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.

![Status buttons diagram]

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.
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 normalised to the Multitrack Send and Group Monitor Input on Row H. The Multitrack Return appears on Row J and is normalised 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 + VCA's 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 possible 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 capabilities 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**

![Diagram](image)

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.