9098i

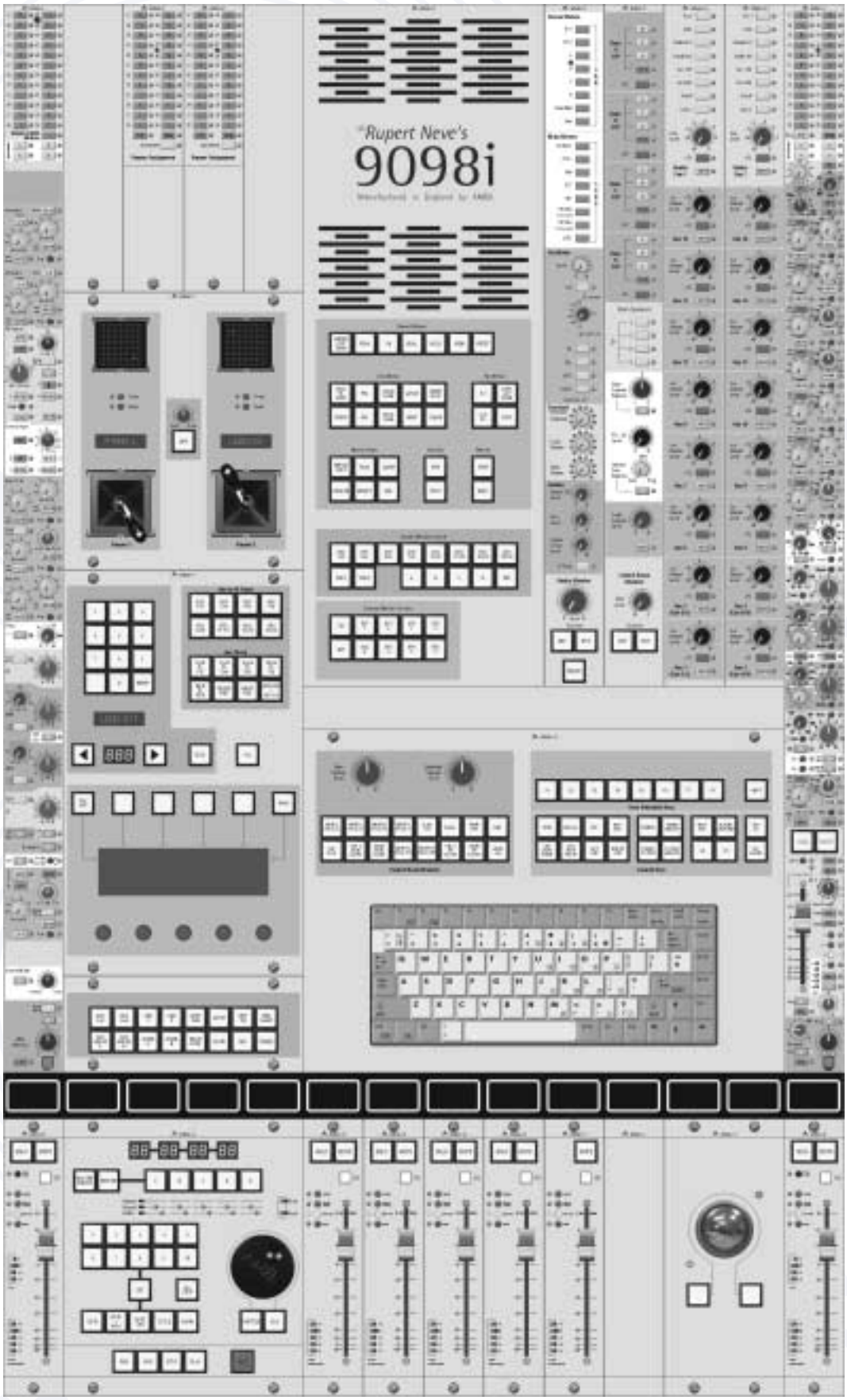
Artistry in Analogue™



AMEK

A Harman International Company

Product Overview


Rupert Neve's
9098i

Introduction

9098i The Genuine Article

Audio to Admire

Every once in a while, something quite simply exceptional comes along and causes us to re-evaluate our preferences, thoughts and opinions.

In the modern audio industry, the AMEK 9098i master recording console, designed in conjunction with Mr. Rupert Neve can only be described as the most important landmark in the history of analogue console development. Critically acclaimed as the greatest sounding console of all time, the 9098i triumphs where its rivals fail by capturing the sonic essence of much loved vintage desks, and surpassing them by combining the extended functionality of the worlds most powerful console automation system, ***Supertrue V4™.***

Genuine Mr. Rupert Neve design

Every great console reflects the views, experience and even the personality of its designer. In the modern audio industry, one designer stands out from the rest, Mr. Rupert Neve; and the 9098i is his greatest design yet.

The magnificent result of a lifetimes work, the **9098i** is **the only new Super Analogue console** with the right to truly bear the words, **'designed by Mr. Rupert Neve'.** Anything else is mere imitation, despite the implied suggestion by other manufacturers in the marketplace. AMEK has been working in close partnership with Mr. Rupert Neve for over 10 years and is the only company with the ability to bring you the experience and meticulous attention to detail, which are the hallmarks of his newest designs.

The Automated Advantage

9098i harnesses the power of the worlds leading console automation system, ***Supertrue V4***™ in its most refined form. In progressive development since 1989 Supertrue offers an unparalleled feature set, incorporating comprehensive fader and switch automation, Virtual Dynamics®, Recall and Visual FX™ as standard. The power and extended flexibility ***Supertrue V4*** provides, ensures you no longer need to compromise on functionality.

Supertrue's advantage stems from the fact that as well as being extremely powerful, it is by far and away the most flexible, intuitive and more importantly easy to learn console automation system available today. Whether you are a console owner, freelance producer or engineer, within a short time period you will be mixing the way you are used to and more! How do we know this? Because flexibility has been built in to enable the user to recreate and set up their own preferred way of working. This quick and easy process affords you the freedom and confidence to concentrate on the creative aspects of your work.

Dedication in Design

The 9098i is the breathtaking result of a massive development project encompassing years of planning and pain-staking experimentation. From the outset it has been designed with a single goal in mind, to be ***without equal*** in terms of ***audio quality***, ***features*** and ***automation***. This goal has without question been achieved.

Every aspect of the console's feature set and intuitive ergonomic layout has been defined using extensive feedback from some of the world's top studios, producers and engineers. Utilising this knowledge, AMEK in conjunction with Mr. Rupert Neve together have been able to skilfully craft a console that is as close to audio and operational perfection as modern technology allows.

Artistry in Analogue

9098i epitomises analogue console technology at its most advanced state and can only be described as the crème de la crème of high-end analogue design. Despite the enormous advances in digital sound technology and the preference for Digital Mixing Systems in some applications, there has been a growing recognition in the industry that the benefits of analogue technology at its best, have not, and will not, be surpassed for some time to come. Analogue consoles have a highly decorated heritage and proven success that will ensure their popularity continues well into the future.



Mr. Rupert Neve

Introduction



Producers Absolute at Olympic Studios, London

Perfect Performance

The 9098i's technical specification is impressive to say the least. Demanding the use of only the highest grade of components, it attains a performance level, which pushes back the boundaries of known theoretical limits. Featuring an extended audio bandwidth of 200kHz (-3dB), 9098i maintains a sense of transparency that is absent from inferior bandwidth limited systems. An incredible dynamic range and remarkable phase linearity provide accurate imaging across the entire bandwidth. Virtual Class A operation throughout provides a sense of realism other consoles simply cannot produce; This is achieved by reducing distortion to a barely measurable level. 9098i features a Mr. Rupert Neve 'Transformer Like Amplifier' input stage that has become the benchmark for other microphone amplifiers, especially for its ability to exhibit enormous overload capacity. The transformer-based output stage and custom transformers fitted to all track, stereo and main outputs as well as both the 9098i-A module's insert sends, ensures that the 9098i provides excellent noise rejection and is fully balanced throughout.

Flexibility, now and for the future

The demand for surround formatted high quality audio material has never been greater. DVD-V, DVD-A, Film, TV, Video, Digital Radio and the internet will require more and more programme material, which must be produced and mixed, or re-mixed, with present and future multi-channel audio formats in mind. For this reason 9098i has been designed from the ground up with your future in mind, to handle multi-format work up to and including 5.1. Multi-format bussing and true multi-format monitoring supports current and envisaged multi-channel broadcast formats such as Dolby Digital®, Dolby Surround® and DTS®.

Commercially Captivating

Having been inspired by the man whose designs have unlocked the creative potential of some of the worlds leading producers and engineers for many years, the purchase of a 9098i will elevate your facility to an elite category of 'a truly world class studio'.

Not only does the 9098i have the power to attract some of the worlds leading artists and producers, it also delights in exceeding the expectations of many of the worlds finest broadcast institutions. The superb engineering, sonic performance and sheer musicality of Mr. Rupert Neve designs have traditionally ensured that consoles bearing his name are also a shrewd investment, often increasing in value. Musicians, engineers and producers simply demand the cleanest, purest sound quality possible, once heard, they will need look no further than the 9098i.

Superior

Once again, In terms of audio quality, features and automation the 9098i sets a performance standard unrivalled by any other console manufacturer in the world.

Don't just take our word for it though, we invite you to bring an audio tape of your choice along for a demonstration and simply listen and hear how you can run ahead of the pack with the 9098i.



9098i in Drama Production

Studio Integration



9098i on test at AMEK Headquarters

The 9098i has been designed to easily integrate into any studio or broadcast environment, for example, all audio connections are made via industry-standard multiway connectors.

AMEK exists to find solutions to your audio requirements, which is why the 9098i can be delivered with a variety of standard and custom options. For critical situations, such as on-air, back-up power supplies with auto-changeover can be supplied to help smooth the integration process.

All power supply wiring is supplied as standard and other mating connectors are available as an option if required.

Documentation

Full documentation for the 9098i is included as standard. This incorporates a Console Service Manual, Supertrue™ Installation Manual, Supertrue User Guide and Virtual Dynamics Operators Manual.

Quality Control & Commissioning

Every aspect of the console's electronics has been extensively tested and "soaked" in our final test rooms. Computerised diagnostics monitor the performance of each and every function of the console prior to shipment, ensuring the 9098i remains the same high standard of quality, when it is integrated into your facility.

Wherever a 9098i installation may be taking place around the world, a skilled commissioning team will oversee the delivery and installation process through to your complete satisfaction.

Post-install commissioning is included as standard and will be carried out by one of our experienced engineers. Every aspect of the console is checked to ensure incident-free sessions from the first day of operation.

As part of the commissioning process an engineer will typically spend about 7 days in your studio. A brief overview is given on routine maintenance procedures, the architecture of the console and basic operation.

Advanced training is available either on-site or at our International Headquarters in Manchester, United Kingdom or at our US Headquarters in Nashville. Prices are available on request.

Installation

Everything is done to ensure that the installation of your new console is made as easy as possible. A Pre-installation kit containing all the necessary mating connectors and connector lists is available in advance of delivery, should it be required. This enables the studio wiring to be completed before the console arrives ensuring viable commercial operation from an early stage. Advice is always on hand if needed from our trained service engineers.

At AMEK we understand that access to most control rooms is quite often limited. With this in mind the 9098i has been designed with a flexible, modular chassis system to make installing a 9098i as painless a process as it can be in even the most un-accommodating studio buildings.

The console is shipped in modular sections of either 24 or 32 positions which can be seen on page 16. This allows the console to be manoeuvred more easily if turning space is limited or if the console has to be moved into an elevator or carried up a flight of stairs.

Where access is limited it may be necessary to remove the console's stand. This reduces the width of the console when turned on its back to 827mm (2ft 9") making it possible to pass through even small doorways.

Spares

The 9098i is also supplied with a basic spares kit as standard. This includes a Mono Input module, a Mono Input fader, fixing tools and various other components. A more comprehensive spares kit is available and prices are available upon request.



9098i at Chicago Trax, Chicago

9098i-A Mono Input Module

The 9098i-A in-line input module is a dual-signal path module with a single equaliser section which can be shared between both paths.

The paths are denoted Channel Path and Monitor Path. Each path has two inputs which, by default, are Mic and Line to the Channel Path and Buss and Tape to the Monitor Path. Only one of the two possible inputs to each path can be selected at any time.

The Channel Path uses, by default, the long-throw fader on the separate fader block, while the Monitor Path uses the short-throw fader further up the module. This allocation can, of course, be reversed.

The equaliser, which defaults to the Channel Path, can be shared with, or switched entirely into, the Monitor Path.

INPUT SECTION
The input stage of the Channel Path is Mr. Rupert Neve's Transformer-Like Amplifier (TLA) design, which provides exemplary low-noise and common-mode rejection performance as well as high overload capability. There are separate, balanced microphone and line inputs.

The LINE button selects the Line Input.

48 Volt Phantom power can be applied to the Mic Input, selected by the 48V button.

When the Mic Input is selected, the input stage gain is adjusted by a switched Mic gain control in 6dB steps (except for the lowest increment, which is 12dB) from 0dB to 72dB. A TRIM control allows a fine adjustment to the gain of +/-6dB.

When the Line Input is selected, the TRIM control alone adjusts the input gain, the switched control being removed from circuit. In this mode, the TRIM permits a range of gain adjustment from -6dB to +18dB. The 0dB gain setting is detented.

Phase reverse, switched by the ø button operates on the Mic input.

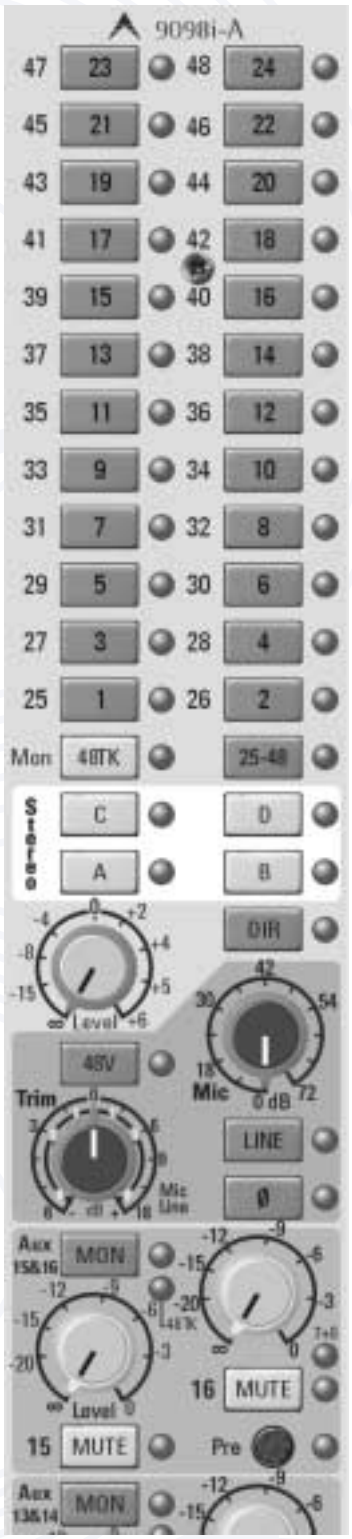
The track meters (in the meterhood above each module) are normally fed from the Monitor Path. However, they may be globally selected to the Channel Path from the Master Section. Internal jumpers can be set to make the "off-channel" meter feed either Pre-EQ or Post-EQ.

EQUALISER
The equaliser is based upon the well-known Mr. Rupert Neve System 9098 outboard mic amp/EQ, and is highly effective without being in any way aggressive in sound character.

It is a 4-band fully-swept design, with parametric mid ranges, and Bell/Shelf switching in the HF + LF sections. The frequency ranges of the 4 sections have a high degree of overlap.

All 4 sections have a CUT/ BOOST control offering +/-18dB of adjustment. The 0dB gain settings are detented.

The LF range is normally a shelving filter with a turnover frequency continuously variable from 30Hz to 300Hz. The LF section may be switched from a shelving to a bell-response filter by the BELL button. In Bell mode, the Q is fixed at 2.0. The GLOW button adds an additional gentle boost contour to the overall LF curve, which has the effect of relaxing the slope, producing a subtly warmer character.



The LMF range is a Bell-Response Filter, with centre frequency continuously variable from 20Hz to 200Hz, or by pressing the X5 button, from 100Hz to 1kHz. The bandwidth can be varied from 0.6 to 2.0 by the Q control.

The NOTCH button coverts the LMF section to a 'cut-only' tunable notch filter, useful for rejecting intrusive tones, such as, air conditioning noise. In Notch mode, the Cut/Boost control becomes Cut-only and the control has a flat response when fully clockwise. Careful adjustment of the Cut, Frequency and Q controls permits the offending frequency to be removed whilst affecting the remainder of the signal spectrum minimally. The maximum rejection of the Notch filter is approximately 25dB, and with the bandwidth at minimum (for the tightest rejection), has a Q of approximately 40.

The HMF range is also a bell response filter, with centre frequency continuously variable from 500Hz to 5kHz, or by pressing the X5 button, from 2.5kHz to 25kHz.

The bandwidth can be varied from 0.6 to 2.0 by the Q control. A Notch Filter identical to that in LMF range (except for being effective over a different range of frequencies) is also included.

The HF range is normally a shelving filter with a turnover frequency continuously variable from 2kHz to 20kHz. The HF section may be switched from a shelving to a bell-response filter by the BELL button. In Bell mode, the Q is fixed at 1.5. The SHEEN button works in a very similar way to GLOW, but affects the upper part of the frequency spectrum. Sheen adds a gently rising contour to the whole upper frequency range, again relaxing the curve, and adding a subtle brightness to the signal.

As stated, the equaliser defaults to the Channel Path. However, two, or all four sections may be moved into the Monitor Path if wished. The HF and LF sections are moved by the HF/LF TO MON button, and similarly, MIDS TO MON moves the LMF and HMF sections. Both buttons are located in the centre of the equaliser section.

The entire equaliser section may be switched in and out of circuit, regardless of the path switching of bands, by the EQ IN button.

FILTERS
Two separate sweep filters are provided on the 9098i-A channel. These have individual IN switches, and both have a slope of 18dB/octave.The -3dB points can be adjusted over the following frequency ranges:
• High-pass Filter: 22Hz-300Hz
• Low-pass filter: 4.3kHz-25kHz
A variety of options are available for the position of the Filters section in the signal paths. These are selected by internal jumpers:
• Permanently in the Channel Path, pre-EQ (Factory default setting).
• Permanently in the Monitor Path, pre- any EQ

switched into the Monitor Path.
• Within the HF/LF section of the equaliser, when it will move with the HF/LF TO MON button.
• Within the MIDS section of the equaliser, when it will move with the MIDS TO MON button.

With the two latter options, the filter section will also be under the control of the automated EQ IN switch.

The TO DYN button moves the whole filter section (regardless of its position) into the sidechain of the Channel Path Dynamics processor (see Dynamics section.)

INSERTS
The Channel Path Insert is balanced, the Send being transformer-coupled, and the Return being a TLA input stage. The Send is always active, and the Return is selected (hence the insert activated) by the CH INS IN button.

The PRE button selects the position of the Insert to be one of two positions in the signal path, the factory defaults being Pre-EQ when PRE is selected and Post-EQ when not. However, two sets of internal jumpers can be changed to alter these options, providing the following alternatives:

The PRE button can select the Insert to be Post-EQ (but still Pre-Fade) when PRE is selected (i.e., button down). In this case, the Insert will be Post-Mute.

The PRE button will select the Insert to be Post-Fade when PRE is not selected (i.e., button up).

AUXILIARY SENDS
The Aux Send possibilities on the 9098i are probably more comprehensive and flexible than on any other console available. The range of sourcing and routing possibilities allow the generation of many different auxiliary mixes for use as cue sends, alternative mixes for broadcast and OB use, FX sends and multiformat mixes.

There are 16 Aux busses on the 9098i, and like all other busses, they are fully balanced. The 16 busses are arranged as 8 mono and 4 stereo, though the stereo pairs can be switched to monos if preferred, giving 16 separate mono sends, with individual level controls.

The default configuration of Auxes 1&2, 3&4, 9&10 and 11&12 is as stereo pairs. Auxes 5, 6, 7, 8, 13, 14, 15&16 are always mono. Individual automated MUTE switches are provided for all mono sends and for each stereo pair.

The Aux Sends are arranged in pairs, and each pair is provided with a PRE/POST switch and CHAN/MON source selection. For all sends, the PRE-FADE source can be selected by internal jumpers to be either PRE-MUTE or POST-MUTE in whichever Path is selected. Auxes 1&2 are additionally designated on the console surface as Cue A. Their controls are physically separated from the remainder of the Aux Send section so there is always one stereo send close to the main fader. Auxes 3&4 are similarly designated Cue B, although their controls are in the main Aux Send block.

In addition to feeding the respective Aux Busses, all Aux Sends can access the 48tk Busses, and Cue A also the four Stereo Busses.



A very useful feature of the Aux Send system allows the upper 8 controls to address the lower-numbered busses (1-8) instead of 9-16. By selecting the source Path of the lower 8 Sends to be different from that of the upper 8, the two Paths in each module can thus address the same 8 busses at entirely different levels.

All Aux Send LEVEL controls are calibrated with 0dB gain when fully clockwise. PAN controls in Stereo Sends operate such that the opposite leg is fully off at full rotation.

As the facilities of the various Aux Sends differ somewhat, the sends are described in pairs:

AUXES 1&2 (CUE A)
Cue A is a stereo send with separate LEVEL and PAN controls. The MONO button reconfigures them as two separate Mono Sends, with LEVEL controlling Aux 1 Send Level, and PAN controlling Aux 2 Send Level. There is a second, outer arc around the PAN control, calibrated for this purpose.

MUTE - mutes any output from the send controls. This is an automated switch.

Default source is the Channel Path; MON sources them instead from the Monitor Path.

Default Path source position is Post-Fade; the PRE button selects Pre-Fade. This applies regardless of which Path is sourcing the sends and whichever fader is in that Path. This function is also controllable from the Central Assignment Panel (CAP). If selected, the PRE button acts as a local override.

The SFP (Send Follows Pan) button sources the Aux Sends from post the main PAN control (Channel or Monitor according to the setting of the MON button). Aux 1&2 PAN is bypassed. Note that selecting SFP will override stereo surround routing via Auxes 1&2, as the source will be the L&R feeds from the main CHANNEL PAN.

The ABCD button disconnects the Aux send controls' outputs from Aux busses 1&2, and instead routes them to the 4 stereo buss access buttons A, B, C and D at the top of the module. This permits these busses to be used as additional Aux sends. If selected, these Busses are unavailable to the Channel Path or Monitor Path.

The Aux send controls can feed the 48tk routing matrix by selecting Aux 1&2 TO 48TK. This function is selected from the CAP (Central Assignment Panel), and the assignment is indicated by green 48TK LED adjacent to the send controls. Access to Aux busses 1&2 is disconnected, and Aux 1 LEVEL/PAN feeds odd-numbered busses, Aux 2 LEVEL/PAN feeds even-numbered busses. If selected, neither Channel Path nor Monitor Path have access to the 48tk routing matrix.

Aux 1 LEVEL and PAN are also used in LCRSS and 5.1. modes as the stereo surround controls.
It is possible to swap Aux 1&2 LEVEL with the Monitor Fader, allowing automated send levels.

AUXES 3&4 (CUE B)
Cue B is a stereo send with separate LEVEL and PAN controls. The MONO button reconfigures them as two separate mono sends, with LEVEL controlling Aux 3 send level, and PAN controlling Aux 4 send level. There is a second, outer arc around the PAN control, calibrated for this purpose.

MUTE mutes any output from the send controls. This is an automated switch.

Default source is the Channel Path; MON sources the sends instead from the Monitor Path.

Default Path source position is Post-Fade; the PRE button selects Pre-Fade. This applies regardless of which Path is sourcing the sends.

The SFP button sources the Aux Sends from post the main PAN control (Channel or Monitor according to the setting of the MON button). Aux 3&4 PAN is bypassed.

The Aux send controls can feed the 48tk routing matrix by selecting Aux 3&4 TO 48TK. This function is selected from the CAP and the assignment is indicated by a green 48TK LED adjacent to the send controls. Access to Aux busses 3+4 is disconnected, and Aux 3 LEVEL/PAN feeds odd-numbered busses, Aux 2 LEVEL/PAN feeds even-numbered busses. If selected, neither Channel Path nor Monitor Path have access to the 48tk routing matrix.

AUXES 5&6
Auxes 5&6 are two mono sends with individual LEVEL controls.

The two MUTE buttons mute any output from the send controls.They are automated switches.

Default source is the Channel Path; MON sources the sends instead from the Monitor Path.

Default Path source position is Post-Fade; the PRE button selects Pre-Fade. This applies regardless of which Path is sourcing the sends.

The Aux send controls can also feed the 48tk routing matrix by selecting AUX 5&6 TO 48TK. This function is selected from the CAP, and the assignment is indicated by a green 48TK LED adjacent to the send controls. Access to Aux busses 5&6 is disconnected, and Aux 5 LEVEL feeds odd-numbered busses, Aux 6 LEVEL feeds even-numbered busses. If selected, neither Channel Path nor Monitor Path have access to the 48tk. routing matrix.

Aux 5 LEVEL is also reassigned as the Sub-Bass Channel level control when the console is set to 5.1 mode. More details are given in the section on Multiformat modes.

AUXES 7&8
Auxes 7&8 are two mono sends with individual LEVEL controls.
The two MUTE buttons mute any output from the send controls. They are automated switches. Default source is the Channel Path; MON sources the sends instead from the Monitor Path. Default Path source position is Post-Fade; the PRE button selects Pre-Fade.



The Aux send controls can feed the 48tk routing matrix by selecting AUX 7&8 TO 48TK. This function is selected from the CAP, and the assignment is indicated by a green 48TK LED adjacent to the send controls. Access to Aux busses 7&8 is disconnected, and Aux 7 LEVEL feeds odd-numbered busses, Aux 8 LEVEL feeds even-numbered busses. If selected, neither Channel Path nor Monitor Path have access to the 48tk routing matrix.

AUXES 9&10
Auxes 9&10 are a Stereo Send with separate LEVEL and PAN controls. The MONO button reconfigures them as two separate mono sends, with LEVEL controlling Aux 9 send level, and PAN controlling Aux 10 send level. There is a second, outer arc around the PAN control, calibrated for this purpose.

MUTE - mutes any output from the send controls. It is an automated switch.

Default source is the Channel Path; MON sources the sends instead from the Monitor Path.

Default Path source position is Post-Fade; the PRE button selects Pre-Fade.

Aux Send 9&10 LEVEL and PAN controls can be switched to feed Aux busses 1&2. This function is controlled from the CAP. This is a unique feature, which permits the signals in the two Paths in any module to be fed to the same Aux buss at different levels.

The Aux send controls can also feed the 48tk routing matrix by selecting AUX 9&10 TO 48TK. This function is selected from the CAP and the assignment is indicated by a green 48TK LED adjacent to the send controls. Access to Aux busses 9&10 is disconnected, and Aux 9 LEVEL/PAN feeds odd-numbered busses, Aux 10 LEVEL/PAN feeds even-numbered busses. If selected, neither Channel Path nor Monitor Path have access to the 48tk routing matrix.

AUXES 11&12
Auxes 11&12 are a stereo send with separate LEVEL and PAN controls. The MONO button reconfigures them as two separate mono sends, with LEVEL controlling Aux 11 send level, and PAN controlling Aux 12 send level. There is a second, outer arc around the PAN control, calibrated for this purpose.

MUTE mutes any output from the send controls. This is an automated switch.

Default source is the Channel Path; MON sources the sends instead from the Monitor Path. Default Path source position is Post-Fade; the PRE button selects Pre-Fade.

Aux Send 11&12 LEVEL and PAN controls can be switched to feed Aux busses 3&4. This function is controlled from the CAP.

The Aux send controls can feed the 48tk routing matrix by selecting AUX 11&12 TO 48TK. This function is selected from the CAP, and the assignment is indicated by a green 48TK LED adjacent to the send controls. Access to Aux busses

11&12 is disconnected, and Aux 11 LEVEL/PAN feeds odd-numbered busses, Aux 12 LEVEL/PAN feeds even-numbered busses. If selected, neither Channel Path nor Monitor Path have access to the 48tk routing matrix.

AUXES 13&14
AUXES 13&14 are two mono sends with individual LEVEL controls.

The two MUTE buttons mute any output from the send controls. They are automated switches. Default source is the Channel Path; MON sources the sends instead from the Monitor Path.

Default Path source position is Post-Fade; the PRE button selects Pre-Fade.

Instead of feeding Aux busses 13&14, Aux Send 13&14 LEVEL controls can be switched to feed Aux busses 5&6. This function is controlled from the CAP.

The Aux send controls can feed the 48tk routing matrix by selecting AUX 13&14 TO 48TK. This function can only be selected from the CAP and the assignment is indicated by a green 48TK LED adjacent to the send controls. Access to Aux busses 13&14 is disconnected, and Aux 13 LEVEL/PAN feeds odd-numbered busses, Aux 14 LEVEL/PAN feeds even-numbered busses. If selected, neither Channel Path nor Monitor Path have access to the 48tk routing matrix.

AUXES 15&16
Auxes 15&16 are two mono sends with individual LEVEL controls.

The two MUTE buttons mute any output from the send controls. They are automated switches.

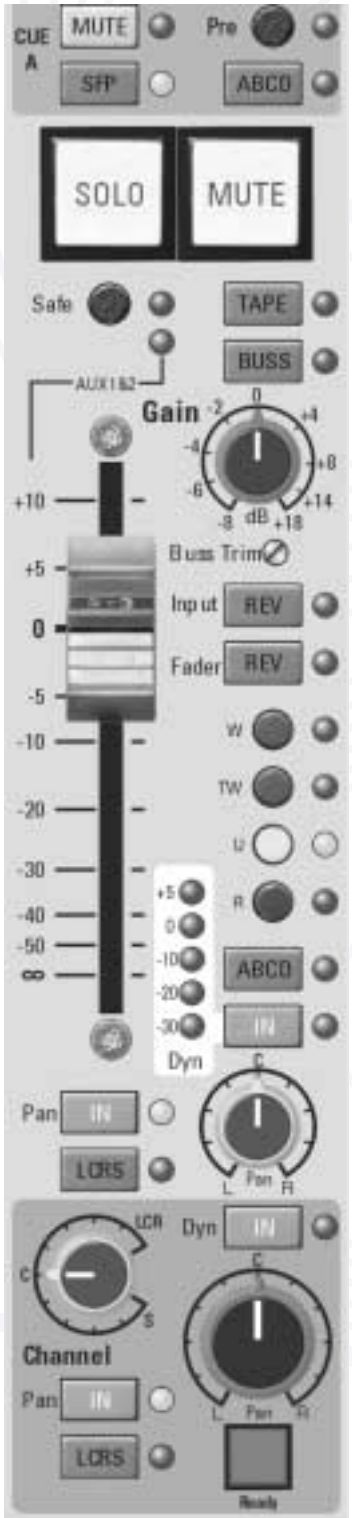
Default source is the Channel Path; MON sources the sends instead from the Monitor Path.

Default Path source position is Post-Fade; the PRE button selects Pre-Fade.

Instead of feeding Aux busses 15&16, Aux Send 15&16 LEVEL and PAN controls can be switched to feed Aux busses 7&8. This function is controlled from the CAP.

The Aux send controls can feed the 48tk routing matrix by selecting AUX 15/16 TO 48TK. This function can only be selected from the CAP, and the assignment is indicated by a green 48TK LED adjacent to the send controls. Access to Aux busses 15&16 is disconnected, and Aux 15 LEVEL/PAN feeds odd-numbered busses, Aux 16 LEVEL/PAN feeds even-numbered busses. If selected, neither Channel Path nor Monitor Path have access to the 48tk routing matrix.

FADER BLOCK
The Channel Path Fader is a touch-sensitive 104mm motorised Penny&Giles Series 3000 type, mounted on a separate 9098i-B Fader Block below the 9098i-A module it controls. The audio signal passes through the fader at all times, except when the automation system is in VCA mode, or when Dynamics are applied, when it is diverted via a VCA for control purposes.



In addition to the fader itself, there are various other controls on the Fader Block:

A large, internally illuminated MUTE button operates a special ramp circuit designed to ensure completely silent muting.

The ramp circuit is also employed, of course, when replaying automated mutes.

A large, internally illuminated SOLO button puts the Channel Path into whichever Solo mode has been selected by the SOLO MODE buttons in the Master Section. Great flexibility exists in the set-up possibilities of the 9098i Solo System - see the section on the Solo Modes for more details.

The green SAFE button (and associated LED) toggles the Channel Path in and out of SOLO SAFE state, which prevents the Path from being muted when other SOLO buttons elsewhere on the console are activated when CHECK (Solo in Place) is selected as the console Solo Mode. CHANNEL SAFE can also be globally selected from the CAP, when the SAFE button becomes a local override.

The small internally illuminated SEL button assigns the entire module to the Central Assignment Panel (CAP) in the Master Section, allowing the selection of the various centrally controllable module functions, and also for the assignment and control of Dynamics functions.

There are four buttons (with matching LEDs) controlling the primary automation modes of the moving fader. Only one mode can be active at a time. The four modes are:
• Write mode (red button) -fader movements are written to the current mix.
• Read mode (green button) -data is replayed from current mix, and the fader replicates movements previously recorded.
• Update mode (yellow button) -The previous mix data is replayed as in READ. Any new fader movements are written to the mix as in WRITE and are merged with the previous movements. If the Automation System is running in VCA mode, Update mode performs a VCA level trim of the underlying faders.
• Touch Write mode (red button) - this is “pre-selected” from READ mode. The LED is on, but the fader remains in READ until the fader knob is touched. The fader then enters TOUCH WRITE mode (which from this point is synonymous with WRITE). Releasing the fader restores READ mode. The mode is deselected by a second button press. Glide times, during which the fader goes back to its previous position when exiting WRITE or TOUCH WRITE modes, can be selected via the screen. See the Supertrue V4 Section for more details.

All faders on the entire console can be placed into any of the automation modes via keyboard shortcuts. A 4-segment PFL meter is fitted, providing “signal presence” indication at all times. The segments are at -30, -15 (green), and 0dB (red), plus Overload (amber). The Overload level is adjustable from the Master Section.

A 5-segment Gain Reduction display is also fitted, which becomes active when the Channel Path Dynamics are active. The display indicates the action of the Compressor, Gate or other Dynamics processor selected.

PANNING
Because the 9098i has been designed to be used in LCRS and other surround modes , the panning facilities of the 9098iA module are more extensive than are those usually encountered.

The console's four pan modes are commanded from the Master Section, and each automatically configures the arrangement of the Channel Path pan controls on the 9098iA modules.

Master Status Stereo Pan mode utilises only the large, main PAN control. This pans between the L&R legs of the LCRS buss, C&S being unused. It also pans across any of the four stereo busses (A, B, C and D), and/or odd (L) and even (R) numbered main busses which may be routed to by the routing matrix at the top of the module.

LCRS mode, used with matrix surround systems such as Dolby Stereo, makes the C&S legs of the LCRS buss active. The post-fade signal first feeds the F-B PAN control, which pans between the S leg (anticlockwise) and the main PAN control. This now pans from L, through C, to R, the centre-detented position feeding the C leg directly. Centrally panned signals will be at -3dB in the L&R legs. Stereo panning remains across the A, B, C and D busses as in Stereo mode. However, the 48tk busses can now be accessed in 12 groups of 4, each forming a further LCRS stem, with panning between the four legs as described for the LCRS main buss. The correspondence is as follows:
• Busses 1, 5, 9, etc. are fed with the L signal
• Busses 2, 6, 10, etc. are fed with the R signal
• Busses 3, 7, 11, etc. are fed with the C signal
• Busses 4, 8, 12, etc. are fed with the S signal

LCRSS mode (5-way) permits panning between independent left-rear and right-rear speakers. The S output from the F-B PAN control now feeds the Cue A LEVEL and PAN controls, the outputs of which can be routed to stereo busses A, B, C and D (via the CUE A TO ABCD button) instead of Auxes 1&2 if wished. Thus any of the 4 stereo busses, or Aux busses 1+2, can be used to feed the rear speakers. The S legs of the LCRS buss and of the 48tk stems are still fed by a mono sum of the left-rear and right-rear signals. Front LCR panning is as in the LCRS mode.

5.1 mode (6-way), used in discrete film formats such as Dolby Digital, and also by DVD encoding systems, maintains the surround format of LCRSS, but calls also for one additional (band-limited) channel, which carries only LF information for special effects. This sub-bass channel does not need to be panned, and is normally derived simply from the post-fade signal of a particular channel (which frequently carries only the sub-bass information). Selecting 5.1 mode invokes all the routing of the LCRSS mode, and also connects the output of the Aux 5 LEVEL control to the S legs of the LCRS buss and 48tk stems, disconnecting it from Aux buss 5. This then controls the sub-bass level.

The main stereo PAN control can be switched in and out of circuit by the PAN IN button. If not in circuit, a full level signal is fed to all busses selected. Divergence cards are standard on every 9098i-A Mono Input Module providing a choice of 8 different panning laws between LCR. These can be selected on a per-channel basis via Supertrue V4. Divergence panning laws, when panned to centre, are 0, -3, -4, -6, -9, -12, -20 and -50dB on left and right

ROUTING
The Channel Path can access all the mix busses. The LCRS button adjacent to the main pan controls routes to the main LCRS mix buss. This routing is also centrally forced by certain Master Statuses; if so selected, LCRS acts as a local override.

The remainder of the module routing is at the top of the module. Separate A, B, C and D buttons route to the four stereo busses. 24 routing buttons labeled 1-24 route to multitrack busses 1-24, plus a 25-48 button which acts as a "shift" key, allowing the same buttons to access busses 25-48 instead, the higher buss numbers being marked on the faceplate.

DYNAMICS
The Channel Path is equipped with a versatile Dynamics Processor, which can be configured as various types of Gate, Compressor, Limiter, Expander or multifunctional devices.

The DYN button adjacent to the PAN controls switches the selected Dynamics device in and out of circuit. Switching the Dynamics in diverts the audio from the audio track of the fader to the VCA, which is now controlled by the fader position as well as the Dynamics processor.

Assignment of a Dynamics device and control of its parameters can be either through the main screen or via the CAP in the Master Section. See the section on the CAP for more details. Note that any Dynamics device assigned to the Channel Fader moves with it when FADER REV is selected.

The sidechain of the Dynamics Processor can be fed from one of several places in the Channel Path; the selection is by internal jumpers. The choices are:
• Channel Pre-EQ - this is the default setting and allows the Mic/Line preamp to be fed directly to the dynamics card.
• Channel Pre-Fade - this permits frequency-dependent Dynamics processing.
These two setting can be switched using the KEY switch in the Virtual Dynamics section of Supertrue.
• Channel Insert Return - this permits external keying of a Dynamics device, via the jackfield. (If this option is selected, it is not necessary to have the Insert enabled.)

As explained in the Filters section, the HF and LF sweep filters may be placed in the sidechain of the Channel Path Dynamics device by selecting TO DYN, permitting frequency-conscious gating or limiting.

THE MONITOR PATH

INPUT SECTION
The input to the Monitor Path is selected by the BUSS and TAPE buttons adjacent to the small fader. The switches are electronically interlocking.

Selecting BUSS permits monitoring of the 48tk buss corresponding to the module position in the frame; thus the module in position 1 monitors Buss 1, and so on. The Buss Return signal is post the Buss Out/To Tape half-normalled pair on the jackfield, to allow for the monitoring of any device patched in pre the recording device.

Selecting TAPE permits monitoring of the same-numbered tape track (here "Tape" is used to signify a recording device of any kind), again post the From Tape/Tape Ret jackfield Insert.

Selection of BUSS or TAPE may be performed globally from the CAP; if so selected, BUSS and TAPE act as local overrides.

INPUT REV swaps the Mic/Line selection in the Channel Path with the Buss/Tape selection in the Monitor Path. Thus, Buss or Tape becomes the input to the Channel Path, while the Mic or Line inputs are available via the Monitor Path. This mode can also be centrally controlled from the CAP; if so selected INPUT REV acts as a local override.

The gain of the input stage is controlled by the GAIN pot, which has a gain range of -8dB to +18dB, with a centre detent at 0dB.

In accordance with conventional in-line practice, the feed to the main track meter (above each module) is taken from the Monitor Path, post the Tape/Buss selection. The GAIN setting does not affect the meter reading. The track meters can be globally selected from the Master Section to be fed from the Channel Paths instead.

INSERTS
The Monitor path has its own fully balanced Insert point, which is identical in properties and facilities to that in the Channel Path. MON INSERT IN switches the Insert in and out.

AUX SENDS
The 9098i's 16 Auxiliary Sends and their facilities on the 9098i-A module

have already been described in detail. Pairs of busses may be sourced from the Monitor Path as desired.

FADER, PANNING AND ROUTING
The Monitor Path Fader is a touch-sensitive 65mm motorised Penny&Giles Series 3000 type. The audio signal passes through the fader at all times, except when the automation system is in VCA mode, or when Dynamics are applied, when it is diverted via a VCA for control purposes.

A large, internally-illuminated MUTE button operates the same silent mute circuit as in the Channel Path.

A large, internally-illuminated SOLO button puts the Monitor Path into whichever Solo mode has been selected by the SOLO MODE buttons in the Master Section. It is an automated switch. See the section on the Solo Modes for more details.

The SAFE button toggles the Monitor Path in and out of the Solo Safe state. This prevents the Path from being muted when other CHECK (Solo) buttons elsewhere on the console are activated when Solo In Place is selected as the console Solo Mode. Monitor Safe can also be globally selected from the CAP, when the SAFE button becomes a local override.

FADER REV swaps the two faders, so that the long-throw fader now controls the signal in the Monitor Path and the short-throw fader controls the signal in the Channel Path. This mode can also be centrally controlled from the CAP; if so selected, FADER REV acts as a local override.

Monitor Fader to Aux 1&2 (MON FAD > AUX 1+2) is a function controlled from the Master Section CAP. The red LED above the Monitor Fader indicates its selection. It swaps the Monitor Fader with Aux 1&2 LEVEL control, providing an automated stereo Aux Send, or automation of rear surround levels when in the appropriate modes. (However, the selection of SFP on Cue A overrides the function, as SFP requires the use of a stereo level control, and the monitor fader is only mono).

The four buttons (with matching LEDs) - WRITE, READ, UPDATE and TOUCH WRITE - control the primary automation modes of the moving fader in exactly the same way as the corresponding buttons on the 9098i-B Channel Path Fader Block.

The Monitor Path signal can be routed to all the main busses:

The LCRS button accesses the main L and R legs of the main LCRS buss. The C and S legs are unavailable to the Monitor Path. This routing is forced by certain centrally assigned Master Statuses; if so selected, LCRS acts as a local override.

The ABCD button permits the four stereo buss routing buttons (at the top of the module) to be fed from the Monitor Path.

The MON TO 48TK button (at the top of the module) permits the 48tk routing matrix to be fed from the Monitor Path. This mode is also centrally controllable from the CAP; if so selected, the button acts as a local override. Selecting MON TO 48TK prevents the Channel Path from feeding the routing matrix.

The MONITOR PAN control is placed in circuit by the PAN IN button. This pans across the L&R legs of the LCRS, A, B, C and D busses, and between odd (L) and even (R) multitrack busses. If not in circuit, a full-level signal is fed to all busses selected.

DYNAMICS
The Monitor Path is equipped with a Dynamics Processor of identical type to that in the Channel Path. The DYN button adjacent to the Monitor Fader switches the selected Dynamics device in and out of circuit. This is an automated switch.

Assignment of a Dynamics device, and control of its parameters is either done through the Dynamics window on the TFT screen or via the CAP in the Master Section. See the section on the CAP for more details. Note that any Dynamics device assigned to the Monitor Fader moves with it when FADER REV or MON FAD > AUX 1+2 is selected.

The sidechain of the Dynamics Processor can be fed from one of several places in the Monitor Path; the selection is by internal jumpers. The choices are:
• Monitor Pre-EQ - this is the factory default, and is the same signal as the main signal feed, for normal Dynamics operations.
• Monitor Pre-Fade - permitting frequency-dependent Dynamics processing
• Monitor Insert Return - this permits external keying of a Dynamics device, via the jackfield.

A 5-segment gain reduction display is fitted adjacent to the Monitor fader, which becomes active when the Monitor Path Dynamics are active. The display indicates the action of the Compressor, Gate or other Dynamics processor selected.

REC/READY BUTTON
The internally illuminated, red REC/READY button (below the Channel Path main PAN) is a 5V Logic switch, accessible on a Sub-D connector on the rear connector panel. This can used to arm tracks on multitrack recording devices.

The internal LED can be controlled by a tally from the recording device, and the tally inputs are available on a similar rear connector.

BUSS CONTROLS
As the 9098i-A is an in-line module, the summing amplifiers for the 48tk busses are located in the first 48 modules themselves. The buss summed corresponds to the module position in the frame, thus the module in position 1 sums the signals routed to Buss 1. Modules in positions 49 and above still have the summing amplifier fitted, though it is unused. The Buss Send is still active, however, and may be used by putting the module in DIR (Direct) mode.

The BUSS/DIRECT LEVEL control (adjacent to the Channel Path Input section) adjusts the Buss Send signal level leaving the module for the recording device. The range of gain adjustment is fully off to +6dB, with a centre-detented 0dB position. There is a trim tool-adjustable BUSS TRIM preset (adjacent to the Monitor Fader) to accurately set the level at the detent position of the GAIN control.

The Buss Send signal is transformer balanced, and is fed to the To Tape multiway connectors via the jackfield. The To Tape feed is also returned to the Monitor Path as the Buss Return.

The DIR (Direct) button selects Direct output mode. This connects the Channel Path Post-Fade signal (but see below) directly to the Buss Send, thus bypassing the main busses and summing amplifier entirely. This gives a noise improvement over routing via the busses (which is itself already very low), and results in the very best noise and distortion performance achievable. The BUSS/DIRECT control still functions normally. Direct mode can also be globally selected from the Master Section and when so selected, the DIR button acts as a local override.

The factory default signal which provides the DIR feed is the Channel Path, Post-Fade. Three other options exist, which are selectable internally by jumpers:
• Channel Path Pre-Fade
• Monitor Path Post-Fade
• Monitor Path Pre-Fade
The two Pre-Fade options are both ‘pre’ the respective Path MUTES.

9098i-L Stereo Input Module

9098i-L Dual Stereo Input Modules may be fitted in any quantity anywhere in the chassis, although for simplicity of wiring layout, it is recommended that they are not fitted in Positions 1-48 and are fitted in groups of four. Note: the Mono modules cannot be fitted in Stereo positions A to D.

The Dual Stereo module contains two separate stereo signal Paths, denoted Stereo Line Input and Stereo FX Return. The Stereo Input Path can alternatively act as a stereo subgroup master.

The Stereo Line Input uses a long-throw fader on the separate fader block, while the FX Return Path uses a large rotary control.

INPUT SECTION
The input stage of the Stereo Line Input is also a Mr. Rupert Neve designed Transformer-Like Amplifier, as elsewhere on the console. The inputs are accessible at the jackfield as well as via multiway connectors.

The BUSS button selects pairs of multitrack busses as the inputs. Normally, the first 9098i-L module in the chassis will pick up Busses 1&2, and so on. However, any alternative arrangement required may be specified. This facility gives a rapid means of forming a stereo audio subgroup without tying up either of the Paths in any of the 9098i-A modules. The usual constraint of not routing such a subgroup to itself applies.

INPUT GAIN permits a range of input gain adjustment from -8dB to +18dB. The 0dB gain setting is detented.

Mono operation may be obtained by pressing the L MONO or R MONO buttons. This selects one leg only as the input to both L+R paths of the Stereo Line Input, the other leg being disconnected. If both L MONO and R MONO are pressed, an L+R sum of both input legs is sent to both paths.

Phase reverse, switched by the Rø button, is operative on the R input leg only.

An MS matrix may be switched into circuit by the M-S button adjacent to the INPUT GAIN control. This permits the 9098i-L Stereo Line Input to handle signals - from field recordings, for example - which have been recorded in Mid-Side format. Selecting the MS matrix decodes MS signals into conventional L/R (A/B) stereo. The matrix is symmetrical, so will also convert AB signals to MS (though the WIDTH control will not perform its normal function).

EQUALISER&FILTER
The stereo equaliser is based on the mono 9098i EQ, but is reduced slightly in facilities. It is a 4-band design, with semi-parametric mid ranges, and switched turnover frequencies in the HF + LF sections.

All 4 sections have a CUT/ BOOST control offering +/-18dB of adjustment.

The LF range is a shelving filter with a turnover frequency of 46Hz or 100Hz.

The LMF range is a Bell-Response filter, with centre frequency continuously variable from 160Hz to 2.7kHz. The bandwidth can be switched from 0.75 to 1.8 by the Q button.

The HMF range is also a Bell-Response filter, with centre frequency continuously variable from 1.2kHz to 18kHz. The bandwidth can be switched from 0.75 to 1.8 by the Q button.



The HF range is a shelving filter with a turnover frequency of 4.8kHz or 10kHz.

The HF and LF sections may be switched into circuit with the HF/LF IN button, and HMF and LMF sections with the MF EQ IN button.

The entire equaliser section my be switched in and out of circuit, regardless of the HF/LF IN and MF EQ IN buttons, by the ALL EQ IN button. It is an automated switch.

A swept Hi-pass filter is also fitted, with a range variable from 20Hz to 300Hz. There is a separate FILTER IN button for this section.

INSERTS
The Stereo Line Input has a stereo balanced Insert (L+R), both Sends and Returns being TLA designs. The Sends are always active, and the Returns are selected (hence the insert activated) by the INS IN button. The PRE button selects the position of the Insert to be Pre-EQ when PRE is selected and Post-EQ when not.

AUXILIARY SENDS
The Stereo Line Input on the 9098i-L module can access all 16 Aux Busses, but with slightly reduced flexibility as compared to the 9098i-A mono module.

The Aux Sends are arranged in pairs. The Send pairs are provided with automated MUTE, and PRE/POST selection as detailed below. Auxes 1&2 are again designated Cue A, and their controls are physically separated from the remainder of the Aux Send section so there is always one stereo send close to the main fader. Auxes 3&4 are similarly designated Cue B.

The mono Aux Sends on the 9098i-L module provide an (L&R) sum of the two signals in the channel. The stereo Sends are true stereo - the L leg only carries information from the L channel, and vice-versa.

All Aux Send LEVEL controls are calibrated with 0dB gain when fully clockwise.

AUXES 1&2 (CUE A)/3&4 (CUE B)
Cue A is a stereo send with separate LEVEL and BALANCE controls.

MUTE mutes any output from the send controls. This is an automated switch.

Default Path source position is Post-Fade; the PRE button selects Pre-Fade.

The SFP (Send Follows Pan) button sources the Aux Sends from post the main PAN control. Cue A BALANCE is bypassed.

The BAL/PAN button, when pressed, converts the BAL control into a PAN control.

The 3-4 button reassigns the output of the Send controls to Aux Buss 3&4 (Cue B).

The ABCD button disconnects the Aux send control's outputs from Aux busses 1&2, and instead routes them to the 4 stereo buss access buttons A, B, C and D at the top of the module, permitting these busses to be used as additional Aux sends. If selected, these busses are unavailable to the Stereo Line Input or FX Return.

9098i-L Stereo Input Module

The Aux send controls can also feed the 48tk routing matrix by pressing 48TK. Access to Aux busses 1&2 is disconnected, and the Send L leg feeds odd-numbered busses, the R leg even-numbered busses. If selected, neither the Stereo Line Input nor FX Return have access to the 48tk routing matrix.

AUXES 5, 6, 7&8
Auxes 5-8 are four mono sends with two shared Level controls-LEVEL 5&6 and LEVEL 7&8.

The two shared mute buttons-MUTE 5&6 and MUTE 7&8 - mute any output from the send controls. These are automated switches. Default Path source position for all four Sends is Post-Fade; the PRE button selects Pre-Fade.

AUXES 9/10 & 11/12
Auxes 9/10 and 11/12 are arranged in pairs as stereo sends. One set of LEVEL and PAN controls is used for the selected pair.

Default Path source position for all four sends is Post-Fade; the PRE button selects Pre-Fade.

The BAL/PAN button, when pressed, converts the BAL control into a PAN control.

Instead of feeding Aux busses 9&10, the LEVEL and PAN controls can be switched to feed Aux busses 11&12 by the 11-12 button.

AUXES 13, 14, 15&16
Auxes 13-16 are four mono sends with two shared Level controls -LEVEL 13&14 and LEVEL 15&16.

The two Mute buttons - MUTE 13&14 and MUTE 15&16 - mute any output from the send controls. These are automated switches.

Default Path source position for all four Sends is Post-Fade; the PRE button selects Pre-Fade.

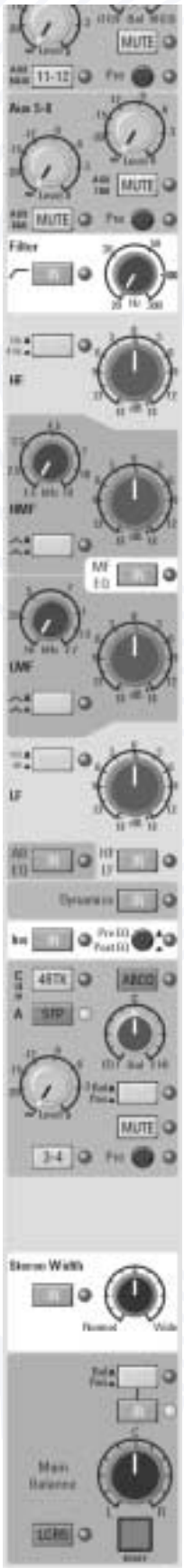
FADER BLOCK
The Stereo Line Input Fader is a touch-sensitive 104mm motorised Penny&Giles Series 3000 stereo type, mounted on a separate 9098i-B Fader Block below the 9098i-L module it controls. The audio signal passes through the fader at all times, except when the automation system is in VCA mode, or when Dynamics are in operation, when it is diverted via a VCA for control purpose.

There are four buttons (with matching LEDs) controlling the primary automation modes of the moving fader. The operation of these is identical to their counterparts on the 9098i-A in-line module.

The MUTE button mutes the Stereo Line Input. The SOLO button puts the Stereo Line Input into whichever Solo mode has been selected by the SOLO MODE buttons in the Master Section. See the section on the Solo Modes for more details.

The SEL button assigns the module to the CAP, allowing the assignment and control of Dynamics and Solo Modes.

The SAFE button toggles the Stereo Line Input in and out of Solo Safe state, which prevents the signal from being muted when other Solo buttons elsewhere on the console are activated when SIP is selected as the console Solo Mode. CHANNEL SAFE, globally selected from the CAP, can also place the Stereo Line Input into SAFE mode. The SAFE button then becomes a local override.



Two sets of LED metering are provided on the fader block.

A 4-segment PFL meter is fitted, providing “signal presence” indication at all times. The segments are at -30, -15 (green), and 0dB (red), plus Overload (amber). The Overload level is adjustable from the Master Section. The meter drive signal is an (L&R) sum of the two channels in the Stereo Line Input.

A 5-segment Gain Reduction display is also fitted, which becomes active when the Stereo Line Input Dynamics are active. The display indicates the action of the stereo Compressor, Gate or other Dynamics processor selected, and again responds to an (L&R) sum of the two signals.

PANNING
The Stereo Line Input MAIN BALANCE control can be switched in and out of circuit by the PAN IN button. The BAL/PAN button converts the MAIN BALANCE control to a PAN control.

In BALANCE mode, the range of the panpot is 0dB/-6dB , with the centre detent being -2.5dB down relative to a mono signal. In PAN mode, the control cuts the opposite leg completely at the end stops, at which point the required signal is at 0dB. The centre position is -3dB.

A Stereo WIDTH control is fitted, which can be used to widen the perceived stereo image by using two MS matrices in series. The WIDTH control can be switched in and out of circuit with the WIDTH IN button.

The WIDTH control also functions normally when the MS matrix is in circuit to decode MS signals into AB.

It is to be noted that the MS matrix is entirely symmetrical, such that AB signals applied to the Stereo Line Input with the MS matrix selected will be converted into MS format signals. In this case, the WIDTH and BALANCE controls will not perform their proper functions.

ROUTING
The Stereo Line Input can access all the mix busses. The LCRS button adjacent to the main balance controls routes to the L&R legs of the main LCRS mix buss.

The remainder of the module routing is at the top of the module. Separate A, B, C and D buttons route to the four stereo busses. 24 routing buttons labeled 1-24 route to multitrack busses 1-24, plus a 25-48 button which acts as a “shift” key, allowing the same buttons to access busses 25-48 instead, the higher buss numbers being marked on the faceplate.

DYNAMICS
The Stereo Line Input is equipped with a stereo version of the high-quality Dynamics Processor fitted to the 9098i-A modules.

The DYNAMICS IN button (immediately below the equaliser) switches the selected Dynamics device in and out of circuit. Placing the Dynamics in circuit routes the audio through a VCA, and also transfers level control from the fader’s audio track to the VCA.

Assignment of a Dynamics device, and control of its parameters is done either through the Dynamics window on the main TFT screen or via the CAP in the Master Section. See the section on CAP for more details. The sidechains of the Dynamics Processors are fed with the Stereo Line Input Pre-Fade signal.

REC/READY BUTTON
The REC/READY button (below the main BALANCE control) is a 5V logic switch, accessible on a Sub-D connector on the rear connector panel. This can used as a start/stop button on external stereo play-in devices, for example, and will be particularly useful in broadcast situations. The associated LED can be controlled by an externally provided tally.

STEREO FX RETURN

INPUT SECTION
The input stage of the independent Stereo FX Return is a Mr. Rupert Neve designed Transformer-Like Amplifier. The inputs are accessible at the jackfield as well as via multiway connectors.

Mono operation may be obtained by pressing the L MONO or R MONO buttons. This selects one leg only as the input to both L+R paths of the Stereo Line Input, the other leg being disconnected. If both L MONO and R MONO are pressed, an L+R sum of both input legs is sent to both paths.

Phase reverse, switched by the Rø button, is operative on the R input leg only. The Stereo FX Return has its input gain fixed at 0dB.

AUX SENDS
The Stereo FX Return has its own Aux Send section. All 16 Aux Busses can be accessed from the Stereo FX Return independently of any sends from the Stereo Line Input, though access is limited to being in pairs. The facilities of the various Aux Sends are as follows (in pairs):

AUXES 1&2 (CUE A)/3&4 (CUE B)
A single dual LEVEL control feeds both Aux Busses 1&2 (a stereo pair) at equal level.

MUTE - mutes any output from the send control. This is an automated switch.

Default Path source position is Post-Fade; the PRE button selects Pre-Fade. This also controls the source of Aux Send 5&6/7&8.

The 3-4 button reassigns the output of the LEVEL control to Aux Busses 3&4 (Cue B).

A single dual LEVEL control feeds both Aux Busses 1&2 (a stereo pair) at equal level.

MUTE - mutes any output from the send control. This is an automated switch.

Default Path source position is Post-Fade; the PRE button selects Pre-Fade. This also controls the source of Aux Send 5&6/7&8.

The 3-4 button reassigns the output of the LEVEL control to Aux Busses 3&4 (Cue B).

AUXES 5&6/7&8
A single dual LEVEL control feeds both Aux Busses 5&6 (mono sends) at equal level.

MUTE - mutes any output from the send control. This is an automated switch.

Pre/Post selection is common with Auxes 1&2/3&4.

The 7-8 button reassigns the output of the LEVEL control to Aux Busses 7&8.

AUXES 9&10/11&12
A single dual LEVEL control feeds both Aux Busses 9&10 (a stereo pair) at equal level.

MUTE - mutes any output from the send control. This is an automated switch.

Default Path source position is Post-Fade; the PRE button selects Pre-Fade. This also controls the source of Aux Send 13&14/15&16.
The 11-12 button reassigns the output of the LEVEL control to Aux Busses 11&12.

AUXES 13&14/15&6
A single dual LEVEL control feeds both Aux Busses 13&14 (mono sends) at equal level.

MUTE - mutes any output from the send control. It is an automated switch.

Pre/Post selection is common with Auxes 9&10/11&12.

The 15-16 button reassigns the output of the LEVEL control to Aux Busses 15&16.

LEVEL, PANNING AND ROUTING
The Stereo FX Return LEVEL is a large rotary control. The range of the control is from fully-off to +10dB gain, with a centre-detent at the 0dB position.

The MUTE button mutes the FX Return signal. This is an automated switch.

The SOLO button puts the Stereo FX Return into whichever Solo mode has been selected by the SOLO MODE buttons in the Master Section. See the section on the Solo Modes for more details.

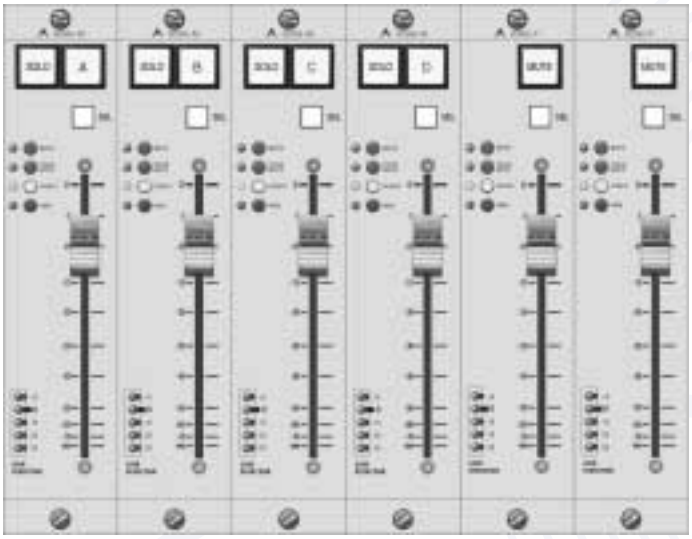
The SAFE button toggles the Stereo FX Return in and out of Solo Safe state. This prevents the Return from being muted when CHECK (Solo) buttons elsewhere on the console are activated. Monitor Safe, globally selected from the CAP, can also place the Stereo FX Return into SAFE mode. The SAFE button then becomes a local override.

The LCRS button accesses the main L and R legs of the main LCRS buss. The C and S legs are unavailable to the Stereo FX Return.

The FX RETURN TO 48TK button permits the 48tk routing matrix to be fed from the Stereo FX Return. Selecting MON TO 48TK prevents the Stereo Line Input from feeding the routing matrix. The FX RETURN BALANCE control is placed in circuit by the BAL IN button. This pans across the L+R legs of the LCRS and between odd (L) and even (R) multitrack busses. If not in circuit, a full-level signal is fed to all busses selected.

The BAL/PAN button converts the FX RETURN BALANCE control to a PAN control. The ranges of operation are the same as for the Stereo Line Input BALANCE control.

9098i-M&P Stereo Faders



A total of four 9098i-M stereo master fader blocks are fitted. These are the Stereo Group Masters for the four stereo busses A, B, C and D.

Each fader block is provided with the following facilities:

The Stereo Master Fader is a touch-sensitive 104mm motorised Penny&Giles Series 3000 stereo type. The audio signal passes through the fader at all times, except when the automation system is in VCA mode or when Dynamics are applied, when it is diverted via a VCA for control purposes.

There are four buttons (with matching LEDs) controlling the primary automation modes of the moving fader. The operation of these is identical to their counterparts on the 9098i-A in-line module.

A large, internally illuminated MUTE button mutes the Stereo Group.

A large, internally illuminated SOLO button puts the Stereo Group Master into whichever Solo mode has been selected by the SOLO MODE buttons in the Master Section. See the section on the Solo Modes for more details.

The small internally illuminated SEL button assigns the module to the CAP, allowing the assignment and control of Dynamics and Solo Modes.

A 5-segment Gain Reduction display is also fitted, which becomes active when the Stereo Group Master Dynamics are active. The display indicates the action of the stereo Compressor, Gate or other Dynamics processor selected, and responds to an (L&R) sum of the two signals.

The LR and CS Master faders control the main LCRS Mix.

The 9098i-P fader block is provided with the following facilities:

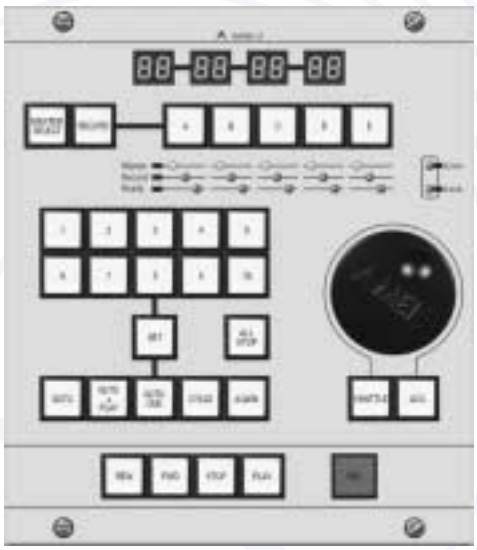
The 9098i-P Master Faders are a touch-sensitive 104mm motorised Penny&Giles Series 3000 stereo type.

When LCRSS or 5.1 Pan Mode is selected, the LR and CS Master Faders can be ganged in software to one of the 4 stereo faders to provide the equivalent of a 6-way fader, without resorting to the use of VCAs.

The MUTE button mutes the LR or CS output.

The SEL button assigns the module to the CAP, allowing the assignment and control of Dynamics.

9098i-U Machine Control



The 9098i-U Machine Control Panel is integrated with 9098i's Supertrue automation system, it provides simple and convenient control of both tape-based and tapeless audio and video recording devices. Standard motion control functions and timecode-based autolocator functions are implemented on dedicated keys. A timecode display, which can show the timecode from either the console automation system or from one of the controlled machines and a numeric keypad are included.

Although integrated with Supertrue, the Machine Control functions are independent of it. Motion commands from the Machine Control Panel are issued to the machines on the system, while Supertrue will normally be a timecode slave of whichever machine is the Control Master on the system.

Machine commands are Serial, Sony 9-pin and MIDI Machine Control (MMC) being output directly by the system. Other, particularly older, machines will require an external synchroniser for protocol conversion, and MicroLynx, Motionworker and Adams-Smith are all supported.

REW, FWD, STOP, PLAY and REC are the standard transport motion control functions. SHUTTLE and JOG allow the jogwheel to move the controlled machines backwards or forwards - JOG incrementally, with the audio and/or video following the motion of the wheel, and SHUTTLE at varispeed down to standstill in either direction.

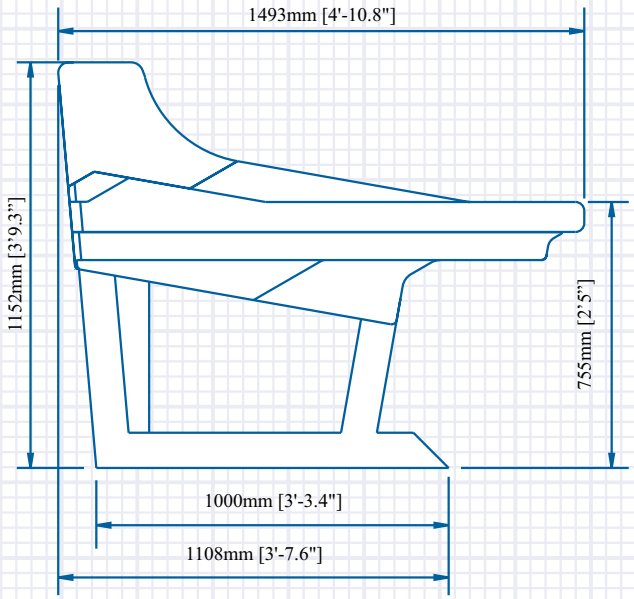
The system permits the storage of 10 Locate Points, which may be captured with the SET key and the numeric keys 1-10. The Locate Points are also accessible and editable in terms of timecode via a menu on the main automation screen.

GOTO, GOTO + PLAY, GOTO CUE, CYCLE and AGAIN are autolocator commands, and are used in conjunction with the numeric keys. The timecode points used in the autolocator commands may either be entered directly (e.g. GOTO), or utilise previously saved Locate Points (e.g. GOTO CUE).

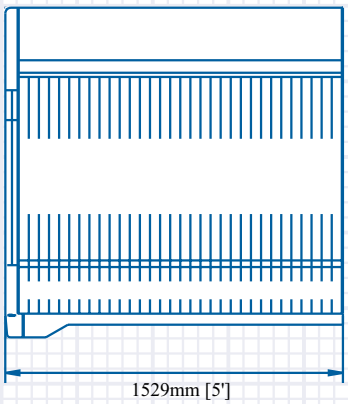
ALL STOP issues a STOP command to all machines on the system, and overrides all previously-issued commands.

The LOCK LED illuminates when all machines on-line have reported satisfactory lock status back to the controller, and the ERROR LED indicates a system fault condition, such as a TAPE OUT condition on a machine.

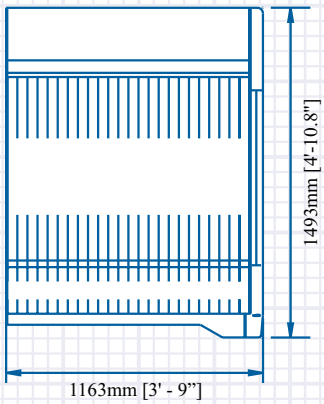


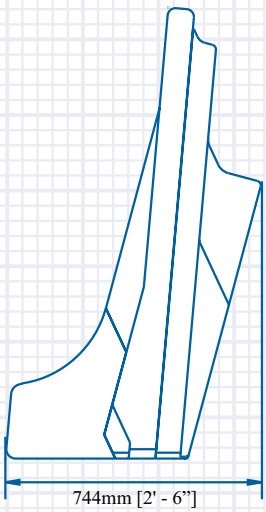


32 Position Bucket



24 Position Bucket





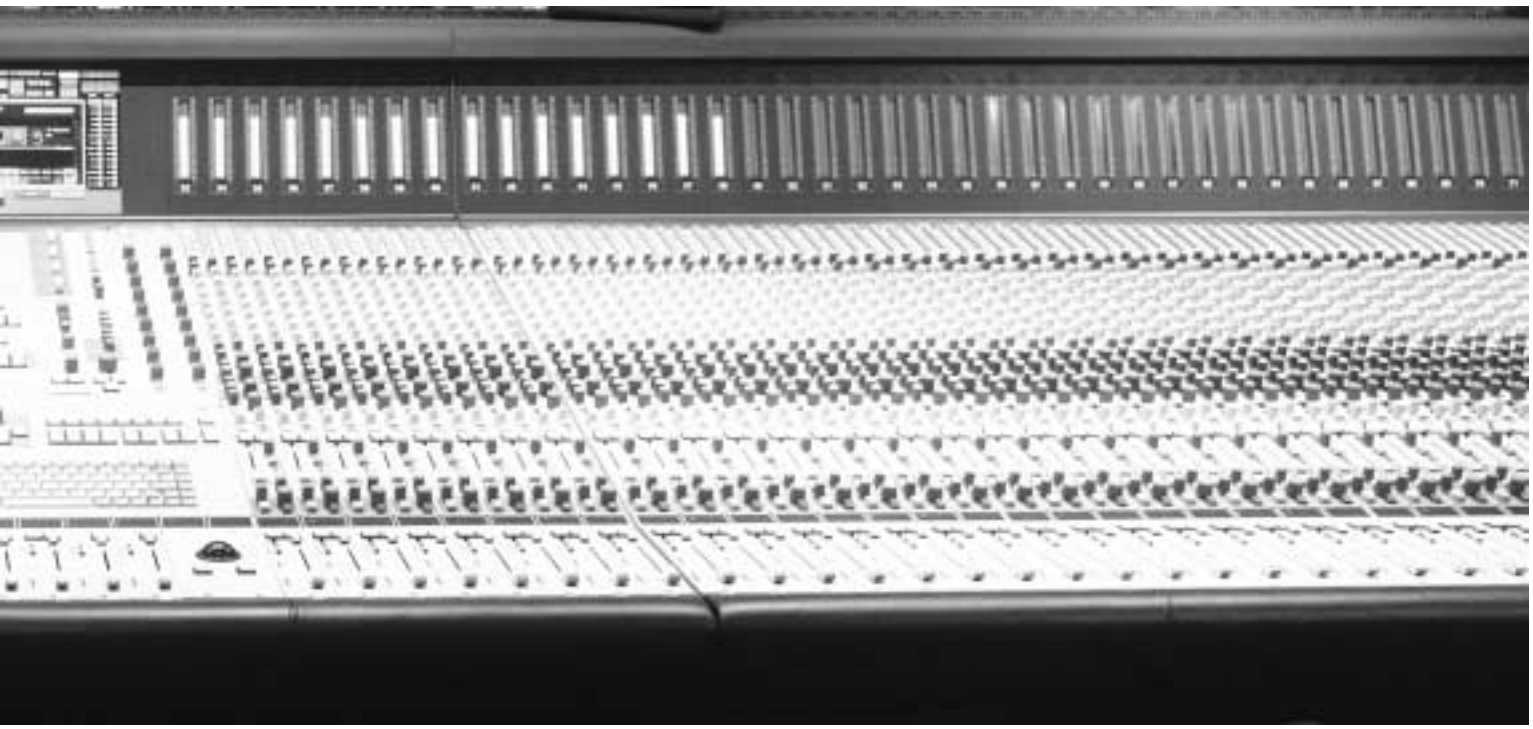
End Elevation - Floorstand Removed

MPS-15 Power Supply - Proven Reliability

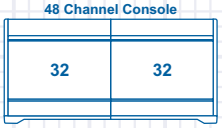
Height: (excl. feet) 266mm (10.47") (6U)
Width: 483mm (19")
Depth: (excl. connectors) 560mm (22.04")
Weight: (excl. packing) 45kg (100lb)

The 9098i is supplied with three rugged MPS-15 power supplies for each chassis section plus one additional supply where bargraph meters are fitted.

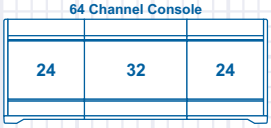




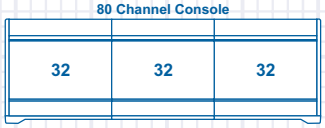
48 Channel Console



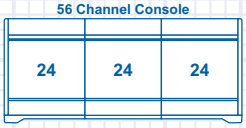
64 Channel Console



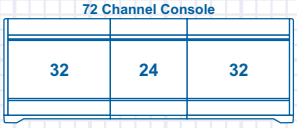
80 Channel Console



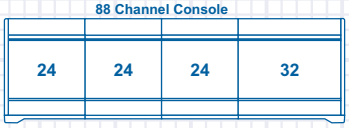
56 Channel Console



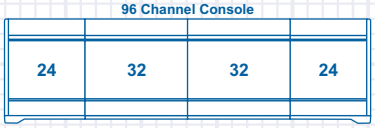
72 Channel Console

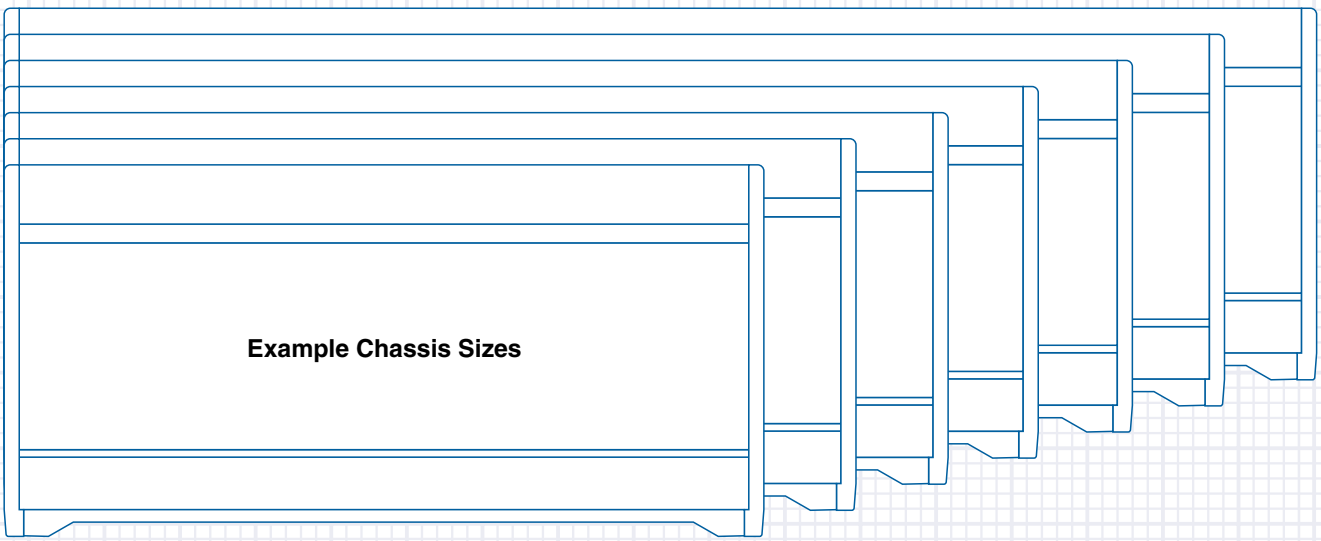


88 Channel Console



96 Channel Console





Example Chassis Sizes

- 48 channel console 3052.1mm (10')
- 56 channel console 3422.8mm (11'3")
- 64 channel console 3788.6mm (12'5")
- 72 channel console 4154.4mm (13'8")
- 80 channel console 4520.1mm (14'10")
- 88 channel console 4891mm (16'1")
- 96 channel console 5257mm (17'3")

9098i-H Master Status Module

The 9098i-H Master Status Module occupies the central area of the Master Section, and contains a variety of large, internally illuminated, electronically latching switches controlling the console Master Statuses. The switches can be divided into 5 groups:

MASTER STATUS SWITCHES
Because many of the switches controlling the signal routing within the input channels are remote controlled, it is possible to globally command various Master console operating statuses from a central position. Six Master Status switches on the 9098i-H panel place the 9098iA modules into pre-definedsignal flow configurations by “forcing” certain channel switches on. A further four buttons globally control the way the various pan controls on the 9098i-A modules are interconnected.

When a Master Status forces a local switch to a ON state, it also illuminates the associated LED on the channel. Any local switch forced into one state or the other by a Master Status switch can cancel the state invoked by the Master Status by being pressed. This overrides the forced state, and the LED accordingly extinguishes.

Note that Master Statuses do not specify any particular Pan Mode, these are set independently.

Custom Statuses can be factory-programmed to suit particular operational situations; however, the default Statuses supplied as standard are as follows:

Record Status - This is the standard mode for multitrack recording. Mic or Line is selected to the Channel Path which is routed to the 48tk routing matrix. The Monitor Path input is switched to Tape, and the output routed to the LCRS buss.

Mix Status - This is the standard mode for multitrack mixing. If INPUT REVERSE is selected the Tape input now being fed to the Channel Path input and the Channel Path (as well as the Monitor Path) is routed to the LCRS buss. The Monitor Path receives either Mic or Line inputs for additional returns, etc. Cue A feeds the 48tk routing, permitting the 48 main busses to be used to provide alternative mixes, etc.

Direct Status - This sets the same module states as Record Status, but additionally forces Direct mode on all 9098i-A modules, bypassing the routing busses and summing amplifiers entirely.

Broadcast Status - This mode permits the simultaneous generation of a stereo master programme feed of Mic and Line inputs on the large faders, and of independent mixed feeds for multitrack recording, a frequent broadcast requirement. Mic or Line is selected to the Channel Path, which is routed to the LCRS buss to provide the main programme. Cue A is selected to Pre-Fade and routed to the 48tk busses, allowing a 48tk recording to be made, with level control of each channel that does not affect the main programme. The Monitor Path receives the Tape signal for checking purposes.

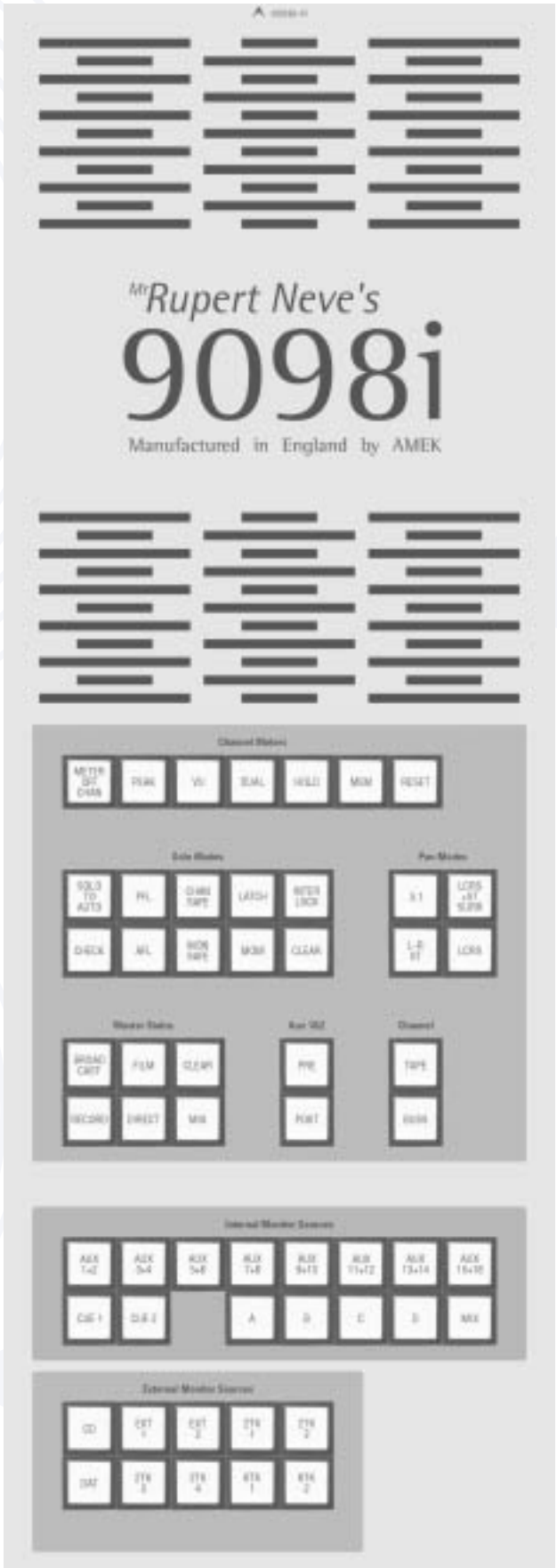
Film Status - This is similar to Mix Status, but INPUT REVERSE is not selected, and Stems tracks from a bank of multitrack or hard-disk recorders are connected to the Line inputs, mixing taking place through the Channel Paths. The final recorder outputs are connected to the Tape inputs, and are monitored via the Monitor Path by setting the Monitor Faders to 0dB. It also arranges for non-destructive Solo functions to be sent to the C speaker only.

Clear - Clears any selected Master Status switch.

The Master Status area also contains two other pairs of switches that set module states globally:

AUX 1&2 PRE/POST - these two switches set the source for all Cue A Sends to Pre or Post-Fade.

TAPE/BUSS - these two switches set all Monitor Paths to Tape or Buss respectively.



9098i-H Master Status Module

PAN MODES
The 9098i can operate in four different Pan Modes, these modes being commanded from the 9098iH module's Pan Mode Master switches. Selecting a Pan Mode configures the interconnection of the pan pots and buss routing switches in the 9098i-A input modules.

The signal routing of the in-line module in each of the Pan Modes is described in detail in the 9098i-A reference section. The four Modes are:

Stereo Mode - for normal stereo operation; the L and R legs of the LCRS main buss are used, and normal L-R panning is available.

LCRS Mode - for Dolby Stereo and other four-channel formats; this uses all four legs of the LCRS main buss, and enables the F-B panning as well as making the front PAN control LCR.

LCRSS Mode - for 5-way formats with stereo rear surround; routes the S signal to Cue A controls, permitting independent rear level and panning.

5.1 Mode - the 6-way mode used in discrete film formats such as DTS® and Dolby Digital®, and also for DVD. This sets the panning as in LCRSS Mode, but additionally routes Post-Fade signals to the Aux 5 LEVEL control to allow a sub-bass channel.

SOLO MODES
The 9098i console has an unusually flexible range of Solo options. All Paths on all input modules have an automated SOLO button. There are 10 SOLO MODE buttons on the 9098i-H Master Status Panel, and divide functionally into 3 groups -Solo Modes, Switch Modes and Solo Safes.

A Solo Active state is indicated on the main automation screen at all times.

There are 3 Solo Modes:

PFL - The Solo signal is pre-fade. Soloing a mono channel will produce a central image, Soloing a stereo channel will produce a full stereo image reflecting the input source imaging. PFL is non-destructive.

AFL - The Solo signal is postfade, and post-Pan. Soloing a mono channel will produce a stereo image as determined by the LCR PAN control. Soloing a stereo channel will produce a stereo image as modified by the BALANCE/PAN control. (Note that the Solo Buss used by both AFL and PFL modes is stereo, and is fed to the L and R speakers, the C and S being muted.)

CHECK (SIP) - This a destructive mode ("real" Solo). Pressing any SOLO button now mutes all other channels except for those that have been selected into SAFE mode. The Soloed channel is now heard in its full spatial location in all surround modes.

There are also 4 switches controlling the mode of operation of the SOLO buttons themselves:

LATCH - in LATCH mode, SOLO buttons are electronically latching. More than one SOLO button may be active, all channels thus Soloed being auditioned.

MOM - in MOM (momentary) mode, Solo is only active while a SOLO button is being pressed. More than one SOLO button may be active as in LATCH mode.

INTERLOCK - in INTERLOCK mode, the button action is as in LATCH mode, but selecting SOLO on another channel will cancel the Solo on the first.

CLEAR - CLEAR cancels any SOLO set anywhere on the input channels.

Two further buttons on the 9098i-H Panel - CHAN SAFE and MON SAFE - are global controls, placing all the 9098i-A Channel Paths or Monitor paths respectively into SAFE mode. On the 9098i-L stereo channels, the Stereo Line Input follows CHAN SAFE and the Stereo FX Return follows MON SAFE (though this can be disabled on jumpers internally). The SAFE switches on the input channels can override these global statuses.

CHANNEL METER MASTERS
These switches control the operation of the individual Channel Meters. These can be bargraphs; other types of meters may be fitted by special request, but not all the facilities may then be available. METER OFF CHANNEL switches all meters above 9098iA mono channels to read the signal in the Channel Paths instead of the Monitor Paths (the default). The point in the Channel Path which feeds the meter can be set by internal jumpers to be either Pre-EQ or Pre-Fade.

Each mono channel bargraph has Peak or VU modes, one of which simulates the ballistics of moving-coil PPMs, the other those of VU meters, as selected by the PEAK and VU buttons respectively. With Yamaki meters fitted, DUAL mode selects the VU scale, but superimposes a single segment indicating the peak level, and obeying PPM ballistics.

Selecting HOLD allows easy visual monitoring of the peak signal level on each channel, the segment corresponding to the highest signal level reached stays illuminated for 1.5 seconds.

In MEM mode, the highest segment illuminated stays lit, until either i) a higher segment is illuminated, or ii) the RESET button is pressed. RESET cancels the segments held by the MEM function.

MONITOR SOURCE MATRIX
The remainder of the switches on the 9098i-H panel select the sources for the Control Room Monitoring system. Up to 15 internal and 10 external sources are available. One internal and one external source may be "pre-selected", the EXT/INT switching being done from the 9098i-F module (see below). Individual consoles may have sources specified by the customer to suit particular requirements, but the default selection is as follows:

Internal Sources comprise all 16 Aux Sends as odd/even pairs; the Stereo Busses A, B, C and D; the derived CUE 1 and CUE 2 stereo cue feeds (see section on 9098i-G modules) and the LCRS main mix buss. All sources except the LCRS buss are stereo, and selecting any of them mutes the C and S speakers. Jumper options allow conversion to eight Stereo and two 6tk sources.

External Sources comprise 8 stereo and 2 6tk sources. Default button cap legends are 2TK1, 2TK2, 2TK3, 2TK4, EXT1, EXT2, DAT and CD (stereo), and 6TK1, 6TK2, (six-track). The CD external source has an option to be -12dB but is supplied as +4dB; all the others are +4dB. Button caps can alternatively be legends to suit the sources in a particular studio.

9098i-T Central Assignment Panel

The Central Assignment Panel (the CAP) is positioned in the console's Master Section to give easy central access to certain channel functions, most of which do not have hardware controls on the module faceplates. The most important of these are the Dynamics functions, and assignment and control of all Dynamics devices is performed via the CAP.

The CAP consists of three areas:

NUMERIC KEYPAD
A 0-9 keypad, with a 3-digit display, is used to enter a Channel number. When ENTER is pressed, the entire CAP becomes active for that Channel, and the Channel Name is displayed on the associated Electronic Writing Strip (assuming one has been previously entered). There are also UP/DOWN nudge buttons, which assign the CAP immediately to an adjacent Channel. Alternatively, the SEL buttons on the fader blocks may be used to call the attention of a Channel to the CAP. When a Channel is called to the CAP, the Function Keys (below) illuminate to show the current status of each Function in that particular Channel.

The SOLO button permits a channel to be soloed without reaching for the SOLO button on the channel itself. This allows the engineer to audition a channel without moving away from the ideal monitoring position.

The ALL button makes the Function keys (see below) active for every channel on the console simultaneously.

FUNCTION KEYS
These control functions on the 9098i-A mono input channels. A total of 16 buttons allow selection of specific functions for the channel currently being addressed by the CAP.

AUXES TO 48TK - 8 electronically interlocking buttons labelled AUX 1&2 to AUX 15&16 route the Aux Send pairs to the 48tk Busses, removing them from the relevant Aux Busses. LEDs on each module indicate this routing.

The 4 buttons 9&10 TO 1&2, 11&12 TO 3&4, 13&14 TO 5&6 and 15&16 TO 7&8 allow Aux Sends 9-16 to access Aux Busses 1-8, in pairs. When selected, the higher-numbered Aux Busses are no longer fed. LEDs on each module indicate this routing.

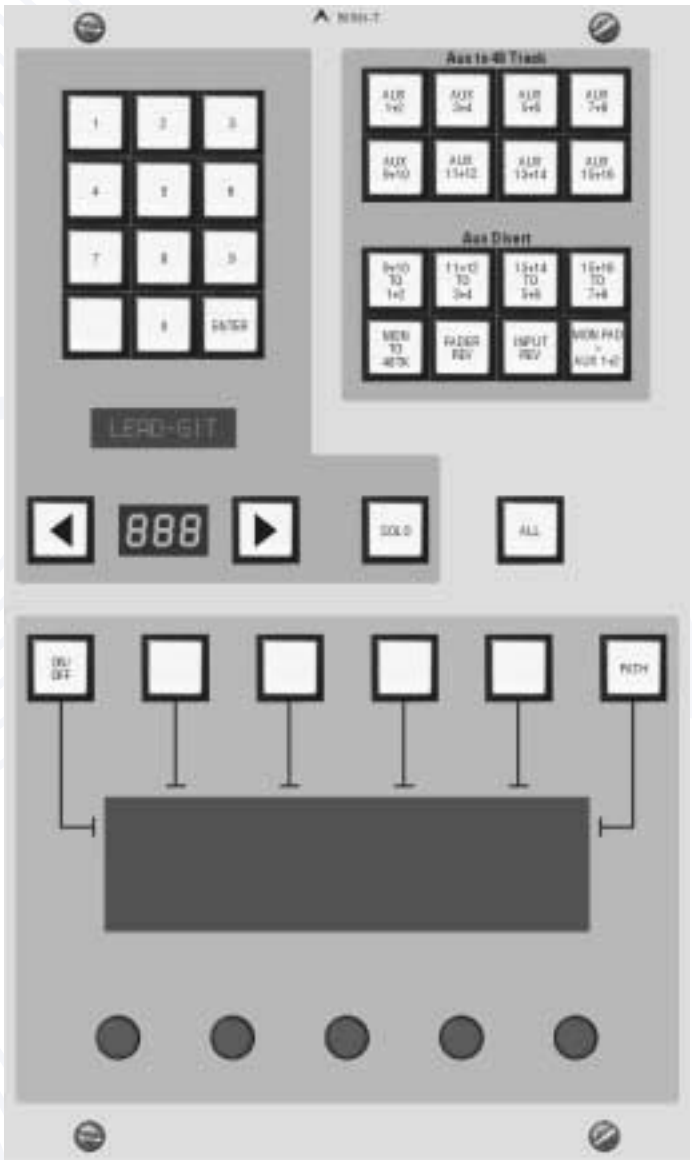
MON TO 48TK, FADER REVERSE, and INPUT REVERSE all duplicate the switches of the same names on the 9098i-A input modules. The local switches act as overrides to a centrally-issued command.

MON FADER TO AUX 1&2 interchanges the functions of the small fader and Aux 1/2 (Cue A) LEVEL control. LEDs on each module indicate this routing. More detail on the signal routing possibilities these functions provide is to be found in the 9098i-A module reference section.

DYNAMICS CONTROL
Every Path on the 9098i input Channels (with the sole exception of the Stereo FX Return Paths on the 9098i-L modules) is fitted with a Dynamics processor. These are programmable devices, each of which can be configured into any one of eleven different device types.

The assignment of a Dynamics device to a Path, and the adjustment of the parameters of the device is carried out through the Dynamics Control section of the CAP. This consists of a 240 x 64-pixel LCD screen, 2 dedicated and 4 soft keys, and five soft rotary controls. Having assigned the CAP to a Channel, PATH assigns the Dynamics control to one of the two Paths in the Channel. ON/OFF bypasses the selected device.

Various on-screen menus control the Dynamics device's parameters using the rotary controls below the screen. The soft controls have various functions - e.g. Threshold Level, Ratio, Release Time, etc. - and are clearly indicated by the display. Simultaneously a representation of



the selected device's "Virtual Front Panel" is presented on the TFT screen, and the knobs and switches thereon can be adjusted with the trackerball if preferred.

A library system allows favoured settings of a Dynamics device to be named and stored for future use.

Dynamics devices may be switched in and out of circuit by the automated DYN IN switches on the channels. The source for the sidechain is selectable on internal jumpers or the KEY switch. Each of the 11 device types permits external keying, which is available via the Insert Return points on the jackfield.

9098i-G Aux Master Modules

These are two electrically-identical modules, differing only in faceplate and switchcap legending. Each contains 8 Aux Send Masters and a stereo Studio Cue Send.

AUX MASTERS
The 9098i-G1 module contains the Masters for the odd-numbered Aux Sends. Each Send has a LEVEL control, providing a range from fully off to +6dB gain. A MUTE button mutes the Send. The 9098i-G2 module is identical for the even-numbered Sends.

An AFL button with each Master Send allows it to be Soloed, the odd-numbered Sends going to the left speaker, and the even-numbered to the right, permitting the stereo Aux Sends to be auditioned with their correct stereo imaging. The Aux Send Master AFL buttons are not automated.

STUDIO CUE SENDS
A stereo Studio Cue Send is provided on each 9098i-G module. The Studio Cue Send may be made up from one or more (the buttons are additive) internal stereo sources: CUE A, CUE B, AUX 5&6 and AUX 7&8 select the first 8 Aux Sends in pairs (post the Aux Masters); STUDIO INT and STUDIO EXT select the internal or external source (respectively) that has been selected for the Studio Monitor speakers; SOLO selects the stereo Solo Buss; EXT1 selects an External Source which can be patched in at the jackfield.

Each Studio Cue Send is provided with a LEVEL control, MUTE and AFL buttons.



9098i-F St Matrix/Mon Control

The 9098i-F module contains the stereo matrix and ancillary Monitoring functions.

STEREO SELECTOR MATRIX
The 4 Stereo Busses A, B, C and D can readily be used as stereo subgroups, mixing finally onto the main LCRS buss. The Stereo Matrix on the 9098i-F module provides the routing to not only accomplish this, but also allows any of the four subgroups to be routed into any of the other three. This is a routing arrangement frequently required in on-air situations.

The matrix has four identical sets of routing buttons, one for each Stereo Buss. The Stereo Groups are fed Post-Fade to their respective set, where they can routed into any or all of the other three stereo busses, and/or the L+R legs of the LCRS buss. An AFL button allows the final stereo output to be Soloed; these AFL buttons are independent of the channel Solo system.

The normal output of each Stereo Buss is always available, regardless of what other busses it is routed to.

ANCILLARY MONITOR FUNCTIONS
The two large internally-illuminated SOURCE INT and SOURCE EXT buttons provides the “A/B” selection of before- or after-recording. INT selects whichever internal source is selected on the 9098i-H panel; EXT does the same for the external sources.

DIM LEVEL sets the amount by which the Control Room Monitor level reduces when DIM (on the CR Monitor Master Panel) is selected from 3dB to 20dB.

In addition to the four sets of CR Monitor speakers supported directly (see CR Monitor Master Panel), a fifth mono feed is available, primarily intended for Return Talkback. SMALL SPEAKER LEVEL and MUTE control this.

Each of the four main speaker feeds can be phase reversed for checking purposes with the Lø, Rø, Cø and Sø buttons. The PFL/AFL LEVEL control allows the level of signals being Soloed (but not in SIP mode) to be balanced against the normal monitoring level. The Solo system on the 9098i can also be put in Upfront Mode by the UPFRONT SOLO BALANCE IN button. In this mode, the normal feed to the monitor speakers is not muted when a SOLO button is pressed (and AFL or PFL Solo Mode is selected), only dimmed. This permits the Soloed channel to be heard “in context”, against the rest of the mix at reduced level. The UPFRONT SOLO BALANCE control sets the balance between the Solo signal and the normal mix, from “all programme” (Prog) to “all Solo” (Solo).

The MAIN SPEAKER BALANCE control permits the stereo balance of the CR Monitors to be adjusted by 3dB each way. This allows the engineer to occupy a position that is not exactly central to the monitors. The BALANCE control can be switched in and out of circuit by the IN button.

9098i-J Keyboard Module

The 9098i console allows for connection of four sets of monitor speakers. These are designated Main 1+2 and Nearfield 1+2. Both Main sets may be LCRS; the Nearfield sets are stereo.

A Main set and a Nearfield set may be active simultaneously; this permits one or both pairs of Nearfield outputs to be used to feed Left Rear and Right Rear speakers in LCRSS and 5.1 Modes. Internal jumpers are available to select the Nearfield outputs to be used for stereo rear speakers and any of Stereo Busses A, B, C or D, or Aux Busses 1+2 can be selected to feed them for this purpose in LCRSS and 5.1 modes. In this case, the MAIN LEVEL control becomes 6-way, adjusting the overall level of all speakers. Stereo Buss D is selected by default.

The two SPK2 buttons select the alternative sets of Main or Nearfield speakers.

Two P&G conductive plastic precision Rotary faders control the Main and Nearfield speakers sets, permitting the Main and Nearfield speaker volumes to be matched.

The Main level is a 6 gang volume control, and can operate from stereo up to 5.1 mode, the Nearfield speakers are stereo.

All main speakers have individual Mute switches In Stereo surround mode one of the Nearfield speakers sets is used for the rear surround speakers. These also have individual mute switches and can also be used as Nearfield L and R mute switches.

SPK SOLO changes the six individual mute switches into speaker Solo switches.

Three main mutes are incorporated: -

MUTE MAIN (LCRS), which mutes the Main speakers LCRS, or just L&R speakers if in ST mode.

MUTE NF (SL-SR) which mutes the L&R Nearfield speakers, or the Stereo surround speakers in stereo surround and 5.1 mode

MUTE ALL mutes all Main and Nearfield speakers sets.

MONO sums all active signals on the main speakers.

MAIN (NF) switches between the Main and Nearfield speaker sets.

DIM reduces the monitor level as set on the 9098i-F module, and acts on the Main and Nearfield speakers.

LCRS>ST folds the LCRS image down to Stereo for checking stereo compatibility.

SPK2 MAIN (LCRS) selects a second set of Main speakers.

SPK2 NF (SL-SR) selects a second set of Nearfield speakers, or switches between Nearfield and Stereo surround speaker sets.

A high quality, 83 key QWERTY keyboard is provided to allow data entry for the Supertrue automation system.

AUTOMATION CONTROL KEYS
These are a set of 18 buttons which provide dedicated, single-key access to the most commonly-needed on-screen functions.

MACRO KEYS
16 User-definable functions can be programmed onto the macro keys F1 - F8 (8 + the SHIFT key). These keys duplicate any function available within the software by recording mouse clicks and key presses. Any automated switch press or fader movement may also be recorded into a Macro. Replaying the Macro will then put any changed switch or fader into its recorded state.

9098i-S Joystick Module





The 9098i-S Joystick Module consists of two joystick panners, with LED matrix displays, automation buttons, Electronic Writing Strips and a link facility.

Each panner has one input and five outputs. The input to the panner is accessed via the jackfield, and normally the signal to be panned would be patched into it from a Channel Insert Send or Direct Out (after de-routing the channel from the mix busses). The outputs are routed via the Joystick Routing Panel. The panner operates either in LCRS or LCRSS modes, as determined by the Master Pan Mode; 5.1 mode configures the panner in LCRSS also. The joysticks are automated. WRITE and READ buttons are provided, which perform similar functions to their counterparts in the input channels, although the joysticks are not motorised. (UPDATE mode is not applicable to joysticks and they are not touch-sensitive).

In addition to the panners dedicated outputs, Supertrue enables each panner to drive six motorised faders. Each channel should in turn be panned hard L, R, C, MONO SUR, SL, or SR. The motion of the panner is transposed onto the motorised faders. This pan information can then form part of the mix data for each motorised fader. Further automated pans can be achieved by selecting a new set of six faders to be driven by the panner.

The 13 x 13 matrix of LEDs above each panner shows the apparent location of the sound being panned in the two-dimensional sound field by a single dot of light, which moves with the panner movements. The matrix replays any panner movements recorded to the automation when Read mode is selected, when a second dot indicates the current panner position for ease of matching.

The LINK button between the two joysticks links the control inputs, allowing two separate signals to be panned simultaneously by one joystick. The associated DELAY control introduces a delay, variable from 10mS to 5S, into the control link.

The Electronic Writing Strip displays the name of the signal applied being panned, providing a name has previously been entered in the automation system.

9098i-R Joystick Routing Panels are only fitted if the 9098i-S Dual Joystick panel is present. Two Panels are normally fitted, one per joystick.

Each panel is essentially a routing matrix for its joystick, permitting the outputs of the joystick to address the 48tk main busses, the Stereo Surround busses and the LCRS buss.

In LCRS Pan mode, the LCRS button routes the L, C, R and S outputs of the panner to the main LCRS buss.

In LCRS Pan Mode, the 48TK routing buttons (24 buttons plus a 25-48 key, as on the input channels), are arranged such that the L output of the panner can access Busses 1, 5, 9, etc., the R output Busses 2, 6, 10, etc., the C output Busses 3, 7, 11, etc. and the S output Busses 4, 8, 12, etc.

The SURR button is used in LCRSS and 5.1 Pan modes only, routing the now-separate stereo surround outputs of the panner (the left-rear and right-rear) to one of A, B, C, D or Auxes 1&2, depending on the setting of internal jumpers.

9098i-E Oscillator/Comms Module

This module is fitted in the upper part of the centre section surface between the 9098i-F and 9098i-G1 modules. It provides facilities for Main Meters Control, Overload threshold adjustment, Comms levels, the Studio Monitor output and the lineup oscillator.

METER SOURCES
The master section of the meterbridge normally contains 6 main bargraph or VU meters. 4 of these are allocated to LCRS metering and the other 2 to stereo. The two sets of meters can be fed independently from a variety of sources, selected by the source switches at the top of the 9098i-E module.

The 4 LCRS meters can be sourced from the following:

LCRS selects the main LCRS mix Buss

SOLO allows metering of the Solo buss signal. Only the L + R meters indicate in this case. Note that in PFL Solo Mode, mono channels route equal signals to the L and R legs of the Solo buss when Soloed, so the two meters will have equal indications.

CR MON (Post-Insert) and CR MON (Pre-Insert) select the signal selected as the Monitor source, either Pre- or Post- the CR Monitor Insert. (This permits metering Pre- or Post- the insertion of an surround encode-decode device, for example.)

INT and **EXT** respectively select the internal or external source selected on the two sections of the Monitor Source selector switches (on the 9098i-H panel).

4TK1 selects one of the four 4-track Tape Returns connected to the CR Monitors.

ANCILLARY applies a mixture of miscellaneous internal signals to the LCRS meters for checking purposes. The L meter displays the signal on a mix-minus buss (if fitted); the C meter displays the Osc To Slate level; the R meter displays the Osc To Patch level and the S meter the Lf Tone level

Both of the LR meters can be sourced from the following:

SOLO allows metering of the Solo buss signal - this would be the normal selection. Mono channels being PFL'd give equal readings.

A, B, C and **D** select one the four stereo busses to the stereo meters. When one of these busses is being used for stereo surround purposes in LCRSS and 5.1 Modes, selecting it here, and the LCRS buss as the LCRS meter source, allows all 5 (or 6) outputs to be metered simultaneously.

NEARFIELD selects the L and R Monitor signals or ST Surround if in 5.1 mode.

EXT1 and **EXT2** select one of two external stereo signals. These inputs are also available at the jackfield.

OVERLOAD THRESHOLD ADJUSTMENT
Three rotary controls adjust the threshold at which the various overload indicators on the console illuminate. The range of adjustment is from +8dB to +22dB.

CHANNELS sets the overload threshold for the yellow O/L LEDs that form the top segment of the individual channel PFL meters on the fader blocks.

TRACK METERS sets the overload threshold for the top (O/L) segment of the per-channel track bargraph meters. If moving-coil meters are fitted instead, an O/L LED is fitted within the meter movement.



MAIN METERS similarly sets the overload threshold for the 6 main meters.

COMMS LEVELS
Three rotary controls adjust talkback level.

MIC LEVEL sets the gain of the console talkback mic. amplifier. An AGC circuit is included to maintain the output level reasonably constant.

RETURN T/B LEVEL sets the gain of the Return T/B mic. A similar AGC circuit is fitted.

STUDIO + CUE LEVEL trims the talkback level to the Studio Monitor and stereo Studio Cue Send outputs.

LF TONE sends a 33Hz tone to the 48tk Busses and/or the LCRS main Buss when the SLATE and/or MIX buttons are pressed on the 9098i-V Comms Control Panel. The LF tone is mixed with the talkback for ident purposes.

STUDIO MONITORS
The 9098i supports a separate set of monitoring speakers intended for location in a live studio area. The Studio Monitor outputs are stereo, so the C + S legs of a 4-way source are merged with the L + R legs. The large STUDIO MONITOR LEVEL control at the bottom of the module adjusts the volume; MUTE mutes the speakers. The source for the Studio Monitors is selected by the INT and EXT buttons, which route the sources selected on the Monitor Source Panel.

OSCILLATOR
A very stable, low-distortion six-frequency oscillator is provided for lineup purposes. The ON button turns the oscillator on. The FREQUENCY control selects a frequency of 20Hz, 100Hz, 440Hz, 1kHz, 10kHz or 20kHz. There is a 440HZ ADJ preset for setting this frequency with great accuracy for tuning purposes. The MIX, 48TK and PATCH buttons route the oscillator output to the LCRS Buss, the 48tk Busses or a jackfield patchpoint respectively.

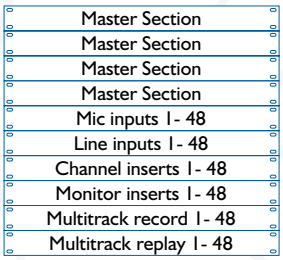
The LEVEL control adjusts the output level up to +20dBu, allowing the overload indicators to be adjusted correctly. Pressing CAL disables the LEVEL control, and sets the oscillator output at a level determined by the CAL TRIM preset. This will normally be the standard operating level of +4dBu. The output level available at the jackfield can be adjusted independently with the PATCH TRIM preset.

Patchbay

Each of the standard configurations is supplied with an external Mosses & Mitchell Bantam patchbay.

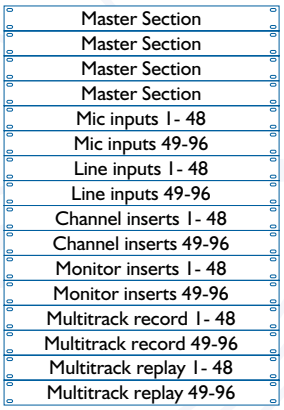
External Patchbay

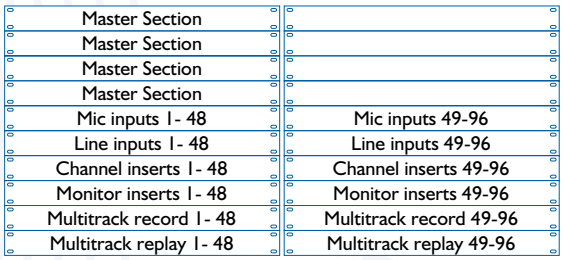
48 channel console



56 to 96 channel consoles

Strips for channels 49 to 96 are part loaded with jack sockets to match the number of channels



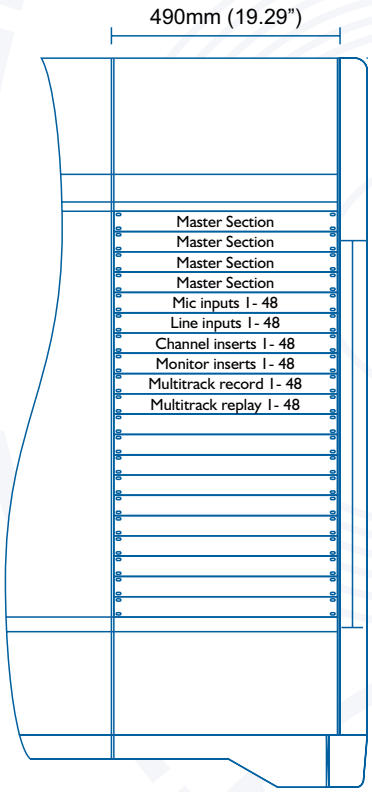




Onboard Patchbay

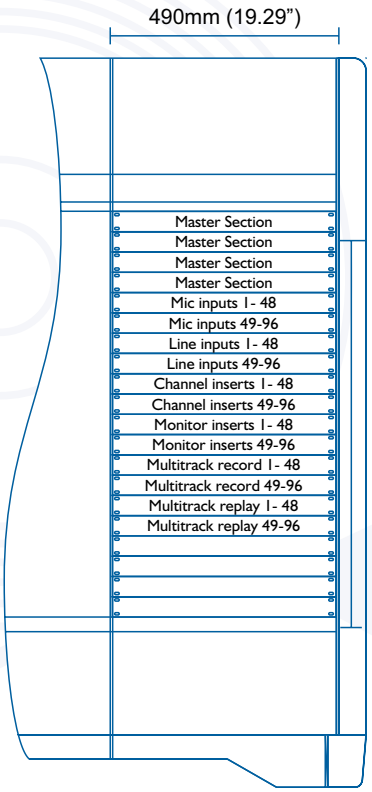
Alternatively, the 9098i can be supplied with on-board Mosses & Mitchell by adding the following optional chassis sections:

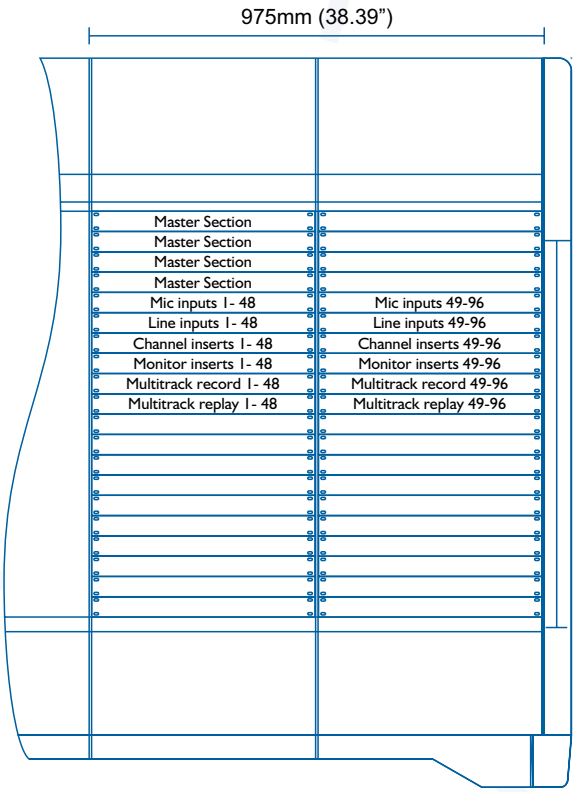
48 channel console



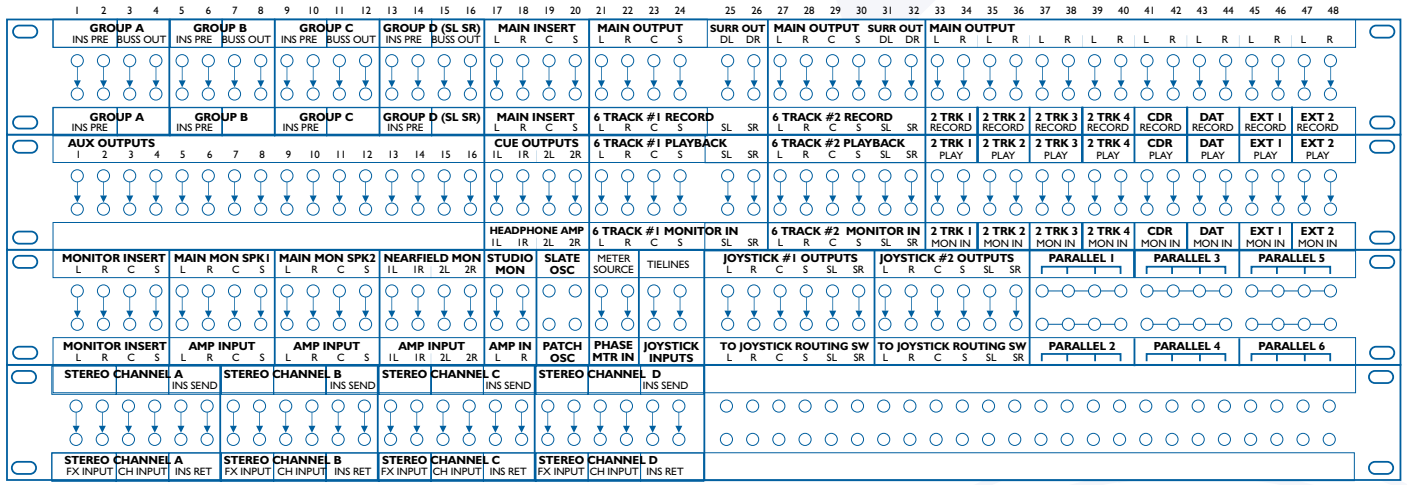
56 to 96 channel consoles

Strips for channels 49 to 96 are part loaded with jack sockets to match the number of channels



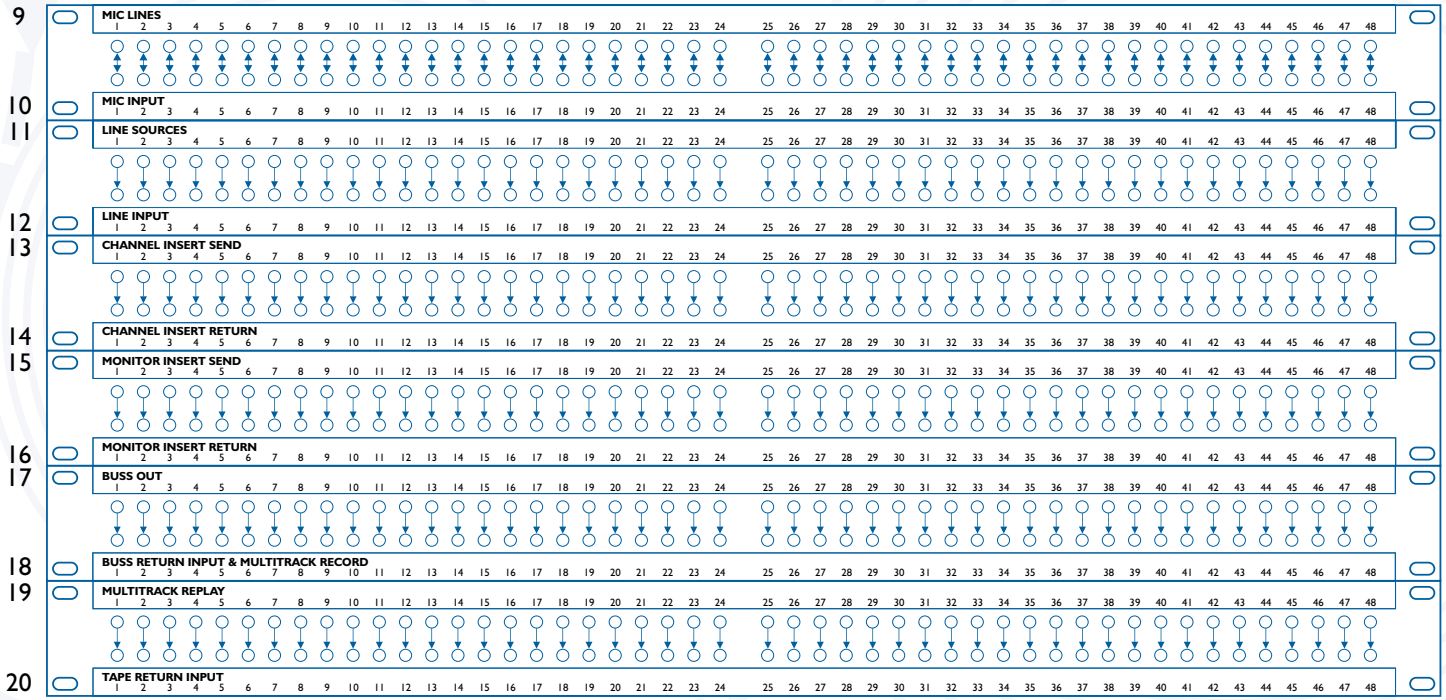


Master Section



First 48 channels for 48 to 88 channel console

Strips for channels 49-96 are part loaded with jack sockets to match the number of channels



Represents full normalled sockets

Represents half normalled sockets

Supertrue V4 Automation

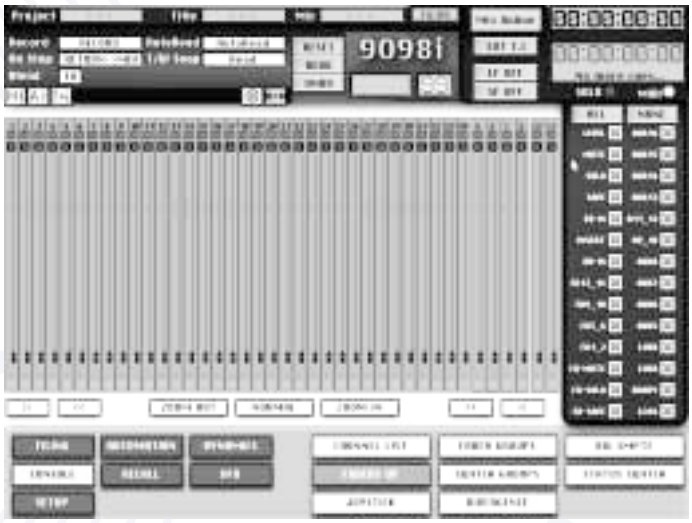
Truly thinks like you mix.

Supertrue V4™ is a console automation system developed exclusively by AMEK. It is a powerful, easy to operate system incorporating fader and switch automation, Virtual Dynamics®, Recall and Visual FX as standard. We understand that functionality is of paramount importance to you. That's why Supertrue's feature set ensures that you don't have to compromise.

Since its introduction in 1989, Supertrue has proven itself to be a console automation system of the highest calibre. Its pedigree is confirmed by the fact that it now encompasses the largest installed user base of any other automation system of its type in the world.

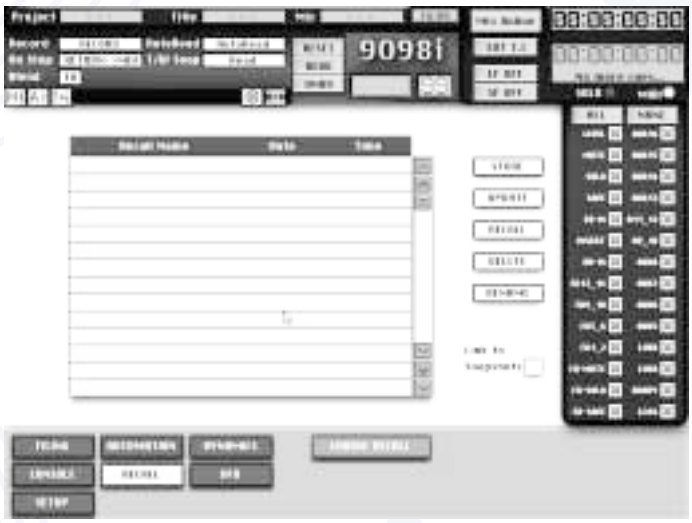
In-built flexibility allows you the freedom to work the way you choose. Operation of Supertrue is logical and practically instinctive. Freelance producers/engineers are quickly able to drive the automation system, either they already have prior experience with previous Supertrue systems, or they find the Supertrue/9098i integration so simple and logical that the learning curve is always short.

Considerable time and effort has been invested in the continuous development and improvement of Supertrue. The 9098i utilises the power of Supertrue in its most advanced state. Version 4 introduces many new features, such as an improved user interface with 256-colour graphics, flexible circular mix-mode, an improved Faders-Up screen, multiple zoom levels, enhanced mix editing functions and an improved Recall system. Only through this commitment and by listening to the ideas and suggestions of our customers worldwide, we have been able to raise Supertrue's operational standard and features to an outstanding level. We will not stop here though, you can take comfort in the knowledge that once you become an AMEK customer you can continue to receive the benefits of our advances in Supertrue for many years to come.



Console Integration

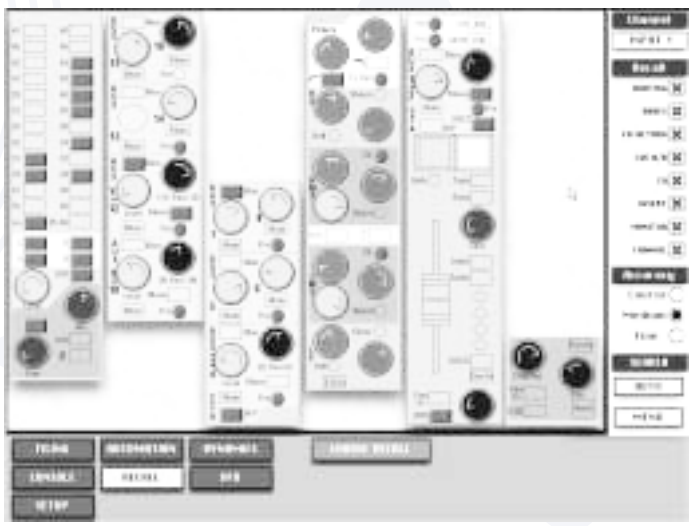
Supertrue V4 brings hardware and software integration to a new level. We have worked very hard to identify those operations which professionals use most often and have incorporated hardware control at these points to speed up operation. While a trackball/mouse is necessary with modern mixing techniques, the goal at AMEK is to have as much tactile control over automation as possible, thereby freeing up the entire process for more creative influences.



Function Grouping

The automation supports ten Fader Groups with the ability to reassign the master if needed without destroying the group. Two kinds of Mute groups can be utilised on the 9098i - the first uses a Global Master/Slave relationship that will override any previous mute states, and the second utilises a "restore" function that will restore previous mute states upon group dissolve.

Switch Groups can also be created associating all selected switches with each other. All automated functions can be write enabled/disabled, or isolated from playback. It is also possible to assign joysticks to channel levels.



Multiple Mix Modes

Mix memory is handled in two ways: Linear mode, where one mix resides in RAM with 6 levels of Undo, and Circular Mix Mode, where all 7mix passes reside in RAM available for audition at any moment. In Circular Mix Mode, users can quickly audition 7 different versions of a mix without disturbing or erasing any other version.

Mix Processor

Supertrue has an extensive off-line editing system which allows comprehensive mix processing. Repeat, Copy, Swap, Erase, Trim, Merge, and Shift are all available for data manipulation and can be applied across individual channels, groups, or entire mixes in order to speed up production work.

Supertrue V4 Automation

On-Line Trim

Supertrue's revolutionary design now allows real-time, on-line adjustment of level in precise increments, eliminating guesswork. Levels can now be precisely adjusted and auditioned in real time without stopping playback!

Macros

Supertrue has a well developed User Macro system that allows most screen, trackball, faders, and automated hardware functions to be recorded for one-button playback.

Superior File Management

The software includes a Project Manager to handle backups - even compressing and coordinating data so that it can be run across several floppies.

Synchronisation

The 9098i's machine control system is integrated with the console automation, but also functions independently. It handles tape and tapeless external recording devices with support for most common synchronisers and timecode autolocator functions. Up to 10 locate points can be set manually or on the fly, using dedicated keys and optionally edited against timecode via a menu in the automation system. Some master control features, such as pre- and post-roll, title timecode limits and machine offsets can also be set-up using Supertrue. Supertrue can output parallel Midi timecode when in receipt of incoming LTC. It can also output MMC, which is useful for Pro Tools systems.

Cue List

The Cue List is especially useful in Post Production, allowing the triggering of external events, such as sound FX and music cues, and internal events, such as Mutes or Fades - to 1/4 frame accuracy. Cues can also be deleted or copied to new timecode positions, using the Edit submenu within the Cue List.

Visual Effects

Supertrue also has the ability to control outboard signal processors through Visual Effects(VFX). Currently there are 28 devices that can be interfaced using MIDI control. They are access and controlled in a similar way to Virtual Dynamics (see over). Settings for VFX can be stored and recalled with the Title or used as presets which may be triggered against timecode from the Cue List.

Recall

Supertrue4™ offers improvements to its popular Recall system. New high resolution graphics and setting indication allows the positions of all knobs and switches to be stored and easily restored

Settings can be saved into the computer before running a mix.
The Recall system's AutoScan procedure speeds console setup. When a recall is activated, the computer scans the console and only pauses when it finds an incorrectly set control. It then brings up a graphics display of the module's controls. The control is adjusted until it matches the target position.







Virtual Dynamics®

Fitted as standard, this unique software manipulation of the console's hardware processors allows each VCA fader to have its own Dynamics control device.

Virtual Dynamics is based on digital control of all parameters and therefore gives the user the ability not only to specify gain contours with great accuracy but also to produce gain control effects difficult to emulate with standard analogue hardware. Supertrue also allows the user to store favoured settings, either within the Dynamics library or with the Mix.

Virtual Dynamics units are resident within the software and can be called to the screen at any time, offering a choice of any one of the ten available devices.

1 - Easy Gate
A simplified gate device, fast and easy to setup. Includes settings for threshold, range and release time with a switchable 'fast' attack mode.

2 - Gate
The standard general purpose gate, similar to the Easy Gate with added variable attack and hold times.

3 - Super Gate
A fully-featured gate with all of the standard gate's functionality plus manual/auto hysteresis, peak, decay, mask time, variable gain and a switchable release curve (log).

4 - Easy Compressor

A quick and simple compressor, includes variable settings for threshold and compression with switchable attack and release modes.

5 - Compressor
The standard compression device. Variable settings for threshold, attack, release, compression ratio and make-up gain. Includes a 'soft' setting to provide a gradual transition after the threshold is reached.

6 - Dual Compressor
A complex compression device with an expander section and compressor with two thresholds and compression ratios.

7 - Limiter
A limiting device with variable ratio, enabling true limiting at 10:1 or lesser values for alternative forms of compression.

8 - Autopanner
An autopanner provides image shifting across two channels. This is achieved by the device controlling the level of the faders once panning has been set. Autopanner events are triggerable and variable points with variable divergence can be set. A variety of other options make this a very flexible tool.

9 - Expander
A straightforward expansion device with variable threshold, ratio, attack, hold and release times and expansion range.

10 - Expander/Compressor
This device enables you to combine expansion and compression on a single channel.

11 - Gate/Compressor
This device enables you to combine gating and compression on a single channel.

1

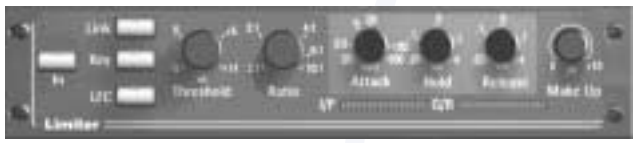

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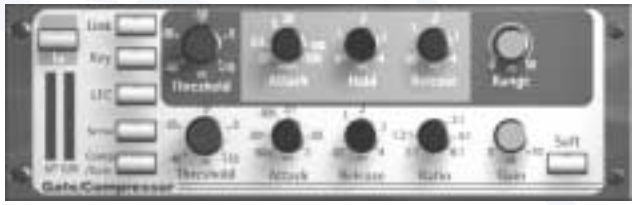

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Technical Specification

Mic Amp

12 switched gain steps from unity gain to +72dB
Mic Gain trim ±6dB

EIN Noise DIN at the Insert Send, 150ohm source

Unity Gain	-100dBu
+72dB Gain	-127dBu

Distortion at 1kHz, level +20dBu

Unity Gain	0.002%

CMRR at 1kHz, level +20dBu

Unity Gain	-60dBu

Maximum Input Level measured at the Insert Send

Unity Gain	+26dBu
+72dB Gain	-46dBu

Line Amp

-6dB to +18dB Gain

Noise DIN at the Insert Send

Unity Gain	-102dBu

Distortion 1kHz at the Insert Send

Level at +20dBu	0.002%

CMRR at 1kHz, level +20dBu

Unity Gain	-60dBu

Maximum input level measured at the Insert Send

Unity Gain	+26dBu

Tape and Buss Return Amp

-8dB to +18dB Gain

Nosie DIN at the Insert Send

Unity Gain	-102dBu

Distortion 1kHz at the Insert Send

+20dBu	0.002%

CMRR at 1kHz. level +20dBu

Unity Gain	-60dBu

Maximum input level measured at the Insert Send

Unity Gain	+26dBu

Filters

Variable High and Low Pass Filters at 18dB per octave

High Pass
22Hz to 300Hz

Low Pass
4.3kHz to 25kHz

Noise DIN at the Insert Send, Filters in

Unity Gain	-95dBu

Distortion 1kHz at the Insert Send, Filters in

+20dBu	0.002%

Equaliser

HF

Cut/Boost	±18dB
Frequency Range	2kHz to 20kHz

HMF

Cut/Boost	±18dB
Frequency Range	500Hz to 5kHz (X1) 2.5kHz to 25kHz (X5)
Q Range	0.6 to 2

LMF

Cut/Boost	±18dB
Frequency Range	20Hz to 200Hz (X1) 100Hz to 1kHz (X5)
Q Range	0.6 to 2

HF

Cut/Boost	±18dB
Frequency Range	30Hz to 300Hz

All EQ In

Frequency Response at Insert Send

Unity Gain	10Hz Flat to 150kHz, -3dB

Noise DIN at the Insert Send, EQ in and set flat

Unity Gain	-90dBu

Distortion 1kHz at Insert Send, EQ in

+20dBu	0.002%

Insert Sends

Output Balance at 1kHz, level +20dBu

Channel Send	-45dBu
Monitor Send	-45dBu

Channel Insert Return

Frequency Response at Buss Out

Unity Gain	10Hz Flat to 200kHz, -3dB

Noise DIN at the Buss Out

Unity Gain	-96dBu

Distortion 1kHz at the Buss Out

+20dBu	0.002%

CMRR at 1kHz

+20dBu	-60dBu

Maximum input level measured at the Buss Out

Unity Gain	+26dBu

Technical Specification

Monitor Insert Return

Frequency Response at Buss Out
Unity Gain 10Hz Flat to 150kHz, -3dB

Noise DIN at the Buss Out
Unity Gain -96dBu

Distortion 1kHz at the Buss Out
+20dBu 0.002%

CMRR at 1kHz
+20dBu -60dBu

Maximum input level measured at the Buss Out
Unity Gain +26dBu

Frequency Response, Unity Gain Path

Line Input to Buss or Direct Out
Typically 10Hz Flat to 200kHz -3dB

Line Input to Aux Send
Typically 10Hz Flat to 200kHz -3dB

Noise DIN Unity Gain path

Channel Path

Line Input to Buss or Direct Out
Typically -96dBu

Line Input to ST Buss
Typically -96dBu

Line Input to Aux
Typically -93dBu

Noise DIN at the LCRS Buss Out (Faders Closed)

24 Channels Assigned	-88dBu
48 Channels Assigned	-82dBu
56 Channels Assigned	-81dBu
56 Channels Assigned and 56 Monitors Assigned	-81dBu

Noise DIN at the LCRS Buss Out (Faders Open)

24 Channels Assigned	-84dBu
48 Channels Assigned	-79dBu
56 Channels Assigned	-78dBu
56 Channels Assigned and 56 Monitors Assigned	-78dBu

Monitor Path

Tape Input to Buss or Direct Out
Typically -96dBu

Distortion 1kHz at +20dBu Unity Gain Path

Channel Path

Line Input to Buss or Direct Out	0.002%
Line Input to Stereo Buss	0.002%
Line Input to Aux	0.003%

Monitor Path

Tape Input to Buss Out	0.003%

Cut Off Unity Gain Path, level +20dBu

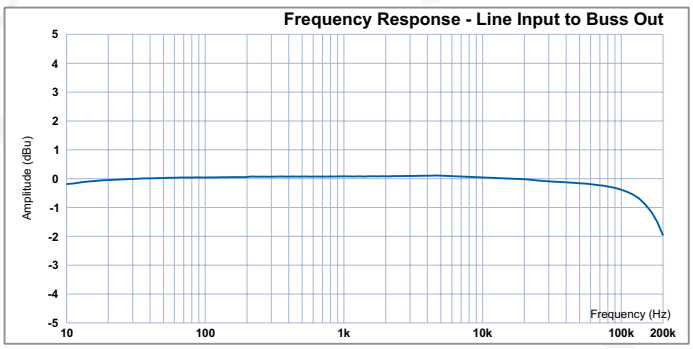
(Results are level compensated)

Channel Path	**1kHz**	**15kHz**
Fader at LCRS Buss	-92dBu	-85dBU
Mute at LCRS Buss	-110dBu	-94dBu
Pan L at LCRS Buss	-76dBu	-76dBu
Pan R at LCRS Buss	-76dBu	-76dBu
Monitor Path)	**1kHz**	**15kHz**
Fader at LR Buss	-103dBu	-92dBu
Mute at LR Buss	-114dBu	-98dBu
Pan L at LR Buss	-70dBu	-70dBu
Pan R at LR Buss	-70dBu	-70dBu

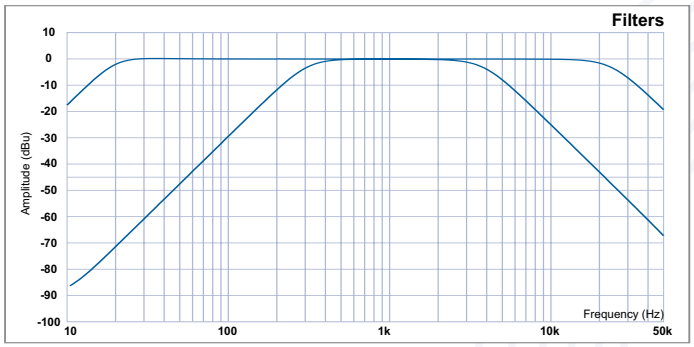
Crosstalk Unity Gain Path, level +20dBu

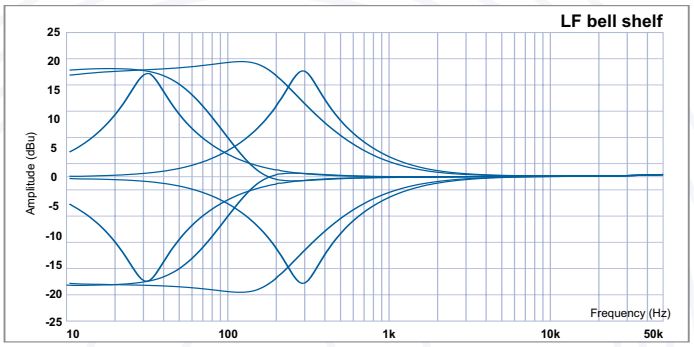
(Results are level compensated)

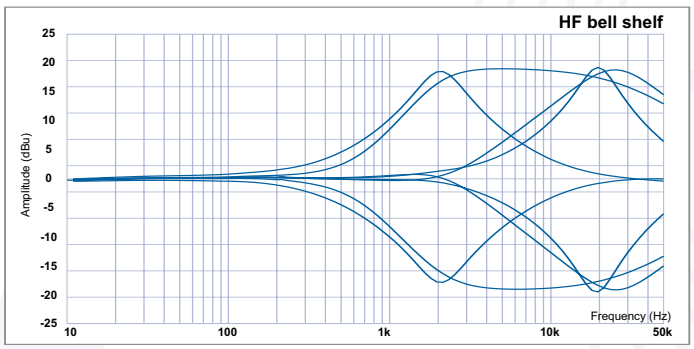
Frequency	**1kHz**	**15kHz**
Mic to Line at Insert Send	-110dBu	-95dBU
Line to Mic at Insert Send	-116dBu	-90dBu
Tape to Buss Return at Insert Send	-120dBu	-105dBu
Buss to Tape Return at Insert Send	-120dBu	-110dBu
Channel to Monitor at ST Buss	-90dBu	-77dBu
Monitor to Channel at ST Buss	-94dBu	-79dBu
Buss 1-2	-118dBu	-115dBu
Buss 2-1	-118dBu	-114dBu

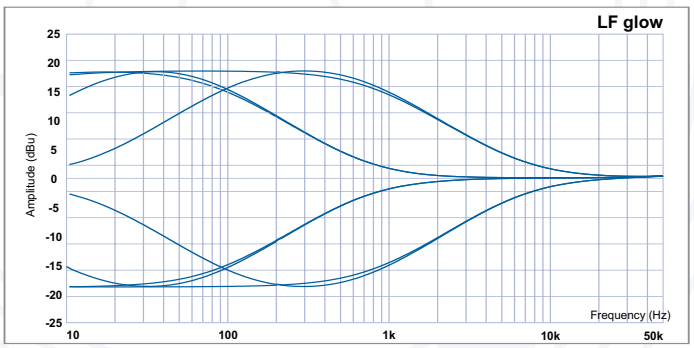


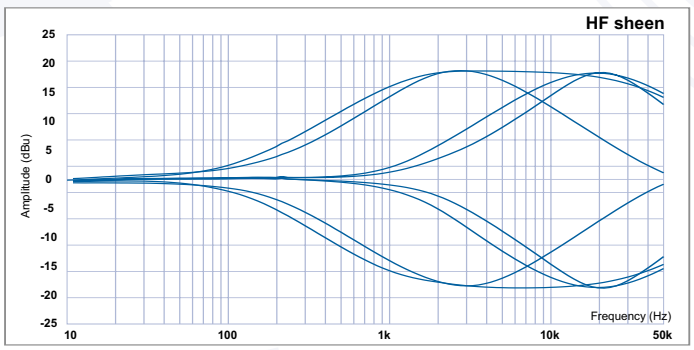
Graphs

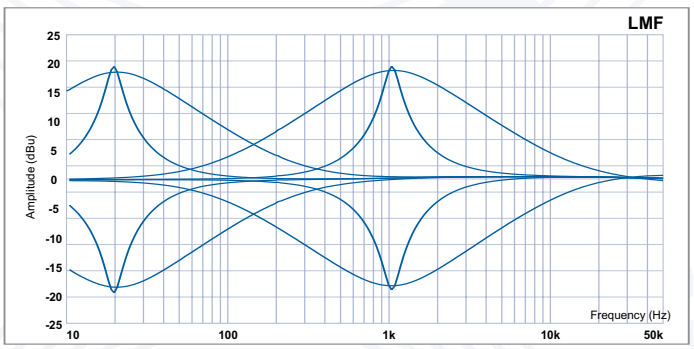

Filters
Amplitude (dBu)
10
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
Frequency (Hz)
10
100
1k
10k
50k

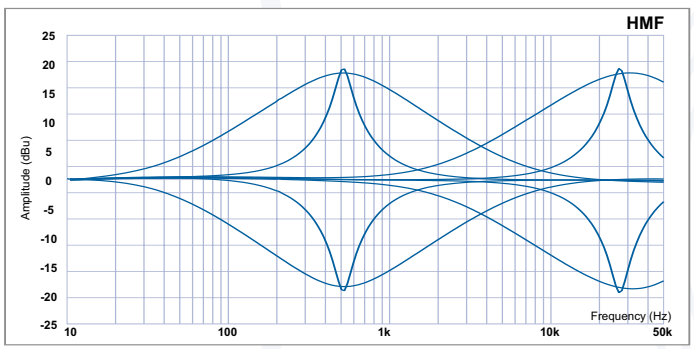

LF bell shelf
Amplitude (dBu)
25
20
15
10
5
0
-5
-10
-15
-20
-25
Frequency (Hz)
10
100
1k
10k
50k

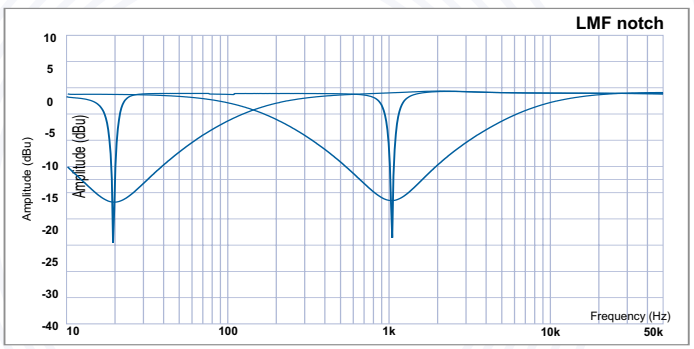

HF bell shelf
Amplitude (dBu)
25
20
15
10
5
0
-5
-10
-15
-20
-25
Frequency (Hz)
10
100
1k
10k
50k

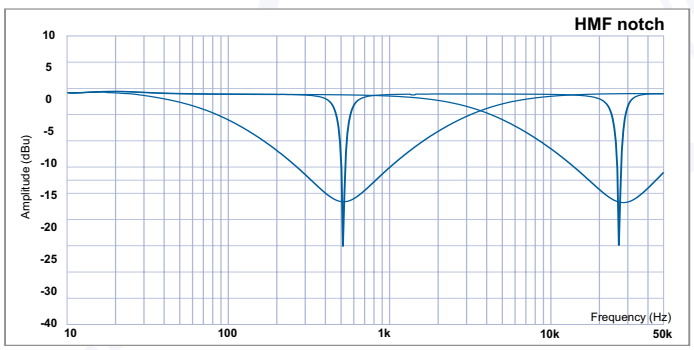

LF glow
Amplitude (dBu)
25
20
15
10
5
0
-5
-10
-15
-20
-25
Frequency (Hz)
10
100
1k
10k
50k

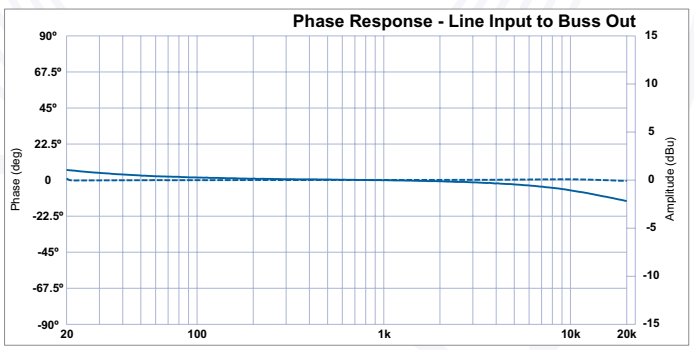

HF sheen
Amplitude (dBu)
25
20
15
10
5
0
-5
-10
-15
-20
-25
Frequency (Hz)
10
100
1k
10k
50k


LMF
Amplitude (dBu)
25
20
15
10
5
0
-5
-10
-15
-20
-25
Frequency (Hz)
10
100
1k
10k
50k


HMF
Amplitude (dBu)
25
20
15
10
5
0
-5
-10
-15
-20
-25
Frequency (Hz)
10
100
1k
10k
50k


LMF notch
Amplitude (dBu)
10
5
0
-5
-10
-15
-20
-25
-30
-40
Frequency (Hz)
10
100
1k
10k
50k


HMF notch
Amplitude (dBu)
10
5
0
-5
-10
-15
-20
-25
-30
-40
Frequency (Hz)
10
100
1k
10k
50k


Phase Response - Line Input to Buss Out
Phase (deg)
90°
67.5°
45°
22.5°
0
-22.5°
-45°
-67.5°
-90°
Amplitude (dBu)
15
10
5
0
-5
-10
-15
20
100
1k
10k
20k

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