording Basic Tracks", below, for more information on the 3 recording methods.) What you will actually be monitoring is the output of your multitrack deck. It doesn't matter how you send the signals to it.

You can monitor through the front panel headphones jack, in which case, your speakers will be disconnected. If you want to monitor through speakers, then make sure that headphones are not connected to the headphones jack. To monitor through your main speakers, make sure the ALT button is not engaged, or press ALT to monitor through your alternate speakers.

You will use the MIX B section on the channel strip to monitor the signals you are recording. This method assumes that when you place a track in RECORD-READY mode on your MT, whatever signal is sent to that track for recording, will appear at the output jack for that track. The MIX B section you use depends on which track you are recording on. You use the MIX B section of the channel number that corresponds to the tape track you are recording on.

For instance, with a tape in the MT deck, and the deck in Stop mode, if you press the Track 3 RECORD-READY button, then any signal sent to the track 3 input jack of the MT, will appear at the track 3 output jack of the MT. And the track 3 output jack of the MT should be connected to the channel 3 MIX B/TAPE RET jack of Ghost. In that instance, you would use channel 3's MIX B section to monitor all signals sent to track 3 of the MT.

Note

The MIX B/TAPE RET jacks are set for +4dBu nominal input levels and if your MT outputs are +4dBu, then the TAPE TRIM knobs can be left in their centre detent positions. However, the jacks can be internally changed to -10dBV nominal input levels. If your tape outputs don't match the input level of the jacks, you may need to adjust the TAPE TRIM knobs. With a signal entering the MIX B/TAPE RET jack, press the corresponding MIX B PFL switch. This will display the MIX B signal on the CRM/SOLO-L/R meters in the master section. Gradually adjust the TAPE TRIM knob until the meters indicate 0, then turn the PFL switch off. This is the procedure to use whether or not you have the optional meterbridge, since even if the meterbridge is set for tape input monitoring, it monitors the tape input before the TAPE TRIM knob.

Procedure:

1. Follow the procedures under "Recording Basic Tracks", below, to send your live signals to the MT for recording.
2. On Ghost, make sure all CUT and SOLO/PFL/AFL switches are off, and that the REV switch is OFF (UP) in the channel strips of the MIX B sections you will use for monitoring.
3. On the MT, insert a tape and press the RECORD-READY switches for the track(s) you wish to record on and set the record level controls, if any, to their nominal positions.
4. In the CRM SRCE section, make sure that only MIX B is pressed and that MONO CHECK is off. Turn the CRM LEVEL knob about 75% up.
5. Turn the MIX B master fader in Ghost's master section about 75% up.
6. On the appropriate MIX B section that corresponds to the track you are recording on, make sure the SRCE switch is set to monitor TAPE (UP Position).
7. With the performers playing their parts, (there should be a reading on the MT's meters for the track(s) you will be recording on), adjust the TAPE TRIM knob, as described above, in the appropriate channel strip's input section, if necessary. Then turn up the appropriate MIX B level control to attain the volume you want and use its pan pot to determine the stereo placement. You will now be monitoring all signals sent to the appropriate tape track.
8. The Channel faders, Group faders (if you're recording with the Group buses), TAPE TRIM knob, MIX B master fader, MIX B level control, CRM LEVEL knob, and the MT record level control, if any, will all affect the volume of the monitored signal.

Even once you start the tape running in Record mode, you will not actually be hearing the playback of the tape, after the new signal has been recorded, as you would on a standard 3-head deck. You are simply hearing all the signals sent to the MT deck's inputs being echoed through the deck's output jacks. You will hear any changes in the signal being sent to or coming from the MT. The individual channel faders determine the levels that are actually sent to the MT. If you change a fader level or an EQ setting, you will hear it. This is desirable because you will hear the changes you make. If you press any SOLO or PFL button, you will hear its signal, but it won't affect what's being recorded. If you don't hear a particular signal, it could either mean it's not being recorded or that you are not monitoring it properly. Keep in mind that what you hear while monitoring may not necessarily be what's going to tape; such as when a SOLO switch is pressed.

Summary

In the control room, to monitor the sources you are recording, send the signal to the MT, put the proper track in RECORD-READY mode, and turn up the recording level control on the MT. On Ghost, make sure REV, CUT, and SOLO/PFL/AFL switches are off, and that TAPE is selected as the MIX B source. Select MIX B as the CRM Source, turn MONO CHECK off, and turn up the CRM level control. Monitor through headphones or speakers. Turn up the MIX B master fader and using the MIX B section on the channel that corresponds to the track you are recording on, turn up its level control to the desired volume and use its pan pot to determine its stereo placement.

Overview

This section details how to monitor in the control room, previously recorded tape tracks. The procedure is very similar to CRM Signal Monitoring, above. You use the MIX B sections of the channels that correspond to the tracks you wish to monitor. That is, channel 1 monitors tape track 1, channel 2 monitors tape track 2, etc.

For instance, if tracks 1 and 2 were already recorded and you were currently recording on track 3, you would use the MIX B sections of channels 1 and 2 to monitor the tape playback of tracks 1 and 2, and you would use the MIX B section of channel 3 to monitor what you were currently recording to track 3.

Basically, you use the same procedure used for signal monitoring, except you'll be monitoring tape playback from the MT. However, there are two changes that should be made before you monitor tape signals.

The two changes are necessary so that AUX 1-2 can be used for Studio Tape Monitoring (see below). On the channel that corresponds to the tape track you wish to monitor, you must press the REV switch. The reason for doing this is that by reversing the signal path, the signal from the MIX B/TAPE RET jack is sent to the channel path. This is done so that AUX 1-2 (which is only in the channel path) can be used with the Studio Foldback section of Ghost. Then, in the same channel's MIX B section you must press the SRCE switch so that CHAN is selected. As a result of reversing the signal paths, you had to select CHAN as the Source for MIX B, so that the MIX B section would also be carrying the tape playback signal. (Since the channel is reversed, selecting CHAN as the source means you are selecting TAPE as the source.) If you didn't select CHAN as the MIX B source, then the channel inputs (MIC I/P or LINE) would be the source for MIX B, and that's not what we want.

Procedure

1. On Ghost, make sure all CUT and SOLO/PFL/AFL switches are off, and that the REV switch is ON (Down) in the channel strips of the MIX B sections you will use for monitoring tape playback.
2. In the CRM SRCE section, make sure that only MIX B is pressed and that MONO CHECK is off. Turn the CRM LEVEL knob about 75% up.
3. Turn the MIX B master fader in Ghost's master section about 75% up.
4. On the appropriate MIX B section that corresponds to the tape track you wish to monitor, make sure the SRCE switch is set to monitor CHAN (DOWN Position). You are really monitoring TAPE, since the channel and MIX B paths have been reversed.
5. Set the output level control on the MT, if any, to its nominal position, and with the MT tape playing, adjust the TAPE TRIM knob in the channel strip's input section, if necessary. Then turn up the appropriate MIX B level control to attain the volume you want and use its pan pot to determine the stereo placement. You will now be monitoring the tape playback of the appropriate track.
6. The TAPE TRIM knob, MIX B master fader, MIX B level control, CRM LEVEL knob, and the MT output level control, if any, will all affect the volume of the monitored signal.

Studio Monitoring

Studio Signal Monitoring

Overview

This section details how to monitor in the studio, the signals being recorded to tape. You use one of the 2 Studio Foldback sections, either STUDIO A or STUDIO B/PHONES, and AUX 1-2 in the channel strip for this purpose. You use the channels that have the inputs you wish to monitor. For instance, if you are miking a drum kit and you have 8 mics connected to channels 1-8, then you use the AUX 1-2 controls in channels 1-8 to monitor the 8 mics. This allows you complete control in determining the contribution each input signal source will have in the overall monitor mix. Note that the AUX 1-2 PRE button must be depressed so that your monitored signals come before the channel fader. This means that moving the fader will not affect the AUX 1-2 send.

With PRE pressed, the AUX 1 knob sends the pre-fader channel input signal to the Studio left output and AUX 2 sends the same signal to the Studio right output. This means the AUX 1 signal will only appear in the left headphone (speaker) and the AUX 2 signal will only appear in the right one. This affords tremendous flexibility in tailoring your mix. If the performers want to hear the signal equally through both sides of the headphones, simply set the AUX 1-2 knobs to the same level. But you can provide many different types of monitor mixes by sending some signals only to the left, some only to the right, and some to both left/right.

For instance, many musicians like to hear the tape tracks on one side of the monitor mix and the overdub they are about to record on the other side of the monitor mix. So it is a simple matter to use just AUX 1 for all the tape tracks (see the next section for studio tape monitoring), sending them to the left side of the mix, and use just AUX 2 for the current signal, sending it to the right side of the mix.

Procedure

1. Follow the procedures under "Recording Basic Tracks", below, to send your live signals to the MT for recording.
2. On Ghost, make sure all CUT and SOLO/PFL/AFL switches are off, and that the REV switch is OFF (UP) in the channels that you are going to monitor.
3. In the STUDIO FOLDBACK section, decide whether you are using STUDIO A or STUDIO B/PHONES and make sure that only AUX 1-2 is pressed. Turn the STUDIO LEVEL knob about 75% up.
4. Turn the AUX 1 and AUX 2 master fader pots in Ghost's master section about 75% up and make sure their AFL switches are off.
5. On the appropriate channels that correspond to the channel inputs you are about to record, make sure the AUX 1-2 PRE switches are depressed, so that you are monitoring Pre-Fader.
6. With the performers playing their parts, turn up the AUX 1-2 level controls, on all channels whose signals you want to monitor, to attain the volume (and balance) you want. AUX 1 will be sent to the left headphone (speaker) and AUX 2 will be sent to the right headphone (speaker). You will now be monitoring all channel input signals.
7. The AUX 1-2 master faders, AUX 1-2 level controls, and STUDIO LEVEL knob, will all affect the volume of the monitored signal.

Studio Tape Monitoring

Overview

This section details how to monitor in the studio, previously recorded tape tracks. The procedure is very similar to Studio Signal Monitoring, above. You use the AUX 1-2 controls of the channels that correspond to the tracks you wish to monitor. That is, channel 1 monitors tape track 1, channel 2 monitors tape track 2, etc.

Basically, you use the same procedure used for signal monitoring, except you'll be monitoring tape playback from the MT. However, there are two changes that must be made before you can monitor tape signals. On the channel that corresponds to the tape track you wish to monitor, you must press the REV switch. By reversing the signal path, the signal from the MIX B/TAPE RET jack is sent to the channel path. This is done so that AUX 1-2 (which is only in the channel path) can be used with the Studio Foldback section of Ghost. Then, in the same channel's MIX B section you must press the SRCE switch so that CHAN is selected. As a result of reversing the signal paths, you had to select CHAN as the Source for MIX B, so that the MIX B section would also be carrying the tape playback signal. (Since the channel is reversed, selecting CHAN as the source means you are selecting Tape as the source.) Selecting CHAN as the MIX B Source is not necessary for Studio Tape Monitoring. It is done so that MIX B can be used for CRM Tape Monitoring.

Procedure

1. On Ghost, make sure all CUT and SOLO/PFL/AFL switches are off, and that the REV switch is ON (Down) in the channel(s) you will use for monitoring tape playback.
2. In the STUDIO FOLDBACK section, decide whether you are using STUDIO A or STUDIO B/PHONES and make sure that only AUX 1-2 is pressed. Turn the STUDIO LEVEL knob about 75% up.
3. Turn the AUX 1 and AUX 2 master fader pots in Ghost's master section about 75% up and make sure their AFL switches are off.
4. On the appropriate MIX B sections that correspond to the tape tracks you wish to monitor (in the control room), make sure the SRCE switch is set to monitor CHAN (DOWN Position). You are really monitoring TAPE, since the channel and MIX B paths have been reversed. This has no effect on Studio Tape Monitoring, but must be done in order to use MIX B for CRM Tape Monitoring.
5. On the appropriate channels that correspond to the tape tracks you wish to monitor, make sure the AUX 1-2 PRE switches are depressed, so that you are monitoring Pre-Fader.
6. Set the output level control on the MT, if any, to its nominal position, and with the MT tape playing, adjust the TAPE TRIM knob in the appropriate channel strip's input section, if necessary. Then turn up the AUX 1-2 level controls, on all channels that correspond to the tape tracks you want to monitor, to attain the volume (and balance) you want. AUX 1 will be sent to the left headphone (speaker) and AUX 2 will be sent to the right headphone (speaker). You will now be monitoring the tape playback of the appropriate tracks.
7. The TAPE TRIM knob, AUX 1-2 master faders, AUX 1-2 level controls, STUDIO LEVEL knob, and the MT output level control, if any, will all affect the volume of the monitored signal.

Monitoring Summary

To sum up, if tracks 1 and 2 were already recorded and you were currently recording on track 3 through the channel 10 input, then for control room monitoring, you would use the MIX B sections of channels 1 and 2 to monitor the tape playback of tracks 1 and 2, and you would use the MIX B section of channel 3 to monitor what you were currently recording to track 3. For studio monitoring, you would use AUX 1-2 of channels 1 and 2 to monitor the tape playback of tracks 1 and 2, and you would use AUX 1-2 of channel 10 (where the input is located) to monitor what you were currently recording to track 3.

Recording Basic Tracks

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Note

First, you should "zero out" the console. That means to turn all faders and level controls fully off, to centre any knobs that have centre detents, to make sure all switches are in the UP position, and to make sure all SOLO/PFL/AFL and CUT switches are off.

Overview

Basic tracks are the first things recorded on the multitrack tape. Recording basic tracks or backing tracks means that you are going to record a number of musicians at once, such as for the rhythm section of a song. For this tutorial we will record a song containing drums, bass guitar, keyboards, electric rhythm guitar, electric lead guitar, background vocals, and lead vocals. For the basic tracks you would record drums, bass, keyboards, and rhythm guitar at the same time.

Sometimes the singer will record "scratch" vocals while the basic tracks are being recorded. This is done so that the musicians can keep their place in the song, without having to count to themselves. Then the "scratch" vocals on tape are used to help the musicians find their place in the song during overdubs. "Scratch" vocals are temporary and are meant to be replaced when the singer overdubs the final vocals after all the instruments are overdubbed. However, sometimes the "scratch" vocals are better than any of the vocal overdubs and they end up being used as the final vocal.

Note

If you're using MIDI virtual tracks as your backing tracks, then you should monitor them as if they were previously recorded tape tracks, and proceed to the section on Overdubbing, below.

Connections

Connect your input sources (microphones and line inputs) to the channel MIC I/P and LINE jacks. Do not connect two sources to the same channel. For drums, you would mike the drum kit and connect the mics to the channel MIC inputs. You can connect keyboards directly to a LINE input. Bass guitar can go direct, but you should connect the bass to a Direct Box and then connect the box to a MIC input. For rhythm guitar, you can place a mic in front of the amp and then connect it to a channel MIC input; or you could record with a direct box; or you could do both. You should use the scribble strip section below the channel faders to label all the channel inputs. It's best to place non-residue adhesive tape to the strip and then label the tape.

Monitoring

To learn how to listen to the sound you are recording, see the section above entitled, "Control Room Monitoring." To learn how to send the sound you are recording to the performers in the studio, see the section above entitled, "Studio Monitoring."

Gain Structure

Next, you need to set the input gain for your sources. The top section of the channel strip contains the input gain controls. For each channel that has an input source, if the source is a MIC input, then leave the LINE switch in the up position. If the mic requires phantom power, then press the 48V switch on the rear connector panel. For a LINE input, press the LINE switch. Make sure the REV switch is up, then play the instrument or sing so a signal is entering the input jack.

If you don't have the optional meterbridge or it's set for tape monitoring, then use the following procedure. Press the channel SOLO switch. Make sure the SIP switch in the master section is off. This will display the channel signal on the CRM/SOLO-L/R meters in the master section. Gradually turn up the Input Sensitivity knob until the meters indicate 0, then turn the SOLO switch off.

If you have the optional meterbridge and it's set for channel input monitoring, then gradually turn up the Input Sensitivity knob until the meterbridge channel input meter indicates 0.

In either case, the Signal Present LED should be brightly lit, and the PK LED should light only occasionally, if at all. Once the input gain is set properly, you shouldn't change it. You should use the channel fader to make changes. Note that the Input sensitivity knob controls the input of the signal as it enters Ghost. The channel fader controls the output of the signal to the buses. If either is set too high, then distortion can occur. If the level is too low, you will hear noise. Your goal is to get as hot an input signal as possible, without distortion.

Nominal level is the normal working level that Ghost is designed to work with and corresponds to 0 on the meters. However, you can raise the signal above nominal level quite a bit before distortion sets in. The difference between nominal level and the onset of distortion represents the available headroom. That's why it's best to initially set Ghost for nominal input/output levels, so that you can raise or lower the faders, as needed, without worrying about distortion or too low a signal level. Generally, nominal level is attained by setting Ghost's faders and knobs 75% of the way up. The nominal level is represented by a heavy line indicating 0 next to the faders and a large dot indicating 7 next to the rotary knobs. One exception is the MIX L/R fader, where nominal level is at the top of the fader's travel.

LCF & Phase

After setting the input gain, if the signal has a muddy low end or you hear rumble, air conditioner noise, or AC hum, then press the Low-Cut Filter (LCF) switch to see if it helps. You should keep the LCF switch in the position that sounds best. The Phase switch should be in the up position, unless you know your input cables are wired incorrectly or if you're employing M-S recording techniques.

EQ

If you want to add EQ to the channel inputs, first press the EQ IN switch and make sure the EQ MIX B button is up. Then apply the EQ as needed. (See the section on EQ elsewhere in this manual.)

Effects & Processing

If you want to add effects or processing, then see the section below, entitled, "Adding Effects and Processors."

Recording methods

There are 3 methods you can use to send the channel signal to a multitrack tape recorder, and they are outlined below:

1. **Using the Group Output jacks:** Use this method if the GRP 1-8 output jacks are connected to the inputs of your multitrack recorder. The group number should match the tape input number. For instance, connect Group output 1 to tape input 1, etc. This way, the Group number represents the tape track number you want to record on. In the channel strip, press the assign switches for the tape tracks you want to record on. For instance, if you want to record on tape track 1 or track 2 or both tracks 1 and 2, then press the 1-2 switch. Next, use the pan pot to send the signal to the Group buses for the tracks you wish to record on. Pan left for odd-numbered tracks; right for even-numbered tracks; and centre for both tracks. For instance, pan fully left to record on tape track 1; fully right for track 2; and keep the pan pot at its centre detent position, if you wish to record on both tracks 1 and 2. Then, turn up the channel fader to its nominal position, as indicated by the fader marking 3/4 of the way up next to 0. You must follow this procedure for all of the inputs that you wish to record. Finally, turn up the appropriate Group faders to their nominal positions, 3/4 of the way up. For instance, turn up Group fader 1, if you're recording on track 1, via the GRP 1 output jack.
2. **Using the DIR/TAPE SND jacks as Group Outputs:** Use this method if the DIR/TAPE SND jacks are connected to the inputs of your multitrack recorder and you wish to use them as Group outputs. The channel number should match the tape input number. For instance, connect the DIR/TAPE SND jack of channel 1 to tape input 1, jack 2 to input 2, etc. If you have a 24-track recorder, then Ghost channels 1 to 24 will be connected to tape inputs 1 to 24. If you have 3 or 4 digital 8-track recorders, then jacks 1-8 go to inputs 1-8 of the first deck; jacks 9-16 go to inputs 1-8 of the second deck; jacks 17-24 go to inputs 1-8 of the third deck; and jacks 25-32 go to inputs 1-8 of the fourth deck.

This way, the channel number represents the tape track you want to record on. For digital multitracks, you should add 8, 16, and 24 to the track number for the 2nd, 3rd, and 4th decks, respectively. That is, deck 1 has tracks 1-8, deck 2 has tracks 9-16, deck 3 has tracks 17-24, and deck 4 has tracks 25-32. If you think of it this way, then using channel 10 will record on tape track 10, since channel 10's DIR/TAPE SND jack is connected to either tape input 10 on a true 24-track recorder, or to tape input 2 of the second deck in a multi-machine digital multitrack setup.

First, press the DIR/GRP n switch (on the rear connector panel) on the channel that represents the tape track you wish to record on. For instance, press the switch on channel 2 to record on tape track 2 or press the switch on channel 10 to record on tape track 10. Then note the GRP n number on the switch. In the above example, both channels 2 and 10 will have a switch that reads DIR/GRP 2. This means that the channel 2 and channel 10 DIR/TAPE SND jacks will act as Group 2 output jacks, when their DIR/GRP 2 switches are pressed.

Next, assign all the inputs you're recording to the appropriate Group numbers. For instance, if you want to record on tape track 2, then press channel 2's DIR/GRP 2 switch and assign all your inputs to Group 2, by pressing the 1-2 assign switch and panning full right. If you wish to record on more than one track, then press the DIR/GRP n switch on the channels representing the additional track numbers. For instance, to record on tape tracks 1 and 2, press the DIR/GRP n switch for channels 1 and 2. The switches will be labeled DIR/GRP 1 and DIR/GRP 2, respectively. The jacks will now carry the outputs of Groups 1 and 2. You then use the assign switches and pan pots for each channel input to determine if the signal is routed to Group 1, 2, or both.

Note that when you press the DIR/GRP n switch for a channel, that channel's input will not appear at its DIR/TAPE SND jack, unless you also assign it to the GRP n bus. In the above example, you would have to press the 1-2 assign switches in channels 1 and 2 to send their inputs to their DIR/TAPE SND jacks.

Next, use the pan pot to send the signal to the appropriate Group bus. Pan left for odd-numbered groups; right for even-numbered groups; and centre for both groups. For instance, if the 1-2 assign switch is pressed, then pan fully left to assign the signal to Group 1; fully right for Group 2; and keep the pan pot at its centre detent position, for Groups 1 and 2.

Then, turn up the channel fader to its nominal position, as indicated by the fader marking 3/4 of the way up. You must follow this procedure for all of the inputs that you wish to record. Finally, turn up the Group faders to their nominal positions. For instance, turn up Group fader 1, if you're recording on track 1, via channel 1's DIR/GRP 1 output. You would also use the Group 1 fader if you were recording on tracks 9, 17, or 25, via channels 9, 17, or 25, since the output jacks of those channels are also labeled DIR/GRP 1.

- 3. Using the DIR/TAPE SND jacks as Direct Outputs:** Use this method if the DIR/TAPE SND jacks are connected to the inputs of your multitrack recorder and you want to use them as Direct Outputs. The channel number should match the tape input number. For instance, connect the DIR/TAPE SND jack of channel 1 to tape input 1, jack 2 to input 2, etc. (See using this jack as a Group Output in #2, above, for more information about connections.)

This method differs from method 2, above, because you're using the DIR/TAPE SND jack as a Direct Output from the channel and the Group buses are not involved at all. The channel signal, post-fader and post-mute, will be routed to this jack for direct recording to your multitrack. With this method, you can only record one channel per track, and the channel must be recorded on whatever tape input the Direct Output jack is connected to. If you match channel numbers with the tape input numbers, then channel 1 can only be recorded on tape track 1; channel 2 on track 2, etc.

To use this method, first make sure the DIR/GRP n switch (on the rear connector panel) is in the DIR (UP) position for all channels that you wish to record. Then, turn up the channel fader to its nominal position, as indicated by the fader marking 3/4 of the way up. The pan pot and assign switches will have no effect on the Direct Output signal.

Recording

With all 3 of the above methods, you should then proceed as follows. On your multitrack recorder, insert a tape, wind to where you wish to begin recording, set the counter to zero, and put all the tracks you wish to record on in RECORD READY mode. If the multitrack has input level controls, set them to their nominal positions. With the performers playing, adjust the channel/group faders so that the multitrack's meters display the desired recording level, as indicated by the multitrack's manual. When you're ready to record, put the multitrack into RECORD mode and have the musicians play the song. When the song is over, press STOP on the multitrack and rewind the tape to the beginning of the song.

Playback

If you set up the control room monitoring as suggested in this chapter, then if you play back the MT tape at this point, you will hear the tape tracks you just recorded in the control room. To let the musicians in the studio hear what was just recorded, you should select CRM as the source in the Studio Foldback section that you are using.

If you are dissatisfied with the take, then either record over it or record another take after the first take. Remember to unselect CRM as a source in the Studio Foldback section, if necessary. When you are satisfied with the recording, you can move on to the next stage, Overdubbing.

Procedure

1. "Zero Out" the console.
2. Connect your input sources to the channel MIC and LINE inputs.
3. Use the MIC/LINE switch to select the appropriate input for each channel. Press the 48V switch for condenser mics, where required. Make sure the REV switch is not depressed.
4. Select one of the 3 recording methods, from above, and follow the directions for signal routing and channel/group fader positioning for each channel.
5. On the MT, insert a tape, wind to where you wish to begin recording, set the counter to zero, put the appropriate tracks into RECORD-READY mode, and set the recording level control of the MT, if any, to its nominal position.
6. With the musicians playing, set up preliminary monitor mixes for the Control Room and Studio (see above). Then use the INPUT SENSITIVITY knob to set your input gain structure, using the optional meterbridge or the CRM/SOLO-L/R meters, and the SIG and PK LEDs.
7. Use the LCF and PHASE switches, as required.
8. Apply EQ, as required.
9. Add effects and processing, as required.
10. Adjust the channel and group faders, as required, so that the multitrack's meters display the desired recording level.
11. Set up your final monitor mixes, and then have the musicians stop playing. Put the MT into RECORD mode and have the musicians play the song. When the song is over, STOP the multitrack and rewind the tape to zero.
12. Play back the tracks you have just recorded. To let the musicians in the Studio hear the take, select CRM as the Source in the appropriate Studio Foldback section.
13. If dissatisfied, record over the first take or add another take after it. Before recording again, remember to unselect CRM and select AUX 1-2 as the Studio Foldback Source, if necessary.
14. When you are satisfied with the take of the basic tracks, you can begin overdubbing.

Overdubbing

Overview

Overdubbing is similar to the procedure used for Recording Basic Tracks, except that in addition to monitoring the new tracks you are recording, you must also monitor previously recorded tape tracks. Usually, you overdub one instrument or group of instruments at a time. During overdubbing, the musician in the studio (or control room) listens to previously recorded tape tracks, through headphones, and then adds a new part, which he also hears in his headphones. In our example, we would overdub the lead guitar, to add guitar riffs and a guitar solo. We might also overdub a keyboard solo. Then we would overdub the lead vocals, and finally the background vocals.

The recording procedure for overdubs is the same as the procedure for recording basic tracks. However, while you are recording the overdubs, you must also provide a monitor mix of previously recorded tape tracks. While recording (either basic tracks or overdubs), on the channels that contain the input sources you are recording, and on the channels for which you are using the MIX B sections for control room monitoring of those sources, the REV switch should not be depressed and the MIX B SRCE switch should be set to TAPE. After you are satisfied with your recording of the basic tracks and after you finish recording each overdub, on the channels representing the tape tracks you wish to keep, you should press the REV switch and the MIX B SRCE switch should be set to CHAN.

For example, assume tracks 1 and 2 are already recorded and you are currently overdubbing a guitar solo on track 3 through channel input 10. On channels 1 and 2, the REV switch should be pressed and the MIX B SRCE switch set to CHAN. This routes the tape returns to both the channel and MIX B paths so you can monitor previously recorded tape tracks using the channel 1-2 MIX B sections for control room tape monitoring and AUX 1-2 sections for studio tape monitoring.

On channels 3 and 10, the REV switch should not be pressed and the MIX B SRCE switch should be set to TAPE. This routes the track 3 tape return to channel 3's MIX B path and the guitar input to channel 10's channel path. This is done so that you can monitor the input signal currently being recorded. The MIX B section of channel 3 is used for control room monitoring of the guitar signal being sent to tape track 3, and the AUX 1-2 section of channel 10 is used for studio monitoring of the guitar input.

After you are finished recording on track 3, then channel 3's REV switch should be pressed and its MIX B SRCE switch set to CHAN, since track 3 is now considered a previously recorded tape track. This will route the track 3 tape return to both the channel and MIX B paths of channel 3. This is done to set up tape monitoring of track 3 for the next overdub. (See the Sections on "Control Room Monitoring" and "Studio Monitoring", above.)

Procedure

1. On all channels that contain the outputs of previously recorded tape tracks, press the REV switch and set the MIX B SRCE switch to CHAN. This routes the Tape Returns to both the Channel and MIX B paths. These are your Tape channels and are for monitoring purposes only.
2. Connect your input sources for the overdub to the channel MIC and LINE inputs. These are your Input channels.
3. On the Input channels, use the MIC/LINE switch to select the appropriate input for each channel. Press the 48V switch for condenser mics, where required. Make sure the REV switch is not depressed and set the MIX B SRCE switch to TAPE.
4. Select one of the 3 recording methods, from "Recording Basic Tracks", above, and follow the directions for signal routing and channel/group fader positioning for each Input channel.
5. On the MT, rewind the tape to the beginning of the song, or to a point before the overdub will be recorded, and put the appropriate tracks into RECORD-READY mode. Make sure that all previously recorded tracks are not in RECORD-READY mode. Then set the recording level controls of the MT, if any, to their nominal positions and start playing the tape.
6. With the musicians playing along with the tape, set up Control Room and Studio preliminary monitor mixes of the overdub being recorded and of previously recorded tape tracks (see Control Room/Studio Monitoring, above). Then use the INPUT SENSITIVITY knob to set your input gain structure for the overdub, using the optional meterbridge or the CRM/SOLO-L/R meters, and the SIG and PK LEDs.
7. Use the LCF and PHASE switches, as required.
8. Apply EQ, as required.
9. Add effects and processing, as required.
10. Adjust the channel and group faders, as required, so that the multitrack's meters display the desired recording level.
11. Set up your final monitor mixes, of both the live signal and of previously recorded tape tracks, and then have the musicians stop playing. Put the MT into RECORD mode and have the musicians play the overdub. When the overdub is over, STOP the MT and rewind the tape to zero or to a point right before the overdub.
12. Play back the overdub you have just recorded. To let the musicians in the Studio hear the take, select CRM as the Source in the appropriate Studio Foldback section.
13. If dissatisfied, record over the first take of the overdub. Before recording again, remember to unselect CRM and select AUX 1-2 as the Studio Foldback Source, if necessary.
14. When you are satisfied with the take of the overdub, proceed to record the next overdub. If there are any mistakes on the overdub that need fixing, and you don't want to record the entire track over again, then see "Punching In/Out", below. If you run out of tracks on the multitrack, you might want to bounce tracks to create more empty tracks. See "Bouncing Tracks", below. When you're satisfied with all the tracks on the tape, proceed to "Mixing Down", below.

Punching In/Out

Overview

Punching in and punching out is a procedure you use when you want to correct a performance on a tape track, without having to record the entire track over again. It allows you to selectively record over just a portion of a tape track. For instance, you might want to fix a guitar solo with one bad note in the middle. Rather than record the solo over again, you can have the guitarist just play over the point where the bad note occurs. Besides punching in/out manually, some multitracks let you automate the process and even have a rehearsal mode, where you can practice the punch, without actually committing it to tape. (See your Multitrack (MT) manual.)

On the MT, you must select a pre-roll point, a punch-in point, a punch-out point, and a post-roll point. The pre-roll point occurs before the bad note and gives the guitarist, in our example, some time to play along with the song before the bad note occurs. The punch-in point is where you actually start recording. The punch-out point is where you stop recording, but the tape continues to play. The post-roll point is where the tape stops.

The procedure is as follows: The multitrack starts in PLAY mode at the pre-roll point. The guitarist plays along with the song, but it is not recorded. At the punch-in point, the MT changes from PLAY mode to RECORD mode. At this point, the guitarist is being recorded. He plays over a small section of the solo, including the point where the bad note is. At the punch-out point, the MT switches from RECORD mode back to PLAY mode. At this point recording is no longer taking place. The MT continues in PLAY mode until the post-roll point, where the MT goes into STOP mode.

Here's a diagram illustrating the procedure:

PRE-ROLL(PLAY)⇒ P-IN(REC)⇒ ...BAD NOTE...⇒ P-OUT(PLAY)⇒ POST-ROLL(STOP)

The procedure is very similar to overdubbing. While performing the punch, the performer can listen to any previously recorded tape tracks. The issue is what the performer will hear on the track that's being used for the punch. Between the Punch-In and Punch-Out points, it is only possible to hear the new part being recorded, since the original part is being erased. Note that you will still be able to hear all the tracks that are not being used in the punch. But you must determine what the performer wants to hear on the punched track, during pre-roll and post-roll. Does he just want to hear himself playing the new part, does he just want to hear the old part and only hear himself during the punch, or does he want to hear himself playing along with the old part?

What the performer hears during pre-/post-roll is determined by the MT. Normally, when the MT is in PLAY mode, you will hear tape playback, unless a track is armed and in RECORD-READY mode, in which case you will hear the input signal for that track, instead of tape playback. Since the punch track will be in RECORD-READY mode during pre-/post-roll, the performer would just hear the new performance during this time. Most MTs will have an INSERT mode, that allows the performer to hear tape playback during the roll points, even though the punch track is armed. Some MTs also have a MIX mode that allows the performer to hear both the old and new material during the roll points. Your MT may use different terms for these functions.

If you select neither INSERT nor MIX on the MT, this is what you will hear:

Pre-Roll: New material

Punch-In to Punch-Out: New material

Post-Roll: New material

This means the performer will never hear the original punch track. The performer will play along with the other tracks that are not involved in the punch.

If you select INSERT, this is what you will hear:

Pre-Roll: Old Material

Punch-In to Punch-Out: New material

Post-Roll: Old material

This most closely approximates what the final punch will sound like. The performer will hear the old material before Punch-In, then hear his new part when the MT goes into record mode between the Punch points, and then hear the old material again.

If you select MIX, this is what you will hear:

Pre-Roll: Old and New material

Punch-In to Punch-Out: New material

Post-Roll: Old and New material

This allows the performer to play along with the old material before and after the Punch points.

It's better if you perform the punch right after the track has been recorded because it will be easier to get the same sound for the punched part that you had on the original part. If you perform the punch at a later date, it's important to try to get the same sound from the source instrument or voice, as you had when you recorded the original part. If the sound is different, it will be easier to detect where the punch points are.

The manual for your multitrack recorder should detail how to set up the MT for punching in/out. This section describes how to set up Ghost for punching in/out.

Procedure

1. On all channels that contain the outputs of previously recorded tape tracks, press the REV switch and set the MIX B SRCE switch to CHAN. This includes the track you will use for the punch. This routes the Tape Returns to both the Channel and MIX B paths.
2. Then proceed as normal to set up the channel input you will use for punching in the new part. Make sure REV is not pressed and that the MIX B SRCE is set for TAPE. For instance, if you're punching in on a guitar track, then plug in the same guitar to one of the channels. (See Overdubbing, above.) Assign the guitar to the track you want to punch in on. Try to get the same sound you used when recording the original part. Play along with the MT tape a few times and use the Input Sensitivity knob, channel/group faders, and other controls to get the same sound and level you have on the track you're using for the punch. Make sure the meters of the MT register the same for the new part and the original material on the punch track.
3. Select MIX B as the only source in the Control Room section and select AUX 1-2 as the only source in the Studio Foldback section.
4. Set up your MT for punch in/out recording. (See your MT manual.) Then, rewind the tape to the pre-roll point. Make sure none of the non-punch tracks are in RECORD-READY mode. Then initiate auto punch in/out recording on the MT. If your MT only has manual punching, then you'll have to manually punch in/out at the appropriate times. The performer should start playing along with the tape until it stops.

5. For the control room, you should use the MIX B section to monitor the punched track, as well as all previously recorded tape tracks. For instance, if tracks 1-4 are filled and you are punching in on track 5, then use the MIX B section on channels 1-5. Channels 1-4 will continuously monitor tape tracks 1-4 throughout the process. However, what you hear on channel 5 during pre-roll and post-roll depends on the settings selected on the MT. (You will hear only the new part, or only the old part, or both the new and old parts.) Between the Punch-In and Punch-Out points you will only hear the new material being recorded, because the MT will be in RECORD mode.
6. For studio monitoring, you should use the AUX 1-2 knobs, in PRE mode, to send previously recorded tape tracks, including the punch track, to the performer. For instance, if tracks 1-4 are filled and you are punching in on track 5, you would use the AUX 1-2 knobs on channels 1-5. Just as with control room monitoring, channels 1-4 will continuously monitor tape tracks 1-4 throughout the process. However, what the performer hears on channel 5 during pre-roll and post-roll depends on the settings selected on the MT. (The performer will hear only the new part, or only the old part, or both the new and old parts.) Let the performer decide which method he prefers. Between the Punch-In and Punch-Out points the performer will only hear the new material being recorded, because the MT will be in RECORD mode
7. When the punch is completed, rewind the tape to the pre-roll point, and play it back. To let the performer in the Studio hear the take, make sure the AUX 1-2 knobs are turned up on the channel that represents the punched track.
8. If dissatisfied, try the punch again until you are satisfied with the results.

Bouncing Tracks

Overview

Bouncing tracks is a procedure whereby you mix previously recorded tape tracks and then record that mix to an open track or tracks on the MT, thereby freeing up the tracks you mixed. This procedure is also known as "Ping-Ponging." For instance, on an 8-track deck, if you have tracks 1-6 filled, that only leaves tracks 7-8 available for overdubs. If you need more than those 2 remaining tracks for overdubs, you could bounce tracks 1-6 to tracks 7-8, and then erase tracks 1-6, so now you would have 6 tracks left for overdubs. You can also record new sources to tracks 7-8, while you are bouncing tracks 1-6 to tracks 7-8. The tracks you wish to bounce are known as source tracks and the empty tracks you are bouncing to are known as destination tracks.

Using the above example, the procedure involves playing back tracks 1-6 through Ghost and then mixing them to stereo by assigning them to tracks 7-8. On the MT, only tracks 7-8 would be armed for recording. Then, when you play back the tracks, the stereo mix is recorded to tracks 7-8. At this point, tracks 1-6 would still be intact, and tracks 7-8 would contain the stereo mix of tracks 1-6. If you're not satisfied with the bounce, you can try it again. The drawback to this method is that you cannot change the mix recorded on tracks 7-8, after you've erased tracks 1-6. The advantage is that you now have 6 tracks for overdubs, instead of 2.

The owner's manual for your multitrack recorder should explain how to set up the MT for bouncing tracks. However, you still need to know how to configure Ghost when you are bouncing tracks, and that procedure is detailed below.

Procedure

To bounce tracks without adding a new part:

1. On the channels representing the tracks you want to bounce, press the REV switch and set the MIX B SRCE switch to CHAN. This routes the Tape Returns to both the Channel and MIX B paths. These are the source channels.
2. To simply let the musicians in the studio listen while you bounce the tracks, select CRM as the only source in the Studio Foldback section.
3. Assign all the source channels to the destination track(s) by using the assign switches and pan pots. The channel faders of the source channels will control the output levels of the source tracks. Then set the appropriate Group faders to their nominal levels, $\frac{3}{4}$ of the way up. For instance, if you're bouncing tracks 1-6 to tracks 7-8, then press the 7-8 assign switches on channels 1-6 and use the pan pots on 1-6 to create the desired stereo perspective. Then turn up the Group 7-8 faders.
4. On the MT, rewind the tape to the beginning of the song and put the destination track(s) into RECORD-READY mode. Make sure that the source tracks are not in RECORD-READY mode. Then set the recording level control of the MT, if any, to its nominal position and start playing the tape. Make sure the MT is in PLAY mode and not in RECORD mode at this point. You just want to listen to the source tracks so you can mix them on Ghost, but you don't want to record anything yet. The reason that the destination tracks are armed is so you can monitor them through the MIX B section.
5. Set up a Control Room preliminary monitor mix of the bounce using the MIX B section(s) on the channel(s) that correspond to the destination tracks. For instance, if you're bouncing to tracks 7-8, then use the MIX B section of channels 7-8 to monitor the bounce. You will be able to hear all the source tracks since they are assigned to tracks 7-8 and those tracks are in RECORD-READY mode.

6. While listening to the tape, adjust the source channel faders to create the mix of tape tracks that you desire. Apply EQ and effects/processing, as desired. Using the Group faders make sure that the multitrack's meters display the desired recording level.
7. Set up your final monitor mix, and then stop the tape and rewind it to the beginning of the song. Then put the MT into RECORD mode and play the song to the end. The source tracks will be routed to Ghost and then sent to the destination tracks, where they will be recorded on tape. When the song is over, STOP the multitrack and rewind the tape to the beginning of the song.
8. Take the destination tracks out of RECORD-READY mode and play back the song. At this point, you'll just be monitoring the destination tracks you just recorded. If you're not satisfied with the results, rewind the tape to the beginning, re-arm the destination tracks, put the MT in PLAY mode, and try mixing the tracks again. When you think you have the mix you want, then rewind the tape and start the MT in RECORD mode to try the bounce again.
9. When you are absolutely sure you are satisfied with the destination tracks, then you can erase the source tracks and use them for overdubs. Be careful, because after you erase the source tracks, you must use the mix of those tracks that you recorded on the destination tracks.

If you want to add a new part as you're bouncing tracks:

10. If you are going to add a new part while you bounce the tracks, then follow the above procedure for bouncing the tracks, but make these changes. Select AUX 1-2 as the only source in the Studio Foldback section. Then proceed as normal to set up the channel inputs you will use for recording the new part. Assign the new part to the destination track(s) and use AUX 1-2 (in PRE mode) for Studio monitoring of both the part you're adding and previously recorded tape tracks, including the tracks being bounced. (See Overdubbing, above.) For instance, if you're bouncing tracks 1-6 to tracks 7-8 and you're also adding a new guitar part to tracks 7-8, and the guitar is plugged into channel 10, then you would proceed as follows. Channel 10 should not have its REV switch depressed. You would assign channel 10 to Groups 7-8, use its pan pot for stereo placement, and turn up its channel fader. Then you would use AUX 1-2 on channels 1-6 for Studio monitoring of the tape tracks and you would use AUX 1-2 on channel 10 for Studio monitoring of the new guitar part.

Overview

There are basically 3 ways to add effects or processors to a signal: add it before the signal reaches Ghost; add it using Ghost's Insert jacks; or add it using Ghost's AUX Send/Return system. For purposes of this discussion, this is how we will define the following terms:

Outboard: An effects device or processor, that is not part of Ghost, which is used to alter a signal.

External Treatment: Using outboard gear on a signal before it enters Ghost.

Processor: Outboard gear connected to an Insert jack, in which the entire signal is processed and then returned to Ghost.

Effect: Outboard gear used by the AUX Send/Return system, in which wet and dry signals are combined within Ghost.

Dry: The unprocessed or original signal.

Wet: The processed signal (the signal that has been treated by the outboard gear).

It is important to understand the distinction between a processor and an effect. With a processor, you want to treat the entire signal and only use this wet signal. Examples of processors are outboard EQ, compressors, limiters, expanders, and noise gates. The latter 4 are collectively known as "dynamics processors." For instance, with outboard EQ, the signal would enter the EQ, be altered by the EQ, and then exit the EQ. You only want to use the EQ'ed signal. You do not want to combine it with the non-EQ'ed signal.

With an effect, you want to combine the dry signal and wet signal. Examples of effects are outboard reverb, delay, chorus, flangers, phasers, and echo. The original signal is split in two when it enters the effect. One signal is processed by the effect and the other signal is not. You then blend the wet and dry signals together to create the effect. For instance, if you run a signal through a delay, the original signal is delayed by a certain amount of time. If you just listen to the original signal by itself or the delayed signal by itself, you won't hear the delay effect. The effect is achieved by combining both signals so that first you hear the original signal and then a short time later you hear the delayed signal.

Effects devices have a mix control that allows you to determine the blend of wet and dry signals that will appear at the unit's output jacks. For instance, 0% could mean all dry signal; 100% could mean all wet signal; and 50% could mean half dry signal and half wet signal. When you use an effects device for external treatment outside of Ghost, you use the effects unit's mix control to determine the wet/dry mix. When you use it with Ghost's AUX Send/Return system, you set the effect for 100% wet signal, and determine the wet/dry mix using Ghost's controls.

The different methods for treating a signal are described below.

1. **External Treatment:** With this method you alter the signal before it reaches Ghost. You can use either an effect or a processor. It is commonly used by guitarists, when using "stomp boxes." For example, you connect a guitar cable to the input of a delay box (an effect), then you connect the output of the box to one of Ghost's LINE inputs. Or, you connect a guitar to a compressor box (a processor), then you connect the output of the box to one of Ghost's LINE inputs. In either instance, the signal is processed before it reaches the Input jack. The effect will usually have a mix control, that allows you to mix the balance of wet and dry signals. It is this blended signal that enters Ghost. With the processor, only the wet signal enters Ghost.

External treatment does not require using any of Ghost's controls. You simply plug the treated signal into one of Ghost's inputs.

- Using Processors:** Outboard processors are connected to Ghost using a send/return Y-cable connected to one of Ghost's Insert jacks. The signal from Ghost is sent to the outboard device, processed, and then the processed signal is returned to Ghost. You use this method when you want to treat the entire signal, as opposed to blending the wet and dry signals. You'll generally use outboard EQ or dynamics processors with the Inserts.

Ghost has Inserts on all Channels, Groups, and the L/R Mix. You use the Channel Inserts when you want to process just the input of one channel; for instance, to use compression on a vocal input. You use the Group Inserts when you want to process a group of signals at once. For instance, if you have all your drum tracks assigned to Groups 1-2, then you could process them all by inserting a stereo compressor into Group Inserts 1-2. You use the L/R Inserts when you want to process the entire Main Mix during mixdown; for instance, to use stereo compression on the Main Mix before it's recorded to a DAT tape.

Using processors with Ghost just requires that you connect them properly to Ghost's Insert jacks. (See **Chapter 5 – 4. INS**). It does not require using any of Ghost's controls.

- Using Effects:** To use effects with Ghost, you can use the AUX Send/Return system. This method involves sending a copy of a channel/MIX B signal to the outboard effect, processing it, and then returning it to Ghost. This wet signal is then combined with the dry signal within Ghost.

You connect an AUX output jack to the device's input. The signal is treated and then returned to Ghost, either through an Effects Return or one or more Channels. If you use an Effects Return, you won't be able to send the signal to the Studio Foldback for monitoring by the performers; so it's best to use the Effects Returns during mixdown, when Studio monitoring is not important.

Sometimes, you will want to record the effect to tape and other times you will want to record dry, but monitor wet. This means that you want to hear the wet signal in the Control Room and Studio monitoring systems, but you only want to record the dry signal. In this instance, you must connect the stereo outputs of the effects device to 2 Channel LINE inputs.

Generally, it doesn't matter which AUX Send you use, but you should be aware of the differences between them. AUX 1-2 are mono channel sends and can be Pre/Post-fader. AUX 3-6 are mono post-fader sends from either the channel or MIX B paths. (You can only use either AUX 3-4 or AUX 5-6 at one time, per channel/MIX B path.) AUX 7 is a stereo post-fader channel send. AUX 8 is a stereo post-fader MIX B send. When you use AUX 1-2 for effects, make sure the PRE switch is not pressed, so they act as post-fader sends.

You use the appropriate AUX Send level control and AUX rotary master fader to send a copy of the signal to the AUX jack. The original signal continues down the Channel/MIX B path. Then after selecting an effect and setting the parameters for it in the outboard device, you must make sure that the device is set to 100% wet signal. You only want the wet signal at the effects unit's output jacks. Then you can connect the stereo outputs to one of Ghost's Stereo Effects Returns or to 2 Channel inputs. If you're recording the effect, you then assign this wet signal to either the Group buses or to the L/R Mix. You also assign the original, dry signal to the Group buses or L/R Mix. (MIX B can only be assigned to the L/R Mix, usually during mixdown.) The Channel/MIX B faders will determine the amount of dry signal on the buses and the Effects Returns level controls (or Channel faders if you returned the wet signal to the Channel inputs) will determine the amount of wet signal on the buses. This is why you must set the effects device to 100% wet signal. You determine the blend of wet/dry signals with Ghost's controls.

Note About Studio Monitoring and Effects

The FX Returns were designed to add effects during mixdown, or while multi-tracking in the control room and only using the control room monitor section. When using the FX Returns, you cannot monitor the wet signal in the Studio Foldback sections. However, you can record the wet signal to the multitrack or the mixdown deck and you can monitor it in the Control Room. If you're recording the effect and the performers don't care if they hear the effect while performing, then you can use the FX Returns. However, if the performers want to hear the effect while recording, or if you want to record dry, but monitor wet, then you should not use the FX Returns. You should connect the stereo outputs of your effects device to 2 channel inputs and use those channels to route the wet signal to the Group or L/R buses for recording, if desired, and to the Control Room and Studio monitoring sections.

It is suggested that you return the outputs of a stereo effects device to an FX Return only under the following conditions:

1. During mixdown, when studio monitoring is not important.
2. When you're recording yourself or the performers while in the control room, you're using the control room monitor section, and don't need to send the effect to the Studio Foldback.
3. The performers are in the studio, you're recording the effect, but the performers don't care if they hear the effect.

You should return the outputs of a stereo effects device to 2 adjacent Channel **LINE** inputs (**Channel Returns**) under the following conditions:

1. The performers are in the studio, you're recording the effect, and the performers want to hear the effect.
2. The performers are in the studio, you're not recording the effect, but the performers want to hear the effect to make them perform better.

Control Room Monitoring While Using Effects

- a. **Monitoring while recording the effect:** (This applies whether you are returning the effect to an FX Return or to 2 Channel inputs.)
 1. **Recording the effect to a multitrack deck:** Assign the effect to the appropriate Groups, set the Control Room Source to MIX B, and use the MIX B section in the channel strip that represents the tape track the effect is being recorded on.
 2. **Recording the effect during mixdown:** Assign the effect to the L/R MIX and follow the usual procedure of setting the Control Room Source to MIX A and simply monitor MIX A in the control room.
- a. **Recording Dry and Monitoring Wet while multitracking:** (You don't wish to record the effect, but you want to monitor it.)
 1. **Using 2 Channel LINE Inputs as Returns:** Don't assign the effect to the Groups, set the Control Room Source to MIX B, and use the MIX B sections in the 2 channel strips where the effect is being returned. Make sure the Channel Return REV switches are not engaged and set their MIX B SRCE switches to CHAN (Down).
 2. **Using an FX Return:** Assign the FX Return to the L/R Mix by pressing the MIX switch, but don't assign it to the Groups. Set the Control Room Source to monitor both MIX A and MIX B. MIX B is what you normally use for control room monitoring and MIX A would be used to monitor the effect. You would normally only use this last method if the performers were recording in the control room using the control room monitor section, and you wished to record dry, but monitor wet.

Studio Monitoring While Using Effects:

- a. Whether or not you're recording the effect, if you want to monitor it in the Studio, then you should connect the stereo outputs of your effects device to 2 adjacent Channel LINE inputs. Make sure their REV switches are not engaged and set their MIX B SRCE switches to CHAN (Down). This routes the effect to both the channel and MIX B paths. We'll call these Channel Returns. Set the Studio Foldback Source to AUX 1-2 and use the AUX 1-2 Send knobs in the Channel Returns to monitor the effect. These AUX 1-2 controls are used for monitoring and should be set up as Pre-Fader Sends by pressing the PRE switch. Note that any AUX 1-2 controls that are being used to send signals to the effects device should be set up as Post-Fader Sends by making sure the PRE switch is not pressed.

Next, we will outline the procedure to use with the FX Returns, which will allow you to record effects and monitor them in the Control Room, but not monitor them in the Studio. Then, we will outline the procedure to be used with 2 Channel LINE inputs, which will allow you to record effects and monitor them in both the Control Room and the Studio.

For connecting effects devices to the FX Returns. Studio Monitoring is not possible.

Procedure

1. First, select which AUX Send you wish to use, based on whether you wish to use it with a Channel or MIX B input and whether your effect has mono or stereo inputs. Let's say you want to use AUX 1. (If you use AUX 1 or 2, make sure the PRE switch is not pressed.) Connect the AUX 1 output jack to the input of your effects device. Connect the L/R outputs of your effects device to the FX 1-L/R jacks. (Note that you can use any FX RETURN.)
2. On the effects device, set the input level and output level controls to their nominal positions. Make sure the effects unit is set for 100% wet output and select the effect you wish to use.
3. Turn the AUX 1 rotary master fader control about 75% up. With a signal present, turn the AUX 1 Send controls about 75% up on all channels that you wish to be treated with the effect. This sends the channel signals to the effects device.
4. There should be a reading on the input meter of the effects device, showing that there is a signal present. If you're recording to a multitrack deck, then set the Control Room Source to MIX B. If you're mixing down, then set the Control Room Source to MIX A. Turn the Control Room Level knob 75% up. You cannot monitor the effect in the Studio Foldback sections.
5. Use the Channel ASSIGN switches and PAN Pots to route the dry signals to the appropriate buses, as usual. Use the FX 1 ASSIGN switches and BAL knob to route the wet signal to the appropriate buses. You can record the wet signal on the same tape tracks as the dry signals or on their own tape tracks. Turn the appropriate Group Faders about 75% of the way up (if multitracking) and set the MIX fader to the top of its travel (if mixing down). This sends the wet and dry signals to the buses.
6. In the control room, to monitor the effect while you're recording to a multitrack deck, you use the MIX B section in the channel strip that represents the tape track the effect is being recorded on. To monitor the effect while mixing down, you should assign the FX Return to the L/R Mix by pressing the MIX switch, and then monitor MIX A in the control room, as usual. To record dry and monitor wet, assign the FX Return to the L/R Mix by pressing the MIX switch, but don't assign it to the Groups. Set the Control Room Source to monitor both MIX A and MIX B. MIX B is what you normally use for control room monitoring and MIX A would be used to monitor the effect.

7. Turn the FX 1 level control about 75% up. This returns the wet signal from the effects device to Ghost.
8. With a signal present in the channels you're using, you should be able to hear the effect. Adjust the AUX 1 Send controls to determine how prevalent the effect will be for each channel. For instance, all other things being equal, if the AUX 1 Send control is turned 75% up for one channel and 50% up for another channel, you will hear the effect more for the former channel.
9. After setting the AUX 1 Send levels for all the channels, press the AUX 1 Master Fader AFL switch. This will send all AUX 1 levels, post-AUX 1 master fader, to the CRM/SOLO-L/R meters. Adjust the AUX 1 Master Fader so that the meters read 0, then turn AFL off.
10. Adjust the input level of the effects device to achieve the meter reading on the effects device, suggested by the device's manual.
11. Then press the PFL switch in the FX 1 section. This will display the effects signal returned to Ghost, pre-FX 1 level control, on the CRM/SOLO-L/R meters. Adjust the output level of the effects device so that the meters read 0, then turn PFL off.
12. Finally, adjust the FX 1 level control, together with the channel faders, to achieve the blend of wet/dry signals that you desire. The channel faders control the dry signal and the FX 1 level knob controls the wet signal. The Group/MIX faders control the overall signal sent to the Group/MIX buses. Remember that the individual AUX 1 Send knobs and AUX 1 master fader determine the level of the signal sent to the effects device and the FX 1 level knob determines the level of the signal returned to Ghost.

For connecting effects devices to 2 Channel LINE Inputs (Channel Returns). Studio Monitoring is possible.

Procedure

1. First, select which AUX Send you wish to use, based on whether you wish to use it with a Channel or MIX B input and whether your effect has mono or stereo inputs. Let's say you want to use AUX 1. (If you use AUX 1 or 2, make sure the PRE switch is not pressed.) Connect the AUX 1 output jack to the input of your effects device. Connect the L/R outputs of your effects device to any 2 adjacent Channel LINE inputs. Make sure their REV switches are not engaged and set their MIX B SRCE switches to CHAN (Down).
2. On the effects device, set the input level and output level controls to their nominal positions. Make sure the effects unit is set for 100% wet output and select the effect you wish to use.
3. Turn the AUX 1 rotary master fader control about 75% up. With a signal present, turn the AUX 1 Send controls about 75% up on all channels that you wish to be treated with the effect. This sends the channel signals to the effects device.
4. There should be a reading on the input meter of the effects device, showing that there is a signal present. If you're recording to a multitrack deck, then set the Control Room Source to MIX B. If you're mixing down, then set the Control Room Source to MIX A. Turn the Control Room Level knob 75% up. For multitrack recording, select AUX 1-2 as the Studio Foldback Source and turn its level control 75% up.

5. Use the Channel ASSIGN switches and PAN Pots to route the dry signals to the appropriate buses. If you want to record the wet signal, then using the Channel Returns, set their ASSIGN switches and PAN Pots to route the wet signals to the appropriate buses. You can record the wet signals on the same tape tracks as the dry signals or on their own tape tracks. Turn the appropriate Group Faders about 75% of the way up (if multitracking) and set the MIX fader to the top of its travel (if mixing down). This sends the wet and dry signals to the buses.
6. In the control room, to monitor the effect while you're recording to a multitrack deck, you use the MIX B section in the channel strip that represents the tape track the effect is being recorded on. To monitor the effect while mixing down, you should assign the Channel Returns to the L/R Mix by pressing the L/R switch, and then monitor MIX A in the control room, as usual. To record dry and monitor wet, don't assign the effect to the Groups and use the MIX B sections in the Channel Returns to monitor the effect.
7. Set the Channel Return Faders to their nominal positions. This returns the wet signal from the effects device to Ghost.
8. With a signal present in the channels you're using, you should be able to hear the effect. Adjust the AUX 1 Send controls to determine how prevalent the effect will be for each channel. For instance, all other things being equal, if the AUX 1 Send control is turned 75% up for one channel and 50% up for another channel, you will hear the effect more for the former channel.
9. To send the effect to the performers in the Studio, whether or not you are recording the effect, use the AUX 1-2 Sends on the Channel Returns. These AUX 1-2 controls should be set up as Pre-Fader Sends by pressing the PRE switch.
10. After setting the AUX 1 Send levels for all the channels, press the AUX 1 Master Fader AFL switch. This will send all AUX 1 levels, post-AUX 1 master fader, to the CRM/SOLO-L/R meters. Adjust the AUX 1 Master Fader so that the meters read 0, then turn AFL off.
11. Adjust the input level of the effects device to achieve the meter reading on the effects device, suggested by the device's manual.
12. Then press the SOLO switches (with SIP Off) in the Channel Returns. This will display the effects signal returned to Ghost, pre-channel fader, on the CRM/SOLO-L/R meters. Adjust the output level of the effects device so that the meters read 0, then turn SOLO off.
13. Finally, adjust the Channel Faders and Channel Return Faders for the wet and dry signals, to achieve the wet/dry recording mix that you desire. Adjust the MIX B level controls and AUX 1-2 Sends to achieve the wet/dry monitoring mix that you desire for the control room and studio, respectively. The Channel Faders that contain the signal sources control the dry signal and the Channel Return Faders control the wet signal. The Group/MIX faders control the overall signal sent to the Group/MIX buses. The MIX B controls are used for control room monitoring and the AUX 1-2 controls are used for studio monitoring. Remember that the individual AUX 1 Send knobs and AUX 1 master fader determine the level of the signal sent to the effects device and the 2 Channel Return Faders determine the level of the signal returned to Ghost.

Overview

After you have recorded all your tracks, you must mix them down to a 2-track recorder, such as a DAT deck, open-reel machine, cassette deck, or CD-R recorder. There are two reasons for doing this. First, the completed MT tape(s) are only playable on the same-format MT deck. If you want to distribute your recordings to others, you must have it on media that you can send to a duplicator/replicator (for large quantities) or that you can distribute yourself (for small quantities). Second, as you mix down to 2-track, you are able to set the levels and balance among the various tape tracks, as well as add EQ, processors, and effects to the tracks.

The completed MT tape is known as the multitrack master tape. Especially with digital media, you should make backup or safety copies of this tape, before you begin mixdown. The completed 2-track tape is known as the stereo master tape or 2-track master tape. You should also make backup or safety copies of this tape. In a home or project studio, if you only need very limited distribution of the final product, you might duplicate the stereo master tape yourself. For instance, dub the master to cassette tapes or CD-Rs, and then distribute those. But for large scale distribution, you must have a duplicator/replicator do the job for you. Today, they will accept DAT, CD-R, open-reel tape, and to a limited extent, cassette tapes from you, and make the required number of copies in the format you specify. You can also send your tape to a mastering house for last minute refinements before duplication. With the proper setup, some people can master the tape themselves.

Note

Today some people use the term "mastering" to refer to the act of mixing down a tape and they refer to the 2-track mixdown deck as a "mastering deck." To avoid the confusion caused by those who are now using a well-established term ("mastering") to also refer to another procedure for which there is a well-established term ("mixing down"), we will use the term "mixing down" to refer to the act of creating a stereo master tape, and use the term "mastering" in its traditional sense. That is, to apply final tweaks to the stereo master tape before duplication.

When you are ready for mixdown, you should route all tape/hard disk/MIDI tracks to Ghost's channel path, so that they come up on the long-throw faders and so that you will have the extra features of the channel path available to you. If you have more sources than channels, you'll have to decide which sources you want to route to the channels and which sources you want to route to MIX B. You can also use Ghost's 4 stereo effects returns as inputs, but as a practical matter, you should only connect one signal source to each effects return. If you connect stereo sources, you'll have an additional 8 inputs, and if you connect mono sources, you'll only have 4 additional inputs. So, if possible, try to connect stereo sources to the effects returns, in order to maximize the number of inputs you'll have. Also, keep in mind that if you want to add effects during mixdown (and you usually will), you'll have to return the effects to either the effects returns, the channels, or MIX B sections. If they are all handling your signal sources, then it will be difficult to add any effects during mixdown.

Once you've decided what your sources will be for the channels, MIX B sections, and Effects Returns, you should zero out the console. Then, press the REV switch on all channels where you want to route the MIX B/TAPE RET inputs to the channel path, and leave the switch up, if you want the channel inputs routed to the channel path. Generally, it's a good idea to route all your tape tracks to the channel path first, and if you run out of channels, then route your hard disk/MIDI tracks to the MIX B path. If you have 2 sources for a channel, make sure the MIX B SRCE switch is set to TAPE (UP). If you only have one source for a channel, and you wish to use MIX B as a pre-fader send for the channel path, then set the MIX B SRCE switch to CHAN (DOWN).

Next, you should assign all channels and effects returns that are in use to the L/R MIX by pressing the L/R switch on the channels and the MIX switch on the effects returns. To globally assign the MIX B bus to the L/R Mix, press the MIX B TO MIX switch in Ghost's MIX B master section. Set the MIX B rotary master fader about 75% up. Set the L/R master fader to the top of its travel.

If you want to group some of your sources, then you should assign them to the appropriate Group buses and not to the L/R Mix. Then assign the appropriate Group buses to the L/R MIX, using the TO MIX- L, R, and L+R switches in the Group master section. Turn the appropriate Group faders about 75% up.

Set the CRM SRCE to monitor MIX A only and turn up the level control. Make sure MONO CHECK is off. You should usually monitor through the CRM speakers and use the headphones sparingly. If you want to send the mix to the performers in the studio, select CRM as the source in the appropriate Studio Foldback section and turn up its level control.

At this point, the INPUT SENSITIVITY and TAPE TRIM knobs should already be set for your sources. If not, then adjust them accordingly. (See "Control Room Monitoring" and "Recording Basic Tracks – Gain Structure", above.)

Now you're ready to practice the mix. Rewind the MT tape, set the counter to zero, and start playback. If the MT has an output level control, set it to its nominal position. If you're syncing a sequencer/hard disk to the tape, make sure they're set up properly, so that the MIDI/hard disk tracks are also playing.

As the tape plays, set the relative levels of the tape/hard disk/MIDI tracks. Use the channel faders for channel sources, MIX B faders for MIX B sources, and the FX level controls for the Effects Returns sources. Use the PAN and BAL controls to set the stereo perspective. USE EQ, effects, and processors, as needed. (See "Effects and Processors", above.) Use the MUTE Automation system, as needed (not Ghost LE). (See "CPU Application Guide.") Use the MONO CHECK switch periodically to check for mono compatibility, if that is important to you. Listen to the mix through your main speakers, your alternate speakers, if any, and headphones. Keep practicing the mix, until you're happy with it, then rewind the tape to the beginning of the song.

Insert a new tape in your 2-track recorder and rewind it to the beginning. Then play about one minute into the tape, so you don't start at the very beginning of the tape. Then, use the TO TAPE switches in the Talkback and Oscillator sections to record any announcements and tones that are needed. Allow the tape to roll a bit past the tones, stop the 2-track, and set the counter to zero. Then, set the deck to RECORD-READY mode and set its input level control to its nominal position.

Play the MT tape again, and adjust the MIX-L/R Master fader, MIX B Master fader, and Group Master faders, to retain the proper balance of your mix, while at the same time, achieving the proper level on your 2-track recorder's meters. The proper recording level should be achieved with the 2-track's input control at its nominal position. Then rewind the MT tape to the beginning of the song.

You're now ready to commit your final mix to tape. Start the 2-track in RECORD mode and then start playback of the MT tape. Make any mix moves that are necessary as the tape plays. When the song is completed, stop the 2-track, then stop the MT. Press the appropriate 2-TK switch in the CRM SRCE section, unselect MIX A, and then rewind and play back the 2-track tape. If you're not satisfied with the final mix, then unselect the 2-TK CRM SRCE switch (make sure only MIX A is selected), and try the mix again. If you are satisfied with the mix of the first song, then proceed to mix down the next song on the MT. When you are satisfied with the mixes of all the songs, then make a dub of the 2-track master to cassette or CD-R, for instance, and play it back on as many systems as you can; such as a home stereo system, boombox, portable stereo, and car stereo. If the mix doesn't sound the way you want on these other systems, then mix it again. If the mix meets with your approval, then the multitrack recording process is completed. Make a backup or safety copy of the 2-track master and label everything. This final 2-track stereo master tape is now ready for mastering and/or duplication.

Procedure

1. "Zero Out" the console and then use the REV switches to route your tape tracks to the channel path. If you have additional tracks, such as hard disk/MIDI tracks, and extra channels, then route the additional tracks to the channels. If you have more inputs than channels, then decide where best to route those extra inputs, among the channel and MIX B paths and the Effects Returns inputs. Make sure the MIX B SRCE switch is set to TAPE (UP), unless you wish to use MIX B as a pre-fader send for the channel path.
2. Assign all channels and Effects Returns that are in use to the L/R MIX by pressing the L/R assign switch on the channels and the MIX assign switch on the Effects Returns. Press the MIX B TO MIX switch in Ghost's MIX B master section and set the MIX B rotary master fader about 75% up. Set the MIX-L/R master fader to the top of its travel.
3. If you're grouping some sources, assign them to the appropriate Group buses and then assign the Group buses to the L/R MIX, using the TO MIX-L, R, and L+R switches in the Group master section. Turn the appropriate Group faders about 75% up.
4. Set the CRM SRCE to monitor MIX A only, turn up the level control, and make sure MONO CHECK is off. To send the mix to the studio, select CRM as the source in the appropriate Studio Foldback section and turn up its level control.
5. Adjust the INPUT SENSITIVITY and TAPE TRIM knobs, if needed.
6. Rewind the MT tape, set the counter to zero, and start playback. If the MT has an output level control, set it to its nominal position. If you're syncing a sequencer/hard disk to the tape, make sure they're set up properly, so that the MIDI/hard disk tracks are also playing.
7. As the tape plays, set the relative levels of the tape/hard disk/MIDI tracks using the channel and MIX B faders, and the FX level controls. Use the PAN and BAL controls to set the stereo perspective. USE EQ, effects, and processors, as needed. (See "Effects and Processors", above.) Use the MUTE Automation system, as needed (not Ghost LE) and use the MONO CHECK switch periodically to check for mono compatibility. Listen to the mix through your main speakers, your alternate speakers, if any, and headphones. Keep practicing the mix, until you're happy with it, then rewind the tape to the beginning of the song.
8. Insert a new tape in your 2-track recorder and rewind it to the beginning. Roll about one minute into the tape and use the TO TAPE switches in the Talkback and Oscillator sections to record any announcements and tones that are needed. Allow the tape to roll a bit past the tones, stop the 2-track, and set the counter to zero. Then, set the deck to RECORD-READY mode and set its input level control to its nominal position.
9. Play the MT tape again, and adjust the MIX-L/R Master fader, MIX B Master fader, and Group Master faders, to retain the proper balance of your mix, while at the same time, achieving the proper level on your 2-track recorder's meters. The proper recording level should be achieved with the 2-track's input control at its nominal position. Then rewind the MT tape to the beginning of the song.

10. To commit your final mix to tape, start the 2-track in RECORD mode and then start playback of the MT tape. Make any mix moves that are necessary and when the song is completed, stop the 2-track, then stop the MT. Press the appropriate 2-TK switch in the CRM SRCE section, unselect MIX A, and then rewind and play back the 2-track tape. If you're not satisfied with the final mix, then unselect the 2-TK CRM SRCE switch, select MIX A, and try the mix again. If you are satisfied with the mix, then proceed to mix the next song on the MT. When you are satisfied with the mixes of all the songs on the MT, then make a dub of the 2-track master and play the dub on as many systems as you can. If you're not satisfied, then mix it again. If the mix meets with your approval on these other systems, then make a backup copy of the 2-track master tape and label everything. This final 2-track stereo master tape is now ready for mastering and/or duplication.

GHOST

8

Application Notes

Application Notes

Overview

Ghost is primarily intended to be used as a multitrack/music production console. However, it can also be used for other purposes. Once you understand Ghost's signal flow and the layout and functions of its controls, you will be able to adapt it to your needs.

Most of the information contained here can also be found throughout the other sections of this manual. However, in order to provide the information in a useful reference list, summarized below are some key points about Ghost that make it useful in a wide variety of applications.

Input Section

1. Both the MIC and LINE inputs are affected by the PHASE switch and the LOW-CUT FILTER.
2. If REV is pressed, the channel insert jack is available to the tape input and not the channel input.

Metering and Signal/Peak LEDs

3. If you have the optional meterbridge and it's set for tape input monitoring, it will monitor the signal right after the MIX B/TAPE RET jack, regardless of the position of the REV switch. The TAPE TRIM control will have no effect on the meter.
4. If you have the optional meterbridge and it's set for channel input monitoring, then the following applies:
 - If REV is not pressed, the channel input is monitored after the channel insert jack. The INPUT SENS knob and LCF switch will affect the meter reading.
 - If REV is pressed, the tape input is monitored after the channel insert jack. Only the TAPE TRIM knob will affect the meter reading.
5. Regardless of the position of the REV switch, the SIGNAL PRESENT LED always monitors the channel input.
6. If the REV switch is not pressed and all EQ is assigned to the channel, then the PEAK LED will only monitor the channel path. If REV is pressed or if the HF/LF EQ is assigned to MIX B, then the PEAK LED will monitor both the channel and MIX B paths.
7. The output of the EQ can trigger the PEAK LED, even if the EQ IN switch is not depressed.
8. The CRM/SOLO-L/R meters are not just for displaying the levels of the Main Mix. They will display any sources selected in the control room section, as well as all PFL/AFL signals. Therefore, in addition to displaying the levels of MIX A, MIX B, and the outputs of your 2-track recorders, you can display any signal that passes through a PFL/AFL switch. This includes all channel and tape (MIX B) inputs, the AUX Sends master levels, the FX Returns, the Studio Foldback, and the Groups. The meters are before the control room level control and are not affected by it.

EQ Section

9. When depressed, the EQ IN switch activates all 4 bands of EQ, regardless of whether the HF/LF EQ is in the channel or MIX B path.
10. The source of the HF/LF EQ section is dependent on the settings of the REV, MIX B SRCE, and HF/LF EQ-MIX B switches. Following is a chart showing the source for the HF/LF EQ with all possible switch combinations:

REV	MIX B SRCE	EQ-MIX B Switch	Source of HF/LF EQ
UP	TAPE	UP	Channel
UP	TAPE	DOWN	Tape
UP	CHAN	UP	Channel
UP	CHAN	DOWN	Channel
DOWN	TAPE	UP	Tape
DOWN	TAPE	DOWN	Channel
DOWN	CHAN	UP	Tape
DOWN	CHAN	DOWN	Tape

MIX B Section

11. Interplay between the REV switch and MIX B SRCE switch:

Regardless of the position of the REV switch, when the MIX B SRCE switch is set to TAPE, it provides a second input to the channel strip. Which input appears at the MIX B section depends on the position of the REV switch. Similarly, regardless of the position of the REV switch, when the MIX B SRCE switch is set to CHAN, you no longer have 2 inputs for the channel and instead MIX B acts as a pre-fader send for the channel path. Again, which input appears at the MIX B section depends on the position of the REV switch. It's helpful to remember that if REV is pressed, then the names on the MIX B SRCE switch are also reversed, so that selecting TAPE means you are selecting the channel as the input, and selecting CHAN means you are selecting tape as the input. Following is a chart summarizing the 4 possible combinations of the REV switch and the MIX B SRCE switch and how they affect the Channel and MIX B paths:

REV	SRCE	Channel Path	MIX B Path
UP	TAPE	Channel Input	Tape Input
UP	CHAN	Channel Input	Pre-fader send for Channel
DOWN	TAPE	Tape Input	Channel Input
DOWN	CHAN	Tape Input	Pre-fader send for Tape

11. Whatever signal is on the MIX B path is automatically routed to the MIX B L/R buses, passes through the MIX B master fader, and appears at the MIX B L/R output jacks.
12. The MIX B L/R buses can be routed to the Main MIX L/R buses by pressing the MIX B TO MIX switch in the master section. The signal is sent post-MIX B master fader and before the MIX L/R Insert jack. This means the MIX B signal is affected by the MIX B master fader and can be processed with the Main Mix through the Main Mix Insert jacks.
13. The MIX B signal that is available in the Studio Foldback Source Select sections comes straight from the MIX B L/R buses and is not affected by the MIX B rotary master fader.

14. The MIX B signal that is available in the Control Room Source Select section passes through the MIX B rotary master fader and is affected by it.
15. If you have CHAN selected as the MIX B Source, then you can create an independent pre-fader mix of the channel path signal, which will appear at the MIX B outputs. This can be useful as a broadcast feed or other special feed.
16. In addition to your tape outputs, you can connect any line level signal source to the MIX B/TAPE RET jacks on the rearcon panel; such as the outputs of your MIDI sound modules.

AUX Section

18. The signals available at the AUX Sends knobs are dependent on the settings of the REV switch, the MIX B SRCE switch, and the AUX 3-4 MIX B switch. AUX 1-2 can be PRE-/POST-fader and the AUX 3-4 "5-6" switch will route the AUX 3-4 sends to the AUX 5-6 buses. The following chart shows the source of the AUX Sends knobs for all possible switch combinations:

REV	SRCE	AUX 3-4 MIX B	AUX 1-2	AUX 3-6	AUX 7	AUX 8
UP	TAPE	UP	Channel	Channel	Channel	Tape
UP	TAPE	DOWN	Channel	Tape	Channel	Tape
UP	CHAN	UP	Channel	Channel	Channel	Chan.
UP	CHAN	DOWN	Channel	Channel	Channel	Chan.
DOWN	TAPE	UP	Tape	Tape	Tape	Chan.
DOWN	TAPE	DOWN	Tape	Channel	Tape	Chan.
DOWN	CHAN	UP	Tape	Tape	Tape	Tape
DOWN	CHAN	DOWN	Tape	Tape	Tape	Tape

Notes

- AUX 1-2 and AUX 7 always carry the same signal, except that AUX 1-2 can be pre-/post-fader and AUX 7 is always post-fader.
- If CHAN is selected as the MIX B Source, then MIX B carries the same signal as the channel path, and all the AUXs carry the same signal. Note, however, that in this instance, if the AUX 3-4 MIX B switch is up, AUX 3-6 carry the post-channel fader signal. If the AUX 3-4 MIX B switch is down, AUX 3-6 carry the pre-channel fader and post-MIX B fader signal.
- When the REV switch is pressed, the AUX sources are the exact opposite of when the REV switch is not pressed.
- AUX 7 always carries the Channel path signal and AUX 8 always carries the MIX B path signal.

Inputs

19. The FX Returns can also be used as line inputs while recording (by assigning them to the Group buses) or during mixdown (by assigning them to the L/R Mix).
20. The channel inputs can also be used as FX Returns while recording (by assigning them to the Group buses) or during mixdown (by assigning them to the L/R Mix).

21. The MIX B inputs can also be used as FX Returns (for recording the effect), but during mixdown only, since they can only be assigned to the Main Mix bus.
22. The Groups can also be used as FX Returns while recording (using the Group buses) or during mixdown (by assigning the Group buses to the L/R Mix), if you use the Group Inserts to connect the line level outputs of your FX devices. (See #24, below.)

Outputs

23. Each channel has a DIR/GRP n switch, where n is a Group number from 1 to 8, and an associated DIR/TAPE SND jack on the rear connector (rearcon) panel. Any signals assigned to the Group n bus will automatically appear at the appropriate DIR/GRP n switch. If the switch is set to DIR (UP), then its DIR/TAPE SND jack will carry the direct output of its channel. If the switch is set to GRP n (DOWN), then its DIR/TAPE SND jack will carry all signals assigned to the Group n bus.
24. If you use a cable with a TS (Tip-Sleeve) plug, you can connect line level sources to the Group Insert jacks. This will allow you to record those sources using the shortest possible signal path to the Group outputs.
25. In the Control Room Source section, the switches are generally used as follows:
 - MIX A – for monitoring during mixdown.
 - MIX B – for monitoring during tracking and overdubbing.
 - 2-TK A – for monitoring the playback of your mixdown deck.
 - 2-TK B – for monitoring the playback of your dubbing deck.

Note

You can also use 2-TK A, instead of MIX A, to monitor the outputs of your 2-track mixdown deck during mixdown.

Normally, you would connect the control room outputs to the main amp/speakers in the control room and you would connect the ALT outputs to the nearfield amp/speakers in the control room. However, if you're not using the ALT outputs for monitors, you can use them to send a feed of the control room sources to another device. For instance, with headphones disconnected, MONO CHECK off, and the ALT switch pressed, any source that you select will be sent out the ALT L/R jacks. This can come in handy if you need an extra set of MIX A outputs during mixdown, or if you want a set of outputs for either 2-track deck for dubbing purposes. You can also use the ALT jacks as an output for your PFL/AFL signals, since pressing any PFL/AFL switch will override your control room source selections. If you use the ALT outputs as an extra feed, then you'll have to monitor that feed at the destination.

26. In the Studio Foldback Source section, the switches are generally used as follows:
 - AUX 1-2 – for monitoring during tracking and overdubbing.
 - MIX B – for monitoring MIX B, before the MIX B master fader.
 - CRM – for monitoring the control room source.

Just as with the control room outputs, you can also use the studio outputs to send a feed of the studio sources to another device. If you're only using one set of Studio outputs, then the other set is available without repatching. If you're also using the control room outputs as an extra feed, and you select CRM as the studio source, then you can have 2 sets of outputs for your control room source.

GHOST

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CPU Application Guide

(Not Applicable To Ghost Le)

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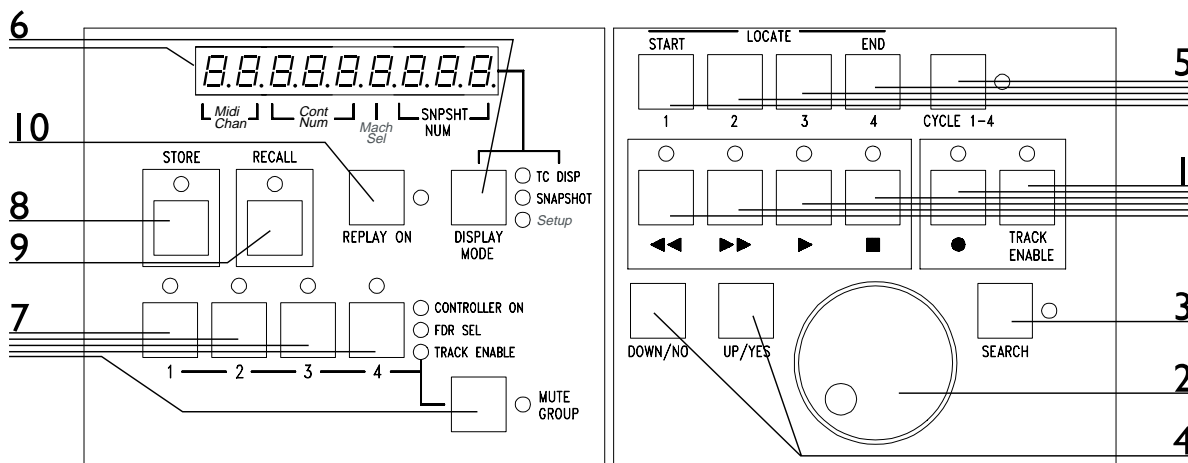
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Front Panel Description



The front panel is divided into four key areas (numbers refer to above drawing):

Machine Control Section (1,2,3,5)

This comprises transport buttons as found on most tape machines, STOP, FAST FORWARD, REWIND, PLAY and RECORD. A TRACK ENABLE enable button allows tracks on a remote machine to be switched to record-ready mode. The JOG WHEEL can be used with certain machines to control jog and shuttle functions. Four LOCATE buttons and a CYCLE 1-4 button allow basic autolocate and cycling to be set up.

7-Segment Display (6)

A 9-digit LED display is switchable to indicate either timecode display, current snapshot number or various system. The legend below the display in italics indicates the various parameters which are displayed in Setup mode.

Multifunction Select switches (7)

A bank of four switches are used for different functions according to the current setting of the DISPLAY MODE switch, or the Mute Group or Track Enable switches. An adjacent array of three LEDs indicates the current function of these switches.

The Multifunction Select switches are used for the following functions: MIDI Controller fader On/Off switching Selecting a MIDI Controller fader when setting up parameters Mute Group Activation Record-ready control of external tape machines

Snapshot Control switches (4,8,9,10) These switches are used for storing and recalling mute snapshots and system parameters, and for enabling automatic replay of snapshots to timecode.

Introduction

.....

The CPU section of the Ghost gives you power and functionality not available on any other console in this class. Using the controls available on the CPU, you can:

- Remotely control tape machines, hard disk recorders and MIDI sequencers, using the Transport controls and timecode display.
- Create up to four mute groups, giving you manual one-touch control of muting for creative effects on groups of channels.
- Store up to 128 snapshots of console mute status and recall them either manually, automatically against timecode, or remotely via MIDI program change messages.
- Record and replay the consoles mutes dynamically against timecode, using an external MIDI sequencer (not supplied).
- Transmit MIDI continuous controller data from any of the four MIDI controller faders -use them to record level changes into a sequencer for mix-down, or remotely control fx unit parameters in real time during a mix. The 128 snapshots can also be used to store useful configurations of controller fader setup.

The Ghost stores all user definable parameter setups and the 128 mute snapshots in internal flash-ram, and will therefore retain all settings on power-off. It is also possible to download the contents of the internal memory via MIDI system exclusive bulk-dump, to a suitable storage device, for backup or archiving purposes.

More About the CPU Features

Machine Control

The Machine Control section makes Ghost the true centrepiece of your studio by enabling your tape machine, hard disk recorder, VTR or MIDI sequencer to be stopped, started, located and dropped in and out of record, all from the centre section of the console, meaning that you don't have to move from the mixing "sweet spot".

The Ghost is fitted with two alternative types of machine control interface, in line with current equipment trends: MIDI Machine Control (MMC), which uses a standard MIDI connection, and Sony 9-pin, or P2, which uses a 9-pin D-type RS422 serial connection. If your machine does not support either of these two interfaces, it may be possible to use a separate synchroniser unit which can convert MMC or 9-pin commands to the specific interface required by your machine. Due to variations in the way different machine manufacturers implement MMC and 9-pin remote control, it is necessary to configure Ghost to match the particular machine you are using. This is easily done in Ghost's setup page, and once set will be memorised in flash ram, until it is deliberately changed due to use of a different machine, for example.

The list of supported machines is as follows. This may be updated from time to time when new machines come onto the market. Software upgrades will be made available, should this happen (see Upgrading the Software).

- MTC Master
- MTC Slave
- LTC Master
- LTC Slave
- Fostex R-Series (MTC)
- Fostex G-Series (MTC)
- Fostex RD-8 (LTC)
- General Closed Loop MMC (MTC)
- General Closed Loop MMC (LTC)
- MMC Open Loop (MTC)
- Alesis ADAT with AI-2
- Alesis ADAT with BRC (MTC)
- Tascam DA-88 (MTC)
- Tascam DA-88 (LTC)
- Sony UVW1800 9-pin plus DA-88 MMC track enable
- Sony 9 pin P2 (48 track record enable)
- Sony 9-pin P2 (no record enable)AKAI DR4/DR8 (MTC)

Note: the first four items in the above list are not machines as such, but timecode generation or reading modes, which allow the Ghost to either act as a master machine, generating MTC or LTC when its transport controls are pressed, to which other machines can be synchronised, or act as a slave, where the transport controls are inoperative, and the console simply displays incoming code (to which mute snapshots can be fired, if required).

The other machines in the list generally allow the option of whether to use MTC or LTC as the synchronisation medium. MTC is more convenient, because it is transmitted down the same MIDI cables used for transport control, but may suffer from timing errors if the MIDI data stream becomes overloaded, whereas LTC is immune from this but requires a separate signal cable from the machine's timecode output to Ghost's LTC input.

The Open Loop MMC option is designed for general use with machines which may not be listed, or MIDI sequencers. This differs from the other MMC options in that it doesn't require the machine to send back tally information to confirm that it has received and actioned the instruction. It is often this part of the process which is different from one manufacturer to another, and therefore the Open Loop option will often work if difficulty is experienced with a new or unlisted machine. The Open Loop option is also recommended for use with Sequencer

packages which generally do not send back any tally information. If the Ghost's transport controls begin to flash when pressed, and seem to be stuck, this indicates that they are expecting to receive tallies from the machine. In this case, either select the correct machine, or try the Open Loop option.

Timecode Reader/Generator

As part of the machine control, Ghost includes an illuminated timecode display, (hrs:min:secs:frames) enabling tape position to be monitored even if the machine itself is not visible. It also means that Ghost can provide its own Locate and Cycle functions, eliminating in many cases the need for a bulky and inconvenient tape machine remote. Timecode can also be generated by Ghost, under local control of the transport buttons, so that the console can act as a master machine, supplying the reference code for other devices in the studio. The timecode generator when in LTC mode (see below) can be used for striping tape (i.e. pre-recording a spare track with timecode for synchronising purposes).

Finally, the capability of reading external timecode can be used to fire pre-set mute snapshots on Ghost at chosen points in the music.

Ghost's timecode reader is accurate to the nearest 1/4-frame. (or 1/100 sec. when working at 25FPS).

Ghost generates and reads two types of timecode:

- LTC, or Longitudinal timecode, which is an audio signal connected to and from the console by 1/4" unbalanced jack sockets.
- MTC, or MIDI timecode, the same timing information as LTC, but transmitted/received instead via the MIDI interface, where it is interleaved with other MIDI data such as MMC, program changes and note-on/off.

MTC is more convenient than LTC, as the same cables can be used to carry timing and machine control information, but it may not be as accurate. Timing errors can occur if the MIDI connection from console to machine is part of a bigger MIDI loop which includes, for instance, a sequencer generating large amounts of MIDI information. For this reason it is better to keep the machine control loop free of sequencer data if possible.

Both types of timecode can be generated/read in the 4 most common frame rates:

- 24 FPS
- 25 FPS
- 30 FPS (non-drop)
- 30 FPS (drop-frame)

The most commonly used rate in the UK is 25FPS, while in the USA it is 30 drop-frame. This difference is for historical reasons, based on the different AC mains frequencies (50 and 60Hz respectively).

The desired frame rate is set for both generator and reader as a global parameter, using Ghost's Setup page, and once set will be remembered until a different frame rate is required.

Mute Groups

The Mute Groups feature allows for extra creativity and control when mixing, giving you effectively several extra pairs of hands !

Four master Mute Group buttons can be programmed to instantly mute any combination of input Channel or Mix B mutes, when pressed. The system is therefore manual in operation, but nevertheless extremely useful, as well as being easy and quick to operate.

For example, Mute Group button 1 could be programmed to mute all channels, so that the console can be completely muted prior to the beginning of the music (to reduce noise, etc). Another press of Mute Group button 1 will then instantly unmute all the channels, bringing the music in cleanly, on cue. Mute Group button 2 could be programmed to mute all the vocals, Mute Group button 3 to mute the drum tracks, etc. and these can be pressed during the mix to bring these elements cleanly in and out of the mix as required.

Each of the four mute groups can be operated either on its own, or in combination with others. When operated together, the mute groups effectively add together:

e.g. If Mute Group 1 has channels 1,2,3,4 If Mute Group 2 has channels 3,4,5,6 (notice channels 3 and 4 are in both mute groups) Pressing both Mute Group 1 and 2 buttons will mute channels 1,2,3,4,5,6.

The Mute Group part of Ghost's mute automation operates completely independently of the 128 mute snapshot system (see below), although mute groups can easily be transferred to any of the 128 snapshots if required.

See "Using the Mute Groups" section for details of how to program and use the Mute Groups.

Mute Snapshots

In addition to the simple manual Mute Group system described above, Ghost also has a more powerful system for storing and recalling various combinations of Channel and Mix-B mutes.

Up to 128 snapshots of the consoles current mute status can be stored in internal memory, and recalled in any of the following ways:

- Manually, by selecting the required snapshot number and then pressing a Recall button
- Automatically, against incoming or internally generated timecode.
- Remotely, by sending a MIDI program change message to Ghost's MIDI input. The program change number will correspond to the snapshot number.

Manual Recall

This is intended to be used as an extension to the mute group system, so that if more than four mute groups are required, additional combinations of mutes can be stored in the snapshot memory, and recalled at the required moment.

Automatic Recall To Timecode

This powerful feature allows presets to be created, consisting of various mute combinations which may be required for different sections of the music -perhaps corresponding to intro- verse-chorus, etc of a song, or if mixing music to picture, to various scenes. These presets are created off-line, (ie without the tape running) using the 128 snapshots. Once created, each preset snapshot can then be allocated a timecode value (in real-time with the tape running, or off-line) which defines the point in the music when the snapshot will be automatically recalled.

Once allocated, the timecode value assigned to each snapshot can be changed if required, by entering an edit mode, allowing the automatic recall to be trimmed to 1/4-frame accuracy. A simple switch allows the automatic recall facility to be turned on or off, making sure that automatic recall does not become annoying when not required. There is also a simple method for clearing the timecode values from any given snapshot, or all at once.

Remotely Via MIDI Program Change

When used with an external MIDI sequencer, this allows Ghost to recall different mute snapshots at specified times programmed into the sequencer.

The advantage of this method is that the sequencers graphical editing interface can be used to precisely control the position of the program change event, and thus the exact time of the snapshot recall.

As Ghost also transmits program changes when a snapshot is manually recalled by pressing the Recall button, the program change events can be transmitted to the sequencer in real time, as the music is playing. The exact timing can then be edited on the sequencer as described above.

Dynamic Mute Automation

It is important to understand the difference between automatic mute snapshot recall against timecode (as described in the last section) and true dynamic mute automation. The former requires mute snapshots to be set up in advance, and then allocated a timecode value while the tape is rolling, in order for the snapshots to subsequently be played back automatically. The latter allows individual channels to be muted and unmuted at will, during a pass through the song, with all the switch presses being recorded in real time. Playback will then reproduce exactly the individual mute operations at the right place in the music.

Ghost does not have the capability for dynamic mute automation using its own internal memory, but it does allow this to be achieved by using an external MIDI sequencer as the storage device.

The way this works is that each Channel and Mix-B mute switch on the console generates a MIDI note-on message whenever the switch is pressed. Un-muting the channel generates a note-on with velocity 127, while muting the channel generates the same note-on but with velocity of 1. A unique note number is allocated to each mute switch on the console. This MIDI data is sent out of Ghost's MIDI out port whenever a mute switch is pressed, and can thus be fed to a sequencer where it can be recorded on a dedicated track. When the sequencer track is played back, the same note-on information will be transmitted back to Ghost's MIDI in port, and will trigger the individual mute switches directly. Thus real-time automation is achieved, and the sequencer graphical edit screens can be used to alter the timings of individual mutes, or add or remove mute events.

The mute switches generate MIDI note events whenever they are pressed, regardless of what else is happening on the console (e.g., machine control, mute groups, mute snapshots, etc) and this information is transmitted and received on the Ghost's global MIDI channel. The same MIDI channel is also used for program change messages (described previously).

A further point to note is that in order for the sequencer to know the correct status of all mute switches when recording is started, but no switches have yet been pressed, Ghost automatically sends out a burst of note-on data containing all the current mute switch states, when the play button on the transport control section is pressed. This must be recorded by the sequencer at the beginning of the mix.

MIDI Controller Faders

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Ghost's last CPU feature is unique on any recording console in its class: Four 100mm faders are provided which can transmit MIDI continuous controller information via the MIDI out port. This opens up a whole range of control possibilities, and further enhance the consoles effectiveness as the centrepiece of the studio. Each fader can be set up individually to transmit any of 128 different types of controller information, on any of 16 MIDI channels, and these setups or configurations can be stored in the consoles snapshot memories.

The uses for this feature are considerable:

- Mixing levels of pre-recorded parts on a MIDI sequencer, using Ghost's MIDI faders to transmit level changes which will be recorded into the tracks on the sequencer. This would normally have to be done using a mouse to drag an on-screen fader up and down.
- Changing parameters of outboard effect units, such as delay time, reverb decay, or modulation level, from the console, for special effects during mix-down or track laying.
- Remotely controlling synth or sampler parameters in real time, for special effects during a mix. For example, the filter frequency could be swept from the console, either as a live effect, or recorded into a sequencer. (This assumes that the synth parameters can be accessed using continuous controllers -many use sys-ex messages for internal controls, and so cannot be controlled by Ghost's controller faders).

It should be noted that the Ghost's MIDI faders are real-time only -they only transmit MIDI information when they are physically moved, and the values sent are not storable within the console in any way.

The memory locations used to store the controller fader setups are shared with the mute snapshots, but there are enough locations (128) to allow some to be used for mutes, and some for controller faders. For example, the last 28 snapshots could be used for controller setups, and the first 100 for mute snapshots. Mute snapshots and controller fader setups can also be stored together in the same location, if required.

In order to save space on the console, the MIDI controller faders are shared with the first four of the consoles audio group faders. It is assumed that the MIDI controllers will not need to be used at the same time as groups 1-4. When groups 1-4 do need to be used for audio, the MIDI controllers can be easily switched off to avoid unnecessary transmission of data. Note that the second four audio group faders (5-8) are always available for audio use, so that they could be used for audio subgroups during mixdown, while the first four faders were used as MIDI controllers.

Using the Machine Control

Connecting The Machine

Depending on which kind of machine is being used, there are two ways of connecting them to Ghost:

- 1 Two standard MIDI cables, plus a separate timecode cable if using LTC.
- 2 A 9-pin D-type serial cable, plus separate timecode cable.

The timecode cable (if needed) will need a 1/4 jack plug on one end, to connect to Ghost's LTC input, and a suitable connector on the other end to match the machine's timecode output.

The 9-pin D-type cable is a pin-to-pin cable with a 9-pin D-type connector at each end.

For details of connections and information about machine parameters on various supported machines, please turn to Appendix A -"Notes for Machine Control", at the back of this manual.

Setting Up Ghost To Match Your Machine

The machine control interface on Ghost has to be configured to match the type of machine you are using.

Press the **DISPLAY MODE** button (6) repeatedly until the Setup LED next to the switch is illuminated. This switches Ghost's timecode display to show setup parameters, instead of timecode.

Press the **UP/DOWN** buttons (4) repeatedly until the three digits on the right hand side of the display (labelled Snapshot Number) start to flash.

Notice that each press of the **UP/DOWN** buttons causes a different set of digits in the display to start flashing, and each set of digits controls a different parameter, as described by the legend under the display. The **UP** button moves through the parameters to the right, while the **DOWN** button moves to the left. Press the **UP** or **DOWN** carefully until the Snapshot Number is flashing.

Turn the **Jog Wheel** (2) in either direction until the flashing Snapshot Number displays the letters GLO.

Notice that as the Jog Wheel is turned clockwise, the number in the display is changed through the range 1, 2, 4, 5, 128, ALL, GLO, then repeated. Turning anticlockwise changes the numbers in the reverse direction.

The console is now in Global Setup mode. In this mode, three parameters can be set:

- The Global MIDI tx/rx channel, used for note-on and prog change data. (see later)
- The Frame rate of the timecode reader/generator. (see next section)
- The type of machine being controlled by Ghost's transport switches.

To select the required machine control driver, press the **DOWN** button once, which will select the Mach Sel (Machine Select) field in the display. (If the Mach Sel field does not flash, continue to press the **UP** or **DOWN** buttons until it is flashing).

The character displayed in the Mach Sel field is a code which represents the different available machine types. The characters range from 0 to 9 and then use the letters A, b,c,d,e,F,g,h, enabling 18 different machine types to be represented. The list of machines, together with which character is used to select them, is shown below. Now turn the **Jog Wheel** to change the character displayed in the Mach Sel field until it matches the one required for the machine you are using.

When the required character has been selected, press the **DISPLAY MODE** button once: the 7-segment display reverts to timecode display (the **TC DISP LED** illuminates) and the message "Storing..." is displayed briefly, indicating that the machine setup has been memorised. This setting will be retained until it is changed again by repeating the above procedure.

Key for Setting Required Machine Control Drivers

Machine	7-segment code
MTC Master	0
MTC Slave	1
LTC Master	2
LTC Slave	3
Fostex R-Series (MTC)	4
Fostex G-Series (MTC)	5
Fostex RD-8 (LTC)	6
General Closed Loop MMC (MTC)	7
General Closed Loop MMC (LTC)	8
MMC Open Loop (MTC)	9
Alesis ADAT with AI-2	A
Alesis ADAT with BRC (MTC)	b
Tascam DA-88 (MTC)	c
Tascam DA-88 (LTC)	d
Sony UVWI800 9-pin plus DA-88 MMC track enable	e
Sony 9 pin P2 (48 track record enable)	F
Sony 9-pin P2 (no record enable)	g
AKAI DR4/DR8 (MTC)	h

Notes:

MTC and LTC Master modes are used to make the Ghost behave as a virtual machine, generating timecode when PLAY is pressed, to which other equipment can be synchronised.

LTC Master mode is useful for striping tape.

MTC and LTC Slave modes are used to activate Ghost's timecode reader to read externally generated timecode, so that mute snapshots and program changes can be fired in sync with external equipment. The transport controls are inoperative in these modes.

MMC Open Loop (MTC) is useful for machines which do not send transport tally information back to the console. This may be the best option when using MMC machines which are not listed above.

The three variations of Sony 9-pin control differ only in the implementation of record enable.

Setting The Correct Timecode Frame Rate

Ghost's internal timecode generator and reader need to be set to the correct frame rate, in order to synchronise properly with other equipment in the studio. Both generator and reader share a common frame rate adjustment, which can be set to the following values:

24 FPS

25 FPS

30 FPS

30 FPS (drop-frame)

The frame rate is set at the factory to a default value of 25 FPS, so if you require this rate, there is no need to take any further action. If you need a different frame rate, proceed as follows:

The frame rate is set by accessing Global Setup mode, in the same way as the machine control driver is set.

Press the **DISPLAY MODE** button (6) repeatedly until the **Setup** LED next to the switch is illuminated. This switches Ghost's timecode display to show setup parameters, instead of timecode.

Press the **UP/DOWN** buttons (4) repeatedly until the three digits on the right hand side of the display (labelled Snapshot Number) start to flash.

*Notice that each press of the **UP/DOWN** buttons causes a different set of digits in the display to start flashing, and each set of digits controls a different parameter, as described by the legend under the display. The **UP** button moves through the parameters to the right, while the **DOWN** button moves to the left. Press the **UP** or **DOWN** carefully until the Snapshot Number is flashing.*

Turn the **Jog Wheel** (2) in either direction until the flashing Snapshot Number displays the letters GLO.

Notice that as the Jog Wheel is turned clockwise, the number in the display is changed through the range 1, 2, 4, 5, 128, ALL, GLO, then repeated. Turning anticlockwise changes the numbers in the reverse direction.

The console is now in Global Setup mode.

To select the required frame rate, press the **DOWN** button twice, which will select the Cont Num (Controller Number) field in the display, and it will start flashing. (This field is actually used for Frame Rate setting in Global Setup mode, but is not legended as such on the front panel for simplicity). If the Cont Num field does not flash, continue to press the **UP** or **DOWN** buttons until it is flashing.

The two-digit number displayed in the Cont Num field shows the currently selected frame rate.

Now turn the **Jog Wheel** to change the number displayed in the Cont Num field until it shows the required frame rate.

When the required rate has been selected, press the **DISPLAY MODE** button once: the 7-segment display reverts to timecode display (the **TC DISP** LED illuminates) and the message "Storing..." is displayed briefly, indicating that the frame rate has been memorised. This setting will be retained until it is changed again by repeating the above procedure.

Assuming all required cables have been connected (see Appendix A), Ghost's transport buttons should now operate the machine, and the timecode display should correctly read the timecode being received from the machine.

The Transport Controls

The transport controls follow standard tape machine conventions in their layout, with the normal **STOP, PLAY, REWIND, FAST FORWARD** and **RECORD** arranged in a row with indicator LEDs above each switch. The LEDs illuminate to show either the true state of the connected machine (using tally signals within the machine control protocol) or are illuminated locally direct from the transport switches (Open Loop machine control or timecode master modes only). The **TRACK ENABLE** button adjacent to the Record button is used to arm individual tracks prior to dropping into record. The exact procedure for this process, including use of the RECORD button is covered in "Arming And Dropping-in Tracks" (see later).

Below the normal transport buttons is the **Jog Wheel** (2) with the associated **SEARCH** button (3). The Jog Wheel incorporates a built-in push switch. The Jog Wheel can be used to control a connected machine if the machine itself supports this function. This generally includes most machines using the Sony 9-pin protocol, but few machines using MMC currently support jog/shuttle.

The **SEARCH** button is used to determine the mode of operation of the Jog Wheel -when Search is pressed, and its LED illuminated, the Jog Wheel is enabled for machine control purposes, and functions as a jog/shuttle wheel. Pressing down on the Jog Wheel switches the mode from **jog** (frame by frame advance of the machine) to **shuttle** (variable fast wind from zero up to 20 times play speed). Shuttle mode is indicated by flashing Search switch LED, while in jog mode the LED is illuminated constantly.

Once Search mode has been entered, it can only be cancelled by pressing STOP, or another transport mode switch. Pressing Search again whilst its LED is illuminated has two different results depending on whether jog or shuttle mode is active at the time:

- In Jog mode (Search LED not flashing), pressing Search switches the Jog Wheel into Shuttle mode (Search LED will now start flashing).
- In Shuttle mode (Search LED flashing), pressing Search will reset the selected amount of fast wind back to zero, which avoids having to turn the Jog Wheel until the correct null point is found.

When Search mode is not selected, the Jog Wheel has no effect on the connected machine, and it functions instead as a data entry wheel for snapshots and other parameters. *(Note therefore that when other sections of this manual ask for the Jog Wheel to be turned to edit a parameter, Search mode must not be selected).*

Using the Locate and Cycle buttons

Ghost incorporates a basic autolocator as part of the machine control section. This comprises four LOCATE 1-4 buttons (5) and the CYCLE 1-4 switch (5), all positioned immediately above the main transport switches.

Each of the four locate buttons can be assigned any timecode value corresponding to a required tape/song position. They can then be pressed at any time to initiate a locate and park on the connected machine. This gives quick and repeatable access to up to four cue points within the music. The locate buttons can also be used when the console is configured as a timecode master, and will work as instant "Go to timecode X" keys.

Locate points 1 and 4 have the additional feature that they can be used to define the start and end points of an automatic cycle loop.

Programming The Locate Buttons

Hold down the master **STORE** button (8) whilst dabbing the chosen **LOCATE** button. The LOCATE button will be assigned the timecode value which is present at the timecode reader input, or generator output at the moment the locate button is dabbed, and the message "Storing..." will be displayed briefly on the 7-segment display. This can be done on the fly if necessary (i.e. with the timecode running).

(Notice that if the assignment is done on the fly, the "Storing..." message only appears when the tape or timecode is next stopped).

A new timecode value can be assigned at any time for any locate button by repeating the above: the new value will replace the previous one.

Once programmed, the Locate buttons will retain their timecode values when the console is powered off, or until a new value is programmed.

Checking The Timecode Values Of Locate Points

Once programmed, each locate button can be interrogated to display its allocated timecode value. Press and hold down the **STOP** transport button, then also press and hold down the required **LOCATE** button. The 7-segment display will change to show the timecode value assigned to the locate button, overriding the previous display for as long as the two buttons are held down. It is not possible to interrogate the Locate buttons whilst the tape or timecode is running.

Creating A Cycle Loop

Pressing the **Cycle 1-4** button (indicated by steady illumination of its LED) will cause the connected machine to cycle automatically between locate points 1 and 4 (also legended as Start and End for clarity). This process continues until Cycle 1-4 is deselected by pressing the button again. (Cycle means: rewind at end point, go into play at start point).

An alternative mode is activated by double-clicking the Cycle 1-4 button, and is indicated by flashing of the Cycle 1-4 LED. In this mode the machine will rewind to the Start when the End point is reached, but will park at the start point and **not** go into play. This mode is useful when more time is needed between passes (to reset or change other equipment settings for example) and continuous cycling would become annoying!

Arming And Dropping-in Tracks

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Arming Individual Or Groups Of Tracks

Press the **TRACK ENABLE** button -its red LED will illuminate steadily. The Track Enable LED next to the four **Multifunction select switches** (7) will also illuminate, showing that these switches are now in Track Enable mode.

At this point, the 7-segment display will show the legend "Tr 1-4". This acts as a bank indication for the four Multifunction select switches, and shows that these four switches now control the record ready (armed) status of tracks 1-4 on the connected machine.

If any of tracks 1-4 are required to be set to record ready (armed), press the corresponding Multifunction select switch. This will cause the switchs LED to start flashing, and the appropriate command to be sent to the machine via the current machine control interface (MMC or 9-pin).

If other tracks are required, press the **UP/DOWN** buttons to scroll through the banks of four tracks, displayed by tr 5-8, tr 9-12, tr 13-16, tr 17-20, tr 21-24, tr 25-32, etc, up to 48. Within each bank, individual tracks can be armed using the four select switches.

When all required tracks are armed, press the **TRACK ENABLE** button once again to exit track enable mode. *(This will allow the four Multifunction select switches to be used for other functions -see later, mute groups and MIDI controllers, and will remove the bank number from the 7-segment display).* Note that the Track Enable button's LED will continue to flash, as a reminder that tracks have been put into armed mode.

Deselecting Individual Or Groups Of Tracks

In all cases, pressing the Multifunction select switch once puts the track into armed mode, and pressing again cancels armed mode. To deselect individual tracks, the correct bank must first be selected using the UP/DOWN buttons, and then the select switches used to deselect the track.

How Do You Know That A Track Is Armed If Its Bank Is Not Selected On The 7-segment Display?

The TRACK ENABLE button's LED will flash as soon as any tracks are placed in armed mode, and will continue to flash until the last track is deselected from armed mode. This serves as a reminder that something is armed somewhere in the system. If necessary, all tracks can be deselected from armed without scrolling through banks -see below.

Setting All Tracks To Armed Mode

A shortcut is available which will set all tracks (max 48) to record enable (armed) mode without having to scroll through banks of four tracks. Press and hold the **TRACK ENABLE** button, then dab the UP/**YES** button. The TRACK ENABLE LED will start flashing, indicating that tracks are set to armed mode.

Deselecting All Tracks (Clear ALL)

Press and hold the **TRACK ENABLE** button, then dab the DOWN/**NO** button. The track enable LED will stop flashing and go out, indicating that all tracks have been deselected from armed mode. This provides a quick and sure way of making sure that nothing is set to record ready, without having to scroll through banks of four tracks looking for flashing select switch LEDs.

Dropping The Machine In And Out Of Record

Having armed all required tracks for record ready, the connected machine is dropped into record using the RECORD transport button.

Dropping In

Press and hold down the PLAY button. Whilst holding the PLAY button, dab the RECORD button. The machine will enter record at the moment the RECORD button is touched.

Dropping Out

Press any other transport button other than RECORD. Normally, pressing PLAY is recommended, as it means the tape keeps moving at the same speed and thus maximises the chance of a smooth drop-out.

Using The Mute Groups

The Mute Groups facility on Ghost gives you a valuable tool for greater real-time control during a mix. Up to four groups of sources (either on channel or mix B inputs) can be created and assigned to a Master Mute button. During the mix, these buttons can be used to bring the selected sources in and out of the mix, with the same effect as if their individual mute buttons had been pressed.

A big advantage of using Mute Groups is that they can be set up and used very quickly, without the more involved programming necessary for automated snapshot or fully dynamic mute automation; they are therefore ideal for auditioning ideas which may later be programmed into the automation for repeatability.

Setting Up Mute Groups

Press the **MUTE GROUP** button (7). This activates mute Group Mode, which allows the four Multifunction select switches to be used as Mute Master buttons.

Mute the required channel or Mix-B inputs by pressing their individual Mute buttons. (The red LED inside each switch illuminates when muted).

Press and hold down the master **STORE** button (8) and then dab one of the four Multifunction select switches (7) which is to be the Mute master button for this group of sources.

Release the **STORE** button. The message "Storing..." appears briefly on the 7-segment display.

This process can be repeated for up to three more groups of sources, pressing a different Multifunction select button for each group. There is no problem in having any channel mute assigned to more than one mute group.

Operating Mute Groups

Once set up as above, pressing any of the Mute Master buttons will toggle the selected channels on and off.

More than one Mute Master button can be activated at the same time -in this case the result will be that all the channels present in each mute group will mute together.

Clearing Mute Groups

To clear a Mute Group, follow the same procedure for setting up a mute group (above), but make sure all channels are unmuted before doing the **STORE** operation.

Using Mute Snapshots

The mute snapshot system on Ghost allows up to 128 different snapshots of the console mute status (all channel and Mix-B mutes) to be stored in internal memory, and either recalled manually, automatically against timecode or remotely by sending a MIDI program change to the console.

Setting Up Mute Snapshots

This is best done with the tape or timecode stopped.

Press the **DISPLAY MODE** button (6) repeatedly until the **SNAPSHOT** LED next to the switch is illuminated. This changes the 7-segment display to show a snapshot number, and allows this to be changed.

Use either the **UP/DOWN** buttons (4) or the **Jog Wheel** (2) to select one of the 128 available snapshot numbers on the display (e.g. initially select number 1). (Notice that the number displayed will begin to flash as soon as it has been changed).

Now set up the required configuration of mutes on the console, and then press the master **STORE** button (8). The message "Store -snapshot number- YES/NO" appears in the display. Press the **UP/YES** button to confirm the store operation. The message Storing to -snapshot number- appears briefly, and the snapshot number will then reappear, but without flashing. The mute configuration is now stored in snapshot 1.

Note that the order in which the snapshot number is selected, and the mute configuration is set up, does not matter -so the mutes could be selected first, and then a snapshot number chosen, before pressing the STORE button.

Now store another snapshot, selecting a different snapshot number and with a different configuration of mutes, using the above procedure. This process could be continued until all the 128 snapshot numbers have been used up. The same mute configuration can be stored to more than one snapshot if required.

Notes:

- The console will retain all 128 snapshots in internal memory, even when power is turned off.
- New snapshots can be stored over existing ones, and will replace them.

The console is shipped from the factory with all snapshots containing "All On" configuration (ie, nothing muted).
- Three flashing dots will be seen in the snapshot number display whenever the current mute status of the console no longer corresponds with the last recalled snapshot. (i.e. If you recall a snapshot and then press some mute buttons, the flashing dots will appear to indicate that something has changed.)

The ALL Snapshot

The ALL snapshot is a special snapshot number which will be found between number 128 and number 1, when scrolling through the snapshot numbers with the Jog Wheel or **UP/DOWN** buttons.

Its purpose is to provide a quick way of storing the same mute configuration to all 128 snapshots at the same time, in one operation. This would be useful when it is required to clear all the snapshots to a "All On" or "All Muted" state, to provide a base from which to program a new set of snapshots. By nature, storing to the ALL snapshot will erase all 128 existing snapshots, so it is essential that the current memory contents is backed up if you need to keep any of the existing snapshots (via MIDI data dump -see later), before using ALL.

Follow the same procedure as for "Setting Up Mute Snapshots", above, but select ALL as the snapshot number before pressing STORE. Notice that an additional safety message "Do it?..." appears after the store operation is confirmed by pressing UP/YES. Press UP/YES again at this stage to confirm the store to ALL operation, or DOWN/NO to abort the operation.

Recalling Snapshots Manually

To recall a snapshot, make sure the Display mode is set to **SNAPSHOT** mode (press the **DISPLAY MODE** button until the adjacent LED indicates this).

Use either the **UP/DOWN** buttons (4) or the **Jog Wheel** (2) to select a snapshot number on the display. (Notice that the number displayed will begin to flash as soon as it has been changed. This indicates that the mute status of the console does not match the newly selected snapshot number. If the old number is selected again, the flashing stops). Press the **RECALL** button (9). The selected snapshot will instantly be recalled, and the mutes should change state accordingly.

An alternative mode, if snapshots need to be recalled in quick succession, is to press and hold down the **RECALL** button, and then increment the snapshot number, using either the **UP/DOWN** buttons, or the **Jog Wheel**. In this case, the snapshot will be recalled as soon as its number appears in the display.

Another feature is that if the snapshot number has been changed, but the new number has not yet been recalled, you can jump back to the original number by pressing down on the Jog Wheel.

Finally, when using the **UP** and **DOWN** buttons to change the snapshot number, the speed at which the number is changed can be increased by holding down the required UP or DOWN button, then pressing and holding the opposite button. (e.g.: if you want to select a higher snapshot number, press and hold the UP button, then press and hold the DOWN button. Pressing the down button will increase the speed of number incrementing.)

Triggering Snapshots From Timecode

Once mute snapshots have been stored, they can be programmed to recall automatically at preset times. This is done by allocating a timecode value to each snapshot. This allocation of timecode can be done with the tape machine or timecode either running or stationary.

It is important to note that snapshots should be created first as a separate task, before allocating timecode values, although once timecode values have been allocated, the mute status of a snapshot can be changed (edited) later by storing a different mute status into the snapshot, without affecting the timecode value.

See the end of this section for a suggested way of using the automatic timecode recall feature.

Allocating Timecode Values To Snapshots

Press the **DISPLAY MODE** button until **SNAPSHOT** mode is selected. Use the **UP** or **DOWN** buttons or the Jog wheel to select the required snapshot number in the display.

Press the **DISPLAY MODE** button until **TC DISPLAY** mode is selected.

Run the tape or timecode until the required timecode point is reached, then press the **STORE** button at the desired moment. The timecode value at the moment the STORE button is pressed will be saved along with the previously stored mute settings, for that snapshot.

Note: You will not see a "Storing..." message until the tape or timecode is stopped -this is to maximise CPU efficiency and avoid timing errors while the code is running.

This process can be repeated for other snapshots by selecting the required snapshot number while the tape or code is running and pressing STORE at the required moment. Several snapshots can be selected in succession and have timecode values allocated -there is no need to stop the tape between each one.

Press the **REPLAY ON** button (10) to enable playback of the snapshots against timecode.

Viewing And Editing The Timecode Value For A Snapshot

Once the timecode values have been allocated on-the-fly as described above, it is useful to be able to interrogate each snapshot to see what its timecode value is, and if necessary change it. This process is done off-line, i.e. with the tape or timecode stopped.

Select the required snapshot using the **UP/DOWN** buttons or **Jog Wheel**. (The Display Mode must be set to SNAPSHOT mode to do this). Press the **RECALL** button to recall the snapshot. Select TC DISP using the **DISPLAY MODE** button. Double-click the **REPLAY ON** button: its LED starts flashing. This selects Timecode Edit mode. The 7-segment display now shows the timecode value currently assigned to the recalled snapshot. If no timecode value has been allocated, the display will show 00:00:00:00.

To edit the timecode value, use the **UP/DOWN** buttons to move the flashing digits to the left or right so that hours, minutes, seconds or frames can be selected.

Note that in the frames field, two dots are used to indicate quarter-frames. The dots illuminate in the sequence no dots, one dot, two dots, to show zero, one, two and three quarter frames respectively. This allows very accurate editing of a snapshot trigger point.

Turn the **Jog Wheel** to edit the value. To save the changes, press the **REPLAY ON** button to exit timecode edit mode -the message "Storing..." appears briefly.

Clearing Timecode Values From Snapshots

This is done by allocating a timecode value of zero to the snapshots. Individual snapshots can be selected and the value changed to 00:00:00:00 using Timecode Edit mode as described above, or the ALL snapshot can be selected, in which case all 128 snapshots will have any timecode values cleared. The console is shipped from the factory with no timecode values assigned to any snapshots.

Example Of Typical Operating Procedure For Automated Snapshot Recall

A suggested way of using the snapshots triggering against timecode is as follows:

1. Listen to music and organise into sections which need different mute snapshots. (e.g., intro, verse 1, bridge, chorus, verse 2, bridge, chorus, etc).
2. Write out a Cue List, showing the sections required and allocating a snapshot number to each. Note that if the same mute config is needed more than once in the song (e.g. for the choruses), a new snapshot number will be required for each occurrence, because no more than one timecode value can be allocated to a given snapshot.
3. With the tape stopped, program all the required snapshots with the relevant mute configurations (see "Setting Up Mute Snapshots"). For sections which need the same mute configuration more than once in the song, it is easy to store several snapshots with different numbers, without changing the mute settings. If possible, keep the numerical order of snapshots in sequence throughout the song - this will make it easier when allocating timecode values.
4. Now run the tape and while listening to the music, allocate the timecode values by selecting the snapshot number and pressing STORE as the music progresses. The display mode should be set to "Snapshot" so the number can be seen.
5. Press the Replay On button, and listen back to the music and check that the snapshots are triggering at the desired time. If the timing of any snapshots needs to be corrected or changed, either clear the timecode value from that snapshot, and run the tape again, allocating the correct timecode value by pressing STORE, or enter "Timecode Edit Mode" (double-click REPLAY ON) and adjust the timecode value using the Jog Wheel.
6. If all the timecode values are wrong, or a new song has to be started, clear all the timecode values by selecting the ALL snapshot and storing a timecode value of zero. (Make sure a memory dump has been done if you need to keep the existing setup - see "Dumping And Reloading The Internal Memory").

Triggering Snapshots Using Program Changes

As an alternative to triggering snapshots from timecode using Ghost's own internal system, MIDI program change messages can be used. Each of the Ghost's 128 snapshots has a corresponding program change number allocated to it - this is the same number as the snapshot number. Receipt of a program change message at the MIDI in port will automatically select and recall the corresponding snapshot. The only setting up required in Ghost is to make sure the correct MIDI channel is selected for reception of program changes. This is done as follows:

Press the **DISPLAY MODE** button (6) repeatedly until the **Setup** LED next to the switch is illuminated. This switches Ghost's timecode display to show setup parameters, instead of timecode.

Press the **UP/DOWN** buttons (4) repeatedly until the three digits on the right hand side of the display (labelled **SNAPSHOT NUMBER**) start to flash.

*Notice that each press of the **UP/DOWN** buttons causes a different set of digits in the display to start flashing, and each set of digits controls a different parameter, as described by the legend under the display. The **UP** button moves through the parameters to the right, while the **DOWN** button moves to the left. Press the **UP** or **DOWN** carefully until the Snapshot Number is flashing.*

Turn the **Jog Wheel** (2) in either direction until the flashing Snapshot Number displays the letters GLO.

Notice that as the Jog Wheel is turned clockwise, the number in the display is changed through the range 1, 2, 4, 5, 128, ALL, GLO, then repeated. Turning anticlockwise changes the numbers in the reverse direction.

The console is now in "Global Setup" mode.

To select the required global MIDI channel, press the **DOWN** button three times, which will select the **Midi Chan** field in the display, and it will start flashing. If the **Midi Chan** field does not flash, continue to press the **UP** or **DOWN** buttons until it is flashing.

The number (1-16) displayed in the **Midi Chan** field shows the currently selected global MIDI channel for transmission and reception of program changes and note-on data.

Now turn the **Jog Wheel** to change the number displayed in the Midi Chan field until it shows the required channel.

When the required channel has been selected, press the **DISPLAY MODE** button once: the 7-segment display reverts to timecode display (the **TC DISP** LED illuminates) and the message "Storing..." is displayed briefly, indicating that channel has been memorised. This setting will be retained until it is changed again by repeating the above procedure.

Using The MIDI Controller Faders

Ghost has four faders which can be used to transmit MIDI controller data. Each of these faders can be set up to transmit on its own MIDI channel, and have its own controller number. In addition each fader has an associated on/off switch which can be used to disable the fader, or punch-in a controller fader at a certain value. The MIDI channel and controller number for each fader can be stored in any of the 128 snapshot memories, along with or separate to, channel mute snapshots. The MIDI controller faders are not automated or resettable -they are intended for real-time manipulation of parameters or recording level changes to a sequencer. Note that the position of the fader is not stored in the snapshot memory, only the setup parameters.

How The Controller Faders Are Related To The Group 1-4 Faders

The first four of the audio group faders double as the MIDI controller faders and have two tracks -an audio track and a data track. The MIDI controller function of each fader can be turned on and off as required, but to save complicated and costly switching, the audio part of the fader is always connected even when the fader is being used for MIDI. When using the faders as MIDI controllers therefore, avoid routing any audio from the input channels to the first four groups. The Groups 5-8 are always available for use as audio subgroups or recording outputs.

Setting Up The Controller Faders

First decide which snapshot number will be used for saving the controller fader parameters. This can either be an individual number, or, if only one setup of the four faders is required all the time, the setup can be stored to ALL the snapshots so it will not change.

Press the **DISPLAY MODE** button (6) repeatedly until the **Setup** LED next to the switch is illuminated. This switches Ghost's timecode display to show setup parameters, instead of timecode.

Press the **UP/DOWN** buttons (4) repeatedly until the three digits on the right hand side of the display (labelled **SNAPSHOT NUMBER**) start to flash.

*Notice that each press of the **UP/DOWN** buttons causes a different set of digits in the display to start flashing, and each set of digits controls a different parameter, as described by the legend under the display. The **UP** button moves through the parameters to the right, while the **DOWN** button moves to the left. Press the **UP** or **DOWN** carefully until the Snapshot Number is flashing.*

Turn the **Jog Wheel** (2) in either direction until the flashing Snapshot Number displays the required memory location for parameter storage. This will either be an individual number, or "ALL", depending on the criteria described above.

Notice that as the Jog Wheel is turned clockwise, the number in the display is changed through the range 1, 2, 4, 5, 128, ALL, GLO, then repeated. Turning anticlockwise changes the numbers in the reverse direction. (Do not select GLO, or you will not be able to setup controller parameters).

The console is now in "Setup" mode.

Note that the LED next to the four Multifunction select switches shows that these switches are now automatically in **FDR SEL** (fader select) mode. This means that these switches are used in Setup mode to select one of the four faders for parameter adjustment and display on the 7-segment display. Only one of the four faders can be selected at any time. Press one of the select switches to select the required fader (the LED above the switch illuminates to show it is selected).

To set up the controllers, press the **DOWN** button twice, which will select the **Cont Num** (Controller Number) field in the display, and it will start flashing. If the **Cont Num** field does not flash, continue to press the **UP** or **DOWN** buttons until it is flashing.

Now turn the **Jog Wheel** to change the number displayed in the Cont Num field until it shows the required value. (see Appendix B: List of MIDI controllers, or the handbook for the equipment you are controlling).

Press **DOWN** again to select the **Midi Chan** field for adjustment, and use the **Jog Wheel** to set the required channel.

The first fader is now set up, and if moved will transmit data accordingly. You can experiment with different controller numbers etc in Setup mode, without having to store anything -as soon as the numbers appear in the display, the controller faders are operational. At this point, you can either store this faders setting and exit setup mode, or select another fader and continue setting up parameters. To continue setting up, press one of the Multifunction select switches to select a different fader, and repeat the above steps.

When the controller number(s) and MIDI channel(s) have been selected for all required faders, press the **DISPLAY MODE** button once: the 7-segment display reverts to timecode display (the **TC DISP** LED illuminates) and the message "Storing..." is displayed briefly, indicating that the setup has been memorised. This setup will be retained until it is changed again by repeating the above procedure.

Switching Controllers On and Off

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Note that after exiting Setup mode, the LED next to the four Multifunction switches indicates that they have now automatically changed to **CONTROLLER ON** function. This is the default function for these switches whenever Setup mode is NOT selected. (The exception to this is when Track Enable mode is selected - this takes priority over all other modes).

In **CONTROLLER ON** mode, the Multifunction select switches work as On/Off switches for the MIDI controller faders. Switching On a controller allows the fader to send MIDI data, and also momentarily transmits the controller value corresponding to the fader's current position. The setting of the switches (On or Off) is also stored with the snapshot along with the other controller parameters for each fader.

Using Snapshots To Store Controller Fader Parameters

The parameters for each controller fader are stored in a snapshot memory location as part of the setup procedure described on the previous pages. There are no dedicated snapshots for Controller setups -they share the same snapshots as used for the console mutes.

The following are suggestions for how to organise mute and Controller snapshots, depending on the application:

All snapshots required for Mutes, but the same Controller setup required regardless of which mute snapshot is recalled:

Store mute snapshots as required, store required Controller setup to ALL snapshots. (Note: storing Controller setups to ALL does not affect any mutes already stored, and vice versa).

Mute snapshots required, with corresponding Controller fader setup required for each mute snapshot:

Store mutes and Controller fader setups to the same snapshots.

Mute Snapshots required for certain tasks, various Controller setups required for different tasks:

Store mute snapshots to snapshots 1-100, store Controller fader setups to snapshots 101-128 (for example).

Using Ghost With A Sequencer For Dynamic Mute Automation

Although Ghost allows automation of mute snapshots via its own internal CPU, full real-time dynamic automation of individual mutes requires the use of an external MIDI sequencer to act as the recording and storage device.

Ghost has been designed to allow each mute switch to transmit MIDI data in the form of note-on messages, which can be recorded on a dedicated track in the sequencer alongside (and therefore synchronised to) normal music tracks. On playback of the sequence, Ghost will receive the note data and will convert it back to individual mute events.

How Mute Information Is Transmitted And Received By Ghost

There are a number of things to bear in mind when using the console with a sequencer in this way:

- Ghost transmits a note-on with velocity of 1 when a channel is muted, and a note-on with velocity of 127 when the channel is unmuted.
- Each channel and mix-B mute switch sends its own unique note number, which will be in the range 0-63 (or 0-111 if you have the 24 Channel Expander option).
- Ghost automatically transmits a snapshot of the current status of all mute switches, when the PLAY transport button is pressed. The sequencer must record this snapshot at the beginning of a new mix, to ensure that it can initialise Ghost's mutes correctly on playback. This snapshot consists of a burst of note-on data corresponding to the initial mute status.
- The note-on MIDI messages are transmitted and received on the console's Global MIDI channel (the same channel is also used for sending and receiving program changes).

Setting The Global Tx/Rx MIDI Channel

Press the **DISPLAY MODE** button (6) repeatedly until the **Setup** LED next to the switch is illuminated. This switches Ghost's timecode display to show setup parameters, instead of timecode.

Press the **UP/DOWN** buttons (4) repeatedly until the three digits on the right hand side of the display (labelled **SNAPSHOT NUMBER**) start to flash.

Turn the **Jog Wheel** (2) in either direction until the flashing Snapshot Number displays the letters "GLO".

Notice that as the Jog Wheel is turned clockwise, the number in the display is changed through the range 1, 2, 4, 5, 128, ALL, GLO, then repeated. Turning anticlockwise changes the numbers in the reverse direction.

The console is now in "Global Setup" mode.

To select the required Global MIDI channel, press the **DOWN** button three times, which will select the **Midi Chan** field in the display, and it will start flashing. If the **Midi Chan** field does not flash, continue to press the **UP** or **DOWN** buttons until it is flashing.

Now turn the **Jog Wheel** to change the number displayed in the **Midi Chan** field until it shows the required channel (off, 1-16). When the channel is set to **Off**, the Ghost will not transmit or receive any note on or program change data.

When the required channel has been selected, press the **DISPLAY MODE** button once: the 7-segment display reverts to timecode display (the **TC DISP** LED illuminates) and the message "Storing..." is displayed briefly, indicating that channel has been memorised. This setting will be retained until it is changed again by repeating the above procedure.

Notes On Setting Up The External Sequencer

- MIDI cables are required from Ghost's MIDI out to the sequencer's MIDI in, and from the sequencer's MIDI out to Ghost's MIDI in.
- The sequencer should be set to "echo off" or "MIDI thru off", on the channel being used for the console, to avoid problems. Program change messages in particular will cause a MIDI "howl-round" if these are passed through the sequencer from its MIDI in to out, with Ghost connected.
- Check that the MIDI channel for the sequencer track matches Ghost's Global tx/rx channel.
- Check that the sequencer is set to send out the current note values when it is started at any point during the song. (e.g. in Cubase, this is done by enabling the Chase Events option). If this is not done, Ghost will not be able to keep track of the sequencer if it is started mid-way through a song.
- Check that "auto-quantise", or "quantise on record" on your sequencer is switched off.
- Note that when the sequencer is put into record at the start of the mix, the PLAY button must be pressed on Ghost in order to send a snapshot of the initial mute status to the sequencer. If this is not done, the sequencer will not record the start of the mix.

*A good way of ensuring this happens is to set the sequencer to sync to external MIDI timecode, and set the Ghost to MTC Master mode. Click the Record button on the sequencer -it will then be in record ready mode and will wait for timecode before starting to record. Press PLAY on Ghost, and the sequencer will start recording, with the initialising snapshot being sent at the same time. This way, the sequencer can be controlled from the console transport controls during mixdown. Note: when recording in this way, you must make sure that the left recording marker in the sequencer is set to the **current timecode value where you are starting the mix from**. If this is not done, and you try to start recording a mix from a timecode value which is not zero, the sequencer will record the initial snapshot from Ghost at the point at which the left record marker is currently set: which is usually close to zero. When you press mute switches, these will be recorded in the correct place, but your initial snapshot will not be: it will be back at the beginning somewhere. This precaution is not necessary if you do all your recording from zero, or if you are not synchronising the sequencer to external timecode which is generated from Ghost.*

- Avoid extreme movements of several MIDI Controller faders whilst either recording or playing back mutes into the sequencer. This will clog up the processor with MIDI Controller data and will result in timing errors with the mutes.
- If you experience problems in your MIDI setup with sound modules being triggered by the mutes on the console (e.g., when the PLAY button is pressed and the snapshot is sent out) try turning the MIDI channel to "off" as described at the top of this page. You will of course need to turn it back on again when you want to do automated mixing.

Dumping And Reloading The Internal Memory

The Ghost's internal flash-RAM holds all the data for the 128 snapshots, MIDI control and machine control setups. This memory data may be "dumped" into an external storage device so that another set of 128 snapshots can be programmed in whilst retaining a backup of the original data. This is done by using the MIDI System Universal Bulk Dump method. Various devices are available on which to store the dumped data: these include stand-alone MIDI bulk-dump recorders, and many sequencer packages and samplers.

Dumping The Memory

- Connect MIDI OUT of Ghost to MIDI IN of the data recorder.
- Set the data recorder to be ready to receive a bulk dump.
- Press and continue to hold the **STORE** button on Ghost, then dab the **DISPLAY MODE** button. Release the **STORE** button.
- The message "saving.." will appear in the 7-segment display, indicating that Ghost's memory is being transmitted. When all the data has been transmitted, the display will revert to its previous state.

Reloading The Memory

- **Make sure you have already backed up the current memory contents of Ghost, if you want to keep it, as reloading will erase all current memory!!**
- Connect MIDI OUT of the data recorder to MIDI IN of Ghost.
- Press and continue to hold the **RECALL** button on Ghost, then dab the **DISPLAY MODE** button. Release the **RECALL** button.
- The message "loading.." will appear in the 7-segment display, indicating that Ghost is ready to receive a memory reload. (It will now wait for data to arrive before doing anything).
- Set the data recorder to transmit the memory data.
- When the transmission is finished, the 7-segment display will revert to its previous mode.
- If no data is received, or this mode is entered by accident, the waiting mode can be cancelled by repeating the **RECALL + DISPLAY MODE** sequence as above.

Re-initialising The Memory

In exceptional cases, if problems occur with the Ghost CPU which cause it to stop responding to controls, or erratic behaviour is experienced, it is possible to re-initialise the CPU. However, before resorting to this procedure, it is recommended that the power supply be turned off and on again, as this may clear the problem. If turning off and on has no effect, the following can be tried, but note that this will erase Ghost's memory of any snapshot and controller setup data.

Turn power off.

Hold down **STORE**, **RECALL** and **UP/YES** buttons at the same time.

Turn on power, still holding down above buttons.

When the message "Storing..." is seen, the buttons can be released.

GHOST

10

Troubleshooting

Troubleshooting

This Troubleshooting chapter lists some common problems you might encounter with Ghost, together with possible causes and recommended solutions. If you can't find a solution to your problem here, then please read this entire manual for a solution before calling Soundcraft technical support.

General

- Make sure Ghost is properly connected to the power supply unit (PSU) that ships with Ghost; that the PSU is set for the correct voltage for your country; and that the PSU is properly connected to a working wall outlet and turned on.
- Make sure you're using the proper cables; that the cables are not faulty; and that they are securely connected to the proper jacks on Ghost.

Troubleshooting Chart

Problem	Possible Cause	Recommended Solution
A) Channel Inputs:		
1) There is no signal from a MIC Input.	1a) Phantom Power is off 1b) MIC/LINE switch is set to LINE.	1a) If you're using a condenser mic requiring phantom power, then press the 48V switch on the rearcon panel 1b) Make sure the LINE switch is in the UP position.
2) There is no signal from a LINE Input.	2) MIC/LINE switch is set to MIC.	2) Make sure the LINE switch is in the DOWN position.
3) MIC or LINE signals sound thin.	3) The PHASE switch is set in the wrong position.	3) Make sure the PHASE switch is in the UP position, unless you purposely want to invert the phase of the input.
4) MIC or LINE signals are distorted or noisy.	4) The Input Gain is not set properly.	4) Use the INPUT SENS knob, following the instructions in this manual, so the signal registers 0 on the meter.
5) MIC or LINE signals are lacking in lower frequencies.	5) The LOW-CUT FILTER (LCF) is engaged.	5) Make sure the LCF switch is in the UP position.
6) MIC or LINE inputs appear at the MIX B section.	6a) The REV switch has reversed the Channel and MIX B inputs 6b) The MIX B SRCE switch is set to CHAN.	6a) Make sure the REV switch is in the UP position. 6b) Make sure the MIX B SRCE switch is set to TAPE (UP).
B) MIX B Inputs:		
7) The Tape Returns are distorted or noisy.	7) The TAPE TRIM is not set properly.	7) Use the TAPE TRIM knob, following the instructions in this manual, so the signal registers 0 on the meter.
8) The Tape Returns appear at the Channel Fader.	8) The REV switch has reversed the MIX B and Channel inputs.	8) Make sure the REV switch is in the UP position.
9) The REV switch is UP, but the Tape Returns don't appear anywhere.	9) The MIX B SRCE switch is set for CHAN.	9) Make sure the MIX B SRCE switch is set to TAPE (UP).
C) FX Returns Inputs:		
10) There is no output from the FX Returns.	10a) The level is down. 10b) The Return is not assigned to any buses.	10a) Raise the FX LEVEL knob. 10b) Assign the Return to the desired buses, using the ROUTING switches and BAL knob.
D) EQ:		
11) The LF/HF EQ has no effect on the MIC/LINE signals.	11a) The EQ is being bypassed. 11b) The EQ is assigned to MIX B.	11a) Make sure the EQ IN switch is in the DOWN position. 11b) Make sure the EQ MIX B switch is in the UP position.
12) The LMF/HMF EQ has no effect on the MIC/LINE signals.	12) The EQ is being bypassed.	12) Make sure the EQ IN switch is in the DOWN position.
13) The LF/HF EQ has no effect on the MIX B signals.	13a) The EQ is being bypassed. 13b) The EQ is assigned to the Channel path.	13a) Make sure the EQ IN switch is in the DOWN position. 13b) Make sure the EQ MIX B switch is in the DOWN position, that REV is UP, and the MIX B SRCE switch is set to TAPE (UP).
14) The LMF/HMF EQ has no effect on the MIX B signals.	14) The LMF/HMF EQ only works in the Channel Path.	14) The LMF/HMF EQ cannot be assigned to the MIX B path. The only way to use it with the MIX B signal is to set the REV switch to the DOWN position, thereby reversing the Channel and MIX B paths.

E) Outputs:		
15) I'm getting input, but no output from either the Channel or MIX B paths.	15a) The signal is muted. 15b) The individual fader is down. 15c) The master fader is down. 15d) For the Channels, the signal has not been assigned to any buses.	15a) Make sure the CUT switch is not engaged. 15b) Raise the appropriate Channel or MIX B FADER . 15c) For the Channel: Raise the MIX and/or GRP 1-8 MASTER FADERS . For MIX B: Raise the MIX B MASTER FADER . 15d) Assign the Channel signal using the Channel Routing Matrix switches and PAN knob.
16) I can't get a Direct Output from the Channel DIR/TAPE SND jack.	16) The jack is being used as a Group Output.	16) Make sure the associated DIR/GRP n switch is set to DIR (UP).
17) I can't get a Group Output from the Channel DIR/TAPE SND jack.	17) The jack is being used as a Direct Output.	17) Make sure the associated DIR/GRP n switch is set to GRP n (DOWN).
18) There is no output at the AUX Output jacks.	18) The AUX Sends or AUX Masters are down.	18) Make sure the appropriate AUX Sends knobs and associated AUX Master Faders are turned up.
19) There is no output from the MAIN MIX, MIX B, or GROUP Output jacks.	19) The appropriate master fader is down.	19) Raise the MIX, MIX B, and/or GI-8 MASTER FADERS .
20) All the switch settings are correct, but the MIC/LINE inputs don't appear at the MAIN MIX, GROUP, or DIRECT Outputs.	20a) A plug is connected to a CHANNEL, MAIN MIX, or GROUP Insert jack, but the other end of the cable is not connected to a processor.20b) The Insert Send/Return cable is not connected properly or the outboard device is not set up properly.	20a) Make sure that a plug is not inserted into a CHANNEL, MAIN MIX, or GROUP INSERT jack, unless you wish to use an outboard processor on the signal. 20b) Make sure that the Insert Send is connected to the outboard device's Input jack and the Insert Return is connected to the device's Output jack, and that the Input/Output Gain of the device is properly set up. Also, if the Inserts are connected to a patchbay, make sure the Send and Return points are Normalled on the patchbay.
F) Metering:		
21) The MIC/LINE Inputs do not display on the optional meterbridge	21) The meterbridge is set for TAPE INPUT METERING.	21) If you want to monitor the Channel Inputs, see the instructions in this manual for how to set the meterbridge for CHANNEL INPUT METERING .
22) The TAPE Inputs do not display on the optional meterbridge	22) The meterbridge is set for CHANNEL INPUT METERING.	22) If you want to monitor the TAPE Inputs (the default), see the instructions in this manual for how to set the meterbridge for TAPE INPUT METERING .
23) The Group signals do not display on the GROUP Meters.	23) The Group Faders are down.	23) Raise the level of the GROUP FADERS . The GROUP meters are located after the GROUP Faders.
24) The MAIN MIX signals do not display on the CRM/SOLO-L/R Meters.	24) The CRM/SOLO-L/R meters do not automatically display the MAIN MIX signals; they display the Control Room Source signals.	24) Select the MIX A switch in the CRM SRCE section.
G) Studio Outputs:		
25) Signals can't be heard at the Studio Outputs.	25a) You're using the incorrect STUDIO FOLDBACK section or its level control is down.25b) No Studio Source has been selected or no signal is available at the selected source.	25a) Use the STUDIO A section for the STU O/P A jacks and use STUDIO B/PHONES for the STU PHNS B jacks, and make sure their level controls are turned up.

		25b) Select either AUX 1-2 , MIX B , or CRM as the source in the appropriate STUDIO FOLDBACK section. If you select AUX 1-2 or MIX B , make sure you have sent signals to those buses. If you select CRM , make sure an audible signal is available in the Control Room Monitor section.
H) Control Room Outputs:		
26) Signals can't be heard at the Control Room Outputs.	<p>26a) The Control Room Level control is down.</p> <p>26b) No Control Room Source has been selected or no signal is available at the selected source.</p> <p>26c) Headphones are plugged into the front armrest jack.</p> <p>26d) The ALT switch is set incorrectly.</p> <p>26e) One or more PFL/AFL/SOLO switches are depressed in sections where there are no signals present. (Note: The SOLO switches function as PFL switches when SIP is off.)</p>	<p>26a) Turn up the CRM LEVEL knob.</p> <p>26b) Select either MIX A, MIX B, 2TK A, or 2 TK B with the CRM SRCE switches. If you select MIX A or MIX B, make sure you have sent signals to those buses and that the MIX and MIX B MASTER FADERS are turned up, respectively. If you select either 2 TK A or 2 TK B, make sure the outputs of the appropriate 2 Track are connected to the associated 2 Track inputs and that their Output Level controls are turned up.</p> <p>26c) Unplug the Headphones if you want to listen to the Control Room or ALT monitors.</p> <p>26d) Make sure the ALT switch is UP, if you're monitoring through the CRM O/P jacks; and make sure the ALT switch is DOWN, if you're monitoring through the ALT O/P jacks.</p> <p>26e) Make sure all PFL/AFL/SOLO switches are not engaged, unless you are intentionally soloing a signal.</p>
27) I hear something other than the selected source in the Control Room Outputs.	27) One or more PFL/AFL/SOLO switches are depressed. (Note: The SOLO switches function as PFL switches when SIP is off.)	27) When any PFL/AFL/SOLO switch is depressed, you will hear its associated signal in the Control Room, in place of the selected Control Room source. To hear the selected Control Room Source, make sure no PFL/AFL/SOLO switches are engaged.
28) The Control Room Output level suddenly drops.	28) A TALKBACK routing switch is depressed.	28) Whenever any TALKBACK Routing switch is depressed, the Control Room Outputs are automatically dimmed.
29) The Control Room Outputs are in MONO.	29) The MONO CHECK switch is on.	29) Make sure the MONO CHECK switch is off (UP).
I) PFL/AFL/SOLO:		
30) I press a PFL/AFL/SOLO switch, but I don't hear anything in the Control Room or the level is low.	30) The PFL/AFL Trim control is set to a low level. (Note: The SOLO switches function as PFL switches when SIP is off.)	30) The PFL/AFL TRIM knob has a +/- 10 dB range. Turn the knob clockwise to increase the level of the PFL/AFL signals.
31) When I press a Channel SOLO switch, the PFL/AFL Trim knob has no effect.	31) SOLO-IN-PLACE (SIP) is activated.	31) When SIP is engaged, the Channel SOLO switches do not function as PFL switches and are not controlled with the PFL/AFL TRIM knob.

<p>32) When I press a Channel SOLO switch, and another PFL/AFL switch, I don't hear the Channel I have Soloed.</p>	<p>32) SOLO-IN-PLACE (SIP) is activated.</p>	<p>32) When SIP is on and you activate a Channel SOLO switch, the Channel signal is not sent to the PFL/AFL buses. Instead, all UN-SOLOED Channels are muted and you hear the SOLOED Channels as the Control Room source. Engaging any regular PFL/AFL switch overrides the Control Room source and you hear the PFL/AFL buses instead.</p>
<p>J) AUX Sends:</p>		
<p>33) The AUX Sends are sending a different signal than I expect.</p>	<p>33) One or more of the REV, MIX B SRCE, or AUX 3-4 MIX B switches is set incorrectly.</p>	<p>33) AUX 1-2 and STE AUX 7 will send the signal routed to the Channel path with the REV switch.</p> <p>With the REV switch UP, AUX 3-4/5-6 will send the signal from the Channel input, when the AUX 3-4 MIX B switch is in the UP position. It will send the signal from the MIX B input when the AUX 3-4 MIX B switch is in the DOWN position and the MIX B SRCE switch is set to TAPE (UP). All this is reversed when the REV switch is depressed.</p> <p>STE AUX 8 will send the signal assigned to the MIX B path.</p>
<p>K) Oscillator & Talkback:</p>		
<p>34) When I press the Oscillator's TO TAPE switch, I can't hear the tone.</p>	<p>34) The OSC LEVEL knob is turned down.</p>	<p>34) Turn the OSC LEVEL knob clockwise to increase the output level of the Oscillator.</p>
<p>35) When I press any of the Talkback Routing switches, I can't hear my voice.</p>	<p>35) The TALKBACK Level knob is turned down.</p>	<p>35) Turn the TALKBACK Level knob clockwise to increase the output level of the TB MIC, and make sure nothing is blocking the TB MIC.</p>
<p>36) When I press the TO TAPE switch in both the Oscillator and Talkback sections, I can only hear the Oscillator.</p>	<p>36) This is a normal condition.</p>	<p>36) When the TO TAPE switch is pressed in both the OSCILLATOR and TALKBACK sections, the Oscillator has precedence and you will only hear its signal. To hear the TB MIC, make sure the Oscillator's TO TAPE switch is off (UP).</p>
<p>L) MAIN MIX:</p>		
<p>37) When I press a Group TO MIX-L+R switch, the Group signal is not sent to the MAIN MIX.</p>	<p>37) The appropriate Group TO MIX-L or R switch is not depressed.</p>	<p>37) The Group TO MIX-L+R switch has no effect on the MAIN MIX routing when pressed by itself. (See Note.) To route odd-numbered Groups to the MAIN MIX-L bus, press its TO MIX-L switch, and to route even-numbered Groups to the MAIN MIX-R bus, press its TO MIX-R switch. To route any Group to the MAIN MIX L+R buses, press its TO MIX-L or R switch and its associated TO MIX-L+R switch. Note: The TO MIX-L+R switch also determines if the Group signal will be routed to the PFL/AFL buses in Mono or Stereo, when its associated AFL switch is pressed.</p>

<p>38) I hear the MIX B signals in the MAIN MIX.</p>	<p>38) The MIX B TO MIX switch is pressed.</p>	<p>38) When the MIX B TO MIX switch is pressed in the master section, all MIX B signals are routed to the MAIN MIX. To prevent this, make sure the MIX B TO MIX switch is in the UP position.</p>
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GHOST

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Specifications

Specifications

INPUT CHANNEL

Microphone input

Sensitivity range for 0VU output	-8dBu to -60dBu
Maximum input level	+14dBu
Input impedance	2k ohm
Common Mode Rejection Ratio (CMRR) 1kHz Typical figure	-90dB @ sensitivity -30dBu
Equivalent input noise (EIN) 22Hz-22kHz measured at insert point	-128dBu @ sensitivity -60dBu
150 ohm mic input load	-122dBu @ sensitivity -30dBu

Line input

Sensitivity range for 0VU output	+12dBu to -40dBu
Maximum input level	+34dBu
Input impedance	15k ohm
Common Mode Rejection Ratio (CMRR) 1kHz Typical figure	-60dBu @ sensitivity 0dBu

Insert send & return

Nominal level	-2dBu
Maximum level	+22dBu
Maximum send load	2k ohm

Direct output level

Channel output selected	-2dBu
Group output selected	+4dBu/-10dBV link selected

Tape Return input

Sensitivity at calibrated centre detent	+4dBu
Tape Trim range	-15dB to +15dB
Input impedance	>24k ohm
Common Mode Rejection Ratio (CMRR) 1kHz Typical figure	-60dB @ Calibrated detent

Low-Cut Filter

Frequency	100Hz
Type of filter	3 pole
	18dB per octave roll-off

Equaliser section

HF EQ turnover frequency	12kHz
Maximum boost/cut	+/- 15dB
LF EQ turnover frequency	60Hz
Maximum boost/cut	+/- 15dB
HMF EQ frequency range	400Hz to 20kHz
HMF Q range	0.7 to 6
Maximum boost/cut	+/- 15dB

LMF EQ frequency range	25Hz to 1.5kHz
LMF Q range	0.7 to 6
Maximum boost/cut	+/- 15dB

Oscillator

1 kHz or 10 kHz, variable level	0 to +15dBu
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MASTER SECTION

Nominal levels

Group output level	+4dBu/-10dBV link selected
Group insert level	-2dBu
Aux output level	+4dBu
Mix output level	+4dBu
Mix insert level	-2dBu
Mix B output level	+4dBu
CRM/ALT/Headphones level	+14dBu at maximum
Studio outputs	+4dBu
2 Track inputs	+4dBu
Stereo return inputs	+4dBu

Console Input/Output circuit types

Electronically balanced inputs:	Microphone, Line, Mix B, Stereo Return, 2-Track
Unbalanced 75ohms inserts:	Channel, Group, Mix
Unbalanced 75ohms outputs:	Channel Direct, Control Room, ALT, Studio B
Ground Compensated 75ohms outputs:	Group, Studio A, Aux, Mix, Mix B

TYPICAL CONSOLE PERFORMANCE

Attenuation (All at 1kHz)

Long Fader attenuation from top to bottom	-90dB
Mix B rotary fader attenuation from max to min	-70dB
Mute attenuation Channel & Mix B	-80dB
Pan isolation, from left to right	-70dB

THD+N (Total Harmonic Distortion + Noise)

1dB below clipping, 1kHz	
Mic/Line to Direct output	0.002% EQ out
	0.003% EQ in
Mix B to Direct out (REV pressed)	0.002%

Direct output noise

22Hz-22kHz Mic sensitivity @ -10dB	
Channel fader at unity	-95dBu EQ out
	-93dBu EQ in

Frequency response

Mic/Line input to any output 20Hz - 20kHz (+0/-0.5dB)
Sensitivity @ 30dB

Crosstalk

Mic input to Line input crosstalk -100dB @ 1kHz
Line input to Mic input crosstalk -90dB @ 1kHz
Mix B to Channel crosstalk -80dB @ 1kHz
Channel to Mix B crosstalk -75dB @ 1kHz

Bus noise (Group & Mix outputs)

22Hz-22kHz Channel faders down
+4dBu/-10dBV selected to +4dBu

Group outputs 1 to 8

Group fader at unity, nothing routed -90dBu
16 channels routed, channel faders down -82dBu
24 channels routed, channel faders down -80dBu
32 channels routed, channel faders down -78dBu

Mix outputs L & R

Mix fader at unity, nothing routed -90dBu
16 channels routed, channel faders down -82dBu
24 channels routed, channel faders down -80dBu
32 channels routed, channel faders down -78dBu

Dimensions and weights

Frame Size	Overall width	Weight(kg/lb)
24	1059.36mm (41.71")	44.0/97
32	1303.20mm (51.31")	53.6/118
24 Expander	815.52mm (32.11")	33.0/73

GHOST

12

Glossary

Glossary

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This chapter contains a list of commonly used audio terms and their definitions, in relation to how they apply to Ghost.

AFL SWITCH – (After-Fader Listen Switch). A switch, located after the fader, used to solo signals from Ghost’s Studio Foldback, AUX, and Group Master sections. The fader position affects the level of the soloed signal.

ATTENUATE – To lower the level of a signal.

BALANCE – The relative level of two or more signal paths, tape tracks, or instruments.

BALANCED LINE – A line consisting of positive and negative conductors, plus a ground shield. More often than not, it is wired with Pin 2 Hot (+).

BANDWIDTH – (a) The difference between the upper and lower frequencies that can be handled by a piece of gear. (b) In an equalizer, the frequency range around the centre frequency that is affected by the boost/cut control. For instance, if the centre frequency is 2,000Hz and the boost/cut control affects the frequencies from 1,500Hz to 2,500Hz, then the bandwidth is 1,000Hz.

BASIC TRACKS – The tracks that are recorded first in a multitrack recording session. Generally, the rhythm tracks, such as drums, bass, keyboards, and guitars.

BOUNCING TRACKS – The process of transferring several previously recorded tape tracks by recording them to one or two unused tracks on the same tape. The previously recorded tracks can then be erased and used again.

BUS – A common signal line or path, where the outputs of several signal paths may be combined. (Sometimes spelled as Buss.)

BUS, AUXILIARY – The common signal line where all the AUX Sends signals are combined.

BUS, GROUP - The common signal line where all the Group Buses are combined.

BUS, MAIN MIX – The common signal line where all signals sent to the MAIN MIX are combined.

BUS, MIX B - The common signal line where all the signals from the MIX B path are combined.

CHANNEL – In Ghost, the term used to refer to the recording path in the Channel strips.

CHANNEL PATH – In Ghost, the signal, either MIC/LINE or MIX B Input, assigned to the Channel with the REV switch.

CUE SYSTEM – The part of the console used by the engineer to send signals to the performers in the studio, for headphone monitoring during tracking and overdubbing. In Ghost, this is done with the Studio Foldback section.

CUT SWITCH – In Ghost, the switches in the Channel and MIX B sections that activate the mute circuits. When activated, the signal doesn’t proceed past the mute circuit. (Also known as a MUTE switch.)

DECIBEL – (dB). A unit of measurement based on a reference level. For Ghost, the two most important values are the pro line level of +4dBu and the consumer line level of –10dBV.

DIM - To lower the level of a signal. In Ghost, the control room outputs are automatically dimmed whenever a Talkback routing switch is depressed.

DIRECT OUTPUT – An output taken directly from a console input, which bypasses the pan pots and assign switches. On Ghost, depending on the position of the REV switch, either the Channel or Mix B inputs can be sent to the Direct Output jack, which can also be used as a Group Output jack.

DISTORTION – An unwanted change in a signal as it passes through a component or a device.

DRY RECORDING – Recording a signal without applying any effects (such as reverb) to it.

DYNAMIC RANGE – The difference, in dBs, between the noise floor of an audio device and 3% THD (Total Harmonic Distortion). The Signal-to-Noise-Ratio (SNR) plus the available headroom represents the dynamic range of the device.

ECHO – A discrete repetition of a sound.

EFFECT - Outboard gear used by the AUX Send/Return system. The wet signal from the effect is returned to Ghost and combined with the dry signal.

EQUALIZATION – An intentional modification of an audio signal's frequency response.

EQUALIZER – A signal processing device used to change the frequency response of the audio signal it processes.

EQUALIZER, GRAPHIC – An equalizer, generally with a series of vertical slide controls, with each control representing a fixed centre frequency. The sliders can boost or cut the signal, and their settings give a graphic representation of the resulting frequency response. Ghost does not have a graphic equalizer.

EQUALIZER, PARAMETRIC – An equalizer with continuously variable controls for the centre frequency and Q (bandwidth) and a boost/cut control. The boost/cut control raises or attenuates the level of the selected centre frequency, with the width of the boost/cut around the centre frequency determined by the setting of the Q control. Ghost has two parametric equalizers for each channel, labeled HMF and LMF.

EQUALIZER, SHELVING – An equalizer that applies a variable amount of boost/cut at all frequencies above or below the equalizer's fixed frequency. It consists of a boost/cut knob for the fixed frequency. Ghost has two shelving equalizers for each channel, labeled HF and LF.

EQUALIZER, SWEEPABLE – (Sometimes called semi-parametric.) An equalizer with continuously variable controls for the centre frequency and a boost/cut control, but no Q (bandwidth) control. The boost/cut control raises or attenuates the level of the selected centre frequency, with the width of the boost/cut around the centre frequency being fixed. In effect, a sweepable EQ is similar to a parametric EQ, but without the Q (bandwidth) control.

EXTERNAL TREATMENT - Using outboard gear on a signal before the signal enters Ghost.

FADE-IN - Beginning a recording by gradually raising the level using a fader.

FADE-OUT – Ending a recording by gradually lowering the level using a fader.

FADER – A variable level control. In Ghost, there are 100mm vertical faders (sliders) for the Channels, Group masters, and Main Mix master, and rotary faders (knobs) for MIX B, MIX B master, and AUX masters.

FADER, MASTER – A single fader used to control the output level of all signals sent to it. In Ghost there are master faders for the Group, MAIN MIX, MIX B, and AUX outputs.

FILTER, BANDPASS – A filter designed to allow a relatively narrow band of frequencies to pass through, while attenuating all frequencies outside that band. (It's the opposite of a Notch Filter.)

FILTER, HIGH-CUT – (Also known as Low-Pass.) A filter that passes low frequencies, while attenuating those at or above a specified frequency. For instance, if the specified frequency is 10kHz, then the filter will not affect frequencies below 10kHz and will cut all frequencies at 10kHz and above.

FILTER, LOW-CUT – (Also known as High-Pass.) A filter that passes high frequencies, while attenuating those at or below a specified frequency. In Ghost, the LOW-CUT FILTER (LCF) in the channel input section, has a specified frequency of 100Hz. This filter will not affect frequencies above 100Hz and will cut all frequencies at 100Hz and below.

FILTER, NOTCH – A filter designed to attenuate a relatively narrow band of frequencies. (It's the opposite of a Bandpass Filter.)

FOLDBACK – see Cue System.

FREQUENCY – The number of cycles per second of a soundwave, measured in Hertz and abbreviated Hz.

FREQUENCY RESPONSE – A graphical representation of an audio signal's level (amplitude) over a frequency range, usually specified within a +/- 3dB range. It is commonly stated that the limits of human hearing are from 20Hz to 20kHz.

GAIN RIDING – Manually adjusting the gain in a signal path, by raising and lowering the fader, in order to decrease dynamic range.

HEADROOM – The difference, in dBs, between the nominal operating level of an audio device and 3% THD (Total Harmonic Distortion). Nominal operating level plus the headroom equals the dynamic range.

HERTZ – (Hz). Cycles per second. Used to measure frequency.

IN-LINE CONSOLE – A console, such as Ghost, in which the channel input, monitor input, and output controls are placed in-line with the channel fader.

INPUT/OUTPUT MODULE – (Also known as the Channel Strip.) On an in-line console, a single module that contains the input, output, and monitor controls for a single channel.

I/O – Input/Output.

KILO – A prefix, abbreviated k, meaning thousand. For instance, 10kHz equals 10,000 Hz.

LEVEL – The amplitude of a signal, expressed in decibels.

LINE – On Ghost, a Line Level input for the Channel, made via a 1/4" jack connection.

LINE LEVEL – There are two line levels in current use; one pro and one consumer. The pro line level is +4dBu and the consumer line level is -10dBV. Ghost can use both levels.

M-S RECORDING – (Mid-Side Recording.) A coincident microphone technique, in which you use a cardioid mic for the M (middle) microphone, and point it toward the middle of the performers, and you use a Figure-8 mic for the S (side) microphone, and point it facing the left/right axes of the performers.

MASTERING – There is some confusion as to the use of this term today. For purposes of this manual, mastering means to apply final tweaks to your stereo master tape before duplication. This can be done either by sending your tape to a professional mastering house, or trying to do it yourself, if you have the proper equipment, the proper room, and the requisite expertise. Either way, during mastering last minute EQ and compression can be applied and the final levels set, so there is a consistency in volume from song to song.

Unfortunately, some people today are referring to the act of mixing down as mastering and referring to the 2-track deck used for mixdown as a mastering deck. This causes much confusion. When used in this sense, the rationale seems to be that because they are creating a (stereo) master tape, they are therefore mastering. But when you record on a multitrack deck, you are also creating a (multitrack) master tape, yet the act of multitrack recording is not referred to as mastering. Because of this confusion today, if someone says that they mastered a tape, we don't know if they simply mixed it down, and skipped traditional mastering, before sending it to the duplicator, or if after mixdown, they actually mastered it in the traditional sense. In the latter case, it could be said they mastered it twice, if one were to use the confusing terminology (once during mixdown and once when it was sent to a mastering house). For our purposes, we will use the term "mixing down", when referring to the process of creating a stereo master tape, and use the term "mastering" in the traditional sense.

MASTER SECTION – On an in-line console, the section providing various master controls for the Groups, Mix buses, studio and control room monitors, AUX Send/Return, Talkback, and Oscillator sections.

MASTER TAPE – A completed or final tape, from which other tape copies are produced, or which is used for mass duplication. In this manual, we refer to two types of master tapes: the multitrack master and the stereo (or 2-track) master. The multitrack master contains the original recordings from a multitrack session. It is routed through Ghost and mixed down to a 2-track deck, such as a DAT deck. The original DAT tape is the stereo master.

METER, PEAK READING – A meter that reacts to and displays the peaks in a signal. Also known as a Peak Program Meter (PPM).

METER, VU – A meter that displays the average level of a signal using Volume Units (VU).

MICROPHONE PREAMPLIFIER – (Mic preamp). In a console, the first stage of amplification, which raises microphone levels to line levels.

MIDI MACHINE CONTROL – (MMC). Not to be confused with MTC (MIDI TimeCode), below. MMC is a MIDI protocol that allows one device to control another device over MIDI cables. With Ghost, you can use the transport controls in its CPU section (not Ghost LE), to control digital multitrack recorders, hard disk recorders, and MIDI sequencers from Ghost.

MIDI TIMECODE – (MTC). Not to be confused with MMC (MIDI Machine Control), above. Timecode that is derived from SMPTE TimeCode and is expressed in the form of Hours:Minutes:Seconds:Frames:Sub-Frames. A SMPTE TimeCode to MTC converter is required to convert SMPTE TC to MTC, and this converter is usually part of a standard SMPTE TimeCode Reader/Generator. Ghost (not Ghost LE) has a SMPTE TimeCode Reader/Generator/Converter in its CPU section.

MIX B - In Ghost, the term used to refer to the monitor path in the Channel strips. It is usually used to monitor the tape returns from the multitrack recorder.

MIX B PATH - In Ghost, the signal, either MIC/LINE or MIX B Input, assigned to MIX B with the REV switch.

MIXDOWN – The process of routing the completed multitrack tape tracks (and hard disk/MIDI tracks) through a console, and then processing and combining them (mixing them down) to two tracks, and recording it on a 2-track machine, such as a DAT deck or analog open-reel deck.

MMC – see MIDI Machine Control.

MONITOR – (a) A loudspeaker, usually in the control room. (b) To listen to, either in the control room or studio.

MONOPHONIC – (Mono). One channel sound. The entire program is heard from a single sound source. On Ghost, there is a MONO CHECK switch, which can be used to monitor the signal in the control room, in Mono.

MTC – see MIDI TimeCode.

MULTITRACK – For purposes of this manual, a multitrack tape recorder, in which you can record a total of 4 or more tracks, by recording 1 or more tracks at a time, while monitoring (and not erasing) previously recorded tracks.

MUTE – see Cut Switch.

NOISE FLOOR – The noise level of an audio device with no signal applied. If the input level of a signal is below the noise floor, the device's noise will be heard. Therefore, it is important to set the input level above the noise floor.

NOMINAL LEVEL – The recommended or standard operating level at which an audio device operates.

OPEN TRACKS – On a multitrack tape recorder, tape tracks that have not yet been recorded on.

OSCILLATOR – A signal generator, that outputs a pure sine wave. Ghost's oscillator can operate at 1kHz and 10kHz frequencies.

OUTBOARD DEVICE – In the case of a console, an external device used to process the console's signals.

OUT TAKE – A recording take, or section of a take, that is not going to be used.

OVERDUBBING – The process used to record new tracks on a multitrack recorder, while listening to previously recorded tape tracks. The performers monitor the tape tracks and the new tracks through headphones and play along with the tape. The new tracks are recorded on open tracks and the previously recorded tape tracks are not erased.

OVERLOAD – (Clipping). The distortion that occurs when a signal exceeds the maximum output level of a device. In Ghost, the Channel PK LED will light 6dB before clipping.

PAN POT – (Panoramic Potentiometer). A knob used to vary the proportion of an audio signal routed to 2 or more locations. For instance, in Ghost, when a Channel is assigned to the L/R bus, the Channel pan pot can route the Channel signal to the Left MIX bus, the Right MIX bus, equally to the Left and Right MIX buses, or anywhere in between.

PATCH BAY – A device with upper and lower strips of horizontal female input and output jacks on its front and rear. Connections with your gear are made to the rear jacks. You use patch cords in the front jacks for signal routing purposes.

PATCH CORD – A short length of cable used for signal routing in a patch bay.

PATCH POINT – Any front jack in a patch bay, that is used with patch cords for signal routing purposes.

PEAKS – The instantaneous high level transients of an audio signal.

PFL SWITCH - (Pre-Fader Listen Switch). A switch, located before the fader, used to solo signals from Ghost's Channel (with SIP off), MIX B, and FX Returns sections. The fader position has no effect on the soloed signal.

PHANTOM POWER SUPPLY – A circuit that supplies d.c. powering to condenser microphones, which is required for them to function. The phantom power is supplied to the microphone using the same conductors as the audio signal.

PHASE – For purposes of this manual, the polarity relationship between two measured signals. When the two signals are of the same polarity, they are said to be "in phase." When they are of opposite polarity, they are said to be "out of phase." Other polarity relationships are expressed as a number of degrees of phase shift, for instance, "90 degrees out of phase." Ghost has a PHASE switch that allows you to reverse the phase of the Channel inputs. If the input is "in phase," the switch will make it "out of phase." If the input is "out of phase," the switch will make it "in phase."

POLARITY – For purposes of this manual, the positive or negative characteristics of an audio signal.

POST-FADER – A circuit that comes AFTER the fader, meaning that the fader will affect the level going to the circuit.

POST-ROLL - For purposes of this manual, the technique of allowing a multitrack tape to play for a few seconds after the Punch-Out point, so the tape doesn't stop abruptly right after the Punch-Out point.

PRE-FADER - A circuit that comes BEFORE the fader, meaning that the fader will NOT affect the level going to the circuit.

PRE-ROLL – For purposes of this manual, the technique of beginning playback of a multitrack tape a few seconds before the Punch-In point, to allow the performer to play along with the tape tracks before the Punch-In takes place.

PROCESSOR - Outboard gear connected to an Insert jack, in which the entire signal is processed and then returned to Ghost.

PUNCHING IN – The technique of starting a multitrack (MT) tape in play mode at the Pre-Roll point, and then having the performer play along with it through the Punch-In and Punch-Out points, before the tape stops at the Post-Roll point. The Punch-In Point is where the MT recorder changes from play mode to record mode, without stopping. This technique is used to correct mistakes on a tape track, without having to re-record the entire track.

PUNCHING OUT - The technique of starting a multitrack (MT) tape in play mode at the Pre-Roll point, and then having the performer play along with it through the Punch-In and Punch-Out points, before the tape stops at the Post-Roll point. The Punch-Out Point is where the MT recorder changes from record mode to play mode, without stopping. This technique is used to correct mistakes on a tape track, without having to re-record the entire track.

Q - In a parametric equalizer, Q represents the centre frequency divided by the bandwidth. For instance, with a centre frequency of 1000Hz, if the bandwidth is 500Hz, then the Q is 2; and if the bandwidth is 1000Hz, then the Q is 1. Therefore, the lower the Q value, the greater the bandwidth. On Ghost, the Q control in the HMF and LMF EQ sections is variable between 0.7 and 6.0. At 0.7 (fully counterclockwise), the bandwidth is widest and at 6.0 (fully clockwise), the bandwidth is narrowest.

RECORDING CONSOLE - A device, such as Ghost, containing the various connections and controls for input, output, monitoring, and signal routing, required for recording. Also known as a Console, Mixer, Board, and (in the U.K.) Desk.

REFERENCE TONE - A single frequency tone or series of tones, which are recorded at the beginning of a tape, and used for alignment purposes when the tape is played back at a later date.

REHEARSE MODE - Found on some multitrack recorders, it is a feature that allows you to practice Punching-In and Punching-Out, without actually committing anything to tape.

REVERBERATION - (Reverb). Numerous repetitions of an audio signal that become more closely spaced (denser) over time.

REVERSE - In Ghost, a switch (REV) in the Channel input section that allows you to send the Channel Input to the MIX B path, and the MIX B input to the Channel path. It is usually used during mixdown, to route the MIX B Tape Returns to the Long-Throw faders in the Channel path.

RUMBLE - Unwanted low frequency signals that are usually caused by mechanical vibrations. Ghost has a LCF switch in the Channel Input section, that is designed to reduce rumble.

SHIELDED CABLE - Any cable in which the conductors are protected by a surrounding braided or foil shielding.

SIGNAL ROUTING - In Ghost, the process of sending signals to various buses, using bus assignment switches and knobs.

SIGNAL TO NOISE RATIO - (SNR). The difference, in dBs, between the noise floor of an audio device and its nominal operating level. The difference between the SNR and the dynamic range represents the available headroom of the device.

SLATING - Recording an announcement, such as the song, artist, and take number, at the beginning of a recording on a multitrack tape.

SMPTE - This acronym stands for the Society of Motion Picture and Television Engineers and is pronounced "SIMP-TEE".

SMPTE TIMECODE - A timecode standard in which tape is recorded with time information, in the form of Hours:Minutes:Seconds:Frames. Generally, an out-board SMPTE Timecode Reader/Generator is needed, but Ghost has one built into its CPU section, together with SMPTE IN and OUT jacks on its rear panel (not Ghost LE). For our purposes, SMPTE Timecode is used for synchronizing multitrack tape recorders, video tape recorders, hard disk recorders, and MIDI sequencers with one another, by converting SMPTE TC to MTC. It is also used with Ghost for MIDI Mute Automation.

SOLO - When used generically, it means to isolate and monitor one signal at a time. For instance, if you solo a channel, you just listen to the signal from that channel.

SOLO-IN-PLACE - (SIP). A method of muting all input signals, except the one being soloed, so that the soloed signal and its effects are heard "in place," in their proper position in the stereo spectrum. SIP can be turned On and Off in Ghost's Master section.

SOLO SWITCH – With Ghost, only the Channels have SOLO switches. All other solo functions are by means of PFL and AFL switches. When SIP is not engaged, then the Channel SOLO switches function as normal PFL switches. When SIP is engaged, then when a Channel SOLO switch is engaged, all Channels without their SOLO switches engaged are muted. You can SOLO more than one Channel at a time.

STEREOPHONIC – (Stereo). Two channel sound, requiring two channels of amplification and two speakers for proper reproduction.

STUDIO FOLDBACK – see Cue System.

SUB-MASTER – Any tape used to produce a master tape. For example, if a master tape is a processed copy of an earlier tape, then the earlier tape is known as the Sub-Master.

TAKE – An uninterrupted performance on a multitrack tape.

TALKBACK SYSTEM – The communication system whereby the control room may speak to the performers in the studio over the Studio Foldback system. Also used to slate tapes and for count-offs.

TIMECODE – Any data signal that contains timing information which is recorded on tape, either before or while a recording is being made. Some common types of timecode are FSK, Smart FSK, SMPTE Timecode, and MIDI TimeCode (MTC).

TRACKS – For our purposes, the individual recorded paths on a multitrack tape. For instance, an 8-track recorder will allow you to record 8 separate paths, at different times, without erasing any of the previous tape tracks.

TRACKING – For our purposes, the process of recording basic tape tracks, during a multitrack recording session.

UNBALANCED LINE – A line consisting of two conductors, one being positive and the other a ground. It's often in the form of a single conductor, with the shield serving as the ground.

UNITY GAIN – No gain is added to the input signal. That is, the output level equals the input level.

VOLUME UNIT – (VU). A unit of measurement related to the average level or loudness of a signal, as opposed to the peak levels of a signal.

WET RECORDING – Recording a signal together with effects (such as reverb).

X-Y RECORDING – A stereo recording made with two cardioid microphones located in the same vertical plane, with their axes about 90-135 degrees to each other.

Y-CONNECTOR – A 2:1 cable or adapter that permits one signal to be split into two signals.

ZERO OUT – To set a console to its default state. That is, to turn all faders down; to turn all knobs off or to their centre detent positions; and to set all switches to their up positions.