

**Operating
and Service
Information**

DN800

**Configurable Active
Crossover**

DN800 Configurable Active Crossover

The Klark Teknik DN800 is a highly specified, active frequency divider designed for use in sound reinforcement, recording studio and installed sound systems. It may be configured as a four-input, two-way systems or as a two-input, three or four-way system, the compact, 1U format making it particularly suitable for use in systems where space is at a premium.

Interchangeable cards are used to set the filter frequency and slope characteristics, while each band has its own adjustable VCA limiter, the time constants being optimised for the frequency range covered by that band. The plug-in filter cards offer a choice of 12, 18 or 24 dB/octave filter slopes with a choice of Linkwitz-Riley, Butterworth or Bessel responses. In many applications, the Linkwitz-Riley response is the most suitable as it exhibits equal phase shift in adjacent frequency bands at the filter corner points. Optional equaliser cards may be fitted.

Optional software is available for those users who wish to calculate component values with a view to populating their own filter boards. This runs on a standard PC computer and unpopulated filter boards are available.

In two-channel applications, the low bands may be linked to provide a mono feed to sub-bass or bass systems while in the stereo, three-way mode, the unused fourth band can be used to provide a direct (unfiltered) feed.

In addition to level and limiter controls, each band is equipped with a phase reverse switch and a continuously variable phase control (180 degrees maximum) based around an advanced all-pass filter design. In combination, these controls allow up to 360 degrees phase shift to be set independently for each band. Full LED status indication is provided for all relevant parameters in each frequency band.

Provision is made for optional equaliser cards which can provide response 'tailoring' for each crossover band.

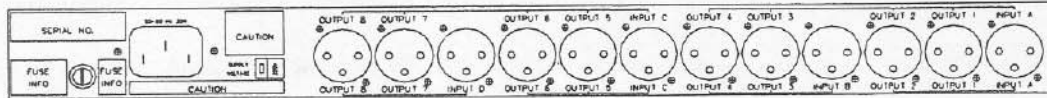
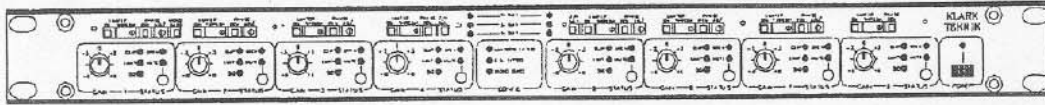
Connections

The signal connections are on conventionally wired XLRs (pin 2 hot). As standard, these are electronically balanced and operate at a nominal +4dBu signal level. Transformer balanced inputs are available as an option while internal System Gain trims can be used to reset the output level if required.

Installation

Before connecting to the main power supply, ensure that the selector switch adjacent to the mains inlet socket is set for the correct mains voltage. It is also prudent when first commissioning the unit to ensure that the correct option boards have been installed.

Using the DN800 Configurable Active Crossover



Controls

Before use, the internal links should be set to configure the system for dual, two-band stereo operation or three or four-band stereo operation. This is achieved by removing the top cover of the unit and selecting the appropriate link positions.

Note: If the DN800 was ordered to a specific setup requirement, then no internal re-adjustment should be required.

Level Control

All eight bands are fitted with Input Gain controls, the 0dB centre position indicating unity gain. These are located prior to the limiter circuitry in the signal chain and provide +/- 6dB of control enabling the user to make fine adjustments to the levels in each frequency band to suit the driver systems being used.

Mute switch

Latching mute switches are provided for each frequency band to assist in setting up and for checking the correct functioning of individual loudspeaker driver systems. A red status LED indicates that a band is muted.

Power

Mains power switch. This has no independent status LED as one of the 2-Way, 3-Way or 4-Way indicator LEDs will always be on when the unit is powered up.

The remaining controls are located beneath the two security panels and will normally only require adjustment during the initial setup. The presets require a small screwdriver for adjustment while the latching switches may be set using a screwdriver, ballpoint pen or similar tool.

Limiter On

Depressing this switch puts the band limiter into circuit.

Limiter Threshold

Controls the limiter threshold over the range -12 to +12dBu. The limiter monitors the signal after the System Gain preset gain controls and so is not affected by any subsequent adjustments. The yellow Limit LED illuminates when the output signal reaches the limiter threshold and the red Over LED comes on when the signal exceeds the limiter threshold by more than 6dB.

Phase Reverse

Depressing this switch inverts the phase of the signal in the corresponding frequency band (180 degrees shift).

Phase Adjust

This preset provides a continuous adjustment of phase shift from 0 degrees (fully anticlockwise) to 180 degrees (fully clockwise). This may be used in combination with the Phase Reverse switch to provide precise phase adjustment up to 360 degrees. Bands 4 & 8 have no variable phase preset as it is normal to set up the lower bands with reference to the highest.

Mono Bass

Depressing this switch sums the signals in the low frequency bands (Bands 1 & 5) to mono. This is common practice when feeding bass or sub-bass speaker systems.

Sub Bass

The input stage incorporates a band pass filter operating at 30Hz to 30kHz. The low frequency response can be extended to 20Hz or 15Hz by replacing 3 filter capacitors on the main board:-

For input A change capacitors C45, C46, C47

For input C change capacitors C245, C246, C247

For a 30Hz filter (standard value) fit 330nF

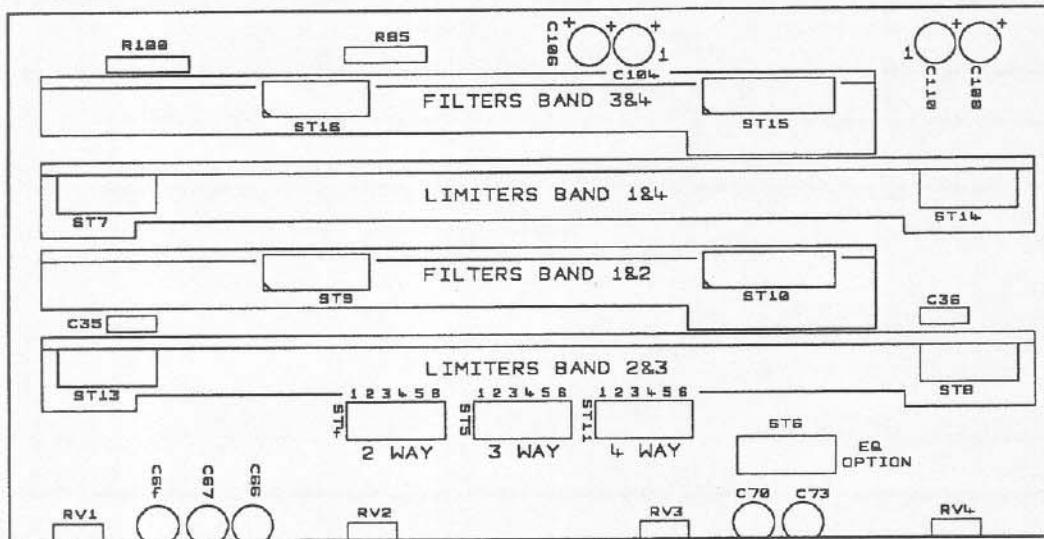
For a 20Hz filter fit 470nF

For a 15Hz filter fit 680nF

Card Installation

Access to the unit is via the top cover which is retained by four captive fasteners. For the location of the individual cards, refer to diagram below.

Filter and Limiter Card Location Diagram (Bands 1 - 4 shown only)



System Gain

Adjustable make up gain is provided after the crossover filters to match the signal level to the power amplifier input requirements. These controls are accessed by removing the top cover and give a gain range from -6dB to +12dB.

Operation

The Klark Teknik DN800 can be used to provide four channels of two-way operation or two channels of either three or four-way operation. In dual three-way operation, bands 4 and 8 may be used to provide a direct output, for example, to a secondary system which utilises passive crossovers.

Whatever the configuration chosen, all inputs pass through an independent band limiting filter section providing an 18dB/octave high pass response at 30Hz and an 18dB/octave low pass response at 30kHz. This provides an extra degree of driver protection and is effective in rejecting RF interference.

Frequency card component table

| Desired frequency | Capacitor | Resistor (ohm) |
|-------------------|-----------|----------------|
| 50Hz | 330nF | 6.8k |
| 63Hz | 220nF | 8.2k |
| 80Hz | 330nF | 4.3k |
| 100Hz | 100nF | 11k |
| 125Hz | 100nF | 9.1k |
| 160Hz | 47nF | 15k |
| 200Hz | 100nF | 5.6k |
| 250Hz | 22nF | 20k |
| 315Hz | 33nF | 11k |
| 400Hz | 68nF | 4.3k |
| 500Hz | 33nF | 6.8k |
| 630Hz | 22nF | 8.2k |
| 800Hz | 33nF | 4.3k |
| 1000Hz | 10nF | 11k |
| 1250Hz | 10nF | 9.1k |
| 1600Hz | 4.7nF | 15k |
| 2000Hz | 10nF | 5.6k |
| 2500Hz | 2.2nF | 20k |
| 3150Hz | 3.3nF | 11k |
| 4000Hz | 6.8nF | 4.3k |
| 5000Hz | 3.3nF | 6.8k |
| 6300Hz | 2.2nF | 8.2k |
| 8000Hz | 3.3nF | 4.3k |
| 10000Hz | 1nF | 11k |
| 12500Hz | 1nF | 9.1k |
| 16000Hz | 1nF | 6.8k |
| 20000Hz | 1nF | 5.6k |

Limiter and Phase Capacitor Selection Table

| Frequency Hz | | Limiter Capacitor | Phase Capacitor (Farads) |
|--------------|--------|-------------------|-----------------------------|
| 20 | | 1uF | 470nF |
| 25 | | 1uF | 470nF |
| 31.5 | | 1uF | 330nF |
| 40 | | 1uF | 270nF |
| 50 | | 1uF | 220nF |
| 63 | | 1uF | 150nF |
| 80 | 20mS | 1uF | 120nF |
| 100 | Attack | 1uF | 100nF |
| 125 | | 1uF | 82nF |
| 160 | | 1uF | 68nF |
| 200 | | 1uF | 47nF |
| 250 | | 1uF | 47nF |
| 315 | | 330nF | 33nF |
| 400 | | 330nF | 27nF |
| 500 | 6.6mS | 330nF | 22nF |
| 630 | Attack | 330nF | 15nF |
| 800 | | 330nF | 12nF |
| 1k | | 100nF | 10nF |
| 1k25 | | 100nF | 8n2F |
| 1k6 | 2mS | 100nF | 6n8F |
| 2k | Attack | 100nF | 4n7F |
| 2k5 | | 100nF | 4n7F |
| 3k15 | | 33nF | 3n3F |
| 4k | | 33nF | 2n7F |
| 5k | .66mS | 33nF | 2n2F |
| 6k3 | Attack | 33nF | 1n5F |
| 8k | | 33nF | 1n2F |
| 10k | | 10nF | 1nF |
| 12k5 | .2mS | 10nF | 820pF |
| 16k | Attack | 10nF | 680pF |
| 20k | | 10nF | 470pF |

Limiters Setup

If the limiters are to be used to eliminate the possibility of power amplifier clipping, they can be set up by monitoring the clip LEDs on the amplifiers and applying a high level test signal. It is advisable to run the amplifiers into a dummy load during this operation. The limiter threshold can then be backed off until the clip LEDs on the amplifier are just extinguished. A more accurate method is to monitor the amplifier output waveform with an oscilloscope which will enable the point of clipping to be determined with greater precision. It is recommended that the limiter be set at least 1dB below the clipping threshold of the power amplifier due to possible amplifier performance fluctuations during normal use.

If the limiter is required to limit the amplifier power to below its maximum output level, then the output of the amplifier must be measured at the desired power ceiling and the limiter threshold set accordingly.

Limiters Time Constants

The Attack and Release Time Constants for the limiters are determined by a capacitor fitted to the filter card. This is used to "optimise" the limiter protection for the frequency band selected. When using limiter protection there is always a compromise required between the degree of protection, the maximum sound pressure level and the amount of distortion when limiting occurs.

The following table gives some suggested capacitor values to provide reasonably low distortion while still offering a high degree of protection. The capacitor selection should be made for the lowest frequency in the crossover filter pass band. For example:

- 1) A mid frequency driver operating from 500Hz to 2K5Hz should select a limiter capacitor for 500Hz on the table i.e. 330nF.
- 2) A low frequency driver should select a limiter capacitor for 30Hz.

Phase Adjustment

Because of the mechanical characteristics of loudspeakers and the geometry of their cabinets, it is generally necessary to adjust the relative phases of the signals feeding drivers in adjacent bands in order to ensure that the sound from drivers is in phase in the crossover region.

Normally, the highest frequency band is used as a reference and all other bands set in relation to that. When the phase is optimised, the level of a test frequency equal to the frequency of the crossover region being optimised will be at a maximum. Hence if, for example, a crossover point is set to 2.5kHz, a 2.5kHz test signal may be applied and then the phase adjustment preset of the lower band turned until the signal is at a maximum. If this occurs at one or other extreme of the preset's travel, then the Phase Invert button should be operated.

A more reliable method is to adjust the phase preset to give a minimum signal level which will occur at the point when the signals in the adjacent bands are exactly 180 degrees out of phase. Once the minimum has been located, the Phase Invert button can be operated to bring the signals back into phase. Some engineers prefer to make final adjustments while listening to musical programme material over the system.

The correct sequence when setting up a four-way system is to first adjust the phase of the third band to align the phase at the crossover point between the third and fourth bands. The process is then repeated using the appropriate test frequency for the crossover point between the second and third bands. Finally, the lower crossover point can be optimised using the phase control preset on the lowest band. If any subsequent adjustment is made to any of the phase controls, then the bands below it should also be readjusted.

Signal Path

After being de-balanced at the input, the signal is passed through the fixed high and low pass filters (18dB/octave high pass response at 30Hz and 18dB/octave low pass response at 30kHz) before being routed to the filter bands via the 2-way or 3/4-way links.

The front panel Gain control is located at the start of the band signal path after which the signal is passed through the limiter and filter circuitry before encountering the System Gain output level trim control (internal). There is an additional control input to the limiter taken after the System Gain control so that any increase in level caused by resetting this control will not cause the limiting threshold to change. The filtered signal is then balanced and passed to the output via the muting relay. This relay also mutes the signal during power up to reduce the risk of loudspeaker damage.

Configurations

Four-channel, Two-way
LEDs Indicate: 2 WAY

| | | |
|---------|--------------|----------------|
| Input 1 | Output 1 Low | Output 2 High. |
| Input 2 | Output 3 Low | Output 4 High |
| Input 3 | Output 5 Low | Output 6 High. |
| Input 4 | Output 7 Low | Output 8 High. |

Two-channel, Three-way
LEDs Indicate: 3 WAY

| | | |
|---------|---------------|-----------------|
| Input 1 | Output 1 Low | Output 2 Mid |
| | Output 3 High | Output 4 Direct |
| Input 2 | Output 5 Low | Output 6 Mid |
| | Output 7 High | Output 8 Direct |

Two-channel, Four-way
LEDs Indicate: 4 WAY

| | | |
|---------|-------------------|------------------|
| Input 1 | Output 1 Low | Output 2 Low Mid |
| | Output 3 High Mid | Output 4 High. |
| Input 2 | Output 5 Low | Output 6 Low Mid |
| | Output 6 High Mid | Output 8 High |

Specifications

| | |
|---------------------------------------|---|
| Inputs | Four |
| Type | Balanced (electronically) |
| Impedance | (ohm) Balanced 20k Unbalanced 10k |
| Outputs | Eight |
| Type | Balanced (electronically) |
| Min. load impedance | 600ohm |
| Source impedance | <60ohm |
| Max. level | >+21dB |
| Performance | |
| Distortion | <0.01% (20Hz to 20kHz @ 4dB) |
| Equivalent input noise | <-90dBu (any output) (20Hz to 20kHz unweighted) |
| Nominal gain | 0dB |
| Adjustable gain | + or - 6db on front panel control additional +12 or -6dB on internal preset |
| Limiter threshold | -12dB to +12dB |
| Phase relationship | Continuously adjustable 0 degrees to 180 degrees between bands Polarity switch provides additional 180 degrees |
| Frequency division filters | Butterworth, Bessel or Linkwitz-Riley 12, 18 or 24dB/Oct |
| Power requirements | |
| Voltage | 110/120/220/240v 50/60HzAC |
| Consumption | <30 vA |
| Dimensions | |
| Width | 482mm (19 inches) |
| Height | 44mm (1.75 inches) |
| Depth | 285mm (11.2 inches) |
| Weight | |
| Net | 3.5kg |
| Shipping | 6kg |



Terminations

| | |
|---------|-----------|
| Inputs | 3 pin XLR |
| Outputs | 3 pin XLR |
| Power | 3 pin CEE |

Options

- Overall security cover
- System equalisation
- Output balance transformers

IMPORTANT WARNING
THIS APPLIANCE MUST BE EARTHED

The wires in the supplied mains lead are coloured in accordance with the following code:

| | |
|------------------|---------|
| Green and Yellow | Earth |
| Blue | Neutral |
| Brown | Live |

As the colours of the wires in the mains lead may not correspond with the coloured markings identifying the terminals in your plug, proceed as follows:

The wire which is coloured Green and Yellow must be connected to the terminal in the plug that is marked with the letter E or by the Earth symbol or coloured Green or Green and Yellow.

The wire which is coloured Blue must be connected to the terminal that is marked with the letter N or coloured Black.

The wire which is coloured Brown must be connected to the terminal which is marked with the letter L or coloured Red.

Voltage Selection and Power Connection

Connection is made by means of an IEC standard power socket. The rear panel voltage label indicated the voltage required for satisfactory operation of the unit. Before connecting the unit to the mains power, ensure that the operating voltage is correct for your local supply. It is important that you observe the following instructions if another voltage setting is required. The unit may be set for 240v or 120v operation (50-60Hz) by means of the recessed slide switch adjacent to the IEC mains inlet socket.

Before connecting this unit to the mains supply, ensure the fuse fitted is the correct type and rating is as indicated on the rear panel, adjacent to the fuse holder. Should the fuse need replacing, it should be replaced only with the same type and value of fuse.

Do not install this unit in a location subjected to excessive heat, dust or mechanical vibrations.

Warranty

This product is manufactured by Klark Teknik and is warranted to be free from defects in components and factory workmanship under normal use and service for a period of one year from the date of purchase.

During the warranty period, Klark Teknik will undertake to repair or at its option, replace this product at no charge to its owner when failing to perform as specified, provided the unit is returned shipping pre-paid, to the factory or authorised service facility.*

No other warranty is expressed or implied.

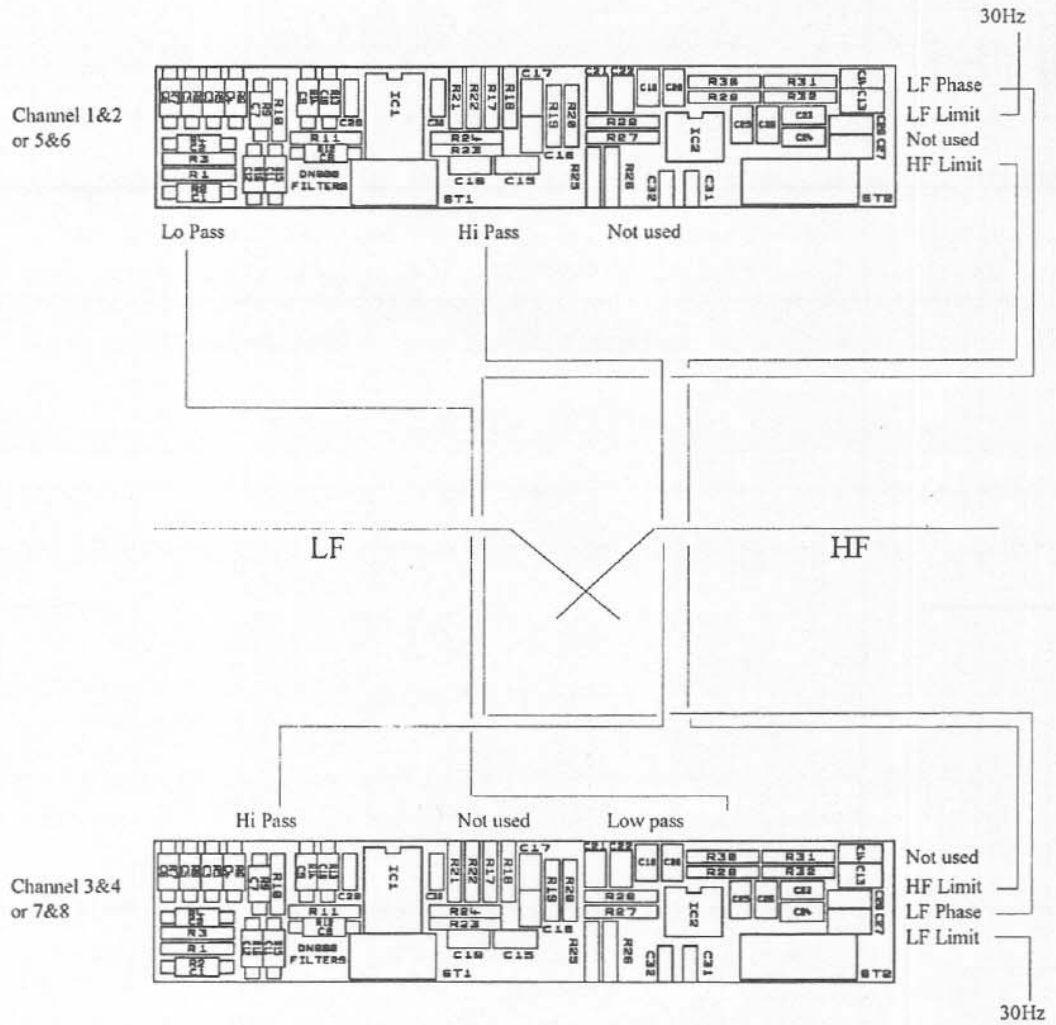
This warranty shall not be applicable and be void when this product is subjected to:

- a) Repair work or alteration by persons other than those authorised by Klark Teknik in such a manner as to injure, in the sole judgement of Klark Teknik, the performance, stability, reliability or safety of this product.
- b) Misuse, negligence, accident, act of God, war or civil insurrection.
- c) Connection, installation, adjustment or use otherwise than in accordance with the instructions provided by Klark Teknik.

* See enclosed service request form.

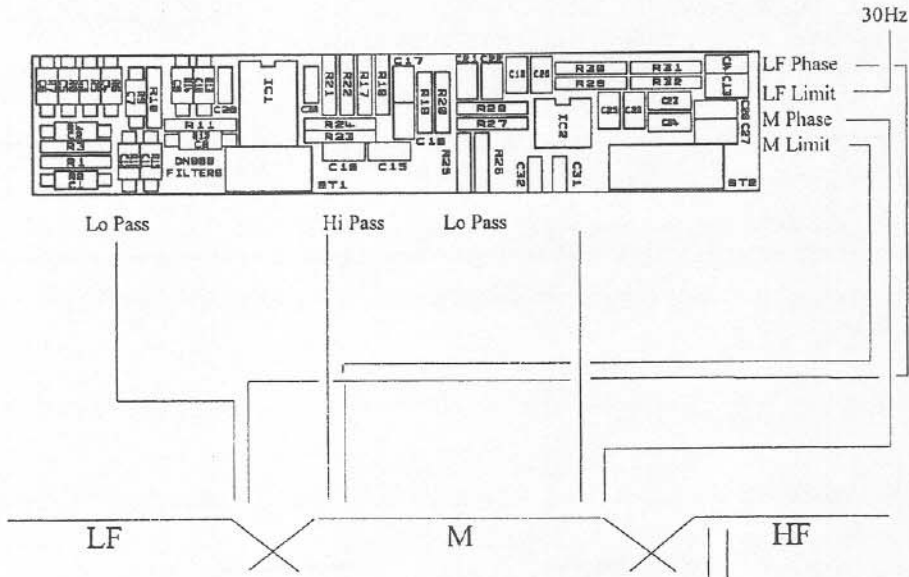
Klark Teknik reserves the right to alter specifications without notice. This warranty does not affect the statutory rights of the UK customer.

2-WAY CROSSOVER FILTERBOARD

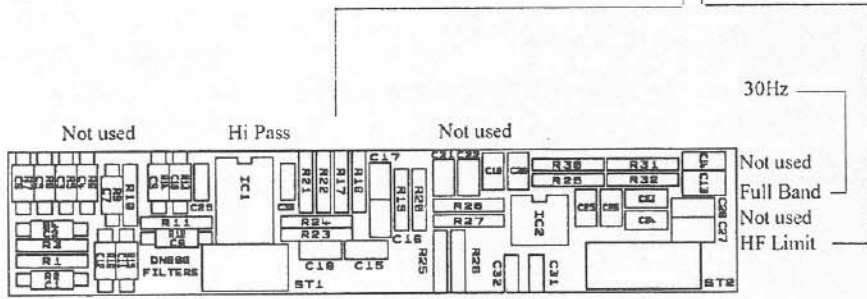


3-WAY CROSSOVER FILTERBOARD

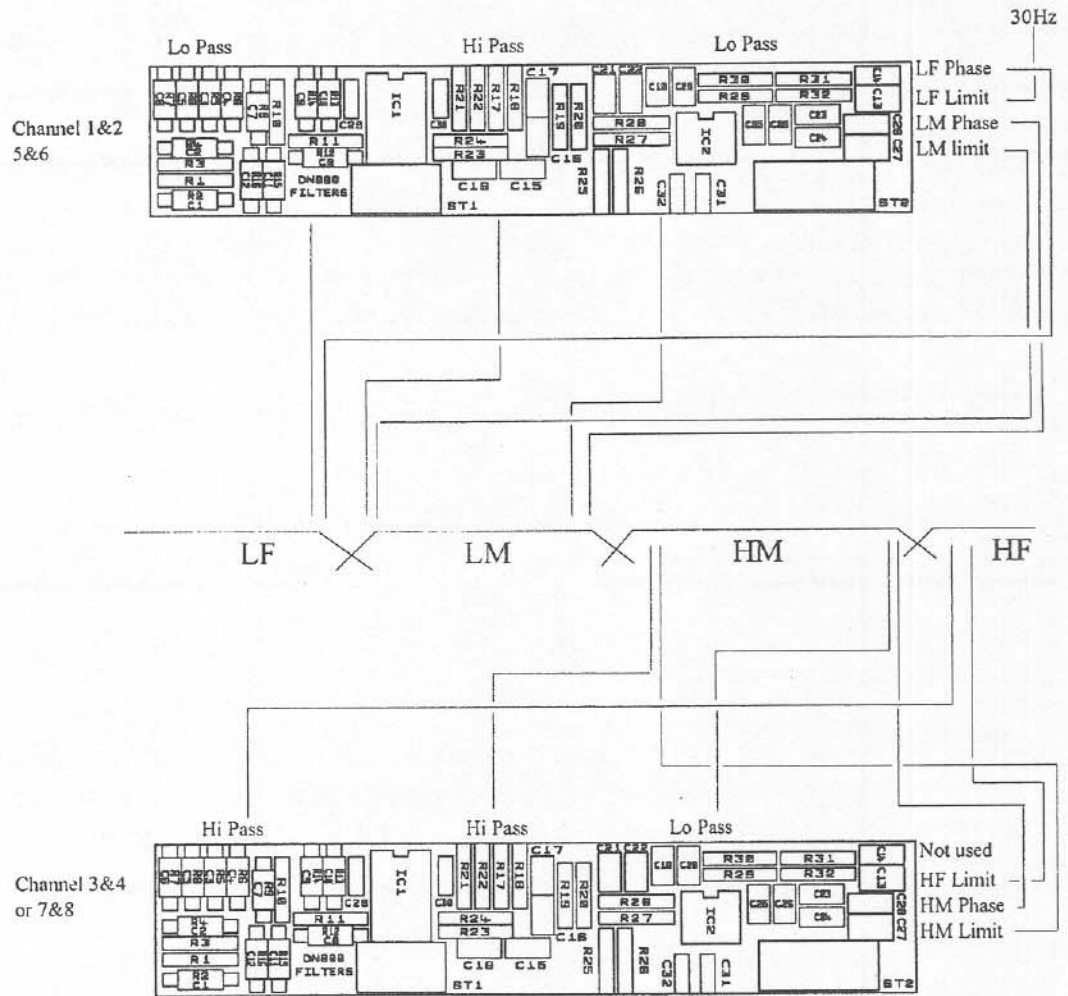
Channel 1&2
or 5&6

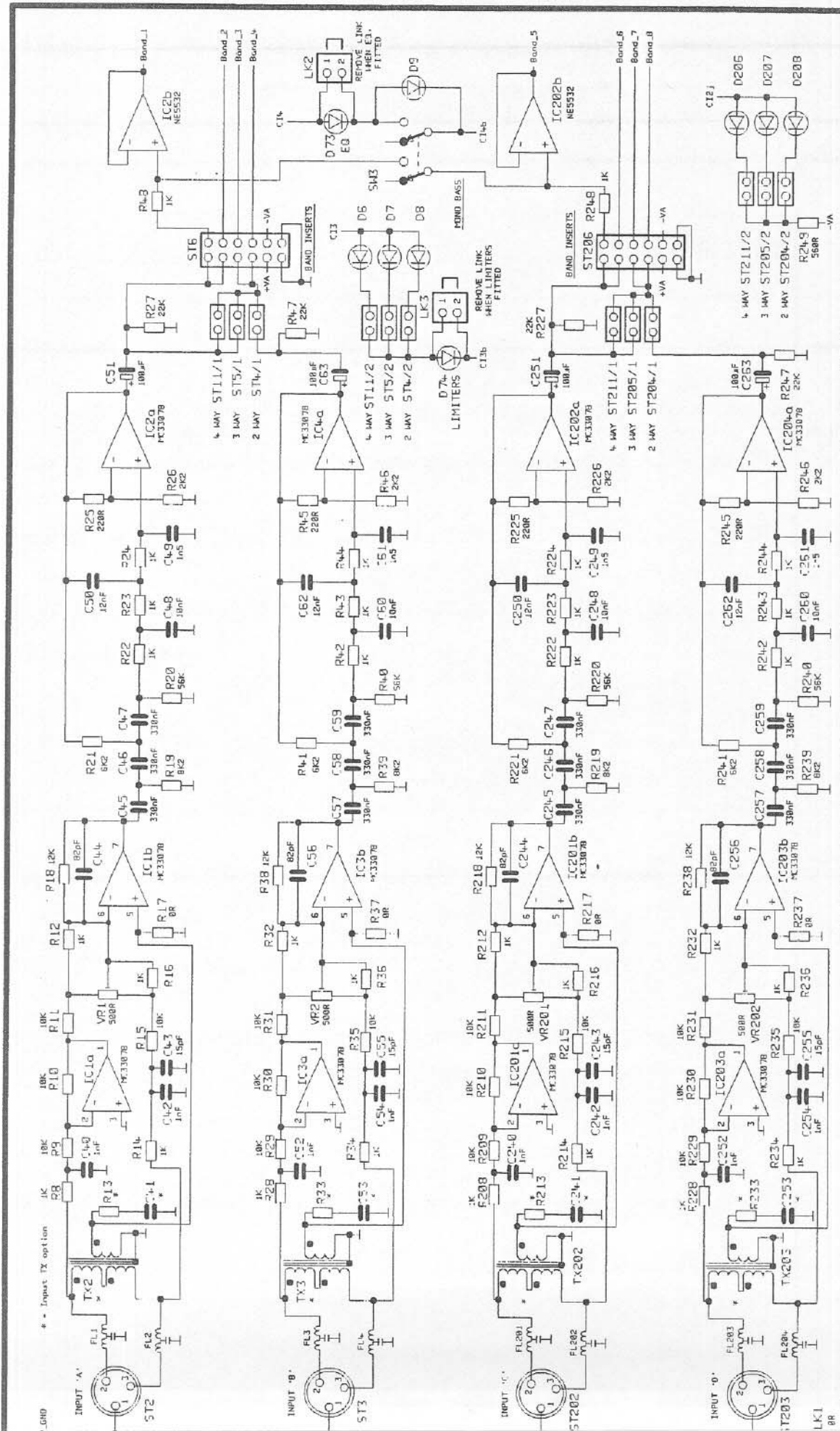


Channel 3&4
or 7&8



4-WAY CROSSOVER FILTERBOARD

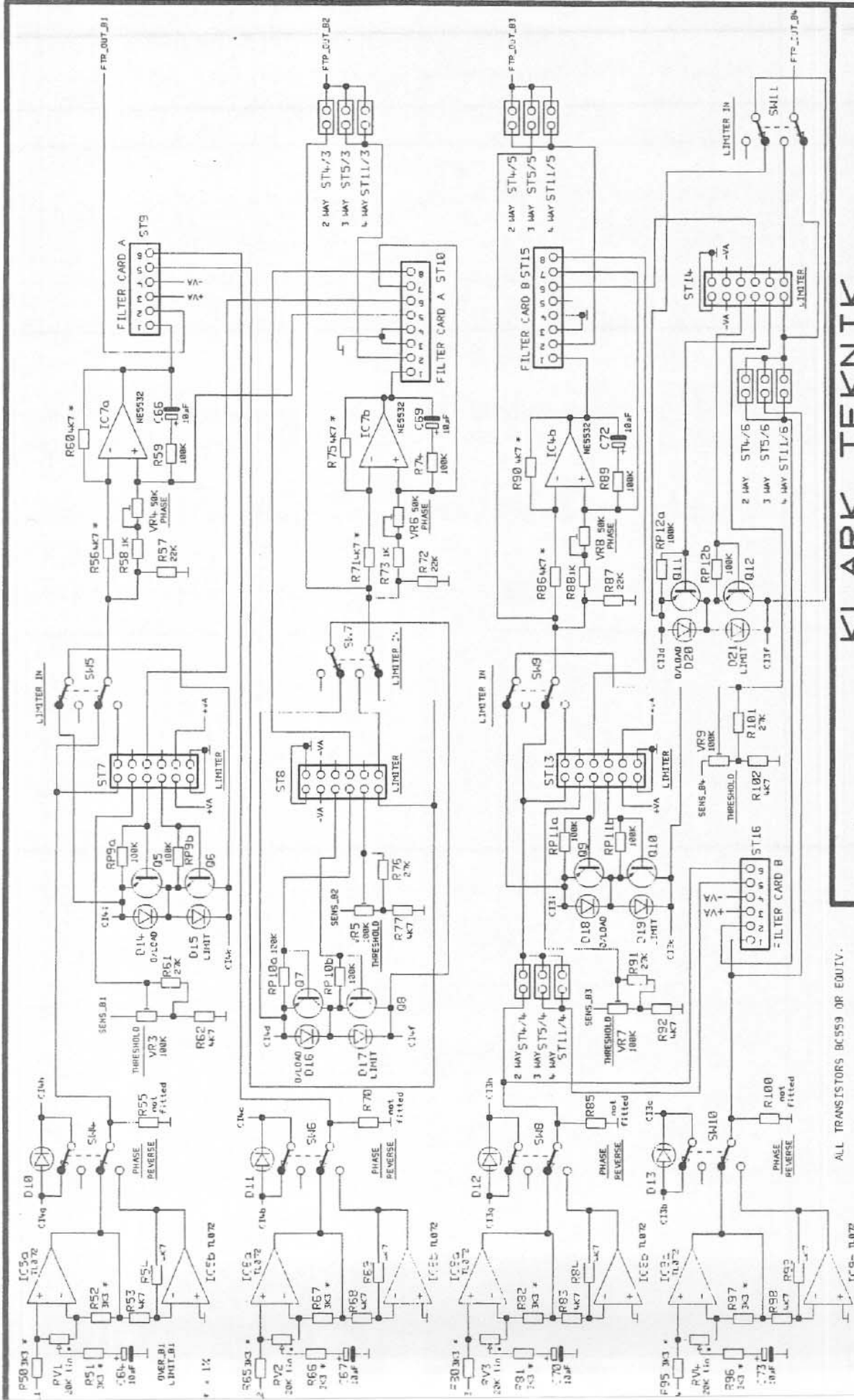




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| Drawn: DGT | Checked: | DN800 CROSSOVER INPUTS & BANDPASS FILTERS | 1 OF 10 |
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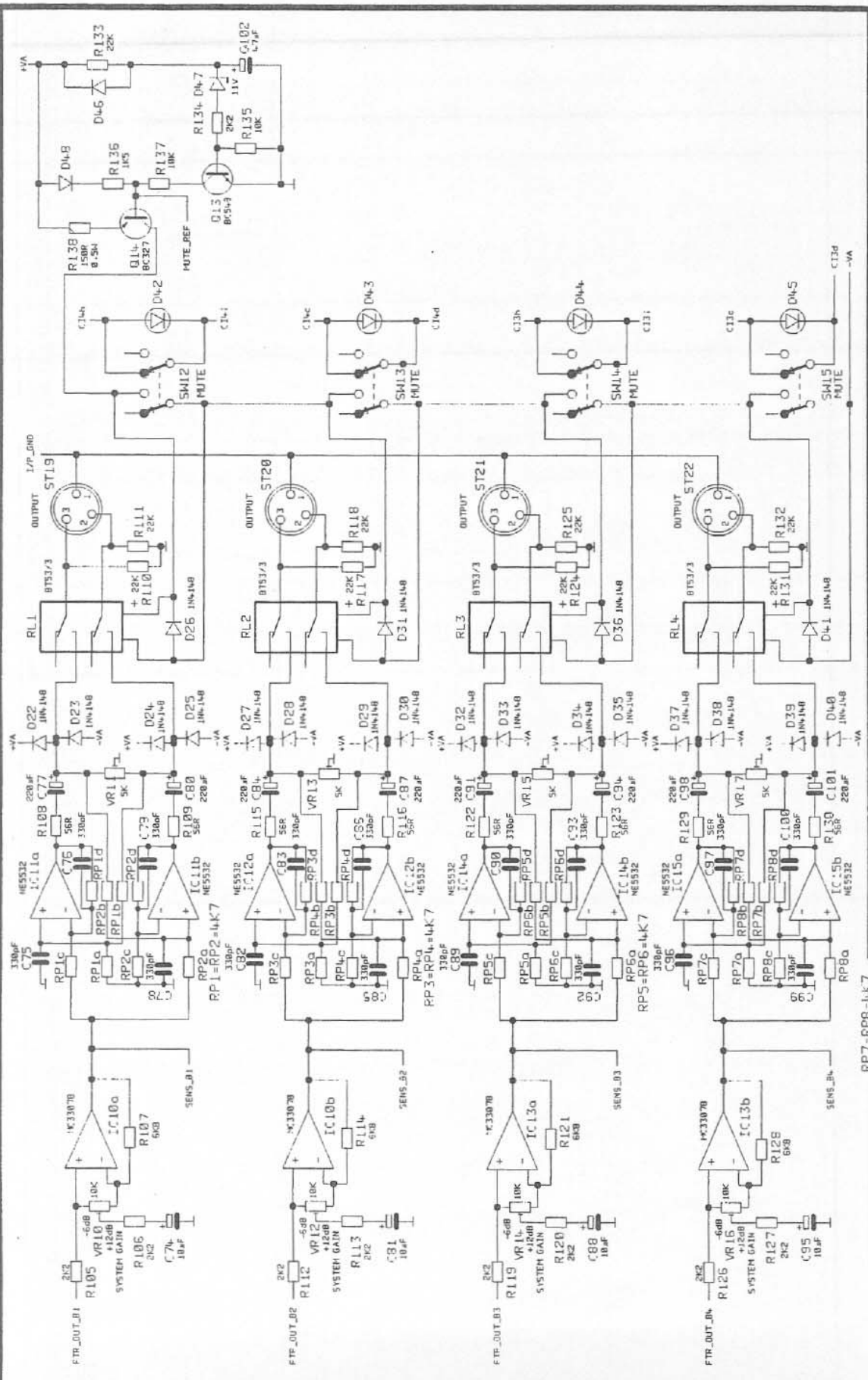
LK1 BR
R7 100R 1000P
CH45S15



ALL TRANSISTORS BC559 OR EQUITV.

KLARK TEKNIK

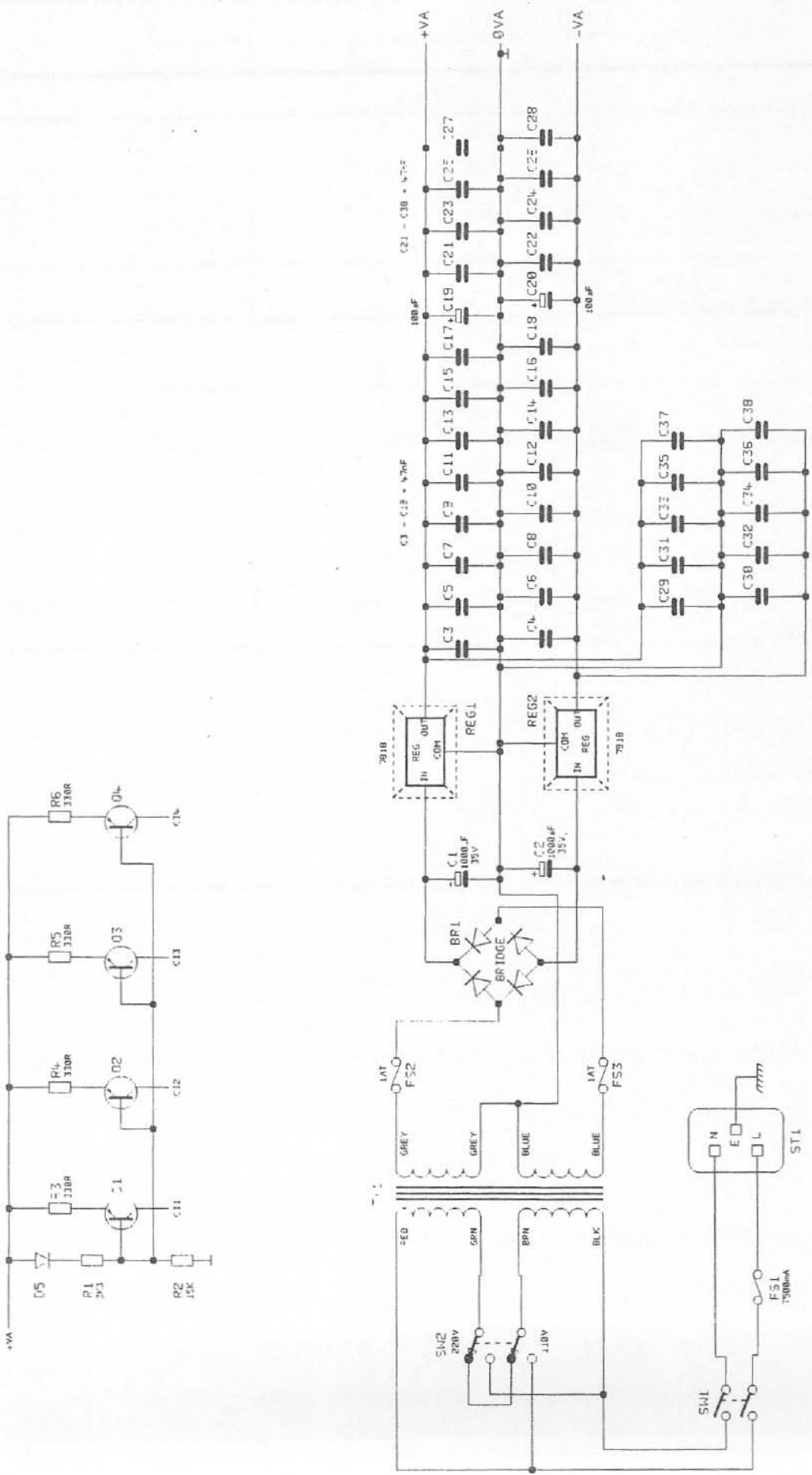
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| | | | DATE: 12.Oct.92 | |



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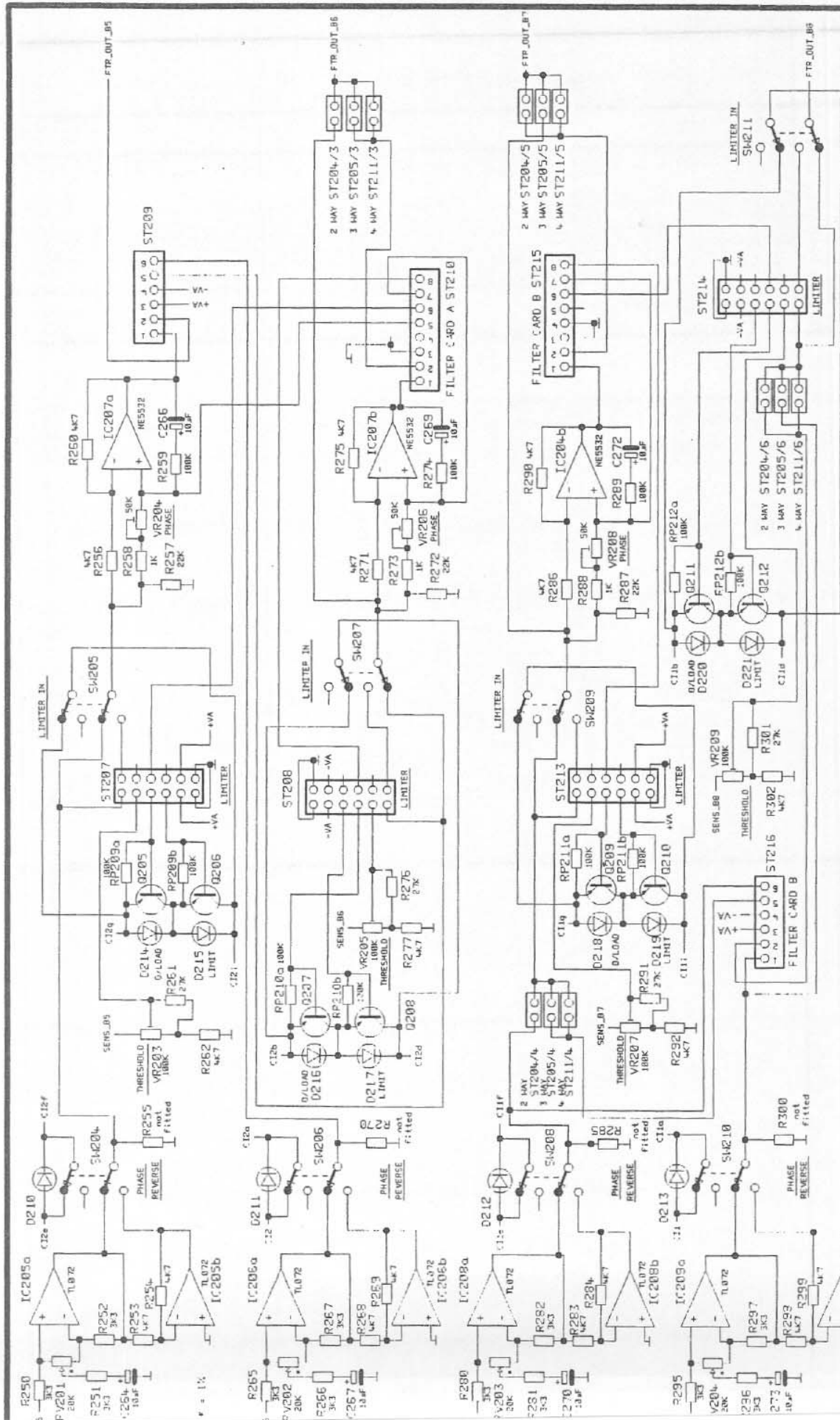
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| BOARD No. B2749/50 | iss | DWG No. DN800_3.DGM | ISSUE: 2 |
| | | DATE: 12.Oct.92 | |

RP7=RP8=4K7



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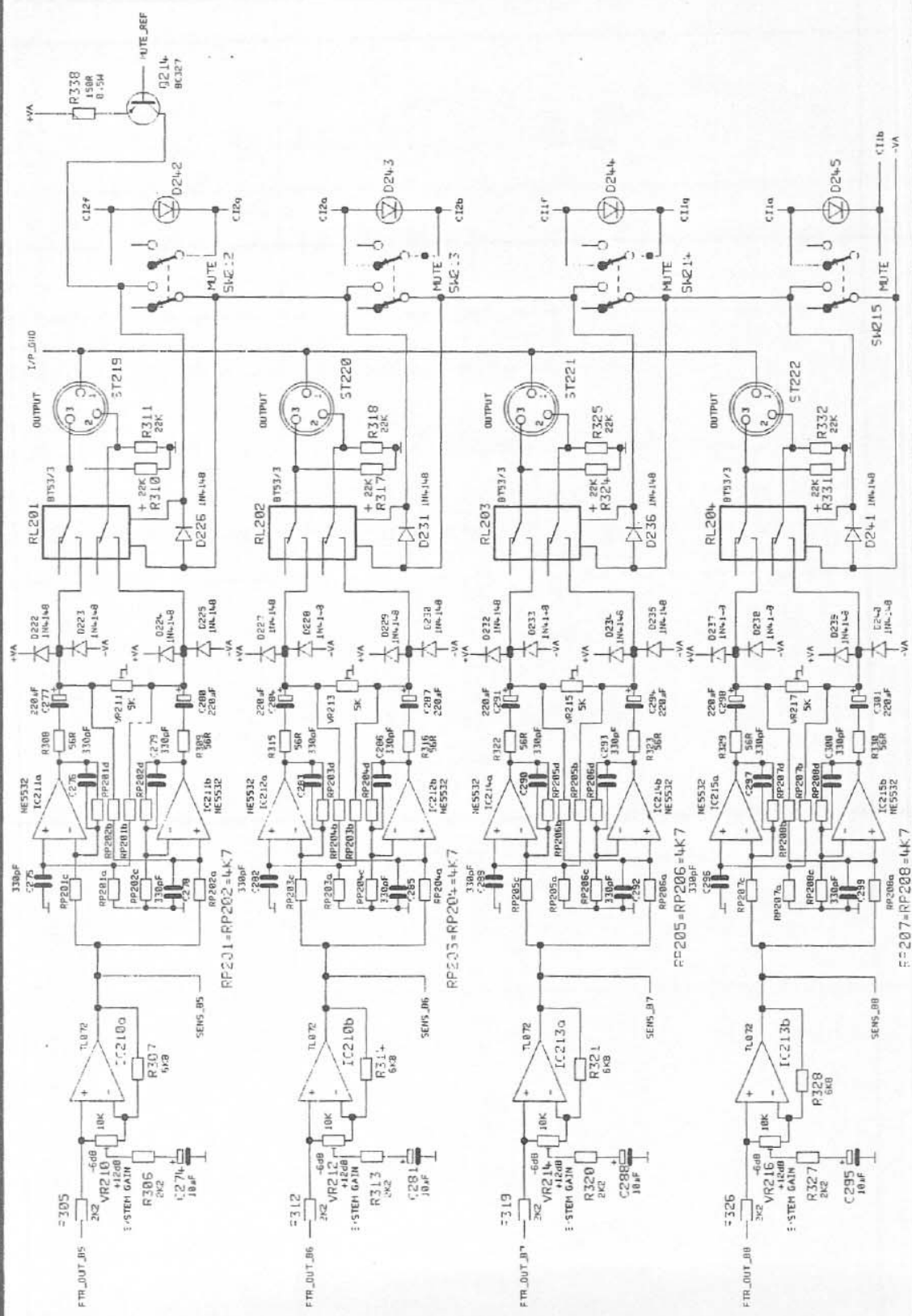
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ALL TRANSISTORS BC559 OR EQUIV.

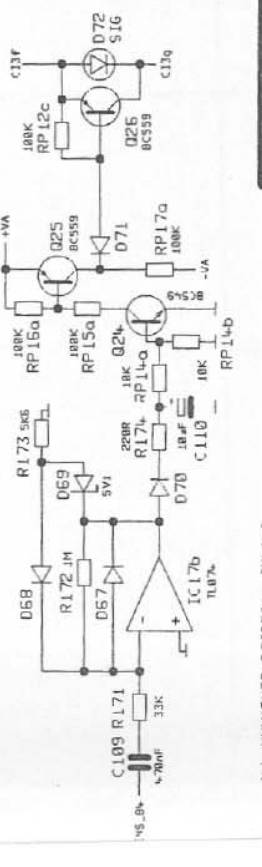
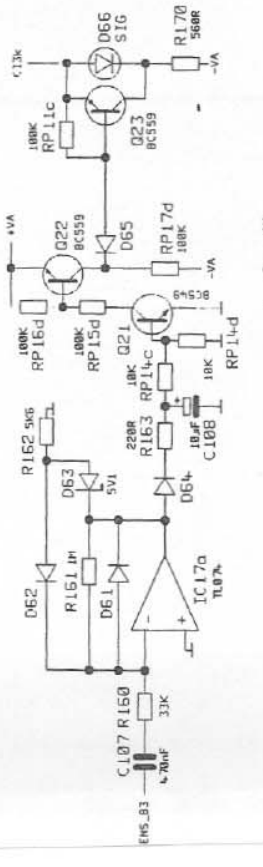
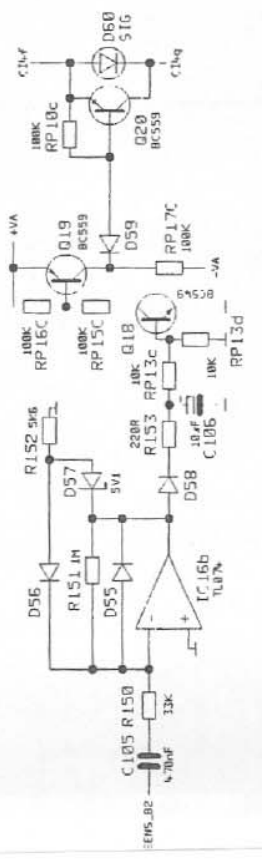
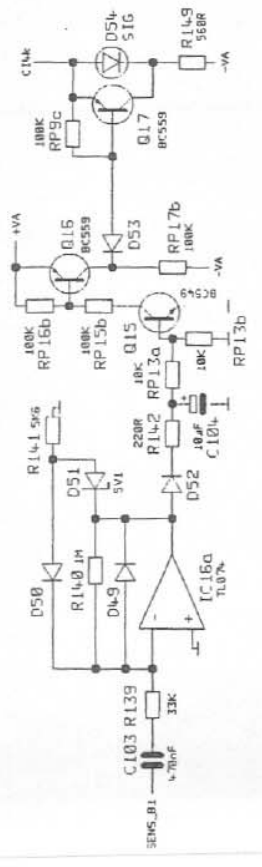
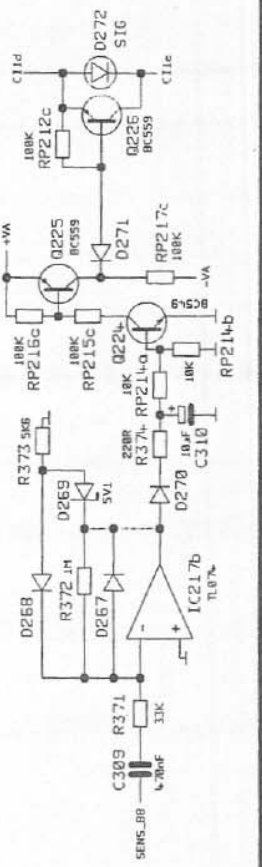
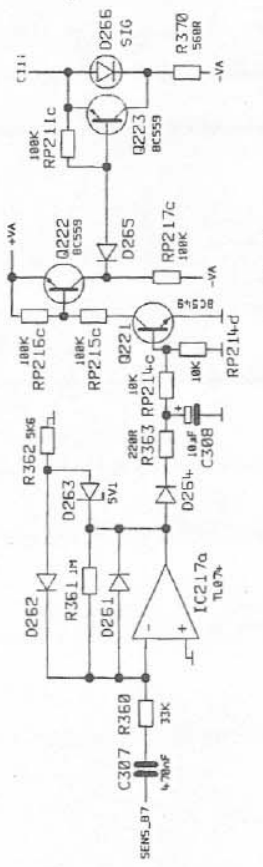
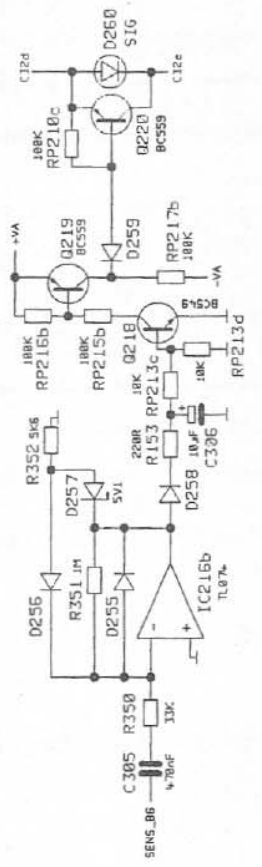
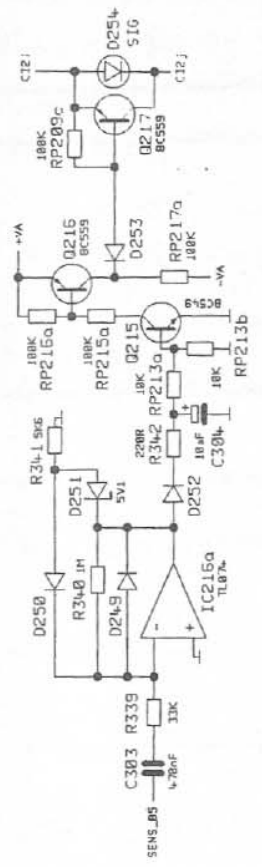
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| BOARD No. B2749/50 iss 1 | | | DWG No. DN800_5.DGM | ISSUE: 2 |
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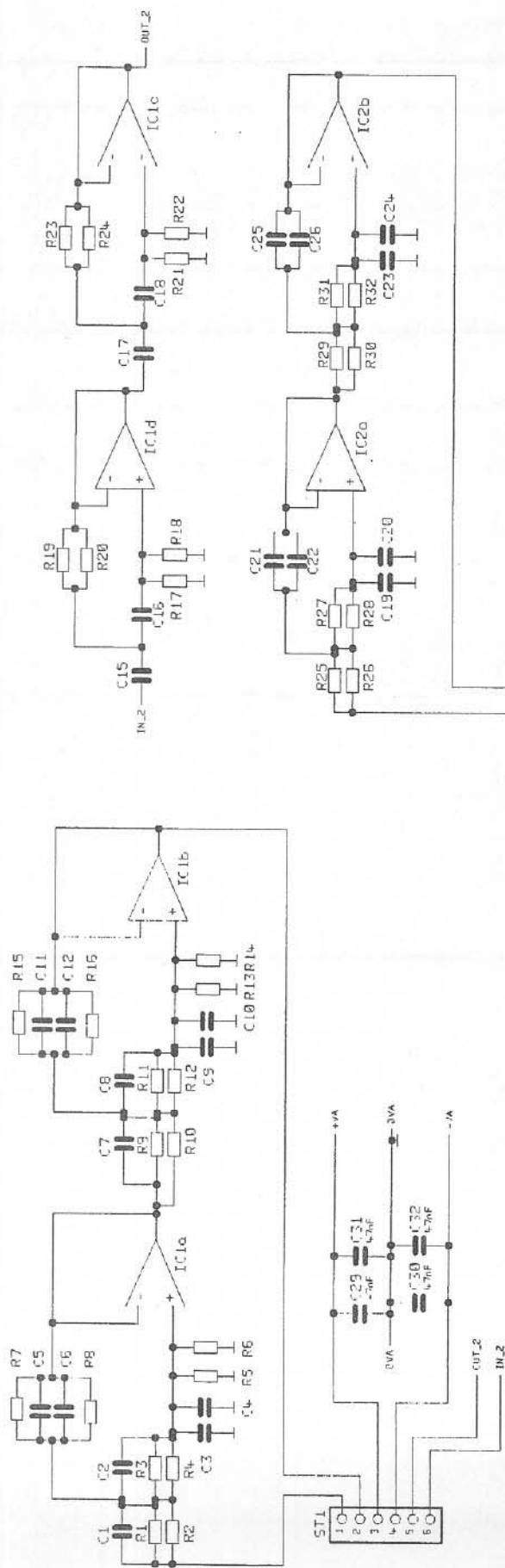
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| BOARD No. B2749/50 iss 1 | | DWG No. DN800_6.DGM | ISSUE: 2 |
| | | DATE: 12.Oct.92 | |



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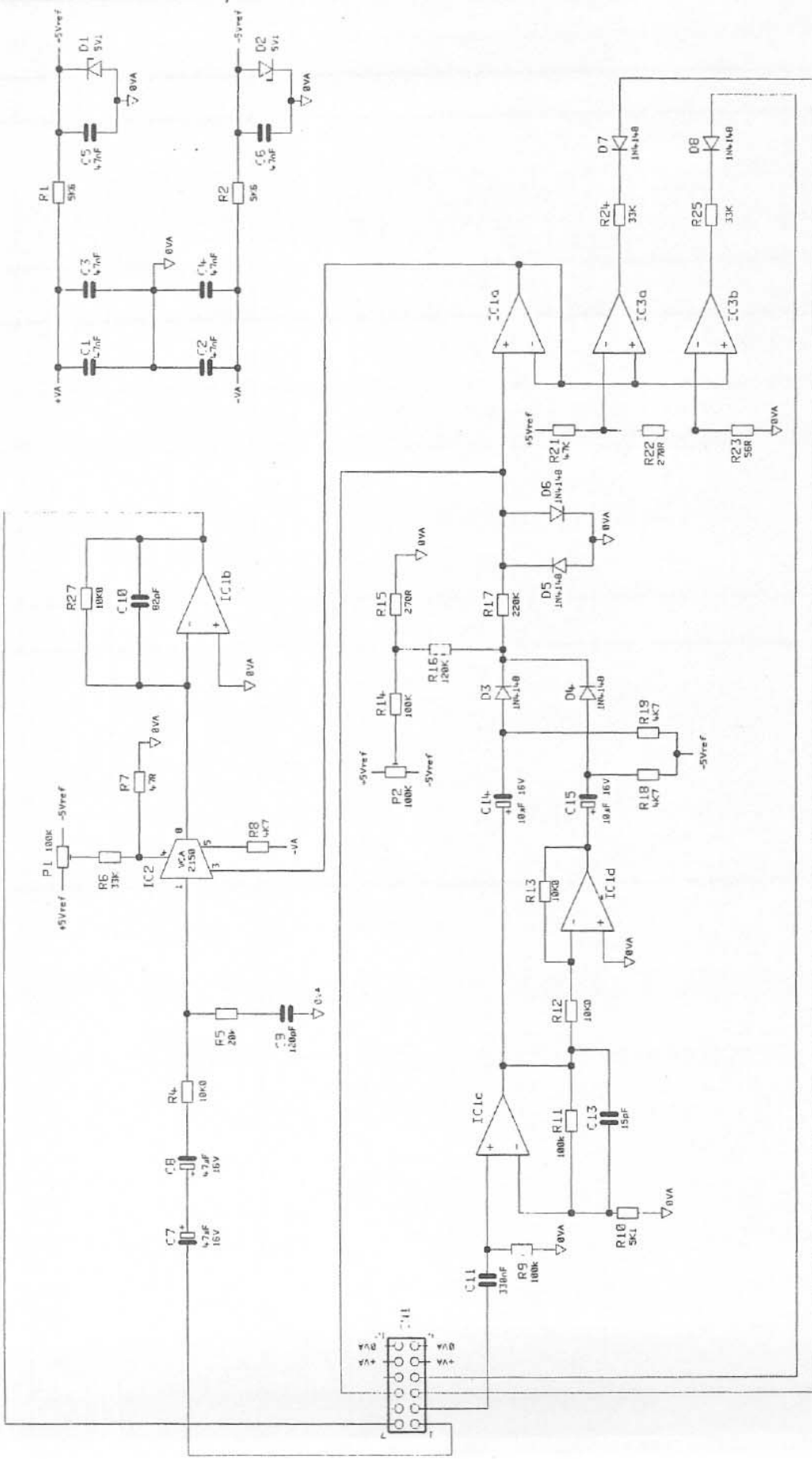
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| BOARD No. B2749/50 iss 1 | | DWG No. DN800_7.DGM | | DATE: 12.Oct.92 |



| | BAND 182 | BAND 384 |
|---|---|---|
| 2 | R1, R2, R3, R4, R9, R10, R11, R12 R17, R19, R20, R21, R23, R24 | R5, R7, R8, R13, R15, R16 R25, R26, R27, R28 R29, R30, R31, R32 |
| 3 | C4, C5, C6, C10, C11, C12 C15, C16, C17, C18 | C20, C21, C22, C24, C25, C26 C1, C2, C7, C8 |
| 4 | R1, R2, R3, R4, R9, R10, R11, R12 R17, R19, R20, R21, R23, R24 | R17, R19, R20, R21, R23, R24 |
| 5 | C4, C5, C6, C10, C11, C12 C15, C16, C17, C18 | C15, C16, C17, C18 |
| 6 | R1, R2, R3, R4, R9, R10, R11, R12 R17, R19, R20, R21, R23, R24 | R5, R7, R8, R13, R15, R16 R17, R19, R20, R21, R23, R24 |
| 7 | C4, C5, C6, C10, C11, C12 C15, C16, C17, C18 | C15, C16, C17, C18 C1, C2, C7, C8 |

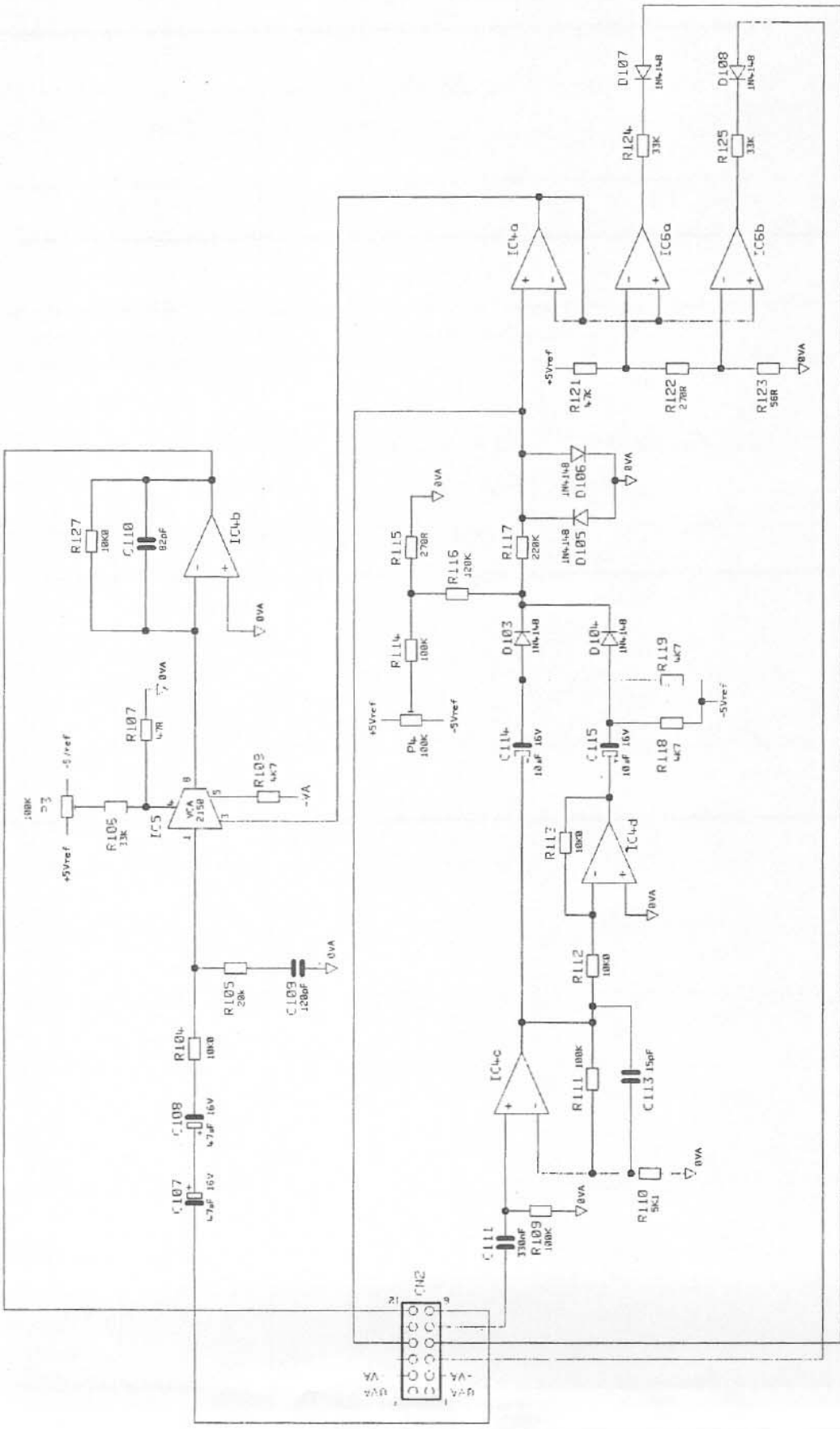
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| BOARD No. B2749/50 | | iss 1 | ISSUE: 2 | DATE: 12.Oct.92 |



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|-------------------|----------|----------------------|--------------------------|-----------------|
| Drawn: T.K.G | Checked: | DN800 CROSSOVER | LIMITER A & POWER SUPPLY | 9 OF 10 |
| BOARD No. B2747/2 | | DWG No. DN800_L1.DGM | ISSUE: 2 | DATE: 12.Oct.92 |



KLARK TEKNIK

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|-------------------|-----------|----------------------|-----------|------------------|
| Drawn : T.K.G | Checked : | DN800 CROSSOVER | LIMITER B | 10 OF 10 |
| BOARD No. B2747/2 | | DWG No. DN800_L2.DGM | ISSUE : 2 | DATE : 12.Oct.92 |