G Series
Master Studio System

Console Operator's Manual

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Solid State Logic

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Solid State Logic

SERIES

Introduction

In 1978 Solid State Logic designed the first A Series Console and Studio Computer. The idea behind the project was to build a system for the company's studio which was buried deep in the Oxfordshire countryside, in a small village called Stonesfield. The studio was called Acorn. It was small and as there was only one room it became known as Huge One.

Not satisfied with the first console, SSL went on to build yet another system, the B Series. It too was innovative and somebody suggested that it should be shown at the Paris AES show in 1978.

Following the show, orders were received from several studios world-wide and SSL became the world's greatest console manufacturing company and not the world's greatest studio. In total, nine B Series consoles were made, featuring a VCA based automation system, Dynamics sections on every channel and many other features that are now accepted as industry standards.

The B Series console achieved cult status amongst those brave engineers who managed to understand the philosophy behind the system. Many of the initial users sent back suggestions about improving the console and the computer. So, in 1980, a third design went into production and was named the SL 4000 E Series Master Studio System. The new system was a giant leap forward, solving many of the operational limitations of the B Series. It was an instant success. As well as sonic improvements there were several changes to the routing system, enabling the small faders to be used as additional inputs to the main mix busses and as extra auxiliary sends via the routing matrix. This doubled the number of inputs that could be mixed down to the main outputs as well as solving the problem of not enough aux sends. Changes in the signal processor routing also gave the system much more flexibility.

About This Manual

This manual is divided into eleven sections. Sections 2 to 6 act as reference sections, giving exact descriptions of each control, the meters and the patch. The key to understanding the power behind the G Series system is to master the routing and signal flow. Sections 7, 8 and 9 cover this in great detail. Some people may wish to start with the applications guide (Section 10) and then consult the reference sections as they read. How you use this manual is up to you; if you get stuck, just skip to a new section as information about a particular desk function may be found in several different sections. It will help if you refer to the foldout photograph of the complete modules and centre section (included at the back of this book) while you read the manual.

The manual has been written so that you may learn to operate the console without actually having one in front of you. However, there is no substitute for putting up a mic and going through the process of laying tracks and then remixing, as you refer to the book. It is also helpful, when learning the system, to sit in on a session with an engineer who knows the console.

If you are new to the system it is suggested that you read the manual from cover to cover a couple of times and then try out a session. Once you become more familiar with the controls you will begin to understand the flexibility of the system, and also why the routing needs to be so complex. This system was designed for professionals who spend ten or more hours a day, seven days a week using the desk. They want to push the console to its limits, hence the limits are far beyond those of lesser systems and it may take you several weeks to completely explore all the possibilities that a SSL system has to offer.

Once you have mastered the art of tracking and mixing, without getting lost in the routing, it is strongly suggested that you go through the manual one more time. It is very easy to settle into one particular way of working, to the exclusion of others, and you may discover some operational possibilities that you previously overlooked. For example, many engineers don't realize that whilst tracking, the main VCA fader may be bypassed on the patch. This frees the quad compressor for use in stereo subgroups or as a master compressor on the drum overheads, for example.

Another major addition to the range came in 1981 when Total Recall™ was first introduced. For the first time, engineers could store and recall all the console module settings from the very first mic EQ at the start of a tracking session to the final take of the mix.

The E Series was designed as a system. Not only a mixing console, but also a central control station for signal processing, machine control, fader automation and Total Recall™.

500 installations later, the system has undergone its fourth major change with the introduction of the SL 4000 G Series Console and Computer at the 1987 New York AES show. Most of the audio circuitry has been redesigned to improve sonic performance, reducing cross-talk, distortion and noise. The entire tracking path now features new EQ, Mic and Line amps, Group amps and Monitoring sections.

There are a few other differences between E Series and G Series Consoles, such as the addition of patchable Stereo VCA Faders, a split Cue system, Channel in to Meters and individual Solo Isolate functions, but for the most part the systems are operationally the same.

The philosophy behind these changes stems from the fact that more and more engineers are using the system for entire projects. There was a need for greater computer data storage and sonic and operational changes to improve tracking performance. The 20MByte Data Cartridge used with the G Series Computer and Total Recall™ allows engineers to store every desk setting, from the start of a session all the way through to the final mix. It is now common for engineers to automate the monitor mix and each mix can be stored and improved upon as the tracking process progresses without having to sort through dozens of floppy discs. At any time, each monitor mix can be accessed and parts of it used during final mix if required. To compliment the new computer facilities, the audio signal paths through the console have been scrutinized and redesigned to meet the ever more exacting audio integrity that today's engineers demand. These changes encourage the desk to be split during the tracking process, with a full monitor section to the left of the centre section and source channels to the right.

Differences between the SL 4000 G and the SL 6000 E

It is probably worth describing the difference between the SL 4000 G Series and the SL 6000 E Series System as they are basically very similar and it will be possible to apply 92% of this manual to the SL 6000 E.

The difference between the two systems lies in the output bus structure:

The SL 4000 G Series console has four output busses labelled Left Front, Right Front, Left Back and Right Back. Each Input/Output module routes directly to the main outputs via the master fader on the SL 651G Master Facilities module.

The SL 6000 E Series console has three stereo output busses labelled A, B and C which can be combined to feed a main stereo Programme output. There are therefore four stereo outputs from the console- the clean stereo feeds from the A, B, and C busses and the stereo Programme output. The SL 688V Mix Matrix panel fits in an additional centre section and deals with the matrixing and control of these busses. The main Programme output feeds through the SL 651V Master Facilities Module in exactly the same way as the Quad bus feeds through the SL 651G on a SL 4000 G Series console, with identical control of such functions as the main fader, master compressor and echo returns.

Where this manual refers to the "Quad Bus", just substitute "A, B or C Bus" if you have an SL 6000 E Series system. The stereo Programme output on the SL 6000 E is the equivalent of the Quad output on the SL 4000 G Series system.

Apart from the main output routing, all other functions and controls are identical. The patch layout and metering, however, reflect the different output configurations.

The G Series Studio Computer system and its operation are identical for each system, so transfer from one type of system to the other is effortless and makes logical sense.

If you are working on an SL 6000 E System frequently, you may be interested in obtaining a copy of the operational manual which deals specifically with this console. Contact your nearest SSL office to purchase a copy.

Finally, if you have any comments on this book please contact us. We will be updating the contents from time to time and would appreciate your input.

Definition of Terms

Although most of the terminology in this manual should be familiar to you, there are a few things that we should cover now to avoid confusion.

BUS - A common term used to describe a mixing bus bar. It refers to a signal path within the console, prior to mix amps and output level controls. As an example, the main Quad outputs will often be referred to as the Quad busses when, for instance, talking about the SL 611G I/O module signals routed to the SL 651G Master Facilities module. Signal is sent from the I/O modules, at low level, onto bus bars running the length of the console, where signals from each module are mixed together. The SL 651G picks up these signals, amplifies them and feeds them to the console outputs at line level (nominally +4dBm). So "output" refers to a line level signal leaving the console via the patchbay whereas "bus" refers to an internal route for signals at low level.

THE PATCH - A jack in the SSL patchbay is designated by a letter for each row and a number counted from the far left of that row. e.g. Channel Mic Input 7 is designated as B7 etc. Section 6 includes patch drawings for reference.

SL 611G - This is the Input/Output Module.

SL 611S - The Stereo Module.

SL 651G - The Master Facilities Module. Located to the right of the centre section. (In E Series consoles this is usually located to the left of the centre section.)

The SL 611G Input/Output Module

When operating the I/O module, it is important to remember that it has two independent main signal paths. Each path has its own input and output section and a fader to control the level. One path, normally controlled by the LARGE VCA FADER, is designated the CHANNEL and the second signal path, normally controlled by the SMALL FADER, is designated the MONITOR.

The two input sections are:

The CHANNEL INPUT Section and the MONITOR INPUT Section.

The two faders are:

The LARGE VCA FADER and the SMALL FADER.

The two outputs are:

The QUAD BUS PANS at the bottom of the module and the MULTITRACK GROUP ROUTING MATRIX at the top of the module.

EQ, Filters, Dynamics and Aux send controls are available on each module and these may be switched into either signal path, even at different points.

Life would be simple (and the console totally inflexible) if there were fixed signal paths through the console. As it is, there are many permutations of routing which give SSL consoles the flexibility that has now become accepted as an essential part of audio mixing. It is these permutations that allow the engineer to configure the desk to conform to any task that is presented during a session.

The following section looks at each control individually, with brief summaries of the routing possibilities. Section 7 of this manual takes a more detailed look at signal flow and routing with flow diagrams.

Channel Input Section
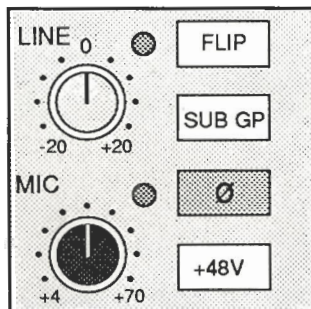
The channel input section may receive any one of three inputs:

LINE - Selects a Line Input from Jack Row D via the Line Trim pot (-20db to +20dB). A green led indicates Line Input selection.

MIC - Selects a Microphone Input from Jack Row B via the red Mic Trim pot (+4dB to +70db).

The new G Series transformerless mic preamps have an improved gain performance over the E Series versions and as a consequence do not require a 20dB pad switch. The preamp will cope with a much wider dynamic range due to a brilliant bit of design work on our part! The gain control is stepped in 6dB increments. A red led indicates Mic Input selection.

SUB GP - When this button is pressed, the above selections are overridden and the input of the channel is taken from that module's Group mix amp. The Subgroup button is associated with a patch-free audio subgrouping facility. By selecting SUB GP on Modules 1-32, the fader previously being fed from the Channel Input Section will now pick up its input from the multitrack bus of the same number. In this way the channel becomes a subgroup. Sources from any of the other modules in the desk may be sent to that fader via the ROUTING MATRICES. The 'subgroup' module's GROUP TRIM control can be used as a level control for this input. Both leds off show this selection.

FLIP - This reverses the MIC/LINE selection on individual channels.

Ø (PHASE) - This reverses the phase of any channel input selected.

+48V - When selected, this provides phantom power to the associated microphone. Powering up a mic will cause a small thump to be heard, so it is preferable to cut a channel when switching the phantom power on.

MIC or LINE inputs are automatically selected by the STATUS switches on the SL651G Master module. In RECORD or REPLAY status, all inputs switch to MIC input, whereas in the MIX Status all inputs switch to LINE input. The FLIP button reverses the normal MIC/LINE selection for individual channels. The MASTER CH INPUT FLIP button on the SL 651G panel reverses the input selection on all channels.
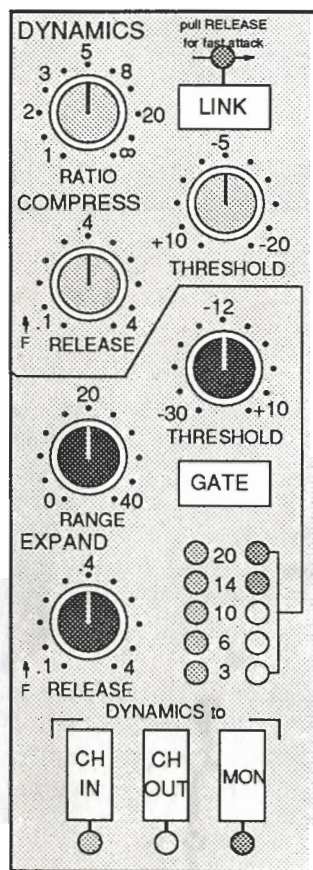
Dynamics Section
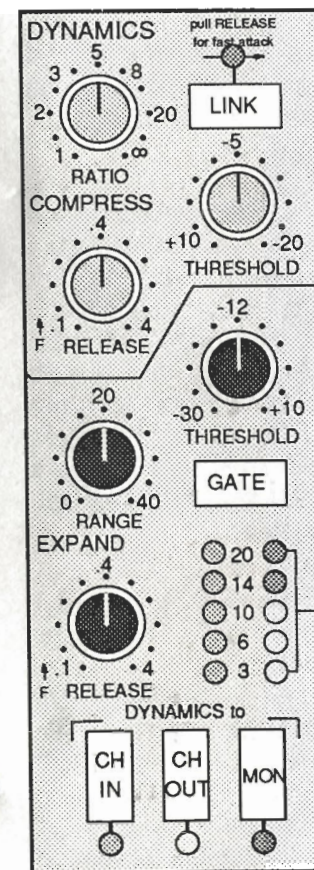
The Dynamics section comprises a compressor/limiter and an expander/gate using the same gain change element. Both sections work independently but can be operational at the same time, thus providing sophisticated dynamics control of either the Channel or Monitor signal.

The Dynamics section has three routing buttons associated with it. Section 8 covers the Dynamics routing in more detail, but briefly these buttons function as follows:

CH IN - Switches the Dynamics into the Channel audio path PRE EQ

CH OUT - Switches the Dynamics into the Channel audio path POST EQ

MON - Switches the Dynamics into the Monitor audio path (Post-EQ if the EQ has also been selected to the Monitor audio path).

If both the **CH IN** (or **CH OUT**) *and* the **MON** button are selected, the Dynamics section is switched into the Channel and the side chain can be accessed from the Monitor signal path (after the READY GROUP and READY TAPE selection buttons). See Section 8 for more details.

Compressor/Limiter

RATIO - When turned to 1:1 the section is inactive. Turning the control clockwise increases the compression ratio to give a true peak limiter in the fully clockwise position.

THRESHOLD - Whenever a signal exceeds the level set by this control, the Dynamics section will compress that signal at the ratio set by the RATIO control. This control also provides automatic gain make-up, i.e. as you lower the threshold and introduce more compression, the output level is increased. This effectively maintains a steady output level regardless of the amount of compression

RELEASE TIME - Sets the time constant (speed), variable from 0.1 - 4 seconds, at which the compressor returns to normal gain settings once the signal has passed its maximum. This control also incorporates a switch which, when pulled up, provides a fast attack time (3ms for 20dB gain reduction). When down, the attack time is programme controlled (3ms-30ms) - in other words, a steep wavefront is met with a correspondingly fast attack; attack time decreases to meet gentler level changes. Note that with a signal that contains transient peaks, such as a piano, a fast attack may result in an unpleasant effect as the compressor will duck the level as it senses the peaks and not the main

body of the input signal. The release time setting is independent of the attack time switch setting.

The yellow and red leds, on the right of the two displays, indicate the amount of gain reduction (compression).

Expander/Gate

This section can act as a 2:1 Expander or as a ∞:1 Gate when the GATE button is selected.

RANGE - Determines the depth of Gating or Expansion. When turned fully anticlockwise (Range = 0) this section is inactive and when turned fully clockwise a Range of 50dB can be obtained.

THRESHOLD - Variable hysteresis is incorporated in the Threshold circuitry. For any given 'open' setting, the Exp/Gate will have a lower 'close' threshold. The hysteresis value is increased as the Threshold is lowered. This is very useful in music recording as it allows instruments to decay below the open threshold before Gating or Expansion takes place.

RELEASE TIME - This determines the time constant (speed), variable from 0.1 - 4 seconds, at which the Gate/Expander reduces the signal level once it has passed below the threshold. This control also incorporates a switch which, when pulled up, provides a fast attack time (100µs per 40db). When down, a controlled linear attack time of 1.5ms per 40dB is selected. The attack time is the time taken for the Expander/Gate to 'recover' once the signal is above the threshold. When gating signals with a steep rising edge, such as drums, a slow attack may effectively mask the initial *THWACK*, so you should be aware of this when selecting the appropriate attack time.

The green leds indicate Expander/Gate activity (the amount of gain reduction).

The **LINK** button at the top of the section links the sidechain signal of that unit to the sidechain of the next Dynamics section along to the right. Note that when the Dynamics section is not in circuit, its sidechain input is also bypassed.
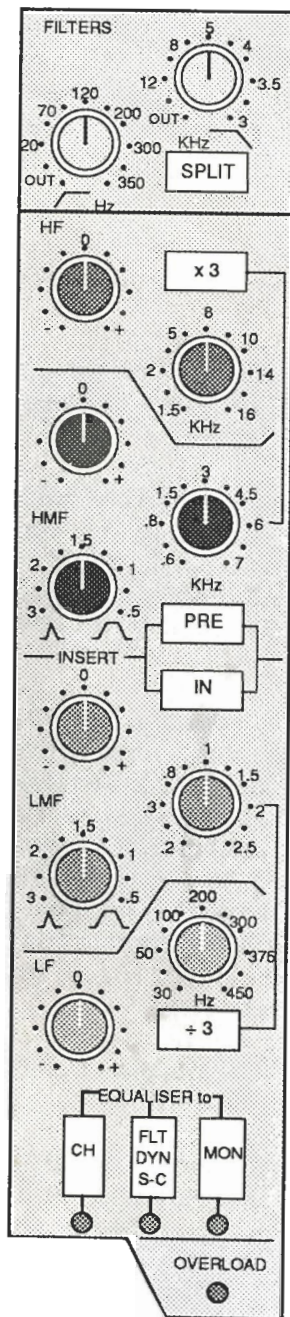
Filters and Parametric Equaliser Section

This section comprises a four band parametric Equaliser plus High and Low pass Filters. The EQ and Filters can be routed separately to different audio paths within the module.

Routing Buttons

There are four routing buttons associated with this section of the module. Section 8 describes the routing combinations in more detail but briefly these buttons function as described below.

CH - Switches the section into the Channel audio path. The Filters are POST the Equaliser.

FLT DYN SC - The Filters are switched into the sidechain of the Dynamics section. The Equaliser can be switched into the Channel or Monitor path independently.

MON - The section is switched into the Monitor audio path. The Filters are POST the Equaliser. The section is PRE the Dynamics section if this has also been selected to the Monitor audio path.

SPLIT - Can be operated in combination with the above selections and splits off the Filters to put them in circuit, immediately after the Channel Input section.

This allows the Filters to be used in channels feeding the multitrack while in RECORD status, with the Equaliser being used on the monitors only. This is also useful in the MIX mode, when additional inputs are being brought into the mix via the Small Faders. The filters can be used on the signal passing through the channel via the Large Fader and the Equaliser used on the signal being fed via the Monitor Input and the Small Fader.

Note that FLT DYN SC overrides the SPLIT function.

As with the Dynamics section, the Equaliser is completely bypassed when none of the routing buttons are pressed.

Parametric Equaliser

HF Section:

Comprises a 12dB per octave shelf filter with variable cutoff frequency and a boost/cut control.

HMF Section:

Continuously variable Q (filter width), gain and centre frequency controls.

x3 - This button is unique to the G Series EQ (E Series consoles have a BELL or peak button in this position which switches the HF section between shelf and peak filters). It operates on the HMF centre frequency control by multipling the frequency range by a factor of 3. This allows the HMF section to be used in the HF region. For example, if the HMF centre fequency is 3KHz, the x3 button will move the centre frequency to 9KHz. Working the HMF (with the x3 button in operation) and the HF sections together can yield some spectacular results unobtainable from the E Series EQ.
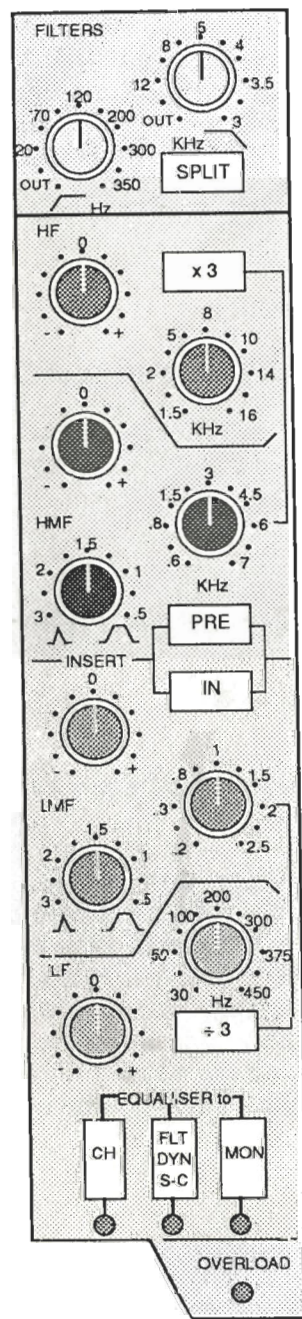
LMF Section:

Continuously variable Q (filter width), gain and centre frequency controls.

÷3 - This button is unique to the G Series EQ (E Series consoles have a BELL or peak button in this position which switches the LF section between shelf and peak filters).

It operates on the LMF section centre frequency control by dividing the frequency range by a factor of 3. This allows the LMF section to be used in the LF region. For example, if the LMF centre fequency is 1.5KHz, the ÷3 button will move the centre frequency down to 500Hz. A calculator is essential for working in this mode.

Using the LMF (with the ÷3 button in operation) and the LF sections together will allow you far more control of the bass frequencies. For example, the LMF controls could be set to remove unwanted resonance whilst the LF controls are set to give a warmer overall sound by boosting the lower end.

The HMF and LMF bands of the Equaliser have continuously variable bandwidth (Q). This measurement of the shape of the EQ curve is calculated as the ratio of Gain/Bandwidth.

Note that the frequency bands overlap considerably, allowing greater flexibility of control. By using the x3 and ÷3 buttons, the HMF and LMF sections can work with, or against, the HF and LF sections respectively.

LF Section:

Comprises a 12dB perOctave shelf filter with variable cutoff frequency and boost/cut control.

Now a little history lesson. SSL uses the colour of the LF knob caps to indicate which EQ type is fitted. The following colour code applies:

BROWN - The original SSL EQ fitted to all consoles prior to Summer 1985. Despite rumours to the contrary, these equalisers only came in one version. There were various small modifications done to early versions but basically they should all now be the same (provided the studio carried out all suggested SSL modifications).

ORANGE - The infamous EQP equaliser. This was a variation on the 'Brown' EQ with controls simulating the curves of valve type equalisers. Very few were sold.

BLACK - The latest version of the standard SSL E Series EQ. It came about from discussions with many engineers and proved to be very successful. This EQ is still fitted to SL 6000 E Series systems as it was found to be excellent for post production applications.

BLACK - The new G Series EQ. Designed with tracking and mixing in mind, with changes to the sound quality and the addition of the x3 and ÷3 buttons.

G Series EQ may be retrofitted to E Series consoles and can be recognised by the x3 and ÷3 buttons. A few early retrofit kits were supplied with yellow LF knob caps, just to confuse you further!
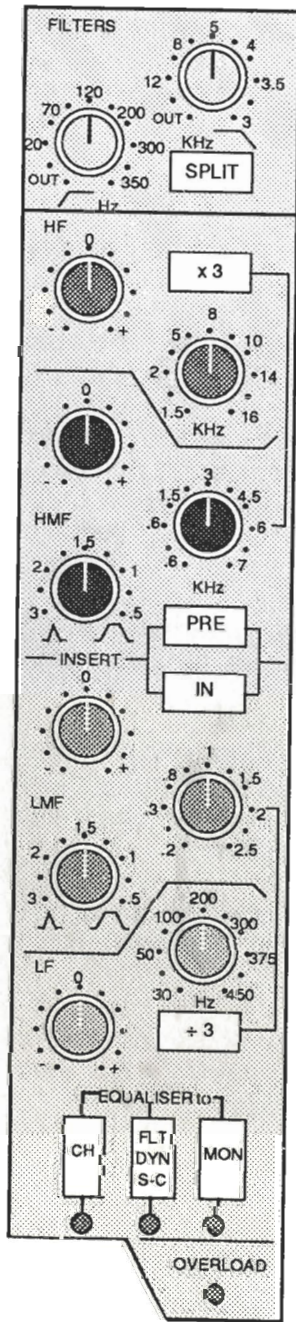
Filters

The Filters can be completely bypassed when the controls are turned fully anti-clockwise to the detented OUT position. On older consoles, all the EQ routing buttons must be switched out to accomplish this.

The High pass filter has a slope of 18dB per Octave and the Low pass filter has a slope of 12dB per octave.

Overload Indicator

The overload circuit monitors the signal in the Channel path at three different points and gives an indication when it is within 4dB of clipping. The monitor points are: post-channel fader, post-insert point and channel front end pre any signal processing.

Insert Point

The insert point is switchable **PRE** or (normally) post the EQ before the fader. The Insert Send jack (Row E) always carries the channel signal and is normalled down to the Insert Return jack (Row F). The **IN** button switches the return back into the signal path, hence switching in any device patched to the insert jacks. Note that the level at the insert send is 0dB, relative to a nominal operating level of +4dB.

There are two different insert point options set by links on the I/O module

mothercard. When the insert point links have been set to CHANNEL, the insert point will always be in the channel no matter where the EQ is. When the links are set for FOLLOW EQ, the insert point can only be switched in when the EQ is switched into an audio path. In this case the insert point moves with the EQ, so if the EQ is in the Monitor audio path then the insert point will also be in the Monitor path.

Cue and Aux Sends
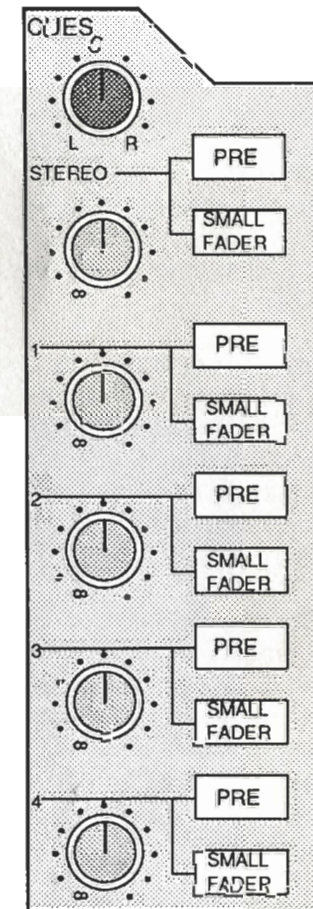
This section comprises one stereo and four mono sends. Either audio path, controlled by the Large or Small Fader within each module, may be routed to any of the send busses, in any pre or post-fader permutation.

Each send has a level control with a built-in push-on/push-off switch so that levels may be preset and easily switched in and out. When the knob is down it is on. The stereo send also has a pan control.

The source select buttons for each send are:

PRE - When pushed down the send is derived pre-fader and when up, post-fader.

SMALL FADER - When pushed down the send is derived from the Small Fader signal path and when up, the send is from the Large Fader signal path.
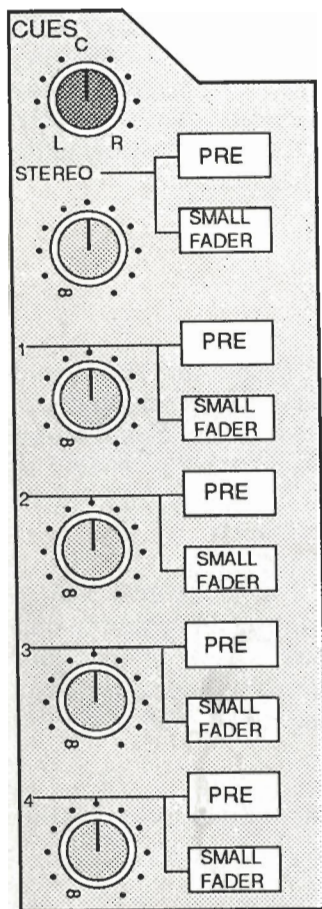
During the recording process, the stereo and the first two mono busses may be used as headphone feeds. All the Aux send bus outputs are found on the jackfield (Jacks N1-6) and can be used as feeds to effects units. The stereo and the first two mono sends are also routed back into the centre section (Jacks P5-8) where talkback, reverb returns and additional external stereo feeds can be added via the **CUES** pot on the SL 651G. Refer to the signal flow diagram on Page 9-5.

After the addition of any talkback, stereo reverb from the stereo reverb returns, and a stereo external source, the Cue outputs appear on the patch (Jacks N9-14). These outputs are then normalled to the headphone power amps (Jacks P9-14).

CUE 1L and 1R are derived from Aux 1. CUE 2L and 2R are derived from Aux 2. CUE 1 and CUE 2 will be mono unless a stereo external source or stereo reverb has been added, whereas CUE STEREO is a true stereo send derived from the stereo Aux bus.

G Series consoles are fitted with a LOCAL (Split) AUX SENDS panel in the centre section. Exact details of the split system can be found in Section 9. Briefly, sends on modules to the right of the centre section always route though the main Aux and Cue system as described above. Modules to the left of the centre section feed out of the console through the controls on the LOCAL AUX SENDS panel which is to the left of the SL 651G. The SPLIT buttons on the panel allow the left hand feeds to be mixed in with the six main sends or 'split' off on their own.

Group Output Section
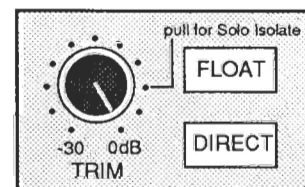
This section comprises a Group mixing amplifier with gain control and the FLOAT and DIRECT routing buttons.

The mix amp takes its input from the associated multitrack mix bus (e.g. all signals routed to multitrack Group 7 will be controlled by the group section on Module 7). The output of the Group appears on patch row G where the signal is normalled down to the Multitrack Send (i.e. to the record inputs of the multitrack) and to the Group Monitor Input via the READY GROUP button, located at the top of the Small Fader section.

The **GROUP TRIM** control attenuates the combined level of signals routed to the group. Normally these controls are left fully up and have detents in this position. Their main use is for attenuating a Group Output when, for example, several channels have been assigned to a group and a relative balance has been set on the faders. If the overall signal level is too high then the Group Trim control can be adjusted to send an optimum level to the multitrack.

When a Group is not being used as a multitrack send it may be routed to the corresponding CHANNEL INPUT SECTION, by pressing **SUB GP** on that module. The channel will now act as an audio subgroup and the Group Trim control as the channel input gain control.

FLOAT - The STATUS logic switching on the SL 651G Master module normally determines, across the console, the output destination of the two faders on each module. The FLOAT button re-routes whichever of the two faders is currently assigned to the main Quad Bus Pans, up to the Routing Matrix, in order to facilitate track bouncing and audio subgrouping arrangements. Note that the other fader's routing destination is then disabled, although it may still feed post-fader Aux sends. This is *not* a fader flip button.
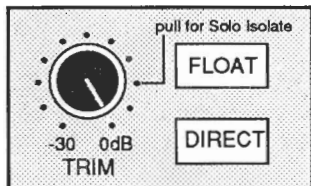
DIRECT - This button provides a means of routing the post-channel fader signal on that module *directly* to the corresponding multitrack Group Output, bypassing the Routing Matrix, Group mix bus, Group mix amp and Group Trim control. This improves noise figures but disables all other channels routed to that Group Output, as the Group mix amp is disconnected from the Group Output (see Section 7). The Group mix amp will, however, still feed the SUB GP button on the Channel Input Section.

The DIRECT button also allows channels above 32 to access their own Group Output (e.g. Group 33 can only be accessed from Channel 33 with the DIRECT button selected). The Group Outputs from 33 onwards can therefore be used as additional sends to a second multitrack during live recording or as direct channel outputs. Remember also that the Insert Send jack always (unless the console has the 'Follow EQ' insert option - see Page 2-11) carries the Channel signal so this may also be used as a direct output in the last resort.

Solo Isolate

The Group Trim control is fitted with a pull-up switch (not fitted to E Series consoles) which, when up, isolates the corresponding VCA fader from the VCA Solo Cut Bus . This facility is very useful for preventing echo returns from being muted when a source is soloed, thus allowing the sources to be heard with their effect returns.

If any channels are being used as audio subgroups, these should also be Solo Isolated to prevent the subgroup output being cut when a channel within that group is soloed. G Series I/O modules are fitted with a switch on the Logic card which can activate Solo Isolate automatically when the SUB GP button is selected.

The VCA Solo button on any channel that is Solo Isolated will operate as an AFL (After Fader Listen) button when pressed.

Routing Matrix
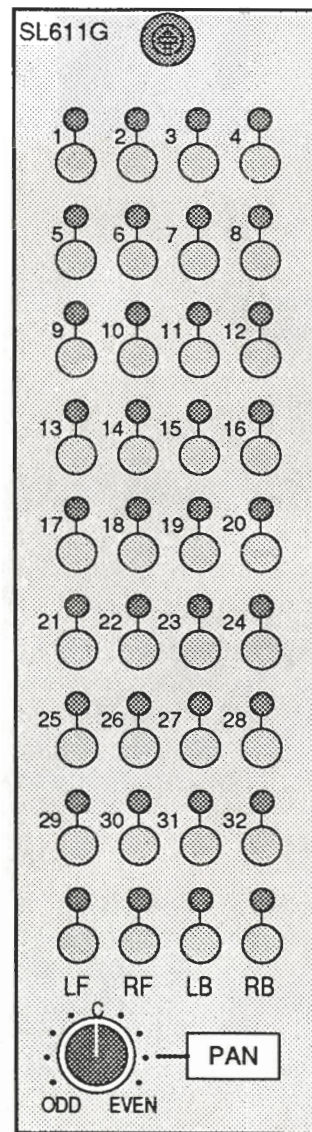
The console has as many Group Outputs as there are I/O modules. The Routing Matrix allows any module to route to the first 32 of these output Groups, as well as the main Quad bus.

The matrix may be fed from either fader path depending on the console STATUS selection and the individual module FLOAT buttons.

There are four main uses for this matrix:

1. In RECORD or REPLAY status the Channel signal can be fed to any multitrack group for track laying, usually from the LARGE FADER *or*, if VCAs TO MONITOR is selected, from the SMALL FADER.

2. In MIX status either the SMALL FADER signals (or the LARGE FADER when the **FLOAT** button is selected) can be fed to the Routing Matrix for audio subgrouping on any of the first 32 channels. Having been routed to the selected group(s), these signals can be picked up on the corresponding LARGE FADER by pressing the **SUB GP** button, or on the SMALL FADER by selecting the **READY GROUP** button.

3. In MIX mode the SMALL FADER can be used as an additional send via a Group. Using the **INPUT** and **OUTPUT** buttons next to the SMALL FADER, the Channel signal, pre-signal processing or pre/post-VCA fader, can be routed to a multitrack group and then patched, from Row G, to an effects unit input.

Buttons Selected	*Source of Small Fader Input*
INPUT	Pre-Signal Processing but after Filters if SPLIT
INPUT & OUTPUT	Post-Signal Processing but Pre-VCA Fader
OUTPUT	Post-VCA Fader

Note that these buttons are also active in RECORD and REPLAY status.

4. In MIX mode as a way of accessing the main Quad Outputs from the SMALL FADERs. Additional Line Inputs (or Mic Inputs, with the optional SSL Dual Mic preamps) can be patched into the Tape Monitor Inputs (Row K) and sent via the SMALL FADER to the Quad bus select buttons on the Routing Matrix, so allowing twice as many inputs to the Quad bus as there are modules.

The Routing Matrix allows a signal to be routed to any number of destinations simultaneously. Stereo panning between Groups can be achieved by selecting two Groups, switching in the **PAN** control and panning between the Odd and Even groups selected (the odd Group is the left of the pair and the even Group is the right). If the signal is routed to the Quad busses, the pan can be used between the LF and RF or the LB and RB busses.

The Routing Matrix and Status Logic Switching

Status	*Routing Matrix fed from*
RECORD/REPLAY	Channel Input via LARGE FADER
RECORD/REPLAY + VCA TO MON	Channel Input via SMALL FADER
RECORD/REPLAY + module FLOAT	Monitor Input via SMALL FADER
RECORD/REPLAY + VCA TO MON + module FLOAT	Monitor Input via LARGE FADER
MIX	Monitor Input via SMALL FADER
MIX + module FLOAT	Channel Input via LARGE FADER

Note that the easiest way to tell which fader is feeding the Routing Matrix, is to look at the green led below the SMALL FADER. When it is lit, the SMALL FADER feeds the matrix and when off, the LARGE FADER is feeding the matrix.
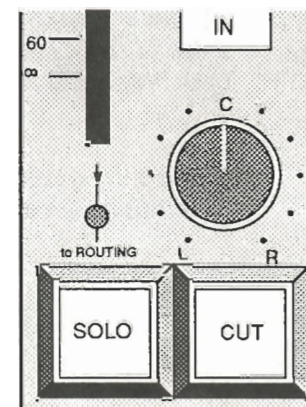
Monitor Input and Small Fader Section
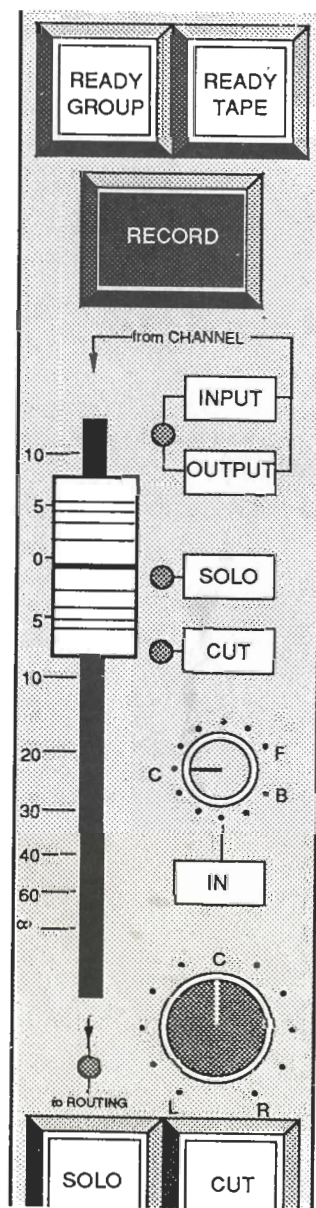
Monitor Input Section

The source selected by the MONITOR INPUT SECTION is governed by the state of the **READY GROUP** and **READY TAPE** buttons and the **INPUT** and **OUTPUT** buttons.

Note that the INPUT and OUTPUT buttons override READY TAPE and READY GROUP, but we will assume that they have not been pressed at the moment.

The READY GROUP and READY TAPE buttons serve two functions:

1. To select which input will be presented to the Monitor fader - the GROUP signal feeding the multitrack and/or the TAPE return from the multitrack machine.

2. To allow the **RECORD** button to function as a Track Ready button.

Each RECORD button is connected to the corresponding multitrack Track Ready remote. The RECORD button is only *ready* (allowed) to prime a track for record if either READY GROUP or READY TAPE is selected. This acts as a safety feature to prevent accidental record priming.

The RECORD button is engraved with the module and track number to clearly indicate which tracks are being primed for record. If the module RECORD button is on, then that track on the multitrack will drop into record if the transport RECORD button is pressed. Some machines allow the module RECORD button to drop the machine directly into record whilst the machine is running with its transport record set. Other machines need a fresh transport record command before a primed track will go into record. You should check the logic of this before dropping in for real!
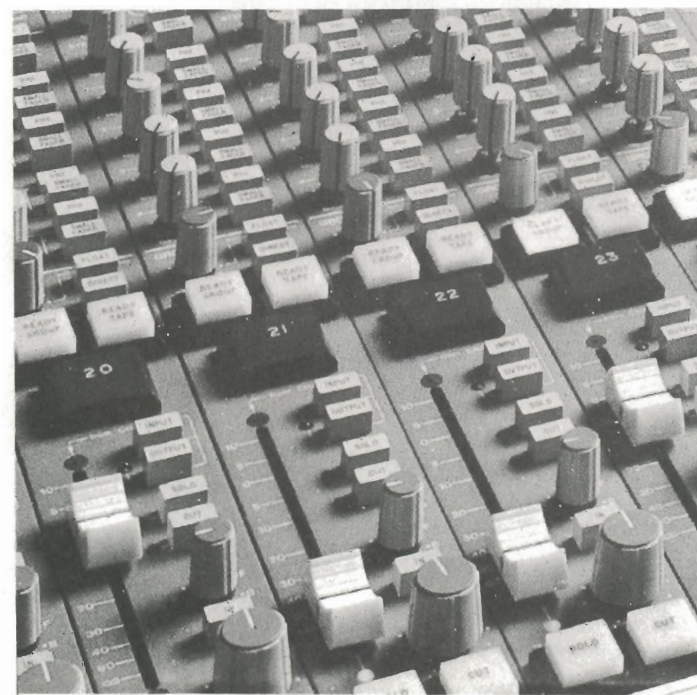
Small Fader Source and Destination

The console STATUS and FLOAT buttons determine if the Small Fader is placed in the Monitor or Channel signal path. (See Section 7 for more details.)

The led situated below the Small Fader is a good indication of the fader's destination and will help you to quickly confirm which signal path it is controlling.

For your reference the sources and destinations of the Small Fader signal are shown below:

Status Buttons Selected	Small Fader Input	Small Fader Output
MIX	Monitor Input	Routing Matrix
RECORD	Monitor Input	Quad Bus
RECORD + VCA TO MON	Channel Input	Routing Matrix

If the channel FLOAT button is also pressed:

Status Buttons Selected	Small Fader Input	Small Fader Output
MIX + FLOAT	Monitor Input	Disconnected*
RECORD + FLOAT	Monitor Input	Routing Matrix (For Track Bouncing)
RECORD + VCA TO MON + FLOAT	Channel Input	Disconnected*

* Post-Small Fader Aux sends will still be fed.

Small Fader Cut and Solo

These **SOLO** and **CUT** buttons are always associated with the Small Fader, regardless of whether the Small Fader is a Monitor fader or a Channel fader (as in RECORD + VCAs TO MONITOR status).

Normally the **SOLO** buttons activate an 'in place' (destructive) Solo function. This is useful when using the Small Faders as Monitor fader in the RECORD status. However, if the Small Faders are being used as Channel faders in RECORD + VCAs TO MONITOR status, the **SOLO** buttons can be switched to an **AFL** (After Fader Listen) function by selecting **AFL** (or **STATUS LOCK**) on the SL 651G (Section 4).

The **CUT** button always cuts (mutes) the Small Fader. However, depending on the console Status and DIL switch settings on the module Logic Card, it may or may not cut the Pre-Fader Cue/Aux sends. This is explained in more detail on Page 2-25.

Quad Pans

These controls allow signals to be panned across the Quad output busses. If the FRONT/BACK pan is not switched in, the LEFT/RIGHT pan feeds the front two busses only, for normal stereo work. The Front/Back pan can be used to split the mix into two separate stereo outputs.
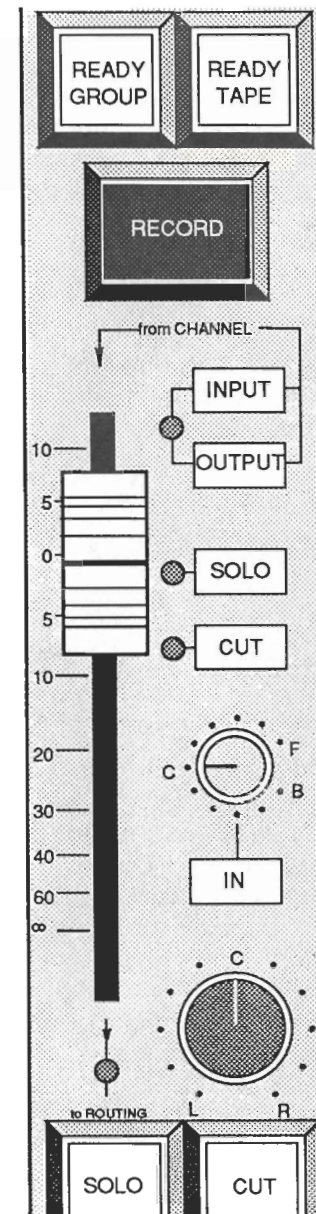
Ready Group/Tape Selections and the Supercue System

The READY GROUP and READY TAPE buttons are used to select monitor sources for the Monitor fader and to determine the Pre-Fader Cue feeds. As already described, these buttons also enable the module track RECORD facility. The table below lists the different combinations of buttons and the resultant signals that are fed to the Monitor fader and the Cue sends:

Ready Button Selected	Monitor Fader Source	Pre-Fader Cue Feeds	Track Record Facility
None	TAPE	TAPE	NO
TAPE	TAPE	GROUP+TAPE	YES
GROUP	GROUP	GROUP	YES
GROUP+TAPE	GROUP+TAPE	GROUP+TAPE	YES

As can be seen above, both Group Output and Tape Return can be monitored together, when both READY GROUP and READY TAPE buttons are selected. This is presented as a 1:1 mix. Note also that when the READY TAPE button is selected on its own, the Cue sends still receive a combination of Group *and* Tape, allowing the engineer to hear the drop-in while the artiste can hear both himself (or herself) as well as a feed from the Sync head of the ATR.

The table above applies while the multitrack is not running in record. When the machine *is* in record, the console senses the machine record line and then adjusts the monitor sources accordingly (see opposite). This facility of automatic source selection is called the SSL Supercue System.

Let's first look at the Monitor fader source before and during the drop-in. The following table shows the sources that will be selected:

Ready Button Selected	Monitor Fader Source Pre-Drop-in	Monitor Fader Source During Drop-in
TAPE	TAPE	GROUP †
GROUP	GROUP	GROUP
GROUP+TAPE	GROUP+TAPE	GROUP *

and for the Pre-Fader Cue feeds:

Ready Button Selected	Pre-Fader Cue Source Pre-Drop-in	Pre-Fader Cue Source During Drop-in
TAPE	GROUP+TAPE †	GROUP * †
GROUP	GROUP	GROUP
GROUP+TAPE	GROUP+TAPE	GROUP *

* The asterix indicates that the Supercue System has switched from GROUP+TAPE to the GROUP signal only. When Cues and Monitors are fed with a GROUP+TAPE signal, the two signals can be optionally reduced by 3dB to avoid coherent summing. This is achieved by links in the I/O modules (G Series only). In this case, when Supercue switches to GROUP only, the level of the Group signal is restored. Check with your studio which option is present. This option is not usually set in video post-production applications

† Indicates that this condition will give TAPE if a DIL switch on the I/O Logic card is set to ON. This may have ramifications in the following text.

In the Control Room

When laying fresh tracks it is possible to monitor either the READY GROUP or READY TAPE signal. READY GROUP allows you to meter signals going to the multitrack.

Remember that when READY TAPE only is selected, you will only hear a signal if the multitrack is playing, or if the multitrack automatically switches to Input when stopped. When the machine is in Record the monitoring automatically switches to GROUP. The metering however will continue to meter TAPE, which may in turn be effectively GROUP if the machine switches to Input when in record. READY TAPE will allow you to hear a "clean edit" when dropping in (i.e. the Sync output of the multitrack prior to the drop-in point and then the Group Output after the drop in point, switched when the track drops into record).

When overdubbing, selecting READY TAPE and READY GROUP together will allow you to hear the artiste playing along with the previously recorded track prior to the drop-in, and then the Group signal on its own during the drop-in.

It may seem like things are getting a little too complicated here. Don't you think it would be better if we all agreed to record bands direct to 2 Track?

In the Headphones

Let's assume that both READY TAPE and READY GROUP are selected. This means that the mic is always present in the headphones and allows the artiste to play or sing along with the previous take and in many cases pick up any complex nuances that were in the original performance. The artiste will hear himself (or herself) as well as the machine Sync output up to the drop-in point.

After the drop-in point, the TAPE signal is switched off and the GROUP signal, the mic or other source, is raised in level by 3db(if the 3dB option has been set internally).

Small Faders as Extra Auxiliary Sends
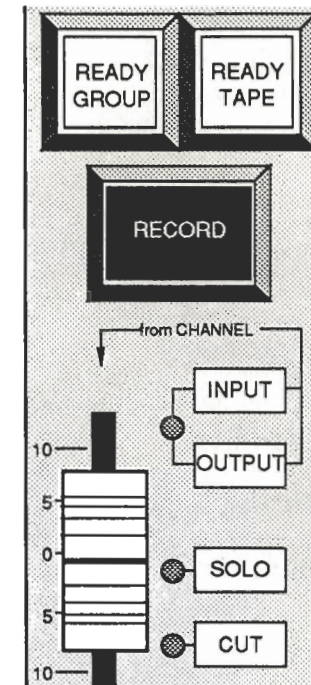
The **INPUT** and **OUTPUT** buttons, next to the SMALL FADER, provide a means of feeding the Channel signal into the Monitor path in place of the READY GROUP, READY TAPE selections.

These two buttons *override* any READY GROUP or READY TAPE selection.

This is very useful in the MIX mode for deriving additional auxiliary sends or clean feeds (see Section 10). These can then be fed to the Routing Matrix and out to effects devices or cue lines e.g. Groups 25-32 can be used as clean feeds of a live mix, the Small Faders being used to send the Channel signal to as many of these clean feeds as required

Buttons Selected	Source of Small Fader Input
INPUT	Pre-Signal Processing but after the Filters if SPLIT
INPUT & OUTPUT	Post-Signal Processing but Pre-VCA Fader
OUTPUT	Post-VCA Fader

Monitor Cut and Solo

When laying tracks it is often preferable to be able to CUT and SOLO the Monitor feeds without cutting the Pre-Fader Cue sends to the studio headphones. There is a DIL switch on the Logic card which determines if the Monitor Pre-Fader Cue sends are cut by the Monitor Cut or not.

In RECORD and REPLAY status, Monitor Cuts do not cut the Pre-Fader Cue sends if this option has been selected.

In MIX status, Pre-Small Fader Cue/Aux sends will also not be cut by the Small Fader Cut button if this option has been selected.

Large (VCA) Fader

The LARGE FADER is usually fed from the CHANNEL INPUT SECTION. However there are exceptions as this table shows:

Status Selected	Large Fader Input	Large Fader Output
MIX	Channel Input	Quad Bus
RECORD	Channel Input	Routing Matrix
RECORD + VCA TO MON	Monitor Input	Quad Bus

If the FLOAT button is also pressed:

Status Buttons Selected	Large Fader Input	Large Fader Output
MIX + FLOAT	Channel Input	Routing Matrix
RECORD + FLOAT	Channel Input	Disconnected *
RECORD + VCA TO MON + FLOAT	Monitor Input	Routing Matrix

* Post-Large Fader Aux sends are still fed.
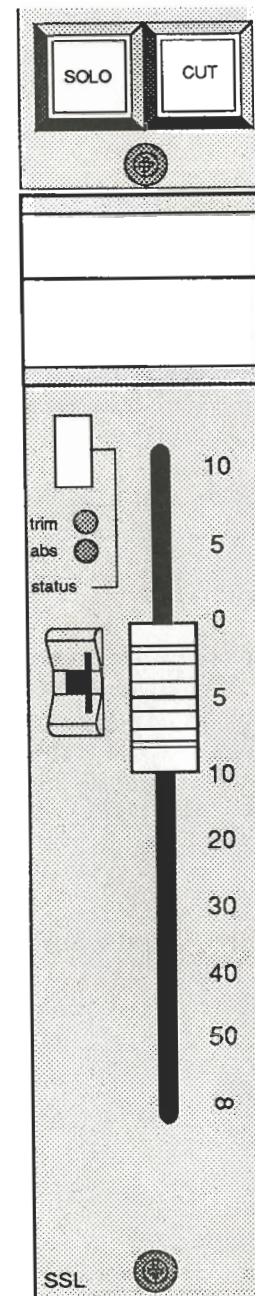
The large illuminated **SOLO** and **CUT** buttons are always associated with the Large Fader.

SOLO - This button does not affect the I/O module at all. However, it *cuts* all other modules which are not soloed, allowing selected channels to be monitored in stereo on their own. This is known as a "destructive solo" and should not be used on Channel signals while recording. If **AFL** is selected on the SL 651G, none of the channels will be cut when Solo buttons are pressed, but the selected channel can be heard in mono on the main monitors. Links within each module select PFL (Pre Fader Listen) instead of AFL if preferred.

If the module's GROUP TRIM control is pulled up, then that channel will be isolated from the VCA Solo Cut Bus and so will be unaffected if another module is soloed (G Series Only).

CUT - When the VCA Fader is used in the Channel signal path the CUT (or Mute) button actually cuts the channel in two places - at the input and at the fader (VCA). This differs slightly from a cut generated when a SOLO button is pressed on another channel. In this case, the channels are only cut at their inputs. This allows the soloed channel to be heard but doesn't send a cut signal to the VCA and hence the automation computer. Therefore, channel solos during an automated mix are not recorded as part of the mix data.
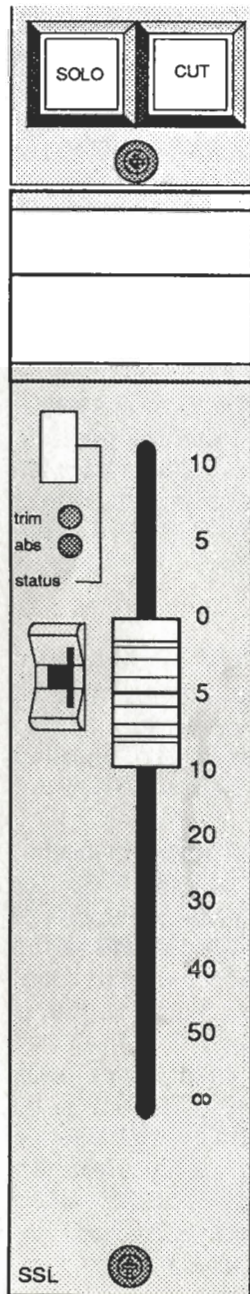
STATUS - This switch beside the Large Fader is related to the automation system, as are the **trim** and **abs** leds.

VCA Fader Subgrouping

The VCA thumbwheel switch is the means by which the module VCA, being controlled by the LARGE FADER, can be assigned to one of the eight VCA GROUP FADERS located in the console centre section.

The VCA Group Faders can also be assigned to other VCA Group Faders, so many combinations of VCA subgrouping can be achieved.

If a VCA Subgroup has been selected then the module VCA will be controlled by the Large Fader *and* the VCA Group Fader. When set at 0 the VCA Group Fader has no effect on the channel VCA, allowing 10dB of headroom above this position.

If **I** is selected on the thumbwheel switch, the Large Fader VCA is 'Independent' of the VCA Group Faders, including their Solo Cut Bus, and the VCA Group 0 Trim control, located on the SL 651G.

The Independent thumbwheel setting has a variety of uses. For instance, it may be that VCA fader levels across the console are basically set but one or more channels need to be slightly higher than their fader allows. In this case, set them to Independent and reduce the level of the other faders with the VCA Trim control. Or, when a VCA subgroup is soloed, all other subgroups will normally be cut (including VCA Group 0), along with the channels assigned to them. This may not be desirable where effects devices fed from the soloed subgroup are returned through channels. If the effects return faders are set to Independent, they will not be cut. In addition this will prevent the return levels being affected if the VCA trim control is being used as above.

Both the Large Faders and the VCA Subgroup Faders are connected to the SSL Primary Studio Computer. See the Computer Operator's Manual for further details.
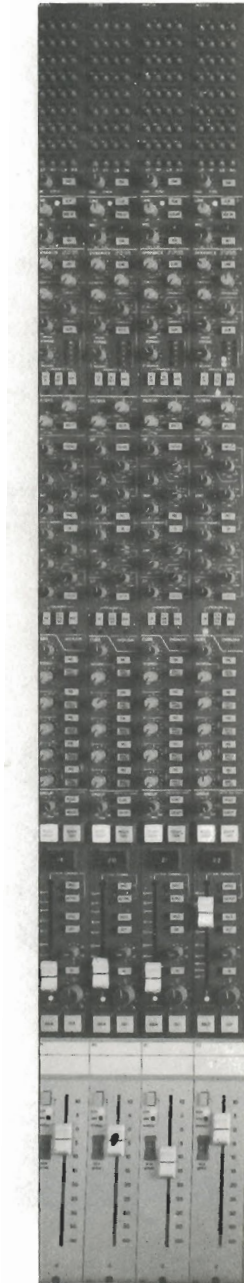
The SL 611S Stereo Channel Module

The Stereo Input Module was first introduced in 1985 and can be fitted in place of the standard SL 611G I/O module. It has been designed to work in both SL 6000 E and SL 4000 G consoles, enabling a stereo input to be controlled by a single module. Slight wiring differences between stereo and mono I/O modules mean that the mainframe and patchbay should be specially pre-wired to accept Stereo Modules.

However, Stereo Modules *can* be fitted in a frame wired to accept only standard I/O modules. If this is the case then the inputs and insert points will appear on these patch points:

Stereo Module Inputs and Outputs	*Standard I/O patch labelling*
Line Input L	Mic Input
Line Input R	Line Input
Insert Send L	Insert Send
Insert Send R	Insert Return
Insert Return L	Group Output
Insert Return R	Group Monitor Input

The SL 611S has comprehensive control facilities to cope with stereo inputs and their routing to the Quad busses and the multitrack Routing Matrix. Unlike the SL 611G module, there is only *one* signal path through the module so the routing is far simpler. Signals present at the input section are fed via the Large VCA Fader to the Routing Matrix at the top of the channel. The entire signal path is stereo.

No signal will pass out of the channel to the Quad bus and Group Outputs unless a destination is selected on the Routing Matrix.

Total Recall™ is also available for these modules and the Fader and Cut button are connected to the computer automation system in exactly the same way as with SL 611G I/O modules. Total Recall™ recognises the difference between I/O and Stereo Modules and will display the appropriate graphic.

The sections that follow will cover each section of the module in detail, starting with the input section.

Most of the controls will be familiar to you, however, there are several sections which are unique to the Stereo Module and give the engineer stereo control that would otherwise be difficult, if not impossible to achieve, without such a device.

Input Section
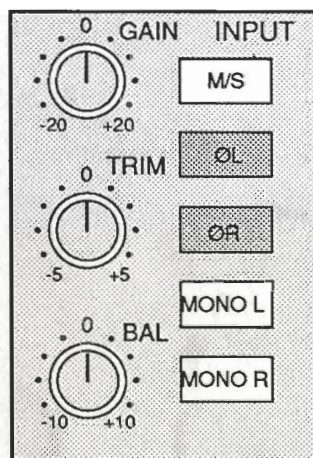
The SL 611S has an electronically balanced stereo line input which will accept either a Left/Right or Sum and Difference (M/S) stereo signal.

GAIN - Switchable gain control providing +/- 20dB of variable gain in 5dB steps.

TRIM - Centre detented, and trims the gain of the input by +/- 5dB.

BAL - Centre detented balance control which provides +/- 10dB of variable left/right gain offset.

Ø (**PHASE**) **L** - Reverses the phase of the left input.

Ø (**PHASE**) **R** - Reverses the phase of the right input. Note that pressing both phase buttons will phase reverse both left and right inputs.

MONO L - When pressed, the left input is fed to both the left and right sides of the channel and the right input to the channel is cut.

MONO R - When pressed, the right input is sent to both the left and right sides of the channel and the left input to the channel is cut.

When *both* MONO L and MONO R are selected, a mono sum of the

left and right inputs (compensated by a level drop of 3dB on each input signal) is fed through the channel.

M/S - When selected, the left input is assumed to be the Middle, or sum, input and the right input is assumed to be the Side, or difference, input. A decoding matrix is inserted with the M/S switch which derives left and right signals from the Sum and Difference inputs.

Just for your information, the following calculations are used to decode Sum and Difference signals:

$$\text{Sum} = L+R$$
$$\text{Difference} = L-R$$

Therefore, to derive the left and right signals from these inputs :

$$L = (\text{Sum} + \text{Difference})/2$$
$$R = (\text{Sum} - \text{Difference})/2$$

This becomes interesting if the matrix is inserted when normal stereo signals are present at the input. Try it with reverb returns!

The Routing Matrix

Unlike the SL 611G module, the only access to the Quad outputs (and the 32 Groups) is found at the top of the channel. The SL 611S Quad bus routing is designated A, B and C, to provide compatability with the SL 6000 E Console which has three stereo mix busses designated A, B and C. The A bus corresponds to the LF and RF Quad busses and the B bus to the LB and RB busses. The C bus selection is not used on the SL 4000 G.
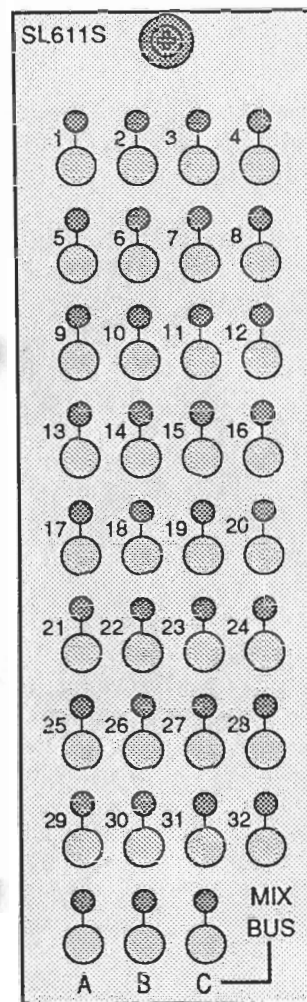
Unlike the I/O modules, SL 611S modules are identical when fitted to either SL 4000 or SL 6000 Series consoles.

The stereo channel can be routed to any combination of these outputs. The left channel signal will route to the odd numbered multitrack groups, the right channel signal to the even groups.

Dynamics Section
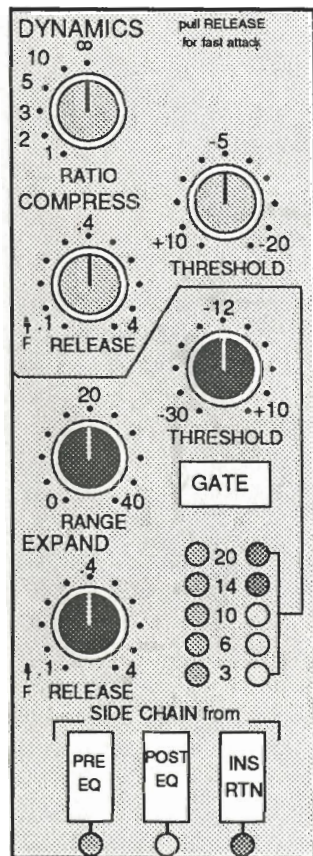
The Dynamics section is a stereo version of that found in the SL 611G with similar operational parameters.

The control element in this case is the channel fader VCA, so the point of effect of the Dynamics section is essentially fixed within the channel.

The Dynamics' sidechain, however, can be derived from a point **PRE EQ**ualiser, **POST EQ**ualiser or from the **INS**ert **ReTurN** for external keying applications. As there is no Group amplifier associated with this module, signals from other modules cannot directly route to the unit's sidechain. However, by routing a signal from another module to an unused Group and patching from that Group Output into one of the Insert Returns, this effect can be achieved. This is especially useful for "ducking" stereo music behind an announcer or for gating stereo reverb returns.

Stereo Equaliser and Filter Section

Filters

The 12dB/octave high and low pass filters have a detented off position so that they may be completely removed from circuit if not required.

Equaliser

This three band stereo equaliser, with carefully matched components, allows accurate stereo control of the audio signal. The three bands each have continuously variable gain and frequency controls.

Each gain control provides +/- 15dB of gain at the frequency selected by the frequency pot. As with the mono equalisers in SL 611G modules, the frequency controls overlap, allowing two controls to work together on the same frequency band if required.

The HF and LF section can be switched from a shelving curve to a bell (peaking) type filter with the **BELL** switch. The MF section has switchable Q factor of 1 or 2 (HI Q).
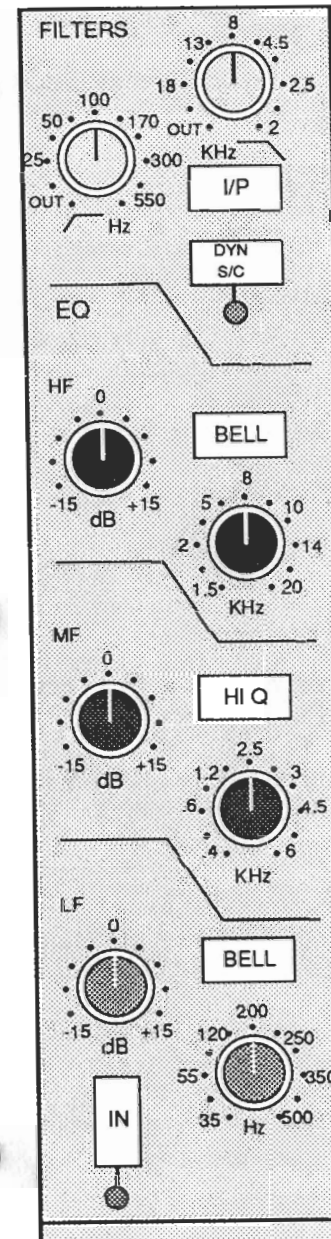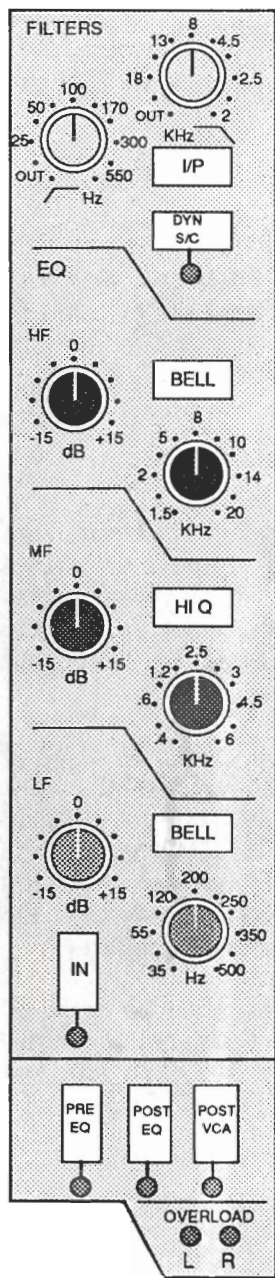
The following buttons select the position of the Equaliser and Filters:

IN - Switches the Equaliser into circuit pre-fader.

DYN SC - Switches the Filters into the Dynamics' sidechain for selective compression and gating.

I/P - When the Filters are switched on with the detented controls, they will be directly after the Equaliser in the signal chain. If the **I/P** button is depressed, they are inserted at the front of the channel before any signal processing (Dynamics and EQ) and the PRE EQ insert point.

Insert Point

The stereo insert can be switched to three points in the signal path:

PRE EQ - The insert point will be before the Equaliser but post the Filters if the **I/P** button is selected.

POST EQ - The insert point will now appear directly after the Equaliser and Filters if they have been switched in.

POST VCA - Yes, the insert point is now after the channel VCA fader (not possible with the SL 611G I/O module) hence after the Equaliser and Dynamics section (which operates on the VCA).

Overload Indicators

A pair of overload indicators are fitted beneath the Insert switches. Overload detection circuitry monitors signals at four points in the module (channel input, post-insert, post-EQ and post-fader) and indicates when the signal is 3dB below clipping point.

Cue and Auxiliary Sends

As with the SL 611G module, six auxiliary busses are available, configured as one stereo and four mono sends. Each send level control has the SSL standard push on/push off facility (up is off) and can be switched pre or post-fader.
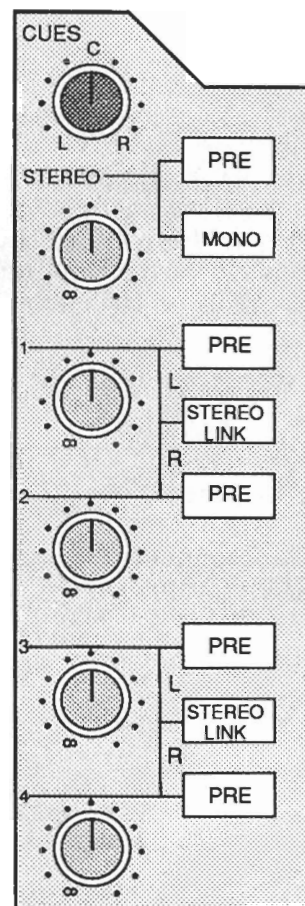
Pre-fader sends are normally cut when the channel is cut. Optionally, links on the motherboard may be set to cut pre-fader sends when their channel or assigned VCA Group Fader is closed. This is useful when studio floor foldback is being fed pre-fader from one of the auxiliary sends. In this case the studio feed will be active from a particular channel until the fader is closed. If the channel is assigned to a stereo source such as a tape machine, unwanted cueing and rewind noises will be prevented from reaching the floor when the fader is closed.

The stereo send (Cue Stereo) feeds the left and right channel signals to the left and right send busses via a single gain control. A centre detented balance control is also provided.

The **MONO** button sums the left and right channel signals and feeds the resultant signal to both sides of the send bus via the balance control which now acts as a pan.

Cue/Aux sends 1-2 and 3-4 normally feed L+R signals to their busses. When the **STEREO LINK** button is pressed, the Left channel signal can be fed to send 1 (and 3) and the Right channel signal may be fed to send 2 (and 4). This configures sends 1-2 and 3-4 as stereo pairs.

Sends from the left hand side of the console are fed to the LOCAL AUX SENDS panel. Sends from the right hand side of the console feed through the main CUE and AUX outputs.

Remote Facilities

Two momentary illuminated switches marked **START** and **STOP** (controlling relay contacts and reading opto isolated tally returns) provide remote control of external devices such as carts, tape machines, disc players or cue lights. When the **FADER START** button has been pressed, these functions will operate as the fader is opened and closed. (Switches on the logic card can be set so that the relay contacts are momentary or latching.)

Meter Controls

A single meter above the module can be switched to read:

L - left channel signal (after the Input GAIN control)
R - right channel signal (after the Input GAIN Control)
> < - the higher of the two signals

The meter will also read the channel VCA fader voltage when the **VCA's** switch on the SL 651G is selected.

Image Controls

Three controls provide a comprehensive stereo image processing system.

IN - The whole image section is switched into the channel when this button is pressed.

IMAGE WIDTH - This control varies the stereo image from full width stereo through mono to a reversed stereo (L/R reversed). The control has a centre detent in the Mono position.

IMAGE PAN - This positions the image, set with the IMAGE WIDTH control, in the stereo picture. With a mono image it provides normal panning; as the image widens, the effect of the pan pot diminishes such that it has no effect on a full stereo image.

Using these controls together can provide the engineer with some interesting perspective effects similar to those found on a video mixer. Stereo images may be flipped, collapsed and panned across the stereo 'picture'.

EXTRA WIDE - This switches in a width enhancement circuit which expands the image outside the normal stereo picture.

FILTER - The FILTER switch can be used to prevent odd phase anomalies on frequencies below 250Hz when the EXTRA WIDE control is in operation.
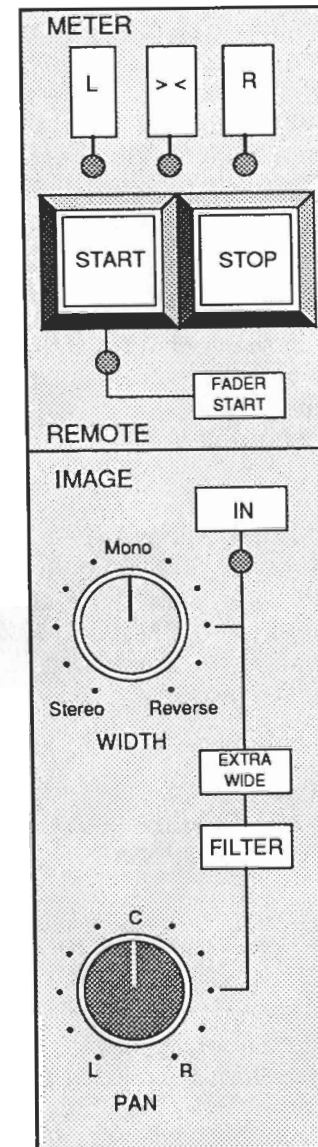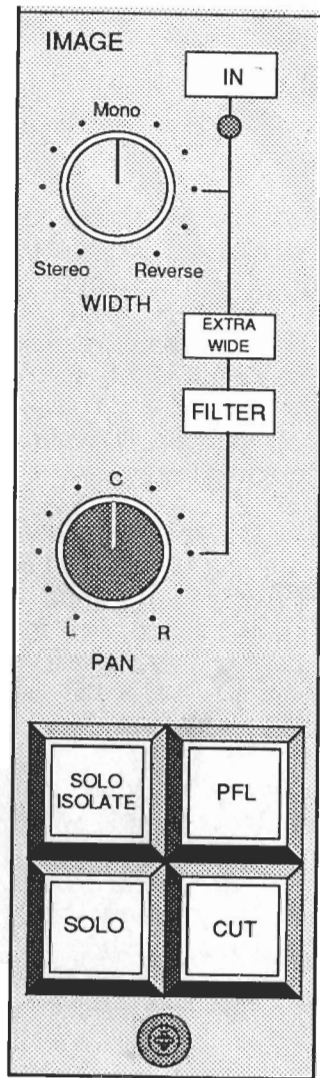
SOLO ISOLATE - Isolates the channel from the Solo Cut Bus. This is very useful when stereo channels are being used as effects returns. When a channel is soloed, any channels Solo Isolated will not be muted. The soloed channel may then be monitored in stereo with its associated effects return.

SOLO - Provides 'Solo in place' unless the AFL mode is selected on the SL 651G Master Facilities Module, in which case a mono (L+R) signal is monitored on the console AFL bus.

PFL - When operated, a mono (L+R) Pre-Fade Listen signal is sent to the monitors. As an option, the fader may be fitted with a switch so that the PFL signal may be monitored when the fader is held against its backstop.

CUT - Cuts (mutes) the channel. Connected to the SSL Studio computer as part of the automation system.

Fader

The fader facilities, including VCA grouping and automation, are exactly the same as the facilities found on SL 611G I/O module faders. The fader controls two VCAs, one each for left and right channel signals.

SL 651G Master Facilities Module and The Centre Section

The centre section of a G Series console is fitted, as standard, with three centre divisions, each four faders wide.

Located to the right of the centre section, the SL 651G Master Facilities Module houses the master logic controls, monitoring and metering controls, aux send and echo return masters, communications facilities, power supply rail indicators and a test oscillator. There are four stereo, patchable, VCA faders below the module.

A full-sized keyboard is located to the left of the SL 651G and spans two centre section widths. Eight VCA Group Faders are located directly below the keyboard. The Local Aux Sends panel is situated to the left of the SL 651G at the top of the section and an in-built TV monitor is fitted directly above the keyboard.
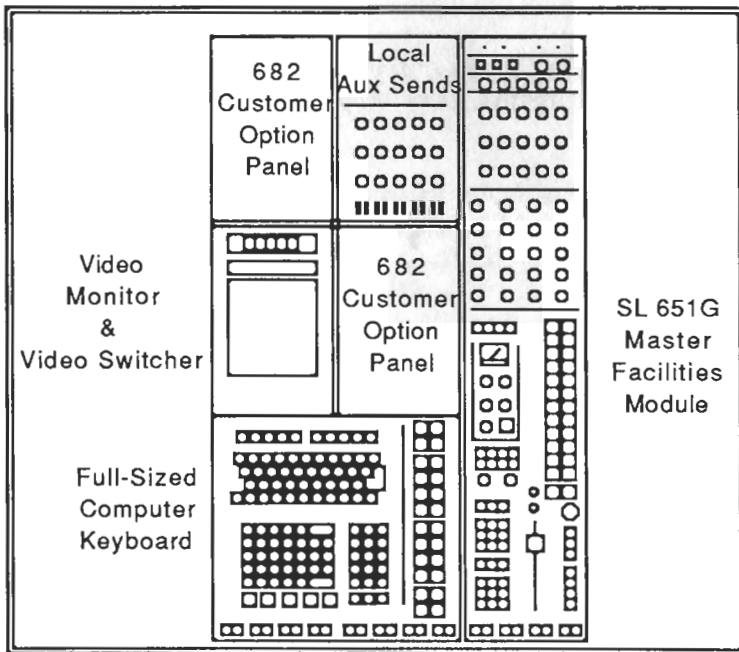
The SL 651G Master Facilities Module

While reading this section it may help to refer to the foldout drawing of the console layout, located at the back of this manual.

Power Supply Indicators
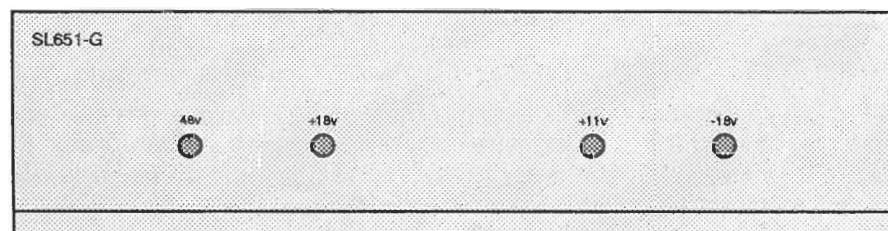
Working down from the top of the module, the first section you will meet has four leds which display the present state of power rails within the console.

The 48 volt supply provides phantom power to the mic lines and the bipolar 18 volt and the 11 volt supplies are for audio and logic circuitry respectively. The CMOS logic actually works between +18 and +11volts so that it does not interfere with the audio 0 volt rail.

All leds should be illuminated, if not then PANIC!

Oscillator Control Panel
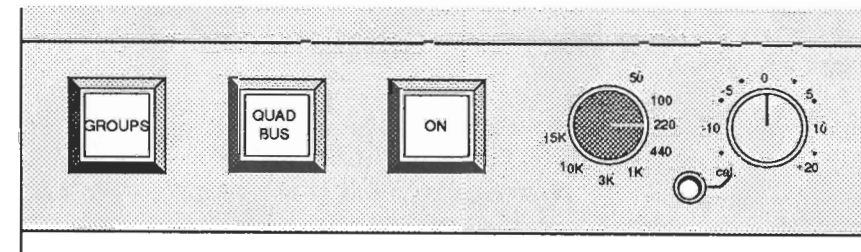
The oscillator section contains controls for frequency, level and routing of the oscillator to the main Quad Outputs and/or the multitrack Groups.

GROUPS - Routes the oscillator to all multitrack Group Outputs.

QUAD BUS - Routes the oscillator to the main Quad Outputs.

ON - Switches the oscillator on, would you believe. You should ensure that the oscillator is *off* during recording to prevent leakage onto the output groups.

The **FREQUENCY SELECT** switch provides eight preset frequencies. The **LEVEL** control adjusts the output level from -25dB to +20dB. When fully anticlockwise, a preset level is presented which can be calibrated with the small multiturn pot located to the left of the main level control.

The oscillator output is available on the patch (Jack L16) and is normalled to the tone distribution system (Jack M16). This allows an external oscillator to be fed into the tone routing switches; very useful for those odd frequencies or for pink or red noise.

Talkback Level Controls

This panel controls the level of Talkback from the built-in microphone to the studio loudspeakers and headphones, Slate level and incoming Listen Mic levels.

TB TO CANS & TB TO STUDIO - These controls set the level of talkback to the CUES (CUE Stereo, CUE 1 and CUE 2) and the SLS (Studio Loudspeakers). Note that talkback is inserted after the Cues and SLS level controls (see Page 4-10).

SLATE LEVEL - This control allows talkback to tape via the OMNI button and the LISTEN MIC TO TAPE signal to be adjusted. A low level 30Hz tone is added to the slate signal so that an ident may be easily located at high tape wind speeds.
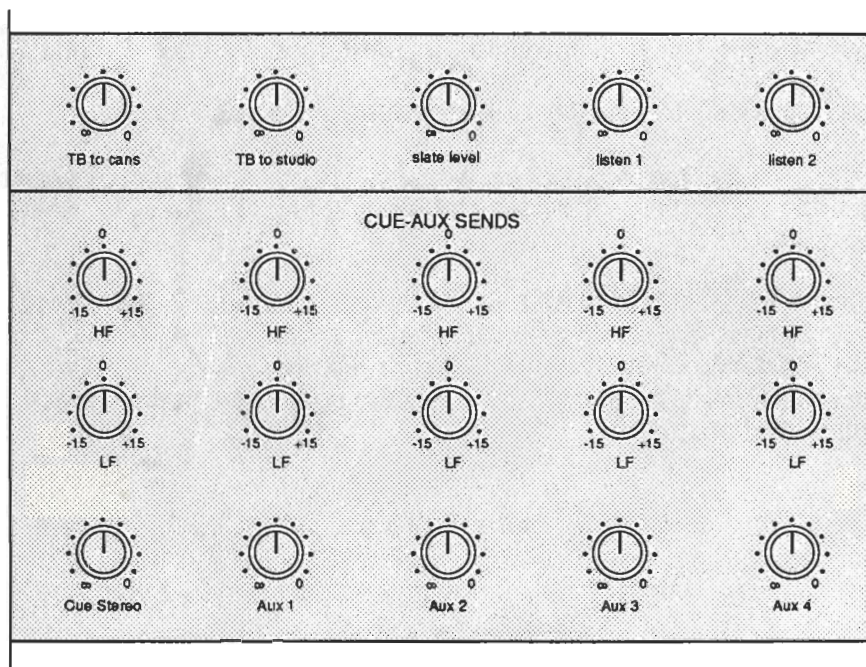
LISTEN 1 & 2 - The Listen Mic gain controls have pull-off switches built in. Two listen mics can be placed in the studio and fed to the Listen Mic inputs on the patch (Jacks R & S 38-39 on consoles with 48 channels or less, L & M 49-50 on consoles with frames larger than 48). The mic signals are mixed with the level controls and fed to a compressor. The LISTEN MIC button, found in the group of COMMUNICATIONS switches (Page 4-19), allows the resultant signal to be fed to the Mini LS whilst dimming the Main monitors.

Cue-Aux Sends

Each channel is fitted with one stereo and four mono auxiliary sends for use as foldback, echo sends or as mix minus feeds. The master controls allow final level adjustment, together with +/- 15dB of HF (10Khz) and LF (100Hz) equalisation. They are always fed from the I/O module sends to the right of the centre section. If the split buttons on the Local Aux Sends Panel are not pressed, sends to the left of the centre section will also feed through these controls.

Auxiliary sends 1 to 4 appear on the patch N1-4 where they are normalled to outgoing Jacks P1-4 to be used as feeds to effects units.

Aux 1 and 2, together with the Stereo send, are simultaneously fed back into the Master Facilities Module where talkback (via the COMMUNICATIONS section), stereo reverb (via the ECHO RETURNS) and external stereo feeds (via the EXTERNAL TO STUDIO selector) can be added.

Three Stereo Cue Outputs then emerge on the patch N9-14 for use as headphone foldback. Note that Cue Stereo is derived from the Stereo send on each channel, Cue 1L & 1R are derived from AUX 1 and CUE 2L & 2R are derived from AUX 2. See page 9-5.

Stereo Echo Returns
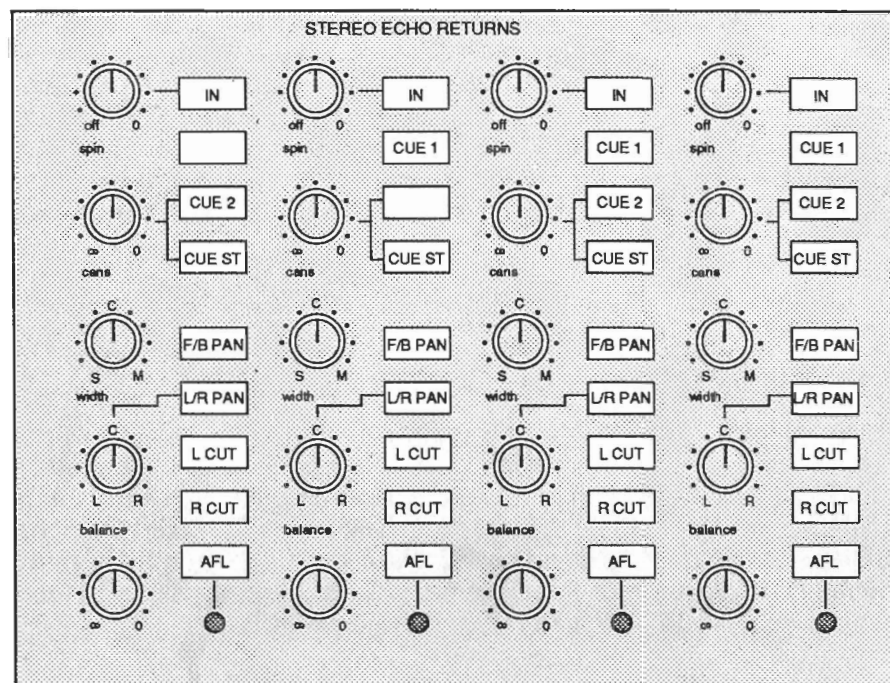
The four stereo echo returns are designed to be driven by the outputs of devices which have been fed from the corresponding mono aux busses described above.

SPIN - The spin control feeds that return back to its corresponding send when the **IN** button is latched, i.e. The spin control on STEREO RETURN 4 will feed a mono sum of the return onto the AUX 4 bus.

CANS - This level control and the buttons associated with it, allow the return to be routed to the other Cue sends for reverb on foldback.

WIDTH - Controls the stereo width of the return. Can be adjusted from full stereo to mono.

F/B PAN - When this switch is up, the **WIDTH** control acts as described above. When the button is down, the Width control will pan the return between the front and back busses.

L/R PAN - When this switch is up, the **BALANCE** control will provide a balance between the left and right return signals. When the switch is down, the inputs are summed in mono and the Balance control now acts as a pan control. Very useful when you have a mono return, such as a delay line, as it saves having to parallel the inputs on the patch.

L CUT - Cuts the left return input.

R CUT - Cuts the right return input.

AFL - Feeds the stereo return, in mono, to the AFL bus and switches the bus output to the main monitors via the AFL level control.

The controls at the bottom of this section set the levels of the returns to the Quad mix busses.

This space is left intentionally blank

Control Room Monitoring System
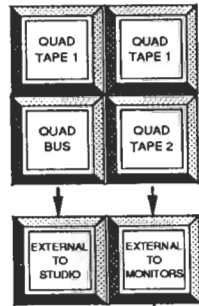
Monitor Selection and Control

The large knob marked **MONITOR** controls the level of the MAIN control room monitors. The monitors are usually fed from the console's Quad Output but alternative sources may be selected by the **EXTERNAL TO MONITORS** button. This button allows any one of the sources on the 13 way switch matrix above, to be monitored.

The group of buttons labelled **MONITOR MATRIX** act as follows:

MONO - Feeds a mono sum of the Quad bus to all monitor outputs.

STEREO - Selects only the LF and RF Quad bus signals to the monitor outputs. When STEREO and QUAD are both pressed, the Quad signal is folded down (LB to LF and RB to RF) to the front pair of monitor outputs.

QUAD - Sends the Quad bus directly to the four monitor outputs LF, RF, LB and RB.

The **MONITORS** buttons:

ALT - This button is provided to switch the MINI (or MAIN) monitor feeds to a third pair of speakers via an external relay box. This switch may, or may not, be wired in your studio.

MINI - When selected, the monitor bus is fed to the Mini LS output via the MINI LS pot.

DIM - The DIM button dims both Main and Mini speaker outputs to a level preset by the DIM LEVEL pot. The DIM circuit is automatically activated when any of the following buttons are pressed: LISTEN MIC, CUES, CUE STEREO, CUE 1, CUE 2, MD, Oscillator to QUAD BUS and GROUPS.

CUT - Cuts whichever pair of monitors have been selected. Activated automatically by the OMNI and the LISTEN MIC TO TAPE buttons.

Monitor Cuts and Trims
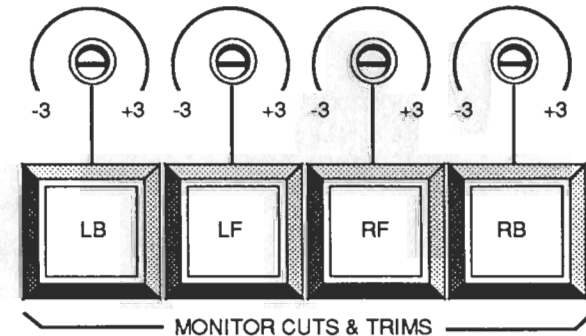
Two separate control room loudspeaker outputs are provided for the MAIN monitors and for a second pair of speakers designated MINI LS. The four Main monitor outputs can be muted individually with the Cut switches. The multiturn pots mounted above these switches allow speaker centering with +/- 3dB of gain offset.

Studio Loudspeakers and External Sources to Cue Sends

The STUDIO LOUDSPEAKER (**SLS**) output is an additional speaker feed provided for foldback or playback in the studio area.

The **EXTERNAL TO STUDIO** button provides a means of routing to the studio loudspeakers or headphones (Cue Stereo and Cue 1 & 2), any of the sources named on the 13 switches situated directly above. The **SLS** control feeds the selected source to the Studio Loudspeakers. The **CUES** control adds the selected source to the existing Cue feeds, rather than being an exclusive alternative source.

The CUES control allows, for example, a stereo tape source to be added to the headphone feed so that a musician can play along. It can also enable an announcer to be cued, over headphones, from an external source.

Note that the SLS feed is normally disallowed when the console is in the RECORD status, to prevent speaker howlround. This safety feature has been disabled by some studios.
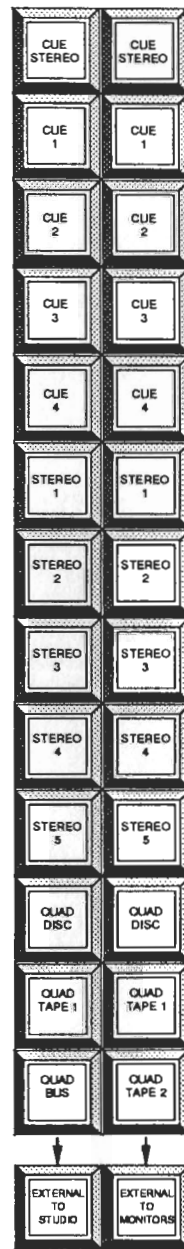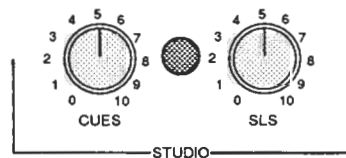
Quad Compressor

This compressor uses the same VCAs that are used by the main output fader and the Autofade circuit on the Quad bus. Hence switching the compressor **IN** introduces no additional audio circuitry to the Quad Outputs.

It is a high quality Quad compressor with straightforward controls. The gain **MAKE-UP** simply acts as a level control to compensate for the lowered level which is a consequence of compressing the signal. This control may be set so as not to change the overall programme level when the compressor is switched in. The meter reads Gain Reduction.
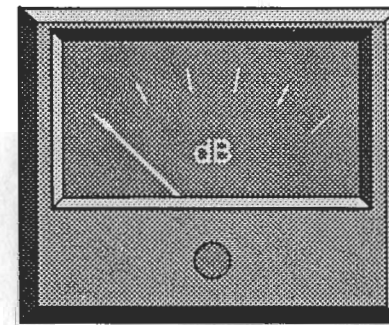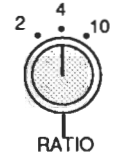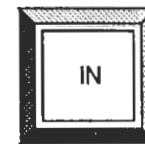
Insert points are provided before (L&M 1-4) and after (L&M 5-8) the VCAs. This can be useful for overplugging the main fader VCAs so that the Quad compressor may be used elsewhere in the console.

Note of warning: Be careful when mixing with the compressor switched in, as you may end up pushing the faders up too far if you forget that it is in circuit.

Status Buttons
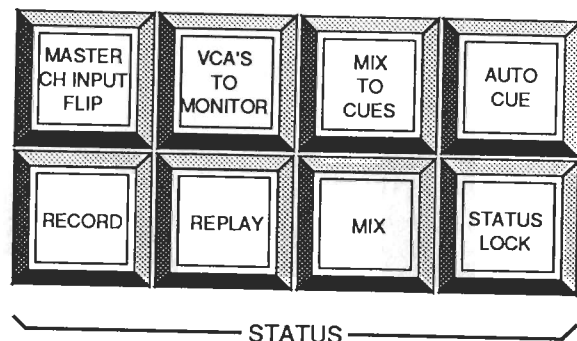
This group of buttons is extremely important as they control signal routing paths within the I/O modules. Four different status configurations can be obtained. They are described in detail in Section 7 and briefly they are:

RECORD - This status is designed for recording sources to a multitrack machine. It switches all channel inputs to Mic and the multitrack machine to Sync (if connected). The inputs are fed via the Large faders, to the multitrack Routing Matrix and thus to the multitrack. The Small Faders take the multitrack returns and/or the group sends (depending on READY GROUP and READY TAPE button selection) and feed these to the main output busses for control room and cue monitoring.

REPLAY - The same routing configuration as **RECORD** status but switches the multitrack to Replay (if connected) and all Small Fader inputs to TAPE, overriding any GROUP selections. This allows quick monitor mixes of the recorded tracks via the main outputs.

MIX - This status switches the multitrack to Replay (if connected). All channel inputs are switched to Line to pick up the multitrack returns and feed them to the Large Faders and then to the main Quad Output busses for remixing. The Small Faders take their input as before but now feed the multitrack Routing Matrix and can be used for additional

inputs to the mix. The Routing Matrix at the top of each channel allows these faders to feed the Group and Quad Output busses. The Small Faders can also be used as additional inputs, which can be subgrouped via the Routing Matrix, or as additional stereo or mono sends from each channel.

MIX + RECORD - When the MIX and RECORD buttons are pressed together, the multitrack switches to Sync for overdubbing. All channels behave as if they were in MIX status unless a module's READY TAPE or READY GROUP button is pressed, which then makes that particular channel behave as if it were in RECORD status. Useful for overdubbing tracks.

The additional buttons within this section function as follows:

MASTER CH INPUT FLIP - Flips all channel inputs between Mic and Line.

VCAs TO MONITOR - In RECORD or REPLAY status, this flips the Small and Large Faders so that the Small Faders feed sources to the multitrack Routing Matrix and the Large Faders are used for the monitor mix to the Quad busses.

QUAD TO CUES - Provides an easy way of sending the Quad bus to the Cue sends via the CUES rotary level control. This selection replaces whatever was on the Cue send busses with the LF and RF Quad bus mix, unlike the EXTERNAL TO STUDIO button which is additive. This may be useful at the beginning of a session to provide a quick workable mix to headphones, while spending some time sorting out the finer points of the Cue mix in the control room.

AUTOCUE - This activates an autocueing system which is very useful in an overdubbing situation. Talkback and optionally the Listen Mic switches, which are normally non-latching, can be latched on for constant two way communication and are automatically switched off when the multitrack machine is in PLAY or RECORD.

STATUS LOCK - For use in broadcast or live applications when changing statuses would cause havoc! It disables the following functions:

- STATUS BUTTONS -
    RECORD
    MIX
    REPLAY
    VCAs TO MONITOR
- MASTER CH INPUT FLIP
- OSCILLATOR ON
- OMNI TALKBACK
- LISTEN MIC TO TAPE
- AUTOCUE
- SOLO IN PLACE
- SLS OUTPUT

- AFL is selected and the RED LIGHT is switched on.
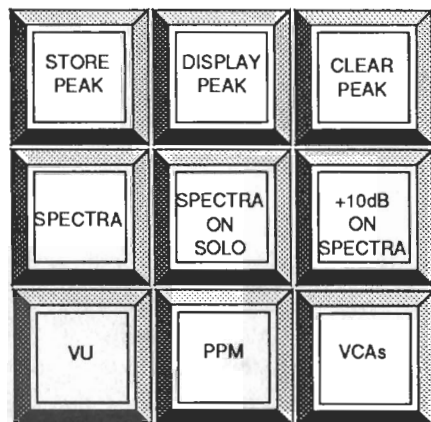

— STATUS —
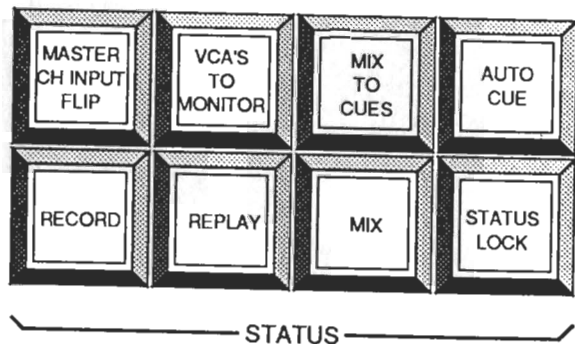
VCA Trim, Auto Fade and AFL
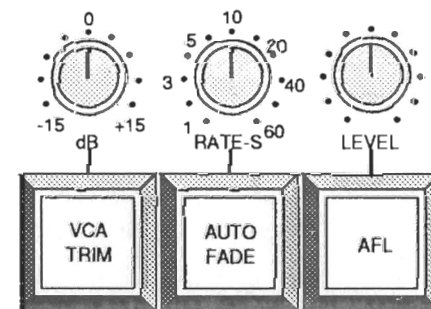
VCA TRIM - The button switches in the VCA TRIM control above. This raises or lowers the level (by +/- 15dB) of all VCA faders (except the main Quad VCAs) which have been selected to Group 0 on their thumbwheel switch. Position I (Independent) disables the trim effect on the fader if it has not been selected to a VCA Group.

AUTO FADE - is an automatic fade in/out facility operating on the main Quad VCAs. It will fade up, or down, the main fader output over a period of time selected on the control above. This can vary from 1 to 60 seconds and is recorded by the computer automation system if this is active. When the button is pressed, the fade down will start. After fading out, the master fader will fade up at the same rate, as soon as the button is released. If this button is left on by mistake the main fader will stay down - a common cause of frustration as the engineer tries to figure out where the main output has gone!

AFL - When AFL is selected, the normal SOLO mode is overridden and pressing a SOLO button will now send an After Fader Listen signal from the selected Channel or Monitor to the separate AFL bus and on to the main monitors. This allows non-destructive monitoring of the selected signal. The AFL signal is mono.

Plasma Bargraph Controls

These buttons are only found on consoles fitted with Plasma meters. If Plasma meters are *not* fitted then only the VCAs button is used, the other eight buttons are then free for use by the studio for custom functions.

[Diagram of nine buttons arranged in a 3×3 grid: STORE PEAK, DISPLAY PEAK, CLEAR PEAK / SPECTRA, SPECTRA ON SOLO, +10dB ON SPECTRA / VU, PPM, VCAs]

A peak storage facility is built into the Plasma meter system. Each meter has two displays; one side is used for the PPM or VU level reading and the other for the stored peak level reading, when this facility is used.

STORE PEAK - The peak level reaching each meter is stored whenever this button is pressed.

DISPLAY PEAK - When selected, the peak levels stored by the STORE PEAK button are displayed next to the Group/ Tape level reading. This peak reading is updated as long as the STORE PEAK button is latched.

CLEAR PEAK - Clears the stored peak readings and hence DISPLAY PEAK if this has also been selected.

The Plasma meter system also provides a third octave, 15 band, stereo, spectrum analysis of whatever signal is being metered by the main output meters. Note that on consoles with a frame size of less than 32 modules, a mono spectrum is displayed.

SPECTRA - Selects the spectrum display.

SPECTRA ON SOLO - A very useful feature which allows the meters to show Group/Tape levels until a SOLO button is pressed. When this happens, the spectrum display is automatically switched on to allow the spectral content of the soloed channel(s) to be monitored. e.g. The vocalist sounds very middley so you solo the channel and equalise out the peak, while referring to the display. Awesome!

+10dB ON SPECTRA - Used to increase the gain of the spectrum display. This is often required when using the SPECTRA ON SOLO facility, to allow sufficient level from a single module to drive the display.

PPM - Selects Peak Programme Meter scale and ballistics.

VU - Selects VU scale and ballistics.

VCAs - Selects the meters to display the levels of the channel VCAs. This can be very useful during an automated mix as the meters can supplement the computer bargraph display. This also applies to mechanical VU or PPM meters if fitted.

Meters

Three buttons assign signals to the the main Quad meters.

DESK OUTPUT - Selects the Quad Output to the main meters.

FOLLOW MONITOR - Whatever signal has been selected to the monitor loudspeakers will be displayed on the main meters.

EXTERNAL SOURCE - The main meters will display the level of whichever external source (from the 13 buttons above the EXTERNAL TO MONITORS button) is selected, irrespective of whether it is being monitored or not. e.g. the console main output can be monitored while the meters are used to check the returns from the stereo tape machine which is recording the output. This facility can also be used to meter the Cue sends if the main meters are not required to meter the Quad Output.

DESK OUPUT	FOLLOW MONITOR	EXTERNAL SOURCE

METERS

LISTEN MIC TO TAPE	LISTEN MIC	RED LIGHT
OMNI	CUES	M.D.
CUE STEREO	CUE 1	CUE 2
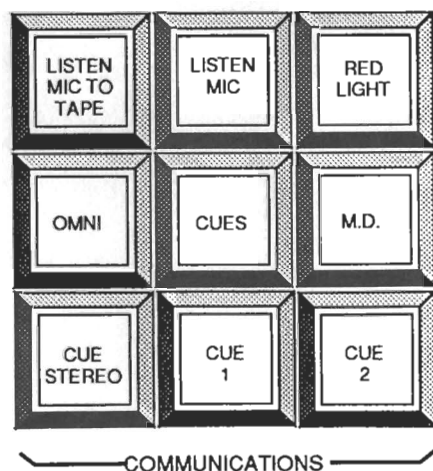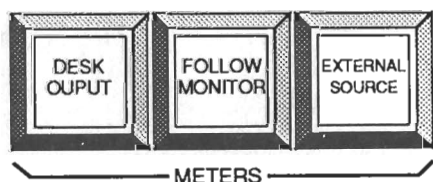
COMMUNICATIONS

Communications

The group of COMMUNICATIONS switches control the switching and routing of the Talkback and Listen systems, as well as controlling the operation of a Red Light.

LISTEN MIC - Feeds the Listen Mics to the Mini LS, dimming the Main LS.

LISTEN MIC TO TAPE - Feeds the Listen Mics to multitrack and main output groups. Cuts the Main monitors. Useful for capturing count-ins from the studio.

RED LIGHT - Provides isolated contact closure for hooking up to a studio red light or transmission light via an external relay box. When the AUTOCUE button is on, the red light can be activated automatically when the multitrack goes into Record. (Internal links can be set to select this option from machine PLAY or RECORD)

M.D. - Provides switched talkback which appears on the patchbay at N41, for use as an additional talkback send to the Musical Director, the studio floor or the machine room.

OMNI - Cuts all loudspeakers and feeds the talkback mic to multitrack, Quad bus, Cue sends and Studio LS. A low level 30Hz tone is mixed in with the signal to tape so that the slate may be easily located at high wind speeds.

CUES - Feeds the talkback mic to Stereo Cue, Cue 1L & 1R and Cue 2L & 2R.

CUE STEREO, CUE 1 and **CUE 2** buttons send talkback to those respective outputs.

TALKBACK MICROPHONE - This is fitted flush into the control surface between the CUES and SLS level controls.

Stereo Patchable VCAs

These four stereo VCAs (not fitted to E Series consoles) are controlled by the faders located below the SL 651G. Fader and mute automation is provided so that they can be used to automate the Stereo Echo Returns, Aux Sends, Small Fader inputs etc., simply by patching the signal through the VCA. By patching across the LB and RB main VCA inserts, the front two main outputs of the console can be controlled by the main fader and the rear outputs by one of the patchable VCAs. This is especially useful if the rear outputs are being used as a mix-minus feed. Patchable VCAs can be picked up on N and P 41-48 on the patch.

AFL - When pressed, switches the console into After Fader Listen mode and feeds a stereo post-fader (VCA) signal to the main monitors.

CUT - Will mute the VCA. This is automated together with the fader level.
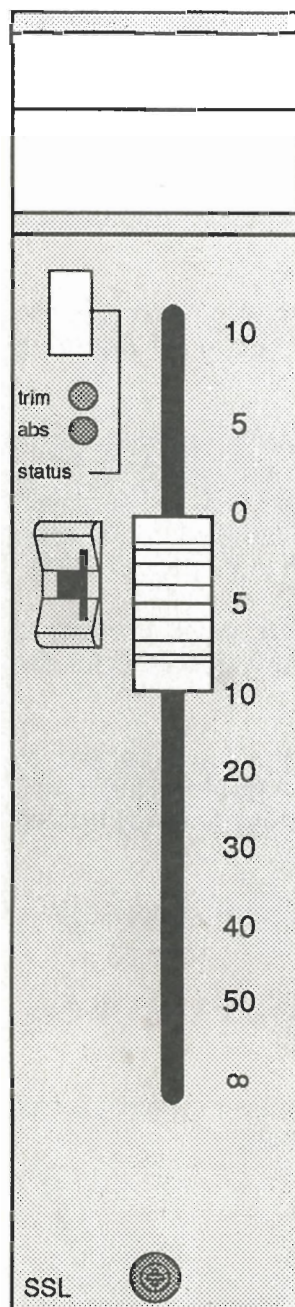
The Keyboard

This is a full sized Qwerty keyboard with numeric keypad and function keys. For details see the G Series Computer Operator's Manual. Twenty-two customer option switches are also provided on the right of the keyboard. These buttons are usually wired with standard SSL options.

The Option Switches

VCA TO MONITOR INHIBIT 25-56 - Prevents the faders of Modules 25-56 from reversing position when RECORD (or REPLAY) + VCAs TO MONITOR status is selected. This is useful when tracking, with the Large Faders on Modules 1-24 acting as Monitor faders to the Quad bus and the Large Faders from 25-56 acting as Channel faders to the multitrack Routing Matrix. Further switches may be provided to select this facility in groups of eight modules i.e. 25-32, 33-40 etc.

MASTER READY GROUP - Selects all modules to READY GROUP. This allows the engineer to quickly set the desk so that the Monitor faders and meters are fed from the module's Group Output. It also provides a quick way to check the desk outputs when aligning the multitrack.

CUT 0 - Cuts all VCA Faders which are selected to VCA Group 0.

SOLO 0 - Cuts all VCA Faders *not* selected to VCA Group 0.

SOLO LINK - Links the Small and Large Fader Solo Cut busses.

CHANNEL IN TO METERS - The meters are normally fed from the Monitor input. This buttons switches the Channel Input to the meters to allow the engineer to read Mic or Line input levels. This mode is extremely useful when mixing, as the metering will follow any cross patching to the Channel Line Inputs.
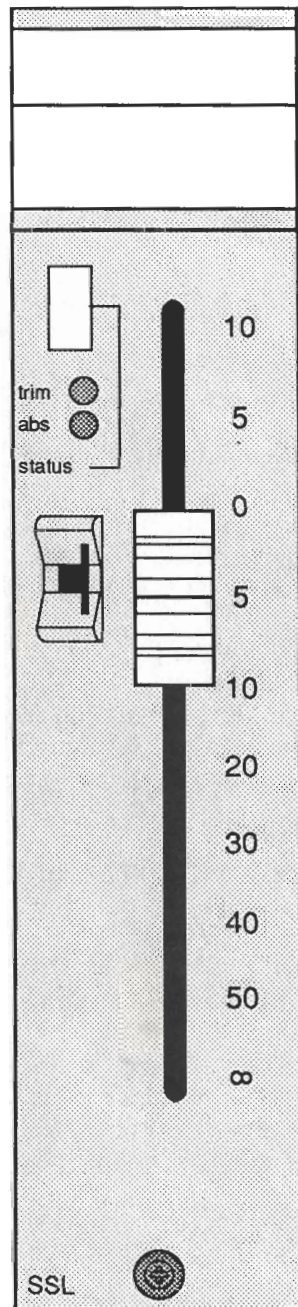
VCA Group Faders

Eight VCA Group Faders are located below the keyboard and details about them can be found in Section 2. Basically, these faders will control any other fader that has its thumbwheel selected to a VCA Group number 1-8. Any VCA Group may be assigned to another Group. For example, all Drum channels may be grouped to VCA 1, Basses to VCA 2, Keyboards to VCA 3 and Guitars to VCA 4. These four groups may then all be assigned to VCA Group fader 5, which will now act as an overall backing level control.

CUT - Will mute all faders assigned to that VCA Group.

SOLO - The VCA Group Solo works slightly differently to the Solo function on an I/O module, in that it cuts all VCA Groups which are not soloed. The cuts thus generated *are* stored by the computer during an automated mix (Note that an I/O or Stereo module SOLO will cut all other channels not soloed but these cuts are *not* recorded by the computer). This is extremely useful as it is possible to 'play' the VCA Group Solo buttons during a mix and store the results. For example, if VCA Groups 1 and 2 (as above) are soloed during an automated mix, the computer will store the cutting of all the other VCAs. This will have the effect of reducing the backing to Bass and Drums only.

Local Aux Sends Panel
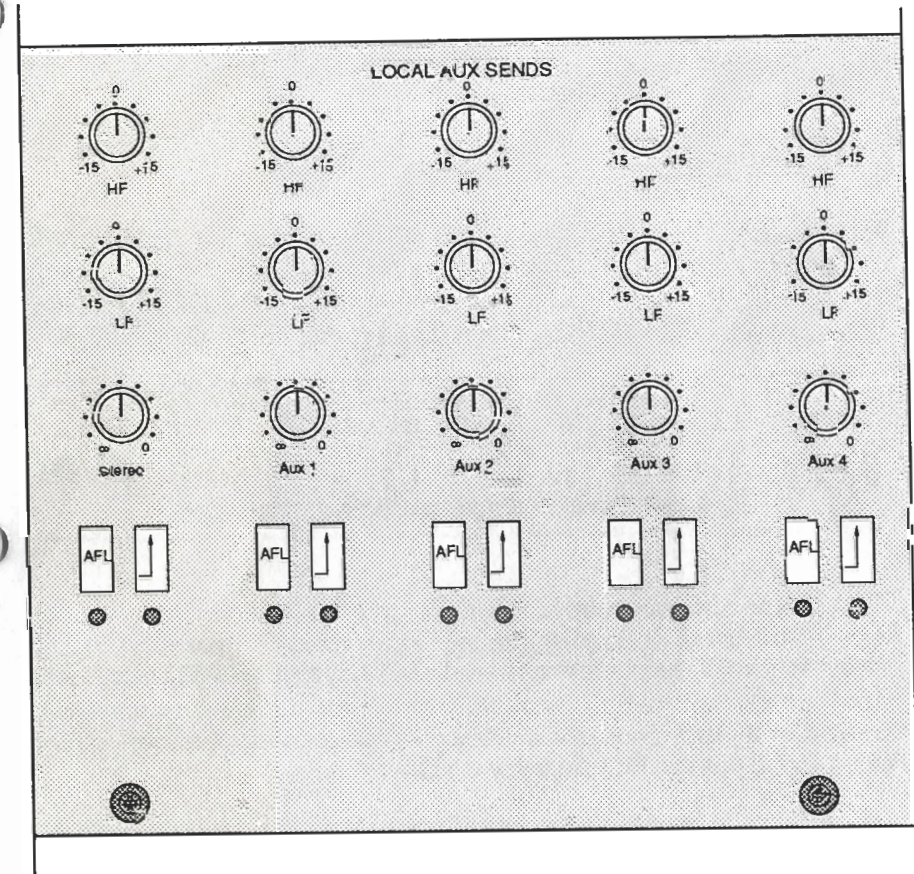
This panel is unique to G Series consoles. Sends from the left hand side of the console always feed through these controls to the six outputs on the patch (R 1-6) and may be normalled to effects devices (S 1-6). If the Split buttons are pressed then the left hand sends will only appear on these jacks. If the Split buttons are *not* pressed then the left hand sends will also feed through the main send controls found on the SL 651G. See Section 9 for further details. The sends are provided with HF and LF cut and boost together with overall level control.

In-board Video Monitor

This is a specially screened video monitor, fed from the G Series
Studio Computer. Four multiturn controls will adjust:

B - Brightness
C - Contrast
V - Vertical Hold
H - Horizontal Hold

The five switches located above the monitor are for use with the SSL
Video Switcher which may or may not be fitted. (SSL usually
recommends that the video switcher be supplied if Total Recall™ is
fitted, as it provides isolated video feeds to the external monitor).
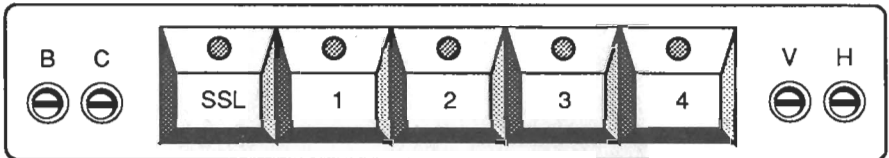
SSL - Toggles between the G Series Computer primary display and the
RGB Total Recall™ display, during Total Recall™ operation. It also
selects RGB (if the remote connections supplied by SSL have been
wired) on the main video monitor. When Total Recall™ is not in use,
the Red and Blue guns are switched off to provide a Green screen
version of the computer primary display.

1, 2, 3, 4 - These buttons remotely select one of four composite video
sources to the main monitor. Usually these inputs are wired to a VTR
output and CCTV cameras but any video source may be connected.

Blank 682 Panels

Two panels are available for customer options. It is usual for SSL to
provide audio tape machine remotes in one of the panels but this will
vary from console to console.

The Meter Bridge

There are three different meter types available for use in the console:

VU - Standard VU meters with built-in high stability drive amplifiers for accurate readings that do not drift.

PPM - Black mechanical PPM meters which give a true peak reading. These are to BBC Standard.

PLASMA BARGRAPHS - Described in detail in the SL 651G section covering the meter select buttons (Page 4-18). This meter option provides a peak store, spectral display and switchable VU-PPM ballistics.

All the meters incorporate various led indicators:

Input/Output Module Meters

TAPE - Indicates that the meter is reading the TAPE Monitor signal.

GROUP - Indicates that the meter is reading the GROUP Monitor signal.

RECORD - When the track RECORD button is primed, a red indication lights (which can be driven from the multitrack tallies).

VCA - When the VCA's master meter button is selected, the meter reads the channel VCA dc control voltage, giving an indication of the VCA level. The VCA indicator on the meter will illuminate to show this selection.

G Series consoles (and some modified E Series consoles) have a facility called "CHANNEL IN TO METERS". When this button (located in the centre section) is selected, the module meters read the channel signal, after the Mic/Line selection, and *not* the Tape or Group Monitor input.

Stereo Module Meters

L - Meter reads the Left channel signal.

> < - Meter reads the the greater of the Left and Right signals.

R - Meter reads the Right channel signal.

VCA - Meter is reading the channel fader VCA level.

Centre Section Meters

A total of eight meter housings are fitted above the centre section of the console.
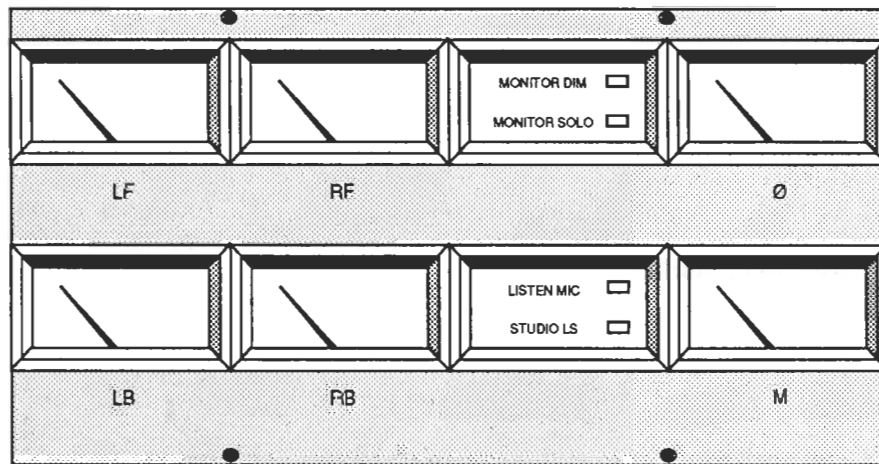
If mechanical VU or PPM meters are fitted, they will be designated as follows:

LEFT FRONT
RIGHT FRONT
LEFT BACK
RIGHT BACK
MONO
PHASE

Two additional housings are fitted with indicators to show Monitor **DIM, SOLO, LISTEN MIC** and **SLS** selection.

If PLASMA meters are fitted, then a combination of these and mechanical meters is used:

The following four meters will be Plasma which have in-built indication of **DIM, SOLO, LISTEN MIC** and **SLS**:

LEFT FRONT
RIGHT FRONT
LEFT BACK
RIGHT BACK
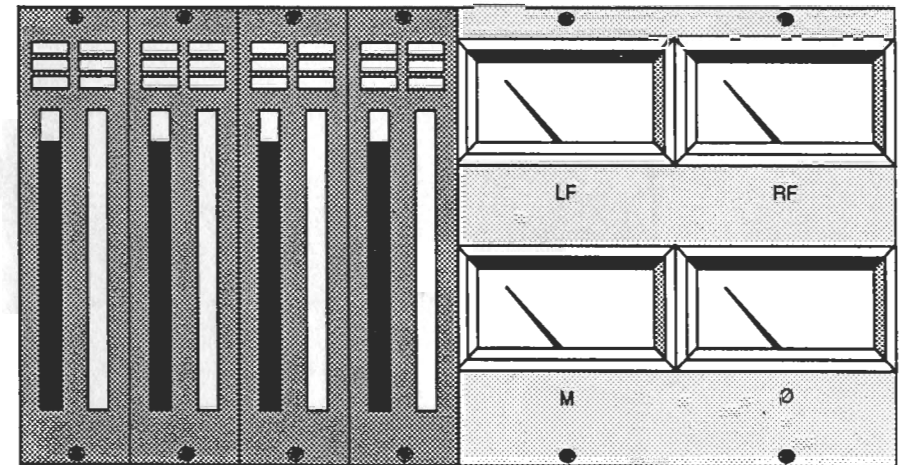
The following four meters will be VU (or optionally PPM):

LEFT FRONT
RIGHT FRONT
MONO
PHASE

Auxiliary Meters

If these eight meters are fitted they are usually mounted above the patch. They display:

SLS Left and Right
STEREO CUE Left and Right
CUE/AUX 1, 2, 3 and 4
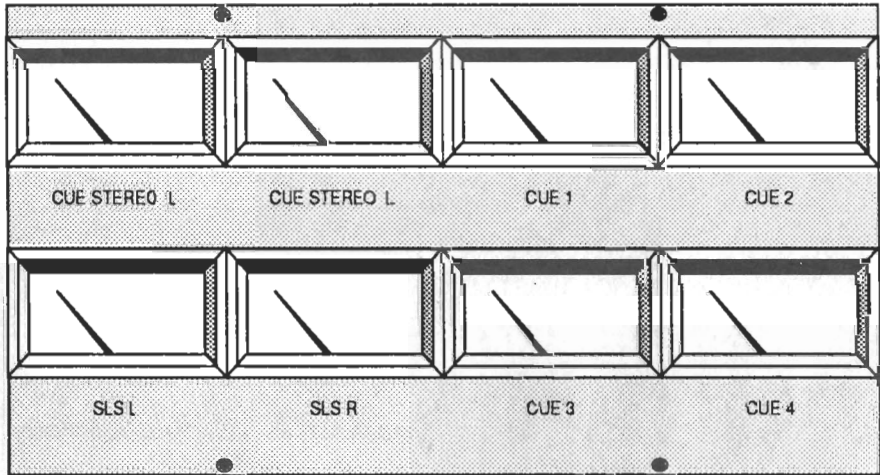
The Patch

The SL 4000 G Series patchbay comes with a minimum of nine rows of bantam (TT) mini-jacks divided into 1U (rack unit) high patchrows each with two rows of jacks.

Each row contains 48 jacks, although consoles with mainframe sizes greater than 48 channels come supplied with 56 jacks per row. The patch is logically divided into paired rows, the upper jack being an output feed and the lower jack being an input. There are two types of normalling used within the patch:

HALF-NORMALLED - The top row is an output listen (bridging) jack. If a jack is inserted into the top row it receives the feed on that socket but does not break the normalling to the row below. The outers are wired down to the inners (blades) of the row below. The bottom row is an input jack and when a patchcord is inserted, it breaks away the normalled feed from the row above.

FULLY NORMALLED - The top row inners are wired to the bottom row inners. A jack plugged into either the top or bottom row will break the normalling.

Only the first two rows of jacks (the Mic Lines and Channel Mic Inputs) are fully normalled to prevent a microphone from being connected to two Channel Inputs. Most of the other rows are half normalled, apart from the User Option jacks in Rows R, S, T & V (unless normalling was requested by the studio). Any additional rows fitted may or may not be normalled and this should be checked with the studio.

ROWS A to K are fairly obvious with these exceptions and notes:

The Multitrack Returns (ie. multitrack outputs) split on entering the console and feed identical signals to both Rows C and J.

Signal is always present at the Channel Insert Send jacks. It is the return signal path that is switched by the insert **IN** switch. This is useful for setting input levels on effects devices before switching them in, and also useful for picking up additional feeds from each module.

The patchbay rows (A–U):

- A — MIC LINES
- B — CHANNEL MIC INPUTS
- C — MULTITRACK RETURNS
- D — CHANNEL LINE INPUTS
- E — CHANNEL INSERT SENDS
- F — CHANNEL INSERT RETURNS
- G — GROUP OUTPUTS
- H — MULTITRACK SENDS & GROUP MONITOR INPUTS
- J — MULTITRACK RETURNS
- K — TAPE MONITOR INPUTS
- L — PRE VCA INS, POST VCA INS, MAIN OUTPUTS + DIST OSC, ... ECHO RETURNS
- M — ... QUAD 1 REC, QUAD 2 REC, ST1 REC, ST2 REC, ST3 REC, ST4 REC, ST5 REC, MONITOR LS MINI LS 1L 1R 2L 2R 3L 3R 4L 4R
- N — ECHO SENDS, CUE INSERTS, CUE SENDS, QUAD 1 REP, QUAD 2 REP, ST1 REP, ST2 REP, ST3 REP, ST4 REP, ST5 REP, QUAD DISC, SLS, PATCHABLE VCAs
- P — ...
- R — LOCAL AUX SENDS ... LISTEN MICS, SMPTE FROM MACHINES, SMPTE TO MACHINES
- S — USER OPTION (INCLUDED)
- T — USER OPTION (INCLUDED)
- U — USER OPTION (INCLUDED)

Group Outputs on Row G are after the GROUP TRIM control. These are normalled down to Row H. Row H feeds the Multitrack Sends (i.e. the multitrack inputs) and also the READY GROUP monitoring button. The READY GROUP button on a module will always monitor a Multitrack Send even if the Groups have been cross patched.

ROWS L to S - Some jacks are cross normalled and these are detailed below together with certain inputs and outputs, the wiring of which may not be immediately obvious:

PRE VCA INS (L1-4, M1-4) - Four insert points after the Quad bus mix amps and before the main Quad VCA fader.

POST VCA INS - (L5-8, M5-8) - Four insert points after the main Quad VCA fader. By patching from L1 to M5 the Left Back VCA can be bypassed. The same applies to the other three feeds. This can free the main Quad fader VCAs (and hence the Quad compressor and Autofade) for use elsewhere in the console. If this is done, you will not be able to fade down the main outputs, but when tracking or overdubbing, this may not be a problem. You can always patch one of the four stereo patchable VCA faders in place of the main Quad VCAs in this case, if you do need automation or level control. M1-M4 provide the Quad compressor inputs and L5-8 the outputs. These insert points may also be used to insert other compressor/limiters or EQs into the main Quad Outputs.

MAIN OUTPUTS + DISTribution (L9-L15, M9-M15) - These are the main Quad and Stereo Outputs from the console. L9-12 carry the main Quad Outputs which are normalled down to the main Quad distribution Jacks M9-12. These four jacks then feed the tape machine Record feed Jacks L17-L34. The Quad machine feeds (L17-20 & L21-24) are all discrete Quad derived from LB, LF, RF, RB (Jacks M9-12). The LEFT, RIGHT and MONO output jacks (L13-15) provide folded down versions of the main Quad Outputs i.e. L=LF+LB, R=RF+RB and M=LF+LB+RF+RB. The stereo machine feeds (L25-L34) come from the LF and RF Jacks M10 & M11.

The four Distribution jacks (M9-12) are very useful for tape copying. Plugging a signal into these jacks will feed the inputs of all the tape machines connected to Jacks M17-34.

Patch bay rows (with section labels):
- Row A: MIC LINES
- Row B: CHANNEL MIC INPUTS
- Row C: MULTITRACK RETURNS
- Row D: CHANNEL LINE INPUTS
- Row E: CHANNEL INSERT SENDS
- Row F: CHANNEL INSERT RETURNS
- Row G: GROUP OUTPUTS
- Row H: MULTITRACK SENDS & GROUP MONITOR INPUTS
- Row J: MULTITRACK RETURNS
- Row K: TAPE MONITOR INPUTS
- Row L: PRE VCA INS | POST VCA INS | MAIN OUTPUTS + DIST | OSC | LB LF RF RB LB LF RF RB LB LF RF LF RF LF RF LF RF LB LF RF RB L R | ECHO RETURNS
- Row M: LB LF RF RB LB LF RF RB LB LF RF RB L R M | QUAD 1 REC QUAD 2 REC ST1 REC ST2 REC ST3 REC ST4 REC ST5 REC | MONITOR LS MINI LS 1L 1R 2L 2R 3L 3R 4L 4R
- Row N: ECHO SENDS | CUE INSERTS | CUE SENDS | QUAD 1 REP QUAD 2 REP ST1 REP ST2 REP ST3 REP ST4 REP ST5 REP QUAD DISC SLS | PATCHABLE VCAs
- Row P: 1 2 3 4 L R 1 2 L R 1L 1R 2L 2R 0 0 LB LF RF RB LB LF RF RB L R L R L R L R L R LB LF RF RB L R 1L 1R 2L 2R 3L 3R 4L 4R
- Row R: LOCAL AUX SENDS | LISTEN MICS MD / SMPTE FROM MACHINES / SMPTE TO MACHINES
- Row S: 1 2 3 4 L R | USER OPTION (INCLUDED) | A B C READING A B C
- Row T
- Row U: USER OPTION (INCLUDED)

TAPE MACHINES (L,M,N,P 17-34) - four jacks for each machine track. Top jack (Row L) is the console main output and is normalled to the machine Record input (Row M). The machine Replay output comes up on Row N and is normalled down to the External Selector input (Row P). The inputs on Row P are very useful if you need to meter a signal. For example, patching into Jack P33 and selecting STEREO 5 on the External Selector, with the main meters selected to EXTERNAL SOURCE, will bring the source up on the LF Quad meter.

OSC (L16 & M16) - Yes - the oscillator! The lower jack (M 16) feeds to the tone distribution system via the QUAD BUS and GROUPS buttons and is useful for feeding an external oscillator or pink noise source to the desk outputs.

MONITOR LS (L35-38 & M35-38) - L35-38 carry the Main monitor outputs which are normalled to M35-38 feeding into the Main monitor amps. **WARNING** - These jacks feed directly to power amps. Patching a standard line level signal into them will run the monitors flat out, probably causing damage to the speakers and your ears.

MINI LS (L39-40 & M39-40) - The feeds to a second pair of monitors. Again remember that plugging line level sources into Jacks M39-40 may blow the speakers.

ECHO RETURNS (L41-48 & M41-48) - L41-48 may be wired to the outputs of reverb or effects devices. They are normalled to the Stereo Echo Return inputs (found on the SL 651G).

LISTEN MICS (On consoles less than 56 channels wide - R38-39 and S38-39. On consoles 56 wide or larger - L49-50 & M49-50) - The top two jacks should be wired to two mics hanging in the studio area. The lower jacks are normalled from the mics and feed into the console Listen Mic inputs. Level controls and on/off switches for these mics can be found on the SL 651G.

MD (On consoles less than 56 channels wide - R40 & S40. On consoles 56 or larger - L51 & M51) - The Musical Director feed. The top jack carries a switched talkback feed from the mic in the console, activated by the **MD** button on the SL 651G. The bottom jack feeds this signal to a destination known only to the studio wiring staff.

Patch bay rows:
- A — MIC LINES
- B — CHANNEL MIC INPUTS
- C — MULTITRACK RETURNS
- D — CHANNEL LINE INPUTS
- E — CHANNEL INSERT SENDS
- F — CHANNEL INSERT RETURNS
- G — GROUP OUTPUTS
- H — MULTITRACK SENDS & GROUP MONITOR INPUTS
- J — MULTITRACK RETURNS
- K — TAPE MONITOR INPUTS
- L — PRE VCA INS POST VCA INS MAIN OUTPUTS + DIST OSC LB LF RF RB LB LF RF RB LF RF LF RF LF RF LF RF LB LF RF RB L R ECHO RETURNS
- M — LB LF RF RB LB LF RF RB LB LF RF RB L R M QUAD 1 REC QUAD 2 REC ST1 REC ST2 REC ST3 REC ST4 REC ST5 REC MONITOR LS MINI LS 1L 1R 2L 2R 3L 3R 4L 4R
- N — ECHO SENDS CUE INSERTS CUE SENDS QUAD 1 REP QUAD 2 REP ST1 REP ST2 REP ST3 REP ST4 REP ST5 REP QUAD DISC SLS PATCHABLE VCAs
- P — 1 2 3 4 L R 1 2 L R 1L 1R 2L 2R 0 0 LB LF RF RB LB LF RF RB L R L R L R L R L R LB LF RF RB L R 1L 1R 2L 2R 3L 3R 4L 4R
- R — LOCAL AUX SENDS LISTEN MICS NO MACHINES / SMPTE FROM MACHINES / SMPTE TO MACHINES
- S — 1 2 3 4 L R USER OPTION (INCLUDED) 1 2 A B C READING A B C
- T — (numbered jacks)
- U — USER OPTION (INCLUDED)

ECHO SENDS (N1-4 & P1-4) - These carry the Aux 1 to 4 outputs which are normalled to the effect send lines out of the console (P1-4). They are always fed from the sends on the right hand side of the console. If the Split buttons on the Local Aux Sends panel are up then the left hand aux feeds will also appear at these jacks. Jacks N1 and N2 are also wired to Jacks N7 and N8 which, together with the Stereo send outputs on N5 and N6 are normalled back into the console (via Jacks P5-8) for the addition of talkback, stereo echo and stereo external sources. These Cue outputs then emerge on Jacks N9-14 as three stereo Cue Sends.

ST1 to **ST5 REP** (N25-34,P25-34) - Up to five stereo machine returns may be wired to these jacks. The inputs to the corresponding External Selectors can be found on Jacks P25-34.

QUAD DISC (N35-38,P35-38) - A disc (or any Quad/Stereo replay device) may be wired to the External Selector via these jacks.

SLS (N39-40,P39-40) - The SLS outputs are normalled to the power amp feed. Watch it!

PATCHABLE VCAs (N41-48 & P41-48) - Four stereo patchable VCAs controlled by the four faders below the SL 651G. Patch into the VCA on the top row and come out on the row below.

SMPTE (R41-48,S41-48, or on 56+ frames N49-56,P49-56) - These sixteen jacks are designed to be used with the SSL Master Transport Selector. They provide comprehensive patching of timecode sends and returns for up to three machines. Timecode from the three machines, A, B and C comes in on Jacks R41-43 (or N49-51) and is normalled to the inputs of the Master Transport Selector. The selected timecode (from the master machine) returns to the patch on Jack R44 (or N52) and is then normalled to the SSL Studio Computer timecode input S44 (or P52).

The Studio Computer timecode generator output (which reshapes any code fed into S44 (or P52) appears on Jack R45 (or N53) and is normalled to the three distribution Jacks R46-48 (or N54-56) via the insert Jack S45 (or P53). These three feeds of generated timecode are then normalled to the A, B and C machine timecode record inputs via Jacks S46-48 (or P54-56).

LOCAL AUX SENDS (R1-6 & S1-6) - The top jacks are fed from the six Aux send busses on the left hand side of the console. They are normalled to the jacks below and may be wired to external effects devices.

I/O Module Patch Wiring on Consoles with more than 56 Channels

A number of SSL consoles are now manufactured with 64 and 72 I/O modules. At the time of writing there are no 80 channel monsters around but this may change! On these consoles, modules above 56 are wired on rows R, S, T, U, V, W, X, Y, Z and AA, as each I/O module takes up ten patch points. In this case, the Local Aux patch points will be moved to accomodate the additional module patch points. Consoles this large must have twelve double rows of jacks to accomodate all the necessary inputs and outputs.

Stereo Modules

If the patch has been wired to accept Stereo Modules then it will be slightly different from the drawing. The usual practice is to wire all the I/O modules to Rows A to K as shown. Stereo Modules may be wired to Rows R, S, T & U as follows:

If, for example, four stereo modules have been specified then stereo lines from the studio or control room will appear on Jacks R7-14. These will be normalled to S7-14. Stereo Insert Sends and Returns will appear on Jacks T7-14 and U7-14. An alternative would be for the lines and Line Inputs to be wired to R&S7-14 and the inserts to R&S15-22. The positions of patch points for Stereo Modules and I/O modules, when there are more than 56 channels, will vary from console to console.

The majority of consoles are supplied with integral patchbays, however, as an option, versions with remote patchfields are available. The layout and normalling will be the same.
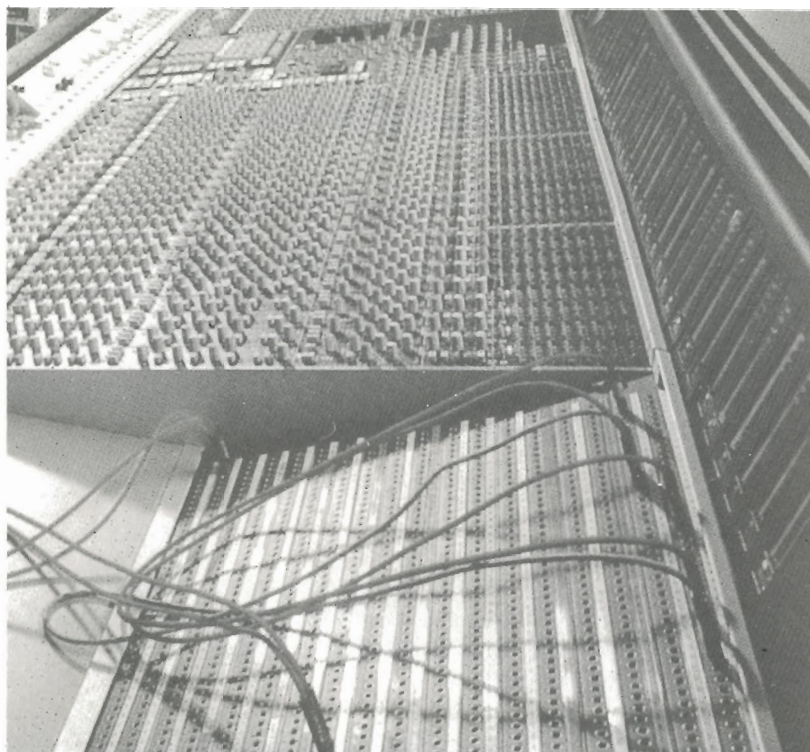
Basic Routing and Signal Flow

In order to understand signal flow through the console, it is probably best to start with the status buttons located on the SL 651G. These buttons determine the basic signal paths of the 611G I/O module so they are very important. Exact details of each control can be found in Sections 2 and 4. The SL 611S stereo modules are unaffected by the console status; their routing is much simpler and is covered in Section 3. This section therefore deals only with I/O modules and the SL 651G.

MASTER CH INPUT FLIP	VCA's TO MONITOR	QUAD TO CUES	AUTO CUE
RECORD	REPLAY	MIX	STATUS LOCK
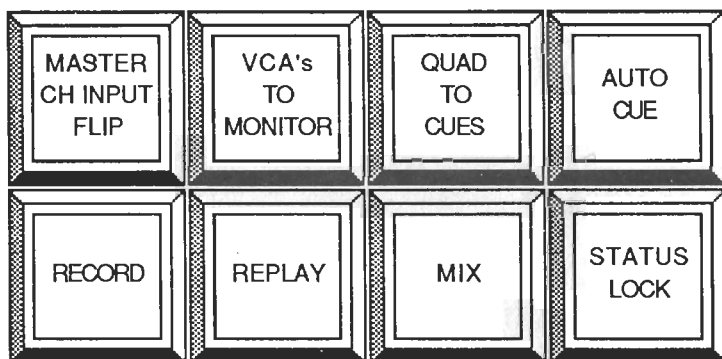
When first setting up the console, you should always check these buttons and select them correctly for the particular mode you wish to work in.

There are four basic desk statuses: RECORD, REPLAY, MIX and RECORD+MIX (overdub). The VCAs TO MONITOR and MASTER CHANNEL INPUT FLIP buttons also affect I/O module signal flow.

Each I/O module has two completely independent audio signal paths, the 'Channel' path and the 'Monitor' path (typical of an *In-Line* console). This gives the system flexibility, but may cause some confusion if you don't understand which parts of each module are dealing with each of these signals.

The Six Key Points in the SL611G

There are six key points in each I/O module which define the two separate audio paths: two inputs to the module, two faders and two outputs from the module. The status buttons determine how these elements are connected together to provide the different configurations required for tackling various tasks from track laying through to final mixdown.

The six elements in the signal paths are:

The Channel Input

The Channel Input section can be found towards the top of the module and has three inputs: MIC, LINE and SUBGROUP. We will deal with the SUBGROUP input later. The flip button allows you to flip between MIC and LINE inputs. *All* inputs can be flipped by using the MASTER CHANNEL INPUT FLIP button located in the SL 651G status button group. The other controls are fairly obvious but are detailed on Page 2-2.
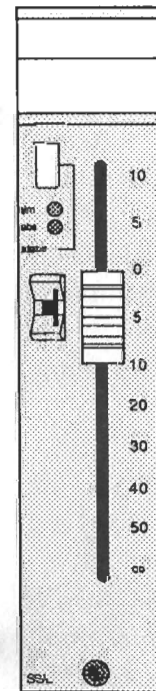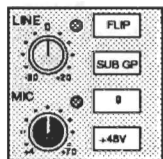
The Large VCA Fader

The Large, or VCA, Fader is linked to the computer automation system. It sends a control voltage to a Voltage Controlled Amplifier card in the SL 611G module. The audio signal passes through this card and is attenuated by an amount dependent on the control voltage from the Large Fader. The voltage from the fader passes via the computer on its way to the VCA, to allow the computer to automate the signal level when the MIX ENABLED mode of the computer is active. See Page 2-26.
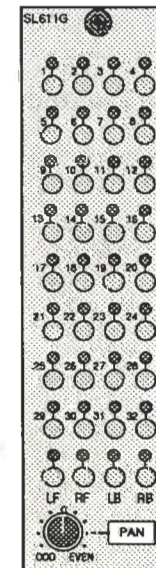
The Multitrack Routing Matrix

The multitrack Routing Matrix is fairly simple in operation. The pan control can be switched in to pan between odd and even groups, or Left and Right outputs to the Quad busses. The fact that you can route to the Quad busses here adds a great deal of flexibility to the console routing. See Page 2-15.

The Monitor Input Section

The Monitor Input buttons enable five different sources to be fed to the monitor fader. READY GROUP selects that module's Group Output, which also feeds the multitrack. READY TAPE selects the track output of the multitrack machine. It is possible to select both of these buttons together to get a mix of the two signals. You will find a more detailed account of this in Section 2.
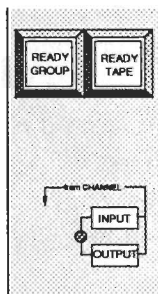
The INPUT and OUTPUT buttons override the READY GROUP and READY TAPE selections and can pick up the channel signal from three points in the signal path (much like a pre/post button selects channel signals pre and post-fader to a Cue send). The signal can be picked up from the front end of the channel (INPUT only selected), pre-channel VCA fader (both INPUT and OUTPUT buttons pressed) and also post-channel VCA fader (by selecting OUTPUT only). These buttons are mainly used during mixdown, as we shall see later.
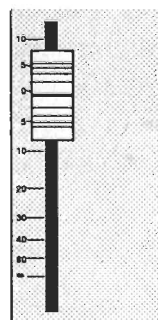
The Small Fader

The Small Fader is a high quality Penny and Giles short throw audio fader.

The Quad Pan Controls

The main Quad Pan controls, at the final point in the chain, allow the signal to be panned across the Quad busses. In most cases, only the Left/Right pan is used for a stereo output but the Front/Back pan can be used if the mix needs to be split (e.g. for main backing to the front busses and vocals to the rear busses). For Film work the Quad outputs of the desk may be used to feed four speakers - Left, Centre, Right and mono Surround. A few consoles have been modified to provide true Left-Centre-Right and Surround pan laws.
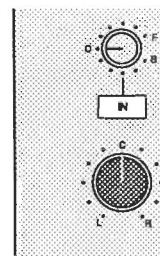
To explain the console routing system, we will go through the master statuses in the most logical progression, from basic track laying to final mixing. The status buttons are designed to differentiate between the various phases of the recording process.

Record Status

Recording basic tracks onto a blank multitrack tape is the starting point! In the record mode, with only the RECORD status button selected, the various elements in the module signal paths are connected as shown on Page 7-7.

RECORD status selects a mic input through the Large VCA Fader to the multitrack Routing Matrix (the 'Channel' signal path) and then to the machine via the module's Group amp associated with that track of the machine (i.e. Track 7 is fed from Module 7's Group Output). The Small Faders monitor the multitrack sends and returns and feed these

signals to the main Quad outputs of the desk via the module Quad Pan pots (the 'Monitor' signal path), the Quad bus and the SL 651G. Again, Track 7 will be monitored on Module 7's Small Fader. Remember that the monitor faders relate to the multitrack and the channel faders (in this case the Large VCA Faders) relate to whatever source is being fed into that channel. Quite often these two signals are completely different. Track 7 may be fed from a mic plugged into Channel 1, for example. Note that no channel input signal will get anywhere unless you select one of the multitrack routing buttons as a destination.

Provision has been made for the multitrack tape machine output to automatically switch to Sync whenever the RECORD status button is selected. This may, or may not, be wired in your studio.

In practice, RECORD status on its own is very rarely used, as you will see from the next status selection.

KEY TO SIGNAL FLOW DIAGRAMS
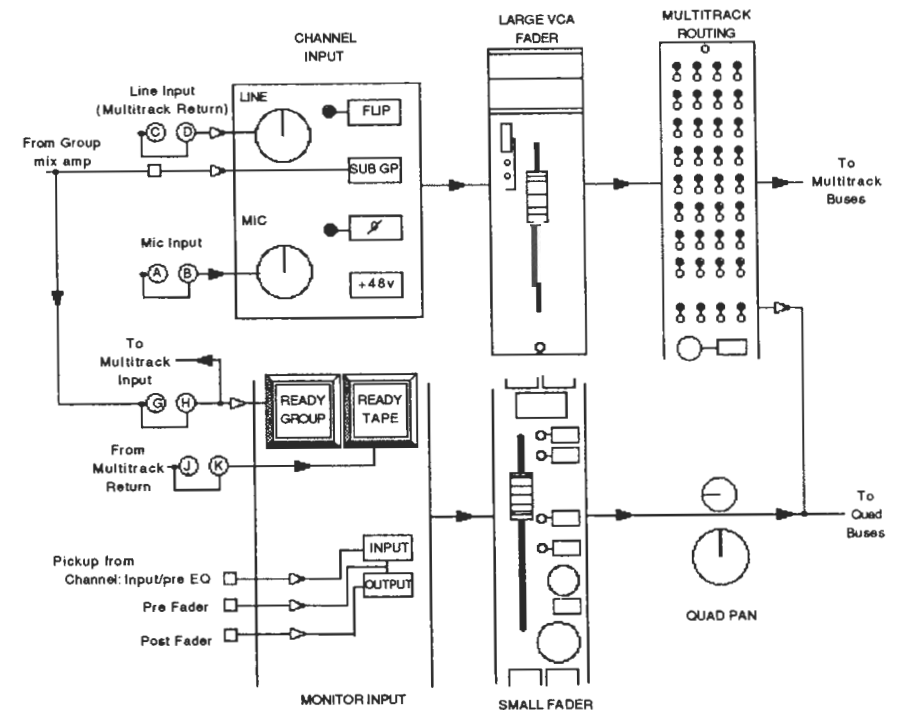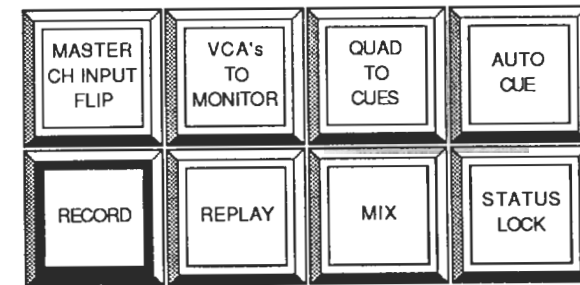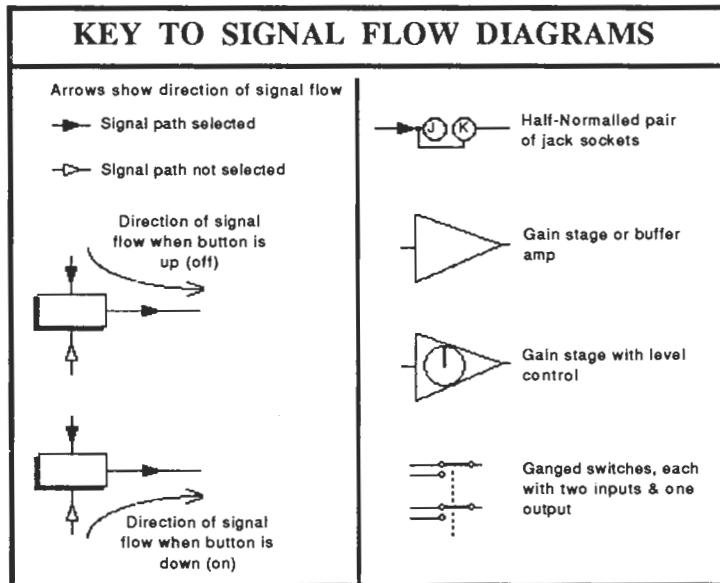
Record + VCAs To Monitor

Most engineers prefer to route source signals through a minimal signal path using the Small Faders rather than the Large VCA Faders. The Large VCA Faders are much more useful if used as monitor faders during recording, as they can, if required, be automated for end-of-the-day monitor mixes. For this way of working there is another status button called VCAs TO MONITOR, which effectively swaps the Small and Large Faders if selected with RECORD or REPLAY status. This button has no effect in the MIX status.

The upper section of the diagram shows the 'Channel' signal path whilst the lower part shows the 'Monitor' signal path. The Channel signal path is that path which originates from the Channel Input section of the I/O module. The Monitor signal is derived from the Monitor Input section.
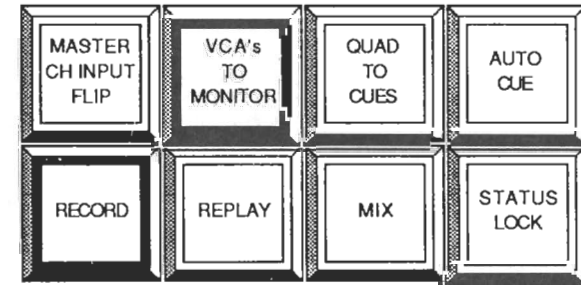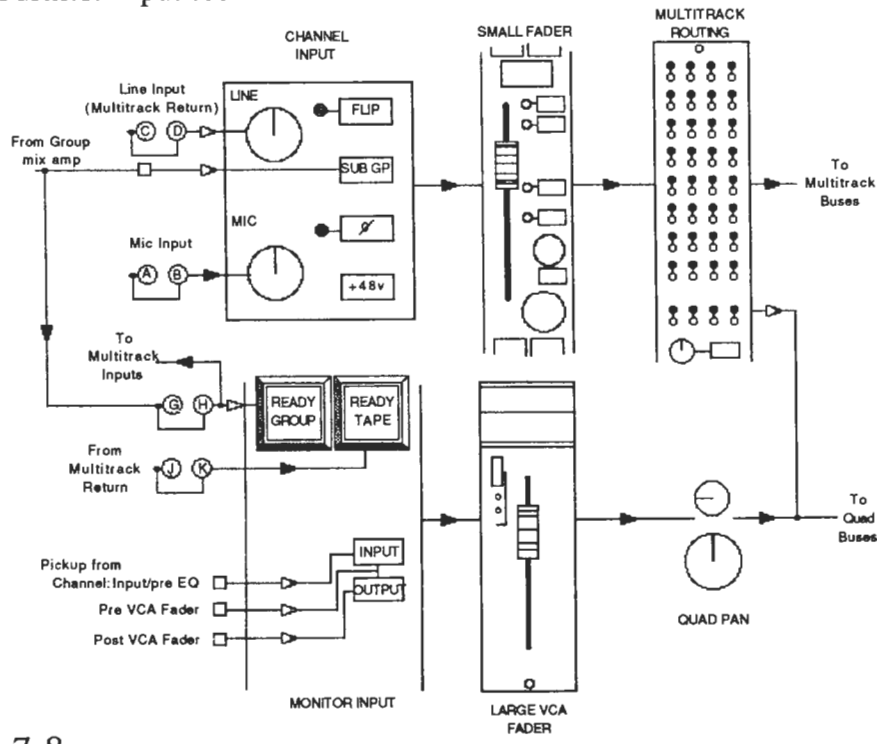
This schematic shows the routing in more detail and will give you a good idea of where the various controls appear in the signal path.
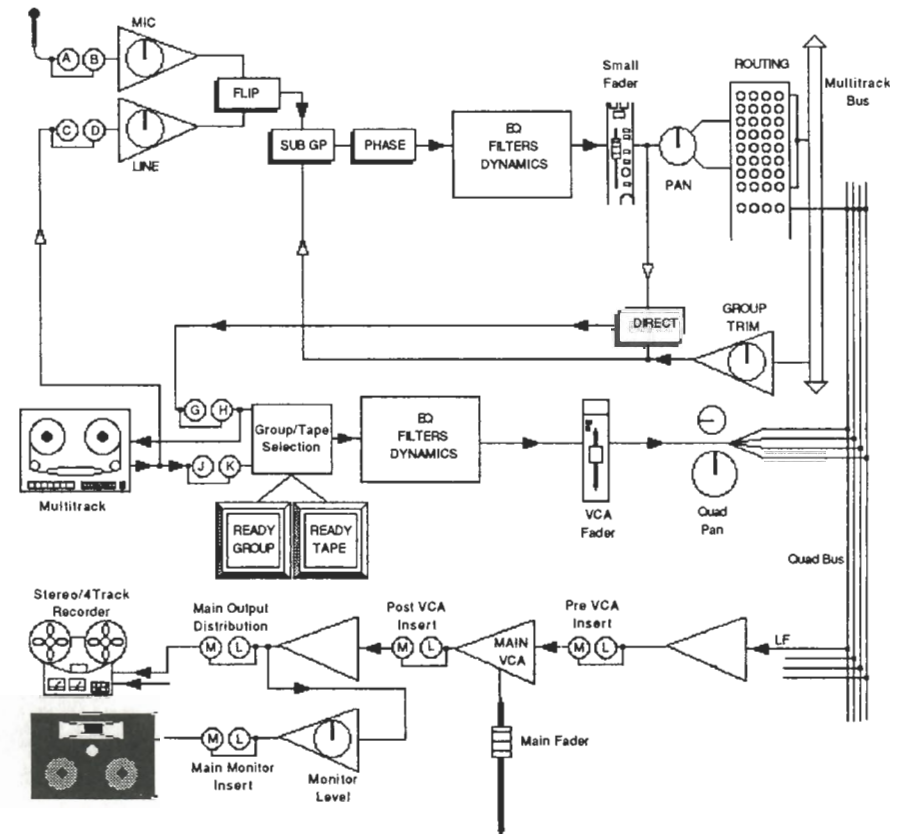
Record + VCAs To Monitor Signal Flow Schematic

This diagram is fundamental to understanding the console signal flow, so it is worth while spending some time to look at it in detail. The symbols used are explained in the schematic key on Page 7-6. In this status, a Mic input is the standard selection and this signal will be fed, via the Mic gain control, to the FLIP switch and the SUBGROUP button. The FLIP button allows the Line input to be selected if you are sourcing from line level feeds rather than from microphones.

Normally the Subgroup button will be up and the Mic signal will pass to the phase reverse circuit. If the Subgroup button is pressed, the Channel signal path will derive its input from that module's Group Output. This allows signals from other modules to be subgrouped through the channel, which is a very powerful feature while mixing. In the tracking mode this could be used to provide overall Dynamics or EQ to a group of signals prior to sending them to the multitrack.

Following the phase reverse circuit, the signal passes on to the Small Fader and at this point can be processed using the EQ and Dynamics sections. The Channel signal can also be fed via the insert points to an external device (not shown on the diagram) which can be switched pre or post the EQ.

After passing through the Small Fader, the signal is sent to the Routing Matrix and from there to the multitrack busses, to be picked up by the Group mix amp associated with that multitrack Group. The Group Trim may be on another module if the channel has been routed to a Group other than its own (which is usually the case). The signal then passes through the DIRECT button and on to the Group Output patch point on Row G, where it is normalled to the Multitrack Send and Group Monitor Input on Row H. The Multitrack Return appears on Row J and is normalled to the Tape Monitor Input (Row K).

Both these Tape and Group Monitor signals feed a switching matrix which is controlled by the READY GROUP and READY TAPE buttons (see Page 2-22 for more details).

The monitor signal can now be processed using the EQ and Dynamics sections (which can be switched into the Monitor or Channel signal paths). The signal passes through the INPUT and OUTPUT switches, which are used in the MIX status to send Channel signals to the Monitor fader for use as additional sends. In RECORD status, these are not normally used. The signal passes on via the VCA monitor fader and out of the module onto the Quad bus. The Quad bus is fed into summing amps in the centre section (SL 651G) and then passes via the main Quad VCAs out to the monitor amps and ATRs.
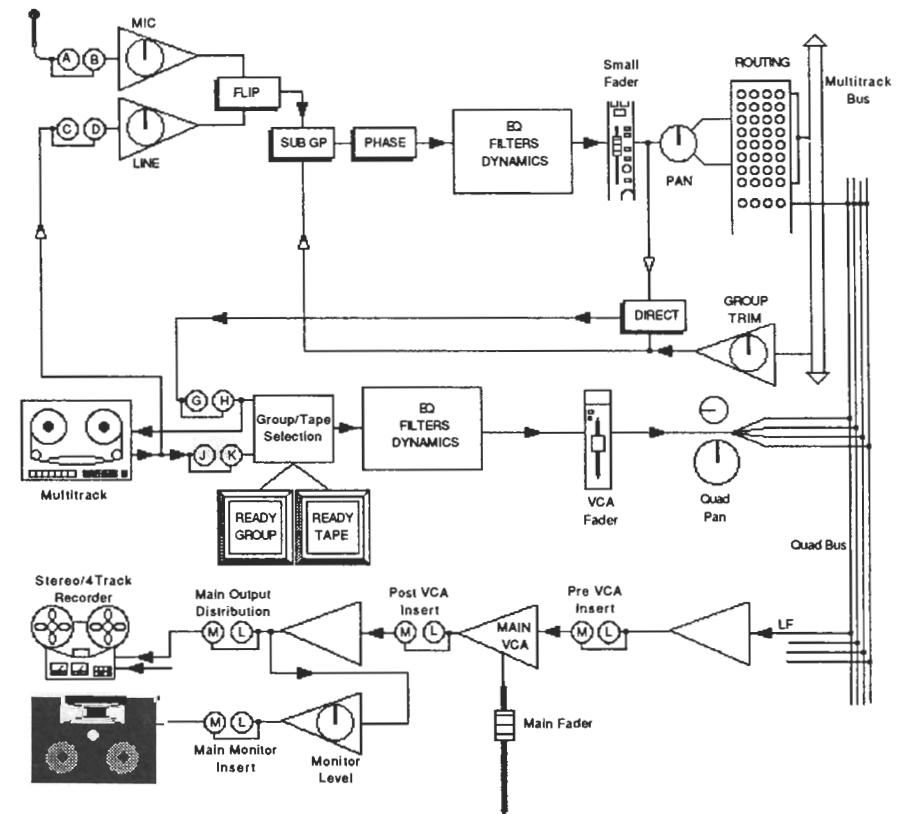
Float

It is worth mentioning one other important function which also dramatically affects signal flow - FLOAT. This button is located in the Group section of the module and is used in RECORD status when track bouncing. FLOAT disables the fader output which feeds the Routing Matrix and feeds the other fader to the Routing Matrix instead. In RECORD + VCAs TO MONITOR mode, the Small Fader feeds the matrix, so its output is disabled. The Large Fader is receiving the off-tape monitor signal and this now gets fed to the Routing Matrix so that it may be re-recorded (bounced) to another track.
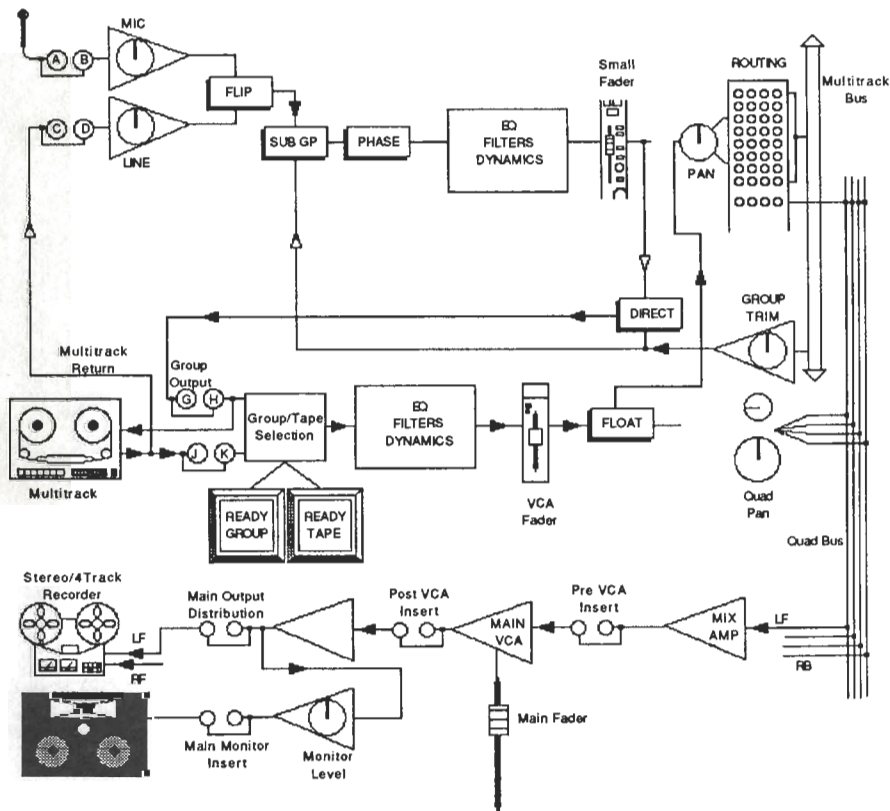
Note that when FLOAT is pressed, neither fader can feed the main Quad Pans. Access to the Quad bus can only be achieved via the four LF,RF,LB,RB buttons on the Routing Matrix.

As an example, say that we want to bounce Tracks 1, 2, 3 and 4 down to a stereo pair on Tracks 7 and 8, and we are still in RECORD + VCAs TO MONITOR status. Hit the FLOAT buttons on Modules 1, 2, 3 and 4 and select routing buttons 7 and 8 on each of these modules. The Large (Monitor) Faders will now balance these tracks to Groups 7 and 8. Switch in the Routing Matrix pan control to pan across the two Groups which can now be monitored on Modules 7 and 8 Large Faders, by selecting the READY GROUP buttons.

Master Channel Input Flip

This button works in any desk status and simply flips all channel inputs between Mic and Line inputs. Each channel can be flipped on an
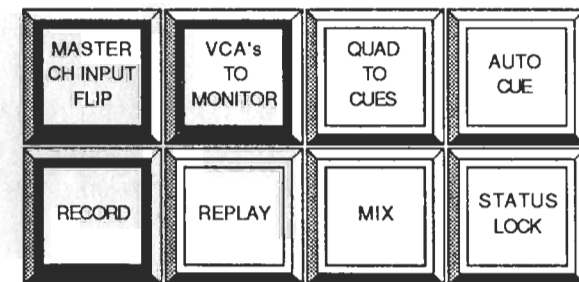
individual basis but it is simpler to hit MASTER CHANNEL INPUT FLIP to select the majority type of input. You would use this button if, for example, you are working in the RECORD + VCAs TO MONITOR mode and wish to use Line inputs for synthesisers or samplers rather than the Mic inputs.

Replay Status
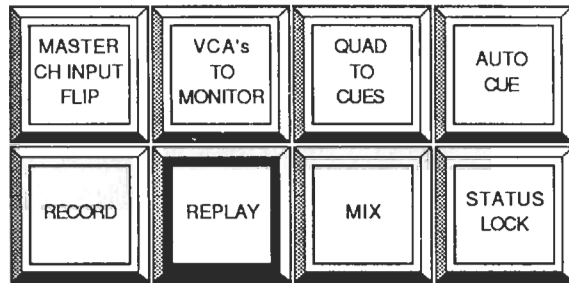
This mode is used when working in RECORD, or RECORD + VCAs TO MONITOR status. The current console status is put on 'standby' and the tape returns are routed to the Monitor faders. This allows a quick replay of the tape without disrupting the console setup. The multitrack machine is switched to normal Replay.

This status is used during track laying. For example, when operating in RECORD status, the time will come when a quick monitor mix is required. This could be accomplished in RECORD status by deselecting all the READY GROUP buttons, switching the multitrack machine to Replay manually and mixing down the monitor inputs via the main output busses onto a stereo ATR. REPLAY status does all this with one button. All READY GROUP selections are temporarily disabled and the monitor inputs pick up multitrack returns from the Replay head.

Reselecting RECORD status will reinstate all the previous READY GROUP and READY TAPE button selections and the multitrack will switch back to Sync, ready for more recording.

REPLAY status is also useful for playback over the Studio Loudspeakers, as RECORD status prevents the SLS outputs from receiving signal.

Mix Status

Line inputs are selected on the channels, sent via the Large Faders to the Quad bus and then, via the Master Fader on the SL 651G, out to the mastering machine. The multitrack machine is usually normalled to the Line inputs, so this single status button will instantly set you up for a mixdown.

The Small Fader can be used to pick up any of the five sources shown below and send them to the Routing Matrix.
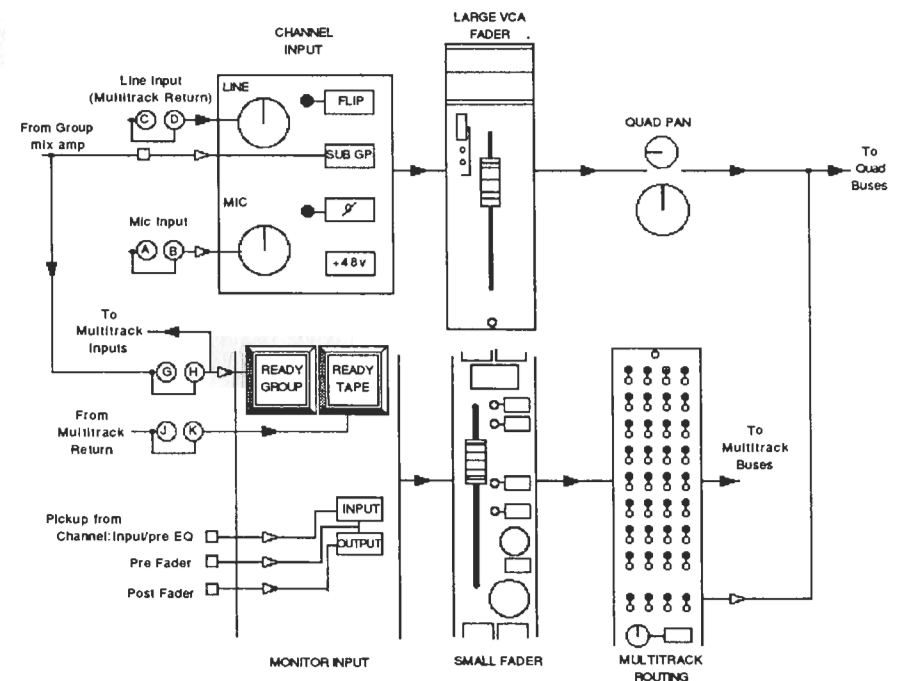
Mix Status continued
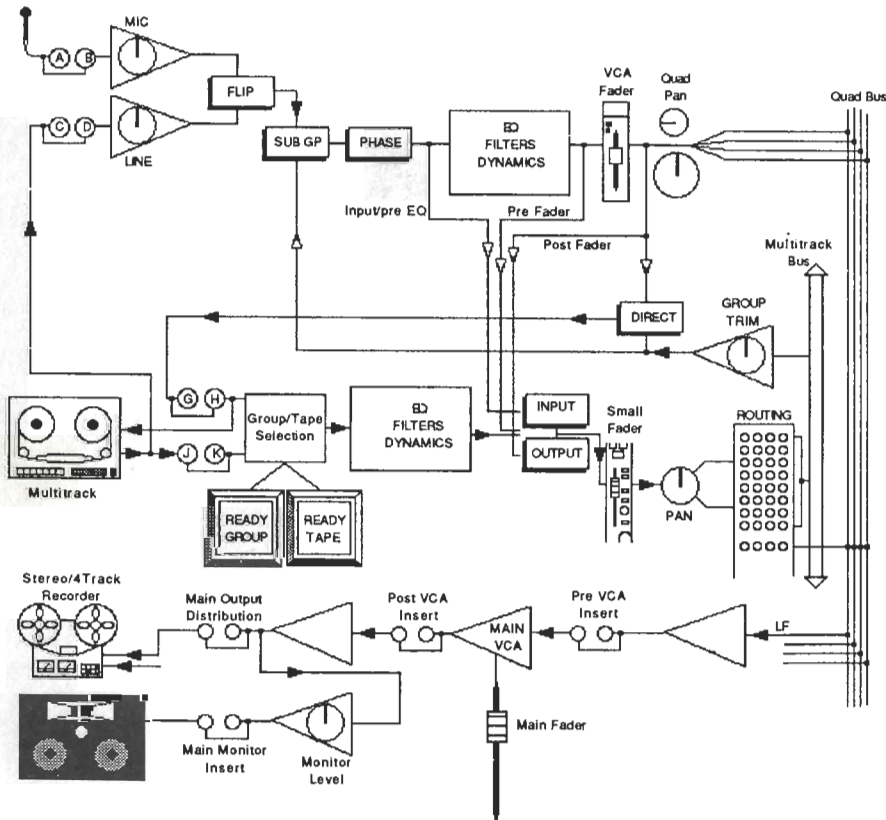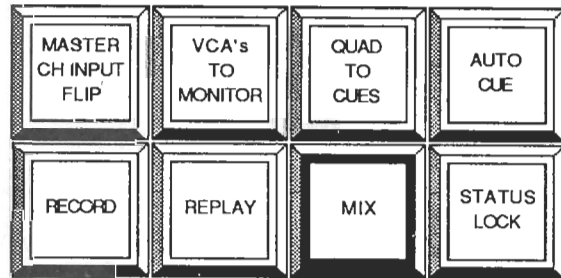
The Small Faders

Learning how to use the Small Faders in various console statuses is the key to getting the most out of the system. We shall investigate the possibilities.

Small Faders used to control additional Inputs to the Mix

By patching a line source into a Tape Monitor input jack on the patch and with both READY GROUP and READY TAPE buttons deselected, this signal will feed the Small Fader. Exact details of the READY GROUP and READY TAPE switching can be found on Page 2-22. By selecting the LF and RF buttons on the Routing Matrix, the
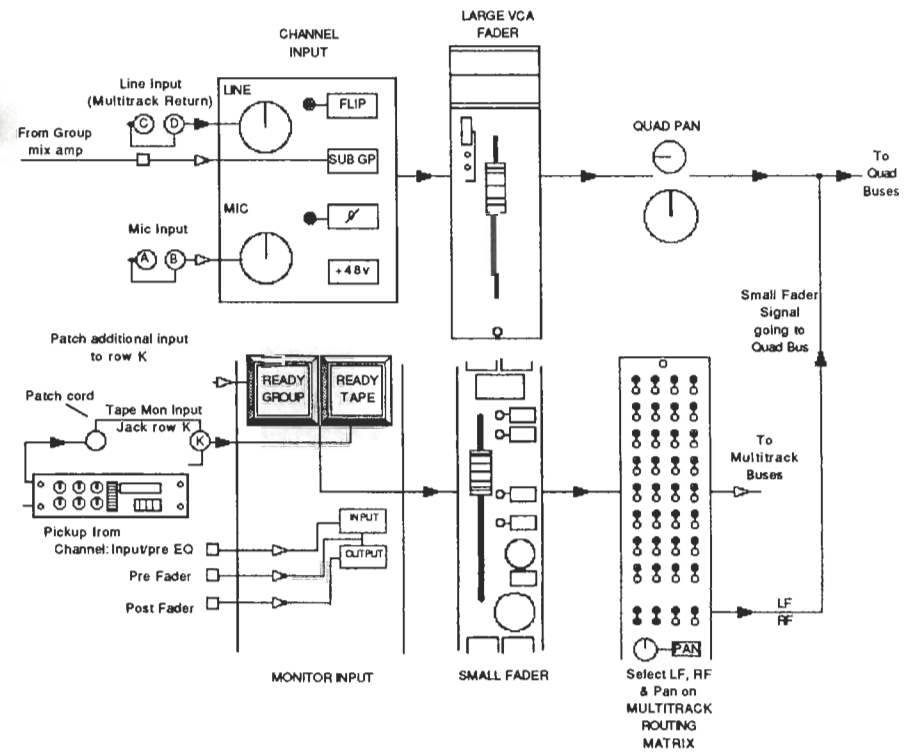
signal can be sent to the Quad bus, adding to the main mix. This instantly gives you double the number of inputs to the mix. A 56 channel console could be feeding 112 inputs to the main outputs. Remember that there is only one Dynamics section and one EQ section per channel, so it is not possible to fully signal process every input. However, this facility allows smaller consoles to deal with mega-mixdown situations which are becoming more and more frequent.

Subgrouping

The Small Faders are not automated but they can be subgrouped to the Large VCA Faders if required. Say, for example, we have six backing vocals on a second multitrack and we are running out of Large Faders during the mix. These sources could be patched into the Tape Monitor Input jacks, sent to six Small Faders and then routed to a pair of Groups, say 25 and 26, via the Routing Matrix at the top of the module. If the SUBGROUP buttons on channels 25 and 26 are now selected, these two channels and their Large Faders will be fed with the mix from the six Small Faders, allowing the overall backing vocal mix to be automated with EQ and Dynamics control (see diagram opposite).

If, instead of hitting the SUB GP buttons on channels 25 and 26 we select the READY GROUP buttons, the two Small Faders will now receive the grouped backing mix, as READY GROUP simply switches that module's Group Output to its Monitor fader. If these two Small Faders are now selected to LF and RF on the Routing Matrix, the subgrouped mix will be sent to the main Quad busses. This allows Small Faders to act as subgroup masters for signals controlled by other Small Faders. You would only do this if overall group level control or signal processing were required, otherwise it would obviously be simpler to route the source faders direct to the Quad bus. However, this is sometimes useful nevertheless.

Signal Flow of Small Fader Inputs subgrouped to Large Faders
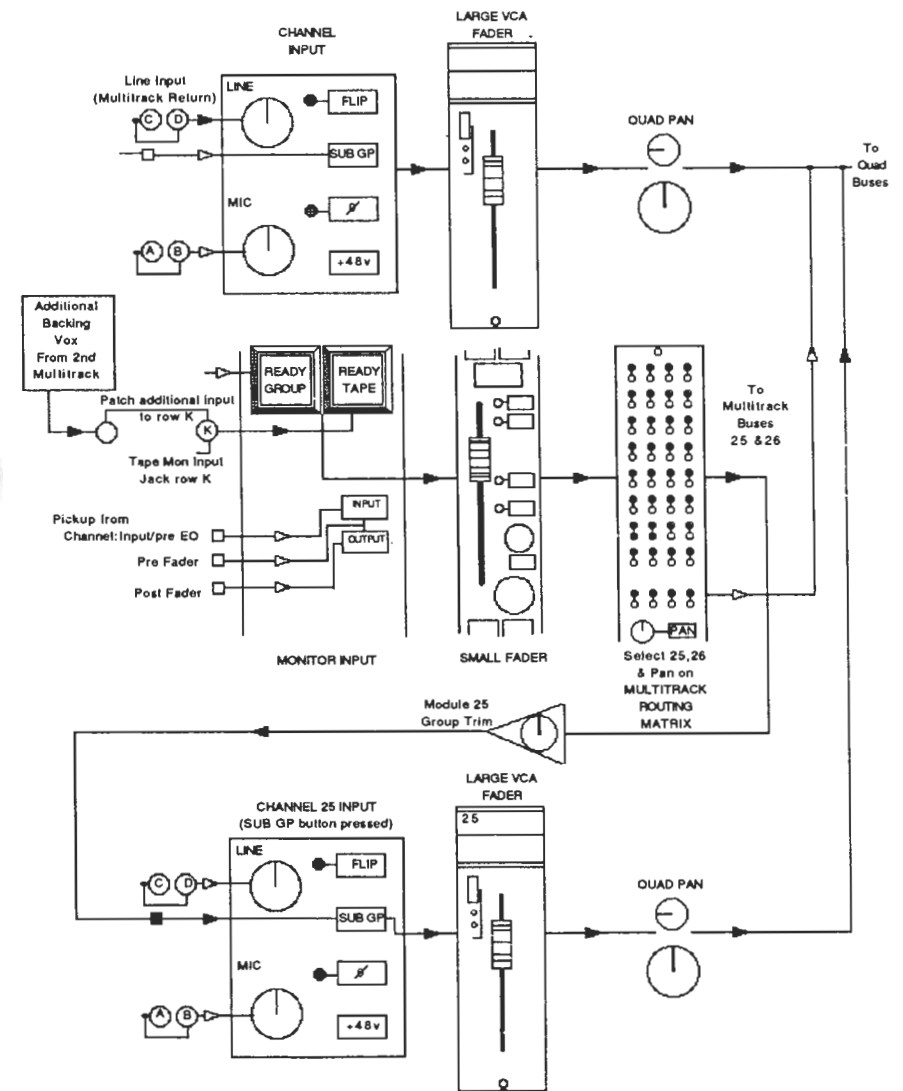
Now that we have strayed into descriptions of the desk's subgrouping facilities, let's take a look at Large Fader subgrouping. By the way, although we are describing all this in the MIX mode, the basic principles are exactly the same in the other desk statuses.

Suppose we have six backing vocals on channels rather than the monitor faders as before. If overall level control or signal processing is required, we need to set up a subgroup. This is where the FLOAT button again comes into play. Selecting FLOAT on each of the modules will feed the backing vocal channels to the Routing Matrix. Select a pair of Groups, say 25 and 26, and the grouped signal can now be picked up on Large Faders 25 and 26 by selecting SUBGROUP on these channels. You could instead select READY GROUP on these modules and have Small Faders controlling the subgroup level to the mix bus.

So it is posssible to route Small Fader to Small Fader, Small Fader to Large Fader, Large Fader to Large Fader and Large Fader to Small Fader. This is why there are no dedicated audio subgroups in the console. They are not required, as every fader in the console can be a subgroup fader. You can only route to the first 32 Groups using the Routing Matrix but you could make Channels 47 and 48 subgroup masters by patching from Group Outputs 25 and 26 into Line Input (or Tape Monitor Input) 47 and 48 if so desired.

The Stereo Modules make very good subgroup masters. They can be fed with subgroup signals as above, by using patch cords.

The Small Fader used as an extra Effects Send

Now back to the Small Fader and its other uses in MIX mode. The Small Fader and the Routing Matrix may be used to derive additional effects sends from each channel. Say you have run out of sends (there are four mono and one stereo send on each module). The channel signal can be picked up by using the INPUT and OUTPUT buttons and routed via the Small Fader to the Routing Matrix. Select a Group Output and patch from there to the effects device input. When setting up for a mix, it is useful to patch into the inputs of all the studio effects devices (apart from the primary reverbs and delays, which are usually fed from the dedicated sends) from Groups; Delay Lines to Groups 1, 2, 3, 4 and Flanger to 5 etc.
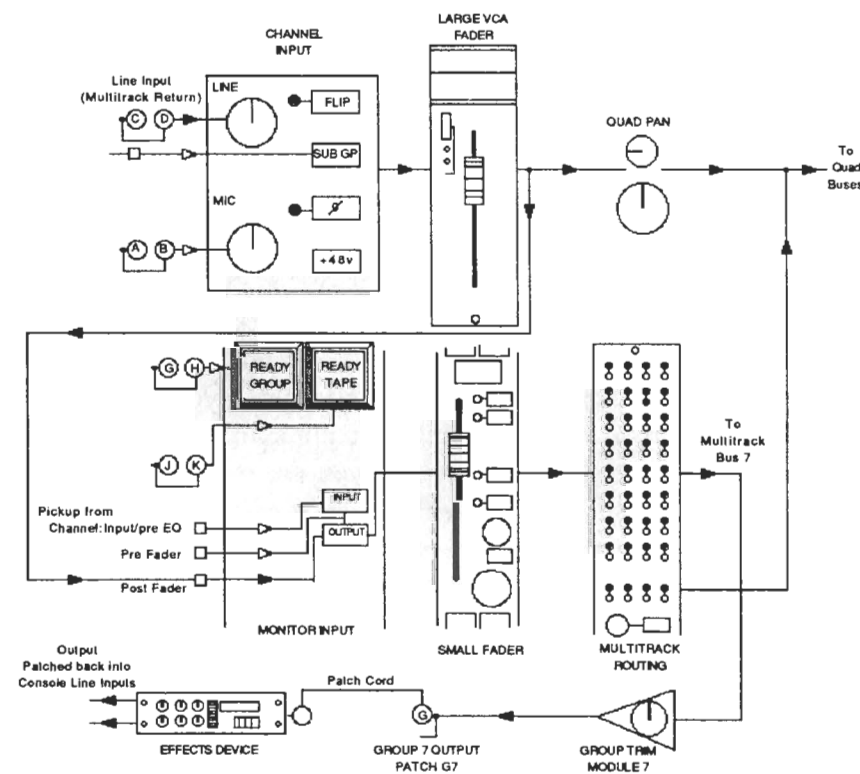
Any channel can then be sent to the Flanger by selecting the OUTPUT button (for post-fader) and selecting 7 on the Routing Matrix, the send level being controlled by the Small Fader feeding the matrix and the overall send level by the Group Trim control on Module 7.

Record + Mix Status (Overdub Mode)
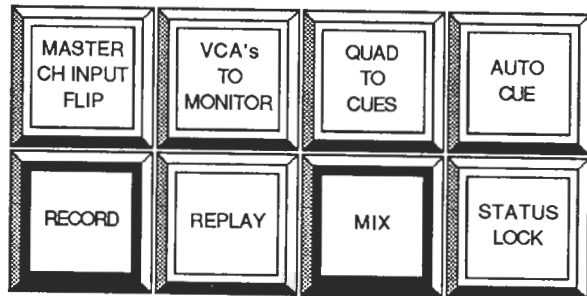
This mode was designed for overdubbing situations but some engineers always use this status when laying basic tracks. The desk is basically in MIX status but an individual module may be put into the RECORD status, in order to record onto that track, if either the READY TAPE or the READY GROUP button is selected. The advantage of this mode is that the majority of modules will be in MIX status and you can mix with the Large Faders as if you were doing a final mix. In other words the modules are not split into source signal paths and monitor signal paths unless you are recording from that module. You can work towards the final mix as you are tracking, using the mix capabilites to their full extent but with the ability to record onto the necessary tracks.

It is quite usual for the desk to be split for this way of working. The first twenty-four modules are dedicated to the multitrack and modules from say 25 to 32 act as source channels, although this is not essential.

By way of an example, suppose you were overdubbing a vocal to several tracks at the very end of the recording process. You have four tracks free, 16 to 19. Select RECORD and MIX and mix the rest of the tracks normally, as you would in the MIX mode. Effects returns could feed Channel 26 and upwards. Plug the vocal mic into Channel 25. FLIP the input to Mic, and FLOAT the channel so that it feeds the Routing Matrix. By selecting routing button 16, the Large Fader on Channel 25 will now feed the mic to Track 16. Monitor the feed to Track 16 on the Small Fader by pressing READY GROUP on Module 16.

Record + Mix + VCAs To Monitor
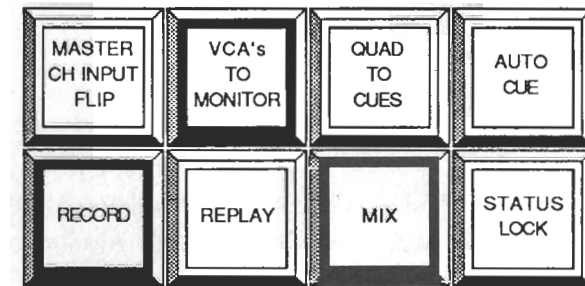
Another and more usual way of achieving the above would be to hit READY GROUP or READY TAPE on Module 25. This will put the module into RECORD mode, automatically selecting the Mic Input and feeding the Large Fader mic signal to the Routing Matrix, thereby saving one button press. It would also make sense to select VCAs TO MONITOR so that the Small Fader on Module 25 controls the mic signal rather than the Large Fader.

Now select READY GROUP (and/or) READY TAPE on Module 16 to monitor the multitrack signal. This will put Module 16 into the RECORD mode but with VCAs TO MONITOR activated, the Large Fader will be monitoring the signal to the Quad bus. When you have completed the overdub, just deselect READY GROUP (and/or READY TAPE) on 16 and select READY GROUP (and/or READY TAPE) on 17 to continue recording onto Track 17. You will also need select 17 on Module 25's Routing Matrix, unless all the overdub tracks have been preselected.

Just to add to the possibilities, you could carry out the same recording process in a slightly different way. Simply plug the mic to Channel 16, hit READY GROUP (and/or READY TAPE) to put 16 into RECORD mode. With VCAs TO MONITOR selected, the Small Fader will feed the mic signal to the Routing Matrix, so select 16 and monitor the multitrack signal on the Large Fader using the READY GROUP and READY TAPE buttons.

The Direct Button

In this case, the Routing Matrix can be bypassed altogether by simply hitting DIRECT. This will send Channel 16's source mic direct to Group 16 without going via the Routing Matrix. The benefit of this is that there will be fewer stages in the signal path. The disadvantage with this method of overdubbing is that you have to re-plug the mic each time you wish to move to another track.

By the way, the multitrack is switched to the Replay head in MIX mode, if this facility has been wired. Whenever the RECORD status button is selected, as in MIX and RECORD, the multitrack will be switched to the Sync head (if wired).

All this shows that there are many ways to carry out a particular task. If you are new to the system it may cause some confusion, but the whole philosophy behind the console is to provide alternatives and to allow an engineer, who knows the system well, some choice. A fixed routing path would be simpler to learn but would soon limit the engineer's ability to work quickly and get the best out of the equipment and the performer.

As you spend more and more time on the console, the many possibilities will start to become obvious and will allow you to work faster and with more options than any other system available.
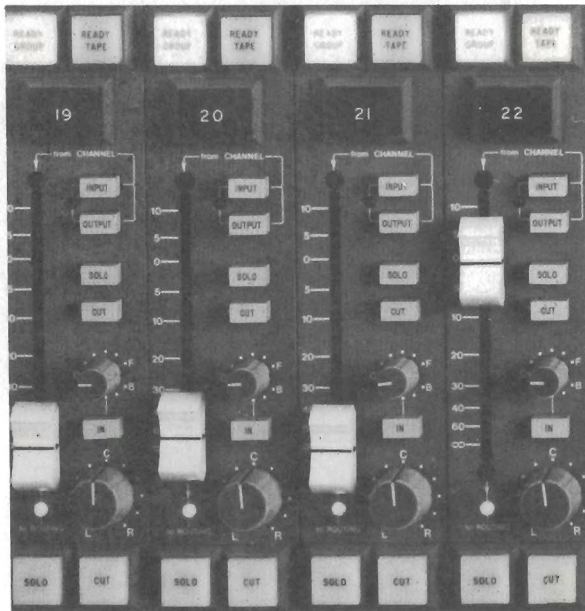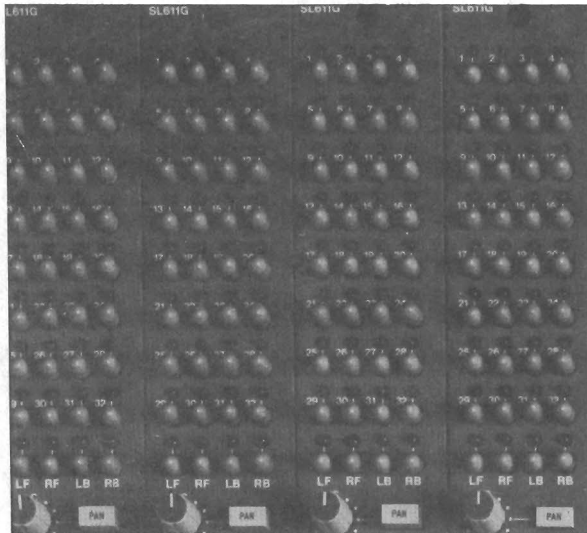
Signal Processor Routing

Each SL 611G module contains three separate signal processing devices:

• The 4 band Parametric Equaliser
• The High and Low Pass Filters
• The Dynamics section which comprises a compressor/limiter and expander/gate.

These processors can be used in the Channel or the Monitor signal paths. Seven buttons are used to determine where each processor will be placed in the signal chain. The following diagrams show the various possible combinations.
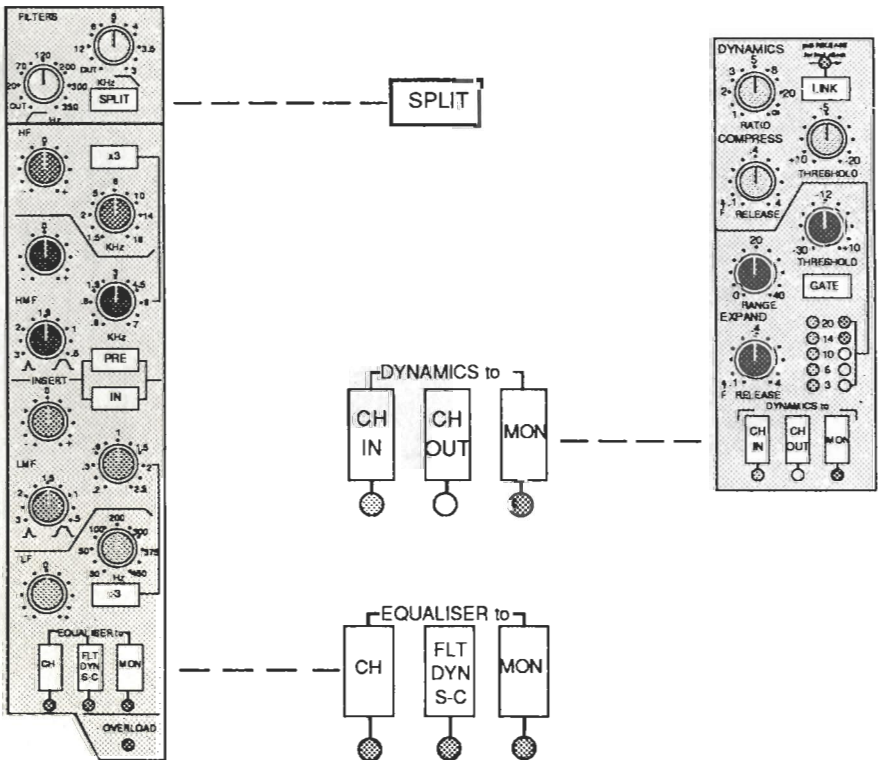
The first two examples show that the Equaliser and Filters are normally treated as a single unit, which may be switched into either the Channel or Monitor path. All these diagrams show input and fader selections for the MIX status. Note that the Channel Input Section always feeds the Channel signal path and the Monitor Input Section always feeds the Monitor signal Path.
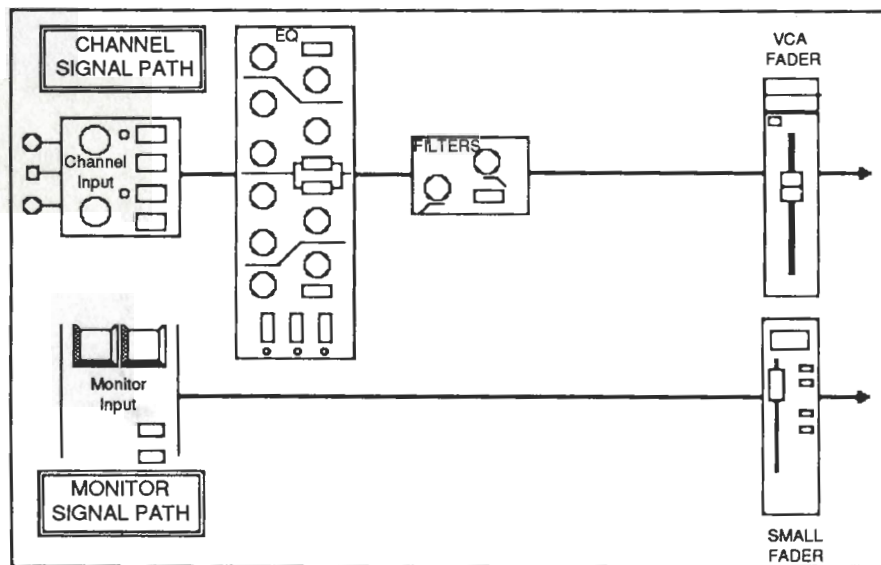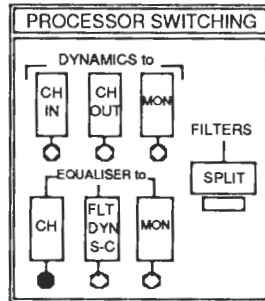
Note that the Filters follow the Equaliser.
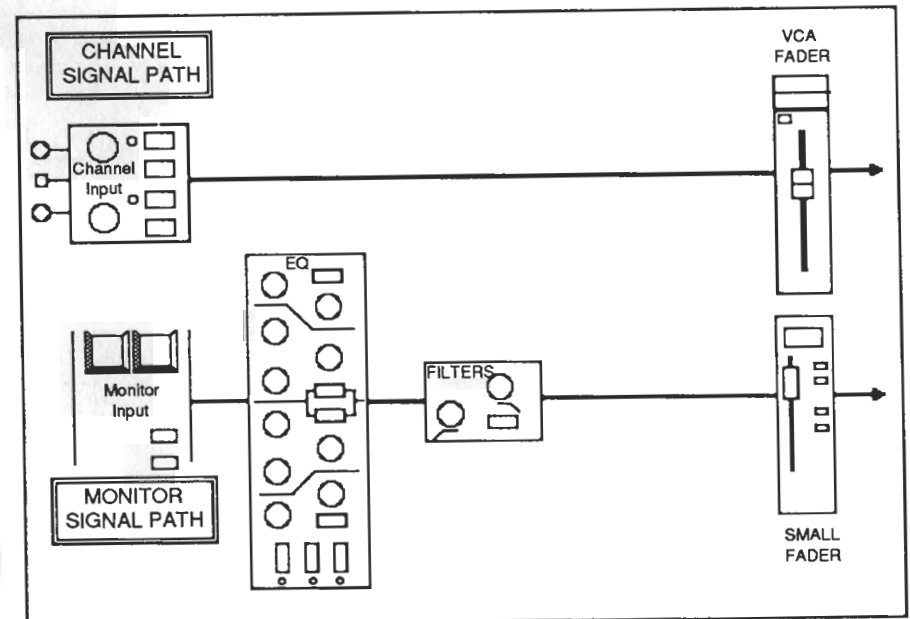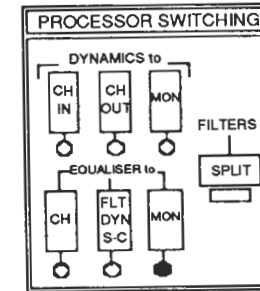
The SPLIT Button always splits the Filters away from the Equaliser and places them directly after the input section. This allows the Equaliser to be placed in the Monitor path and the Filters in the Channel path.
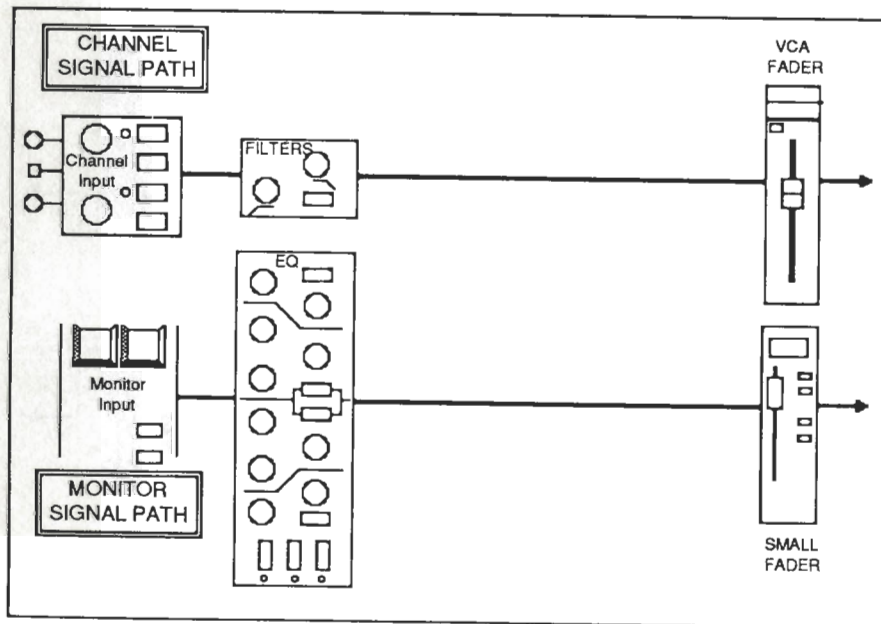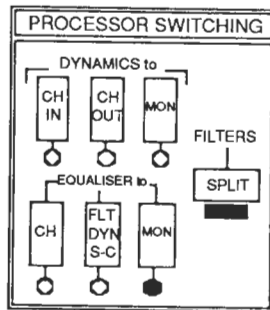
The Dynamics section can also be switched to either the Channel or Monitor path.
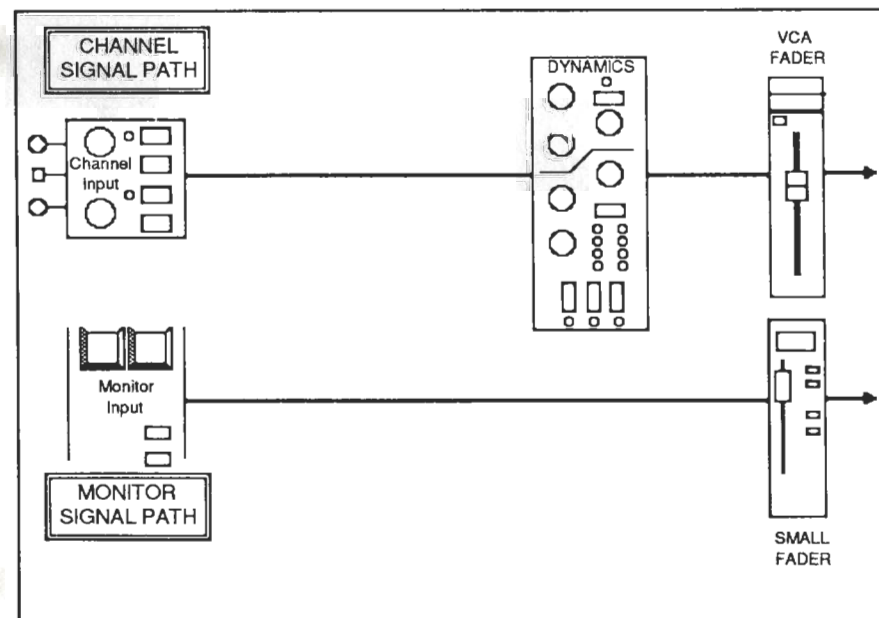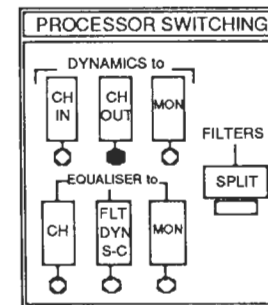
The Equaliser may be placed in the Channel path and the Dynamics in the Monitor path.
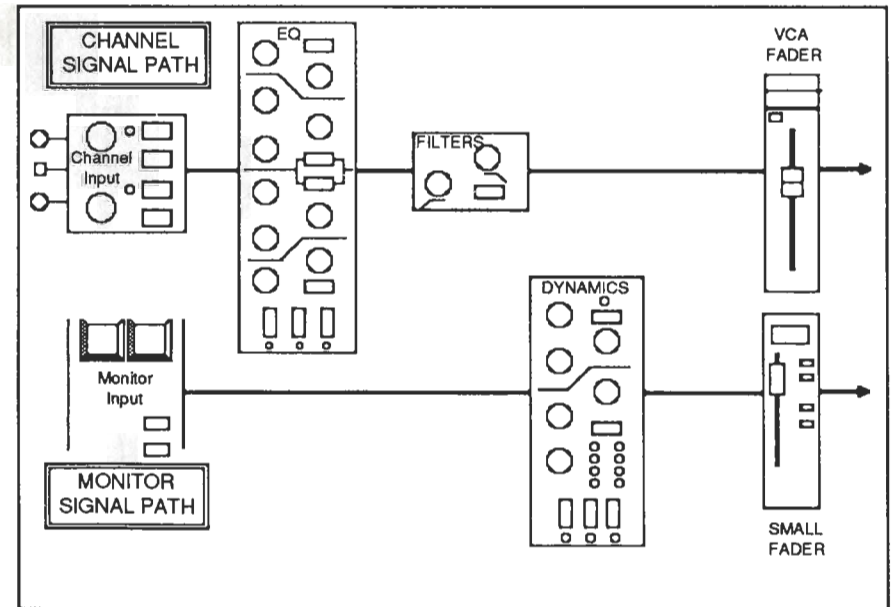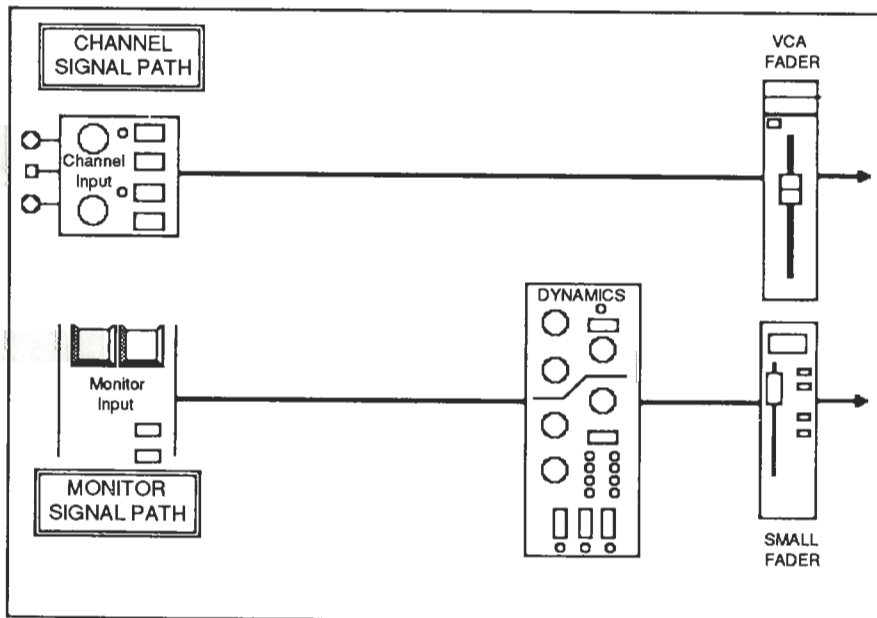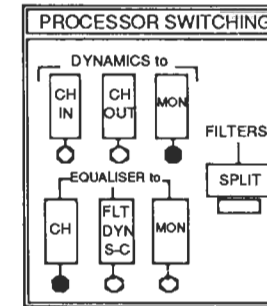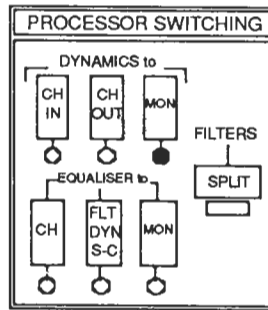
The Dynamics section may be placed pre or post the Equaliser in the Channel using the CH IN or CH OUT buttons.
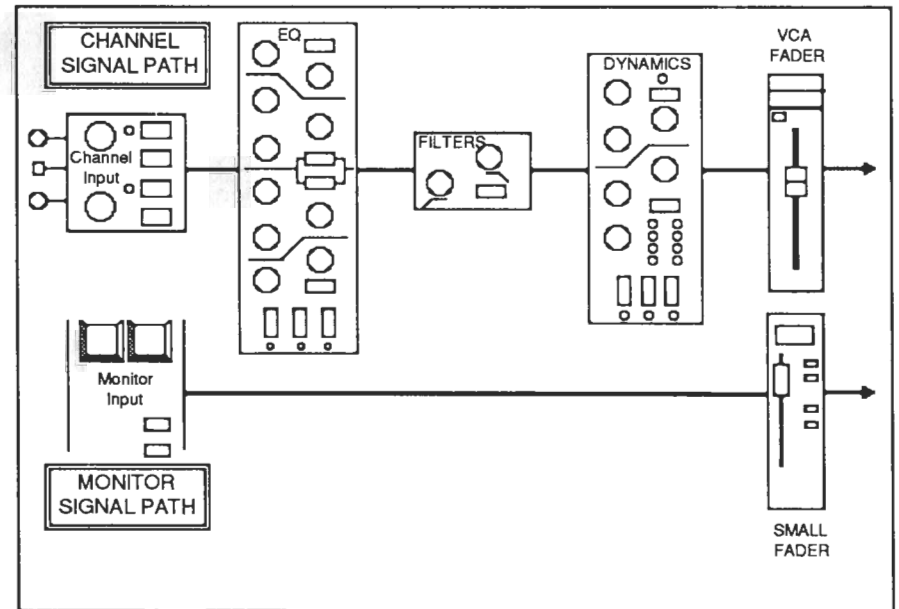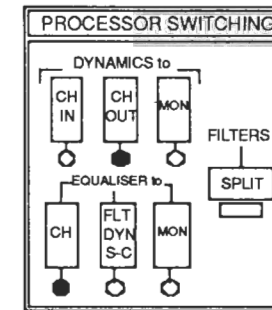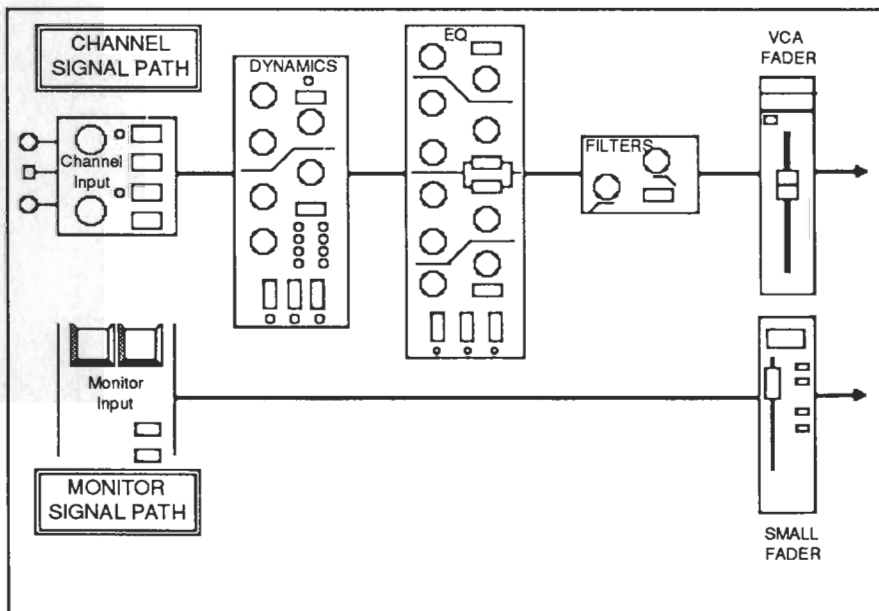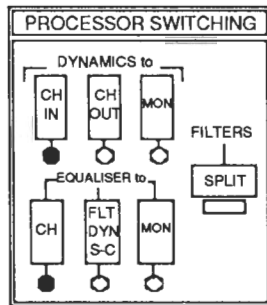
Using the SPLIT button, the Filters may be placed pre-Dynamics and the Equaliser positioned post-Dynamics in the Channel.

It is also possible, using the SPLIT button, to place the Filters in the Channel path while the Equaliser and Dynamics sections are in the Monitor path, although this is not shown. Note that the Dynamics section always follows the Equaliser when they are both placed in the Monitor path.
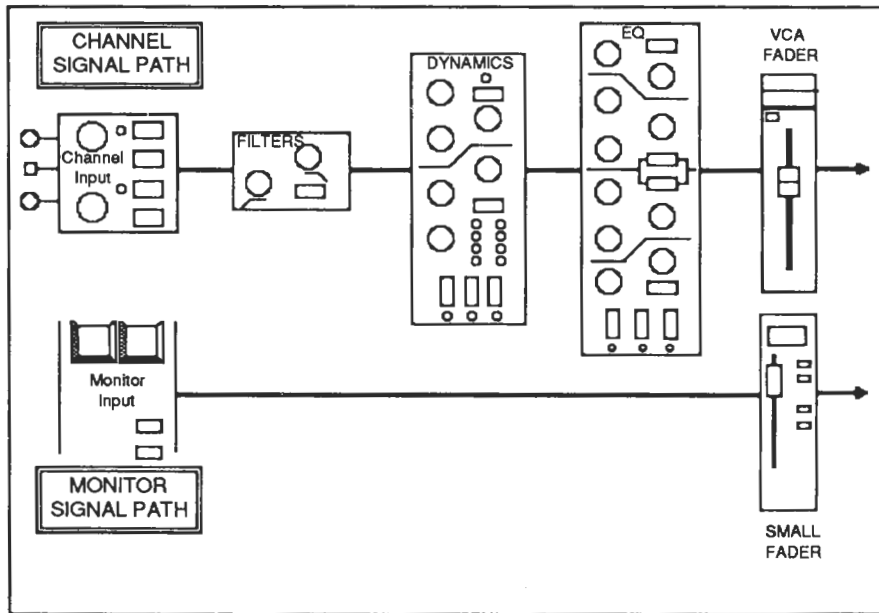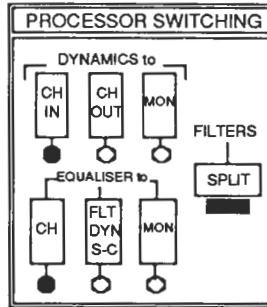
Access is also provided to the level sensing sidechain of the Dynamics section. The Filters may be placed in the sidechain with the Dynamics section in either the Channel or Monitor path. Frequency dependent effects such as stressing or de-essing are thus easily achieved. This is also useful for filtering out unwanted signals when gating. For example, when gating drums, the cymbal frequencies can be filtered out of the sidechain signal to prevent the gates on the drums from opening when the cymbals are played.
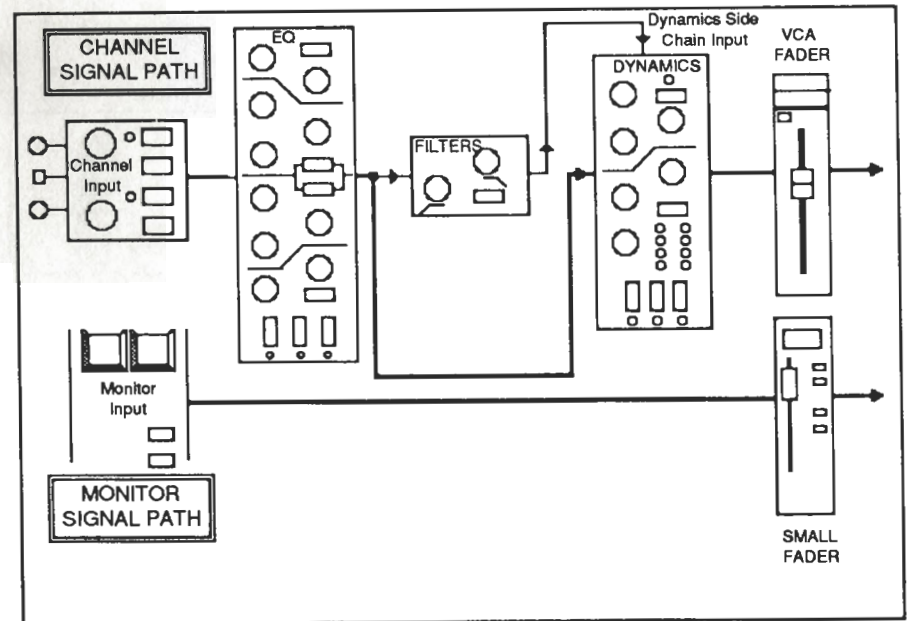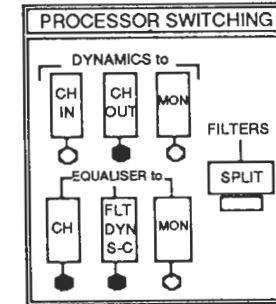
The Equaliser may be placed in the Channel, the Dynamics in the Monitor and the Filters switched to the sidechain input.
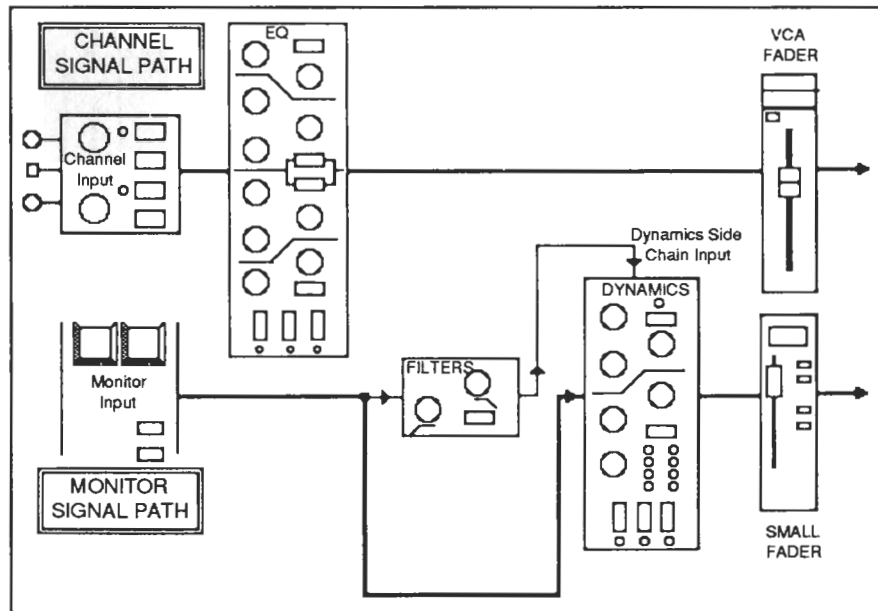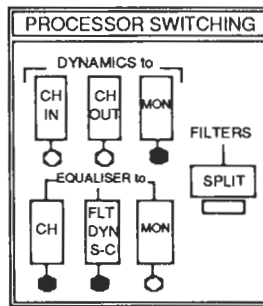
The Dynamics section can be 'keyed' from an external signal by selecting either CH IN and MON *or* CH OUT and MON. The key signal is taken from the Monitor Input pre-fader, so patching into the Group Monitor Input or Tape Monitor Input will access the sidechain. As the Monitor Input can pick up the module's Group Output (i.e. Module 21 can monitor Group Output 21) signals can be routed to the module's Group via the Routing Matrix and be selected to the sidechain input with the READY GROUP button. This application, where a module's Dynamics section is keyed from another module, is covered in more detail in the applications guide.
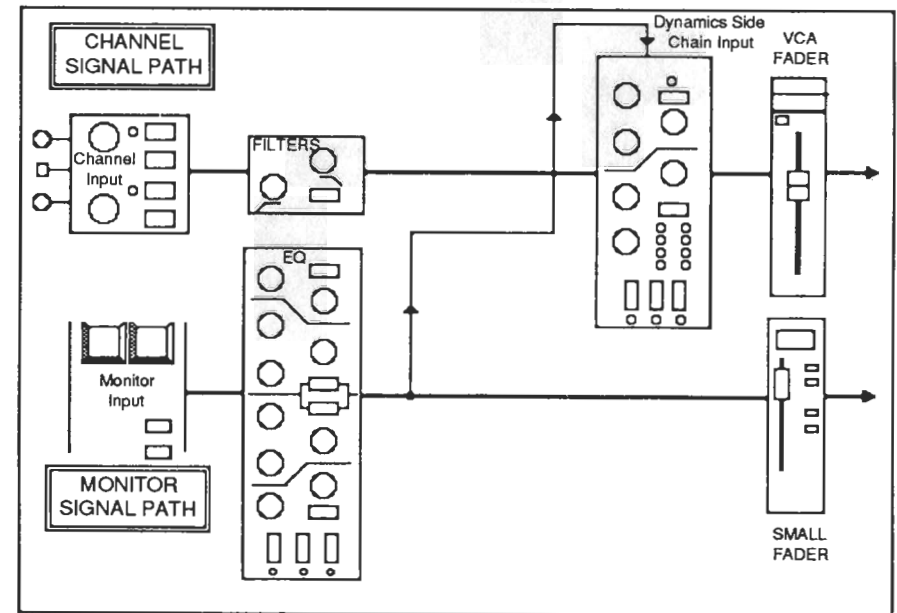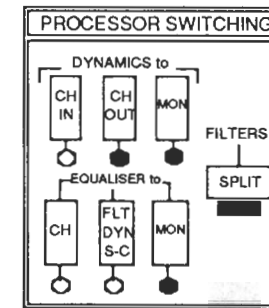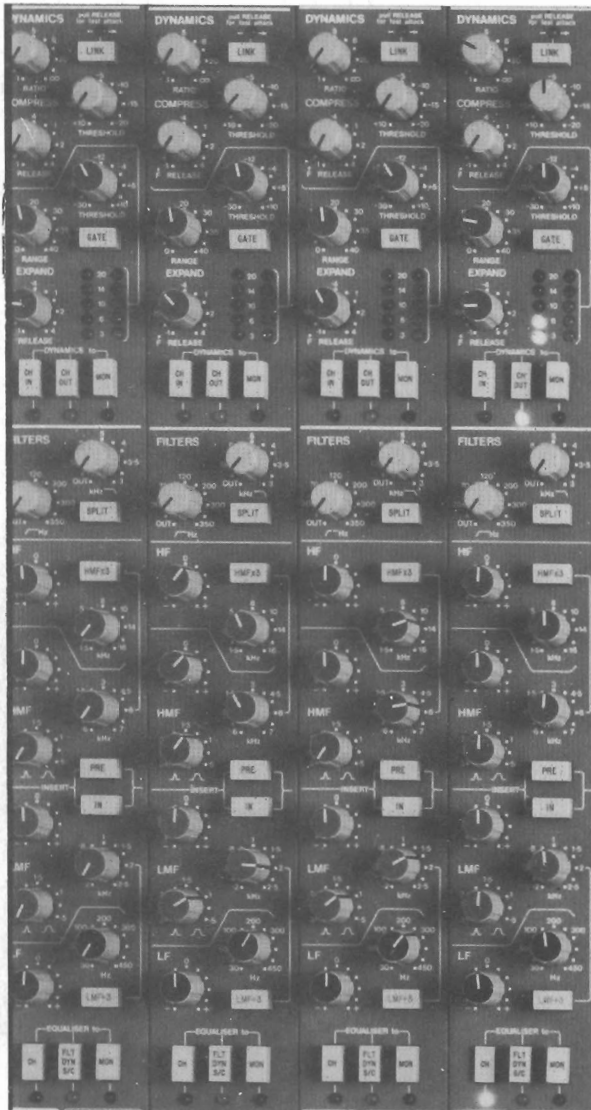
Cue and Auxiliary Sends

The SSL Cue and Aux send system is based around one stereo and four mono sends per module, with master send controls located in the centre section. With the introduction of the G Series system, the Cue and Aux send capabilities have been expanded to provide two sets of sends, one from each side of the desk.

This section describes the overall signal flow to give you an idea of how all the elements of the system work together. Details about individual controls can be found in Sections 2 (I/O sends), 3 (Stereo Module sends) and 4 (Cue/Aux Master controls).
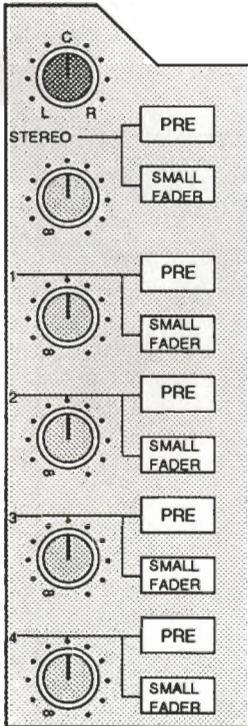
Input /Output Module Sends

Stereo send controls: Level (with integral push on/push off switch) and Pan, together with Pre/Post and Large Fader/Small Fader source selection buttons.

Four sets of Mono send controls: Level (with integral on/off switch), together with Pre/Post and Large Fader/Small Fader selection buttons.

Sends on the Stereo Modules are similar and are described in detail on Page 3-7.

E Series consoles have six (one stereo and four mono) send busses running the length of the console, with master controls located towards the top of the SL 651E Master Facilities Module. G Series consoles employ a slightly different system, as the six busses can be split either side of the centre section, to provide two sets of outputs.

Master Send Controls on the SL651G

The sends from the right hand side of the console feed the master controls on the SL 651G and are the same as the sends found on E Series consoles. Each send has Level and Equalisation controls. From here the sends go to the patch. They appear at the Echo Send jacks (N1-N4) and are designated AUX (or ECHO) SENDS. The stereo and first two mono sends are then fed back into the SL 651G (Jacks P5-P8) and have talkback, external selector and echo return feeds added before they appear again on the patch as CUE SENDS to the foldback amplifiers and studio headphones.
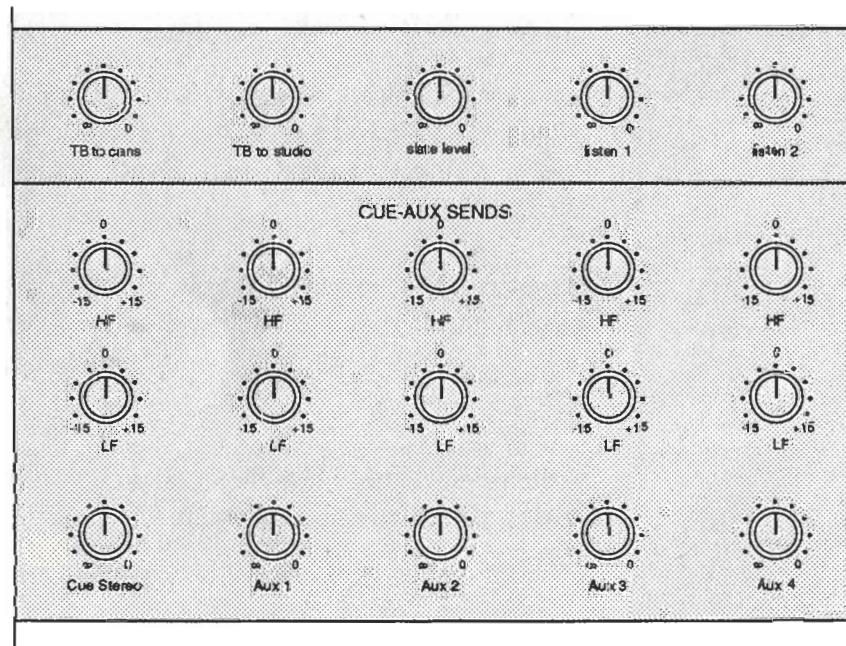
The Local Aux Sends Panel

The sends from the left hand side of the console are fed via the master controls on the Local Aux Sends panel located to the left of the SL 651G and always appear at the 'split' Local Aux Send outputs on the patchbay. If the split buttons are *not* pressed then these sends will also appear at the main Echo Send and Cue Send outputs together with the sends from the right hand side of the console. If a Split button *is* pressed, two separate sets of outputs are available, separating the sends from the left and right hand sides of the console. If this seems confusing, the signal flow diagram on Page 9-7 should help.
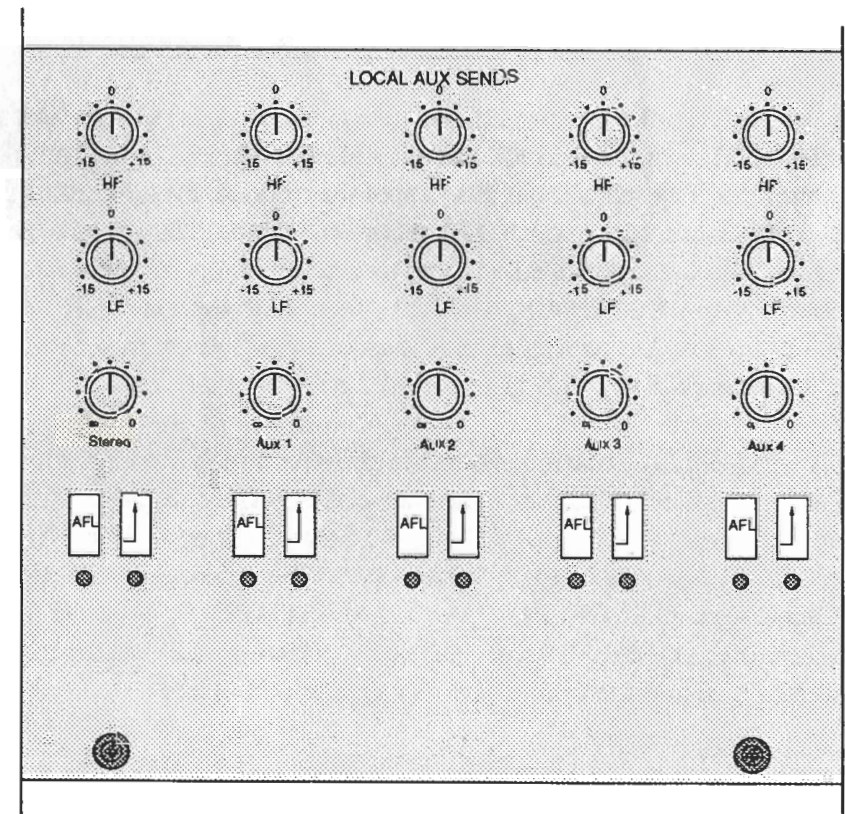
The reason that this 'split' facility has been added, is to make the system more flexible. When tracking and overdubbing, it is possible to separate the console into 'Source' channels to the right of the centre section and 'Monitor' channels to the left.

The 'Monitor' channels act as a multitrack mixdown section providing a monitor mix from the multitrack outputs to the main output mix busses and on to the control room speakers. Reverb and effects returns can also be brought into the mix, either on spare channels or via Small Faders. The sends from these modules are used to feed the headphones and monitor reverbs via the Echo and Cue Send outputs. The sends that feed the headphones (usually the stereo and first two mono sends) would not be split so that foldback can be derived from any channel on the console. The other sends (usually sends 3 and 4) would normally be split so that the left hand sends can feed the monitor effects devices.

The 'Source' channels are used to feed mics and line level sources (e.g. synthesisers) to the multitrack via the routing matrices at the top of each module. The sends from this side of the desk are used for adding reverb and effects to the sources for recording to tape. They need to be separate from the sends used on the 'Monitor' channels for enhancing the monitor mix. Hence the Split buttons are used to separate these two different uses of the send controls, allowing the 'Source' modules to feed their sends to the 'split' Local Aux Sends outputs.

There will be many occasions when the above situation does not apply (for example, when working in the standard I/O configuration, where sources are fed to the multitrack via the Small Faders on Channel 1 upwards and the Large Faders from 1 upwards are used as multitrack monitor faders (RECORD + VCAs TO MONITOR). In this case the Split buttons are not selected and the aux send busses will be common to all modules and the main Echo and Cue Send outputs

During mixdown, the split facility adds to the flexibilty of the aux system, with the choice of split or common busses available at the touch of a button.

Four terms have been used to describe the sends. They have the following meaning in this context:

AUXILIARY send - describes a send as it passes from the I/O and Stereo modules, via the master controls and out to the patch.

ECHO send - refers to the four mono sends before any reverb, talkback or external source has been added. These 'clean' sends are normalled to effects device inputs.

CUE send - the stereo and first two mono sends with talkback, stereo reverb return and external sources added. These outputs are for use as foldback sends to studio headphones.

LOCAL AUX sends - sends on the patch derived from the left hand side of the console via the Local Aux Send panel master controls.

Options

Standard G Series consoles have the Split Cues facility wired as described above. However, some consoles have been specified with the 'split' point away from the centre section of the desk, or even with the split feeds coming from the right hand side of the console and the main feeds from the left hand side. Check with your studio to see if these options have been implemented.

Signal Flow

The I/O module sends feed from the Channel or Monitor fader signal path to the six busses. Signals then pass via the master controls and appear on the patch.

The left hand busses feed the Local Aux Send outputs.

The right hand busses feed the main Echo Send outputs. Note that when the Split button is up, the Echo Send outputs are fed from both sides of the console. The stereo and first two mono sends are then returned to the SL 651G. The mono sends are each fed to two busses so that the Cue Sends appear as three stereo outputs. Before reappearing as Cue Sends they have talkback, stereo echo returns and stereo feeds from the External Source Selector mixed with them. Cue Stereo will be true stereo, as it was derived from the stereo send controls on each module. Cues 1 and 2 will be mono sends but with stereo reverb and external source feeds, if added.

The QUAD TO CUES button replaces cue signals with the main Quad Output mix folded down to stereo.
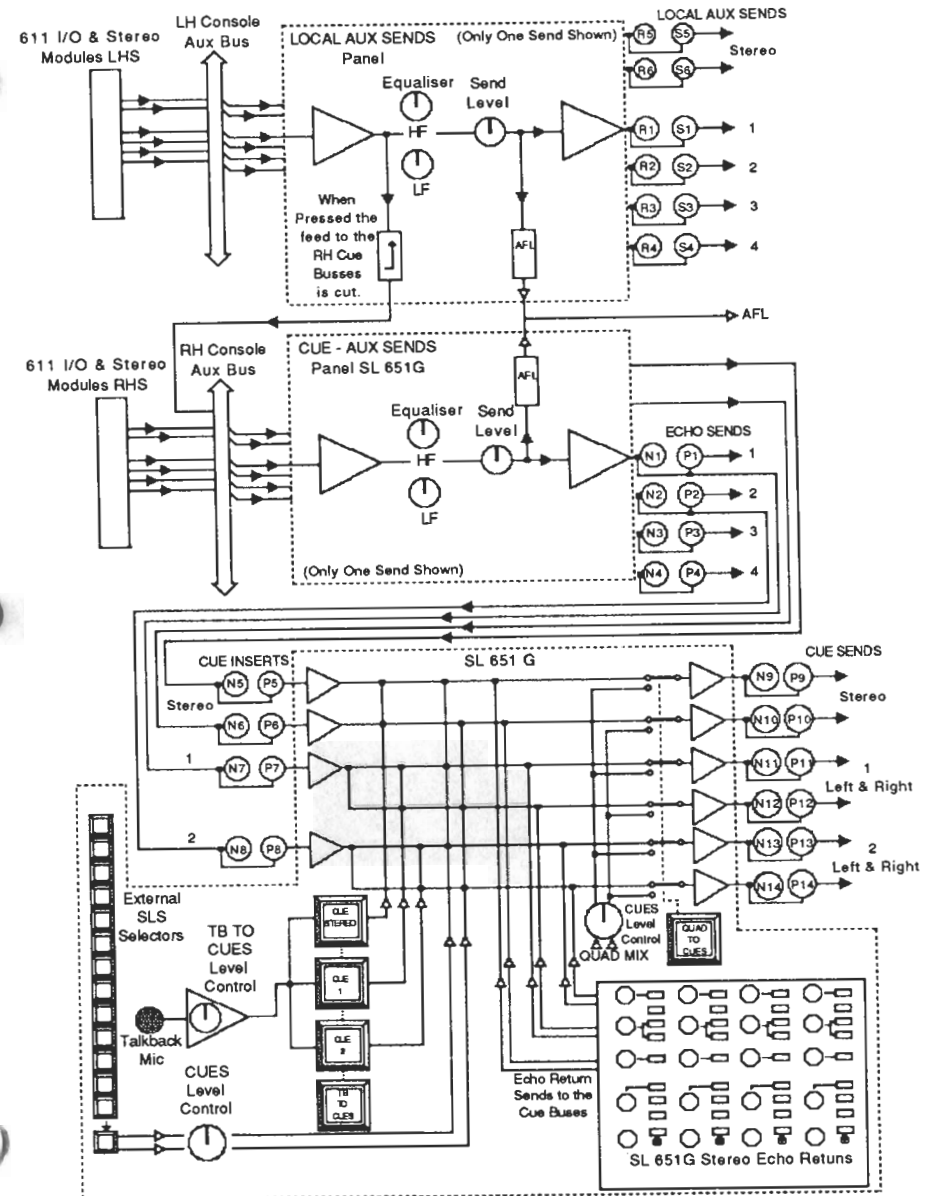
Applications Guide

The SL 4000 G Series Console is an extremely versatile piece of equipment which can be configured to operate in a number of different audio environments. Because of the inherent flexibility of the console we have included this applications guide to demonstrate various ways to approach real sessions.

For each type of audio recording we look at typical situations that you may be expected to have to cope with and then examine how the console may best be operated to achieve the required result.

You may only be interested in one particular area of audio. However, you will find it very useful to check through all the sections in order to see how the system can be configured to operate in different environments. It is also true to say that each area of recording has some relevance to another.

There are many ways to tackle each situation and we only cover some of the various ways of working. These examples should not therefore be looked upon as the way you must do it, but rather as some of the ways which can be used to achieve the required end result.

Zero the Console

Before you start it is probably best to zero the console.

I/O and Stereo Modules:

• All switches should be off (up), including Cue send level pots. Small Faders down.

• Set the following pots to their detent position:
Line input gain, HF, HMF, LMF, LF gain controls, Group Trim.

• The following pots should be set to the indicated value:
Dynamics Ratio to 1, Expand/Gate Range control to 0, Filters out, Cue send level pots to infinity (this is, in fact, pretty close to off).

• VCA thumbwheels to 0.

On the SL 651G:

• Main fader up, Aux Send levels off (pretty close to infinity), Echo Return levels off, Quad Compressor out, Select Status button required, all other status buttons off, CUES and STUDIO levels down, EXTERNAL TO STUDIO and EXTERNAL TO MONITORS off. All other functions should be off and those that can't be switched off don't matter!

Music Recording

Let's assume that we are recording a band to 24 track. Let's also assume that the band consists of a drummer, a bass player, a keyboard player, a sax player and a lead singer with dark hair.

The recording will go through three stages:

Basic track laying, overdubbing and finally an automated mix.

If you don't need to edit the multitrack, start by laying timecode on Track 24. This is useful if you are using the SSL Studio Computer as cue points can be entered as soon as the basic track has been recorded. From this point on, the computer can be used for autolocation, drop-ins, automated monitor mixes, Total Recall™ of console setups, track lists, notes pages etc.

Basic Track laying

Let's start with the bass and drums. Assume that the console has been zeroed. The console needs to be in Record status so hit the **RECORD** status button on the SL 651G. All channels switch to Mic input and feed via the Large Faders to the multitrack Routing Matrix. The multitrack will also switch to the Sync head.
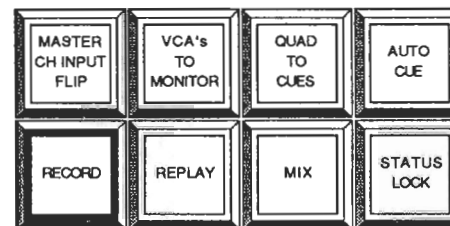
Plug up the mics (with the faders down!) to Channels 1-24 (twenty-two for the drums, bass DI into Channel 23 and a bass cabinet mic into 24). With luck, and the faders and mic gain controls in useful positions, you should see and hear nothing. This is because the channels are not routed anywhere. So route each channel to a multitrack Group(s). If you need to pan between Groups (e.g. the seven toms to Groups 4 and 5, which will act as a stereo pair) select the two Groups and switch in the multitrack routing pan control to pan the channel send between the selected Groups. Check the flow diagram on Page 7-7 to see the signal path in more detail.

The Routing Matrix can be bypassed if the channel is carrying the same signal as the the track. So if we have the bass drum mic coming into Channel 1 and we want to record it on Track 1 only, it can be sent directly by pressing the **DIRECT** button. Because the Routing Matrix and Group mix amplifier are bypassed, the noise figures will be improved. Note that when the **DIRECT** button is pressed no other channel may route to that Group.

You still have dead meters and monitors? The monitor faders are probably looking at the multitrack outputs (**READY TAPE** is selected or both **READY GROUP** and **READY TAPE** buttons are off) so select **READY GROUP** for
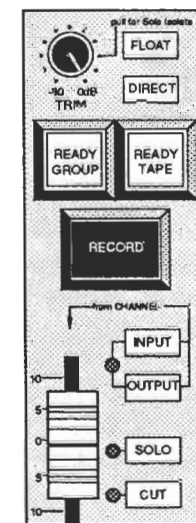
each track that you wish to record to. This selection will also allow you to set that track to Record Ready with the module **RECORD** buttons. Now the Group Outputs will be feeding the monitor faders and meters, so you should be able to set up a quick monitor mix on the Small Faders, the pan controls at the bottom of the modules allowing you to set the stereo position of each Group Monitor signal. If the tape machine is in Auto-input, you will hear the same signal by selecting **READY TAPE**, as the machine will be returning the Group signal to the desk.

The **GROUP TRIM** controls on each module can be used to attenuate the level feeding the Group Outputs and these should normally be left fully up. If the level is too high, first check that the channel fader is set around the nominal '0' level. Then adjust the input Line or Mic trim pot. The Group Trims should be used for adjusting the level of Groups that are fed from several channels (i.e. the tom tracks, 4 and 5, are fed from seven tom mics). If the Group level is too high, it is easier to adjust the Group Trims than to take down the level of all the tom mics and maybe upset the overall balance.

If things are still dead, check the module meter. OK - so it is getting to the machine. Check that the **READY GROUP** button is selected and the monitor fader is up. OK - so it is going to the Quad bus. Now check on the SL 651G that all controls are zeroed (see above). The main fader should be up, EXT TO MONITORS off etc. Now check that the monitor amps are on, take out you earplugs and panic.

Still nothing? Try the main MONITOR level pot!

The Large Faders will control the level to tape and the Small Faders will control the monitor mix level. You are actually monitoring via the main Quad output. Most engineers prefer to feed the multitrack via the Small Faders, using the Large Faders for the monitor mix. This can be achieved by pressing the **VCAs TO MONITOR** button on the SL 651G. In RECORD status this simply flips the two faders. From now on we

MASTER CH INPUT FLIP	VCA's TO MONITOR	QUAD TO CUES	AUTO CUE
RECORD	REPLAY	MIX	STATUS LOCK
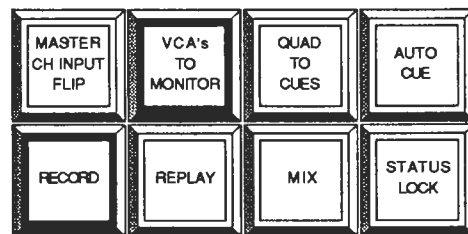
will assume that you have **VCAs TO MONITOR** selected. See the signal flow diagrams on Pages 7-8 and 7-9.

G Series consoles are fitted with a **VCA TO MON INHIBIT** button. This prevents the fader flip on Module 25 and upwards, with the result that the multitrack can be monitored on Large Faders 1-24 and the mics can be plugged up to Channel 25 and upwards, to feed the multitrack via those Large Faders. This simply separates the Channels (on the right) from the Monitors (on the left), for those who prefer to split the desk in this way.

For most people the distinction doesn't matter and each I/O module may handle a Mic or Line input feeding a multitrack Group as well as carrying a monitor fader fed from a multitrack Group.

We need reverb on the monitors, so patch Aux Send 3 to the reverb input and the reverb returns to Tape Monitor Inputs 25 and 26. Aux Send 4 can be used for a second device, the returns being patched into Tape Monitor Inputs 26 and 27. You will hear these inputs, if the monitor is selected for them (i.e. **READY GROUP** and **TAPE** both off or **READY TAPE** only selected) via the Large Fader.

"What about reverb on the toms tracks?" you shout. Well, in that case plug the reverb returns into Channel Line Inputs 25 and 26 and **FLIP** the inputs to Line. Route the reverb return to the appropriate multitrack Group (in this case Groups 4 and 5) via the Small Fader (remember we have **VCAs TO MONITOR** pressed) and you should have the desired effect.

Maybe you need to gate the reverb, triggered (keyed) by the toms. This is an interesting effect and neatly demonstrates the inter-module routing that makes the console so versatile. You have already routed the toms to Groups 4 and 5. Also route them to Groups 25 and 26. Gate the reverb return channels by switching the Dynamics on Channel 25 and 26 to **CH IN** or **CH OUT**. To externally trigger the gate, simply push the **MON** button as well as the **CH** button. The gates will be triggered from the monitor input to that module (i.e. Group 25 and 26) if you now select the **READY GROUP** button.
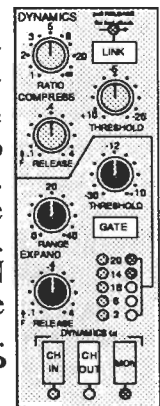
Set the Gate (or Expander) controls so that the reverb signal is gated at the correct threshold level from the Group Monitor signal. If required, the Group Trims on 25 and 26 will attenuate the level of signal feeding the Dynamics' sidechain. This may sound confusing. If so, read it again.

If it still sounds confusing, try once more or give up.

What about triggered reverb on the monitors only? In this case, plug the reverb returns into the Channel Line Input, route to the LF and RF busses at the top of the module (remember that the channel inputs feed the multitrack groups at the top of the module and that there is also access here to the main Quad output busses). As before, you can switch the Dynamics to **CH IN** or **CH OUT** with the **MON** button pressed and having selected **READY GROUP**, the gate will be triggered from multitrack Groups 25 and 26 which have the toms signals on them (see Page 8-13). Again this is easy to do but hard to grasp for the first time. Maybe you didn't want gated reverb after all?

What about EQ? Well, now is the time to switch it in with the **CH** button where needed. The same applies to the Dynamics section. If you want the Dynamics pre-EQ then select the **CH IN** button. For Dynamics post-EQ, select the **CH OUT** button. There are many more combinations of EQ and Dynamics routing - see Section 8.

Remember that the EQ and Dynamics sections can be used on both the Monitor and Channel signals. This allows you to try something out on the monitors before you decide to switch the effect into the channel and commit it to tape. However, you can only toggle EQ and Dynamics between Channel and Monitor on the same module, if the Channel is feeding the same numbered track. It is quite likely that the Channel signal will be monitored on a different module, in which case you will need to transfer the EQ and Dynamics settings to the Channel module after your experimentation.

The insert point can be switched pre or post-EQ and has an **IN** switch which is useful if you need to switch effects in and out while recording. The insert points can be configured in two ways (Page 2-10). If your inserts are permanently in the channel, effect units can still be inserted in the monitor chain before the Tape Monitor Input jacks (Row K).

You should have a good monitor mix by now and this can be sent to the studio headphones by simply pressing the **QUAD TO CUES** button on the SL 651G. Set the correct level on the **CUES** level pot, just below the Status buttons. This allows the musicians to hear what they are doing while you get a foldback mix together with the cue send controls on each module.

Select the **EXTERNAL TO MONITORS** button and the **CUE STEREO** button on the External Selector bank above. You are now monitoring the stereo cue output to the headphone amps (interrupted at this moment in time by **QUAD TO CUES** which is feeding the headphone amps with a straight Large Fader monitor mix). Set the Cue Stereo Master send level to about 2 o'clock, and get a stereo cue mix together on the module cue send controls.

You should be picking up a pre-fader send from the monitor (Large) fader for each multitrack Group you are monitoring. Switch the send on by pressing the level control down. When you are as happy as you ever will be, simply deselect the **QUAD TO CUES** button. The headphones will now be fed from the stereo cue mix. Deselect the **EXTERNAL TO MONITORS** button on the SL 651G otherwise you will forever be monitoring the Cue Stereo mix!
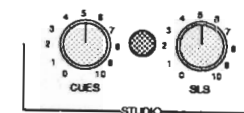
You can talk to the musicians by pressing the **CUES** button in the communications section of the SL 651G or talk to the Cue sends individually on the buttons below. If you select **AUTOCUE**, the **CUES** button will latch on, allowing you to talk to the cues whilst the tape machine is *not* playing. Very useful for instant hands-off communication but avoid comments like "That was the worst bass playing I've heard
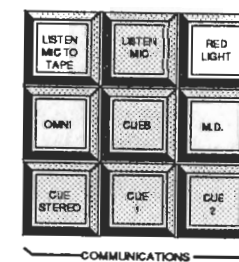
in my entire life", as you may be unaware that people are listening!

If you want to listen to someone in the studio, simply press the **LISTEN MIC** button. Again this is to be found in the communications group of buttons at the bottom of the SL 651G. There should be two mics hanging in the studio, connected to two mic amps whose gains are controlled by the **LISTEN 1** and **LISTEN 2** controls at the top of the SL 651G. The mics can be cut off by pulling up the appropriate level control. You will find that these two mics come up on the jackfield (R38 and 39) and other mics can be substituted here in S38 and 39 if you wish. Some studios have tied the **LISTEN MIC** button to the **AUTOCUE** facility so that the button latches on if selected when the tape machine is *not* playing, thus allowing continuous two way talkback automatically. Be a little careful here that you get the levels correct, to prevent feedback.

When you are happy with the rehearsals, prime each track by pressing the module **RECORD** buttons and get something down onto tape. When you have done a take you wish to hear, simply rewind the tape and play it back. But you will hear nothing on the monitors as long as the **READY GROUP** buttons are pressed, as you will be monitoring the Group Outputs and not the returns from the multitrack. You could go along all the modules and deselect **READY GROUP** but there is a much simpler method.
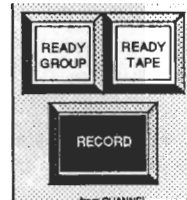
Simply press the **REPLAY** status button on the SL 651G and all the **READY GROUP** buttons will be electronically defeated (those that were selected will go to half brightness showing that **REPLAY** has been actuated). The multitrack will automatically switch over to the Replay head. You can now hear the playback through the monitor faders with the same balance as you had when monitoring the take. As the Quad bus is always used for the monitor mix, you can record this rough mix straight to all the stereo machines normalled to the main desk output.
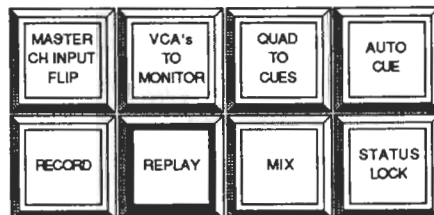
Since **REPLAY** status deselects **RECORD** status, the SLS feeds will be enabled and you can now select **EXTERNAL TO STUDIO** and **QUAD BUS** on the External Selectors of the SL 651G (see Page 4-10). This allows the Quad bus mix to be sent to the Studio Loudspeakers via the SLS level control so that the musicians can hear the playback.
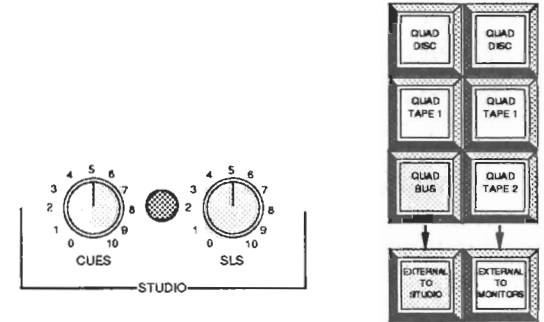
To prepare for another take, just return to **RECORD** status and like magic all the **READY GROUP** buttons will go to full brightness.

If you need to bounce a couple of tracks, the **FLOAT** button can save a lot of time. Say we wish to bounce the drum tracks across to Tracks 21 and 22. (Having recorded eight tracks of drums, we find that we will need more tracks than we have free space). This is simple. The monitor mix of drums coming from the eight Large Faders can be re-routed to the multitrack by hitting the **FLOAT** button on each of these eight modules and selecting Groups 21 and 22 at the top of each module. Select **READY GROUP** on Modules 21 and 22 and monitor the bounce on those two modules' Large Faders. It's as simple as that.
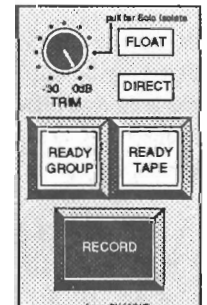
The above description only covers use of the standard I/O modules. If you wish to use any Stereo Modules that the desk may be fitted with, simply plug the source into the Line Inputs and route the signal to the required destination via the Routing Matrix at the top of the module. The operation of stereo channels is much simpler than the standard I/O modules, due to the fact that there is only one stereo signal path through the module. With external SSL Mic Preamplifiers, the stereo modules may be used with stereo mics. You could also patch out of a pair of Channel Insert Sends and use those I/O module Mic preamps.

If you are using M/S (Sum and Difference) techniques, simply select the **M/S** button. The left hand input should be fed with the M signal and the right hand input with the S signal.

Stereo Modules can also be used for stereo audio subgroups, with EQ and Dynamics, which can then feed the multitrack. Take the example of the tom tracks. Instead of routing these to Groups 4 and 5 they could be routed to a pair of unused Groups, say 31 and 32. The Group Outputs (G31 and 32) can now be patched across to the Stereo Module inputs and the resultant stereo signal routed via Groups 4 and 5 to the multitrack.

Split Console Recording

Basic track laying, as described above, uses the console as a true in-line system. However, there is an alternative way to record basic tracks. The console is 'split' so that all sources are plugged up to the right hand side of the centre section and the left hand side is used for the monitor mix. The main advantage of this way of working is that the EQ and Dynamics sections do not have to be shared between source and monitor, as is the case with in-line working.

The desk can still be worked in **RECORD + VCAs TO MONITOR** status. Mics and line sources are patched to the right hand side inputs and and sent to the Routing Matrices via the Small Faders. Any EQ or Dynamics treatment required is switched into the channel, where appropriate.

The left hand side of the console is used for the monitor mix. The inputs are still selected using the **READY GROUP** and **READY TAPE** buttons feeding the Quad bus via the Large Faders. All the EQ and Dynamics sections are available for the monitor mix as none of these are being used for the source signals.

The Local Aux system is useful in this mode. Aux 3 and 4 can be split using the buttons on the LOCAL AUX SENDS panel. The source signals on the right hand side of the desk can feed the main Echo Send patch outputs, for adding reverb onto tracks with the sources. Aux 3 and 4 can be used separately by the monitor section for sending to two different devices, which can be returned into the monitor section to add effects to the monitor mix.

Overdubbing

The second step in the recording process is overdubbing. The console allows you to do this is two ways.

1. Stay in **RECORD** status and record in exactly the same way as above, the only difference being that you deselect all the **READY GROUP** buttons on the tracks that you have just recorded and select **READY GROUP** and/or **READY TAPE** for the tracks that you are about to record onto.

2. Press the **RECORD** and **MIX** status buttons on the SL 651G simultaneously. This is logically called Record and Mix status! The tape machine will switch to Sync. This status allows you to build up a mix on all channels except those associated with tracks that you are recording to. The advantage of this way of working is that as the overdubbing proceeds, you get closer to the final mix and the desk can be set up in exactly the same way as you would for the mix, while still adding tracks. Again, the split way of working is very useful here, as the left hand side of the console can be set up as a full mix section and the right hand side used for sources feeding the Routing Matrices.
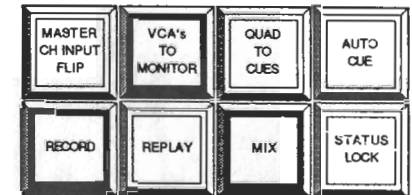
However, if you have many source channels (e.g. twenty-eight synthesiser outputs), depending on the size of the console, you may need to work in **RECORD** or **RECORD + VCAs TO MONITOR** status if there are not enough Large Faders to work in the split mode.

For the purpose of our example we will look at the recording we have made so far: Drums on Tracks 1-8, Bass to Tracks 9 and 10.

Select **RECORD + MIX** status. Let's assume that we now wish to overdub synthesisers.
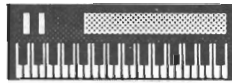
All inputs will switch to Line and as the multitrack is normalled to the Line Inputs, the first ten channels will receive the Drums and Bass that we recorded previously.

The inputs feed the Large Faders and then the main Quad bus via the Left/Right and Front/Back pan at the bottom of the module. A mix can be made using EQ and Dynamics in each channel as required.

We now want to lay the first synth overdub onto Track 11. Several tracks will be needed, fed by different synthesisers, sometimes on their own but sometimes simultaneously with others (the wonders of MIDI!).

The most sensible way to do this is to leave Channels 11-24 clear for overdubbing. Set up the keyboards to feed Channels 25-32 (we only have four stereo keyboards I'm afraid). Patch reverb and effects into Channels from 33 upwards or into the Tape Monitor Inputs (Small Faders) on channels not being used for overdubbing (i.e. not Channel 11) and route these to the multitrack or the main Quad output bus via the Routing Matrix at the top of the module.

The keyboards will now be feeding the main output busses via the Large Faders. This is useless, as they need to go to the multitrack. So **FLOAT** Channels 25-32 off the main busses and send them to Track 11 via the Routing Matrix. But wait, there is an easier method!

When in RECORD and MIX, all modules behave as in **MIX** status *unless* either a **READY GROUP** or **READY TAPE** button is pressed. In this case, that module reverts to the **RECORD** mode (i.e. Channel Input to Routing Matrix via Large Fader and Monitor Input to main output busses via the Small Fader). So to overdub onto Track 11, just select **READY GROUP** on Module 11. The Large Faders on Modules 25-32 will set the levels feeding the multitrack and the Small Fader on Module 11 will allow this feed to be monitored, together with Channels 1-10. As before, if the **VCAs TO MONITOR** status button is pressed, any module in the **RECORD** mode will now feed its source to the Routing Matrix via the Small Fader.

Again the module **RECORD** button can prime or drop in Track 11 and the synth can be recorded. The musician will always hear Module 11's Group Output, but if you need to drop in on a mistake, you will want to hear the signal off tape. This is where the SSL Supercue system comes to the rescue. By selecting **READY TAPE** *and* **READY GROUP**, the (Large) monitor fader will be fed with a 1:1 mix of the Group Output and the tape return.
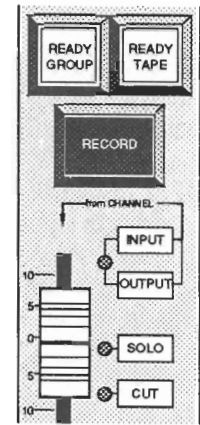
Both you and the musician (assuming he is listening to the Cue system on headphones) can now hear this 1:1 mix. The keyboard player can always hear himself and will also hear the Sync output of Track 11 whenever the tape is playing. (See the table on Page 2-23 for the different monitoring combinations of READY GROUP and READY TAPE buttons) As soon as the track drops into record he hears only the Group Output.

The other, more usual, monitoring combination can be achieved by selecting **READY TAPE** only. In this case the engineer can hear the tape signal and will be able to monitor the drop-in exactly. The musician still receives a 1:1 mix so his monitoring is identical to the **READY TAPE** and **READY GROUP** situation above.

With Track 11 completed, deselect the **READY TAPE** and/or **READY GROUP** buttons. Module 11 now behaves in the same way as the other modules and Track 11 can be added to the mix via the Large Fader. If you need to add more synth tracks, simply deselect Group 11 on Channels 25-32 and select another track.

Repeat the process for several months.

This is a good time to take a break.

Although the process is fairly easy once you get the hang of it, it may be extremely confusing first time round.

If you only have a single mic source to overdub onto one track, plug this into the Mic Input of the module corresponding to the track you are recording onto. Let's assume you need to add a guide vocal onto Track 15. Plug the mic into Channel 15 and hit **READY GROUP** and/or **READY TAPE** on Module 15. Select the **DIRECT** button and the mic will be fed directly to Group 15. Monitor as before on the Large Fader.

To track bounce in this mode (the same example with the drums) **FLOAT** Modules 1-8 off the main mix busses and select Groups 21 and 22 on the Routing Matrices. As before, select **READY GROUP** on Modules 21 and 22 and monitor the bounce as a normal overdub.

G Series Automation and Total Recall™

Now that the G Series computer is fitted with 20MByte Data Cartridges, it makes much more sense to use Total Recall during this stage of the recording process.

All the fader levels, EQ and Dynamics settings for the source channels can be stored on one disc and recalled at a later date. This is especially useful if you need to re-record a track or section of a track, because Total Recall allows you to exactly match the new source with the settings used during the original recording. Before, this process used piles of discs and was a pain. Providing that you sensibly name the TR setups, any setting can be accessed within seconds.

The 'split' method of working the console also helps this recall process as all channels on the left hand side of the console will be saved as monitors and those on the right will be the sources.
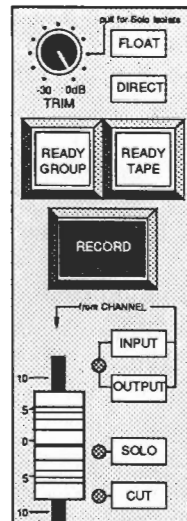
With the additional storage capacity of G Series, it is now possible to store and replay automated monitor mixes for each song, without having to dig through stacks of discs.

The possibilities are endless.

Phew!

Now back to the Console Operator's Manual.

Mixing

If you haven't already recorded timecode on the multitrack (you obviously didn't use a SSL for overdubbing) and you intend to use the Studio Computer, this is the time to panic if you don't have any spare tracks. Check the Computer Operator's Manual for details of the automated mixing system.

Back to the console. Select **MIX** status and zero the desk.

All channel inputs are switched to Line and feed via the Large Faders to the main Quad outputs. The Small Faders feed the Routing Matrix and the machine is switched to Replay.

The multitrack will of course come up on Channels 1-24 (or more with a 52 track machine) and you should patch reverb and other effects returns to the spare channels. If you think that you will require audio subgroups, leave a couple of channels free between Channels 1-32 as these can all be accessed by any other faders and used as subgroups, as we will see later.

G Series consoles are all fitted with a facility called **CHANNEL IN TO METERS**. Normally, with this button off, the meters above each I/O module look at the Monitor Input (either the Group or Tape signal depending on the READY GROUP and READY TAPE selections).

This is fine while recording but during mixdown it is useful to see the channel input on these meters. As the tape returns are normalled to both Line Inputs and the Tape Monitor Inputs, confusion can arise if the meters are looking at the Monitor inputs, especially if the Channel Line Inputs have been crosspatched with another source. When CHANNEL IN TO METERS is deselected, the meters will look at the outputs of the multitrack machine (provided **READY GROUP** or **VCAs** to meters have not been selected). When CHANNEL IN TO METERS *is* selected, the meters will look at whatever source (Mic or Line) has been patched into the channel input.

While on this subject, there is one variation of this facility that can be useful during the recording process if the console is being operated in a 'split' mode (i.e. monitor mix on the left and sources on the right of the centre section). If the Channel In to Meters function has been split into two or more sections, there will be a button labelled **CHANNEL IN TO METERS RHS**. This allows the meters on the left hand side of the console to meter the multitrack via the Monitor Inputs and meters on the right hand side to meter the sources (Mics or Lines) via the Channel Inputs.

The great thing about SSL consoles is that you can use any of the Small Faders as additional inputs to the main mix busses. A 56 channel console actually has 112 fader inputs available for mixing (see Page 7-17).

Any signals that you wish to automate should be in the Channel path, as the Small Faders are not hooked up to the automation system. However, all is not lost, as the Small Faders can be subgrouped to the Large Faders which, of course, are linked to the automation system. You can also patch additional inputs via the patchable Stereo VCA faders and then into Small Fader inputs. These patchable VCAs are also useful for automating stereo echo returns.

A common problem can be a 48 track mix using a 40 channel desk. In this case, buy a bigger console! No, we must be serious. Plan the inputs carefully. If there are groups of tracks that can be grouped and then automated, these are best patched to the Small Faders and subgrouped to one or more channel inputs.

Let's assume that we are remixing a 48 track and that there are eight vocals which will form a stereo backing (see Page 7-18). They can be patched to Small Faders 1-8 via the Tape Monitor Inputs, Row K.

Route the Small Faders to Groups 25 and 26 at the top of each module and switch in the routing pan. Select **SUB GP** on Channels 25 and 26 and these channels will now pick up the vocals. You now have overall EQ and Dynamics capability as well as automation. The alternative method is to patch from Group Outputs 25 and 26 (G25 & 26) into a Stereo Module if you are fortunate enough to have some of these fitted.

You can also use the Small Faders as additional effects sends. If you need to do this, avoid using these faders as extra inputs on the modules where you need additional sends.

For the main vocal on Channel 18 you may need an additional delay as well as the usual effects hooked up to the stereo and four mono Aux Sends. In this case the Small Fader will be needed as an extra send from this channel, so don't plug one of those backing vocal tracks into this Tape Monitor Input.

The **INPUT** and **OUTPUT** buttons next to the Small Fader can pick up the signal from the channel (see Pages 2-25 & 7-21). Let's assume we need a pre-fade send after the EQ. Select both **INPUT** and **OUTPUT** buttons. Select Group 32 on the Routing Matrix and patch Group Output 32 (G32) into the delay unit. The Small Fader will now act as your send level control.

What about subgroups? Well, there are five different ways of doing this covered in a special section so there is little point repeating all that. We will however explain which subgrouping methods you can use for specific examples in a typical mix.
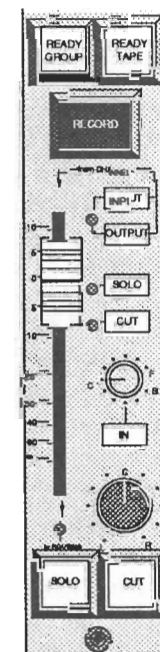
VCA Subgroups

If you simply need level control of a group of signals, then use the VCA Group Faders situated in the centre of the console. In our mix we can select the two Bass faders (Ch 9 and 10) to VCA Group 1, using the thumbwheel switches on these faders.

Large Faders to Large Faders

The eight Drum tracks need to be combined into a stereo group that we wish to EQ and compress, so **FLOAT** these channels (1-8) off the Quad bus and route them to Groups 29 and 30. Select **SUB GP** on Channels 29 and 30, which will now act as audio subgroups.

Large Faders to Small Faders

The above has taken up two additional Large Faders. OK, so the Drums may need to be faded out by the computer. But if they don't and you still need an audio subgroup, we can route all the Drum channels to a pair of Small Faders instead. As before, **FLOAT** Channels 1-8 and route them to Groups 29 and 30, but this time select **READY GROUP** on Modules 29 and 30. The inputs to Small Faders 29 and 30 are now fed with the Group monitor and if they are routed to the Quad bus at the top of the module, we have the two Small Faders controlling the overall Drum levels. EQ or Dynamics can be switched in with the **MON** button. The patchable VCAs can be used here beween the Group Outputs and the Group Monitor Inputs, to automate this stereo subgroup with one fader and you avoid wasting two complete channels.
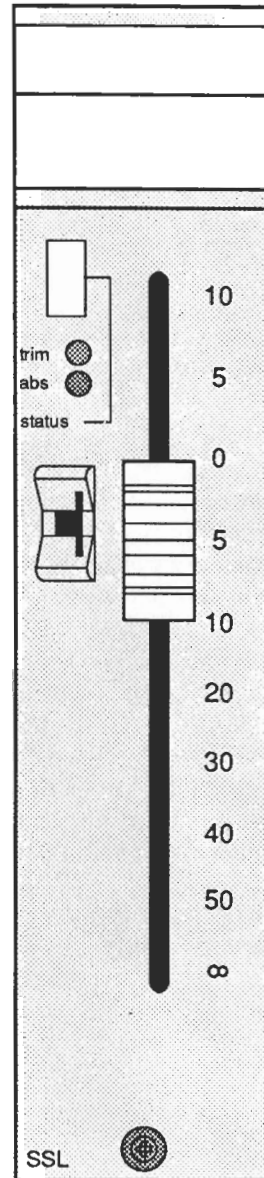
Small Faders to Large Faders

This is covered on Page 10-17, in the example of the vocal backing subgroup using a pair of Large Faders.

Small Faders to Small Faders

Assume that the eight vocal backing tracks, that are patched into Small Faders 1-8, need audio subgrouping for overall EQ and Dynamics. However, we do not need automation as the tracks are clean and they sing most of the way through the number. So we don't need to use a Large Fader for the subgroup. In this case the tracks are sent to Groups 29 and 30 from the Small Faders on Modules 1-8 as before. However, this time we can hit the **READY GROUP** buttons on 29 and 30 and pick these signals up on the Small Faders, routing them to the busses via the Quad routing buttons at the top of the module. Don't forget the patchable VCA option here as well. Simple and very versatile!
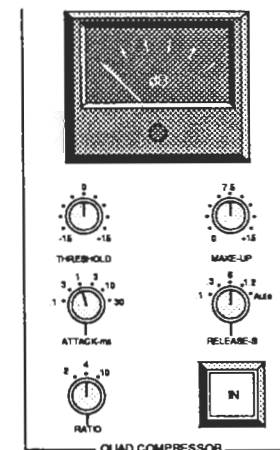
Finally, before you commit the mix to tape, try the compressor on the main Quad output.
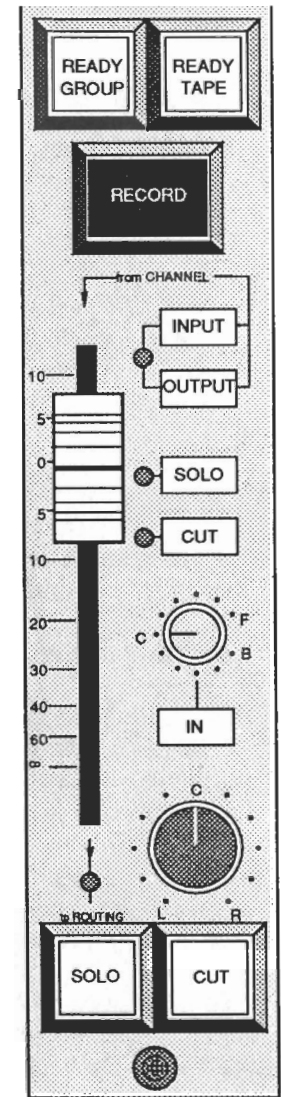
Remote (Mobile) Recording

There are now several SSL consoles in mobile environments and although the operation is usually one of track laying, there are occasions, usually in Television work, when it is essential to provide a stereo mix in addition to a multitrack back-up tape.

There are two basic ways to tackle the problem:

1) Work in the same way as a recording studio would. In other words put the desk into **RECORD** status and route all Channel Mic/Line Inputs via the Large Faders to the multitrack Groups. The stereo mix can be derived from the twenty-two Groups (assuming use of a 24 track with timecode) via the Small Faders and the main Quad output busses. Selecting **VCAs TO MONITOR** will flip all the faders so that the inputs are routed to the multitrack via the Small Faders and the show is mixed down on the Large Faders.

2) Set the desk in the **MIX** mode and audio subgroup from Large Faders to Large Fader those signals that need to be grouped for the multitrack. Then use the Small Faders as sends on all the channels that need to be routed to the multitrack. Take the pre-Large Fader signal from the channel, by selecting both **INPUT** and **OUTPUT** buttons next to the Small Fader, and assign the fader to the appropriate multitrack Group.

Let's look at the advantages and disadvantages of each approach.

Method 1

The desk is in **RECORD** and **VCAs TO MONITOR** mode. The inputs to the console come up on Small Faders and are routed to multitrack Groups. The Large Faders mix the Group Outputs to the main Quad output by selecting **READY GROUP** on each of the first twenty-two modules.

You achieve two things. First of all you know that what is going to the multitrack is OK because you are deriving your stereo mix from the multitrack feeds 'on-the-night'. Your mix will be much simpler as you are only working from twenty-two faders plus effects returns. You will also have a very clear idea of any problems that you may encounter when you eventually come to the remix, as you will have already done the mix once on the night.

In some cases (especially in broadcasting), the on-the-night mix may be acceptable for use at a later date and may simply need small corrections at various points. With Total Recall, the desk in the remix room (hopefully a SSL!) can be set up in exactly the same way as on the night of the show, to remix the unacceptable sections for editing back into the on-the-night mix.

The disadvantage of this way of working is that you will only be able to have as many sources as channels on the console. The Small Faders or (if **VCAs TO MONITOR** is pressed) the Large Faders, will be used for the stereo mix and therefore cannot be used as additional inputs.

To avoid this problem on larger shows, it is wise to use external submixers for additional inputs. Say you have a 48 channel console and you need sixty inputs to the desk. This would be simple if there was no multitrack, as the additional twelve inputs could be brought in on the Small Faders and routed to the output busses. However, in this method of working you need to route these to multitrack Groups and then mix these Groups to the main outputs. So you will have to use external submixers.

SSL manufactures a stereo rack mounting submixer for this very application. In our example above, we could plug up ten audience mics plus eight mics on the brass section of the band to the submixer, routing these to Output Groups 1 and 2 respectively (the SSL submixer

has four stereo output groups available). This would leave six modules on the desk free. The outputs from the submixer could then be patched into four of these free channels (or two Stereo Modules) and the problem is now solved.

It should be remembered that any changes in level on the channel faders routed to the Groups, will affect levels recorded on the multitrack. For example, if the engineer decides that the internal mix of the brass is wrong and alters it, these changes will affect the multitrack feeds, making the remix at a later date slightly more difficult as the balance of the brass tracks will alter during the programme.

This method of operation is adopted by most remote recording trucks using SSL consoles.

Method 2

This method is favoured by some broadcasters, as feeds to the multitrack are completely independent of the main mix. In Method 1 sends to the multitrack form the basis of the stereo mix. This method effectively sets up two separate mixes. The first is the 'on-the-night' mix and the second is the mix of sends to the multitrack.

The sources are subgrouped as required for the mix and then the Small Faders are used as sends to the multitrack groups. If the subgrouping has been sensibly organised, there should be no more than twenty-two channels, including subgroup control channels, for the main mix.

With no audio subgroups and forty-eight channels routed directly to the Quad bus, there is the problem of how to condense these down to twenty-two multitrack Groups. All the module **INPUT** and **OUTPUT** buttons next to the Small Faders must be pressed and the Small Faders will now feed the channels' pre-Large Fader signals to the multitrack. The grouping of signals to the multitrack will have to be setup on the Small Faders.

For example, a band with twenty mics needs to go to six tracks of the multitrack. All the brass channels can be routed to, say, Groups 16 and 17, the balance of the Group being determined by the Small Fader levels and so on. Monitoring of these outputs has to be carried out externally from the desk as all the Small Faders are being used as sends from the channels.

The one and only advantage of this system is that the multitrack sends are completely independent of the main mix; whatever happens on the night, the multitrack levels will be intact. This may be an advantage in the case of another remote truck wanting many feeds from your desk for its own use. If they are not happy with the grouped sends that you want to supply, this could be the solution. In this situation, the direct output facility on the console is useful. Pressing **DIRECT** on every module not being used as a subgroup will provide another truck with a feed from every channel and do away with the need for mic splitters.

The disadvantages are as follows. The remix from multitrack will be completely different from the mix on the night. The engineer at the desk has no idea of what is going on with the multitrack sends, apart from an indication on the meters, and cannot control them adequately unless he has some means of monitoring them.
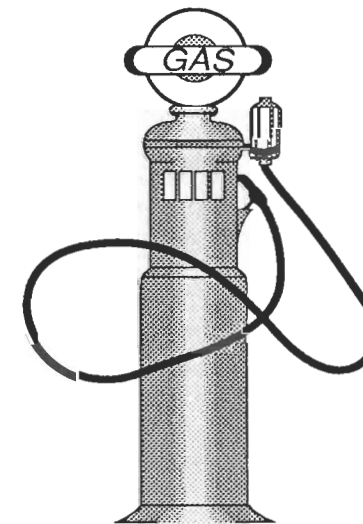
Audio Post-Production

Introduction

Solid State Logic now manufactures two different types of Post-Production Console:
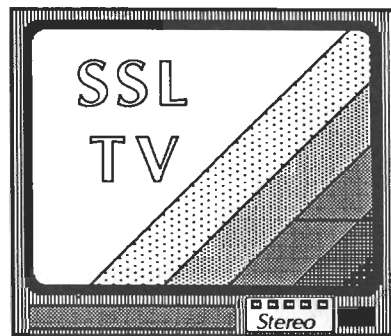
1) The SL 6000 E Series Stereo Video System is a derivation of the SL 4000 Series and as such will be familiar in operation to anyone who has worked on an SL 4000 Series Console (see Page 1-4 for a detailed account of the differences). It is basically an SL 4000 E Series Console with the addition of three dedicated stereo subgroups for splitting the mix into Music, Dialogue and Effects outputs, whilst at the same time providing a composite mix for layback to a VTR or ATR.

2) The SL 5000 M Series Audio Production System was introduced in 1986 as a system designed for Broadcasting, Film Studios and Video Post-Production houses that wanted dedicated custom consoles for specialist applications. Each SL 5000 console utilizes the same basic architecture but with unique channel and output configurations which exactly match the requirement of the studio. For example, a Film dubbing console may require mix busses in several sets of up to eight outputs, while a Post Production house might need four sets of stereo audio subgroups and a main stereo programme output.

One of the main considerations when dealing with Audio post-production is the requirement to split the mix into stereo or mono components, usually Music, Dialogue, Effects and sometimes Audience reaction. It is this one requirement, together with the monitoring and machine control for these mix minus feeds that is characteristic of post-production work.

As a result of this requirement, the SL 4000 G Series console will never be as suited to this type of work as the SL 6000 or SL 5000 Systems.

However, the SL 4000 G Series is a very flexible system and it is possible to configure the routing to accommodate some of these requirements. If all that is required is a stereo (or indeed a 4 track) mix to picture, then the SL 4000 G Series will provide better facilities than practically any other system in the world. Laying tracks and mixing can be accomplished in an similar manner to that described in the Music Recording section of this applications guide. If there is a requirement for mix minus feeds, then some I/O or Stereo Modules will have to be configured as mono or stereo subgroups. If only a mono final mix is required, the four main Quad busses can quite easily provide the Music, Dialogue and Effects split.

In this section, various methods and helpful hints for console operation in the post-production environment will be looked at. As you will see, the SL 4000 G Series console and associated options offer an incredible amount of flexibility and power (even fun) in solving the many problems facing the audio post-production engineer.

Room Setup

One of the many challenging aspects facing audio post-production work is the incredibly large amount of different types of source material. In a well equipped audio post room you will find a multitude of machines to play back this source material. These include video machines, mag decks (to play and record audio on film stock coated with magnetic oxide), cart machines, compact disc players, disc turn-tables, 1/4 and 1/2 inch mono/stereo/centre-track timecode/pilot tone machines, to name but a few. All of these plus a record machine. This has generally been left to 24 track analogue and more recently, digital machines (although any multitrack from 4 to 32 tracks may be used).

OK, now that we have a machine room the size of a Zepplin hanger, a bunch of cables running in the general direction of the console and a client overloaded with bags of tapes with questionable markings, "What's next?" you ask.

Beginning the 'Typical' Session

The first and highly recommended task is to record continuous timecode onto the multitrack (hereafter assumed to be a 24 track). It should be recorded for at least the length of the programme to be mixed. This gives a solid reference to start building elements onto, and reduces the chance of messy sync problems that can bite you later.

Caution:

If video is to be used at *any* stage in the project, a video-referenced timecode generator should be used. Unfortunately, the built-in SSL timecode generator is not able to be referenced. It can of course be used for mixing and synchronising on audio *only* sessions.

Track Laying

Most audio post-production jobs involve the proper placement in time and recording of a single (or very few) track(s) at a time, such as a single dialogue track or sound effect (SFX). At this stage, the proper laying out of audio elements on the multitrack is time well spent and later rewarded. Here are a few points to consider:

Keep similar types of audio elements on the same track.

Maintain a reasonable space in time between audio elements on the same track.

Record multiple tracks of any element that may need more than one setting of EQ or other processing.

Work to a standard track format that will be the same between different jobs.

A convenient console master status for tracking, oddly enough, is **MIX**. This sets up all modules in mix mode with Line Inputs from the 24 track feeding the Large Faders. To use this mode, make sure your multitrack is locally switched to monitor off the *Sync* head.

Ideally all the source machine outputs should be normalled to Channel Line Inputs above 24, thus allowing playback/monitoring of the 24 track on the first twenty-four Large Faders. In this way, a mix can be gradually built up, one fader at a time, as sources are recorded. This mix can even be automated as you record, leaving you with only a few adjustments to be made to the final mix in one pass!

In **MIX** status, source channels normally route to the 24 track via the Small Faders. Alternatively, the **FLOAT** button may be selected to allow Large Faders to feed the Routing Matrix on source channels.

Source channels (above Channel 24) may be have been specified with Dual Line Inputs instead of Mic/Line Inputs. This allows two separate line level sources to be selected at the channel input, with just a press of the **FLIP** button.

As stated above, many different sources are used to build a 'typical' audio post-production mix. What has not been mentioned is the varying *quality* of these sources. To make all the sources manageable in a mix, a common practice is (unlike music recording) to clean up tracks while recording. A great feature on the SSL is the ability to Gate/Expand/Compress on *each* module, as well as EQ with Filters and the four band parametric Equaliser.

While laying a pre-recorded dialogue track to the 24 track, it is possible to use the **GATE** function of the Dynamics section to clean up tape hiss or extraneous noises. At the same time, compression and minor EQ may be added to start shaping up the tracks before the final mix.

While recording dialogue tracks, either live from a booth or from a pre-recorded tape, you have the ability to feed that source to all multitrack inputs and the Quad bus at the same time, via the **FLOAT** button and the Routing Matrix. This makes it a breeze to select any track to Ready from the console, with the module **RECORD** button, and record just to that track. Then you can quickly move onto the next track to record, without reassigning any routing or changing levels. This also allows you to record several tracks of the same source on the multitrack, all at the same time, which is useful when dealing with a pre-recorded dialogue track that needs many separate EQ settings during mixdown.

Automation during Track Laying

Use of the SSL G Series Studio Computer during tracking can be as basic as autolocating the multitrack tape to various points in the recording. The computer also permits frame accurate drop-in and drop-out points. This can make cramming-in that last sound effect on the only available track, less of a hit and miss adventure.

After a few tracks have been recorded on the multitrack, automated mixing can start. As each new track is added, and while using the Large Faders for monitoring, you can build up the mix.

Other SSL automation features such as the Events Controller, the Master Transport Selector and the Integral Synchroniser System are all useful in the process of building up tracks on the 24 track. For operational details, refer to the G Series Computer Operator's Manual.

Mixing

Setting up

The console master status should be **MIX**.

If there is a need to split the mix into several mix minus feeds then it will be necessary to configure the console to include three (or four) stereo or mono subgroups. If mono only is required, the LF, RF, LB and RB Quad busses can be used. Alternatively, in a typical situation, where stereo Music, mono Dialogue and stereo Effects outputs are required, three subgroups will be needed. If the console is fitted with Stereo Modules then these may be the best modules to use. Each of the multitrack return channels should be **FLOAT**ed off the Quad bus and sent via the Routing Matrix to five Groups (Group 28 for Dialogue, 29 & 30 for Music and 31 & 32 for Effects). The Subgroup buttons on these I/O modules should be selected so that these channels are now the masters for the mix minus feeds. It is then possible to take the Group Outputs and feed them to their ATR destinations.

If the console is put into **MIX + RECORD+VCAs TO MONITOR** status, the **READY GROUP** and **READY TAPE** buttons can be used to allow the Group Outputs and their Tape Returns to be monitored via the Large Faders (on Modules 28-32) and the Quad bus. In this case the module Subgroup buttons are not used.

In this mode of working, all the channel inputs will be floated up to the Routing Matrix so the Small Faders will be disconnected and will be unable to control additional inputs to the mix.

At this point, initial EQ, Dynamics, outboard effects and level adjustments should be made to individual channels. Unfortunately a large part of audio post-production work involves fixing problems as opposed to enhancing good quality audio.

The powerful parametric EQ and Filters, with careful adjustment, can take care of the worst audio offenders, such as timecode leakage, hum, and other garbage.

One method for finding a problem frequency:

With the EQ selected to **CH**, zero all the controls. Choose the most likely frequency band and turn the Q control to the sharpest curve. The x3 and the ÷3 buttons allow the HMF and LMF bands to be swept over the entire frequency range. Turn the level control of that frequency band up as far as you dare and sweep the frequency control until you make the offender scream out the most. It is then a simple matter to reverse the level boost and dip out the problem while adjusting the Q for the necessary width.

If your console is fitted with Plasma Bargraph metering, the Spectral display can be of great help in locating problem audio frequencies. It also lets you see the effect of any EQ you are putting in.

The Dynamics section on each module can be used to keep track noise down with the Gate function. This can make the mix easier by not having to remember cuts.

The Mix

Many post-production jobs can be mixed without the aid of automation. This is made easier by the wide variety of grouping combinations offered on the console. For instance, the eight dedicated VCA subgroups can control any or all of the Large Faders from the centre section. Usually they are placed in the best stereo monitoring position in the control room. The VCA subgroups may be further grouped to themselves to allow even greater control.

The READY GROUP and READY TAPE buttons on the 'subgroup' I/O modules allow the more traditional film-style 'pick-up and record' mixing method through the use of the module RECORD Buttons. This allows punching in selectively on Music, Dialogue and SFX tracks while perfecting your mix.

Automation

The SSL G Series Mix System is so friendly that you'll find it can be used on even the simplest jobs. This makes going back to revise those mixes easy, without having to resort to separate Music, Dialogue and SFX tracks and their associated generation loss.

The amazing power and flexibility of the Mix System is fully described in the G Series Computer Operator's Manual.

Here are a few automation features to look at:

A mix can easily be built up a fader at a time. This lets you concentrate fully on, for instance, a dialogue track that was recorded very unevenly. Instead of compressing the —— out of it, a more natural sound can be gained from riding little nuances with the fader. Once those moves are stored, it is a simple matter to do overall level trims on subsequent passes.

Cuts (mutes) and Faders can be written separately to save either the good cuts or good fader levels from a previous mix.

A common problem in post-production is the need to uncut a track at exactly the right moment. An interesting feat if there is nothing on uncut tracks or the picture to cue from. A neat trick is to use the Small Fader to feed the Routing Matrix to monitor the track, while the Large Fader is cut. Now it is easy to uncut at the right moment and have the automation play back the cut/uncut on the next pass.

The rollback and **JOIN** function can be used to accomplish frame accurate cuts or level changes, such as on a video scene change.

An infinite amount of mix versions can be stored and recalled at a later date, e.g. Producer's version, Client's version, Client's mother's version, the Right version. Different versions can even be compared on-line.

A fully automated mix can be transferred directly from the multitrack to the finished product, such as a 1" video tape, without intervening steps or generation loss. A second automated pass can be made for separate M/D/E tracks via the Quad bus.

The **REVISE MIX** feature can move mix data in time to a different point on the 24 track. This can make mixing different versions a matter of a few faders, instead of starting from scratch.

The best way to learn anything is to do it. Take the time to read the Computer Operator's Manual, hopefully sitting in front of the console, and then start mixing!

Film Mixing and Scoring

It is much more common these days for recording studios to be working with Film Soundtracks and even Film Mixing. Providing that the output requirements are for four busses or less, the SL 4000 G Series console is capable of mixing to Film.

The most common requirement is for a 3 or 4 Track mix configured as LEFT-CENTRE-RIGHT and sometimes a mono SURROUND. As the SL 4000 G Series Console has Quad output capabilities this should not present a problem.

In this case the outputs from the SSL should be configured as follows:

LEFT FRONT	Left
RIGHT FRONT	Right
LEFT BACK	Centre
RIGHT BACK	Surround

It is possible with a standard SL 4000 System to hard pan, using the Quad pan controls at the bottom of each module, to these four outputs. The monitor speakers in the room need setting up so that the Left Back output feeds a Centre speaker and the Right Back output feeds to a set of mono Surround speakers.

SSL can now provide a special modification which allows the console to instantly configure the panning to provide true L-C-R-S panning. A single button, located on the SL 651G in place of the QUAD monitor button, switches the pan laws of all I/O modules between standard Stereo panning and Film panning. In this case the main Quad Left/ Right pan control now pans the signal between the L-C-R outputs of the console. The Front/Back pan control will allow the signal to be panned between the front (L-C-R) and the mono surround. When this modification is fitted it is not possible to route to a stereo pair of rear busses in the 'non-Film Pan' mode, due to the Left Back bus being dedicated as a Centre Output.

When working in this way, it is usual to monitor via a Dolby DS4 or DS-2-4 module.
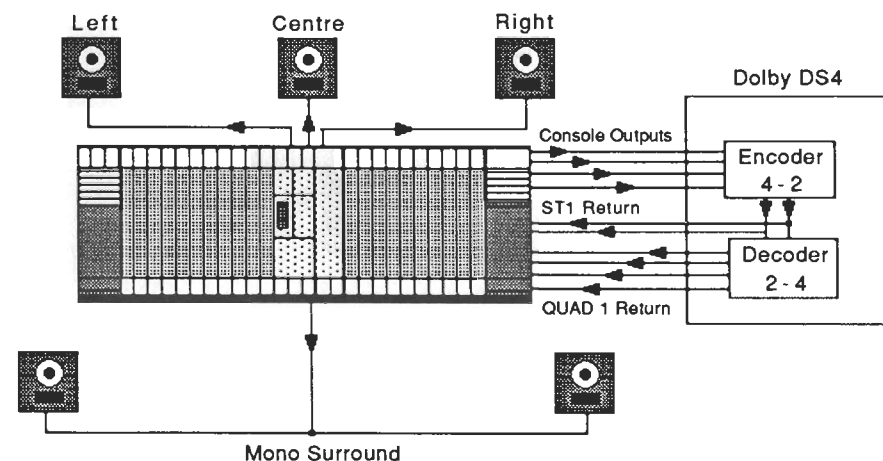
The usual way to patch this is to feed the DS4 inputs from the Quad Bus Outputs (Jacks L9-12). The DS4 provides a stereo encoded signal (this is recorded if you are doing the final mix to picture) which can be fed back into an External Stereo Selector (e.g. ST1 REP, Jacks P25-26) for monitoring. There is also a decoded 4 track output from the DS4 which should be fed back into the QUAD 1 input of the external monitoring selector so that the effect of the encoding/decoding can be monitored simply be selecting **QUAD 1** and **EXTERNAL TO MONITORS**.

For film scores it is usual to record the discrete four channel output of the console whilst monitoring the 4 Track output of the DS4. When doing a final mix to picture it is usual to record the stereo encoded output of the DS4 while monitoring the 4 Track decoded DS4 output.

Basic Fault Finding

Introduction

This section is not meant to teach you how to fix *any* fault on a SSL, it is merely a guide to some of the basic principles of locating and getting round faults as they occur during a session. In many cases, faults can be located and overcome in less than 15 minutes and without much technical knowledge. It is not suggested that you should take a degree in electronics or that you should take the desk apart every time you come across a fault, but there are things that you can do to help the session progress smoothly through a problem and which will greatly help your technical engineer.
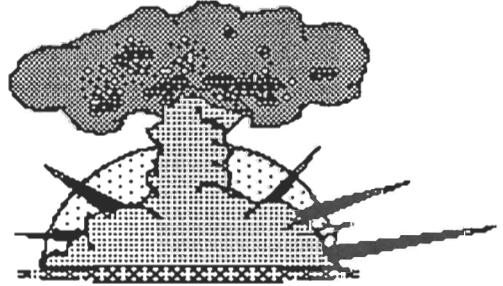
The SL 4000 G is built with the highest quality components and is designed to make the job of maintenance easy. Most problems that occur are usually not console faults at all but are due to 'finger trouble' or external equipment.

To a musician or a producer, a 'fault' is a pain in the neck. The flow of the session is interrupted and the atmosphere can quickly degenerate from being warm and friendly to aggressive and violent. Characters who are usually quite reasonable can turn into homicidal maniacs and relationships can change within a very short space of time.

In these situations the prime objective of the engineer is to ensure that the fault lasts for as short a time as possible and, if at all feasible, is not even noticed by the musician and producer.

Locating the Problem

In many cases the fault can be left alone and ignored, to be fixed at a more convenient time. A 'noisy' channel can be left and others in the console used, for example.

However, if the fault cannot be ignored, the first thing to do is to locate the problem. Yes, we know the first thing may be to locate the maintenance engineer, but sometimes these very useful people are not immediately at hand.

If you don't understand the signal flow through the console you will never be able to find a fault, so a good operational knowledge is essential. The SSL has many controls in the signal path and by playing with these controls it is often simple to locate, not only the card on which the problem is occurring, but also the component which has failed.

You should always check external equipment first (unless the fault is obviously within the console, such as an EQ going dead when it is switched into the channel). The SSL sits quite happily, day in and day out, without being moved or kicked or dropped, whereas microphones, their cables, tape machines and effect devices etc. are constantly on the move and are much more susceptible to damage.

To give you an example, let's look at the following problem. By going through this you can see all the basic principles at work. A good technical engineer would find and fix this problem in less than 10 minutes. You are overdubbing a mic onto Track 16 from Channel 1 and you cannot monitor the mic on channel 16's READY TAPE button.

You should always start with the most obvious solutions (which in real life are usually the easiest to solve) :

You have pressed the wrong button.

Especially if you are new to the console, you are probably at fault, not the equipment. If you get a maintenance engineer in and he presses the right button within 30 seconds of arriving, you will look like a complete idiot in front of the musicians and producer; after all you are getting paid to push the right buttons, the maintenance engineer isn't.

Checking every control from Channel Mic Input to the control room Monitor Output can take time, so halve the problem by checking the situation half way down the chain. Is the mic getting to the tape machine? If the VU meter is reading on Track 16 then the problem is on the monitor side and has nothing to do with the mic, Module 1 or the Group Output.

If you have a reading on the VU, then halve the signal path between Group Output 16 and the monitors. Is the signal reading on the main LF and RF Quad meters? If it is, then the problem is in the SL 651G. In 10 seconds the fault has been narrowed down to the monitor section of the SL 651G. The main monitors could be CUT, an AFL button somewhere on the desk could be pushed, the main monitor gain control could be down, the EXTERNAL TO MONITORS button could be feeding STEREO 2 to the monitors etc.

For the sake of this example let's assume that the mic isn't reaching the tape machine and there's no reading on the multitrack VU meter 16. One most basic fault is that the wrong console STATUS button is pressed. If this happens (for instance, the console is in MIX mode and you need the RECORD status) then there is no way you will be able to figure out what is going on.

Now check all controls on Channel 1. As you understand the signal flow, start with the Input section. Check that the Mic Input is selected and the Mic gain is turned up. If the Dynamics are in the channel path check that the GATE is not cutting the signal. Assuming VCAs TO MONITOR is selected, is the Small Fader up? Is the signal routed to 16 on the Routing Matrix (a common fault). If the FLOAT button is down, this would cause a problem. Assuming that all the controls are correct, check that the GROUP TRIM on module 16 is not turned down (this is a very common cause of problems, usually as a result of the previous engineer not zeroing the desk). Hit the READY GROUP button on Module 16 to check that the signal is leaving the console. Having done all this and there is still no sign of life, then it is safe to assume you have a problem.

Leave the console and check the mic before assuming that the fault is within the desk. First plug up a new mic and if that doesn't solve the problem try a new mic cable. If audio is still eluding you, cross patch the mic into Channel Mic Input 2. This will prove whether the problem is, or is not, related to Channel 1 of the desk.

Still dead? Then the problem could be Group 16, so now route the channel to 17. Ahh! a reading. As you are now in Channel 2, the fault

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is not in Channel 1 but is associated with the mix amp in Module 16. It could in fact be due to the tape machine's Track 16 but this possibility could be eliminated by patching Group Output 17 (Jack G17) to Jack H16 which is the multitrack machine's Track 16 input. If the VU on the machine doesn't read then the fault lies between the desk and the tape. Assuming the machine reads OK, then the fault is most likely to be the SSL, Module 16's Group card. This process should have taken about 5 minutes and you know know the exact location of the fault. You have done this without any test equipment or electronics knowledge and without the help of a technical engineer.

The same sort of location procedures can be applied to all the different signal paths throughout the console and the basic principles will always be the same.

Fixing the Fault

Having found the source of the problem, how can you fix it? If there is a technical engineer at hand then it is best to let him sort things out from here. However, there are often occasions when you are on your own and the session must go on.

There are some basic things that you *can* do. The SSL is a modular system, each section of the console being split into smaller subsections (circuit cards) which can quickly be replaced with spare cards. Every console comes supplied with spare I/O module cards and if the console was fitted with a complete set of modules on delivery, there will be a complete spare I/O module somewhere. SSL can supply a full set of spare cards for the SL 651G and this is recommended if there is no full-time technical engineer at the studio.

Replacing Modules and SL 651G Cards

The I/O and Stereo Modules can easily be removed from the console for replacement but first you should shut down power to that section of the console.

A set of power switches is located under the patch at the front of the console (in a few cases the switches are located elsewhere beneath the console). Each section of the console is powered from these switches. The channel modules can be switched off, in bays/buckets of eight modules, as can the SL 651G and the meters. Before switching anything off, make sure that you switch off the power amps or overpatch *all* monitor sends (Main Quad LS, Mini LS and SLS). If you power down with these connected, the DC thump generated may permanently damage the loudspeakers, headphones and someone's ears!

Technical engineers may remove I/O modules with the power still connected but the SL 651G cards should **NEVER** be removed without cutting the power to that section. If you are not a technical genius then *always* power down the section.

If possible, you should get the studio maintenance person to demonstrate powering down sections of the console, removing channel modules and replacing SL 651G cards. Once you have seen it done it is fairly simple.

The SL 611G I/O Module

First power down the section of modules. Lift out the trim strip at the top and the scribble strip at the bottom of the module. Undo the two exposed screws and screw two SSL module pullers into the screw holes. (The pullers will have been provided with the console but may be hard to locate in the workshop. Do not attemt to extract the module

without them. Pulling at the knobs will not do!) The module can then be carefully lifted out, keeping it parallel with the slope of the console.

If you going to completely replace the module ensure that the replacement is of the same type. There have been many revisions to SSL modules and some modules cannot be fitted into an SL 4000 G frame without modification. This is very important if there are several SSLs at the facility, each of a different age and type.

When replacing the module, be careful to lower it into place at the same angle as the slope of the console. Locating collars will guide the module into the correct position. When the module is in place, firmly push it all the way down into the connectors by pressing around the area of the EQ section and remove the pullers. Replace the two module screws and power up the section. Turn the power amps back on and take the plugs out of the monitor jacks. Check all the routing paths before continuing with the session.

Replacing I/O Module Cards

If there is no spare module and you wish to change cards in the module you have removed, you should locate the fault down to card level. The SSL Service Manual includes a more detailed I/O signal flow diagram and you can use this to locate the fault down to a particular board by following the location methods described above. Briefly, the cards in the SL 611G and the functions they perform are as follows:

MIC/LINE INPUT CARD - 82E291 (older versions: 82E241 Transformerless; 82E149 Dual Line; 82E01 Original Transformer)
• Mic and Line Amp
• Channel Input and Routing Matrix Buffer Amps
• Patch Return Amp
• FET Switches for the Mic/Line/Subgroup selection, Input Cut and Small/Large fader to Routing Matrix.

82E291
Mic/
Line
Input

82E
1 0
Dyn

82E13
VCA

82E
292
EQ
Filter

82E
294
Group

82E03
Total Recall
Multiplex

82E293
Logic
(under TR Card)
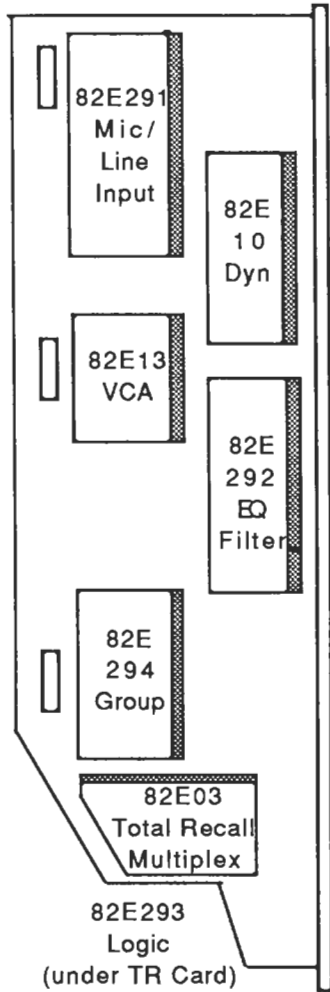
SL 611G I/O Module

VCA CARD - 82E13
• Large Fader VCA and computer send and returns
• FET Switches for AFL and Channel/ Monitor path to VCA
• Overload detection circuitry

GROUP CARD - 82E294 (Older versions 82E11)
• Group Mix Amp and Group Trim Control
• Group Output Buffer Amp
• Group Monitor Input and Tape Monitor Input Buffer Amps.
• Quad bus routing Buffer feeding the main Quad outputs via the Quad pan controls
• Small Fader Buffer
• FET switches for Supercue Group/ Tape switching, Small/Large Fader to Quad bus, Channel/Monitor path to Small Fader, Meter select.

DYNAMICS CARD - 82E10
This a completely self contained section on one card. If there is a problem with anything in the Dynamics section, replace this card.

EQUALISER AND FILTERS CARD - 82E292 (Older versions: 82E242, 82E132, 82E02)
This a completely self contained section on one card. If there is a problem with Equaliser or Filters, replace this card.

LOGIC CARD - 82E293 (Older versions 82E12)
Mounted under the TR Multiplexer, this card contains all the logic for the module. If any FET switching within the module does not function correctly, then the fault may lie on this card. Although the FETs are on other cards, they are driven from this card and it is normally the driver circuits that fail first.

TOTAL RECALL MULTIPLEXER CARD - 82E03 (Mounted on top of the Logic Card.)
If TR is faulty on a particular module this card could be the cause. If it is removed, note how the looms are connected. Address switches on the card need to be set differently on each module for correct operation of TR. If the card is replaced with a spare, set the switches identically to those on the card you have removed. See the Console Service Manual for more details.

82E201
Stereo
Line
Inputs,
Insert Send
& Rtns

82E210
Stereo
Dynamics
Side Chain

82E202
Stereo
EQ &
Filters

82E212
Logic

82E03
Total Recall
Multiplex

82E213
Stereo VCA and
Image Control
(under TR Card)

The SL 611S Stereo Module

Removal of this module is identical to that of the I/O module.

The cards are as follows:

82E201 - Input Card - Line Input, Balance, Phase and Trim circuits, Insert Send and Return.

82E213 - VCA & Image Controls

82E202 - Equalisers and Filters

82E210 - Dynamics side chain

82E212 - Logic Card

82E03 - TR Multiplexer Card

The SL 651G

Faults in the centre section can quite often be overcome by replacing individual cards in the SL 651G. The module can be lifted up on rails to gain access to the cards. If you do not have spare cards then leave the repair to someone who is qualified to do this work.

If you have to lift the SL 651G, first of all power it down after overplugging the monitors. Remove the four screws in the corners of the module and screw in two module pullers, one at the top left and one at the bottom right of the front panel. Gently lift the module with the pullers, keeping it at the same angle as the console slope. The module can be raised about 9", when it will click into place on the top and bottom support rails.

You can now see (from the left hand side) all the individual cards. Carefully remove the faulty card and replace with an identical spare ensuring that the spare locates fully.

SL 651G CARDFRAME - SIDE VIEW

Rail Latch

82E34 Oscillator MD out
82E33 T/B Listen Amps & Comps
82E32 3 Cue Mix Amps & EQ
82E31 Cue Patch Rtns
82E30 2 Stereo Echo Rtns
82E29 Ext Mon Buffers
82E28 Ext Mon Selectors
82E26 Quad MixAmp Comp Side Ch
82E27 Comp Master; Quad Fader
82E25 Quad Bus O/Ps
82E24 Int-Ext-Cut Monitor Relays
82E23 Ext Mon Matrix; AFL; SLS
82E22 Main & Mini LS Outputs
82E21 Status; Red Light; Autocue
82E20 VCA Groupers & Trim

The SL 651G can then be powered up whilst in the raised position and the fault again checked to ensure that it has been cured. If this is not the case, power down again and try a different card. When the fault has gone, power down and lower the module slowly and carefully back into place. This should be done with two people holding it, one at the top and one at the bottom. Whilst holding the module firmly, push the release latch on each of the support rails and lower the module down slowly. Be careful to ensure you are holding the module as it will fall as soon as you have pushed in the release catch, unless you have a firm grip on it.

The SL 651G cards have the following functions. Some cards are only found once whereas others (such as the four main VCA cards) are each the same type of card. Locate the fault and replace the appropriate card:

82E20 - VCA Groupers and Cuts; VCA Trim
82E21 - Master Status; Red Light; Autocue
82E22 - Monitor Outputs; Mini LS Outputs
82E23 - Ext Monitoring Matrix; AFL Amp; SLS
82E24 - Internal/External Monitor select; Quad Meter select; Main and Mini Monitor circuits; Cut and Dim
82E25 - Quad and Stereo output amps to the tape machines.
82E26 (1 of 4) - LF VCA
82E26 (2 of 4) - LB VCA
82E26 (3 of 4) - RF VCA
82E26 (4 of 4) - RB VCA
82E27 - Main Quad Compressor time constants; Autofade and Main Fader computer sends and returns
82E28 (1 of 2) - Switch card for the 13 External To Monitor Selectors
82E28 (2 of 2) - Switch card for the 13 External To SLS Selectors
82E29 - External Monitoring buffers (All external inputs go through this card then on to the 82E28 switch card)

82E30 (1 of 2) - Stereo Echo Return 1 & 2
82E30 (2 of 2) - Stereo Echo Return 3 & 4
82E31 - Cue Patch Return - Adding talkback etc. to the Cue feeds.
83E32 (1 of 2) - Aux Stereo and 1 & 2 mix amplifiers (picks up signals from the Aux bus level and EQ controls and sends them out to the patch)
83E32 (2 of 2) - Aux 3 & 4 mix amplifiers (as above)
82E33 (1 of 2) - Engineer and Producer talkback
82E33 (2 of 2) - Listen Mics 1 & 2
82E34 - Main and Slate Oscillators; MD Output

Armed with this information, you may be able to save an otherwise dead session. Even if you can't, this information will help you communicate faults to the maintenance engineer with much more precision. Finally, always double check what you are doing and if you are unsure about anything then **DON'T DO IT!**

SOLID STATE LOGIC

THE END

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