3. INPUT/OUTPUT MODULE

3.1. Multitrack Routing Section

3.1.1. 48-track Routing

A matrix of 24 multitrack assignment pushbuttons and two 48-track routing pushbuttons select one or more of 48 output buses. Each assignment pushbutton selects either or both of two output buses, depending on the state of the two 48-track routing pushbuttons. If the MTK 1–24 routing pushbutton is pressed, the assignment pushbuttons select buses in the range 1 to 24; if the MTK 25–48 routing pushbutton is pressed the range is switched to 25 to 48. If both routing pushbuttons are pressed each assignment pushbutton selects the appropriate bus in both ranges. Each pushbutton has an LED indicator associated with it.

3.1.2. 4-Track Routing

The 1, 2, 3 and 4 pushbuttons, located immediately below the multitrack switching matrix, allow effects returns to be switched via the monitor path to one or both of the 2-track outputs during mixdown. This arrangement effectively doubles the number of available line level inputs available.

Pressing the B'NCE (bounce) pushbutton connects the corresponding multitrack return, via the monitor path, to the
multitrack routeing matrix. The bounced down track can then be selected on the assignment pushbuttons. The 2–track routeing is automatically cancelled to prevent any doubling of the signal level. The associated LED illuminates when PAN is pressed.

When pressed this pushbutton enables the adjacent pan pot and allows panning between odd and even selections on the assignment pushbuttons. The integral LED illuminates when the pushbutton is pressed.
3.2. Input Section

Mic/line switching is master controlled and set depending on console status. C/O flips the inputs locally in the opposite sense to the selected master status. Both mic and line have continuously variable gain controls. The range of the line trim control LINE is $-10\,\text{dB}$ to $+10\,\text{dB}$ with a centre detent (0). For the mic input the range is $+20\,\text{dB}$ to $+70\,\text{dB}$ with the optional addition of a $-30\,\text{dB}$ pad. With a total range of $-10\,\text{dB}$ to $+70\,\text{dB}$, the mic input can be used for line level signals if desired.

C/O

Performs mic/line changeover switching. The red LED next to the changeover control illuminates when the I/O module input status is different to the master selection made from the monitor panel.

GRP

This pushbutton provides a patch free audio sub-grouping facility. On selecting GRP on any of the modules 1–48, the channel path picks up the multitrack bus of the same number, allowing the equalizers, filters, insertion and dynamics to be used on the multitrack signal as if it were a conventional channel path input signal. The channel fader now acts as an audio subgroup fader and the signal can be routed in the usual manner. Routing back to the associated multitrack send can be achieved using the DIR pushbutton (situated in the TRACK section above the small fader). The associated LED illuminates when subgroup is selected.

Ø

The phase–reverse pushbutton operates on both mic and line inputs (but not the subgroup). The associated LED illuminates when the pushbutton is pressed.
3. Input/Output Module

3.2.1. Filter Section

The high-pass filter has a range of 31.5Hz to 315Hz and the low-pass a range of 7.5kHz to 18kHz. Both filters are smooth controls and are individually selected by pulling the corresponding knob. The adjacent LED indicates when either or both filters are selected. The filter slope, in both cases, is 12dB/octave.
3.3. Dynamics Section

The dynamics unit is set out with the gate/expander on the left hand side of the module and the limiter/compressor on the right.

3.3.1. Gate/Expander

The gate/expander controls are as follows:

**KEY**

Pressing this pushbutton provides a dedicated patch input to the gate only, enabling the gate to be triggered by an external device or any other path signal. The compressor operation is not affected. When **KEY** is selected the associated LED illuminates.

**INV**

This pushbutton inverts the external trigger control so that the gate closes when a signal of the required level is present. This can be used as a 'ducker' or for muting severe breakthrough from another source.

**HYST**

Hysteresis is the difference in dB between the muted gate level (set by the threshold rotary control, **THR**) and its unmuted level. Varying the hysteresis allows more precise triggering of the wanted signal whilst still allowing the correct amount of signal tail through. (10dB of hysteresis is usually a good starting value for setting the gate). The fully anti-clockwise position ( **EXP** ) switches the circuit into a 2:1 ratio expander.

**THR**

Provides threshold control over 70dB in two overlapping ranges. Pulling the pot adds -30dB to the panel values and illuminates the adjacent red LED.
3. Input/Output Module

RGE

Sets the range (mute depth) of the gate over a 50dB range. Pulling the knob changes the attack time for the circuit from 1ms to 100us.

REL

The release time for the gate/expander is continuously variable from 30ms to 3s.

GATE

Switches the gate/expander into circuit separately from the limiter/compressor.

3.3.2. Limiter/Compressor

The limiter/compressor controls are as follows:

L/C

Switches the limiter compressor into circuit separately from the gate/expander.

→

When the arrow pushbutton is pressed, it links the limiter/compressor to the next module on the right to form a stereo pair or quad ganging. The link can also be made if the limiter/compressor is not in circuit, so that it can be used for a stereo/quad link even if it is not actively processing.

I/O Module
Dynamics Section

GAIN

Gain make-up of up to 30dB enables an excellent signal to noise ratio to be maintained throughout the path even under heavy compression.

THR

The threshold level can be controlled over 50dB in two overlapping ranges. Pulling the pot adds –20dB to the panel values and illuminates the associated red LED.

RAT

Controls the compression ratio with a conveniently arranged law between 1:1
and limiting (1 and lim). Pulling the pot nominally increases the impulse attack time from 1ms to 100us. However, the attack time is programme dependent, normally having a 7ms time constant, with faster time constants being applied to transient programme material.

REL

The release time can be varied from 30ms to 3s with the additional benefit of automatic 'hold' and impulse release circuits to remove pumping and breathing effects. The fully clockwise position switches the release control to a triple time constant programme dependent release time.

3.3.3. Sidechain Equalizing

The module equalizer may be inserted in the control sidechain of the dynamics unit by pressing the [Dyn] pushbutton in the equalizer section.
3.4. Auxiliary Section

This section can be configured as eight mono auxiliary sends with level control or four stereo pairs with panning facility and pre/post fader switching.

The effect of the stereo pairing pushbutton (ST) auxiliary sends 1 and 2 is as follows, the operation of the other stereo pairs (3–4, 5–6 and 7–8) is similar:

a) With ST 1–2 pushbutton not pressed –

The 1 and 2 pushbuttons act as individual switches for auxiliary sends 1 and 2; the integral LED illuminates when the pushbutton is pressed. The rotary controls act as individual level controls. The PRE pushbuttons act as individual switches and place the associated auxiliary pre–fader when pressed.

b) With ST 1–2 pushbutton pressed –

When pressed the 1 pushbutton switches the stereo pair on. The LEDs in both 1 and 2 pushbuttons are illuminated, 2 being disabled. Similarly, PRE 1 switches the stereo pair pre–fader. The rotary control associated with auxiliary 1 becomes the level control for the pair and the rotary control associated with auxiliary 2 (PAN) becomes the panning control.

Whether PRE auxiliaries are affected by the source path CUT button is controlled automatically by the master mixdown/record switching. In record mode the auxiliaries are taken pre–path

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CUT to allow in-place solos to be performed whilst sends to cues are unaffected. In mixdown the auxiliaries are taken post-path CUT so that effects sends are cut with source.

The auxiliaries may be selected in pairs to the monitor path by pressing the pushbuttons marked AUX [1-2], AUX [3-4], etc. alongside the small fader in the MONITOR PATH section. The auxiliaries stay assigned to the monitor or channel path independent of the fader swap system.
3.5. Insertion and Equalizer Section

3.5.1. Insertion

Each module contains an independently switchable patch insertion.

**INS**

This pushbutton switches the insertion facility in and out of the signal path; if the **INS** pushbutton next to the small fader is pressed then the insertion is assigned to the monitor path. The insertion is 'hot wired' and so always provides an output regardless of the **INS** pushbutton state.

**PREQ**

Insertion, when selected, is normally post–equalizer. Pressing **PREQ** switches the insertion point pre–equalizer and dynamics.

**EQ**

Pressing the **EQ** pushbutton switches the equalizer into the circuit. The integral LED illuminates when the equalizer is selected.
3.5.2. Equalizer

The equalizer comprises four continuously-variable overlapping frequency bands with a peaking characteristic. The two middle bands have variable Q with a range of 0.5 to 9 and a centre detent at Neve FSE traditional settings. The Q and characteristics of the high and low bands can be switched from 0.71 to 2 using the HIQ switches and from peak to shelving using the → and ← switches. Each band has 18dB of cut or boost on a smooth control. The equalizer design is such that the Q automatically varies with gain on all bands in peaking and shelving modes. As the gain is increased, so is the Q.

The ranges of the frequency controls are as follows:

Low: 33Hz to 370Hz
Mid1: 190Hz to 2kHz
Mid2: 0.8kHz to 8.7kHz
High: 1.5kHz to 17kHz
3.6. Small Fader and Mixdown Section

(See Figure 3.1)

This pushbutton routes the channel output directly to the to multitrack send of the same number and disables all other channels routed to that track (via the multitrack bus). [DIR] is used when a single channel path signal is all that is required to be sent to tape and that channel path can be configured on the same I/O module as the required track send.

![Diagram of multitrack bus and faders](image)

Figure 3.1 Use of TRACK and DIR Controls

(See Figure 3.1)

Signal level of the multitrack send, when routed either via the multitrack bus or via the [DIR] pushbutton in the small fader section is adjusted using the rotary control TRACK. The control has a detented centre position at line-up level and 10dB of in-hand gain.

(See Figure 3.1)

This pushbutton enables the overdub facility and illuminates the associated LED. The overdub system is operated in conjunction with the multitrack monitor and the cues sections on the monitor section, a description of which is included here:

[OP] and [P/B] allow monitoring of multitrack send and return globally.
OD, MIXED CUE, and CUES POST EQ operate only when the individual channel OD pushbuttons are pressed. OD is enabled by the individual channel pushbuttons and allows monitoring of multitrack send on selected overdub channels in conjunction with selection of the master OD status. The three master pushbuttons (O/P, P/B, and O/D) are interlocked and can be selected without affecting the cue sends. (See Multitrack Monitoring and Overdubbing Section.)

3.6.1. MODE

C/O

The C/O pushbutton has an electronically latched changeover function which reverses master status for record and mixdown modes on a local basis. The associated LED when illuminated indicates that the local status is in opposition to the master status.
3. Input/Output Module

**SWAP**

This is an individual fader swap control that transposes the small fader with the large fader; the associated solo and cut functions are also transposed. There is also a master [FADER SWAP] control in the STATUS section of the main monitor. The position of the small fader is indicated by two LEDs, one above the fader has an arrow with TO MTK indicating that the fader is feeding the multitrack assignment matrix, the other above the main pan pot (and labelled SMALL FADER ) indicates that the small fader is feeding the 4T routing matrix.

The auxiliaries remain assigned to the channel or monitor path independent of the swap function. Therefore the operator can replace a small fader with a large fader, or a manual fader with an automated fader, without any reassignment of auxiliaries.

3.6.2. MONITOR PATH ASSIGNMENT

**CH-OP**

This connects the input of the monitor path to the channel postfade output offering up to 48 additional effects sends during mixdown.

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The seven remaining pushbuttons; **DYN** (dynamics), **INS** (insert patch), **EQ** (equalizer) and **AUX 1-2**, **3-4**, **5-6** and **7-8** (auxiliaries) in the **MONITOR PATH** section enable these facilities to be assigned independently to the monitor path. The associated LEDs illuminate when the pushbuttons are selected.

**SOLO** and **CUT**

The pushbutton functions are dependent on master selection and record status. The switch function can be selected at the Monitor **SOLO + CUT** panel to have a momentary, interlocking (**ML**), or latching (**LATCH** ) action and can be assigned to select cut solo, positional AFL or PFL. If the tape machine is in record, solo safe is automatically set on the channel path and solo monitoring continues via the AFL/PFL buses.

Selecting **1**, **2**, **3** or **4** gives access to the main 2–track mix outputs for mixdown and simultaneous monitoring during multitrack recording.

**Effects** **RET**

This pushbutton allows the I/O module to be used as an effects return. When a path with effects send is soloed, the operator needs to hear the 'effect' of the return mixed in with the source; the return’s path therefore must not be cut. This facility allows any path to be an effects return path. In mixdown mode the monitor path may also be an effects return or send. The associated LED illuminates when **RET** is selected.

**PAN**

When pressed this pushbutton inserts the adjacent pan pot and allows panning between odd and even mix output tracks selected.

**SOLO**

This pushbutton function is dependent on master selection and record status. The function can be selected at the Monitor **SOLO+CUT** panel to have a momentary, interlocking (**ML**), or latching (**LATCH** ) action and can be assigned to operate as a cut solo, positional AFL or PFL. If the tape machine is in record, solo safe is automatically set on the channel path and solo monitoring continues via the AFL/PFL buses.

The solo and cut functions remain permanently associated with their corresponding faders regardless of **SWAP** condition.
The cut circuit can be operated individually, remotely, or by master controls in conjunction with the A and B pushbuttons immediately above. If the CUT pushbutton is operated individually then the lamp glows at full brightness; if the circuit is activated remotely or by master control the lamp glows at half brightness. If both master and individual cuts are activated the lamp glows at full brightness, indicating that if the master is released the path will still be cut.

The solo and cut functions remain permanently attached to their corresponding faders regardless of path condition.