

SYSTEM FORMATS:

F760X-RS stereo rack-mounting unit has a front panel 88mm x 482mm (3½' x 19''). The depth of the unit excluding XLR plugs is 247mm (8½''). A tapped mains transformer provides options for 220-240v or 110-120v AC.

F760X-R Mono rack-mounting unit is identical to the -RS system above.

F760X-N Mono module is 80mm x 190mm with depth of 112mm behind a 2mm thick front panel. Termination is via a 16-way Blue Ribbon P & S. (15mm extra) Power requirements are +24v @ 100mA. Units can be stereo matched (/ST)

Balancing Transformers can only be supplied fitted in rack units (code /T) but in the case of modules can always be mounted to the desk chassis, behind or alongside the module connection skt.

PRODUCT OPTION CODES

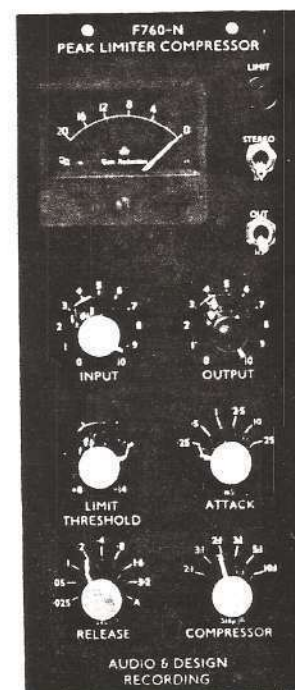
- / - Optional extra
- /T - Balancing transformers fitted to inputs and outputs
- /St - Stereo match modules (e.g -N/St)
- /50u - Limiter pre-emphasis 50µS
- /75u - Limiter pre-emphasis 75µS

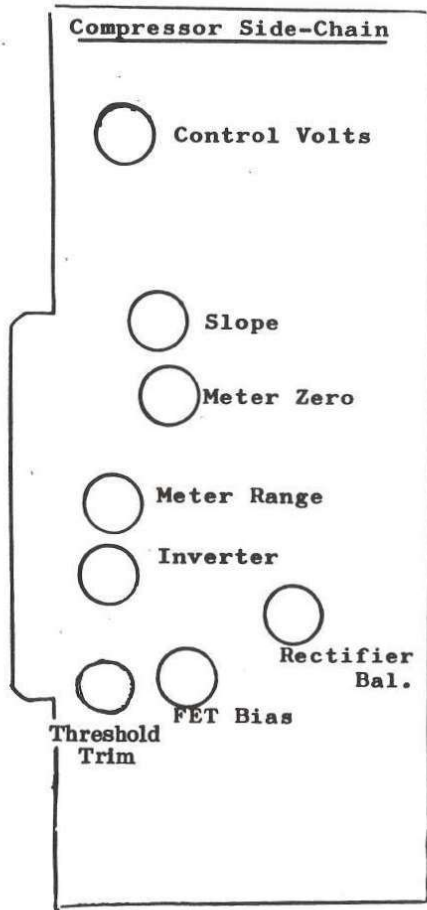
GUARANTEE

Products are guaranteed for one year from date of sale - labour and parts free of charge if returned carriage paid to ourselves or our overseas agents.

F760 COMPRESSOR-LIMITER

Units without the expander section are available in mono and stereo rack-mounting formats as well as the N-module illustrated alongside.





F760-A Pc Board
(Component side)

Mounting into two 16-way
Cinch 0.15 grid sockets.
(sockets placed $\frac{1}{2}$ " apart
with boards placed back
to back)

Overall width as mounted
above is 40mm.

On 'Wiring Schematic' A8
refers to 'A' card socket
pin '8'.
B6 would refer to 'B' board
socket pin '6'. etc

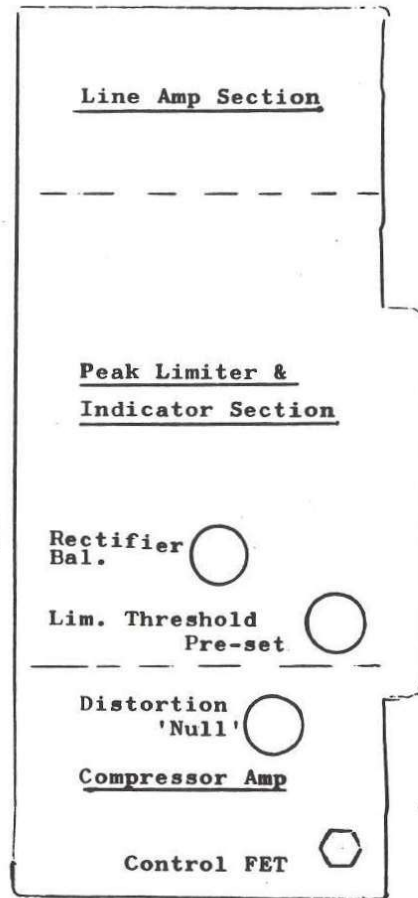
Blue Ribbon 16-way module
plug - connections
as indicated on 'Wiring-Schematic'

F700 Compressor

Connections for F700 unit
is identical except for the
following omissions:

- Peak Limiter Threshold
- Peak Lim. Indicator bulb
- B5 to A14 link unnecessary

There are component changes
on the Compression and Attack
switches.



F760-B Pc Board
(component side)

Bulletin No. 1/p3

In the new rack units the front panel and sub assemblies come away together with the p/c boards. The four chrome panel retaining screws are removed (not the black allen screw to the sub-assemblies) and the panel will lift to lay across the chassis flat with cards vertical ready for adjustment. Prior to doing this the top cover should be removed.

Alternatively top and bottom covers can be removed only and the unit stood on its side thus giving access to both B board (topside) and C and A boards (bottomside).

If only the FET Bias is to be adjusted the bottom cover only need be removed and the C board unplugged.

In the older 5 $\frac{1}{4}$ " stereo chassis an extender board is necessary to make adjustments to any of the boards and it is in this case that care should be taken to switch off the unit before unplugging or re-plugging the A board.

STEREO MATCHING CHECK

Having checked the gain on both channels to be the same (FET Bias); select 20:1 in the compressor Ratio and switch the Threshold to -4 position; ensure the Attack is on 'F' or 'M' (same on both sections).

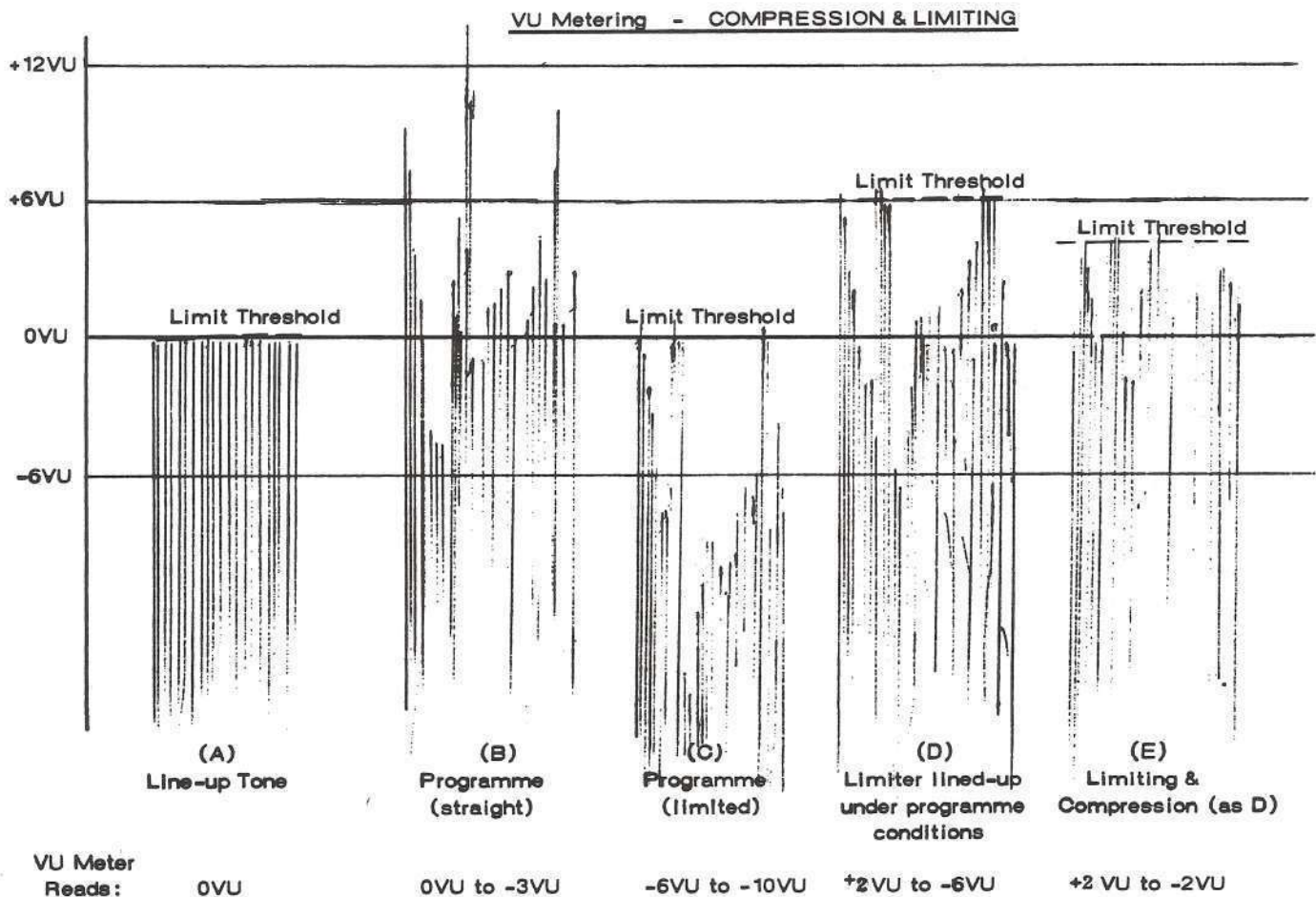
Feed a mono generator source to both channels. If it has its own continuously variable attenuator have the unit stereo input attenuator fully open along with all the others. Increase the generator from below threshold of gain reduction (-24dBm) through about 20dB gain reduction (Input level of -3dBm). As the range of gain reduction is moved through the Stereo-link switch should be periodically switched in and out and the effect observed on the GR meters. There should be negligible effect on the reading of either meter or on either channel output. A tolerance of plus/minus 1dB over the range should be acceptable. Tolerance can be spread by slightly adjusting the Slope pre-set on one of the A boards observing the effect on the meter when the stereo switch is linked in. (i.e. channel 1 moves to the left when stereo link 'in' and output on that channel drops by 2dB. Adjust chan.1 Slope pre-set with stereo link 'out' so that the meter moves to the left by 1dB (very critical on pre-set at this slope) switch in the stereo link and the error is now only 1dB. Check at top and bottom of the range and in the centre. One may have to tolerate plus 1dB at top end and minus 1dB at the bottom. Alternatively it can be adjusted for close accuracy over a smaller range (say 10-15dB) with 2db out at the top end of the GR range.

It is important that if the boards are unplugged in a stereo unit that care is taken to see that they are not mixed up since each board is matched and set-up in relation to the other(s).

In the event of a control FET failing it will be necessary to obtain a new matched pair (though in an emergency its worth trying a few - you may be lucky). When a control FET is changed it is necessary to go through the full setting-up procedure.

COMPRESSION & VU METERING: Many systems monitor channels with VU meters whose response to programme and tones are somewhat different and can be misleading when used with a limiter/compressor. As a general guide it is probably better to adjust the output of the compressor/limiter when operating on programme signal rather than a tone, so that the output reaches 0VU. The attached diagram shows the effect of setting up on a tone so that the system may tend to be unnecessarily undermodulated compared to the normal modulation levels of uncompressed programme; with a consequent loss in improving the system dynamic range capabilities.

If the levels are established by tone it will be found that the VU meter never reaches 0VU under programme conditions; and will only approach it under conditions of considerable compression, coupled with a tight ratio and fast release time. Under normal conditions of compression the level will tend to read -6VU to -4VU. Peaks are of course reaching and being held at 0VU but the VU mechanism is designed for reading mean level not peak level. Since channel headrooms are designed with VU metering in mind, peaks of 10dB over the top being quite common, it makes sense to at least reach 0VU when using compression especially if there is limiting on top.



PRE-EMPHASIS CALCULATIONS FOR
F 760 SERIES PEAK LIMITER

Resistors 47K & 4K7 form a pad of 20dB at the input to the side-chain of the peak limiter(B16).

Pre-set (Peak limit threshold) must be increased by 20dB to make up side-chain gain.

Cx is determined by:

$CxR = T_x$ where $T_x =$ Time Constant.

Example:

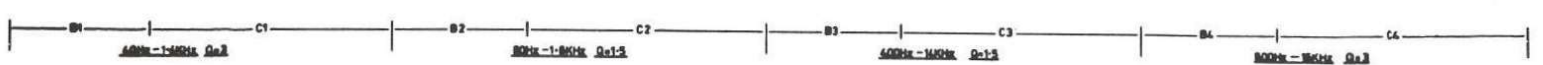
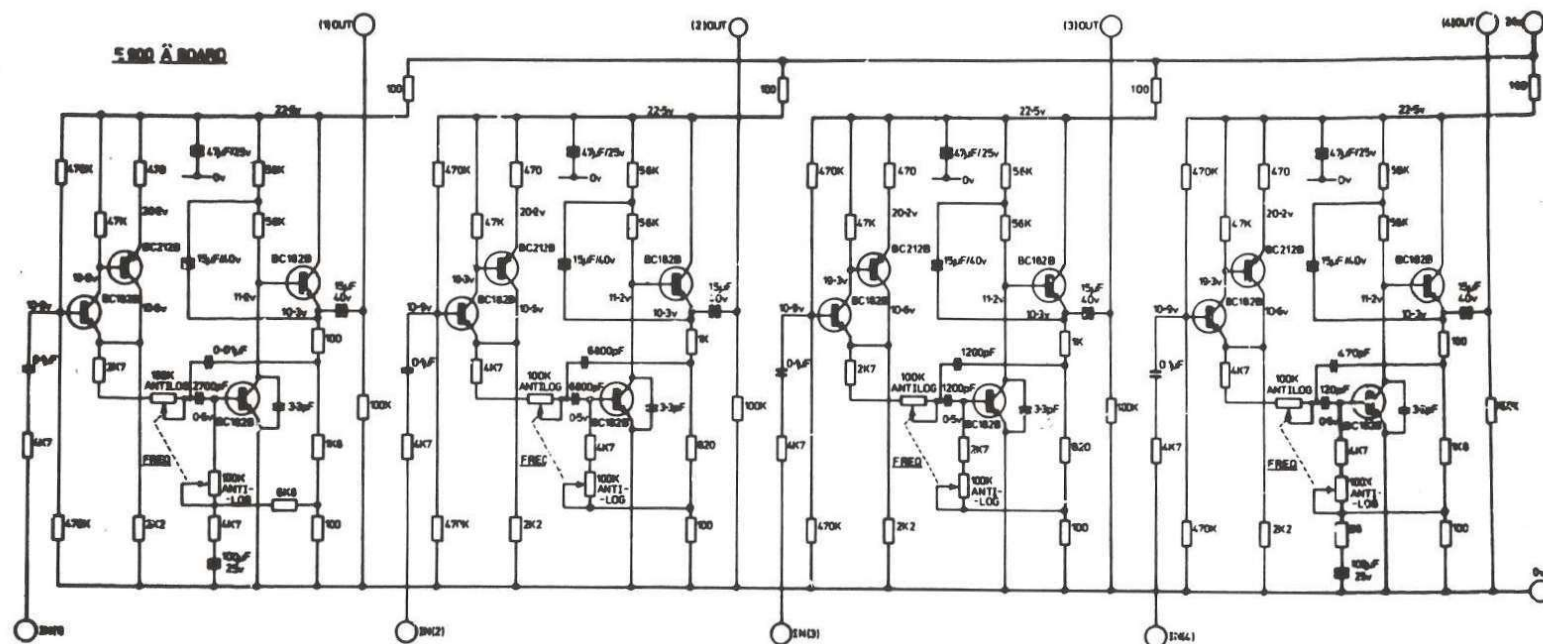
$$47K \times C_x = 47\mu s$$

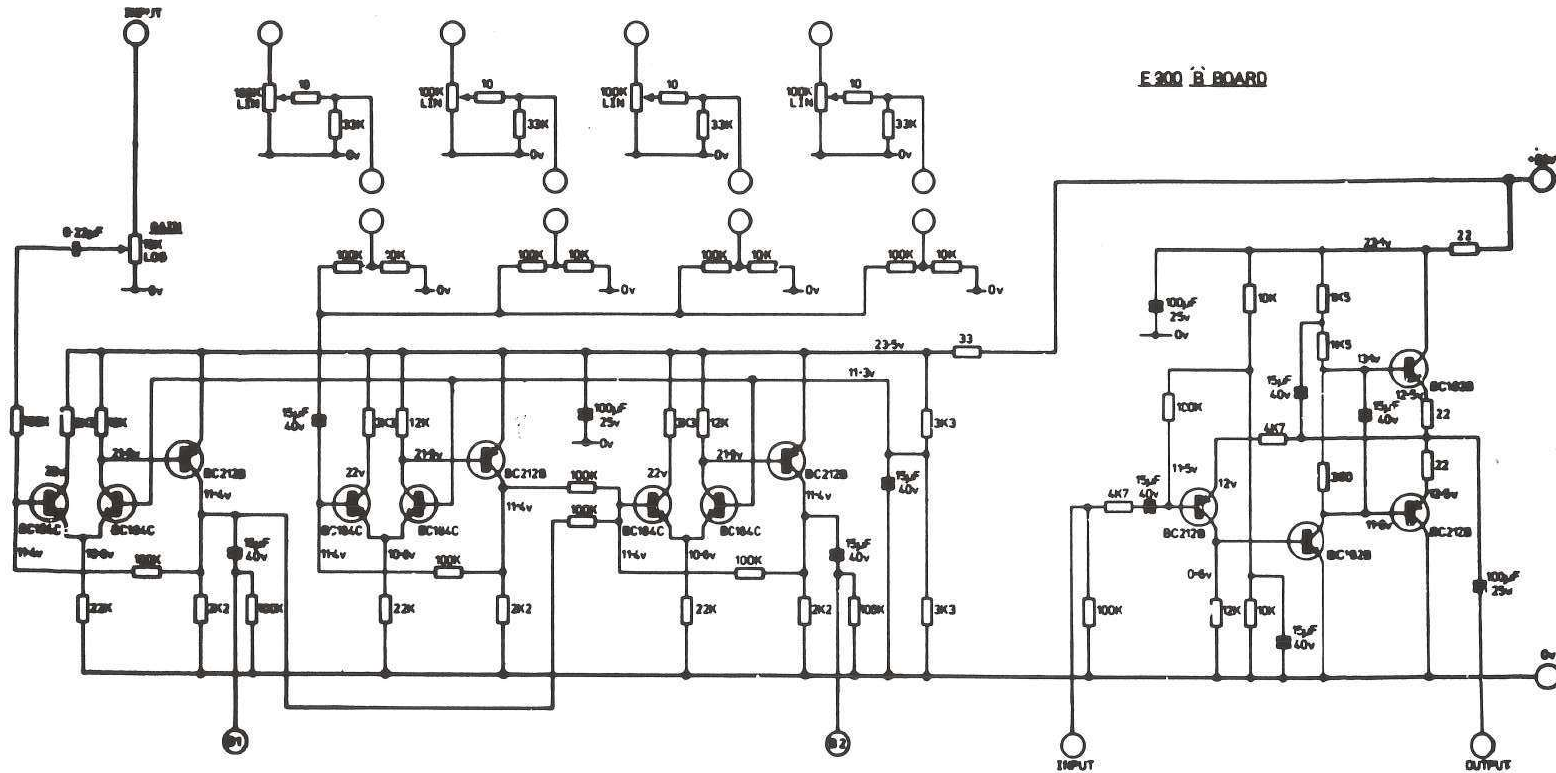
$$C_x = \frac{47 \times 10^{-6}}{47 \times 10^3}$$

$$C_x = 10^{-10} \text{ fd}$$
$$= 1000\text{pF}$$

<u>Time Constant</u>	<u>Cx</u>
25us	500pF
50us	1000pF
75us	1500pF
100us	2000pF

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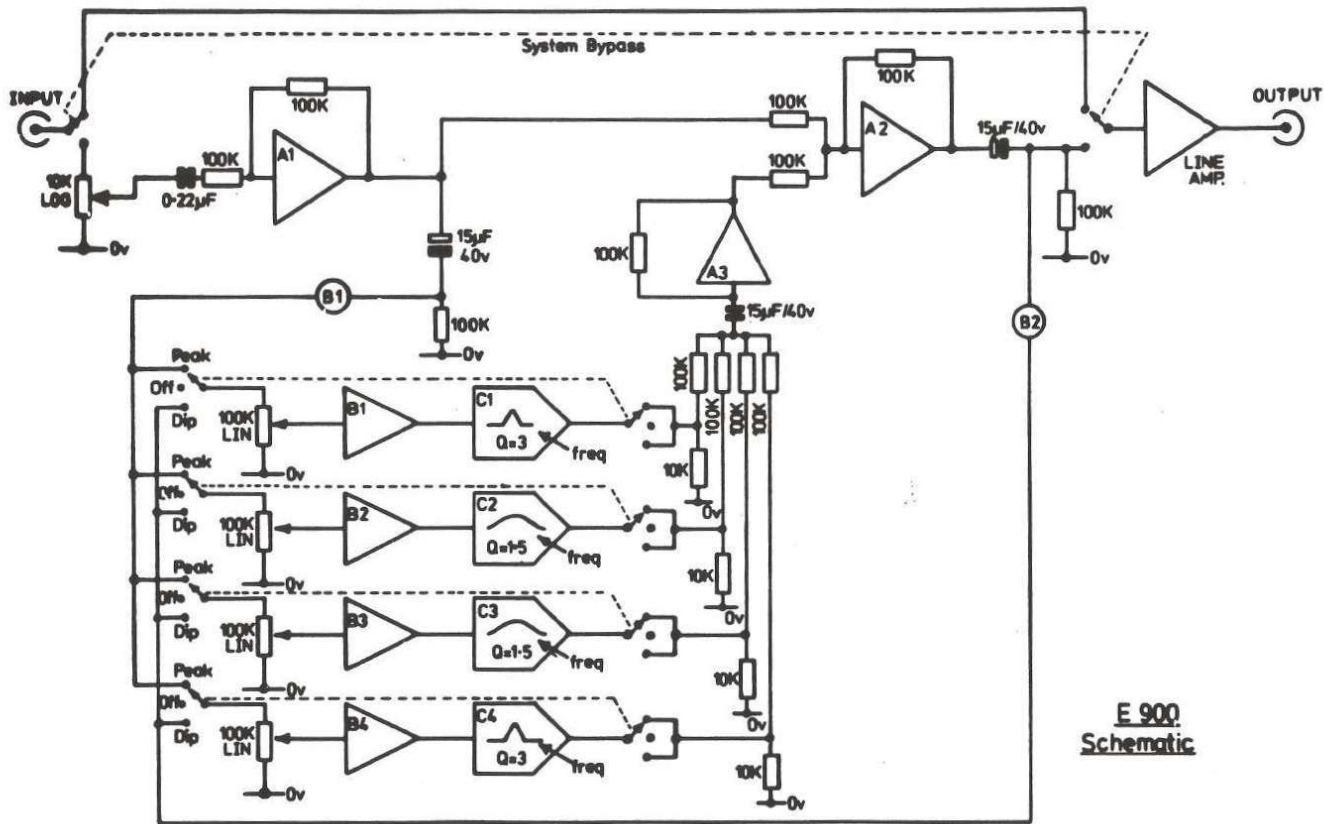




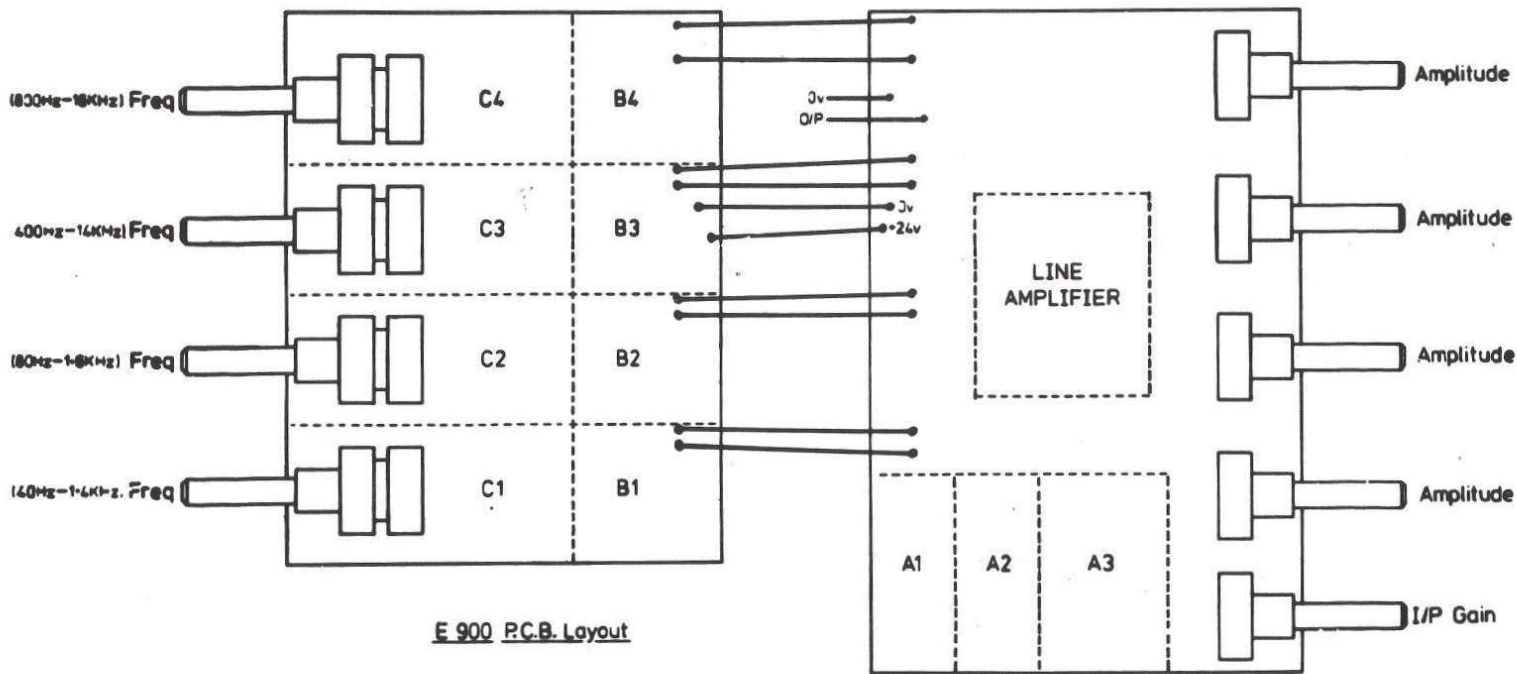
E-300 B BOARD

— M ———— A3 ———— A2 ————

————— LINE DRIVE AMPLIFIER —————



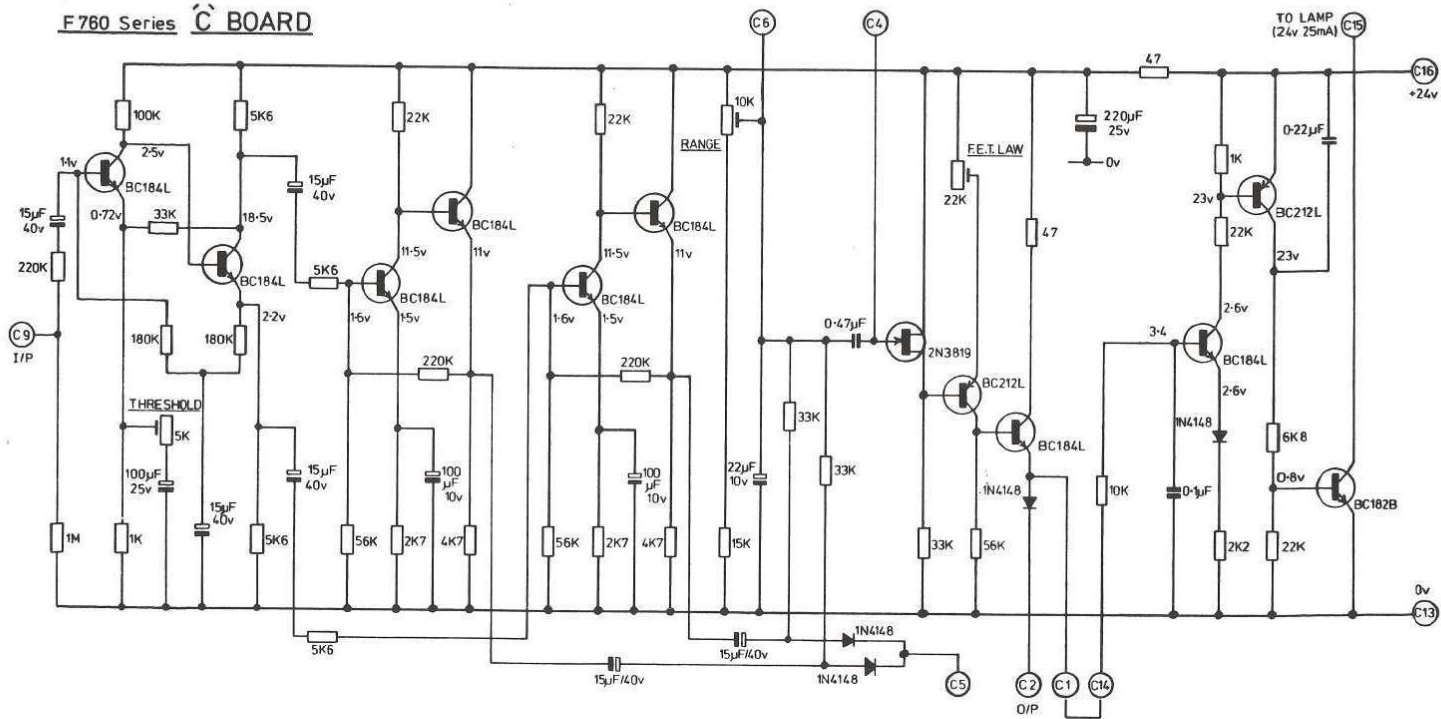
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E 900 P.C.B. Layout

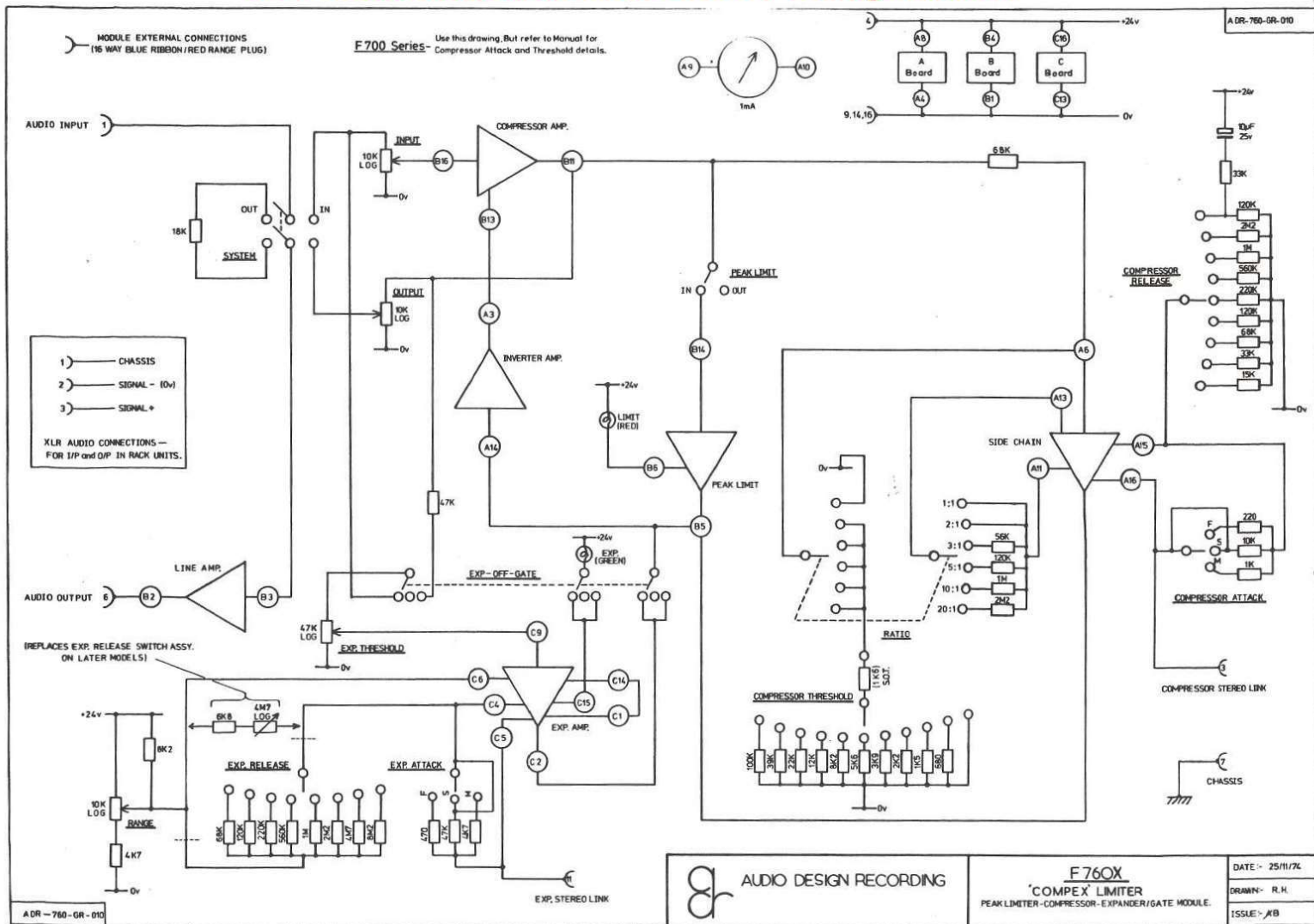
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F760 Series BOARD



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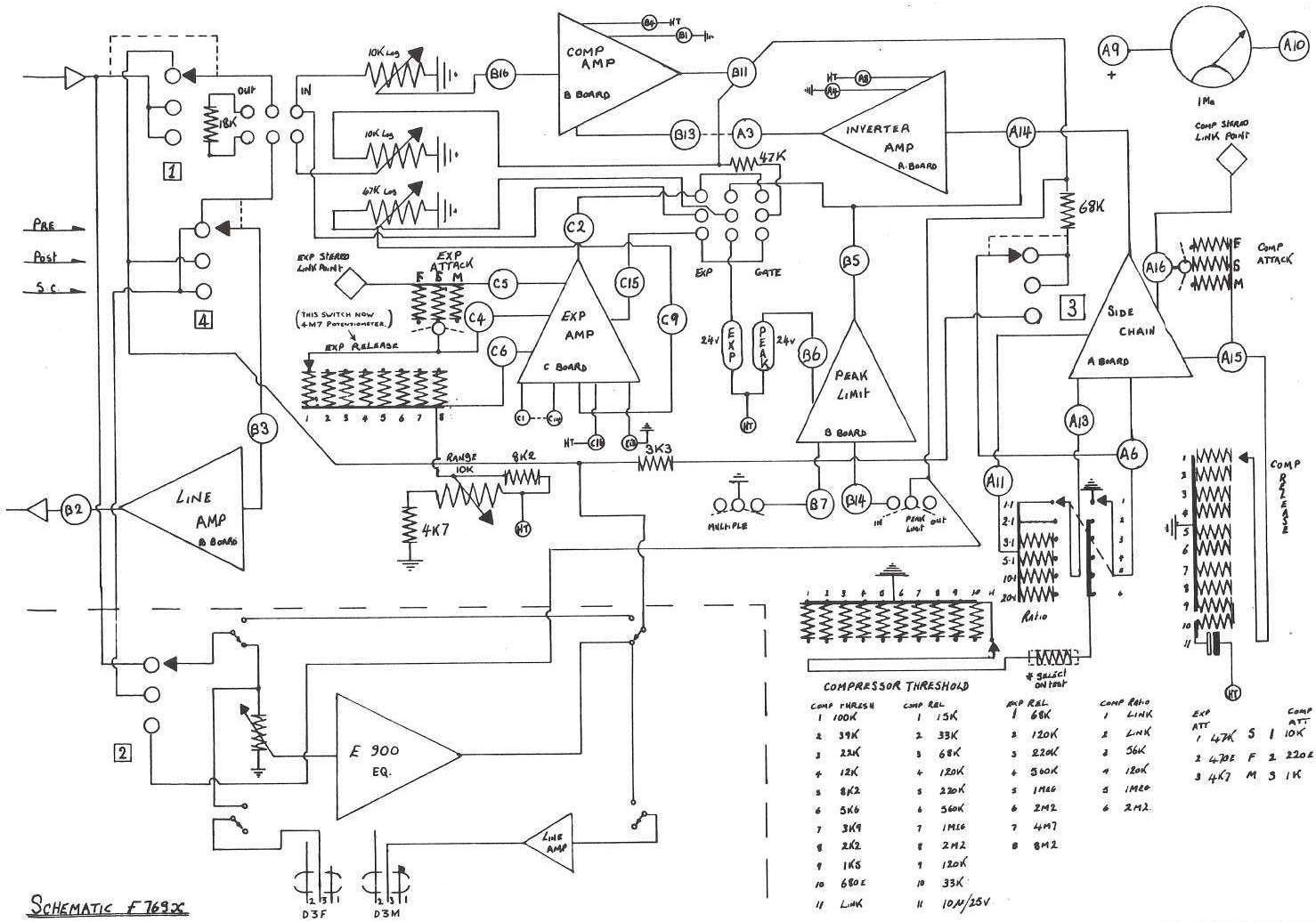


ADR-760-GR-010

AUDIO DESIGN RECORDING

F760X
'COMPLEX' LIMITER
PEAK LIMITER-COMPRESSOR-EXPANDER/GATE MODULE.

DATE: 25/11/74
DRAWN: R.H.
ISSUE: #8



COMPRESSOR THRESHOLD		EXP REL		COMP RATIO		COMP ATTACK	
1	100K	1	15K	1	LINK	1	4.7K
2	39K	2	33K	2	LINK	2	56K
3	22K	3	68K	3	220K	3	4.7K
4	12K	4	120K	4	500K	4	120K
5	8K2	5	220K	5	1MΩ	5	1MΩ
6	5K6	6	500K	6	2MΩ	6	2MΩ
7	3K9	7	1MΩ	7	4MΩ	7	4MΩ
8	2K2	8	2MΩ	8	8MΩ	8	8MΩ
9	1K5	9	120K	9	120K	9	120K
10	680K	10	33K	10	33K	10	33K
11	LINK	11	10M/25V				

SCHEMATIC F7692x

F760X SERIES - LIMITER-COMPRESSOR-EXPANDEROperation Procedure:Establishing the unit in the channel

- a). Check Expander section (if any) switched 'out'; Compressor Ratio switched to 1:1 (i.e non-operative); the Peak Limit switched 'In'; and the output attenuator turned down (in a stereo unit the individual channel potentiometers would be fully open and the ganged attenuator attenuated). The Input attenuators (in a stereo unit would be fully open on each channel with control effected on the ganged device) would be adjusted as required.
- b). With the channel by-pass switch to 'out' (i.e by-passing the F760 Compressor amp section) the channel levels should be established in the usual way as though the F760 were not in circuit. The channel level should be peaking to at least -10dBm, but preferably to 0dBm in order to obtain maximum compression possibilities.
- c). Having established the normal level, switch the F760 'In' and adjust the Input pot. until the overall amount of gain reduction likely to be required, is indicating on the meter (e.g. 10dB). At this stage the Peak Limit section is working and the red indicator will be flashing.
- d). Open the Output attenuator and adjust so that the level is peaking to the same level as the direct signal. This is best done under dynamic signal conditions rather than on tone if monitoring with VU meters (see LIMITING & COMPRESSION - Considerations). A relevant direct comparison is now available between direct and compressed signal at the flick of the 'In/Out' switch at closely approximating peak levels.
- e). With the Compressor Ratio control select the Slope required (e.g 2:1) and adjust the Compressor Threshold control until the Peak Limit only indicates on peaks above the amount of compression required (i.e. move the threshold down from '0' towards the -20 point until the Limit light goes out, then come back one position). The limit section will then operate on any further unexpected increase in level. The amount of compression may be changed by increasing/decreasing the Input pot. and adjusting the Compressor Threshold to adjust the relationship between compression and peak limiting. Once set-up it will not be necessary to alter the Output level (as per step 'd').
- f). The Release time in the compressor section will be adjusted for effect and the Attack time. Note when long Attack time is selected more peak limiting will occur.
- g). In adjusting the compressor section always reference it to the Peak Limiter even if the Pk.Limit is then switched out during operation. This maintains optimum signal-noise level in the system. When using lighter slopes in the compressor the Threshold will lie just under the Pk.Limit in position -2 to -8 (20:1 to 3:1 ratios).

h). The Compression Slopes are calculated on a 15dB range of gain reduction. (i.e the 2:1 ratio is established in the set-up procedure as 30:15). It will be found in practice that the initial slope in that position is more akin to 1:1.5 becoming slightly tighter as gain reduction increases. Thus if only 6dB of compression were required this will be softer than the ratio indicated and the next position higher could be selected. In practice this will not be found of great importance; but it is useful to know of.

The Expander/Gate Section: EXPAND MODE

i.) In the 'Expand' mode the low level gain reduction slope is of the order of 2:1. The control is 'feed-forward' so that the expander side-chain is arranged to monitor the input signal prior to the F760 input attenuators. The meter will indicate gain reduction when it operates and at the same time the green indicator will flash to differentiate it from high level gain reduction (limiting/compression).

j). To set up the Expander mode it is probably best to switch the compressor section to 1:1 and back-off the main input attenuator until Pk.Limiting is only just operating.

k). Switch the Expand/Gate switch to 'Expand' and the Expand Attack to 'M'. With the Expander Threshold fully anti-clockwise (shut - i.e infinitely high) adjust the Expander Range control so that the maximum amount of low level attenuation is set-up on the meter (i.e 20dB) and the green indicator will be on.

l). Now open the Threshold control until the meter and light indicate no gain reduction when signal is present but with fast expander Release attenuates quickly on unwanted noise/crosstalk. Thus the threshold is adjusted so that it is just open to allow all wanted signal through, but is closing rapidly during pauses. If it is operating on noise and crosstalk there will be no modulation effect and fastest release (attenuate time) can be used (see Expander/Gate - Considerations). The open speed will be determined by the Attack control switch.

m). Should the maximum attenuation range not be reached during pauses, this will be because the expander is being held open to some degree on input noise (see EXPANDER/GATE - Considerations). One must either accept the limited range possible or turn back the Threshold pot slightly when some of the wanted signal may now begin to be expanded and release and attack may need adjustment to avoid modulation effects. The alternative is to use the GATE position.

n). Having established the Expander mode satisfactorily switch in 'out' re-establish the compression section by selecting the ratio and increasing the input attenuator to give compression required. Then switch the Expand mode 'In'. Make any final fine adjustments.

Bulletin No.3/p3

The Expander/Gate Section: GATE MODE

- o.) The Gate position provides low level gain reduction at a slope of 20:1. In this mode the control side-chain is in a 'feedback' arrangement deriving its sense-data from the F760 output. Thus the Compressor/limiter sections must be established and fully operating whilst the Gate Threshold is found.
- p.) Having set up the Compressor/Limiter sections switch the F760 bypass 'In/Out' switch to 'Out' so that no signal is going through the unit.
- q.) Switch the Expander/Gate switch to the Gate mode. The green light will come on and the meter indicate gain reduction providing the Range control is not on '0'. Adjust the Range control for the maximum amount of low level gain reduction required (i.e -20 or whatever).
- r.) Switch in the F760 and adjust the Threshold of the Gate along with the Release and attack controls so that it is closing quickly on noise, yet fully open in the presence of wanted signal. (see EXPANDER/GATE - Considerations)

STEREO OPERATION

- s.) The Compressor section and Expander/Gate section are matched for stereo in stereo units. The 'Stereo-Link' switch links the relative control voltages so that gain reduction is always identical on both channels thus obviating any image shift. For simplicity it is best to set-up controls identically on both channels - setting each channel prior to throwing the Stereo switch 'IN'.
- t.) The Peak Limit sections are not linked and will continue to function independently; momentary attenuation of transients will not appreciably notice with regard to image shift.

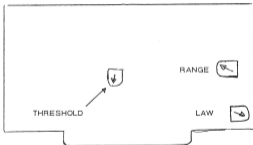
1. Before switching on the unit check that the mechanical zero of the meters is correct - adjust as necessary.
2. Switch on the unit
Input & Output attenuators fully open
Expander section switched 'out'
Stereo-link 'out'
Peak Limit 'out'
Compressor section to 1:1 - Ratio
Compressor Attack to 'F'
Bypass switch to 'In'
3. Signal generator to input (both inputs if stereo) at level of -34dBm; use 1kHz. Adjust the FET Bias pre-set fully anti-clockwise to give maximum output; Adjust the Inverter pre-set to give maximum output (about +4dBm i.e 38dB gain in the system). Re-set the Inverter so that the level is attenuated by about 1dB; then adjust the FET Bias to further attenuate the output to 0dBm (i.e system gain of 34dB)
4. Select the Compressor Ratio of 2:1; move the Compressor Threshold to lowest position (-20 this is referenced to the internal Pk.Limit threshold) Increase the signal generator until gain reduction is just beginning to indicate on the meter (unit input attenuators can be used). Increase the input by 30dB and the output should rise by only 15dB.
5. To adjust the Compressor Slope/Ratio, use the Compressor Slope pre-set to give correct output. If this pre-set is adjusted it is necessary to return to Step 3 in order to check that the FET Bias and overall system gain are correct. If the Bias needs re-setting follow through Steps 4 and 5 again returning to check the Bias if further adjustment is made on Step 5.
6. Adjust the meter range to read 15dB Gain Reduction.
7. Select 20:1 Ratio in Compressor; -2 on the Threshold control and adjust the input signal level to give 4dB gain Reduction indicating on the meter.
8. If output attenuators are fully open, the output level should be +12dBm
9. Check distortion at this stage; a measurement of about 0.2% should be obtained with a release-time setting of 0.45+
10. Peak Limit threshold is now checked by switching that section 'In' and switching the Threshold control (compressor) to 'O'. The Pk.Limit light should come on and the gain reduction indicated drop by 2dB. The output level of the unit will rise to +14dBm approx.

11. EXPANDER SECTION: Adjust range pot to maximum (-20dB); Attack switch to 'F' and Threshold to 'High' (anti-clockwise).
12. Select EXPAND mode and meter should read 20dB Gain Reduction with the green indicator lighting.
13. If it does not read 20dB adjust the RANGE pre-set on the 'C' board so as to read 20dB.

IF STEREO - check both channels reading 20dB, then select the 'Stereo IN' mode on the stereo link switch, and observe any change of position in meter readings. If movement occurs, switch out stereo link, and adjust the one moving towards '0' with the LAW pre-set on that board, so that it moves forward by TWICE as much as the backward error. (i.e. over-correct by 100%) Now bring back to 20dB with the RANGE pre-set. Check the stereo match again by switching IN the stereo link; Repeat the procedure if necessary, and as necessary until matched.

14. Threshold Adjustment: Have Exp. Threshold potentiometer fully open; select EXPAND mode; check RANGE control at maximum; Attack switch to 'F' and Release to fastest position.

15. 1kHz input signal @ -40dBm; adjust the THRESHOLD pre-set on the board so that Expander is just open (meter reading '0') and green indicator lamp is flickering.



Type 'C' Expander Board

9th June 1974

F700X - F760X SERIES: MAINTENANCE

Printed Circuit Boards: An F760 channel consists of three p/c boards, marked 'A', 'B' and 'C'.

The 'A' board comprises the Compressor Side-chain, Control Voltage Mixing (from all side-chains), Inverting Amplifier and FET Bias control.

The 'B' board consists of the variable FET controlled amplifier (30dB gain), the Line Amplifier (4dB gain), and the Peak Limit Side-chain and Indicator switching circuit (RED).

The 'C' board has the Expander/Gate Side-chain with associated Indicator switching circuit (GREEN).

F700/F760 units supplied without Expander/Gate facilities will have the 'C' board omitted along with associated controls.

The F700 differs from the F760 only in that the Peak Limit Side-chain is omitted from the 'B' board along with associated wiring and controls. A different threshold arrangement is also used on the F700 unit (see Threshold Slopes and Schematics).

With The FET Bias pre-set correctly adjusted, and with the Input/Output attenuators fully open, the overall gain of the system (F700/F760) will be 34dB. (30dB Variable amp; 4dB Line-drive amp - this 4dB is lost in a pad when in the direct signal mode to maintain unity gain).

Normal Maintenance would consist of checking system gain and making any necessary adjustment to the FET Bias; measuring frequency response; checking distortion and stereo matching.

System Gain: In checking the gain ensure that attenuators are fully open and that no gain reduction is taking place (i.e. switch Compressor to 1:1, Peak Limit and Expander switches 'Out'). Insert signal level of -34dBm and the output should read 0dBm. Slight drift may be experienced due to temperature changes but this will not affect the dynamic characteristics until the gain rises to +37dB. Therefore a normal tolerance of ± 2 dB would be acceptable. On stereo units if there is a difference, it should be the same difference of course.

Measuring Frequency Response: Care should be taken to ensure no gain reduction is taking place for the effect will be to flatten out any error and conceal it.

Distortion: This is normally checked at 1kHz; if measured at low frequencies care should be taken to have the release on a long setting; or at least to note the effect of the release at low frequencies.

Accessibility of Boards: It is usually necessary to remove the 'C' board in order to make any adjustment to an 'A' board (e.g. FET Bias). The 'C' board will tolerate being plugged in and out whilst the unit is switched on; should it necessary to remove an 'A' board however experience has shown it to be safest to switch off the unit whilst doing so, since there is some liability of transistors being damaged.

Compressor Side-Chain

Control Volts

Slope

Meter Zero

Meter Range

Inverter

Rectifier
Bal.

PET Bias

Threshold
Trim

F760-A Fc Board
(Component side)

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Line Amp Section

Peak Limiter &
Indicator Section

Rectifier
Bal.

Lim. Threshold
Pre-ast

Distortion
'Null'

Compressor Amp

Control FET

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(component side)

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