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SERIES 1624

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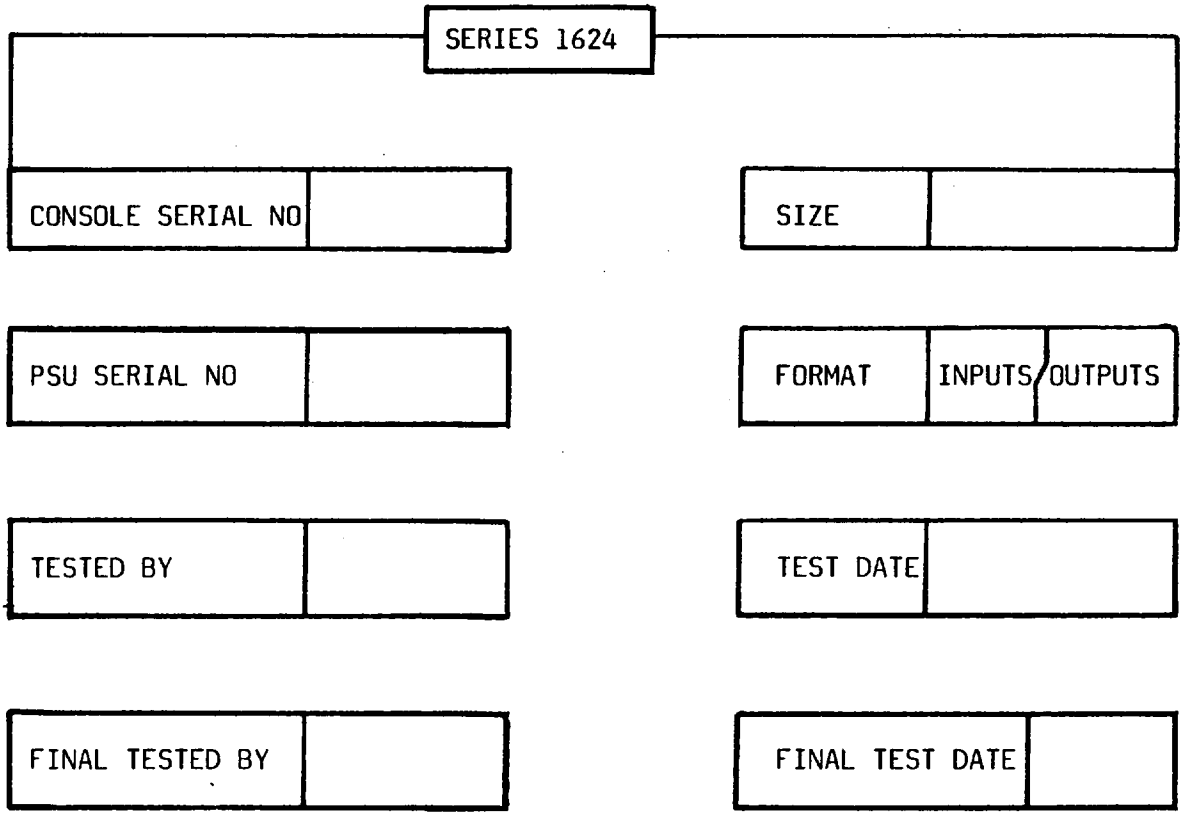
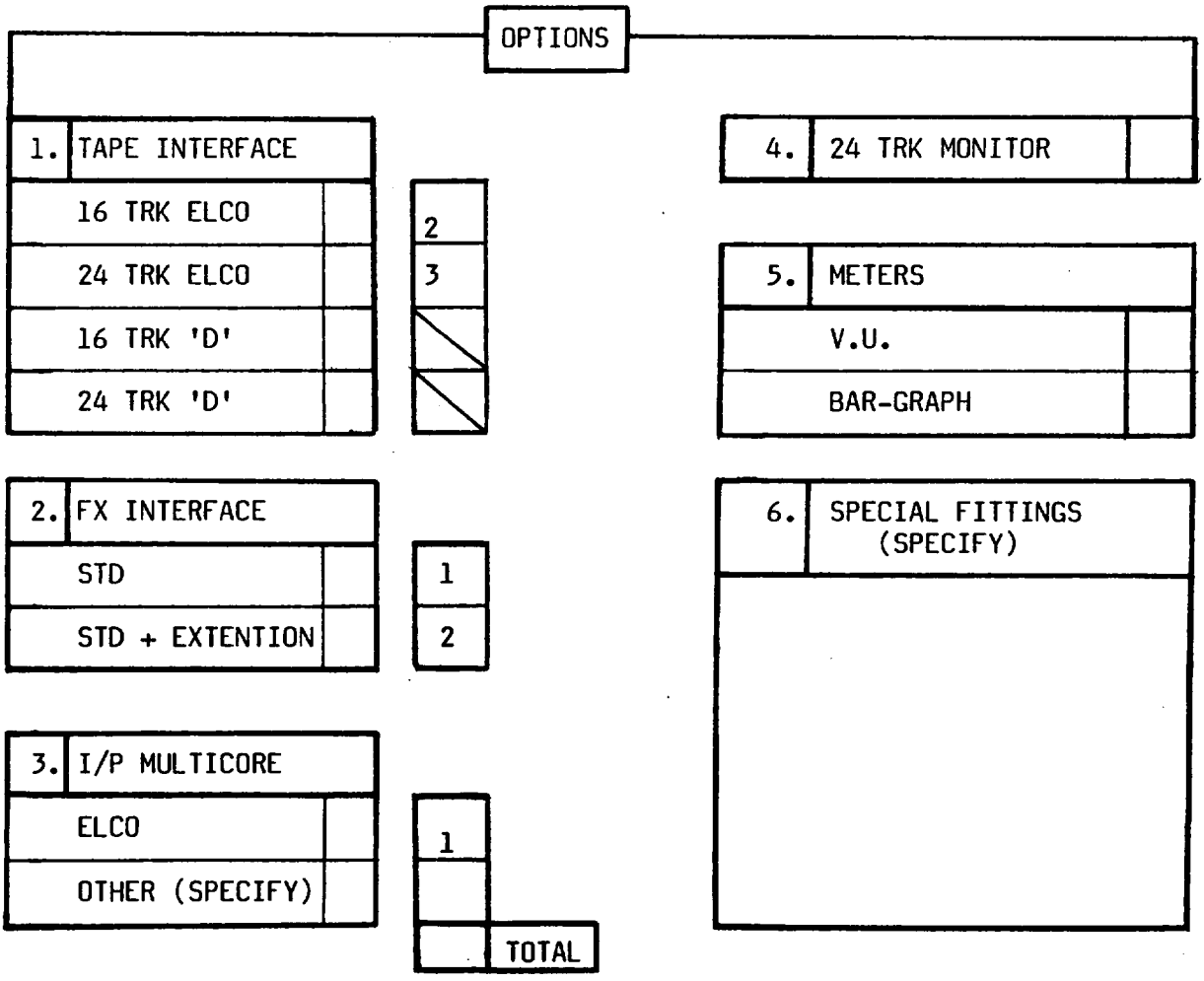
1.01 Specification and Serial Number





SERIES 1624 SYSTEM MEASUREMENTS

1	CHANNEL LINE I/P TO MIX O/PS			
	CH. NO.	THD % AT 1KHZ +4dBv O/P	FREQ. RESPONSE REF 1KHZ	
			20HZ	20 kHz
	1	0.00	0.	0.
	2	0.00	0.	0.
	3	0.00	0.	0.
	4	0.00	0.	0.
	5	0.00	0.	0.
	6	0.00	0.	0.
	7	0.00	0.	0.
	8	0.00	0.	0.
	9	0.00	0.	0.
	10	0.00	0.	0.
	11	0.00	0.	0.
	12	0.00	0.	0.
	13	0.00	0.	0.
	14	0.00	0.	0.
	15	0.00	0.	0.
	16	0.00	0.	0.
	17	0.00	0.	0.
	18	0.00	0.	0.
	19	0.00	0.	0.
	20	0.00	0.	0.
	21	0.00	0.	0.
	22	0.00	0.	0.
	23	0.00	0.	0.
	24	0.00	0.	0.
	25	0.00	0.	0.
	26	0.00	0.	0.
	27	0.00	0.	0.
	28	0.00	0.	0.
	29	0.00	0.	0.
	30	0.00	0.	0.
	31	0.00	0.	0.
	32	0.00	0.	0.

2 CHANNEL LINE I/P TO AUX SENDS

AUX SEND	THD (%) AT 1KHZ +4dBv
1	0.0
2	0.0
3	0.0
4	0.0
5	0.0
6	0.0

3 CHANNEL LINE I/P TO CONTROL RM O/PS

	THD (%) AT 1KHZ +4dBv
CONTROL RM L VIA SOLO L	0.0
CONTROL RM R VIA SOLO R	0.0
CONTROL RM R VIA PFL	0.0

4 CHANNEL LINE I/P TO STU O/PS VIA ALL GRPS

	THD (%) AT 1KHZ +4dBv
STUDIO L	0.0
STUDIO R	0.0

5 CROSSTALK (10kHz)

STEREO MIX BUS	- ____dB
MUTE	- ____dB
CHANNEL TO CHANNEL	- ____dB

6 MIX NOISE (DIN AUDIO BANDWIDTH)

MIX L	_____dBv
MIX R	_____dBv

POWER SUPPLY

	VOLTAGE (V)	RIPPLE (dBv)
+17v	_____	_____
-17v	_____	_____
+7.5v	_____	_____
-7.5v	_____	_____
+48v	_____	_____

NOTE:- 0dBv = 0.775v
0dBv = 1.00 v

The constraints and conditions under which the above performance figures have been measured are configured so as to ensure that all signal paths are within specification, with a minimum of separate tests. Many are therefore recorded via very long signal paths or under other worst case conditions.

The results should not, therefore, be taken as representative of typical published specifications, which would normally be conducted under standard operative conditions.

1.02 SERIES 1624 INTRODUCTION

The Soundcraft Series 1624 is a fully modular 16 group console system for up to 24 track recording and mixdown. It is configured as a split console, i.e. the submaster and monitor channels are located in separate modules from the input channels. This gives greater clarity of operation over the inline console format and is of particular advantage when creating sub groups during recording and mixdown.

The Series 1624 is truly state-of-the-art in all aspects of its design and construction. Almost all the wiring is computer flatwire and the amplifiers are the latest low noise, high slew rate devices with the exception of the mic preamplifier, which is a proprietory discrete transformerless design offering a lower noise figure and superior high frequency common mode rejection to conventional transformer designs. 41 position detent potentiometers are used throughout (except the equaliser boost/cut and pan controls having single centre detent), enabling accurate repeatability of previously established settings. The precision of these controls is such that volume tracking between any similar control will be typically within 1dB and frequency tracking within 2 semitones. Solid state switching of channel mutes and master mode removes the inherent unreliability of relays. The channel and submaster faders are all Penny & Giles conductive plastic and the monitor fader is a well proven conventional carbon track design. The ability to reverse the faders on the groups/monitor channels gives the engineer greater choice in his approach to mixing and recording.

The several unique features of the Soundcraft Series 1624 represent a completely new approach to the split console format. The combination of a very sophisticated hardwired system and a large modular patchbay

brings to the recording industry a new medium priced console that can truly claim to meet the demands of the 1980's.

Main Features

Group Monitor Channels

A unique feature of the Series 1624 is the ability of the group/monitor channels to divide into 2 sections during mixdown allowing creation of a submaster with or without auxiliary sends and pan, and an effect return with 3 band sweep frequency equaliser with or without auxiliary sends and pan. This means that a 24/16 configuration in mixdown become 24/16/2 plus 16/2, all with equaliser, auxiliary sends, pan and solo.

Solo Modes

Another unique feature is the triple mode solo facility on the input channels. The 3 modes are "Mono" (prefade), "Stereo" (postfade) and "Solo In Place". The first two modes are "safe" in that they are separate busses and do not destroy the mix. This is an obvious requirement for any kind of "live" application. The "Solo In Place" mode mutes all input channels other than those soloed or assigned to "Safe" mode. This mode gives the complete picture for any combination of channels soloed in respect of level, position and effects since effects return channels would be assigned to "Safe". These modes are selected on the master module. The group and monitor solos and aux master solos only have the first two modes of operation. These switches are disabled in "Solo In Place" mode.

Mute system

To further facilitate complex mixdowns, two muting busses have been provided. Any input channel may be assigned to Mute A, Mute B or

both. The master mute controls are situated on the master module.

External Treatment

With the modern tendancy towards a plethora of external effects being used in the recording and mixing processes, any console must be able to access these devices with ease and in a variety of different ways. The Series 1624 tackles this problem in three ways:

1. Auxiliary Sends - There are six independantly controlled auxiliary sends available from every input and group/monitor channel. Two are fixed prefade, two switchable pre or post fade and two fixed post fade. In addition all six may be muted independantly of the channel mute by one push switch. On the input channels, the postfade pair may be assigned to the outputs of the PAN control enabling rapid creation of a stereo effect. This facility operates even if the PAN is switched out of the routing matrix, enabling a centre image vocal, for example, to have an effect panned around it with no patching and waste of other channels.

2. Patch Points - Every input channel, group channel and the stereo master has a prefade insert point driven at nominal level from a low source impedance. This allows the insertion of any external devices such as limiters, compressors, parametric equalisers etc. into the signal path at the individual channel, at the sub group or at the overall master.

3. Post Fade Outputs - All input channels and sub groups have their post fade outputs available at the patchbay. This allows further access to the non insertable kind of device, such as reverberation, to that afforded by the six auxiliary sends.

Equalisers

Two different equalisers are present on the Series 1624.

1. Input channel equaliser

   ± 15dB at 16kHz or 8kHz shelving

   ± 15dB from 600 Hz to 10kHz peaking / dipping

   ± 15dB from 150Hz to 2.4kHz peaking / dipping

   ± 15dB from 60Hz or 120Hz shelving

2. Monitor channel equaliser

   ± 15dB at 12kHz shelving

   ± 15dB from 300Hz to 5kHz peaking / dipping

   ± 15dB at 60Hz shelving

Both equalisers can be switched out of circuit. In addition, there is a high pass filter on the input channels, switchable in/out. This has a slope of 12dB/octave below cut off frequency which is variable between 50Hz and 800Hz.

2.0 Description (Physical)

2.01 Introduction

The following description is intended to describe the function of each module and other parts of the console to enable the user to achieve a clear picture of the general functioning of the system. The various signal paths will not be discussed in detail here, but will be covered in the operational section (3.0).

2.02 Console Layout

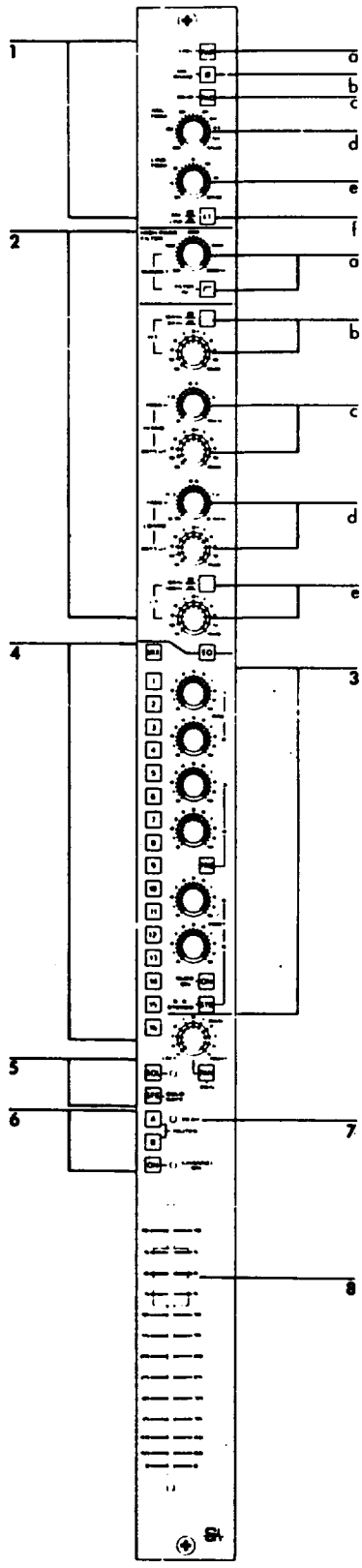
The Series 1624 console utilizes the classic "split" approach, with all input channels located on the left and all sub group outputs and monitoring facilities located on the right. Each sub group and monitor module contains all the electronics and facilities for two tape tracks in a double width module.

Between the input section and output section is the master module. This contains the stereo mix master fader, Control Room and Studio monitoring facilities and also the lin-up oscillator. Master programming switches for the solo system and mute busses are also contained in this module.

Between the sub group/monitor modules and the patchbay is space for the optional 24 track monitoring module. This provides an additional 8 monitoring channels to the 16 already contained in the sub group and monitoring section, to enable monitoring of a 24 track tape recorder to be achieved.

At the far right of the console is the patchbay. This is built up of up to 19 rows each row containing 16 jacks. All jacks are of the Bantam or T.T. type, allowing acess to all channel inputs, outputs and insertion points, as well as external devices such as reverberation systems, limiters and equalisers.

Metering facilities are provided in a meter bridge assembly across the top of the console. This contains 16 V.U. meters for the sub group outputs or tape returns, and two centrally mounted V.U. meters for the stereo mix outputs or stereo tape return. An LED above each meter indicates a peak signal level 8dB above OVU.



TITLE	S1624 INPUT MODULE
DRG No.	

1) Input to Channel

Each channel is individually switchable between the microphone input and the line input by depressing the Line Input (LI) switch.

The microphone input is an electronically balanced, transformerless design, configured for optimum low noise operation. This method reduces the degradation which is introduced by the more normal transformer coupled designs, and ensures superior transient response, minimal phase shift, and excellent common mode rejection, even at high frequencies.

The input impedance is normally 2k ohms, increasing to 5k ohmswhen the 20dB pad is inserted, thus ensuring correct matching for all normally used microphones.

The high level line input is unbalanced, with an input impedance of 10kohms, which is sufficiently high to interface to any normal studio equipment without causing undue loading of the source.

a) PWR

Capacitor microphones may be powered by the internal 48 Volt phantom power supply by depressing the PWR button. When using direct injection boxes or unbalanced sources, the phantom power supply should not be switched on.

b) Ø

The phase of the microphone signal may be reversed by depressing the Ø button. This is needed to correct for out of phase microphone pickup in multimicophone situations, or to correct miswired microphones.

c) PAD

The PAD button inserts a 20dB attenuator at the input to the microphone amplifier, and allows extremely high level input signals to be catered for, without fear of overloading. Such high level signals can easily occur from high output capacitor microphones used in close proximity to electric guitar amplifiers, drum kits etc. Direct injection boxes are also capable of providing such signals.

d) MIC TRIM

The microphone input sensitivity may be varied between -55dB and -20dB ref 0.775V using a 41 detented position potentiometer, allowing good resetability with essentially contiously variable gain control. When used in conjunction with the 20dB PAD, this gives a 55dB gain control range.

e) LINE TRIM

The line input sensitivity may be varied between -10dB and+20dB, ref 0.775V using a 41 detented position control.

f) LINE INPUT (LI)

The high level line input is selected by depressing the LI button. This connects the relevant tape return to the input channel for the purpose of remixing or overdubbing. Therefore, tape return I will connect to channel input 1 etc. However a patch point at the input to each channel allows cross plugging of the inputs.

2) Equaliser

The 1624 equaliser is an extremely flexible device allowing five areas of control to be exercised. All amplitude pots are centre detented for easy zeroing, while the mid frequency pots are 41 detent types. The equaliser may be switched in or out of circuit, independantly of the high pass filter.

a) High Pass Filter

The High Pass filter has a continuously variable turnover frequency between 50Hz and 800 Hz, below which the signal is attenuated at a rate of 12dB per octave.

b) High Frequency

The frequency is switchable between 8kHz and 16kHz. 15dB of boost or cut is available, with a shelving characteristic: i.e. the slope of the eq curve does not keep rising with frequency, but having reached the desired amount, flattens out or "shelves" from that frequency on.

c) High Mid Frequency

The frequency is continuously variable between 600 Hz and 10kHz with 15dB of boost or cut available. The response of the mid eq is of the "bell" type i.e. having reached a maximum (or minimum in the case of cut) at the selected frequency, the response returns to zero on either side of that frequency, The shape of the curve when plotted gives the characteristic "bell" shape. The Q of the network (a measure of the bandwidth) is 1.5.

d) Low Mid Frequency

This is identical to the High Mid Frequency except that the frequency is continuously variable between 150Hz and 2.4kHz.

e) Low Frequency

The frequency is switchable between 60Hz and 120Hz. 15dB of boost or cut is available, with a shelving characteristic.

3) Auxiliary or Cue Sends

Six sends are available from the input modules for Echo, Foldback (Cues) or auxiliary effects devices. All level controls are 41 detent types.

Send 1 and 2 are permanently pre fader, but post equaliser, patch bay insert point and channel mute circuitry.

Sends 3 and 4 are normally post fader, but may be switched pre fader.

Sends 5 and 6 are permanently post fader. If the STE button is pressed however, they are connected post pan-pot, so that a stereo mix may be obtained, i.e. for stereo headphones or effects. All six sends are switched on by depressing the Cues On button.

4) Routing Matrix

A signal may be routed to any or all of 16 sub groups by depressing the relevant routing button. The signal may also be routed direct to the mix busses by depressing mix, or via the pan-pot by also depressing PAN. The pan pot may also be used to pan between sub groups by depressing PAN, and the required sub groups. The signal may then be panned to the sub groups with all odd numbered busses being fed from pan-pot left, while even numbered busses are fed from pan pot right.

The pan-pot is a centre detented control, with a loss of 4dB at the centre point. This is a compromise between the 3dB loss required for constant power panning, and the 6dB loss required for constant voltage panning.

5) Channel Solo

The solo function has 3 modes of operation, selected by 2 master control buttons on the master module. The Mono/Stereo button causes the solo monitoring point to be moved from post pan-pot (stereo solo or AFL) to pre fader (mono solo, or PFL). Neither of these modes will cause an interuption or disturbance to the signal going to tape, as only the monitor facilities are being switched. Therefore, this is a completely safe mode of operation. However, the signal heard will not necessarily be at the same level as the signal heard in the mix. Should it be desired to solo a signal, while still preserving the relative levels and perspective within the mix, the solo in place (SIP) mode may be selected on the master module. Now, when a channel solo is selected, all other channels will be muted, as indicated by their channel on LED being switched off. This is a potentially dangerous mode, as the signals to tape are affected by the muting of all other channels. The muting command to other channels can however be disabled selectively on each channel by depressing the solo safe (SFE) button. Any channel with the SFE button depressed will remain in operation when any other solo is depressed.

An LED is illuminated on any channel with a solo depressed (except when channel is muted) and a lamp is also illuminated on the master module. The solo button is a latching action switch, and any number of buttons may be operated at one time.

6) Channel Muting

Each channel may be switched on or off from either of 2 Master Muting busses, programmed from the Master Mute A or Master Mute B buttons on

the Master module. Any channel set to Mute A will be controlled from Master Mute A buss, and similarly any channel set to B will be controlled by Master Mute B buss.

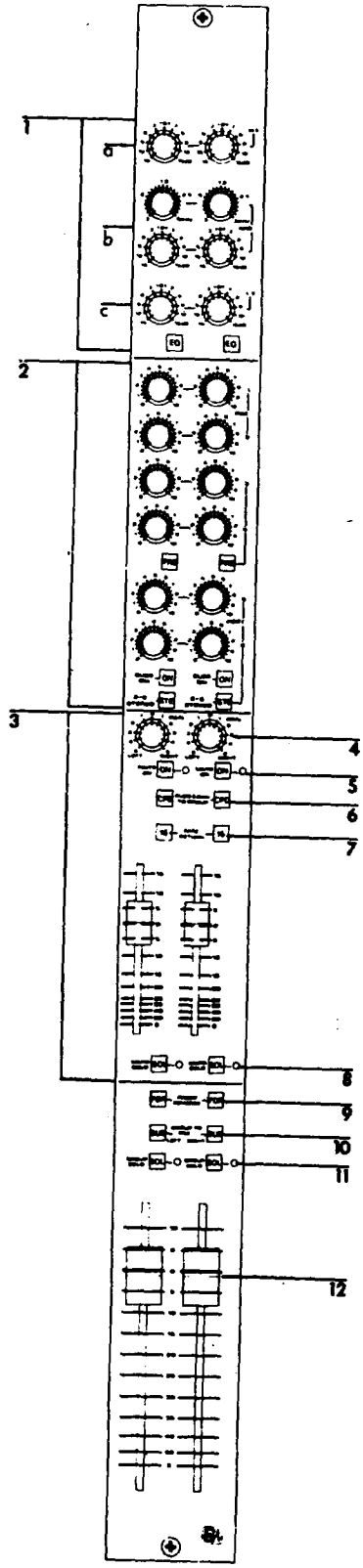
In addition, each channel has an individual Channel On/Off button which is independant of the Master Mute function. When a channel is muted or switched off, all sends are also muted, with the exception of the insert send signal to the patch bay. An LED indicates when the channel is on.

7) Peak LED

Each channel has a peak LED which monitors the level of the post equaliser, pre fader point. The LED will illuminate at a level of 4dB below the clipping point of the channel. Even very short duration transients will be registered for a period of time due to the memory action of the peak measuring circuit.

8) Channel Fader

The fader is a high quality Penny & Giles conductive plastic unit. The law has been specially tailored to allow very fine resolution in the upper working region with excellent attenuation when the fader is completely down.



TITLE
S1624
GROUP/MONITOR
MODULE

SERIES No.

2.04 GROUP/MONITOR MODULE

The extreme flexibility of the 1624 Series console is in the main due to the design of the double function module. In addition to performing its normal function as sub groups and monitor for each track of the multitrack tape recorder when recording, it may also be used in the remix mode to provide other facilities. The Sub Group section may be used to form audio groups which may then be compressed, limited, or otherwise processed, before being combined with the rest of the stereo mix. The monitor section may be used to provide additional line inputs into the stereo mix. By using the console in this way, a 24 input 16 output console in fact become a 40 input console when remixing simultaneously with the flexibility of up to 16 sub groups. This flexibility is provided by 2 buttons marked SUB and CPG (Cues and Pan to Group). The operation of these will be dealt with in detail later in this section. Each output module handles the functions of 2 sub groups and 2 monitor channels.

1. Equaliser

The equaliser is a 3 band device, which may be switched in or out of the monitor section by depressing the EQ switch.

a. High Frequency

The high frequency section is a shelving network giving 15dB of boost or cut at 15kHz.

b. Mid Frequency

The mid frequency section is a "bell" network giving 15dB boost or cut at frequencies between 300Hz and 5kHz, selected by a 41 detent

control.

c. Low Frequency.

The mid frequency section is a shelving network giving 15dB of boost or cut at 60Hz.

2. Auxiliary Sends

The 6 auxiliary sends are normally situated in the monitor section unless the CPG button is depressed. All level controls are 41 detent types.

Sends 1 and 2 are permanently pre fader

Sends 3 and 4 are normally post fader, but may be switched pre fader by depressing the button marked PRE.

Sends 5 and 6 are permanently post fader. By depressing the STE button, they may be placed post pan-pot.

All auxiliary sends are switched on by depressing the Cues On button.

3. Monitor Section

The monitor section enables monitoring of either the sub group output or the tape return signal, and provides the facility to route the monitored signal to the stereo mix, normally via the pan-pot. However, the mode of operation of the monitor section and the output group section is modified by the operation of the two buttons marked CPG and SUB. This allows four modes of operation which will be dealt with in detail in the next section.

4. Pan

The monitor pan control allows the monitored signal to be routed between the left and right of the stereo mix.

5. Monitor On

Depressing the ON button switches the Monitor Section on.

6. C.P.G.

Depressing CPG (Cues and Pan to Group) removes the pan pot and auxiliary send controls from the monitor section in readiness to be assigned to the group section which will occur when SUB is also selected. When in this mode, all odd numbered monitors route directly to the left of the stereo mix, while all even numbered monitors route directly to the right.

7. Tape Return

Selects whether the monitor section receives the group output signal or, when depressed, the tape return signal, via the monitor return jack. If SUB has been pressed, the group output is removed from this switch.

8. Monitor Solo (SOL)

Depending on the solo mode selected on the master module, the soloed signal may be either Mono (Pre Monitor Fader) or Stereo (Post Monitor Pan Pot). If solo in place, (S.I.P.) mode is selected however, this switch has no function. In CPG mode stereo solo will be left or right, depending on whether the monitor channel is odd or even.

9. Fader Reverse (FDR)

The fader reverse button, when depressed, reverses the function of the monitor fader and the group fader. This is useful when using the monitor channels for extra line returns into the stereo mix, to allow the long Penny & Giles faders to become the return faders.

10. SUB

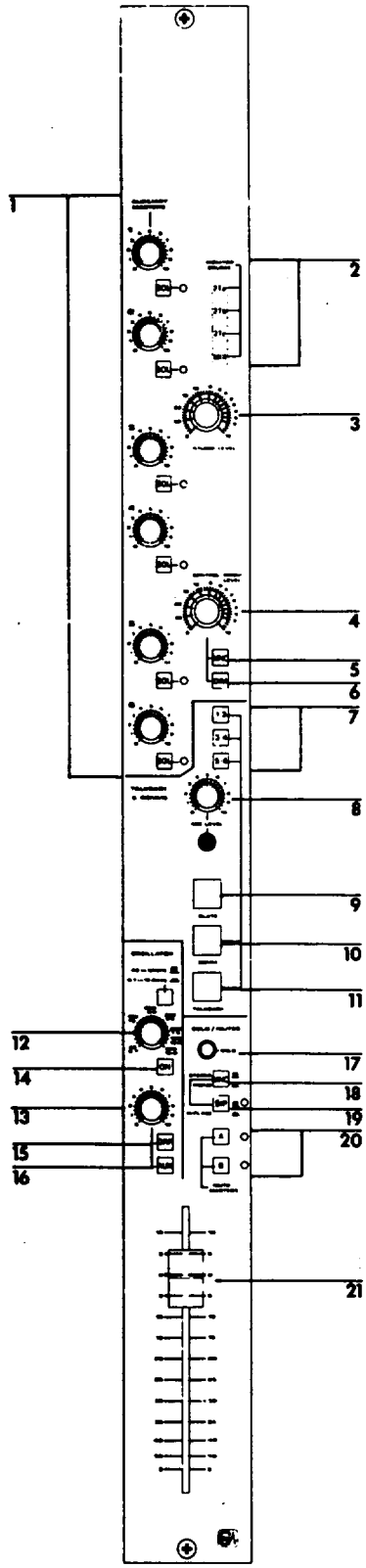
If the SUB (Group to Mix) button is selected, the group signal, in addition to its jackfield destination, is also routed directly to the stereo mix, odd numbered groups being assigned to the left, even numbered groups being assigned to the right. However, if CPG is also selected, the pan pot and the auxiliary sends are connected into the group signal chain, providing the facility of panning the group signal across the stereo mix. SUB is used to enable the formation of audio sub groups when mixing, and to allow the return routing of such groups into the stereo mix, without using any extra return channels, either directly, or via the pan pot.

11. Group Solo (SOL)

The group solo is similar in operation to the monitor solo, except that the soloed signal is either pre or post the group fader. In SUB or SUB + CPG mode, the soloed signal will appear on the control room speakers in its stereo position.

12. Group Fader

A high quality, low noise conductive plastic Penny & Giles fader.



TITLE
S1624
MASTER MODULE

2.05 MASTER MODULE

The Master Module contains all master level controls relating to the six auxiliary sends, the control room and studio monitoring selection and volumes, the talkback facilities, alignment oscillator, the mute and solo programming, and of course, the stereo mix master fader.

1. Auxiliary Masters

The six auxiliary sends can be controlled in level using 41 detented controls. Each auxiliary send has a solo switch below it, with an associated indicator LED. If the Master Solo mode is selected to mono, the signal will be heard in mono as a centre image from the control room speakers. However, if the master solo mode is selected to stereo, the odd numbered auxiliary sends will be heard on the left, while the even numbered sends will be heard on the right. This enables easy monitoring of stereo auxiliary sends, e.g. stereo headphone mix.

2. Monitor Source

Four interlocking push switches marked 2Ta, 2Tb, 2Tc, and Mix, select the outputs of the three stereo tape returns and the stereo mix output from the desk, to the control room and also the studio monitor systems.

3. Studio Level

The volume of the signal selected by the monitor source selector to the studio monitoring system is controlled by studio level control. The injection of the talkback signal is independant of the setting of this control, and partial muting of the monitor source signal takes place.

4. Control Room Level

The level of the signal to the control room monitor speakers, selected by the monitor source selector switch is adjusted by the control room level control.

The source selection is over-ridden by any solo switch. Therefore any soloed channel will be heard either in dual mono or in stereo, depending on the solo mode selected on the master module.

Becuase the stereo mix meters are fed from the signal to the input of the control room level control, any soloed signal will also be displayed on the meters. This enables, for instance, the level of the signals of the auxiliary sends to be read.

5. MNO

Depressing the switched marked MNO will cause the control room monitor signals to be summed together, in order to check the mono compatability or a stereo signal.

6. DIM

Depressing the switch marked DIM will cause the control room monitor signals to be attenuated by a fixed amount (20dB). This is useful if a conversation needs to be carried out or a telphone call answered, without disturbing the setting of the control room level control.

Talkback Facilities

7. 1-2, 3-4, 5-6

Depressing the switches marked 1-2, 3-4, 5-6 determines which of the pairs of auxiliary masters will be fed with talkback signals. This is necessary to prevent talkback signals being routed to any pair of auxiliary masters which are being used for echo sends, or other effects devices. The switches may be used in combination.

8. Mic Level

The mic level control adjusts the level of the talkback signal.

9. Slate

Depressing slate routes the talkback signal to all group busses combined with a 30Hz tone. This signal will therefore be recorded on the multitrack tape recorder in order to identify the tape. The 30Hz tone assists in the location of specific sections of the tape because it will still be heard at high winding speeds even with the tape not in physical contact with the heads. When slate is selected, partial muting of the control room monitor speakers take place.

10. Comm.

Depressing communication routes the talkback signal to any auxiliary masters which have been selected by depressing buttons 1-2, 3-4, or 5-6. Partial muting of the control room monitors also occurs.

11. Talkback

Depressing talkback is identical to comm., with the addition of the talkback

signal being routed to the studio speakers, independant of the studio level control.

OSCILLATOR

12. Frequency

The oscillator frequency is continuously variable between 45Hz and 15kHz in two ranges. The first range covers 45Hz to 900Hz, with second range covering 700Hz to 15kHz.

13. Level

The oscillator level is adjusted using a 41 detent potentiometer.

14. ON

The oscillator is switched on by depressing this button.

15. GRP

Depressing this button routes the oscillator signal to all output groups.

16. Aux

Depressing this button routes the oscillator signal to all auxiliary busses.

Solo/Mutes

17. Solo

The Solo lamp illuminates whenever any Solo function on the console is operated. This serves as a warning lamp to inform the operator that a Solo condition exists, which may then be found by observing the individual channel solo warning lamps.

18. MNO

The overall mode of the Solo system is selected by this master control button. When in the normal unpressed position (stereo) the soloed signal from any channel is the post pan-pot signal. Therefore, a soloed signal is heard in stereo across the control room speakers, in the same perspective as was heard within the stereo mix.
However, when the MNO button is depressed, the soloed signal is the pre-fader signal (P.F.L.) and the signal is heard in double mono, i.e. a centre image across the control room speakers. Neither of the above modes will affect the signals going to tape, and will only affect the control room monitoring conditions. They are completely safe to use at any time.

19. S.I.P.

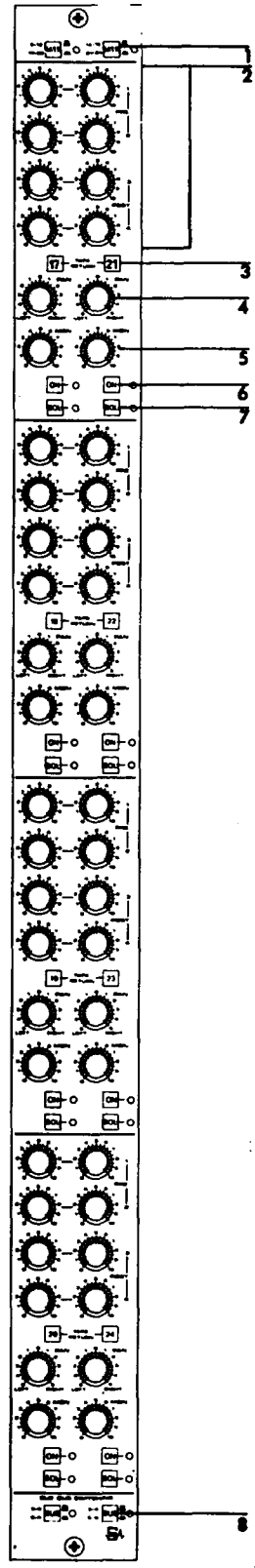
The third mode of the solo system is known as "Solo in Place". If S.I.P. is enabled, selecting Solo on any input channel causes all other channels to be muted except those which are selected "Safe".
The effect of this is to mute the signal and the auxiliary sends on all but the soloed channel, and the effects return channels, which have been selected to "Safe". The soloed channel with its effects return will therefore be heard in its true stereo perspective, exactly as in the stereo mix, with no level change. Obviously this solo mode cannot be used during recording, as signals to tape are affected.

20. A. B. (Mute Masters)

Any input channels which have been assigned to either A or B mute busses may be controlled by depressing the relevant mute master button, which will then switch those channels on or off. A LED indicates the state of the channels.

21. Fader

The stereo mix level is controlled by a closely matched Penny & Giles stereo conductive plastic fader, allowing smooth fades to be achieved, without significant shift of the stereo image during fade out.



S1624
24 TRK MONITOR
MODULE

2.06

24 TRACK MONITOR MODULE

The optional 24 Track Monitor Module may be installed at any time in the 24/16 configuration console to give full 24 track monitoring facilities. Input signals to tracks 17 to 24 may be derived either from the direct output of the input channels, or from any of the main output groups, and patched directly into the relevant tape send on the patch bay. The signal to tape or the signal from tape may be monitored and metered through the 24 Track Monitor Module, with full panning, auxiliary sends, solo, and meter switching facilities.

1. MTR

To allow metering of tracks 17 to 24 meters 9 to 16 may be switched in 2 groups of 4. Meters 9 to 12 will therefore meter tracks 17 to 20, and meters 13 to 16 will meter tracks 21 to 24 when the respective MTR button is depressed.

2. Auxiliary Sends

4 Auxiliary send controls are provided on each monitor. Sends 1 and 2 are connected pre monitor, while sends 3 and 4 are connected post monitor.

3. Tape Return

The Tape Return switch selects the monitor and meter source. If not depressed, the source will be the signal which is patched into the tape send, i.e. console output. If depressed, the monitor source will be the tape return signal i.e. tape recorder output.

4. PAN

The monitor signal may be panned between the left and right of the stereo mix, via the centre detented pan pot.

5. MON

The monitor level control allows adjustment of the level of the monitored signal within the stereo mix.

6. ON

When depressed, the ON button will switch on the monitor channel and the auxiliary sends.

7. Solo (SOL)

Depending on the solo mode selected on the Master Module, the soloed signal may be either Mono (Pre Monitor Level) or Stereo (Post Monitor Pan Pot). If solo in place (S.I.P.) mode is selected however, the solo button is inoperative.

8. Cue Bus Switching

Although each monitor section has only 4 auxiliary send controls, access to auxiliary busses 5 and 6 may be obtained by depressing the relevant Cue Bus Switching button, which is operative on the 4 monitor channels above it. Auxiliary send controls 3 and 4 will now route to auxiliary send busses 5 and 6.

3.00 OPERATION

3.01 INTRODUCTION

The 1624 Series console has been designed to provide the facilities required in a modern recording studio, with a minimum of operator effort and to allow free and uninhibited use of these facilities, without unnecessary patching, or redundant switching. Sub grouping and monitoring facilities in particular are novel in operation, and require a certain amount of understanding of the console signal flow, in order to fully utilize the potential and flexibility which is available.

The recording process can be broken down into 4 basic sequences:-

1) Record Mode: Recording direct from microphone on to the multitrack tape recorder.
2) Multitrack Playback: Listening to what has been recorded.
3) Overdubbing: Building up the track complement while listening to what has already been recorded. Basically, this is a combination of 1) and 2).
4) Mixing: Combining all the recorded tracks, various effects, echo etc to form the final stereo mix.

An understanding of the signal flow through the mixer is best gained by a study of the simplified block diagram, which illustrates the 3 main modes of operation. A detailed explanation of all controls and switches has been given in Section 2, and it is assumed that the user is familiar with basic multitrack recording methods.

3.02 Record Mode

1. Signal Flow

This is the basic starting point in making a recording. Input channels are placed in the microphone mode by placing the mic/line switch to the "up" position. The signal is routed to the desired console group output by depressing the relevant group routing button on each channel. The signal may be routed to more than one group if desired and may be panned between any odd and any even numbered groups by selecting the channel pan pot into the signal flow.

The signal now appearing at the console group output which feeds the tape recorder can now be metered on the relevant VU meter, if the Tape Return button is in the "up" position, and a monitor balance achieved by raising the appropriate monitor fader, and depressing the monitor "ON" button. The monitor pan pot will pan the signal between left and right speakers.

The various gain and level controls throughout the signal chain may now be adjusted to set the operating levels for optimum signal to noise ratio and headroom conditions.

2. Channel and Group Faders

In general the channel and group faders should be set to approximately the "0" position. This will enable the engineer to increase the level by 10dB, or fade out completely, while normally operating in the fine resolution area of the fader travel. The absolute position of the fader is not too critical, but the situation where for example the channel fader is operated at -30dB, while the associated group fader is at +10dB should be avoided, as this will degrade the normally excellent signal to noise ratio of the console. Similarly, the opposite case will run the risk of distortion.

3. Microphone Gain

Having set both channel and group faders as above, the microphone gain can be set to give the required level at the group output. The amount of gain required will of course depend on the type of microphone, the sound pressure level developed by the instrument or voice and the distance between the sound source and microphone. In the case of high output microphones and for high sound pressure levels, it may be necessary to switch in the -20dB attenuator pad, to avoid overloading the input stage.

4. Insert Patch Points

In situations where the dynamics of the input signal are very wide, or unpredictable, or where a particular effect is required, it may be required to patch in a limiter/compressor, equaliser or effects device into the signal chain. This may be done either via the channel insert jack points or the group insert jack points. Which insert point is used will depend on the actual effect required. If only an individual instrument is to be affected, then the channel insert points will be used. However, if a number of microphone channels have been mixed to a single group, such as backing vocals for instance, then it may be necessary to patch in an overall limiter. This can be done using the group insert points.

5. Headphone Mix

During recording, it is of course essential for the musicians to hear what they and everybody else are playing. Headphone mixes may be derived using any or all of auxiliary sends, either direct from the

input channels, or alternatively from the group monitor channels. Deriving the headphone mix from the monitor channels has the advantage of giving musicians a mix when replaying the recording just made, which is useful when overdubbing to enable them to hear their performance. However, a mix derived from the monitor channels during recording will be affected by any "gain riding" of the faders which may cause problems. This is avoided by using the input channel auxiliary sends 1 and 2, and for 3 and 4 if switched to Pre. The headphone signal is thus derived from before the channel fader, and is unaffected by any change in the position of that fader.

6. Echo Sends

Similarly to headphone mixes, echo sends may also be generated from either the input channels or the group monitor channels. However, unlike headphone mixes the echo send is usually required to be derived after the fader, so that it is proportional to the fader level. This ensures that the percentage of direct signal to echo signal remains constant, regardless of fader position. This condition is met on auxiliary sends 3 and 4, if Pre is not selected, and also on sends 5 and 6. This pair may also be derived after the Pan Pot by selecting STE, which is useful if a stereo effect send is required.

The individual situation determines whether the echo send is derived from the input channel or the monitor channel. Normally if the echo return signal is to be recorded on the multitrack tape recorder, then the echo send will be derived from the input channels. However, if it is an echo mix for monitoring purposes only, then it would be more relevant to use the monitor channel sends to derive the echo send mix.

7. Echo Returns

The output of the echo or reverberation device, i.e. the echo return signal, may be patched into either unused input channels if this signal is required to go to tape for monitors, or alternatively patched into unused monitor channels if it is only monitor echo and no input channels are available.

If an input channel is used, the return signal is patched into the Line Input jack of the relevant channel. The channel must then be placed in the Line mode by depressing LI. Line gain and fader position may now be set up as described for microphone inputs.

The echo return signal may now be routed to the group outputs, if it is required to record the echo signal, by depressing any of the group routing buttons, and possibly even selecting the Pan Pot if required.

Naturally, when an input channel is used as an echo return, the echo return signal may also be sent to any of the auxiliary sends. This will allow echo to be added to the headphone mix if desired. It is also possible of course, to send the echo return to the echo send, and create a loop in the echo system. When used with a reverberation device the effect will be to increase the reverberation time. When used with a tape delay, it will create multiple delays, decaying in amplitude in a manner controlled by the send level. This effect must be handled with care. If the echo send level from the echo return channel is set too high, the entire system will start to feed back, and go into oscillation, instead of decreasing in amplitude with each successive loop.

If it is not required to record the echo return signal, but merely to route it direct to monitors depress Mix. This will route the signal directly to the stereo mix buss, which is the monitor signal.

3.03 Multitrack Playback

Having actually recorded something on the multi-track recorder, it is necessary to be able to listen to the recording. This is achieved by simply selecting Tape Return. The effect of this is to connect the individual group monitor to the output of the relevant track of the multitrack tape recorder. Therefore the signal from the recorder will now follow the same monitor signal path as the group output signal had been using. This means that all levels, and panning, and therefore the monitor mix, will remain the same as they were when the recording was being made. This is assuming, of course, that the tape machine is correctly aligned.

The facility of monitoring the playback of the multitrack in this way enables the operator to perform a quality control check even while the recording is being made, providing that certain precautions are observed.

1. Isolation between control room and studio is good. If not, the musicians will hear a delayed version of what they are playing.
2. Headphone mix is derived from the channel faders, otherwise the musicians will again hear a delayed version.
3. Noise reduction system is either a simultaneous encode-decode system, or not used. If it is not a simultaneous encode-decode system, then while recording, it will be in the encode mode, and the signal presented to the console monitor return will probably be the tape recorder line input signal i.e. the signal from the console group output. In this case, depressing Tape Return will appear to have no effect, as it will be the same signal in both cases. This particular effect can in some cases be put to good use,

however, when overdubbing as it allows the monitor switching to be achieved automatically, depending on the mode of the tape recorder. This will be dealt with more thoroughly in Section 3.04 which describes the overdubbing process.

3.04 Overdubbing

Overdubbing is the process of building up a recording track by track. while listening to all the previously recorded tracks. As such it will be clear that this is a combination of the previous 2 modes, with some channels in the Microphone (Recording) mode, and some monitors in the Tape Return (Multitrack playback) mode.

Any tracks which have already been recorded are monitored by selecting the relevant Tape Return buttons. A headphone mix may be set up using the auxiliary sends on these monitor channels. Monitor echo can also be similarly set up, as already described in section 3.02.

Input channels in the microphone mode, which will form the overdub signal can now be routed to the output group corresponding to the track to be recorded, in exactly the same way as described in Section 3.02.

At this stage, a decision must be made as to the source of the headphone mix signal from the overdub channels. It can be derived from either the input channel or the group monitor channel or both.

1. Input Channel

   In this case, the musician will always hear himself. However he will not be able to hear his previously recorded signal off the tape recorder, if he needs to "drop in" in the middle of a take.

2. Monitor Channel

Now the engineer can decide whether the musician will hear himself live or the previously recorded signal off tape (sync playback) by depressing the Tape Return button. However he will not be able to hear both, and a vocalist for instance may find it difficult to match levels. and intonation.

This switching can sometimes be achieved automatically if a noise reduction unit is in use, and with some tape recorders. If the tape recorder or noise reduction unit is arranged to switch its sync output to line input whenever the tape recorder is in stop, fast forward, rewind, or record, and to only switch to sync playback off tape when the tape recorder is in the play mode, the automatic switching condition will be met.
All that is now usually necessary when overdubbing is to select Tape Return on the relevant monitor channel, and let the tape recorder and/or noise reduction system perform the work of monitor switching.

The musician will now hear himself live at all times except when the tape recorder is actually in the sync play mode, when he will hear his previous signal off tape. This method saves the engineer from continually switching monitor sources, but can only be used with certain tape recorders.

3. Both

If derived from both, then the musician will be able to hear himself via the input channel and his previous recording via the monitor channel, if it is switched to monitor Tape Return, until the moment of entering the record mode. At that point, most tape recorders will switch from sync playback to line input. The effect of this

will be a slight increase in the level of that signal in the headphone mix, due to the addition of the input channel signal and the tape recorder line input signal, which is effectively the same signal.

3.05 Remix Mode

When all recording and overdubbing has been completed, the console is placed in the remix mode.

This is done by selecting the line input of each input channel (LI). This connects the output of the multi track tape recorder to the input of each channel, via the line trim control. This will normally be set approximately to the "0" position if the recorder is operating at a nominal +4d8v line level. However, like the mike trim, it will usually be adjusted to allow the channel fader to work near its nominal "0" position.

The channel may be routed directly to the stereo mix, by depressing Mix, or via the channel pan pot by also depressing Pan to allow positioning of the signal within the stereo perspective.

Alternatively the signal may be routed to any of the output groups, to enable the formation of sub groups.

See section 3.06.

Limiters or other devices may be connected to any input channel by patching into the channel insert points on the jackfield.

All 6 auxiliary sends may be used, to feed echo or effects devices, as headphone mixes will not be required during remixing.

The composite stereo mix will be controlled in level by the stereo master fader and the level metered on the stereo mix V.U.meters.

These V.U. meters also indicate the level of any solo signal, or any of the stereo tape returns selected on the monitor source buttons. The monitor source selection buttons also allows quality checking of the stereo recording in the same way as described for multitrack playback. Section 3.03.

3.06 Sub Groups

In the remix mode of operation, the 1624 Series console becomes an extremely flexible mixer, due to the innovative use of the normally redundant monitor and group output section to provide effects returns and sub groups.

All monitor inputs may be used as extra line inputs to the stereo mix busses, complete with equalisation, 6 auxiliary sends, and panning. Access to the monitor return inputs is obtained by patching into the Monitor Return jack on the patch bay, and selecting Tape Return on that monitor channel.

In addition to this, the group section may be used to form mono or stereo sub groups from the input channels, to feed external equipment or even to feed the stereo mix busses, totally independant of the monitor section. If required, the auxiliary sends, and the pan pot may also be allocated to the group section, instead of being assigned to the monitor section.

This flexibility is achieved by the operation of 2 buttons, on the group and monitor module; CPG, and SUB (marked GTM in early consoles).

Operation of these 2 buttons in various combinations will give 4 modes of operation, which will best be understood by referring to the simplified block diagram, in conjunction with the following description.

1. This is the normal recording mode, as described in Section 3.02. In this mode, the group output (G.O.) is normalled to the tape send (T.S.) from where it will feed the multitrack tape recorder. The multitrack tape return (T.R.) is normalled to the monitor return (M.R.).

   The Tape Return button allows the monitor section to monitor either the group output or the tape return.

2. SUB (GTM on early consoles)

   Depressing the SUB button allows the formation of sub groups from the input channels, which are directly assigned to the stereo busses. All odd numbered groups are assigned to the left stereo buss, while even numbered groups are assigned to the right stereo buss. In this way, a number of input channels may be routed to a pair of groups, a limiter or other device patched into the group insert points to provide overall control, and by depressing SUB, the groups will be directly assigned to left and right of the stereo mix.

   Independent of this, the monitor return section can also be used to provide a line level input to the stereo mix, via the pan pot, with the monitor equaliser, and auxiliary sends operative on this input. This is done by patching into the Monitor Return jack and selecting Tape Return.

3. SUB and CPG (Cues and Pan to Group)

In this mode, the basic operation is the same as the previous mode, i.e. the formation of a sub group. However, depressing CPG transfers the auxiliary sends (Cues) and pan pot to the sub group, and away from the monitor return. This enables the sub group to be panned between the left and right stereo busses, and the auxiliary sends to be used to provide signals for echo, or other devices from the sub group.

The monitor return section is still available for use, but now is assigned directly to left or right of the stereo mix depending on whether it is an odd or an even numbered monitor. This is useful as a direct stereo return into the stereo mix , complete with equalisation.

4. CPG .

When CPG is selected the auxiliary sends and pan pot are disconnected from both the monitor and group signal chain. This allows the formation of a stereo sub group with EQ, by setting the monitor faders to the unity gain position, and not selecting Tape Return. All odd numbered groups will route to stereo mix right. This signal path is also available in mode 1, with the addition of the auxiliary sends (Cues) and panning to the stereo mix.

In modes 1 and 4, if Tape Return is selected, the Group output has no direct route to the stereo mix, but is available only at the jack-field. In this way, it can be used as an additional effects send group, formed from any number of input channels.

The monitor return input, of course, is now available as an effects return, directly routed to the stereo mix. Used in this way, the group output becomes the send to an effects device, e.g. delay line, harmoniser etc. while the monitor return becomes the effects with equalisation return to the stereo mix, conveniently located close to the effects send.

5. Fader Reverse (FDR)

In any mode, the functions of the long group fader and the short monitor fader may be interchanged. This allows the engineer to have all monitor returns controlled by the long faders, while group outputs are controlled by the short faders. During remix, this means that all line inputs into the stereo mix are controlled by the high resolution Penny & Giles faders.