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Brand:	**Seck**	
Model	**1282 MKII, 1882 MKII**	
Product:	**Multi-Track Mixer**	
Description:	**Service Manual**	**Dated: 1984-88**

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SECK

AUDIO CONSOLES

MULTI-TRACK
RECORDING

SOUND
REINFORCEMENT

WELCOME TO THE FAST TRACK.

Your music sounds better than ever. But until you get someone to listen, talent alone won't put your career on the fast track. You've got to sound good on tape too.

In the past, cutting a demo meant booking studio time that could cost you the farm. Today a new generation of narrow gauge recorders brings multitrack technology to the home studio musician. Personal multitrack recorders give you many of the facilities of major studio machines, on a more compact, more affordable scale.

SECK consoles are designed to complement the new generation multitrack. SECK recording consoles give you the features, the quality and the capabilities of larger more expensive consoles, in a compact and affordable package.

Configured Inputs

Balanced inputs with very wide gain swing accommodate a broad range of signal sources. And a select switch allows both line and mic inputs to be permanently connected. Once patched-in, signal passes via the effects "Insert" point to a musical three band, mid-sweepable equalizer. At this point, effects can be layered and routed using one pre- and two post-fader aux sends. The signal then passes through a long throw fader to a panpot and push buttons on its way to the main stereo output or eight subgroups.

Monitoring

The pace at which overdubs are made demands fast and flexible monitoring. The in-line monitoring facilities on multitrack recorders follow the recorder's track status, providing the correct line, tape or sync signal to avoid operational confusion.

The monitor mix is set up using level and pan controls along with one pre- and a stereo post-fader aux send. At mixdown, this section may be switched to the main channel signal path – offering you up to 6 aux busses. If you're using sequencers to create more "live" tracks at mixdown, the monitor mix section can be patched to a pair of aux returns. This approach extends your inputs to a total of 38 (26 on the 1282 version).

Output Control

SECK Consoles feature eight subgroups which feed the recorder inputs. On the 1882, each subgroup can be routed to outputs 1/9, 2/10 etc. for direct connection to a 16 track machine.

For further subgrouping during mixdown or for live sound applications, you can route each subgroup to the corresponding (odd-left, even-right) stereo master group. Four line level auxiliary returns with equalization may also be routed to the subgroups or main outputs.

Advanced Features

The "Solo" feature, standard on all SECK Consoles, provides you with yet another method of pinpointing a signal. Often complicated stereo mixes are easily achieved using Seck's 'in-place' feature. And accurate, 13 point LED's, with switchable "peak hold," take the guess work out of finding your optimum signal levels.

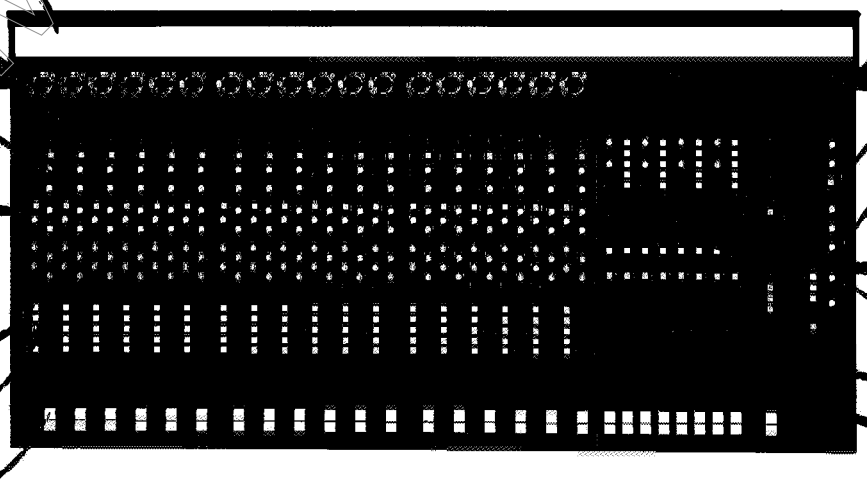
A Most Versatile Mixer

In many recording situations you're both performer and engineer, requiring the mixer to be at the center of operation. Built to the same mechanical design as our live mixers, the SECK 1282 and 1882 offer the same hands-on advantages. With SECK there's an overall sense of precision throughout the line.

First and Foremost

These consoles complement the new generation of multitracks. For eight or sixteen track recording, SECK consoles are versatile enough to make your job easy, yet are rugged enough to take on the road. Features, size and rugged construction combine to make the 12 input model 1282 and 18 input model 1882 ideal for the sophisticated home studio and double nicely for sound reinforcement.

MODEL 1882



Mic (+48V phantom) on XLR. Line and insert on stereo jacks.

Input Switch selects mic or line.

Monitor section with 3 AUXs. May be switched to channel path.

1 pre, 2 post fader AUXs. May be switched to monitor or channel.

Three band EQ with wide mid sweep.

Push button routing to main stereo or 8 subgroups.

Solo switch.

Stereo bargraph meter.

Master AUX output controls with solo.

4 line returns with hi/lo EQ and 8 buss routing.

Talkback to tape, studio and cue.

Main monitor select.

Buss Solo.

Twin headphone jacks with level control.

SECK
MULTITRACK
MIXER SERVICE
MANUAL
1282, 1882

MULTI-TRACK RECORDING – MODELS 1282 & 1882

FREQUENCY RESPONSE	
All outputs routed from Mic or Line	Better than ±1dB, 20Hz-20kHz
SIGNAL TO NOISE RATIO	
Mic input equivalent input noise of 600Ω, max gain	Better than −124dBu (DIN 45 633)
Group outputs, all inputs at unity gain	Better than −80dB (ref. +4dBu)
Master outputs, all inputs at unity gain	Better than −80dB (ref. +4dBu)
C.M.R.R.	
Mic input common mode rejection ratio, 1kHz signal	60dB typical at max gain
DISTORTION	
Mic input (set to −30dBu) subgrouped to master outputs	0.0085% T.H.D. at 1kHz; 0.012% at 20kHz
Intermodulation, mic to masters	0.0012% (SMPTE, 60Hz-7kHz)
INPUT IMPEDANCE	
Mic, balanced (XLR female)	Greater than 1kΩ
Line, balanced (3 pole A-type jack)	50kOhm
Tape, balanced (3 pole A-type jack)	20kOhm
CROSSTALK	
Channel to group, routed, fader down	−88dB at 1kHz; −70dB at 20kHz
Pan attenuation, odd to even groups	−63dB at 1kHz; −62dB at 20kHz
Channel to masters, routed, fader down	−85dB at 1kHz; −67dB at 10kHz
OUTPUT	
Maximum output before clipping (600Ω load on groups masters and monitors, otherwise 2kOhm load or greater)	Greater than +21dBu at 20Hz-20kHz
EQUALIZER	
Low Frequency	±15dB at 45Hz shelving
Mid Frequency	±15dB at 330Hz-6.5kHz, sweep peak/dip
High Frequency	±15dB at 11kHz shelving
METERS	
Twin peak reading 12-element bargraphs scaled −20 to +10dB	Green for levels 0dB or less; Red above 0dB
POWER REQUIREMENT	
US/Japan	110/120 VAC 60Hz
UK/Europe	220/240 VAC 50Hz
DIMENSIONS	
Model 1882, excluding handle	1.89″ x 18.23″ x 39.17″, 37.84 lbs. 48mm x 463mm x 995mm, 17.2 kg
Model 1282, excluding handle	1.89″ x 18.23″ x 30.35″, 29.7 lbs. 48mm x 463mm x 771mm, 13.5 kg
Power Supply Unit	1.89″ x 5.24″ x 6.54″, 3.08 lbs. 48mm x 133mm x 166mm, 1.4 kg
	0dBu corresponds to 0.775V referred to no load (open circuit) conditions

SECK MULTITRACK MIXER SERVICE MANUAL
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SECTION 1

INTRODUCTION TO THE SECK MULTITRACK SERIES CONSOLES

State-of-the-art components and materials have been used in a very elegant way to produce the smallest, lightest and most cost-effective Stereo Sound Mixing Console available.
Excessively complex circuit configurations and awkward assembly techniques have been avoided to enable easy service or maintenance with a minimum of tools.
Custom aluminium extrusions form a rigid, attractive and protective shell. This shell, with the steel front panel, screens the electronics from radio interference and hum.
The versatile input, insert, routing, solo and output facilities of the SECK often make it possible to locate and bypass suspected faults without on-site disassembly.
Low profile, plug-in printed circuit board assemblies provide high reliability with easy access for circuit verification on the service bench.

SERVICE / MAINTENANCE

Absolute beginners will find this service manual a good introduction to the internal workings of a multitrack mixing console but should not attempt to test or repair the SECK without formal technical training or considerable previous experience.
POWER SUPPLY UNIT should be opened and serviced by SENIOR, FULLY QUALIFIED SERVICE ENGINEERS ONLY.

REMEMBER THAT SAFETY ALWAYS TAKES PRIORITY

As with any portable equipment, mains cables and plugs should be inspected regularly for wear and tear.
Mains plug terminal screws and cable clamps should be checked for security every few months, if the system is in constant use.

CARE IN USE

The console is both portable and rugged but some potential hazards should be avoided:

MOISTURE

The power supply unit should be placed in a well-ventilated area, sheltered from water and condensation.
As with any metal object brought in from a cold vehicle or left outdoors in the evening, condensation may form temporarily but should clear if the unit is given a few minutes to temperature-settle.
For regular outdoor, mobile use, a sunshade/umbrella or canopy is recommended.

HEAT

Avoid leaving the console in direct sunlight, near heaters or in vehicles parked in the sun.

DIRT

To prevent a mixture of dust and perspiration etc. finding its way into faders and switches, dust the console with a wide soft brush in directions away from the fader areas.
Sound operating can be a demanding task but try to avoid placing drinks and smoking materials on or near the console. Sticky drinks and cigarette ash will soon clog up faders and switches.

CLEANING

Use a very lightly dampened soft cloth to remove sticky finger marks etc. Smears may then be removed with a soft dry cloth a few minutes later.
Avoid using solvents and polishes as these may eventually remove the protective surface of the console.

FAULT FINDING

Remember that many "faults" occur through operator error rather than through electronic or mechanical failure.
If possible, get the operator to demonstrate the fault or describe the working conditions in detail before investigating further.
Cross-check all input, output and insertion wiring plus the mains supply to rule out external causes.
Before dismantling the console:
1. Try to locate the fault by tracing a signal, from input to output, via the various insertion points, solo's and routing functions, using headphones or a monitor system.
2. Read through all relevant parts of this SERVICE MANUAL.
3. Read through any relevant parts of the OPERATOR'S MANUAL.

TOOLS REQUIRED FOR SERVICE WORK

A good Set of "Watch-makers", Flat-bladed Screwdrivers.
"Phillips" or "Supadrive" screwdrivers - Sizes 0,1 and 2.
Miniature short-bladed "flush" wire cutters.
Miniature "side" wire cutters.
Miniature "bent snipe-nose" pliers.
Miniature "round-nose" pliers.

25W de-soldering iron, de-soldering (recoilless) gun, or de-soldering braid.
45W temperature-controlled soldering iron with selection of tip sizes from 1.6mm to 6.4mm. To avoid damaging static-sensitive components ensure the soldering iron is fully earthed and has a low "earth leakage" of less than 20uA.
22 s.w.g. 60/40 "multi-core" solder.
Accurate "multi-meter" with integral continuity test facility.

NOTE: DO NOT USE SIMPLE BUZZER-TYPE CONTINUITY TESTERS ON THE CONSOLE CIRCUIT BOARDS AS THESE CAN DAMAGE CERTAIN SENSITIVE COMPONENTS.

Audio frequency sine wave generator with integral attenuator. To avoid hum loops this unit should have a balanced output and be fully floating or battery powered.

Audio frequency millivoltmeter - preferably with a balanced input, fully floating or battery powered.

Insulated bench mat for p.c.b. testing.

An oscilloscope will not be required for most fault finding operations, but may be used, driven from the "Output" of the millivoltmeter, if such a facility is available. If the oscilloscope is used directly and not via a millivoltmeter, remember that it is unlikely to have balanced inputs and may not be fully floating. This could lead to confusion when investigating hum problems or checking quasi-balanced outputs.
A variety of X.L.R. leads, jack leads,adapters and test leads terminated with miniature clip-probes will be found useful.

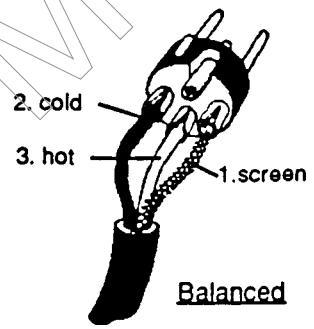
For hum problem solving a variety of "Ground-Lifting" XLR and jack extenders will be invaluable.

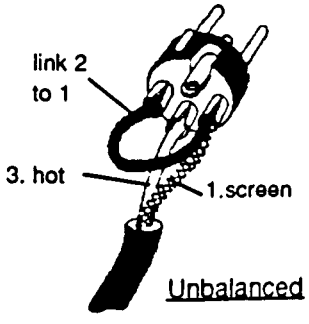
CABLE TYPES
Unbalanced sources may be run via balanced cable with the COLD and SCREEN joined, or via an unbalanced cable through a mono jack plug,which automatically shorts the 3-pole jack socket RING and SLEEVE to unbalance the console input.

Note: Many modern audio/musical instruments have electronically balanced outputs which should not be unbalanced by shorting one leg to screen. Always use the SECK console inputs balanced where feasible and check pin configurations if in doubt.

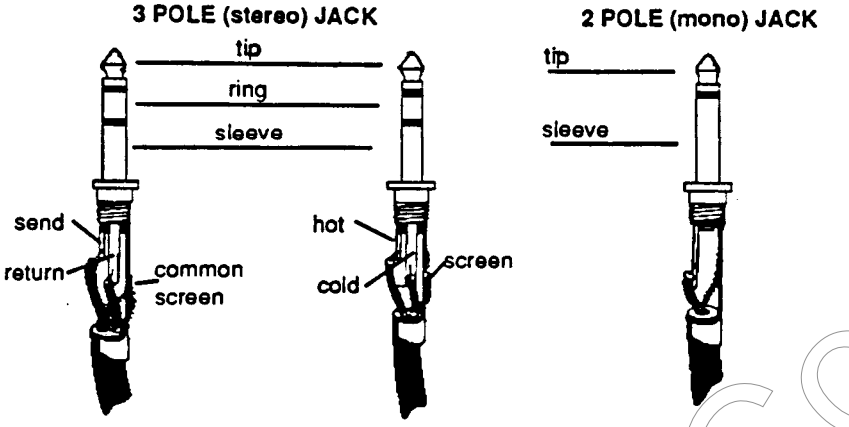
Note that F.B. Aux and Echo Sends, Outputs & Echo Returns are wired unbalanced inside the 1882. i.e. RING and SLEEVE are internally connected. This allows 3-pole or 2-pole jacks to be used without cable modifications.

XLR Mic Inputs:-





JACK Inputs and Insertion Points:-



Insert Point	
TIP	SEND
RING	RETURN
SLEEVE	COMMON

Balanced line input	
TIP	HOT
RING	COLD
SLEEVE	SCREEN

Unbalanced Line in Aux Send/Return.	
RING	SIGNAL
SLEEVE	SCREEN

Note that 3 pole (stereo) jack Tip and Ring pinouts vary with manufacturer - CHECK BEFORE WIRING.

SECTION 2

SECK MULTITRACK MIXER SYSTEM DESCRIPTION

The first part of this section lists all sockets and controls, to be found on the SECK Mixer with a brief functional description. It should be read with reference to the actual console front panel and used as an "aide memoire" when fault locating using the Insert, Solo and Routing facilities.
The second part describes the major signal flow paths and gain structure of the system and should be read with reference to the console block schematics included in this manual.
For detailed circuit descriptions see SECTION 3.

INPUT SECTION FUNCTIONAL DETAILS

MIC Socket - Accepts inputs, balanced or unbalanced, from approx. -58dBV to approx. -8dBV. (Pin 3 HOT)

LINE socket - Accepts inputs, balanced or unbalanced, from approx. -23dBV to approx. +17dBV. (Tip HOT)

TAPE socket - Accepts input of -10dBV from Tape Machine Playback or Sync. (Tip HOT)

INSERT socket - Break-Point in Channel Signal Path. Normally Closed, Switched Jack. (Tip SEND, Ring RETURN)

MIC/LINE switch - When OUT selects MIC input signal, when IN selects LINE input signal.
GAIN control - Varies MIC or LINE sensitivity. Continuously Variable.

MONITOR TAPE/CHAN switch - When OUT routes TAPE signal to Monitor Section, when IN routes MIC or LINE signal to Monitor Section.

MONITOR LEVEL control - Varies level of signal routed to the (STEREO) MONITOR OUTPUT section.

MONITOR ECHO control - Varies level of signal routed to the (STEREO) MONITOR ECHO OUTPUT section.

MONITOR L PAN R control - Varies stereo position of signal routed to MONITOR ECHO OUTPUTS.

FBI control - Varies level of monitor signal routed to the FB1 output. Not affected by mon. level control.

SELECT TAPE/CHAN - When OUT routes MIC or LINE to Channel and routes Pre-Fader (Equalised MIC or LINE) signal to Monitor Section. When IN routes Tape signal to Channel and MIC or LINE signal to Monitor Section.

FB2 control - Varies level of Pre-fader CHANNEL signal routed to the FB2 OUTPUT.

AUX 1 control - Varies level of Post-fader CHANNEL signal route to AUX SEND 1 OUTPUT.

AUX 2 control - Varies level of post-fader CHANNEL signal routed to AUX SEND 2 OUTPUT.

H.F. CUT/BOOST control - Varies amount of TREBLE boost or cut. Flat in (detented) central position.

MID SWEEP control - Varies the freqency at which the MID/CUT BOOST control is most effective.

MID CUT/BOOST control - Varies amount of MID frequency boost or cut. Flat in (detented) central position.

L.F. CUT/BOOST control - Varies amount of BASS boost or cut. Flat in (detented) central position.

CHANNEL L PAN R - Varies stereo position of Channel signal routed to odd (Left) and even (Right) stereo GROUP pairs and to STEREO MASTER OUTPUTS.

SOLO switch - Routes post-pan, pre-fader signal to (STEREO) MONITOR OUTPUTS,, HEADPHONES AND METERS.
L - R switch - Routes post-pan, post-fader signal to STEREO MASTER OUTPUT Section.
1 - 2 switch - Routes post-pan, post-fader, signal to GROUP 1 (left) and GROUP 2 (right).
3 - 4 switch - Routes post-pan, post-fader signal to GROUP 3 (left) and GROUP 4 (right).
5 - 6 switch - Routes post-pan, post-fader signal to GROUP 5 (left) and GROUP 6 (right).

7 - 8 switch - Routes post-pan, post-fader signal to GROUP 7 (left) and GROUP 8 (right).

CHANNEL FADER - Varies ROUTING LEVEL to groups and master outputs.

GROUP AND TRACK OUTPUT SECTION FUNCTIONAL DETAILS

GROUP INSERT socket - Break Point in GROUP signal path. Normally closed, switched jack (Tip SEND, Ring RETURN)

TRACK OUTPUT socket - Provides output of +4dBu (unbalanced) for Multitract Tape Recorder Inputs (Tip HOT)

MASTER OUTPUT socket - Provides output of +4dBu (unbalanced) for two track tape recorder inputs etc. (Tip HOT)

GROUP TO MASTER switch - Routes post-fader GROUP signal to MASTER output section. (ODD GROUPS to LEFT) (EVEN GROUPS to RIGHT)

TRACK SELECT LO/HI switch - Routes post-fader GROUP signal to a choice of two of the sixteen TRACK OUTPUTS - GROUP 1 to TRACKS 1 & 9, 2 to 2 & 10, 3 to 3 & 11 etc.

TRACK SELECT INDICATORS - L.E.D.'s illuminate to show GROUP TO TRACK assignments.

SOLO switch - Routes pre-fader signal to STEREO MONITOR OUTPUTS, HEADPHONES and METERS. (ODD GROUPS to LEFT, EVEN GROUPS to RIGHT)

GROUP FADER - Varies ROUTING LEVEL to TRACK OUTPUTS and MASTER OUTPUTS.

STEREO MASTER FADER - Varies LEFT and RIGHT MASTER OUTPUT levels.

TALK BACK SECTION

TALK BACK MICROPHONE - Enables voice communications (via FOLD BACK system) or cueing (on TAPE)

TALK BACK LEVEL control - Varies TALK BACK MICROPHONE section sensitivity.

TAPE switch - Routes TALK BACK MIC signal via GROUPS to selected TRACK or MASTER OUTPUTS. Not affected by GROUP FADERS.

FB switch - Routes TALK BACK MIC signal to FOLDBACK outputs.

SLATE switch - Routes low frequency tone (30hz) to TRACK OUTPUTS. Tone audible during fast forward or rewind for off-tape cueing.

METER SECTION

BAR GRAPH indicator - Illuminates GREEN L.E.D.'s up to O.V.U., RED L.E.D.'s +1VU and above.

PEAK HOLD switch - Stores maximum signal level indications for a short time. Stops operator missing instantaneous high levels that may have overloaded tape.

SOLO ACTIVE indicator - Illuminates when any SOLO button is pressed to show that the normal MONITOR OUTPUTS, HEADPHONES and METER signals (MASTER L & R) have been overridden by the selected SOLO function.

DIM ACTIVE indicator - Illuminates to show that the MONITOR OUTPUTS have been reduced in level to avoid howl round during TALK BACK operations etc.

AUX SEND SECTION FUNCTIONAL DETAILS

AUX SEND sockets - Provide nominal +4dBu (unbalanced outputs from AUX SND 1 and AUX SEND 2 sections.

FB SEND sockets - Provide nominal +4dBu (unbalanced) outputs from FB1 and FB2 sections.

FB1 control - Varies FB1 output level.

FB1 SOLO switch - Routes FB1 signal to MONITOR OUTPUTS, HEADPHONES and METERS. Not affected by FB1 control.

FB2 control - Varies FB2 output level.

FB2 SOLO switch - Routes FB2 signal to MONITOR OUTPUTS, HEADPHONES and METERS. Not affected by FB2 control.

MIX FB1 + FB2 switch - When IN both FB1 & FB2 outputs are the sum of FB1 & FB2 signals.

AUX 1 control - Varies AUX 1 output level.

AUX 1 SOLO - Routes AUX 1 signal to MONITOR OUTPUTS, HEADPHONES and METERS. Not affected by AUX 1 control.

AUX 2 control - Varies AUX 2 output level

AUX 2 SOLO - Routes AUX 2 signal to MONITOR OUTPUTS, HEADPHONES and METERS. Not affected by AUX 2 control.

MONITOR ECHO (STEREO) control - Varies MONITOR ECHO L & R output levels.

MONITOR ECHO SOLO - Routes (stereo) MONITOR ECHO signal to STEREO MONITOR OUTPUTS, HEADPHONES and METERS.

AUX RETURN SECTION

AUX RETURN socket - Accepts unbalanced inputs of -10dBV from effects units etc. (Tip HOT)

H.F. BOOST/CUT control - Varies amount of TREBLE boost or cut. Flat in (detented) central position.

L.F.BOOST /CUT control - Varies ROUTING LEVEL to Groups and Master Outputs

AUX RETURN LEVEL control - Varies ROUTING LVEL to Groups and Master Outputs.

AUX RETURN L PAN R control- Varies stereo position of Aux Return signal routed to odd (left) and even (right) stereo Group pairs and to Stereo Master Outputs.

L - R switch - Routes post-pan, post-level control signal to Stereo Master Output Section.

1 - 2 switch - Routes post-pan, post-level control signal to Group 1 (left) and Group 2 (right)

3 - 4 switch - Routes post-pan, post-level control signal to Group 3 (left) and Group 4 (right).

5 - 6 switch - Routes post-pan, post-level control signal to Group 5 (left) and Group 6 (right).

7 - 8 switch - Routes post-pan, post-level control signal to Group 7 (left) and Group 8 (right).

SOLO switch - Routes post-pan, pre-level control signal to STEREO MONITOR OUTPUTS, HEADPHONES and METERS.

MONITOR OUTPUT SECTION FUNCTIONAL DETAILS

MONITOR ECHO SEND socket - Provides extra post-monitor pan output of +4dBu (unbalanced) for stereo effects etc. (Tip HOT).

MONITOR ECHO RETURN socket - Accepts input of -10dBV from stereo effects units, echo chambers etc. (Tip HOT).

MONITOR OUTPUT socket - Provides main MONITOR output of +4dBu (unbalanced) to drive monitor amplifier/high quality loudspeaker system.

2 TX INPUT socket - Accepts input of +4dBu from 2 - Track Tape machine. Enables playback of 2 Track mixdown through monitor system.

MONITOR SOURCE CHAN MONS switch - Routes input section monitor signals to stereo monitor output section.

MONITOR SOURCE L-R switch - Routes stereo master signals to stereo monitor output section.

MONITOR SOURCE 2 TX switch - Routes 2 TX input to stereo monitor output section.

MON ECHO TO FB control - Varies level of stereo mon. echo return signal routed to FB section. (left to FB1) (right to FB2)

MON ECHO TO MONS control - Varies level of stereo mon. echo return signal routed to main stereo monitor output section.

MON LEVEL control - Varies main stereo monitor output level. DIM switch - Reduces main stereo monitor output level to avoid howlround during talk-back operations or to enable control room conversation without upsetting level settings.

HEADPHONE OUTPUT SECTION

HEADPHONE VOLUME control - Varies stereo headphone level.

HEADPHONE sockets - Provide 2 watts stereo headphone drive via 1/4 inch stereo jack sockets.

SECK MULTITRACK MIXER SIGNAL FLOW PATH (For detailed circuit descriptions refer to Section 3)

INPUT SECTION - Refer to the top left of the SECK MIXER BLOCK SCHEMATIC.
Signals from the MIC XLR or the LINE JACK are routed to the balanced MIC/LINE amplifier via the MIC/LINE selector switch. The sensitivity of this amplifier is set by the GAIN control.

TAPE JACK signals route dirctly to the balanced TAPE input amplifier. The sensitivity of this amplifier is factory set to -10dBV. External jack attenuators may be used to suit high output machines.

The SELECT tape/chan switch allows either MIC/LINE signals or Tape input signals to be routed via the normally-shorting Insert jack to the channel EQ section and either post-EQ or MIC/LINE signals to be routed to the Monitor function switch. It would normally be used in the MIC/LINE to EQ, post-EQ to Monitor switch mode for recording and in the tape to EQ, MIC/LINE to monitor switch mode for PLAYBACK or MIXDOWN.

The MONITOR tape/chan switch allows either TAPE input or SELECT switch (Post EQ or MIC/LINE) signals to be routed to the FB1, MONITOR and MONITOR ECHO controls. For example, when recording this allows pre and post-tape comparisons to be made with the SELECT switch up. When playing back or preparing for an overdub it allows tape and post-EQ overdub comparisons to be made with the SELECT switch up or Tape and pre-EQ overdub comparisons to be made with the select switch down.

Insert reurn signals are routed directly via the H.F./L.F. and MID EQUALIZER sections to the solo, FB2 and Fader controls.

Note that FB1, Monitor, Monitor Echo, FB2 and Solo levels are all independent of the Fader Setting while AUX 1, AUX 2 and Group Assisnment levels are all Fader controlled.

The CHANNEL PAN control provides post-fader left/right odd/even control, via inverting, gain compensating amplifiers, GROUP ASSIGNMENTS and is ganged to provide simultaneous pre-FADER left/right control for the stereo SOLO function.

OUTPUT SECTION - Refer to lower part of Block Schematic.

Sends

AUX signals from the input channels are summed by virtual earth amplifiers AUX 1 and AUX 2. These summing amplifier outputs are routed, via the AUX SEND level controls to unbalanced inverting line drive amplifiers. These output amplifiers provide drive to the individual AUX SOLO switches and to the AUX 1 and AUX 2 send output jacks.

Note: The virtual earth summing amplifiers are naturally inverting. The inverting line drive stages actually **reinvert** the signals to maintain phase coherence through the AUX system.

MONITOR ECHO signals from the INPUT channel MONITOR PAN controls are summed by virtual earth amplifiers M.E.L. and M.E.R. These summing amplifier outputs are routed, via the ganged STEREO MONITOR ECHO SEND level control to unbalanced inverting line drive amplifiers. These output amplifiers provide drive to the STEREO MONITOR ECHO SOLO switch and to the MONITOR ECHO SEND LEFT and RIGHT output jacks.

Foldback (F.B.) signals from the INPUT channels and MONITOR ECHO RETURN section are summed by virtural earth amplifiers FB1 and FB2. These summing amplifier outputs are routed via the individual F.B. SEND level controls to a MIX 1 and 2 switch. This switch allows either individual FB1 and FB2 signals to be routed directly to the individual unbalanced inverting line dirve amplifiers or a mix of the two signals to be routed to both amplifiers simultaneously. The output amplifiers provide drive to the individual FB1 and FB2 SOLO switches and to the FB1 and FB2 SEND output jacks.

Returns

Unbalanced AUX RETURN 1, 2, 3 or 4 signals route directly from the individual AUX RETURN input jacks via the four AUX RETURN H.F./L.F. EQ sections to four individual AUX RETURN level controls. Each AUX RETURN channel is provided with a pre-level control SOLO facility.

The AUX RETURN level controls are buffered by non inverting gain compensating amplifiers. These amplifiers provide drive to the AUX RETURN PAN controls for post-level left/right odd/even group asignments.

The unbalanced MONITOR ECHO RETURN signals route directly from the L and R MONITOR ECHO RETURN input jacks to parallel drivers MONITOR ECHO RETURN TO MONITOR and MONITOR ECHO RETURN TO F.B. stereo level controls. MONITOR ECHO RETURN LEFT routes via these controls to MONITOR LEFT or F.B.1 and MONITOR ECHO RETURN RIGHT routes via the controls to MONITOR RIGHT or F.B.2.

Monitor, Mix and Output Functions.

MONITOR signals from the INPUT channel MONITOR PAN controls are summed by virtual earth amplifiers MON L and MON R. These summing amplifiers route to the stereo MONITOR SELECT "CHAN. MONS." switch via inverting amplifiers to maintain absolute phase.

[**Note**: MONITOR SELECT is labelled MONITOR SOURCE on the console.]

Unbalanced L and R 2-Track input signals are routed directly to the STEREO MONITOR section via the stereo MONITOR SELECT "2TX" switch.

MASTER OUTPUT L and R signals are routed to the STEREO MONITOR section via the stereo MONITOR SELECT "L-R' switch.

MONITOR SELECT switches "CHAN. MONS.", "2TX" and "L-R" are interlocked, electrically and mechanically, so that only one MONITOR SOURCE is selected at a time.

GROUP ASSIGNMENT signals 1 to 8, from the INPUT channels, are summed by virtual earth MIX amplifiers 1 to 8 (MIX 1 and 2 only shown on BLOCK SCHEMATIC for clarity). These summing amplifiers provide drive, via the normally shorting GROUP INSERT jack, to the individual GROUP SOLO switches and GROUP FADERS.

Post-FADER signals are routed, via non-inverting unbalanced gain compensating amplifiers (1 and 2 only on the BLOCK SCHEMATIC) and the TRACK SELECT switches to the unbalanced TRACK OUTPUT jacks. These amplifiers also provide drive for the individual GROUPS TO MASTERS (STEREO SUBMIX) assignment switches.

Note that the INPUT channel PAN and GROUP ASSIGNMENT functions are left/right, odd/even. To reflect this relationship through the STEREO MONITOR/SOLO facilities the individual GROUP SOLO's route left only for Groups 1, 3, 5 & 7 and right only for Groups 2, 4, 6 & 8. This left/right, odd/even relationship is also maintained for STEREO SUBMIX assignments to the LEFT and RIGHT MASTER OUTPUTS - GROUPS 1, 3, 5 & 7 routing to the LEFT MASTER only and GROUPS 2, 4, 6 & 8 routing to the RIGHT MASTER only.

Virtual earth amplifiers SUB L and SUB R provide a SUB MIX facility for the GROUP TO MASTER assignments before they are mixed with the direct L and R MASTER asignments from the INPUT channels. The inverting nature of these summing amplifiers compliment the INPUT channel inverting PAN buffers and maintain phase coherence between INPUT channel and GROUP assignments to the MASTER L and R section.

LEFT and RIGHT signals from the INPUT channels and from the SUB MIX amplifiers (SUB L and SUB R) are summed by virtual earth amplifiers MIX L and MIX R. These summing amplifier outputs are routed via the STEREO MASTER FADER to non-inverting, gain compensating line amplifiers which provide left and right master signals to the MONITOR SELECT "L-R" switch and unbalanced drive to the LEFT and RIGHT MASTER OUTPUT jacks.

STEREO SOLO signals from the INPUT channels, MONO SOLO signals from AUX RETURNS, MONITOR ECHO SENDS, AUX SENDS and FOLDBACK SENDS plus L-odd/R-even SOLO signals from the GROUP sections are summed by virtual earth amplifiers SOLO L and SOLO R. These summing amplifiers feed STEREO SOLO signals to the internal SOLO RELAY.

When any SOLO button is pressed a SOLO SENSE BUS is driven which activates the SOLO RELAY circuit. This switches any STEREO SOLO signals through to the

STEREO MONITOR OUTPUT, STEREO HEADPHONE OUTPUT and STEREO BARGRAPH METER sections INPLACE of the normally-routed STEREO MONITOR signals from the MONITOR (SOURCE) SELECT switches. A SOLO ACTIVE LED indicates this condition.
STEREO MONITOR or STEREO SOLO signals from the SOLO RELAY route to the STEREO MONITOR level control, the STEREO HEADPHONE level control and to the STEREO BARGRAPH METER circuits.

Stereo signals from the STEREO MONITOR level control route via a relay-activated DIM attenuator circuit to non-inverting, gain compensating line amplifiers which provide unbalanced drive to the LEFT and RIGHT MONITOR OUTPUT jacks. When the DIM button is pressed or a TALK function is used a DIM SENSE BUS is driven which activates the DIM RELAY circuit. This switches a stereo attenuator into the MONITOR OUTPUT signal paths to lower the STEREO MONITOR LOUDSPEAKER level and avoid howlround. A DIM ACTIVE LED indicates this condition.

Stereo signals from the STEREO HEADPHONE level control route directly to power amplifiers L and R. These amplifiers provide drive to the two STEREO HEADPHONE OUTPUT jacks.

POWER SUPPLY AND METER SECTIONS- Details not shown on BLOCK SCHEMATIC. The external POWER UNIT provides +20 Volts unregulated D.C. rails, +15 Volts regulated D.C. rails, +48 Volts PHANTOM and GROUND to the console. The power transformer in the external unit isolates the console supplies from the mains. All rail voltages are refered to GROUND potential.

A POWER ON LED illuminates when power is reaching the console.

STEREO MONITOR or STEREO SOLO signals from the SOLO RELAY circuit are routed to active precision rectifier circuits. Signal-dependant D.C. levels from these rectifiers display drive circuit with a PEAK HOLD facility selected by the PEAK HOLD BUTTON located just below the display window on the console.

Note thqt the STEREO MONITOR, STEREO HEADPHONE and STEREO BARGRAPH sections are driven with common STEREO MONITOR or STEREO SOLO signals determined by the MONITOR and SOLO functions in use.

SECTION 3

SECK MULTITRACK MIXER CIRCUIT DESCRIPTIONS

This section describes all major circuit blocks in detail and should be read with reference to the following circuit drawings:

INPUT CHANNEL sections
.....drawing no. RE 602

GROUP, SUBMIX and MASTER SECTIONS, MONITOR MIX,and MONITOR ECHO SEND and RETURN SECTIONS, AUX and F.B. SEND SECTIONS .....drawing no. RE801(part 1)

SOLO MIX SECTION, MONITOR and HEADPHONE OUTPUT SECTION, METER RECTIFIER SECTION, TALK-BACK SECTION and AUX RETURN SECTIONS
.....drawing no. RE 801(part 2)

METER SCHEMATIC
.....drawing. no. RE201M

POWER SUPPLY SCHEMATIC
.....drawing no. RE 102 P

Many explanations have been simplified for greater clarity but some basic input/output equations have been included to highlight the components that govern important features.

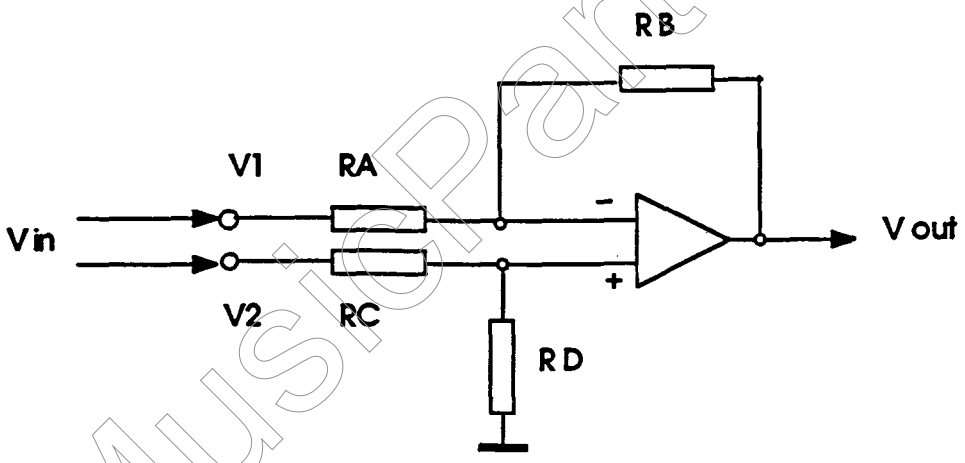
As with any multichannel unit based on operational amplifier circuitry, the descriptions will tend to be a little repetitive if read through from start to finish, but this does allow a section to be used as a reference for fault tracing etc. and is, therefore, desirable.

INPUT CIRCUITS

MIC/LINE STAGE

The balanced (difference) amplifier, formed around one-half 5532 bipolar operational amplifier, handles either MIC or LINE signals depending on the MIC/LINE switch position.

A simplified version of this circuit is shown below:



$$*V_{out} = \left[\frac{RA + RB}{RC + RD}\right] \times V2 \left[\frac{RB}{RA}\right] \times V1$$

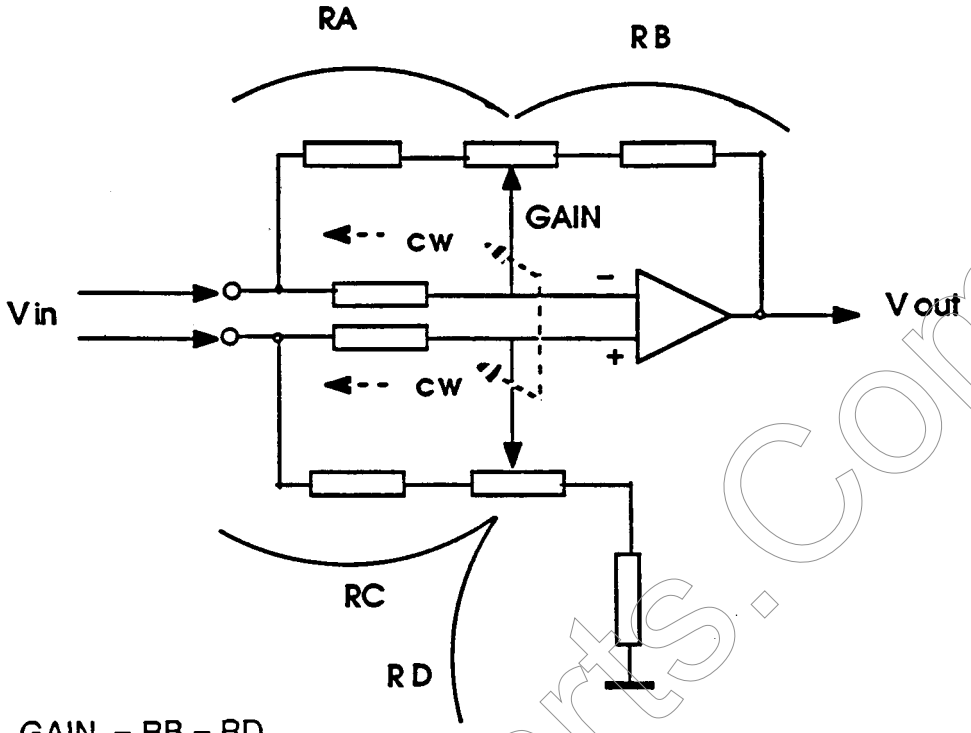
Where RA = RC and RB = RD

the equation simplifies to

$$V_{out} = \frac{RB}{RA} \times V_{in} = \frac{RD}{RC} \times V_{in}$$

***NOTE** that where RA = RC and RB = RD, there is no V out if V1 is equal to, and in-phase with, V2. i.e. COMMON MODE REJECTION occurs.

The actual circuit employed in the Seck replaces parts of RA/RB and RC/RD with the two gangs of the GAIN control and their associated end-stop resistors thus:-



$$GAIN = \frac{RB}{RA} = \frac{RD}{RC}$$

As the GAIN control is moved clockwise RB and RD INCREASE
RA and RC DECREASE

thus the GAIN of the circuit INCREASES.

As the GAIN control is moved counter-clockwise
RB and RD DECREASE
RA and RC INCREASE

thus the Gain of the circuit DECREASES.

Phantom power is applied (to the MIC inputs only) via 1K8 common mode resistors. Any hum or noise on the Phantom supply, is attenuated with a 220R/47uF 50v smoothing network.

Two 47uF 50v capacitors provide MIC input D.C. blocking with 56K "pull down" resistors ensuring a nominal Ov D.C. at the MIC/LINE switch for click-free operation. Two 10uF 16v capacitors provide LINE input D.C. blocking-again with 56K resistors to ensure a nominal Ov D.C. at the MIC/LINE switch.

The 22K/6K8 resistor pad provides balanced LINE input attenuation enabling one balanced input amplifier to be optimised for both MIC and LINE applications.
The input amplifier has an A.C. coupled output, via a 10uF 16v capacitor, with a 22K "pull down" resistor for a nominal Ov D.C. at the INSERT POINT for click-free operation.

CHANGE NOTE. IN EARLIER MODELS THE LINE AND MIC INPUTS WERE D.C. COUPLED (VIA PHANTOM AND ATTENUATOR NETWORKS) TO THE MIC/LINE SWITCH. 47uF 50v CAPACITORS PROVIDED COMMON D.C. BLOCKING, AFTER THE SWITCH, AT THE DIFFERENCE AMPLIFIER INPUT.

EQUALISER CIRCUITS

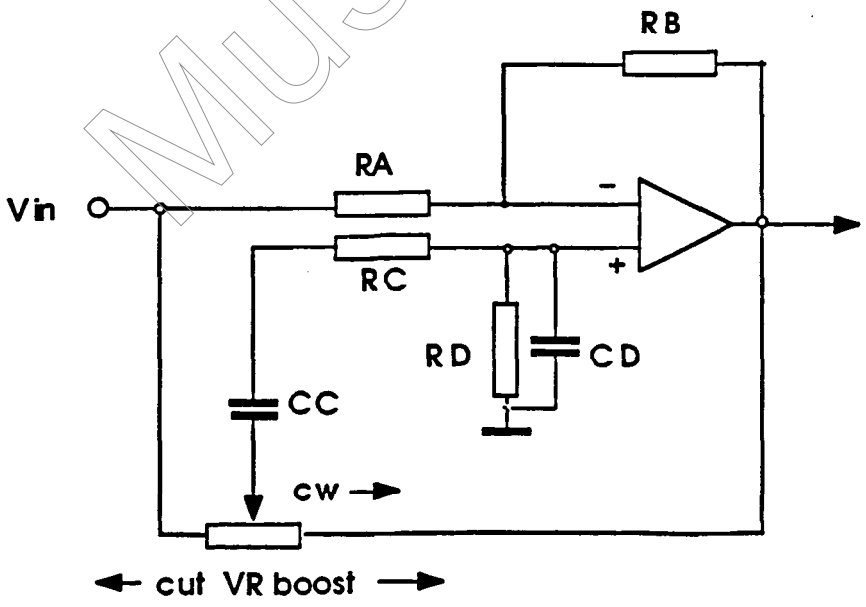
H.F. and L.F. RANGES

A Baxandall type H.F. and L.F. control circuit is formed around one-half 072 bifet operational amplifier.
Its operation may be likened to an inverting "virtual-earth" amplifier with two separate, frequency-dependant input/feedback networks having common input and output points. (For virtual-earth amplifier description see Section 3 page 13)

The H.F. section includes the H.F. control, its two 2n2 "end stop" capacitors and a 15K "summing" resistor.
When the H.F. control is at its central (detent) position, feedback capacitor reactance plus half the control value is equal to the input capacitor reactance plus the other half of the control value, giving unity gain at high frequencies.
If the H.F. control is rotated clockwise the feedback capacitor reactance plus the full control value is much larger than the input capacitor reactance at high frequencies giving a high frequency gain boost.
If the H.F. control is rotated counter-clockwise the feedback capacitor reactance is much lower than the input capacitor reactance plus the full control value at high frequencies and results in high frequency attenuation.
The L.F. section includes the L.F. control, its two 10K end stop resistors and a 39K "summing" resistor.
When the L.F. control is at its central (detent) position, the feedback resistor value plus half the control value is equal to the input resistor value plus the other half of the control value.
The 47nF capacitor is connected between equidistant input and feedback points such that its overall effect on gain is cancelled. The circuit, therefore, gives unity gain at low frequencies.
If the L.F. control is rotated clockwise the feedback resistor value plus the control value in parallel with the 47nF capacitor reactance is much larger than the input resistor value at low frequency to give a low frequency gain boost. (Note that at MID and HIGH frequencies the control value is bypassed by the capacitor leaving the gain, at those frequencies, unaffected by the L.F. control.)
If the L.F. control is rotated counter-clockwise the feedback resistor value is much lower than the input resistor value plus the control value in parallel with the 47nF capacitor reactance at low frequencies and results in low frequency attenuation. (Again at Mid and High frequencies the control value is bypassed by the capacitor leaving the gain, at those frequencies, unaffected by the L.F. control.)
The 47pF capacitor provides compensation against general circuit capacitance to ensure a good stability margin and clean transient response.

MID RANGE

A Wien-bridge type MID control circuit is formed around one-half 072 bifet operational amplifier.
A simplified version of this circuit is shown below:-



Ignoring CC, RC, RD and VR the circuit simplifies to an inverting amplifier where

gain = RB divided by RA.

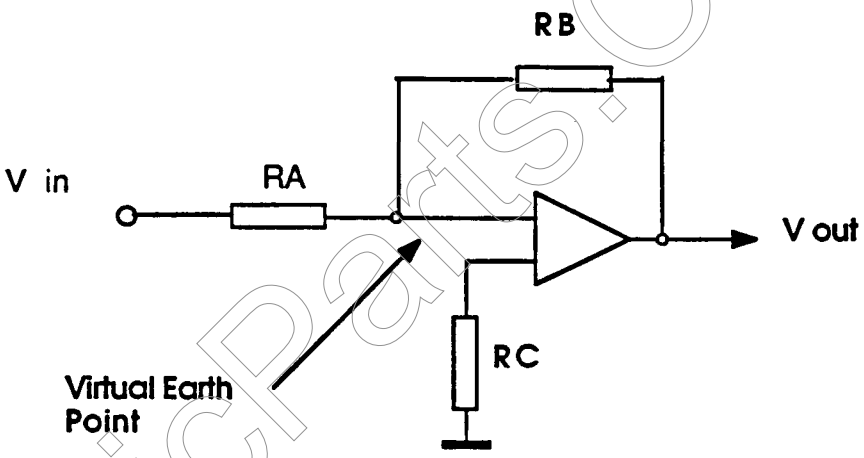
RA = RB in the actual circuit so the nominal gain is unity.

The networks CC, RC, and CD, RD cause a phase shifted version of the signal present on VR wiper to be passed to the operational amplifier non-inverting (+) input. At one frequency (determined by the values of CC,RC and CD,RD) this phase shift is 0 degrees allowing the circuit to operate as a difference amplifier.

When the control wiper is in the central (detent) position, equal and opposite signals (from the circuit input and inverted output) cancel resulting in no signal feed to the operational amplifier non-inverting (+) input, and a nominal unity gain at all audio frequencies.
If the control is rotated clockwise the non-inverting signal at a particular frequency is out of phase with the main signal input and the difference is at a maximum causing gain boost at that frequency.
If the control is rotated counter-clockwise the non-inverting signal at a particular frequency is in phase with the main signal input and the difference is at a minimum causing attenuation at that frequency.
In the actual SECK circuit RC and RD are made variable enabling a range of MID frequencies to be obtained. The 4K7 end-stop resistors set the high frequency limit with the control value plus its end-stop resistor setting the low frequency limit.
Note that the inverted output from the H.F. and L.F. circuit is "re-inverted" by the MID circuit so that the nominal overall equaliser output is in phase with signal input.

VIRTUAL EARTH AMPLIFIER

This operational amplifier configuration is used, in the SECK, wherever signal inversion or a summing function is required.
The general form is shown below:

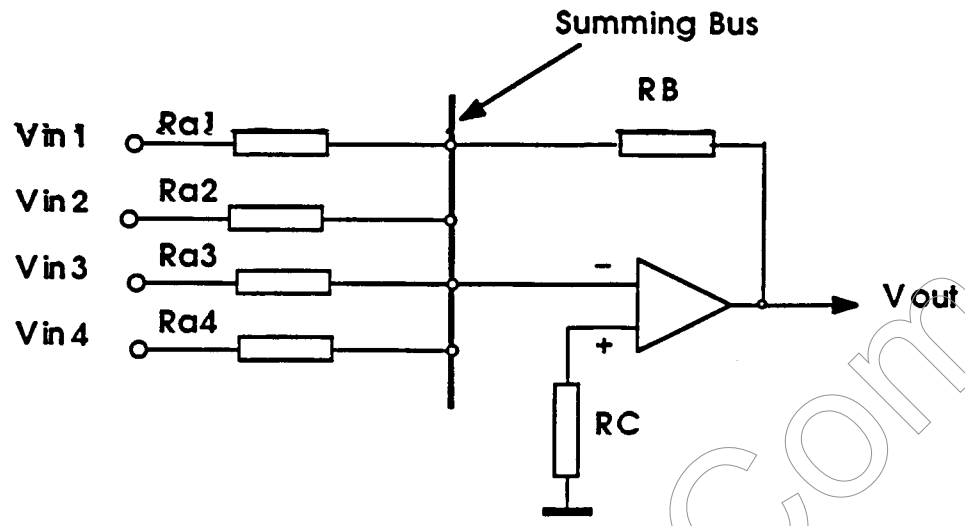


$$V_{out} = \frac{RB}{RA} \times V_{in}.$$

The output is out of phase with the input.

If the operational amplifier is assumed to have very high open loop gain and negligible loading effects then the output will tend to produce an inverted version of the input signal such that signal currents flowing through RB and RA will be equal and opposite keeping the operational amplifier inverting (-) input at the same potential as the non-inverting input, i.e. at Earth potential. The inverting input thus becomes a "Virtual Earth" point.

Several RA's may be driven from different V IN's thus:-



$$V_{out} = \left[\frac{RB}{RA1} \times V_{in}\,1\right] + \left[\frac{RB}{RA2} \times V_{in}\,2\right] + \left[\frac{RB}{RA3} \times V_{in}\,3\right] = \left[\frac{RB}{RA4} \times V_{in}\,4\right]$$

The output is the sum of all the input signals each having gain equal to RB divided by its RA value.

Because the inverting input is at virtual earth — potential the load (impedance) "seen" by each VIN is equal to the value of its own RA and is not affected by other input RA's.

Where bipolar (traditional transistor) operational amplifiers are used a slight d.c offset develops at the inverting input which is the product of the operational amplifiers input transistor base current flowing through the input resistors. This may be compensated for, to a certain extent, by including a resistor (RC) in series with the non-inverting input such that a similar offset voltage develops there, to cancel the original effect.

INVERTING ROUTING DRIVERS.

Virtual earth inverting amplifiers are formed around IC 3A & 3B. These operate as described above, their GAIN (from the PAN stage) being:

$\frac{100K}{10K}$ = x10 or 20dB.

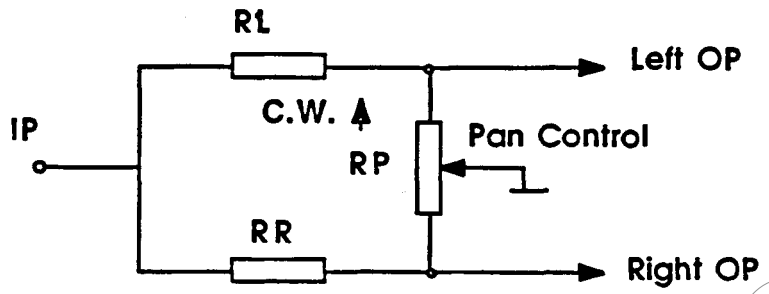
(Note that when routed via the virtual earth inverting summing amplifiers absolute phase is maintained.) The 10pF capacitors compensate for stray input capacitance to ensure good stability and a clean transient response. Outputs are A.C. coupled, via 47uF 16v capacitors, with 22K "pull-down" resistors providing the nominal Ov d.c. output potential to avoid clicks as the routing switches are operated.

TAPE AMPLIFIER

A balanced (difference) amplifier is formed around IC 1A. Its operation is similar to the MIC/LINE stage, but this time with a fixed gain to suit common tape machine output levels. The tape amplifier is A.C. coupled throughout with 10uF 16v capacitors. A 22K resistor sets a nominal Ov D.C. output potential to avoid clicks as the MONITOR switch is operated.

PAN NETWORK

Single potentiometer PAN control networks are used throughout the SECK console.
A differential potential divider is formed thus:-



When the PAN control is rotated clockwise (C.W.) the LEFT O/P is grounded (no output) and the RIGHT O/P is at a maximum level determined by RR and RP.

MAX O/P voltage = RP divided by (RP + RR) x I/P voltage.

When the PAN control is rotated counter-clockwise (C.C.W.) the RIGHT O/P is grounded (no output) and the LEFT O/P is at a maximum.

When the PAN control is centred each O/P is at an intermediate level determined by RL, RR and RP.

CENTRED O/P voltage = one-half RP divided by (RP + RR or RL) x I/P voltage.

In practice RP (MAX O/P) or one-half RP (CENTRED O/P) is effectively paralleled by other level control and/or summing resistor loads so that the nominal network loss is in the order of 10dB. The network is designed to attenuate both L and R outputs by a further 3dB, when centred.
The CHANNEL FADER nominal position loss (10dB) and the CHANNEL PAN control losses (10dB) are fully compensated for by the 20dB gain of the inverting amplifiers (formed around 1C 3A and 3B) that follow the CHANNEL PAN control and drive the left/right, odd/even GROUP ASSIGNMENT switches.

The SOLO PAN control losses (ganged to the CHANNEL PAN) are compensated for by gain in the SOLO section virual earth summing amplifiers.

OUTPUT STAGES [See RE 801 (part 1).]

GROUPS

The GROUP summing stage is a virtual earth amplifier formed around a bipolar transistor operational amplifier as described earlier. Output is A.C. coupled, via a 47uF 16v capitor, with a 22K "pull down" resistor to ensure a nominal O volts d.c. at the GROUP INSERT SEND output.

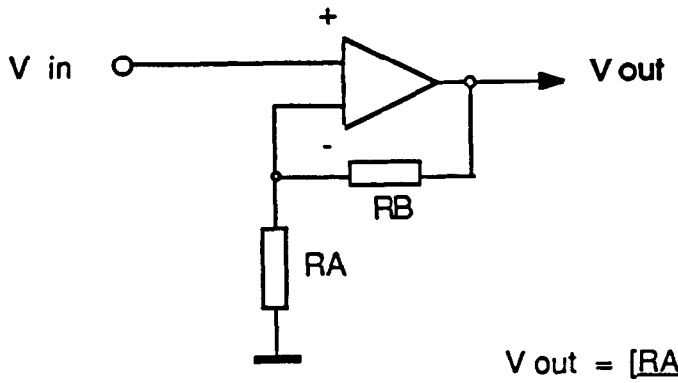
The GROUP INSERT RETURN signal is A.C. coupled to the GROUP FADER via a 10uF 16v capacitor. A 22K resistor keeps the INSERT RETURN at a nominal O volts d.c.

The GROUP FADER is buffered by a non-inverting, gain compensating amplifier. The FADER law is determined by the 5K6 non-inverting-input resistor. Output is A.C. coupled, via a 47uF 16v capacitor with a 22K "pull down" resistor to ensure a nominal O volts d.c. at the SUBMIX ROUTING and TRACK OUTPUTS.

NON INVERTING AMPLIFIER

This operational amplifier configuration is used, in the SECK, wherever a non-inverting, gain compensating or drive amplifier is required.

The general form is:-



$$V_{out} = \frac{[RA + RB]}{RA} \times V_{in}$$

The Output is in phase with the Input.

If the operational amplifier is assumed to have very high open loop gain and negligible loading effects then the output will tend to produce an in-phase, amplified version of the input signal such that the inverting input will be at the same potential as the non-inverting input will be at the same potential as the non-inverting input. It follows that if RA and RB form a potential divider, the output must rise to a higher potential to compensate. The higher the ratio RB:RA, the higher the gain.

SUBMIX STAGE

The SUBMIX summing stage is a virtual earth amplifier formed around a bifet operational amplifier as described earlier. This type of operational amplifier develops negligible offset voltages so no output capacitor is necessary. It is coupled, via a summing resistor, directly to the appropriate (left or right) MASTER MIX bus.

MASTER SECTION

The MASTER summing stage is a virtual earth amplifier formed around a bipolar transistor operational amplifier. It is A.C. coupled to the MASTER FADER, via a 10uF 16v capacitor. The MASTER FADER is buffered by a non-inverting, gain compensating amplifier. The FADER law is determind by the 5K6 non-inverting-input resistor. Output is A.C. coupled, via a 47uF 16v capacitor, with a 22k "pull-down" resistor to ensure a nominal 0 volts d.c. at the MASTER OUTPUT and to avoid clicks as the MONITOR SOURCE switch is operated.

AUX, MONITOR ECHO and F.B. SEND SECTIONS

All these sections are similar. Each summing stage is a virtual earth amplifier formed around a bifet operational amplifier, which is directly coupled to a LEVEL control.
The LEVEL control drives an inverting, gain compnsating amplifier (as described earlier in the manual under the "Virtual Earth Amplifier" section). This amplifier output is A.C. coupled via a 10uF 16v capacitor, with a 22K "pull-down" resistor to ensure a nominal 0 volts d.c. at the SEND output and to avoid clicks as the SOLO switch is operated.
Note the F.B. MIX switching arrangement described in SECTION 2. Given similar F.B.1 and 2 signal levels, F.B. level will remain substantially the same as the mix switch is operated.
The MONITOR ECHO SEND SOLO switch is common to both left and right MONITOR ECHO sections and provides a MONO (L&R) SOLO function.

MONITOR SECTION

The MONITOR summing stage is a virtual earth amplifier formed around a bipolar transistor operational amplifier. Output from the amplifier is directly coupled to an inverting, gain compensating amplifier formed around a bifet operational amplifier. Output from this stage is A.C. coupled via a 10uF 16v capacitor, with a 22K "pull-down" resistor ensuring a nominal 0 volts d.c. at the MONITOR SOURCE switch and SOLO RELAY to avoid clicks as they are operated.

The STEREO MONITOR LEVEL control is driven directly from the SOLO RELAY section (to be described later). MONITOR LEVEL control signals are routed to the non-inverting output amplifiers via a DIM attenuator circuit. Each output is A.C. coupled via a 47uF 16v capacitor, with a 22K "pull down" resistor to ensure a nominal 0 volts d.c. at the MONITOR OUTPUTS.

When the DIM RELAY is energised, its contacts change over to insert potential dividers into the MONITOR signal paths, lowering the MONITOR LEFT and RIGHT OUTPUTS by approximately 27dB.

The DIM RELAY control circuit comprises a 24 volt double pole, change-over relay (with a 1K2 series dropping resistor) energised by a ZTX 212 P.N.P transistor. This transistor is normally biased off by a 22K base-to-emitter resistor. When a DIM or TALK button is pressed, a negative potential causes current to flow, via the DIM ACTIVE LED and the transistor base-emitter junction. This turns on the transistor which energises the relay. A 100nF capacitor reduces control transients for quiet operation. The diode, connected across the relay coil, is normally reverse-biased but conducts to clamp the coil reverse potential produced as the magnetic field collapses when the relay is de-energised. This protects the transistor from high voltage damage.

SOLO SECTION

The SOLO summing stage is a virtual earth amplifier formed around a bifet operational amplifier. Output from this summing amplifier is A.C. coupled via a 10uF 16 volt capacitor, with a 22K "pull-down" resistor ensuring a nominal 0 volts d.c. at the SOLO RELAY to avoid clicks as SOLO function is operated.

The SOLO RELAY circuit is similar to the DIM RELAY circuit previously described. When any SOLO button is pressed the relay contacts route the SOLO summing amplifier outputs to the MONITOR OUTPUT and HEADPHONE sections IN PLACE OF the normal MONITOR signals.

HEADPHONE AMPLIFIERS

MONITOR or SOLO signals, from the SOLO RELAY circuit, source the STEREO HEADPHONE VOLUME control. Each control wiper drives a non-inverting HEADPHONE POWER AMPLIFIER comprising a bifett operational amplifier with a high current output buffer stage. Discrete bipolar transistors BC 637 and BC 638 form a complementary (push-pull) emitter follower stage, operating in class A/B mode.

The forward voltages of the two 4001 diodes determine the output transistor base-to-base bias. This bias voltage, minus the two output transistor base-emitter voltages, sets the voltage across the two 4R7 output emitter resistors and, therefore, the quiescent current of the output stage. 100% d.c feedback is applied via the 33K resistor, with the 3K3 resistor and the 10uF 16v capacitor providing A.C gain of (33K + 3K3) divided 3K3 = approx. 21dB. (See earlier "Non-inverting Amplifier" description, earlier in this section.)

The 33pF feedback capacitor provides compensation against general circuit capacitance to ensure a good stability margin and clean transient response. It is connected from the output of the operational amplifier to prevent stability being adversely affected by capacitive loads.
Note that the outputs are direct-coupled. The very low input offset of the bifet type operational amplifier and the 100 percent d.c. feedback ensure a nominal 0 volts d.c. at each output pin. To permit this 0 volts d.c. output potential the output pin of the operational amplifier will tend to rest at about +550mV.

BARGRAPH METERS

MONITOR or SOLO signals, from the SOLO RELAY circuit source the METER section in addition to the MONITOR output and HEADPHONE amplifiers.

Each (L or R) signal is converted to d.c. by an active, precision rectifier circuit formed around a bifet operational amplifier.

Positive-going signals are muted at the inverting input by the virtual earth point formed by heavy feedback through the 4148 diode connected between the operational amplifier output pin and inverting input pin. Negative-going signals are attenuated by the virtual earth amplifier formed by feedback through the other 4148 (output) diode and the 220K resistor. These negative-going input signals are, therefore, inverted. The resulting positive output signal is routed, via the 4148 output diode and the 2K2 output resistor to the 1uF 35 volt tantalum capacitor. When the signal drops the capacitor discharges via the 2K2 and 220K resistors, the 4148 output diode being reverse-biased.

On-time is 2K2 x 1u = 2.2mS
Off-time is (220K + 2K2) x 1u = 222mS
(Refer to RE201M METER SCHEMATIC.)

The IR2E12 is a special dual, 12 segment bargraph display driver circuit. To save current the circuit allows its six outputs to be multiplexed (time-shared) between four areas - top 6 LEDS left, bottom 6 LEDS left, top 6 LEDS right, bottom 6 LEDS right. These four areas are sequentially power via four ZTX 212 PNP transistors switched from the four synchronised switching output pins of the IR2E12.

The PEAK HOLD feature is selected by decoupling pin 12 to ground via the PEAK HOLD button and a 10uF 16v capacitor.

The +5 volts supply for the display system is derived from the +20 volts, unregulated rail via a 220R, 4W resistor with a 5V1, 1.3W shunt zener decoupled by a 100uF 25v capacitor.

TALKBACK (T/B) SECTION

An electret microphone is biased via a 4K7 resistor from the +15 volts rail. Microphone signals are A.C. coupled to the microphone amplifier by a 100nF capacitor.

A non-inverting amplifier is formed around a bifet operational amplifier. (See earlier in this section for "Non-inverting Amplifier" description.) The LEVEL control position determins the TALKBACK gain. When fully clockwise the gain is (47K + 10K + 100R) divided 100R = 55dB. When fully counter-clockwise the gain is (47K + 10K + 100R) divided (10K + 100R) = 15dB.

The 220R output resistor is for passive mixing with the SLATE signal.

Note the extra poles on the TALK switches which provide the -15 volts required to activate the DIM RELAY control circuit whenever a TALK function is used.

SLATE OSCILLATOR

When the SLATE button is pressed, -15 volts is switched to the DIM RELAY control circuit and to the base resistor of a ZTX 212 P.N.P. transistor, biasing it on and "grounding" the 100K resistor. This forms a 3.3dB non-inverting amplifier stage around a bifet operational amplifier. At a particular frequency, near 0° phase shift will occur between the operational amplifier output pin and its non-inverting input pin, resulting in positive feedback and oscillation. This oscilation is prevented from building-up to rail-to-rail clipping level by the two 4148 diodes in parallel with the 47K feedback resistor.

These diodes start to conduct, lowering the feedback impedance and therefore the gain, as soon as the output voltage swing approaches their forward conducting thresholds. The frequency of oscillation is determined by the 180K resistors, the 100nF capacitor and the 10nF capacitor.

SLATE OSCILLATOR signals are passively mixed with the TALKBACK MIC signal via the 2K2 output resistor.
Note the single 4148 diode in the -15 volts switching circuit. This allows the SLATE button to access the DIM RELAY control circuit but prevents TALK function DIM control signals from activating the SLATE oscillator.

AUX RETURNS

The unbalanced AUX RETURN input is A.C. coupled, via a 10uF 16v capacitor, to the AUX RETURN H.F./L.F. EQUALISER circuit. A 22K input resistor keeps the input end of the input coupling capacitor at a nominal 0 volts d.c. to avoid clicks as AUX sources are plugged in. A

Baxandall control circuit is formed around a bifet operational amplifier. Its operation is identical to that used in the INPUT CHANNEL EQUALISERS - see "EQUALISER CIRCUITS - H.F. AND L.F. RANGES" at the beginning of this section of the manual. The H.F. and L.F. equaliser stage is A.C. coupled via a 10uF 16v capacitor, to the AUX RETURN LEVEL control. A non-inverting gain compensating amplifier follows the LEVEL control and provides drive to a PAN and routing system. Note that there are no inverting amplifiers after the PAN control, as the Baxandall circuit has already provided the phase inversion required to ensure phase coherence after the re-inverting virtual earth summing stages of the GROUP and MASTER output sections. The AUX RETURN SOLO function is actually out of phase with that of the INPUT CHANNELS but this should be of little prctical consequence as the majority of effects units will be non-phase-coherent anyway.

SECK UNIVERSAL POWER SUPPLY UNIT.
A flying mains cable carries LIVE, NEUTRAL and EARTH to the POWER UNIT. The LIVE mains input leg is routed via the MAINS fuse. The step-down and isolating transformer has a multitap primary and three low voltage secondaries.
The SECK UNIVERSAL POWER UNIT may be connected to 100, 120, 220 or 240 MAINS supply voltages. The correct tapping is selected by a rear panel VOLTAGE SELECTOR, it is important that this selector be set to the correct MAINS SUPPLY VOLTAGE.

A 2 amp Quick Blow fuse is placed in series with the MAINS live leg (L).
The correct fuse rating is:-

MAINS. 2A QUICK BLOW

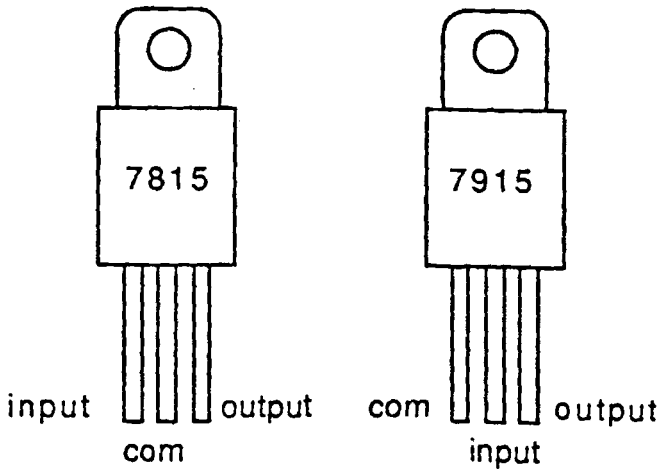
A 2A Quick Blow fuse is placed in series with each AC input leg of the main +/- 24Volt rectifier.

Two of the secondary windings are connected in series to provide centre tapped AC supply to the main console rail system and the third provides a single, higher voltage for the +48 Volt Phantom regulator system.

The +/- 15 Volt rails are protected by a crowbar type system using an MC3423 I.C. and a C106D Thyristor. If the voltage across the +/- Volt rails rises above approx. 32 volts the thyristor will operate and short the rails together thus causing the regulators to current limit. Should a regulator fail the low voltage fuses will blow. The button marked TEST allows the engineer to check the operation of the crowbar protection circuit. The button should be pressed continuously for approx. half a second before the circuit operates, this delay ensures that the circuit will not operate on mains interference of short duration.

Phantom Regulator.
Phantom +48Volts DC for microphones is derived from a low current secondary winding of the mains transformer. 40 Volts is full wave rectified before it is smoothed by the 470uf reservoir capacitor to approx. 55Volts DC. This is then stabilised to a nominal 48 Volts DC, which drives the phantom power LED through the phantom switch. This voltage is further filtered by the 330 ohm /47uf combination before being fed to the output connector.

LED Indicators
Positive and negative power is indicated by green and amber LEDS respectively, these are connected across the relevant rail via 1K5 current limit resistors.
Phantom power indication is by a rectangular LED which is integral in the phantom power switch.



SECTION 4

FUNCTIONAL TESTING

The following TEST CHARTS should allow any experienced engineer to verify the basic gain structure of a SECK mixer with the minimum of test equipment.

SECK mixers are designed for LOW NOISE and LOW DISTORTION under normal operating conditions. Noise or distortion problems are often easier to locate audibly (using the SOLO facilities via good quality HEADPHONES). Remember that some noise is present in any system operating at temperatures above absolute zero! It is,therefore, sensible to locate a noise problem by comparison with other channels or sections set for similar operating conditions.

Use an Audio frequency Sine wave generator and an Audio frequency millivoltmeter with appropriate test leads as follows:

TEST LEAD CHART

To Source From	Use Test Lead From Generator Output		To
	Bal'd/Floating	Unbal'd	
Mic Inputs	Hot		Mic XLR Pin3
	Cold		Pin2
	Screen		Pin1
		Hot	Mic XLR Pin3
		Screen	Pins 1&2 (S/C)
Line Inputs	Hot		Line jack Tip
	Cold		Ring
	Screen		Sleeve
		Hot	Line jack Tip
		Screen	Ring & Sleeve S/C
Tape Inputs	Hot		Tape jack Tip
	Cold		Ring
	Screen		Sleeve
		Hot	Tape jack Tip
		Screen	Ring & Sleeve (S/C)

NOTE that Aux Monitor Echo and 2 track Returns are via UNBALANCED jacks and should be sourced as follows. (Some electronically balanced outputs do not operate correctly with Cold and Screen Short Circuited.)

Aux, Monitor, Echo 2-track Returns	**Fully Floating/Transformer**		
	Hot		Return jack Tip
	Cold		Ring & Sleeve
	Screen		Internally (S/C)
	Push Pull Electronic		
	Hot		Return jack Tip
	Cold (Not Used-Leave O/C)		Ring & Sleeve
	Screen		Internally S/C.
		Hot	Tip
		Screen	Ring & Sleeve
			Internally S/C

To Source	Use Test Lead		
	From Generator Output		To
	Bal'd/Floating	Unbal'd	
Insert Returns	Fully Floating/Transformer		
	Hot Cold Screen		Insert jack Ring Both to Sleeve only-Leave Tip for Send
	Push Pull Elect.Bal'd		
	Hot Cold (Not Used-Leave O/C) Screen		Insert jack Ring Sleeve only-Leave Tip for Send.
		Hot Screen	Insert jack Ring Sleeve only-Leave Tip for Send

To Measure	Use Test Lead		
	From	To A.C. Voltmeter	
		Bal'd/Floating	Unbal'd
Insert Sends	Insert jack Tip Ring-Leave for Return. Sleeve	Hot Cold (Leave Screen Unused)	
	Insert Jack Tip Ring-leave for Return Sleeve		Hot Screen
Group, Track & Monitor O/P's Aux, F.B. and Mon Echo Sends	O/P orSend jack Tip Ring & Sleeve S/C	Hot Cold (Leave Screen Unused)	
	Tip Ring & Sleeve S/C		Hot Screen

Note that on most balanced - input test gear, it is O.K. to short circuit the Cold and Screen terminals, but some very old inputs use an input transformer with a centre tap. These do not operate correctly with Cold and Screen joined as half the input primary gets short circuited.

For regular SECK testing afullset of test leads should be made up and indivually labelled for easy identification.

Work through the console, stage by stage, applying the appropriate source level, setting the relevant controls and measuring the various outputs to verify correct operation.

TEST	CONTROL POSITION	SOURCE	SET	MEASURE OR OBSERVE
Input Section				
Mic I/P	Channel on test to list A All others to List B.	Mic XLR - 59dBu (150R source)	GAIN fully C.W.	Approx OdBu 30Hz-15Hz at INSERT SEND jack.
Line I/P	As before but MIC/LINE switch in.	Line jack -25dBu	GAIN fully C.W.	" "
Tape I/P	As before but SELECT TAPE/CH. switch in.	Tape jack -12dBu	----	" "
	(Remove INSERT JACK after test)			
Solo functon	As before but SOLO button in.	Tape jack -12dBu	----	Check that L & R BARGRAPH Columns match with Ch. PAN centred. (SOLO ACTIVE should illuminate)
Equaliser Section				
	Channel on test Select Tape/Ch. Switch in Solo Button in. All others to List B	Tape jack -12dBu	AF. Signal generator for.....	approx -6' reading on Bargraphs
HF Boost	Increase HF to fully CW.			Approx '+7' on BARGRAPHS at 11KHz.
HF Cut	Decrease HF fully CCW			Approx '-20' on BARGRAPHS at 11KHz (may be just off scale)
	(Set HF to Centre after test)			

TEST	CONTROL POSITION	SOURCE	SET	MEASURE OR OBSERVE/BOOST
MID Boost	Increase MID fully C.W. (MID SWEEP should be CENTRAL)			Approx +7 on BARGRAPH at 2KHz.
MID Cut	Decrease MID fully C.C.W.			Approx -20 on BARGRAPH at 2KHz.
	(Set MID to CENTRE after test)			
L.F. Boost	Increase L.F. fully C.W.			Approx +7 on BARGRAPHS at 45Hz
L.F. Cut	Decrease L.F. fully C.C.W.			Approx -20 on BARGRAPHS at 45Hz.
	(Set L.F. to CENTRE after test)			
Now release the SOLO button to prepare for GROUP & TRACK tests.				
Group and Track Sections				
Group Summ. Stage	Group (pair) on test and Ch.1 to List A. All others to List B.	MIC I/P I -57dBu (150R Source)	Ch.1GAIN fully C.W.	Approx OdBu 30Hz - 15KHz at GROUP INSERT SEND jack.
(Remove GROUP INSERT JACK after test)				
LO Track O/P Stage	"	"	"	Approx OdBu 30Hz - 15KHz at corresponding LO TRACK O/P jack
HI Track O/P Stage	"	"	"	Approx OdBu 30Hz - 15KHz at corresponding HI TRACK O/P jack
SUB-MIX AND MASTER OUTPUTS	"	"	"	Approx OdBu 30Hz - 15KHz at OUTPUTS both MASTER OUTPUTjacks.
MASTER O/P's Only.	As before but de-route any GROUPS 1 - 8 on Ch.1 and press L-R.	"	"	Approx OdBu 30Hz - 15KHz at both MASTER OUTPUT jacks.

TEST	CONTROL POSITION	SOURCE	SET	MEASURE OR OBSERVE
Solo/Monitor Output Sections				
SOLO/MONITOR Gain	Ch.1 to List A. and press SOLO All others to List B.	MIC I/P 1 -57dBu (150R Source)	Ch.1 GAIN fully C.W.	Approx +12dBu 30Hz - 15KHz at both MONITOR O/P jacks (SOLO ACTIVE should illuminate BARGRAPH should INDICATE
Headphone Section				
Headphone	As before but with Headphone VOLUME C.W.	"	"	Approx +20dBu (may be clipping) at RING and TIP of both H'PHONE jacks 30Hz - 15KHz.
	(Release Ch.1 SOLO and reduce Headphone volume after test)			
Aux 1, Aux 2 and F.B.2 Sections.				
Aux Send	Ch.1 to List A	MIC I/P -57dBu (150R Source)	CH.1 GAIN fully CW	Approx +5dBu 30Hz-15KHz at both AUX SEND jacks
F.B.2 SEND	"	"	"	Approx +15dBu 30Hz-15KHz at F.B.SEND jack
Monitor, Monitor Echo Send and F.B.1 Sections				
Monitor Summing Stage	Ch.1 to List A but with SELECT TAPE/CH. switch in.	MIC I/P 1 -57dBu (150R Source)	Ch.1 GAIN to fully CW	Approx +13dBu 30Hz-15KHz at both MONITOR OUTPUT jacks
Mon. Echo Send	"	"	"	Approx -4dBu 30Hz-15KHz at both MONITOR ECHO SEND jacks
F.B.1 SEND	"	"	"	Approx. +15dBu 30Hz-15KHz at FB1 Send jack
Aux Return Section				
Aux Return	Aux return on test to list A All others to List B	Aux Rtn jack -15dBu	Aux Rtn LEVEL fully CW	Approx OdBu 30Hz-15KHz at both MASTER OUTPUT jacks
Aux HF Boost	"	"	As before but with Aux H.F. to fully CW	Approx +15dBu at both MASTER OUTPUT jacks at 11KHz
Aux HF Cut	"	"	As before but with Aux H.F to fully CCW	Approx -15dBu at both MASTER OUTPUT jacks at 11KHz
	(Set Aux H.F. to Centre after Test)			

TEST	CONTROL POSITION	SOURCE	SET	MEASURE OR OBSERVE
Aux L.F. Boost	Aux return on test to list A	Aux Rtn Jack -15dBu	As before but with Aux L.F. fully C.W.	Approx +15dBu at both MASTER OUTPUTjacks at 45Hz
Aux L.F.Cut	"	"	As before but with Aux. L.F. Fully C.C.W.	Approx -15dBu at both MASTER OUTPUT jacks at 45Hz
(Set Aux L.F. to centre after test)				
Monitor Echo Return and 2 - Track Inputs.				
Monitor Echo Rtn	All sections to List B	Mon. Echo Rtn jack -24dBu	MON.ECHO-TO-MONS LEVEL fully CW	Approx 0dBu 30Hz to 15KHz at corresponding (L or R) MONITOR OUTPUT jack
2 - Track Inputs	As before but with MON.SOURCE 2-TX switch IN	2 - track Input jack -12dBu	----	Approx 0dBu 30Hz - 15KHz at corresponding (L or R) MONITOR OUTPUT jack.

NOTE. 0dBu corresponds to 0.775 volts rms under no-load conditions
0dBm " to 0.775 volts rms under 600R load conditions
0dBv " to 1.00 volts rms under no load conditions

Therefore +4dBu " to 1.23 volts rms under no-load conditions
-10dBv " to 0.316 volts rms under no-load conditions

INITIAL FRONT PANEL CONTROL POSITIONS FOR FUNCTIONAL TESTS

CONTROL	LIST A	LIST B
Input Sections		
MIC/LINE switch	MIC	LINE
GAIN control	Fully Clockwise	Fully Counter-clockwise
MONITOR TAPE/CHAN switch	OUT	OUT
MONITOR LEVEL control	FULLY CLOCKWISE	FULLY COUNTER CLOCKWISE
MONITOR ECHO control	" "	" "
MONITOR L PAN R control	CENTRE	CENTRE
FB1 control	FULLY CLOCKWISE	FULLY COUNTER CLOCKWISE
SELECT TAPE/CHAN switch	OUT	OUT
FB2 control	FULLY CLOCKWISE	FULLY COUNTER CLOCKWISE
AUX 1 control	" "	" "
AUX 2 control	" "	" "
H.F. Cut/Boost control	Centre	Centre
MID SWEEP control	Centre	Centre
MID Cut/Boost control	Centre	Centre
L.F. Cut/Boost control	Centre	Centre
Channel L PAN R control	Centre	Centre
SOLO switch	OUT	OUT
L-R switch	OUT	OUT
1-2 switch	{ IN for	OUT
3-4 switch	{GROUP on TEST	OUT
5-6 switch	{ OUT for all	OUT
7-8 switch	{ others	OUT
CHANNEL FADER	Set to 'O'	Down

CONTROL	LIST A	LIST B
Monitor Output Section		
MONITOR SOURCE CHAN MON switch	In	In
MONITOR SOURCE L-R switch	Out	Out
MONITOR SOURCE 2-TX switch	Out	Out
MON ECHO TO F.B.control	Fully Clockwise	Fully Counter Clockwise
" " " MONs	" "	" "
MONITOR LEVEL control	Fully Clockwise	Fully Clockwise
DIM switch	Out	Out
HEADPHONE VOLUME control	Fully Counter Clockwise	Fully Counter Clockwise
Aux and F.B. Send Sections		
All AUX & F.B. SOLO switches	Out	Out
Aux Send 1	Fully Clockwise	Fully clockwise
Aux Send 2	" "	" "
F.B. Send 1	" "	" "
F.B. Send 2	" "	" "
Meter Section		
Peak Hold	Out	Out
Talk Back Section		
LEVEL control	Fully Counter Clockwise	Fully Counter Clockwise
TAPE switch	Out	Out
F.B. switch	Out	Out
SLATE switch	Out	Out

CONTROL	LIST A	LIST B
Aux Return Section		
H.F. controls	Centre	Centre
L.F. controls	Centre	Centre
Level controls	Fully Clockwise	Fully Counter Clockwise
L PAN R	Centre	Centre
L-R switch	In	Out
1-2 switch	Out	Out
3-4 switch	Out	Out
5-6 switch	Out	Out
7-8 switch	Out	Out
SOLO switch	Out	Out

SLATE and TALKBACK facilities are best checked functionially via the TRACK OUTPUT and FOLDBACK (F.B) SEND jacks as no external source input exists for a test generator. Ensure that all the TRACK OUTPUTS are approximately the same level and that all the F.B. SENDS are approximately the same level.

Group and Track Output Section

GROUP TO MASTER switch	In	Out
TRACK SELECT LO/HI switch	Out	Out
SOLO switch	Out	Out
GROUP FADER	Set to '0' position	Down
MASTER FADER	Set to '0' position	Set to '0' position

SECTION 5

IN-SITU CONSOLE FAULT DIAGNOSIS

VERIFICATION

As mentioned in Section 1 of this manual, get the operator to demonstrate the fault or describe the working conditions in detail before investigating a fault. This may save time by eliminating possible user error.
Check all input, output and insertion wiring by swopping similar inputs, outputs or effects inserts.
If a particular Channel or Group is suspected, try routing via a different Channel or Group in the same way i.e. verify faults by comparing similar sections on the console.
If necessary, route a signal through the suspected section, stage-by-stage with close reference to the BLOCK SCHEMATIC and Section 2 in general. Pay particular attention to the position of PAN controls and switches.
Make liberal use of the SOLO buttons to confirm the presence and level (indicated on the BARGRAPH METERS) of the required signal.
It is unwise to subject your favourite (and expensive) monitor speakers to the end results of a fault-finding session ! Be cautious - use the BARGRAPH METERS and HEADPHONES as signal monitors where possible. A good ploy is to keep a powerful set of HEADPHONES round your neck with the VOLUME turned to about three-quarters full level. You won't get your ears blasted if you suddenly SOLO an unexpectedly high signal but can easily pull a muff to one ear for low signal detection.

CLICKS AND THUMPS

When a problem has been traced to a particular circuit block,check for d.c. offsets on controls (that may indicate I.C. failures, wiring board shorts,leaking capacitors etc) by operating switches and listening for clicks or fast-sweeping controls and listening for very high control noises or even thumps. Check that the offset has not originated in an earlier stage by routing the earlier stages to other sections and cross checking.

INTERMITTENT SIGNALS

If signal flow is intermittent, varying in level or distorted, operate all the switches, in the signal path, a few times to check that none of them has failed or become contaminated with dirt or drink spillages. Check rotary and fader controls in a similar way. Switches and controls normally have to be replaced if faulty.
Jack sockets may cause intermittent problems if contaminated by dirty jack plugs or a dusty environment. Advise operators to avoid touching their jack plugs with damp or sticky fingers. Jack leads do tend to get dragged across floors and will pick up dirt if suitably primed with finger marks. Remember that clean INSERT jack sockets are essential for signal continuity,even if not in use,as the signal must flow via the normally-shorting contacts.
Turn off the console before cleaning any jack sockets. Use a small bottle brush, lightly moistened with contact cleaning fluid. Do not spray fluid directly into the console via the jack socket holes - it only makes a sticky mess and does not remove the dirt. After cleaning, lightly "polish" the socket contacts with another,clean and dry bottle brush.
If there is no time for bench service work, remember that a fault will normally occur at the most critical point during a session ! It is always advisable to bypass a suspected section by rerouting or repatching with reference to the BLOCK SCHEMATIC and in liaison with the operator. Do not be tempted to dismantle the console for a "quick repair". This will invariably lead to mistakes made under pressure of time, failures and missed sessions.

BENCH DIAGNOSIS

To confirm a fault traced to a particular part of the console, run through any FUNCTIONAL TESTS (Section 4) before dismantling anything. See Section 3 for circuit details.

POWER SUPPLY SECTION

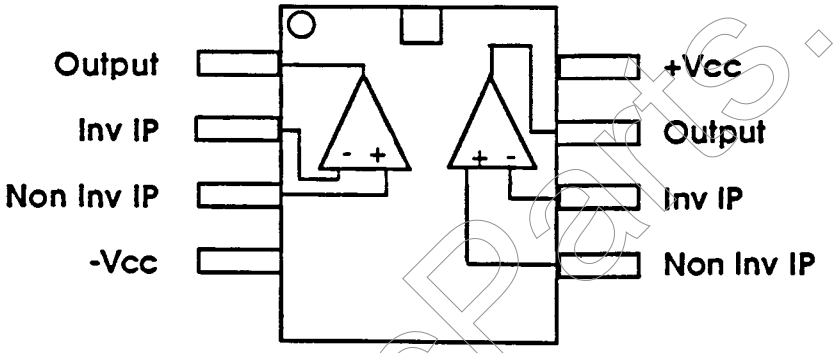
If the external POWER UNIT is suspected, unplug it from the mains supply and the console to check the fuses etc.
Use only the recommended replacements (See parts list at the rear of this manual). Carefully check rail voltages at the console. If one rail is missing do not attempt to power the console as prolonged single rail powering may cause damage to the operational amplifiers or electrolytic coupling capacitors.
Turn off the POWER UNIT each time the console DC POWER plug is removed or reinserted. This will preserve the connector

pins, particularly under fault conditions. See POWER UNIT circuit descrition at the end of Section 3 to verify operation. Check power transformer secondary voltages and the integrity of the bridge rectifiers and reservoir capacitors if any D.C. components or regulators have failed.

COMPONENT CHECKS

If the console is to be dismantled, refer to Section 6 of this manual. Double-check that there is nothing about to short circuit any of the printed wiring boards before powering the disassembled unit.

Integrated Circuit (I.C.) Stages - The dual operational amplifiers used throughout the SECK have the following pinout:-



Most of the circuit configurations are sensitive to capacitive (Test Lead) loads. The operational amplifier output pins should always be probed via a small value (100R) resistor to avoid confusion caused by induced instability.

The 5532 bipolar operational amplifiers will tend to have normal output d.c. offsets ranging from a few millivolts (most circuits) to a few hundred millivolts (Mic/Line stage at full gain). These offsets polarise the electrolytic coupling capacitors used throughout the console. If a similar offset is observed on both sides of a coupling capacitor,check the following stage for possible d.c. faults before changing the capacitor.

The 072 bifet operational amplifiers will tend to have lower output d.c. offsets than the 5532 types (normally 1 or 2 millivolts) when used in audio circuits. These bifet devices have very high input impedances and may be damaged by static discharges if not handled with C.MOS type antistatic procedures.

If any stage is grossly unstable check for broken or desoldered feedback components, damaged wiring board tracks etc. Look at other areas of the console to make sure the instability is not a test anomaly or present,at a very high level,on the power rails. I.C.'s normally fail by latching to one rail or exhibiting excessive noise. Instability should always be investigated at component level before changing I.C.'s.

Do not try to measure the virtual earth busses, directly. Alow impedance or capacitive test probe may cause the relevant summing stage to exhibit high gain or become unstable. It may be useful to note that a direct short cct, between bus and Ov. will tend to cause gross instability.

If a passive component is suspected, turn off the supply, cut one end of the component to break continuity, and solder a known, good component in position to retest that stage.

Integrated circuits will need to be replaced completely if suspected.

REPLACING COMPONENTS.
The wiring boards throughout theSECK are double-sided, through plated. To remove components, always proceed with the utmost care. If possible, cut off the body of the component, on the top side of the board first.

The component legs should be cut close to the board, below the wide (shoulder) section. The remaining legs should be desoldered and sucked away from the underside of the board. Remove any excess solder with a desoldering gun.

--DO NOT ATTEMPT TO REMOVE SOLDER FROM A PLATED HOLE WITH A.P.C.B. DRILL --

Make sure the new component is placed the right way round. Check the rest of the unit for solder splashes and stray component offcuts before reapplying power.

Discrete Transistor and Relay stages - These stages may be most easily tested by operating the front panel buttons,with reference to the circuit descriptions to be found in Section 3. Do not attempt to check the function of a transistor by shorting its base directly to a rail. Always use a 3K3 current limiting resistor.

If a relay drive transistor has failed, change the 4148 relay diode,also,as this may be faulty and is difficult to test in-circuit.
If a relay is suspected it should be changed. Solder the new one as quickly as possible - excessive heat can easily damage a relay.

SECTION 6

DISASSEMBLY/REASSEMBLY DETAILS

Refer to the double-page "exploded" assembly drawing.

All front-panel controls, with their associated electronics, are mounted on a series of multipin,double-sided,through-plated printed wiring boards that are attached to the one-piece steel front panel via the INPUT XLR socket body screws (Detail A) at the rear end and via the FADER body screws at the front.
The supporting chassis comprises two custom-designed aluminium extrusions interlocked at a central chassis joint (Detail C).

Insulated printed wiring board support-pillar strips run the full length fo the chassis extrusions.
Two end-cheeks provide extra overall stiffness and house the bushes for the rear handle assembly.
The front panel/printed wiring board assembly slots into the rear of the chassis (Detail B) and is supported on the insulated pillar strips. Self-tapping screws clamp the complete assembly to the front chassis extrusion and the side-checks.

TO REMOVE FRONT PANEL/BOARD ASSEMBLY FROM THE CHASSIS

Although this assembly can be removed by unscrewing the front and side panel screws only, it will normally be found easier to remove at least the right-hand side-cheek first. To do this:-

1. Remove the handle assembly by unscrewing the knurled clamping knobs completely. Take care of the four P.T.F.E. washers (two each side). Try to avoid pushing the splined handle mounting bushes inside the unit.
2. Remove the front panel screws (at the front and sides),
3. Lift away the side-cheek(s).
4. Lift the front panel/board assembly, at the front, to an angle of about 7 degrees (see bottom of Detail B) and pull the assembly up and out of the rear extrusion. It may be necessary to adjust the angle of pull slightly to avoid the printed wiring board solder-joints fouling the insulating support-pillar strips.

CAUTIONS

Place the front panel/board assembly on a clean,insulated,flat surface to avoid damage to the underside of the printed wiring board and facilitate out-of-chassis testing.
Check that all chassis pillar strip insulation is still firmly in place to prevent severe circuit damage when the unit is reassembled.

TO REMOVE THE BOARD FROM THE FRONT PANEL

1.Set the complete front panel/board assembly on a flat surface with the faders towards you.
2.Remove all FADER knobs (simply pull off).
3.Turn all XLR body screws one-eighth turn counter-clockwise. Use a good quality flat-bladed, "watchmakers" screwdriver only. If the screwdriver is not a good fit do not attempt to use it as the XLR body fittings are easily damaged.
4.Remove all FADER body screws (two per fader) and Pillar securing screws.
5.Lift the front panel away from the board and,when possible,disconnect the HEADPHONE SOCKET lead from the 5-pin,board-mounted plug.
6.Lift the front panel away,completely,leaving the board assemblies on the working surface.
Note that the RE 701 INPUT BOARD(S) and the RE 501 OUTPUT BOARD are linked together via RIBBON CABLE ASSEMBLIES.
The RE 201M DISPLAY CARD fits onto a nylon push-fit pillar and is linked to the RE 501 OUTPUT BOARD via a flying insulation-displacement connector.
If resting on a suitably clean,insulated working surface the complete board assembly may be powered from the external POWER UNIT for signal tracing etc.

CAUTIONS

(i) Do not stand the board assembly on pieces of wire,tools,jack plugs etc. as these will short circuit the board and damage components and/or printed wiring tracks,if the unit is powered.
(ii) The unit will be much more susceptible to hum and interference when out of its chassis. It may be necessary to drop the board assembly into a grounded (insulated) chassis to locate a noise problem free from external interference. Use the flying ground tag from the RE 501 OUTPUT board to ground the chassis.
If required the HEADPHONE jacks may be removed from the front panel and plugged into the board assembly for aural fault-finding.

TO REASSEMBLE THE SYSTEM

Reverse the dismantling procedures remembering to include the following operations:-

1. Re-link the INPUT and OUTPUT boards, carefully,and in the right order.
2. Ensure that the DISPLAY CARD is firmly fitted into position and connected.
3. Clean the front panel DISPLAY WINDOW to remove any finger prints !
4. Ensure that the ground tag is visible, to the right of the RE 501 OUTPUT board, and is not tucked underneath.
5. Connect the HEADPHONE SOCKETS via the 5-pin connector.
6. Make sure all LED's are protruding through the front panel and not squashed or damaged.
7. Check that all XLR body screws are locked one-eighth turn clockwise.
8. Check all front panel-to-board assembly screws.
9. Ensure that no chassis insulating strips have become dislodged.
10. See panel C of the "exploded" assembly drawing to check that front and rear chassis halves are interlocked correctly.
11. See detail B of the assembly drawing to check that the panel and board are located into the rear chassis correctly.
12. Ensure that the board assembly is in the correct position and does not allow printed wiring board component pins to foul the insulated chassis pillar strips.
13. Check that the handle bushes are still attached to the side cheeks.
14. Re-check all screws.
15. Check that the handle is refitted with two P.T.F.E washers per side (see assembly drawing).
16. Replace all FADER knobs.

SECK UNIVERSAL POWER SUPPLY UNIT

To dismantle the unit, remove four screws from the top panel and two screws from the bottom of both sides. This allows the top cover to be removed from the lower chassis.

To dismantle the P.C.B. assy from the lower chassis, remove three screws protruding from the P.C.B. and two screws from the rear heatsink. Unplug CN1, CN2 and CN3, the P.C.B. assy can then be removed by sliding towards the rear section and to the left.

FUSES

For 100v/120v/220v/240v Mains use 2A Quick Blow.

For Low Voltage (D.C.) fuse use 2A Quick Blow.

To reassemble the unit, simply reverse the procedure making sure that no debris, off-cuts etc....have been left inside.

Ensure that all connectors have been replaced correctly and that the mains wiring is correct and safe.

NOTE: THE UNIT SHOULD BE SERVICED BY QUALIFIED SERVICE ENGINEERS ONLY.

PARTS LISTING AND CIRCUIT DRAWINGS.

Issue Date : 23.05.1988

SECK MULTITRACK MIXER HARDWARE PARTS LIST.

DESCRIPTION.	PART CODE
10 x 6 mm Adhesive Foam Strip	ARA25E
25 x 10mm Adhesive Foam Strip	ARA105E
15Way PCB Mounting Connector	CNM5046-15
Grommet Strip	HPGS2
CS10 White Fader Knob	KFCS10
Handle Knob	KH504M
Beige Knob	KPSEKBE
Blue Knob	KPSEKBLU
White Knob	KPSEKWH
Beige Square Switch Cap	KSSBE
White Square Switch Cap	KSSWH
Blue Square Switch Cap	KSSBLU
Stereo Mixer Operators Manual	LSST
M3 Hank Bush	NM3HB
M3 x 6mm Csk Poz B Black Screw	NM3X6CPB
M4 Tap Tite Extrusion Screw	NM4TTCSK
M4 Tap Tite Handle Bracket Screw	NM4TTPAN
M8 Hank Bush	NM8HB
M8 PTFE Handle Bracket Washer	NM8X1.5W
M3 Starred Solder Tag	NTM3S
18-8-2 Ribbon Cable Assy	WM7307-15-BAND
12-8-2 Ribbon Cable Assy	WM7307-15-1282
5 Way Headphone Cable Assy	WM8997-5-BAND
Black Switch Spacer	HPMB16

PART : Y602/5 RE602 6 CHANNEL INPUT SUB ASSEMBLY.

DESCRIPTION.

Capacitors.

10 pF Ceramic .1" pitch	CC110
33 pF Ceramic .1" pitch	CC133
47 pF Ceramic .1" pitch	CC147
680pF Ceramic .1" pitch	CC268
2n2 63V Polyester	CCP322
3n3 63V Polyester	CCP333
6n8 63V Polyester	CCP368
47nF 63V Polyester	CCP447
2.2uF 35V Tantalum	CCT622
10uF 16V Electrolytic Rad	CER710/16
47uF 16V Electrolytic Rad	CER747/16
47uF 63V Electrolytic	CER747/63

Connectors.

Stereo break Jack	CNHJSB
3 Pin PCB Mounting XLR	CNXNC3FDV
15 Way PCB Mounting Connector	CNM5046-15

Semiconductors.

NE5532 Dual Low Noise Op Amp	INE5532P
TL072CP Dual Bifet Op Amp	ITL072CP

Miscellaneous.

RE602 PTH 6ch IP PCB	PCRE602
Single DPCO 2mm push Switch	SUZ12B16
5 way DPCO 2mm push Switch	SUZ51B09
10K A Mono Fader	VFA10KA8MM
8 Pin DIL Low Profile Socket	CNI8

Potentiometers.

10KA	Non	Detented	VRK161B410A
10KB		Detented	VRK161B410BCD
20KB	Non	Detented	VRK161B420B
100KB		Detented	VRK161B510BCD
10KB x 2	Dual	Detented	VRK162410BX2CD
20KA x 2	Dual Non	Detented	VRK162H420X2
100KC x 2	Dual Non	Detented	VRK162H510CX2
500KB x 2	Dual Non	Detented	VRK162H550BX2

Resistors.

10K	1/8W	5%	Resistor	CF	RC05410
22K	1/8W	5%	Resistor	CF	RC05422
10R	1/4W	5%	Resistor	CF	RC15110
150R	1/4W	5%	Resistor	CF	RC15215
220R	1/4W	5%	Resistor	CF	RC15222
680R	1/4W	5%	Resistor	CF	RC15268
2K2	1/4W	5%	Resistor	CF	RC15322
2K7	1/4W	5%	Resistor	CF	RC15327
4K7	1/4W	5%	Resistor	CF	RC15347
6K8	1/4W	5%	Resistor	CF	RC15368
8K2	1/4W	5%	Resistor	CF	RC15382
10K	1/4W	5%	Resistor	CF	RC15410
15K	1/4W	5%	Resistor	CF	RC15415
22K	1/4W	5%	Resistor	CF	RC15422
39K	1/4W	5%	Resistor	CF	RC15439
47K	1/4W	5%	Resistor	CF	RC15447
56K	1/4W	5%	Resistor	CF	RC15456
100K	1/4W	5%	Resistor	CF	RC15510
1K8	1/4W	2%	Resistor	MF	RM12318

PART : Y801 RE801 GP C/P SUB ASSEMBLY

DESCRIPTION		PART CODE
Capacitors.		
33pF	Ceramic .1" pitch	CC133
47pF	Ceramic .1" pitch	CC147
68pF	Ceramic .1" pitch	CC168
2n2	63V Polyester	CCP322
10nF	63V Polyester	CCP410
47nF	63V Polyester	CCP447
0.1uF	63V Polyester	CCP510
1uF	35V Tantalum	CCT610
2.2uF	35V Tantalum	CCT622
10uF	16V Electrolytic	CER710/16
47uF	16V Electrolytic	CER747/16
100uF	25V Electrolytic	CER810/25
Connectors.		
Stereo Jack Socket		CNHJS
Stereo Break Jack Socket		CNHJSB
8 Pin DIL Low Profile Socket		CN18
5 Way PCB Mounting Connector		CNM5046-5
6 Way PCB Mtg Power Input Plug		CNREPSUCH
15 Way PCB Mounting Connector		CNM5046-15
Semiconductors.		
1N4001 1A 50V Diode		D1N4001
1N4148 Fast Signal Diode		D1N4148
2.5 x 7.5 mm Amber LED		DL153AMB
2.5 x 7.5 mm Green LED		DL153GDT
2.5 x 7.5 mm Red LED		DL153IDT
400mW 12 V Zener Diode		DZ0.4/12
400mW 24 V Zener Diode		DZ0.4/24
1.3W 5V1 Zener Diode		DZ1.3/05.1
TL072 Dual Bifet Op Amp		ITL072CP
NE5532 Dual Low Noise Op Amp		INE5532P
BC637 Telefunken 1A NPN Transistor		QBC637
BC638 Telefunken 1A PNP Transistor		QBC638
ZTX 212 General Purpose Transistor		QZTX212

PART : Y801 Cont....

Miscellaneous.

6.3 x 9.5 mm Round Grommet	HGRM
M2 x 20mm Brass Pillar	HP1X20
M3 x 16 Tapped Brass Spacer	HP3X16
M3 x 24 Tapped Brass Spacer	HP3X24
M3 x 10.5 LED Spacer	HPM3X10.5
M3 x 16 Tapped Plastic Spacer	HPM3X16
M3 X 24 Tapped Plastic Spacer	HPM3X24
M2 Star Washer	NM2SW
M2 x 8 Pan Poz Zinc Screw	NM2X8PP
M3 internal Tooth Star Washer	NM3SW
M3 x 8 Pan Poz Plated Screw	NM3X8PP
RE801 PTH Output PCB	PCRE801
Single DPCO 2mm Push Switch	SUZ12B16
3 Way Momentary Swithcbank	SUZ31B14
3 Way Interlinked Switchbank	SUZ31B15
5 Way Latching Switchbank	SUZ51B09
24V DPCO Relay	RYG5A237P
10KA Mono Fader	VFA10KA8MM
10KA Stereo Fader	VFA10KAX28MM
Electret Microphone Capsule	TEQM10LB

Potentiometers.

5KB	Detented	VRK161B350BCD
10KA	Non Detented	VRK161B410A
10KB	Non Detented	VRK161B410B
100KB	Detented	VRK161B510BCD
20KA x 2	Non Detented	VRK162H420X2

Resistors.

100R	1/4W	5%	Resistor	CF	RC15210
150R	1/4W	5%	Resistor	CF	RC15215
220R	1/4W	5%	Resistor	CF	RC15222
1K	1/4W	5%	Resistor	CF	RC15310
1K8	1/4W	5%	Resistor	CF	RC15318
2K2	1/4W	5%	Resistor	CF	RC15322
3K3	1/4W	5%	Resistor	CF	RC15333
4K7	1/4W	2%	Resistor	CF	RC15347
5K6	1/4W	5%	Resistor	CF	RC15356
10K	1/4W	5%	Resistor	CF	RC15410
15K	1/4W	5%	Resistor	CF	RC15415
22K	1/4W	5%	Resistor	CF	RC15422
33K	1/4W	5%	Resistor	CF	RC15433
39K	1/4W	5%	Resistor	CF	RC15439
47K	1/4W	2%	Resistor	CF	RC15447
100K	1/4W	5%	Resistor	CF	RC15510
180K	1/4W	5%	Resistor	CF	RC15518
220K	1/4W	5%	Resistor	CF	RC15522
560K	1/4W	5%	Resistor	CF	RC15556
4R7	1/2W	5%	Resistor	CF	RC25047
22R	1/2W	5%	Resistor	CF	RC25122
1K8	1/2W	5%	Resistor	CF	RC25318
100R	4W	5%	Resistor	WW	RC55210

PART: ZSREGPSU SECK GP REGULATED PSU +48V

DESCRIPTION.		PART CODE.
Capacitors.		
	0.1uF Polyester	CCP510
	1uF 35V Tantalum	CCT610
	10uF 35V Tantalum	CCT710
	10uF 16V Electrolytic Rad	CER710/16
	47uF 50V Electrolytic Rad	CER747/50
	470uF 63V Electrolytic Rad	CER847/63
	2200uF 35V Electrolytic Rad	CER922/35
Semiconductors.		
	1N4001 1A 50V GP Diode	D1N4001
	BR22 2A Bridge	DBR22
	MV5053 5mm Amber LED	DLMV5053A
	MV5053 5mm Green LED	DLMV5053G
	W005 1A Bridge	DW005
	Zener Diode 1.3W 10V	DZ1.3/10
	Zener Diode 1.3W 47V	DZ1.3/47
	MC3423 Overvoltage Detector	IMC3423
	Fairchild +15 V 1A Regulator	IUA7815UC
	Fairchild -15 V 1A Regulator	IUA7915UC
	GE C106D Triac	QC106D
Inductors.		
	Siemens S1222-K 2u2 Inductor	XB78108
Resistors.		
	330R 1/4W 5% Resistor CF	RC15233
	1K 1/4W 5% Resistor CF	RC15310
	1K5 1/4W 5% Resistor CF	RC15315
	2K2 1/4W 5% Resistor CF	RC15322
	4K7 1/4W 5% Resistor CF	RC15347
	8K2 1/4W 5% Resistor CF	RC15382
	10K 1/4W 5% Resistor CF	RC15410
	68K 1/4W 5% Resistor CF	RC15468
	22R 1/2W 5% Resistor CF	RC25122
	470R 1W 5% Resistor CF	RC35247
	680R 1/4W 2% Resistor MF	RM12268
Transformer.		
	XFR 16-0-16 All Volt	X2642/B
Switches.		
	IMO B3F-1050 PCB Tact SW	SB3F1050
	Double Pole Rocker SW	SDP ROCKER
	LED Rocker SW	SLED/ROCK
Miscellaneous.		
	6 Core 16/0.2 Black Cable	W6
	IEC Mains Supply Input Connector	CNIECSKT
	6 Pole DC Cable Socket	CNREPSULN
	3 Way PCB Pin Connector	CNM23913W
	6 Way PCB Pin Connector	CNM23916W
	3 Way Female Connector	CNM7675-C03D
	6 Way Female Connector	CNM7675-D06F
	2A Quick Blow Fuse	F2AQB
	Fuse Clip RS412-784	FCLIP
	"L" Bracket	HLBKT

M3x15 Tapped Spacer	HPM3x15
Regulator Insulating Pad	HREGINS
Black Feet	HSJ5003
Heyco Strain Relief Bush	HSR6W1
Rivets	HTAPK33
Seck PSU Operators Manual	LSPSU
4AB x 0.5"Pan Poz Blk S.T. Screw	N4ABx0.5PPB
M3 Lock Nut	NM3LN
M3 Internal Tooth Star Washer	NM3SW
M3 x 12mm Pan Poz Blk Screw	NM3x5PPB
M3 x 5mm Pan Poz Blk Screw	NM3x5PPB
M4 Spire Nut	NM4SN
M4 x 10mm Pan POx Blk Screw	NM4x10PPB
M5 Lock Nut	NM5LN
M5 Star Washer	NM5SW
M5 x 10mm Pan Poz Blk Screw	NM5x10PPB
M3 Starred Solder Tag	NTM3S
RE103 Bare PCB	PCRE103

PART : Y201 STEREO BARGRAPH SUB ASSEMBLY.

DESCRIPTION.	PART CODE
Capacitors.	
15nF Polyester	CCP415
10uF 35V Tantalum	CCT710
Connector.	
16 Pin DIL Low Profile Socket	CNI16
Display.	
12 Element LED Array	DGL112F13
Hardware.	
3.3mm PC Clip Pillar	HPDLCBS3N
RE201M Issue 2 PTH PCB	PCRE201M
5 Way Ribbon Cable with Connector	WM8997-5-BAND
Semiconductors.	
LED Array Driver	IIR2E12
ZTX 212 General Purpose Transistor	QZTX212
Resistors.	
82R 1/4W 5% Resistor MF	RC15182
3K3 1/4W 5% Resistor MF	RC15333
100K 1/4W 5% Resistor MF	RC15510

M3 screws attach the faders to the top panel (These must be removed before the PCB's and top panel can be separated).

A

Three PCB-mounted pillars run along the rear of the output board. Three screws are then used to attach the top panel.

Each PCB support pillar has an insulating strip attached to it.

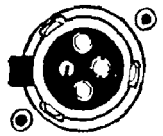
B

The top panel/PCB assembly is attached to the aluminum chassis by nine number 4 self-tapping screws which run along the front and end-cheek flanges.

C

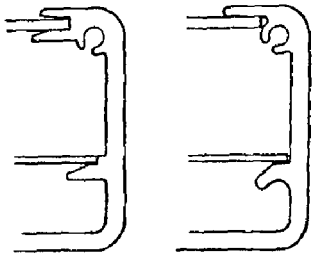
Each end-cheek is attached to the main chassis by five number 8 self tapping screws.

Detail A - XLR's



To release the rear of the PCB from the top panel, insert a small screwdriver into the XLR hole nearest the tab, and turn anti-clockwise. (Repeat for each XLR)

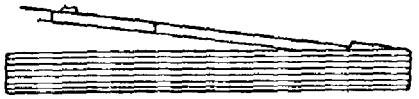
Detail B - Rear chassis extrusion.



Early models | Current models

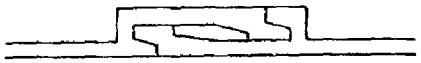
Please note that on earlier models, the top panel was inserted into a groove in the rear chassis.
On later and current models, the top panel sits under a single lip.

Approximately 7°

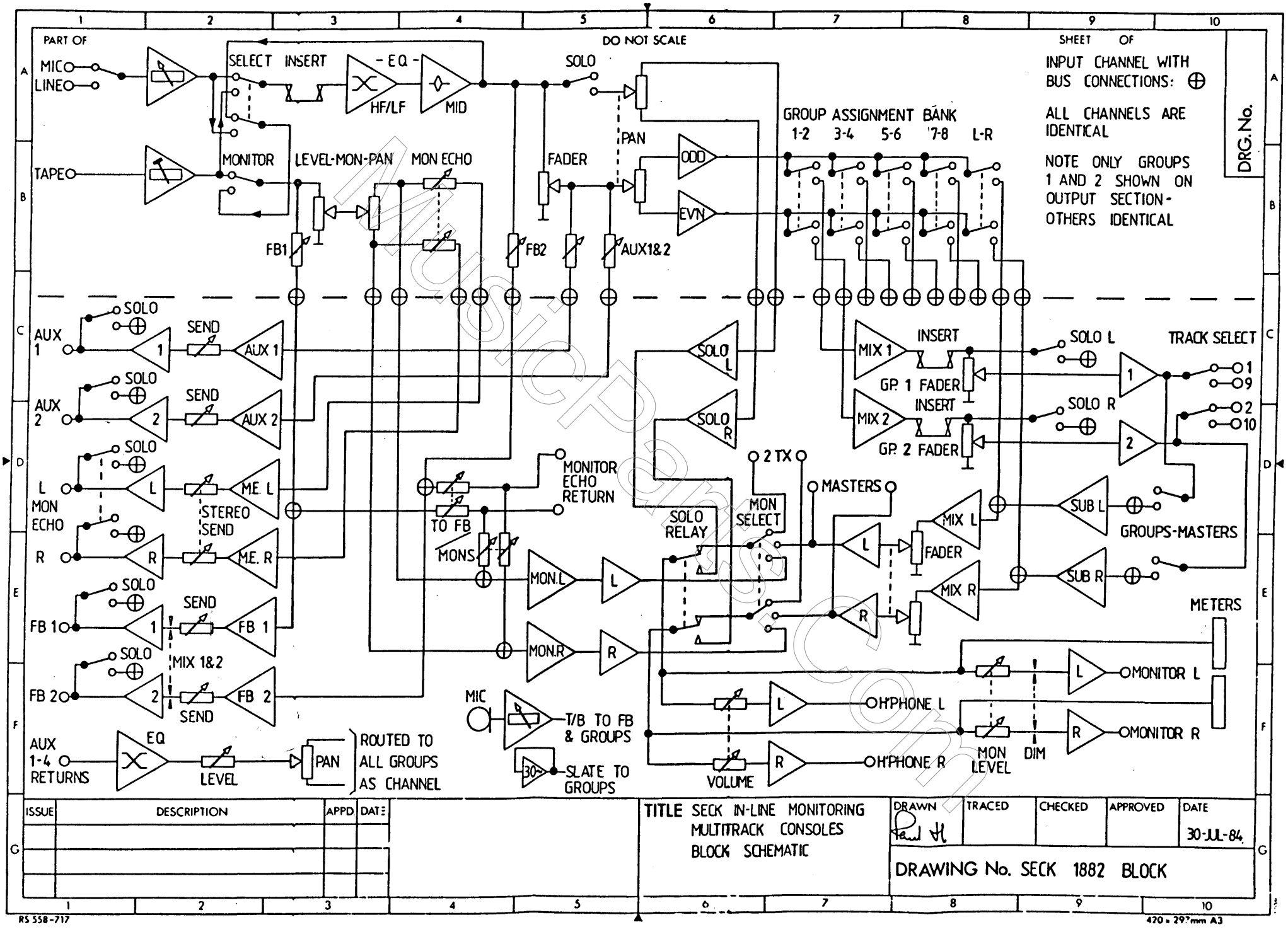


Suggested angle for inserting and removing the top panel/PCB assembly.

Detail C - Central chassis joint.



Note how the two sections interlock to produce a 'hole' for the end-cheek securing screw. This joint allows for some lateral adjustment when assembling the mixer.



ISSUE	DESCRIPTION	APPD	DATE

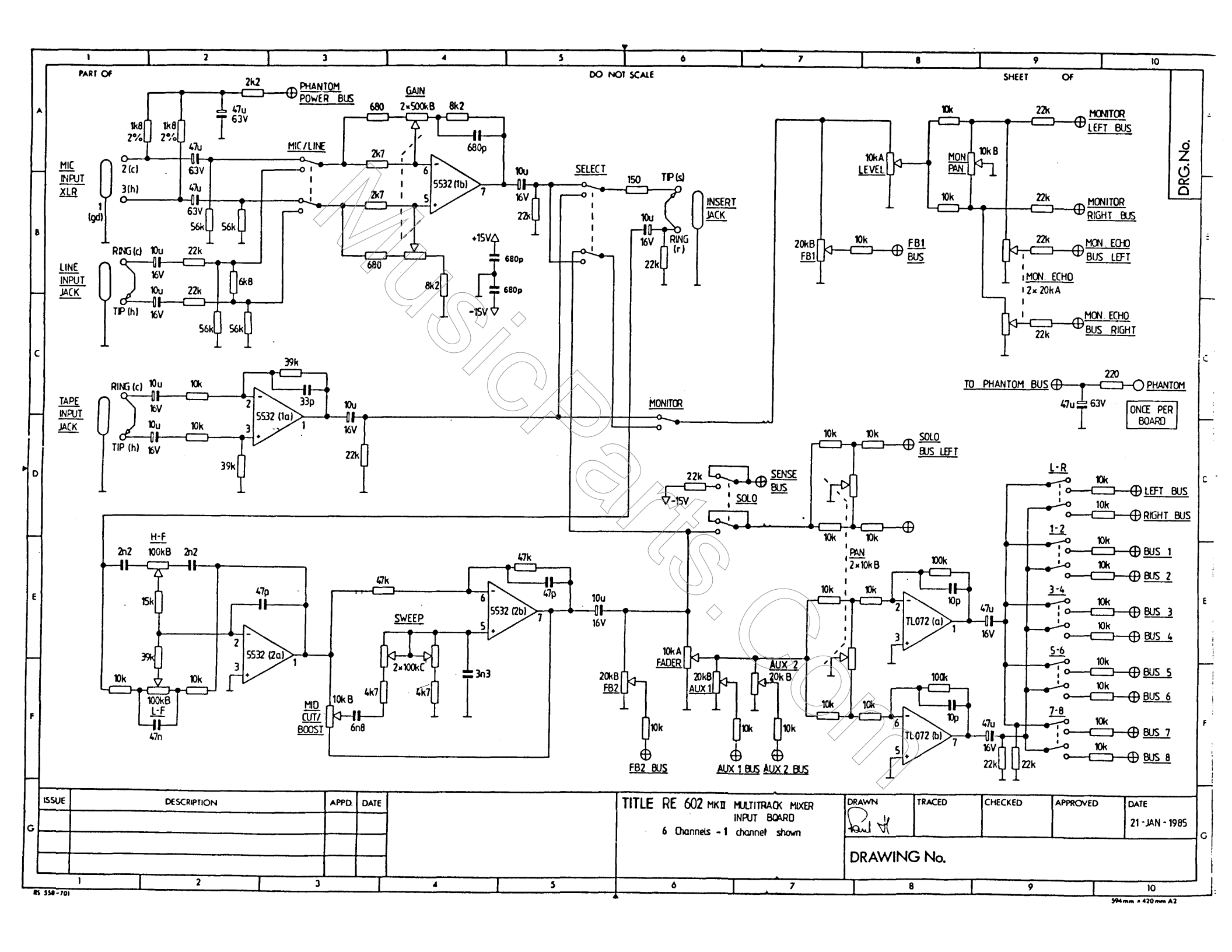
TITLE SECK IN-LINE MONITORING MULTITRACK CONSOLES BLOCK SCHEMATIC

DRAWN	TRACED	CHECKED	APPROVED	DATE
Paul H				30-JUL-84

DRAWING No. SECK 1882 BLOCK

RS 558-717

420 x 297mm A3



ISSUE	DESCRIPTION	APPD.	DATE

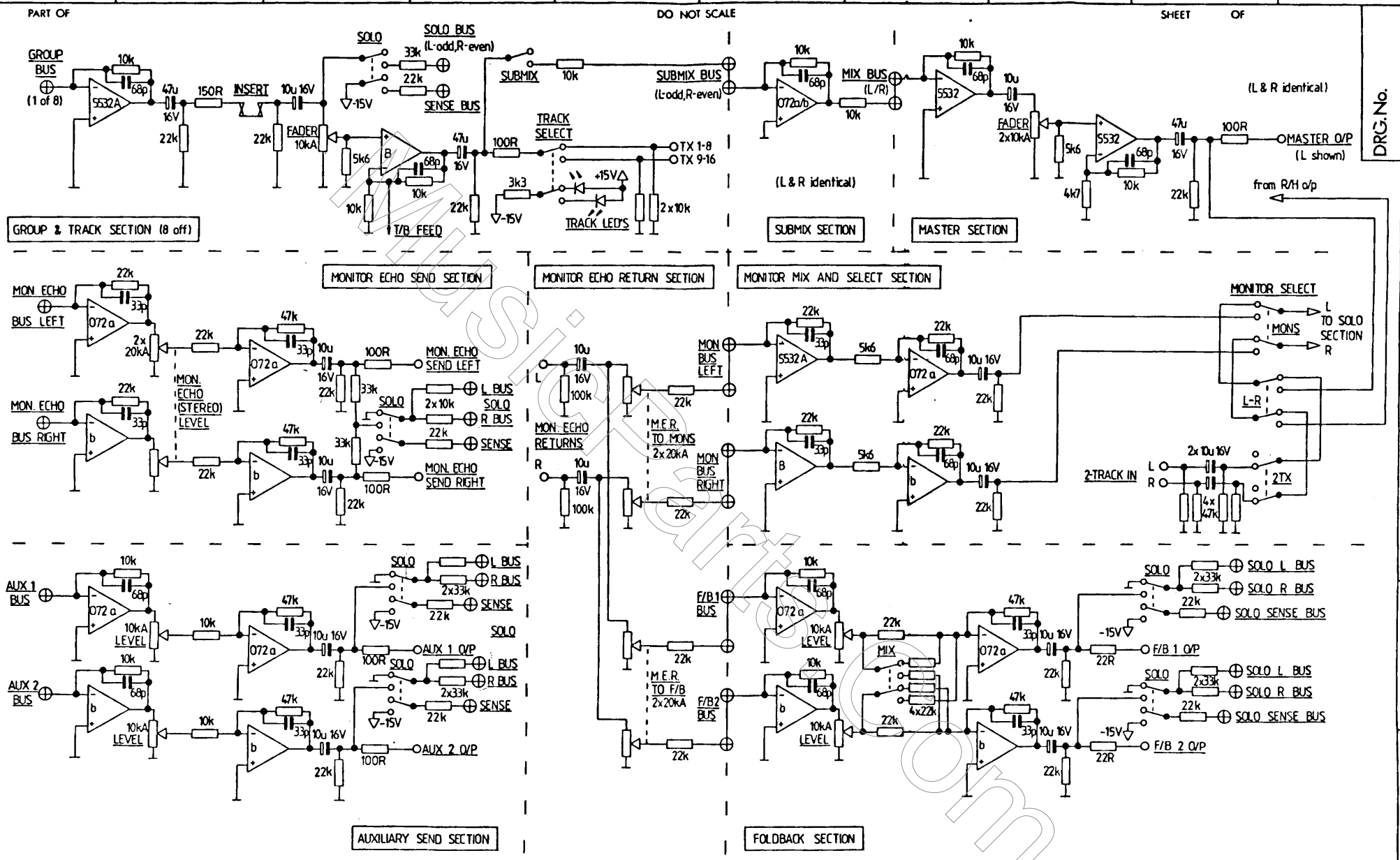
TITLE RE 602 MKII MULTITRACK MIXER
INPUT BOARD
6 Channels - 1 channel shown

DRAWN	TRACED	CHECKED	APPROVED	DATE
				21-JAN-1985

DRAWING No.

BS 558-701

594mm x 420mm A2



ISSUE	DESCRIPTION	APPD.	DATE

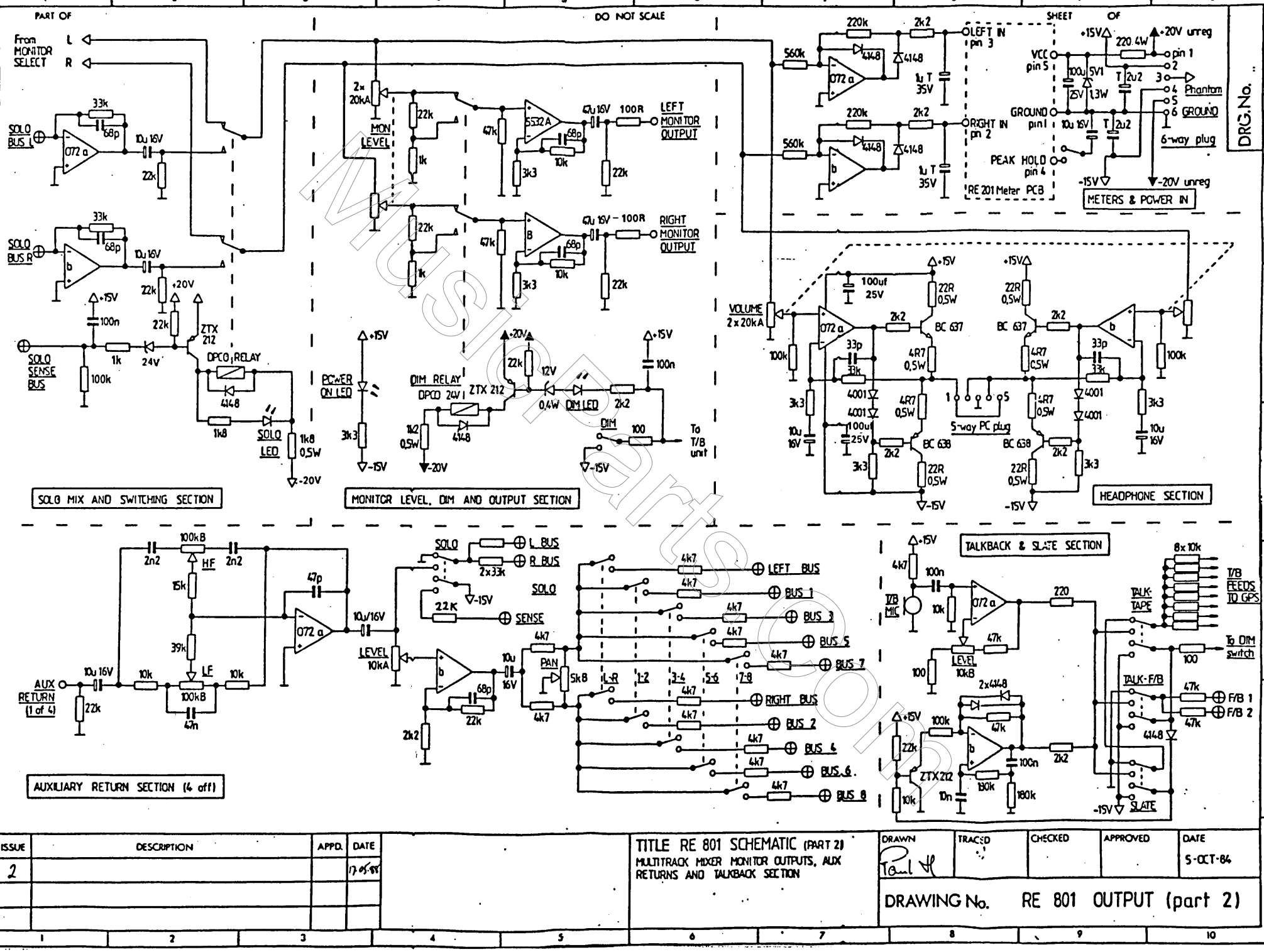
TITLE RE 801 SCHEMATIC (PARTIAL)
MULTITRACK MIXER GROUPS, MASTERS, MONITOR MIX, AUXILIARY SENDS & MON. ECHO SECTIONS

DRAWN	TRACED	CHECKED	APPROVED	DATE
Paul H				26-SEP-84

DRAWING No. · RE 801 OUTPUT (PART 1)

RS 558-701

594mm × 420mm A2



ISSUE	DESCRIPTION	APPD.	DATE
2			17.05.84

TITLE RE 801 SCHEMATIC (PART 2)
MULTITRACK MIXER MONITOR OUTPUTS, AUX RETURNS AND TALKBACK SECTION

DRAWN	TRACED	CHECKED	APPROVED	DATE
Paul H				5-OCT-84

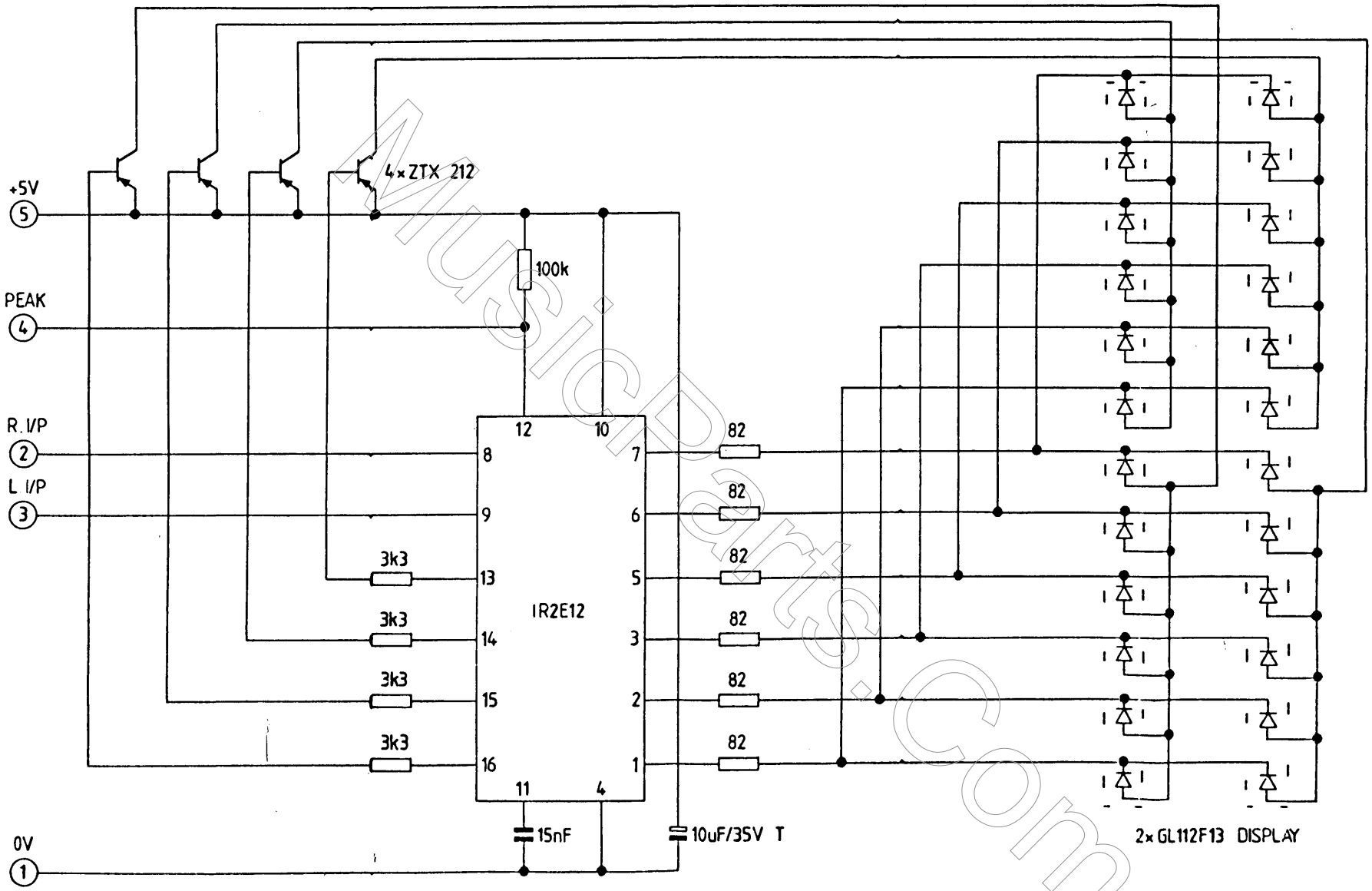
DRAWING No. RE 801 OUTPUT (part 2)

PART OF

DO NOT SCALE

SHEET OF

DRG. No.



ISSUE	DESCRIPTION	APPD.	DATE

BANDIVE Ltd.
Brent View Road
NW9 7EL
01-202-4155

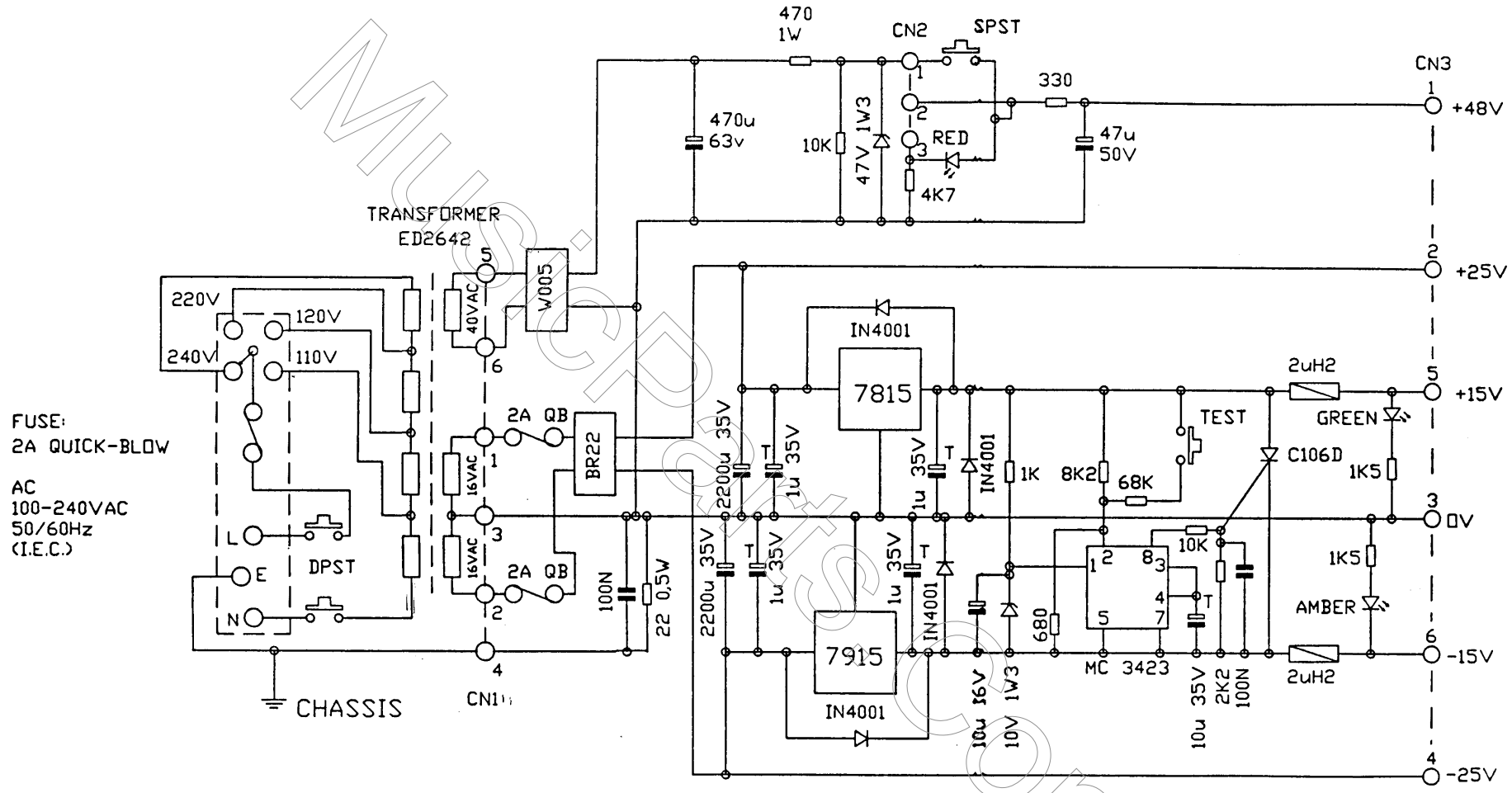
TITLE RE 201M
METER SCHEMATIC

DRAWN	TRACED	CHECKED	APPROVED	DATE
Paul H				20-JUL-84

DRAWING No. RE 201 METER

RS 558-717

420 x 297mm A3



Dimensions in Millimetres Third angle projection	Date: 30-Nov-88	BANDIVE Ltd 01-881-3778	PROJECT: SECK	UNIVERSAL TITLE REGULATED PSU	DRAWING No.