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):

![Wrong Button Image]

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
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 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 attempt 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.
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.
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.
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
82E28/338 (1 of 2) - Switch card for the 13 External To Monitor Selectors
82E28/338 (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 82E28/338 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