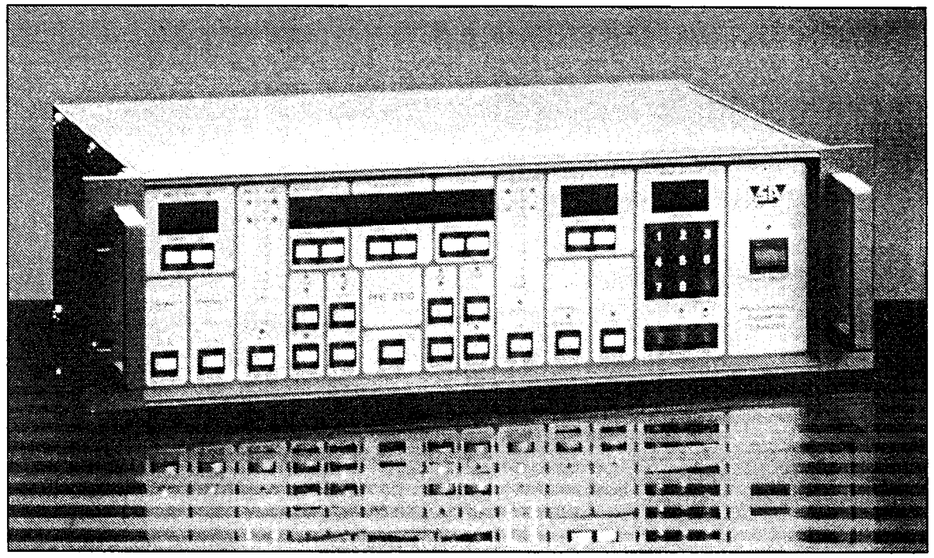
stage accompany

PPE-2410

Programmable Parametric Equaliser

SERVICE MANUAL



Contents:

1 Safety and warranty

1.1 Safety

-Warning
Inside the PPE 2410, AC voltages up to 240 V may be present !

-Connection to the mains voltage
The PPE 2410's chassis is connected to ground by the grounding conductor in the power cord. To avoid electrical shock, plug the power cord into a properly wired receptacle. When this ground connection is not present or interrupted, all accessible parts of the equaliser can cause an electrical shock.

-Fuses
To avoid fire hazard, only replace fuses by the same type and value.

-Servicing
Do not perform internal service or adjustments unless there is another person present, capable of rendering first aid and reanimation.
Try to perform all service work with mains power off. Remove mains plug to be sure that there are no internal voltages present.

1.2 Warranty

SUMMARY

Stage Accompany warrants to the original commercial purchaser of each new Stage Accompany product, from the date of purchase by the original purchaser until the end of the warranty period, that the product is free of defects in materials or workmanship.

WARRANTY PERIOD

The warranty period on all Stage Accompany products is five years from the date of the first consumer purchase, with the exception of:
- all electrical products: three years from the date of the first consumer purchase;
- cone assemblies in the loudspeaker and diaphragms in the Compact Drivers: one year from the date of the first consumer purchase;

- movable parts, such as castors, locks, handles, hinges, fans, etc: one year from the date of the first consumer purchase;
- computers and associated peripherals: six months from the date of the first consumer purchase.

HOW TO VALIDATE THE WARRANTY

To validate warranty, fill out the enclosed warranty card and return it to Stage Accompany within ten days of the purchase date. The purchaser must always keep the original bill of sale to establish the date of purchase.

ITEMS EXCLUDED FROM WARRANTY

Appeal on warranty will be voided in case :
- of defects caused by influence from the outside, accident, misuse, neglect or influence of water;
- the serial number on the warranty and/or product has been defaced, altered or removed;
- of damage due to shipment;
- of damage resulting from neglection of instructions listed in the user manual;
- of damage caused by incorrect, abnormal or abuse during delivery;
- the unit has been repaired (or shown signs of repair) by someone not authorised by Stage Accompany;
- if the warranty registration card has not been returned to Stage Accompany within 10 days of purchase;
- the original bill of sale can not be presented whenever warranty service is required;
- the cause of damage is unknown

WHAT WE WILL DO

Shipment of the product to a Stage Accompany dealer is at the risk and responsibility of the customer.
Stage Accompany will pay all labour and material expenses for all repairs covered by this warranty. Stage Accompany will not pay the cost of shipment to the Stage Accompany dealer or to the factory. However Stage Accompany will pay the return shipping charges if repairs are covered by the warranty.

CAUTION

Warranty work can only be performed at our authorised service centers or at our factory. Every repair or attempted repair by a non authorised party will void the warranty.

Stage Accompany reserves the right to alter specifications without prior notice.

3 Taking the PPE 2410 apart

In most servicing cases, it will be sufficient to remove the equalisers top panel. After this you will have access to all the boards.
First be sure that the mains plug is removed from the receptacle. Then remove the eight top panel screws and four side panel screws (fig 1). Now the top panel can be removed and the motherboard with all the plug in boards will be visible.

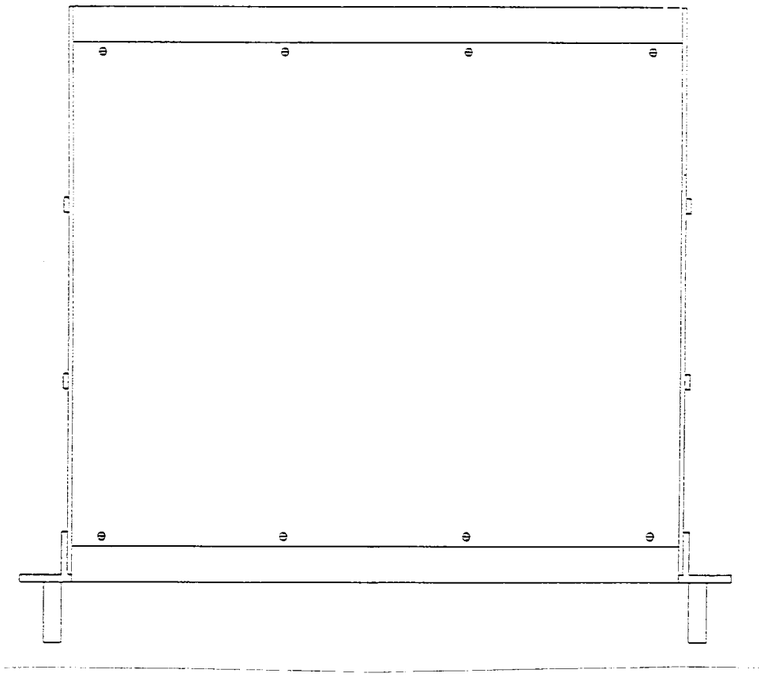


Fig 1 Top side of the PPE 2410

The plug in boards can be taken out just by pulling (fig 2).
Access to the front and input / output board can be obtained by removing the two screws of the appropriate bar at the side panels of the PPE 2410. After removing the bars the front or back panel can be

taken out.
The motherboard and the power supply board can be taken out by removing the screws that lock them to the bottom panel. For the power supply board an additional four screws that secure the power transistors have to be removed (see fig.3).

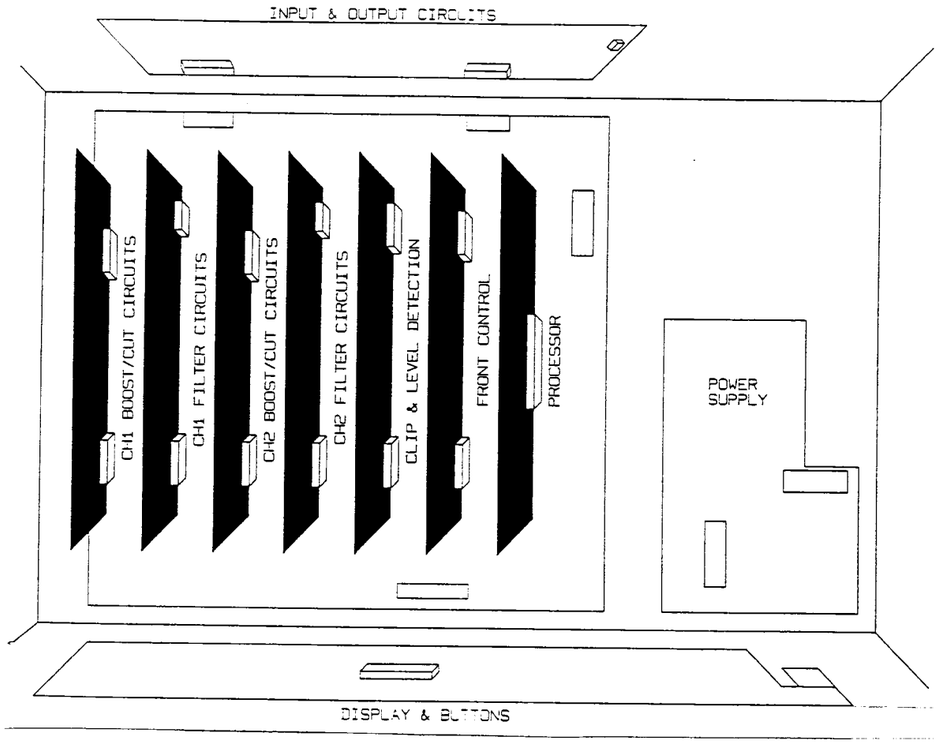


Fig 2 PPE 2410 with removed top panel

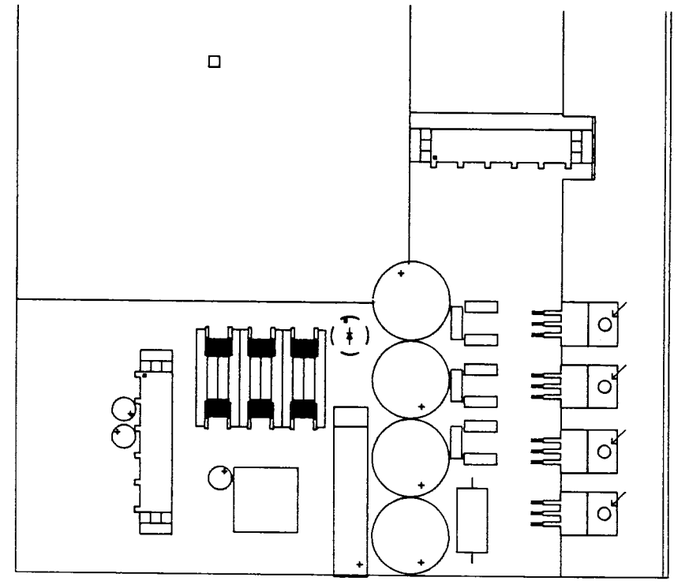


Fig 3 Power supply details

CHANNEL 1 INPUT

BYPASS

INPUT GND LIFT

TO PROCESSOR

DIGITAL ATTENUATOR

TO CLIP DETECTION

TO LEVEL DETECTION

CUT CIRCUITS

BOOST CIRCUITS

TO CLIP DETECTIO

FILTER CIRCUITS

DIGITAL ATTENUATOR

TO CLIP DETECTION

TO LEVEL DETECTION

BYPASS

TO PROCESSOR

OUTPUT GND LIFT

CHANNEL 1 OUTPUT

SANET OUT

SANET IN

SANET

SANET GND LIFT

MIDI

IN

OUT

THRU

CLIP & LEVEL DETECTION

PROCESSOR CIRCUIT

FRONT CONTROL CIRCUIT

DISPLAYS & BUTTONS

CLIP & LEVEL INFORMATION

+18V

-18V

+5V

SYSTEM GND LIFT

POWER SUPPLY

MAINS SWITCH

MAINS FILTER

MAINS

CHANNEL 2 INPUT

CHANNEL 2 OUTPUT

BASIC DIAGRAM PAGE 9

STAGE ACCOMPANY

TITLE PPE 2410 BASIC DIAGRAM

REVISIONS

DRAWN R.K.

A1 DATE 16-12-88 SHEET OF

5 Basic operation of the electronics

This chapter describes some of the key circuits of the PPE 2410. The complete circuit drawings can be found on page 18 to 44.

5.1 The input / output board

The input / output board contains the electronics for the input amplifiers, the bypass relays, the output amplifiers, the MIDI and the SAnet connections.

The input amplifier is a straightforward opamp differential amplifier.
The amplifier provides for a 3 dB gain. Common mode rejection can be trimmed with TR2 for low frequencies and with TR1 for high frequencies. See page 52 for the exact adjustment procedure. The value of R4 is three times higher than R5 to obtain the same input impedance at the + and - inputs (24kΩ each leg).

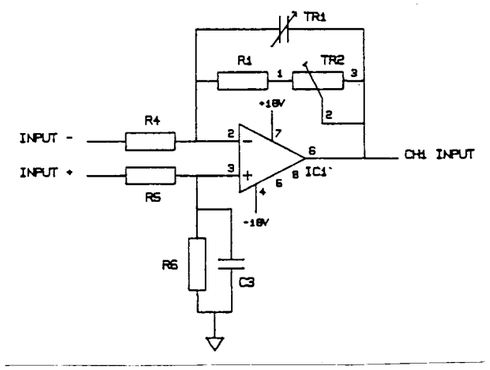


Fig 4 Input amplifier

Both inputs and outputs are equiped with relays to provide full bypass in case the power of the equaliser is turned off.
The outputs are electronically balanced and have a DC servo feedback. This feedback provides for a low output offset.
The outputs are cross-coupled so that a shortcircuit of one output results in a 6 dB extra gain on the other (transformer simulation).
Output symmetry can be adjusted with TR5 and TR6. See page 52 for the adjustment procedure.
The output board also contains the digital interfaces.
A SN75176 RS422 driver provides the SAnet interface.
MIDI is only buffered and the controller is located on the processor board

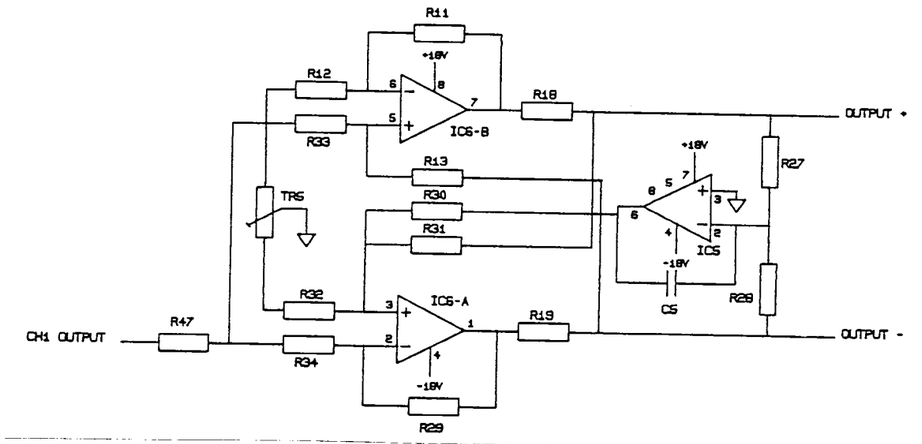


Fig 5 Output amplifier

5.2 The boost / cut board

The boost / cut board contains the electronics to supply the filters with the right amount of signal and to add the filter output to the original signal.
Each of the two channels has its own boost / cut board and figure 6 shows the basic set up.
The input level is controlled by DC1 and extra gain can be added in the feedback network around R13 and R14. The digital code at the digital input of the DAC determines the attenuation of the circuit. This level in dB can be calculated with the formula:

$$A = 20 * \log \frac{n}{4096}$$

where n is the decimal value of the bit code. When extra gain is used, add 10 or 20 dB.
Since the internal resistance of the DA converter influences the overall gain of the circuit, R13, R14 and R15 should be matched to the DA converter. Page 22 contains a table where the exact values can be found.
The DAC resistance can be measured between pins 1 and 20 after it has been removed from its socket. A condition is that you have to supply the DAC with a voltage of 12 V between pins 3 (Gnd) and pin 18 (Vdd).

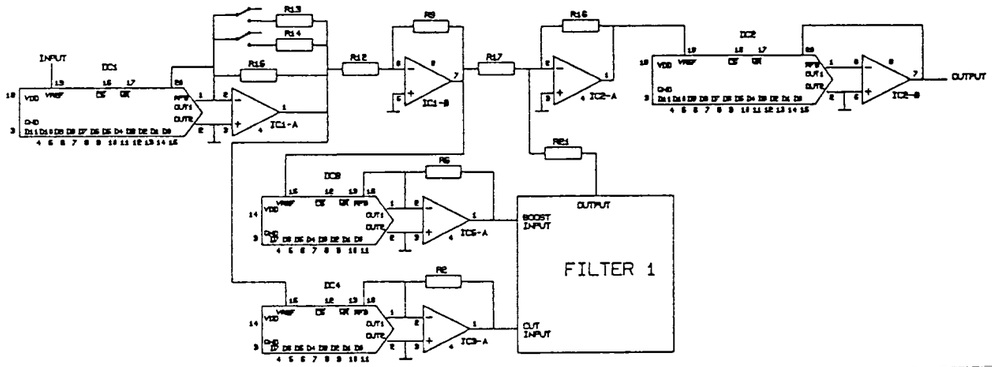


Fig. 6 Boost / cut board set up

Next the signal is fed to four DA converters which provide the cut signal for the state variable filters. In figure 6 only one (DC4) is shown for the cut signal of filter 1. This circuit can provide a gain factor of -0.89.
After inverting the signal with IC1-b, another four DA converters feed the signal for boost purposes to the filters. The boost circuit for filter 1 is shown (DC8) and this circuit can provide a gain factor of 8.44.
Here again, all the feedback resistors have to be matched to the DAC. The values can be found in the tables at page 24. The DAC resistance can be measured between pins 1 and 16 after the DAC has been removed from its socket. A power supply is not necessary.
The original signal is added with the filter outputs at the input of IC2-a. The polarity of the output signal of each of the filters determines whether the signal is going to be boosted or cut at a certain frequency. The frequency is determined by the filter settings at the filter board
The output level is controlled by DC2.

5.3 The filter board

Each channel is equiped with its own filter board and each board contains four state variable filters. Figure 7 shows the basic configuration of a state variable filter.

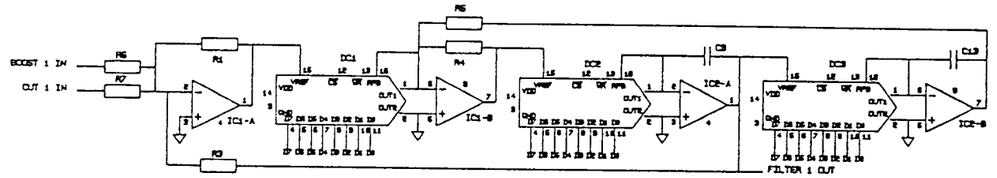


Fig.7 State variable filter with DAC's

The boost and cut inputs (from the boost/cut board) are summed at IC1-a. Next you find a circuit with 3 multiplying DAC's and multiple feedback. DC2 and DC3 are matched and determine together with C9 and C13 the center frequency of the bandpass filter. C9 and C13 are of the same value. The centre frequency is given by the formula:

$$f_c = \frac{1}{2 * \pi * R_{dac} * C}$$

where Rdac is the internal value of the DAC (which depends on the digital code present at the digital input). The DAC resistance is given by:

$$R_{dac} = \frac{256 * Rfb}{n}$$

n Represents the analogue value of the digital code (00000000 = 0 to 11111111 = 255) and Rfb is the basic resistance of the R-2R network inside the DAC. The value varies between 5 and 15 kΩ and the correct values of the capacitors can be found in the tables at page 27.

DC1 determines the Q-factor and its value is given by:

$$Q = \frac{Rdac * R3}{R1 * R4} \sqrt{\frac{R4}{R5}}$$

All resistors that should be matched to DC1 can be found in the table at page 31.

5.4 The clip and level detection board

The main function of the clip and level detection board (see schematics at page 33) is to interface analog levels to the microprocessor. There are two types of interfaces, one for level detection and one for clip detection.
For the level detection, four analogue signals (both the inputs and both the outputs) are precision rectified (Fig 8) and fed to an analogue multiplexer. After the multiplexer, each of the DC signals is converted in a digital code.

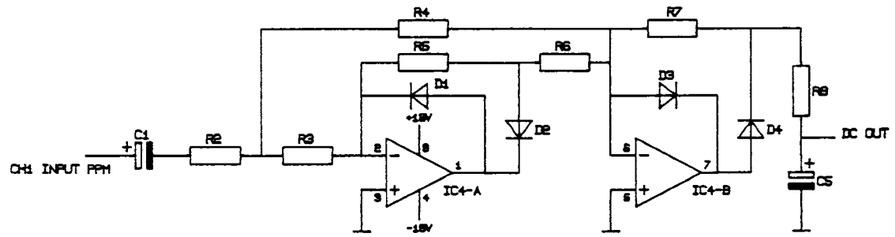


Fig.8 Precision rectifier

The AD converter is built around IC1, IC2 and IC3. After the multiplexer the signal is passed to a buffer and comparator IC3 compares the input signal with the reference signal produced by DA converter IC1. This reference level depends on the digital code produced by the processor. By means of succesive approximation, the processor determines the digital value which is closest to the analogue level with the formula:

$$D = \frac{Uin * 256}{-U_{ref}}$$

D is the analog value of the digital code (00000000 = 0 and 11111111 = 255). U_{ref} is the reference voltage (-10.24 V) adjusted with P1.
For the clip detection, all possible places where an overload can occur are sensed and fed to comparators. These are:

- The two inputs of the equaliser (an overload can occur when 10 or 20 dB extra gain is used).
- The four boost outputs of each channel (each filter can provide 19.5 dB of gain).

- The filter output summing point (each filter can provide a small amount of boost at the same frequency causing the output to clip).

All signals are single sided rectified and attenuated 6 dB before they are fed to the comparator. The comparator has outputs on logic level and are interfaced to the data bus through 74HC244 buffers. IC15 latches the control signals for bypass, input gain and the multiplexer.

5.5 The processor board

The processor circuit (see page 35) contains a microprocessor, power down protection, memory and the MIDI controller.
The processor has three different kinds of on board memory. IC4 is an EPROM which contains the software for starting the processor, testing the other memories and downloading the system software.
IC3, a Flash EPROM, contains the system software and can be programmed through SAnet without removing it.
IC5 is a RAM which contains program variables, e.g. the equaliser control settings. This IC is provided with battery backup to save the settings when the mains power is switched off. The battery has a life time of approx. 10 years.
IC7 and IC8 are protection IC's to save memory contents when power is switched on and off.
IC6 is the MIDI controller which is the direct interface between MIDI and the processor.
On the PCB, R7 and C24 are omitted and D1 is replaced by a 0 Ω resistor. With these components, the programming voltage of the flash EPROM can be influenced.

5.6 The front board

The front board (see page 37 & 38) contains the user interfaces: buttons and displays.
Both the readout of the buttons and the display drive are multiplexed.
The buttons are scanned in the following way:
All keyrow signals are normally high. Keycol 0 to 7 are normally pulled 'high' by the resistor network A6. To read a row of switches, its keyrow input is made 'low' by the processor. Every button that is pushed causes a shortcircuit between its row and its column so all of the columns of the activated switches are pulled low. Unactivated switches leave their column high. All keycol levels are read by the processor, the next keyrow is made 'low' and the same procedure follows. By making all the keyrow signals subsequently low, all the buttons are scanned.
The displays are driven in a similar way. The control logic on the front control board loads the data for a certain column into the shift registers IC3, IC4, IC7 and IC1. After this is finished, demultiplexer IC9 selects the right column. The registers are loaded again and the next column is activated.

5.7 The front control board

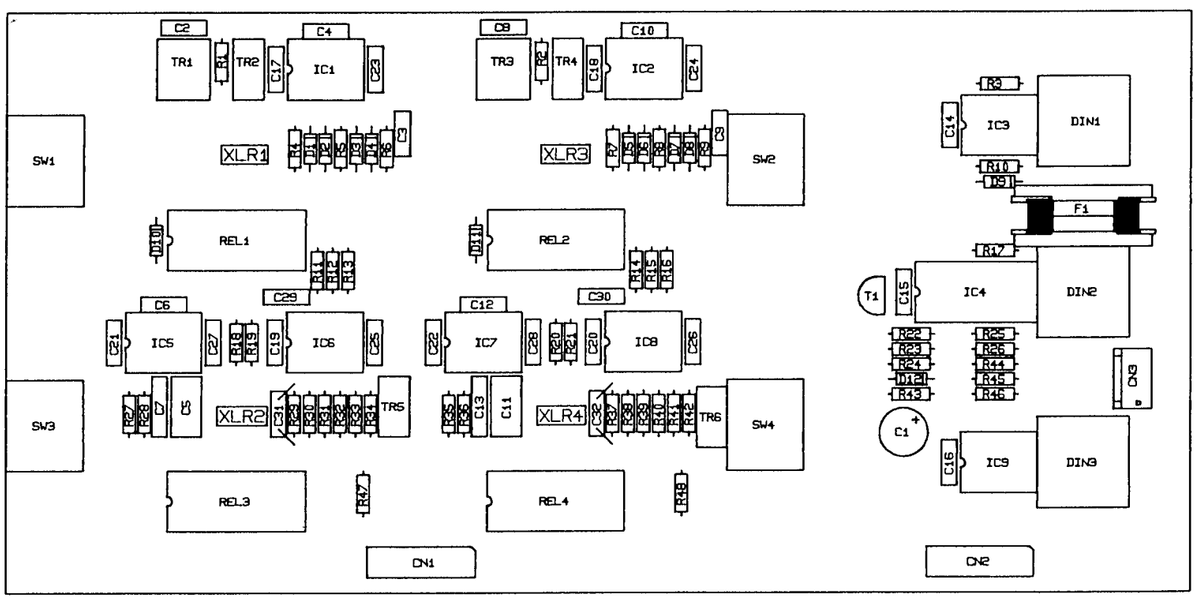
The front control board contains the drive electronics for the displays on the front board and the circuitry to read the position of the switches.
All information for the displays is sent serially to the front board. Each frame contains the information for one column (32 bits). Each time data is written to a certain column of leds or displays, a read and a write cycle is performed.
In the read cycle, the "video int" level is low and the display data is stored by the processor into RAM IC9. The processor adress buss is passed to the RAM through IC1 and IC2. The data contains 32 bits that are divided over 8 nibbles. The data is stored into IC9 through IC10-A.
In the write cycle, "video int" is high and display control is taken over completely by the control circuit. The RAM nibbles are subsequently loaded into IC11 and serially transmitted to the front. The end of the cycle is detected by IC5.
The readout circuit for the switches comprehenses IC12, IC13 and IC14. The keybuf signals are normally high. To read a row of switches, one of the keybuf signals is made low by the processor. The output of IC13 goes low and the keycol byte is transferred to the data bus.

5.8 The mother board

On the mother board all interconnections between the various PCB's are made.
It also contains the decoding logic for various control and chip enable signals.

5.9 The power supply board

The power supply (page 43 and 44) is a straightforward regulated supply with 78 and 79 series regulators.
The 5 volt supply (mainly for the digital circuitry) is extended with a power transistor to provide for a higher current capability. Its output is filtered to eliminate processor noise out of the supply and mains noise out of the processor circuit.



PAGE 18 INPUT / OUTPUT BOARD

F1 250MAT
+5
SANET 5V
SANET+
SANET-
SANET GND
I/O
DATA
IC9 SN75176BP
VCC
GND
DE
RE
D
R
A
B

IC4-D 7407
IC4-E 7407
IC4-F 7407

C1 100U 35V
R43 221E
D12 1N4148
R23 3K32
R22 3K32
R24 3K32
T1 BC557B

IC3 6N138
NC
ANOD
CATH
NC
VCC
VB
VO
GND
R3 10K0
R10 221E
D9 1N4148
DIN1
MIDI IN
R26 221E
R44 221E
IC4-B 7407
R25 221E
R17 221E
DIN2
MIDI OUT
IC4-A 7407
R45 221E
R46 221E
DIN3
MIDI THRU
IC4-C 7407

CN3
SANET-
SANET+
SANET 5V
SANET GND

CH1 BYPASS
D10 1N4148
XLR1
SW1
REL1
D1 1N4148
D3 1N4148
D2 1N4148
D4 1N4148
R4 30K1
R5 10K0
R1 41K2
TR1 1-8P
C2
TR2 2K 10T
IC1 SS34AN
C4 22P
C3 47P
R6 14K0
CH1 INPUT
CH1 OUTPUT
R11 10K0
C29 33P
R12 9K0
R33 10K
R18 51E1
IC6-B NE5532AN
R13 10K0
R30 1M00
R31 10K0
R32 9K05
IC6-A NE5532AN
R19 51E1
R47 2K67
R34 10K0
C31 10P
R29 10K0
TR5 2K 10T
C6 22P
IC5 TL071
C5 470N
R27 1K00
R28 1K00
C7
CH1 BYPASS
REL3
XLR2
SW3

CH2 BYPASS
D11 1N4148
XLR3
SW2
REL2
D6 1N4148
D8 1N4148
D5 1N4148
D7 1N4148
R7 30K1
R8 10K0
R2 41K2
TR3 1-8 PF
C8
TR4 2K 10T
IC2 NE5534AN
C10 22P
C9 47P
R9 14K0
CH2 INPUT
CH2 OUTPUT
R14 10K0
C30 33P
R15 9K05
R41 10K0
R20 51E1
IC8-B NE5532AN
R16 10K0
R38 1M00
R39 10K0
R40 9K05
IC8-A NE5532AN
R48 2K67
R42 10K0
R21 51E1
C32 10P
R37 10K0
TR6 2K 10T
C12 22P
IC7 TL071
C11 470N
R35 1K00
R36 1K00
C13
CH2 BYPASS
REL4
XLR4
SW4

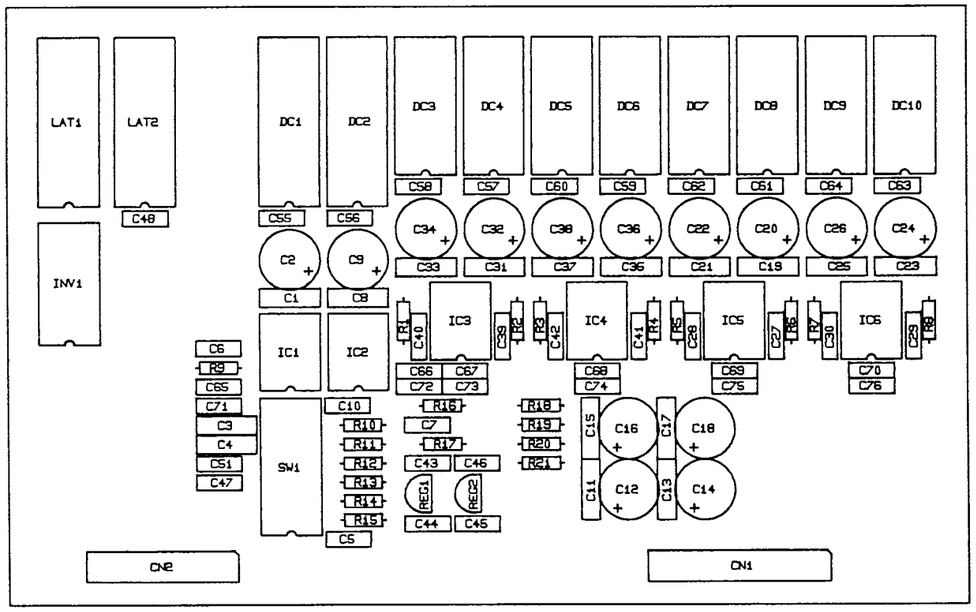
CN1
+18V
CH2 INPUT
CH1 INPUT
-18V
CH2 OUTPUT
CH1 OUTPUT

+5V
C14-16 100N
-18V
C23-28 100N
C17-22 100N

CN2
I/O
CH1 BYPASS
MIDI IN
+6
DATA
CH2 BYPASS
MIDI OUT

INPUT / OUTPUT BOARD
PAGE 19

STAGE ACCOMPANY
TITLE: PRE 8410 INPUT/OUTPUT CIRCUIT
REVISIONS
DRAWN: R.K.
A1
DATE 30-11-88
SHEET OF



PAGE 20 BOOST / CUT BOARD

R13, R14, R15 SEE GAIN RESISTOR TABLE

SW1-A CD4053BE

SW1-B CD4053BE

SW1-C CD4053BE

SW1-D CD4053BE

-5V +5V

INPUT PPM

+10 DB

0 DB

R11 10K0

R10 10K0

R13

R14

R15

C4 100N

C3 100N

C5 33P

INPUT

C1 100N

C2 100U 35V

+3V

INPDAC

DC1 AD7545JN

IC1-A NE5532AN

-18V

R12 10K0

C6 10P

R9 10K0

IC1-B NE5532AN

R17 10K0

C7 10P

R16 10K0

IC2-A NE5532AN

OUTPUT CLIP

C8 100N

C9 100U 35V

OUTPDAC

DC2 AD7545

C10 10P

IC2-B NE5532AN

OUTPUT OUTPUT PPM

C31 100N

C32 100U 35V

CUT 1

DC4 SA1010

C39 10P

R2

R2 SEE CUT RESISTOR TABLE

IC3-A NE5532AN

CUT 1 OUT

C33 100N

C34 100U 35V

CUT 2

DC3 SA1010

C40 10P

R1

R1 SEE CUT RESISTOR TABLE

IC3-B NE5532AN

CUT 2 OUT

C35 100N

C36 100U 35V

CUT 3

DC6 SA1010

C41 10P

R4

R4 SEE CUT RESISTOR TABLE

IC4-A NE5532AN

CUT 3 OUT

C37 100N

C38 100U 35V

CUT 4

DC5 SA1010

C42 10P

R3

R3 SEE CUT RESISTOR TABLE

IC4-B NE5532AN

CUT 4 OUT

CN2

C19 100N

C20 100U 35V

BOOST 1

DC8 SA1010

27 10P

R6

R6 SEE BOOST RESISTOR TABLE

IC5-A NE5532AN

BOOST 1 OUT

C21 100N

C22 100U 35V

BOOST 2

DC7 SA1010

28 10P

R5

R5 SEE BOOST RESISTOR TABLE

IC5-B NE5532AN

BOOST 2 OUT

C23 100N

C24 100U 35V

BOOST 3

DC10 SA1010

C29 10P

R8

R8 SEE BOOST RESISTOR TABLE

IC6-A NE5532AN

BOOST 3 OUT

C25 100N

C26 100U 35V

BOOST 4

DC9 SA1010

30 10P

R7

R7 SEE BOOST RESISTOR TABLE

IC6-B NE5532AN

BOOST 4 OUT

C55-64 100N

C65-70 100N

C71-76 100N

R21 3K01

C11 100N

C12 100U 35V

FILTER 1 IN

R20 3K01

C13 100N

C14 100U 35V

FILTER 2 IN

R19 3K01

C15 100N

C16 100U 35V

FILTER 3 IN

R18 3K01

C17 100N

C18 100U 35V

FILTER 4 IN

INV1-C 74HC04

INV1-D 74HC04

INV1-E 74HC04

INV1-F 74HC04

LAT1 74HC373

LAT2 74HC373

DACS LSB

DACS MSB

INV1-A 74HC04

INV1-B 74HC04

INPDAC

OUTPDAC

BOOST / CUT BOARD
PAGE 21

REG1 78L05

REG2 79L05

C43 100N

C44 100N

C47 100N

C48 100N

C45 100N

C46 100N

C51 100N

CN1

FILTER 3 IN
FILTER 1 IN
BOOST 3 OUT
BOOST 1 OUT
CUT 3 OUT
CUT 1 OUT
OUTPUT
OUTPUT CLIP
INPUT PPM
-18V

FILTER 4 IN
FILTER 2 IN
BOOST 4 OUT
BOOST 2 OUT
CUT 4 OUT
CUT 2 OUT
INPUT
+18V
0 DB
+10 DB

STAGE ACCOMPANY

TITLE PPE-8418 BOOST/CUT CIRCUIT

REVISIONS

DRAWN: R.K.

A1

DATE 18-12-89

SHEET OF

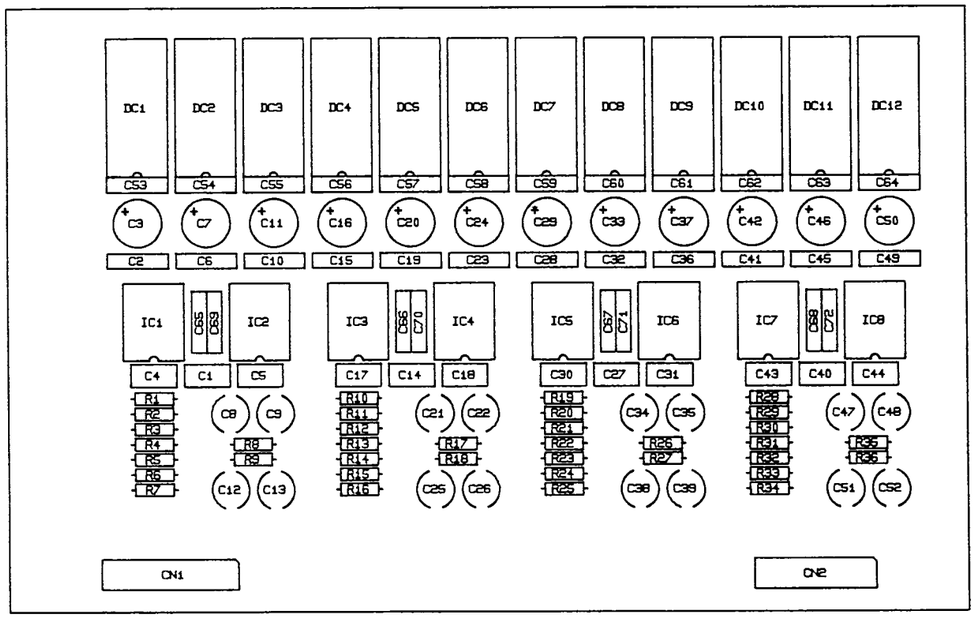
PPE-2410 resistor values for input gain circuit using AD7545JN

DAC resistance range (Ω)	R13 (Ω)	R14 (Ω)	R15 (Ω)
5000 - 5250	23700	5620	51100
5250 - 5500	24900	5900	53600
5500 - 5750	26100	6190	56200
5750 - 6000	27400	6490	59000
6000 - 6250	28000	6810	61900
6250 - 6500	29400	6980	63400
6500 - 6750	30900	7320	66500
6750 - 7000	31600	7500	69800
7000 - 7250	33200	7870	71500
7250 - 7500	34000	8060	73200
7500 - 7750	35700	8450	76800
7750 - 8000	36500	8660	78700
8000 - 8250	37400	8870	82500
8250 - 8500	39200	9310	84500
8500 - 8750	40200	9530	86600
8750 - 9000	41200	9760	88700
9000 - 9250	42200	10000	90900
9250 - 9500	43200	10500	93100
9500 - 9750	44200	10700	97600
9750 - 10000	45300	11000	100000
10000 - 10250	46400	11300	102000
10250 - 10500	47500	11500	105000
10500 - 10750	48700	11800	107000
10750 - 11000	49900	12100	110000
11000 - 11250	51100	12400	113000
11250 - 11500	52300	12700	115000
11500 - 11750	53600	13000	118000
11750 - 12000	54900	13000	118000
12000 - 12250	56200	13300	121000
12250 - 12500	57600	13700	124000
12500 - 12750	59000	14000	127000
12750 - 13000	59000	14300	130000
13000 - 13250	60400	14700	133000
13250 - 13500	61900	14700	133000
13500 - 13750	63400	15000	137000
13750 - 14000	64900	15400	140000
14000 - 14250	64900	15800	143000
14250 - 14500	66500	15800	143000
14500 - 14750	68100	16200	147000
14750 - 15000	69800	16500	150000
15000 - 15250	69800	16900	150000
15250 - 15500	71500	16900	154000
15500 - 15750	73200	17400	158000

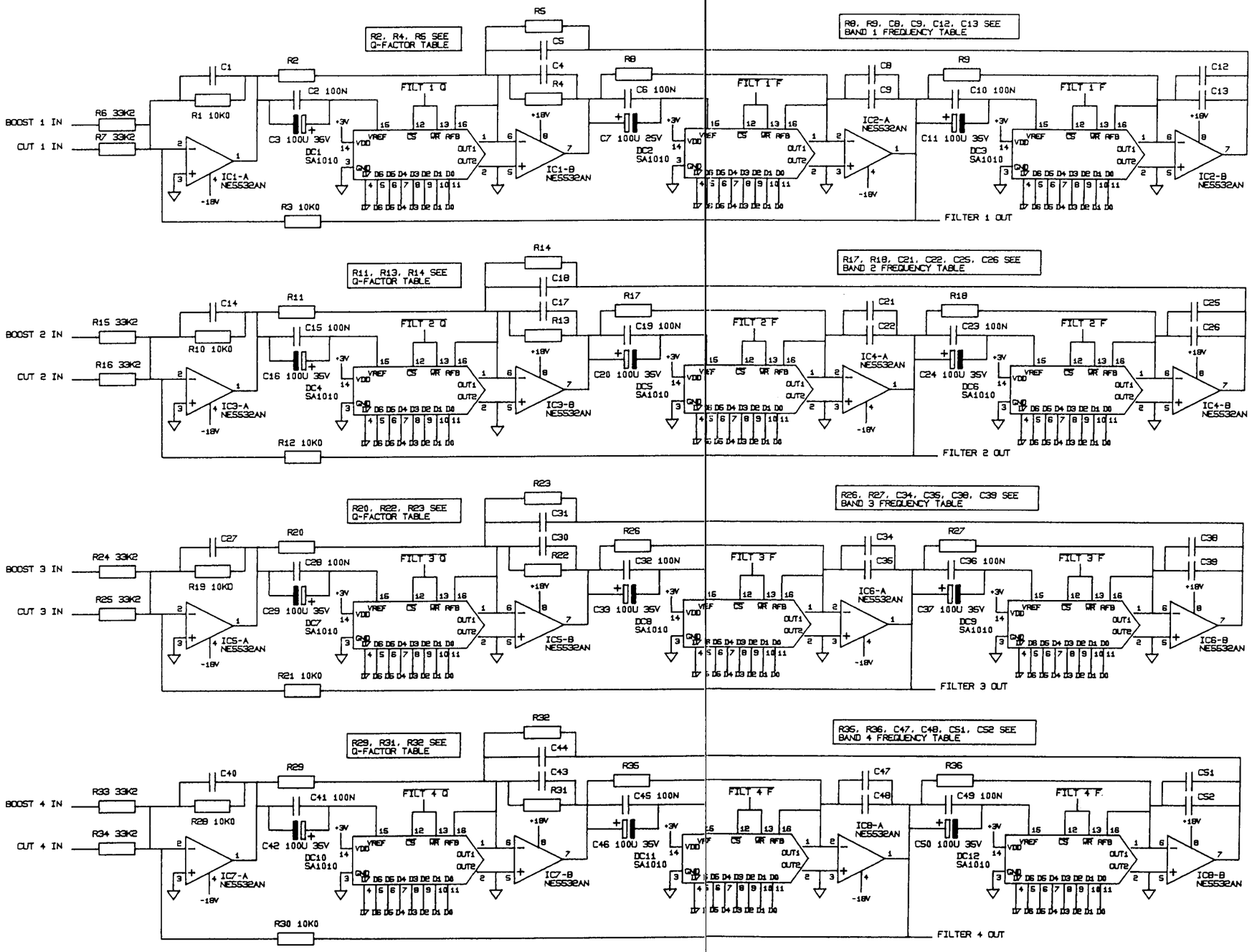
15750 - 16000	73200	17800	158000
16000 - 16250	75000	17800	162000
16250 - 16500	76800	18200	165000
16500 - 16750	76800	18200	165000
16750 - 17000	78700	18700	169000
17000 - 17250	78700	19100	174000
17250 - 17500	80600	19100	174000
17500 - 17750	82500	19600	178000
17750 - 18000	82500	20000	178000
18000 - 18250	84500	20000	182000
18250 - 18500	84500	20500	182000
18500 - 18750	86600	20500	187000
18750 - 19000	86600	21000	191000
19000 - 19250	88700	21000	191000
19250 - 19500	90900	21500	196000
19500 - 19750	90900	21500	196000
19750 - 20000	93100	22100	200000

Resistor values for PPE 2410 boost and cut circuits using SA1010 or AD7524JN

DAC resistance range (Ω)	R5, R6, R7, R8 (Ω)	R1, R2, R3, R4 (Ω)
5000 - 5250	43200	4640
5250 - 5500	45300	4870
5500 - 5750	47500	4990
5750 - 6000	49900	5230
6000 - 6250	52300	5490
6250 - 6500	53600	5760
6500 - 6750	56200	5900
6750 - 7000	57600	6190
7000 - 7250	60400	6340
7250 - 7500	61900	6650
7500 - 7750	64900	6810
7750 - 8000	66500	7150
8000 - 8250	68100	7320
8250 - 8500	71500	7500
8500 - 8750	73200	7680
8750 - 9000	75000	8060
9000 - 9250	76800	8250
9250 - 9500	78700	8450
9500 - 9750	82500	8660
9750 - 10000	84500	8870
10000 - 10250	86600	9090
10250 - 10500	88700	9310
10500 - 10750	90900	9530
10750 - 11000	93100	9760
11000 - 11250	95300	10000
11250 - 11500	95300	10200
11500 - 11750	97600	10500
11750 - 12000	100000	10700
12000 - 12250	102000	11000
12250 - 12500	105000	11000
12500 - 12750	107000	11300
12750 - 13000	110000	11500
13000 - 13250	110000	11800
13250 - 13500	113000	12100
13500 - 13750	115000	12100
13750 - 14000	118000	12400
14000 - 14250	121000	12700
14250 - 14500	121000	13000
14500 - 14750	124000	13000
14750 - 15000	127000	13300



PAGE 25 FILTER BOARD


R2, R4, R5 SEE Q-FACTOR TABLE
R8, R9, C8, C9, C12, C13 SEE BAND 1 FREQUENCY TABLE
BOOST 1 IN
CUT 1 IN
R6 33K2
R7 33K2
R1 10K0
R2
R3 10K0
R4
R5
R8
C1
C2 100N
C3 100U 36V
C4
C5
C6 100N
C7 100U 25V
C8
C9
C10 100N
C11 100U 35V
C12
C13
FILT 1 Q
FILT 1 F
DC1 SA1010
DC2 SA1010
DC3 SA1010
IC1-A NE5532AN
IC1-B NE5532AN
IC2-A NE5532AN
IC2-B NE5532AN
+3V
-18V
+18V
FILTER 1 OUT
R11, R13, R14 SEE Q-FACTOR TABLE
R17, R18, C21, C22, C25, C26 SEE BAND 2 FREQUENCY TABLE
BOOST 2 IN
CUT 2 IN
R15 33K2
R16 33K2
R10 10K0
R11
R12 10K0
R13
R14
R17
R18
C14
C15 100N
C16 100U 35V
C17
C18
C19 100N
C20 100U 35V
C21
C22
C23 100N
C24 100U 35V
C25
C26
FILT 2 Q
FILT 2 F
DC4 SA1010
DC5 SA1010
DC6 SA1010
IC3-A NE5532AN
IC3-B NE5532AN
IC4-A NE5532AN
IC4-B NE5532AN
FILTER 2 OUT
R20, R22, R23 SEE Q-FACTOR TABLE
R26, R27, C34, C35, C38, C39 SEE BAND 3 FREQUENCY TABLE
BOOST 3 IN
CUT 3 IN
R24 33K2
R25 33K2
R19 10K0
R20
R21 10K0
R22
R23
R26
C27
C28 100N
C29 100U 35V
C30
C31
C32 100N
C33 100U 35V
C34
C35
C36 100N
C37 100U 35V
C38
C39
FILT 3 Q
FILT 3 F
DC7 SA1010
DC8 SA1010
DC9 SA1010
IC5-A NE5532AN
IC5-B NE5532AN
IC6-A NE5532AN
IC6-B NE5532AN
FILTER 3 OUT
R29, R31, R32 SEE Q-FACTOR TABLE
R35, R36, C47, C48, C51, C52 SEE BAND 4 FREQUENCY TABLE
BOOST 4 IN
CUT 4 IN
R33 33K2
R34 33K2
R28 10K0
R29
R30 10K0
R31
R32
R35
C40
C41 100N
C42 100U 35V
C43
C44
C45 100N
C46 100U 35V
C47
C48
C49 100N
C50 100U 35V
C51
C52
FILT 4 Q
FILT 4 F
DC10 SA1010
DC11 SA1010
DC12 SA1010
IC7-A NE5532AN
IC7-B NE5532AN
IC8-A NE5532AN
IC8-B NE5532AN
FILTER 4 OUT
C1, C4, C5, C14, C17, C18, C27, C30, C31, C40, C43, C44 OMITTED
CN1
FILT 4 F
FILT 2 F
FILT 4 Q
FILT 2 Q
D7
D5
D3
D1
+3V
FILT 3 F
FILT 1 F
FILT 3 Q
FILT 1 Q
D6
D4
D2
D0
C53-64 100N
C65-68 100N
C69-72 100N
CN2
-18V
CUT 4 IN
CUT 2 IN
BOOST 4 IN
BOOST 2 IN
FILTER 4 OUT
FILTER 2 OUT
+18V
CUT 3 IN
CUT 1 IN
BOOST 3 IN
BOOST 1 IN
FILTER 3 OUT
FILTER 1 OUT
FILTER BOARD
PAGE 26
STAGE ACCOMPANY
TITLE : PPE 2418 FILTER CIRCUIT
REVISIONS
DRAWN : R.K.
A1
DATE 17-11-88
SHEET OF

Resistor and capacitor values for PPE-2410 band 1 frequency circuit using SA1010 or AD7524JN. In general, PPE's with an ID-code > 121 use E12-range capacitor values. However, values with an "*" are E24.
Resistor values are in ohms, capacitor values are in picofarads.

		— (ID≤121) —		— (ID>121) —	
DAC range (Ω)	R8,R9	C8,C12	C9,C13	C8,C12	C9,C13
5000 - 5250	196000	13000	27000	18000	22000
5250 - 5500	205000	12000	27000	15000	24000 *
5500 - 5750	215000	10000	27000	15000	22000
5750 - 6000	226000	8200	27000	11000 *	24000 *
6000 - 6250	237000	6800	27000	12000	22000
6250 - 6500	243000	5600	27000	15000	18000
6500 - 6750	255000	4300	27000	7500 *	24000 *
6750 - 7000	261000	6200	24000	12000	18000
7000 - 7250	274000	5100	24000	6800	22000
7250 - 7500	280000	1100	27000	10000	18000
7500 - 7750	294000	180	27000	12000	15000
7750 - 8000	301000	4300	22000	4700	22000
8000 - 8250	309000	1500	24000	3300	22000
8250 - 8500	324000	750	24000	2700	22000
8500 - 8750	332000	2000	22000	12000	12000
8750 - 9000	340000	1300	22000	1500	22000
9000 - 9250	348000	2700	20000	4700	18000
9250 - 9500	357000	100	22000	100	22000
9500 - 9750	374000	1500	20000	3300	18000
9750 - 10000	383000	1000	20000	2700	18000
10000 - 10250	392000	470	20000	5600	15000
10250 - 10500	402000	2000	18000	10000	10000
10500 - 10750	412000	1500	18000	1500	18000
10750 - 11000	422000	1100	18000	1000	18000
11000 - 11250	432000	620	18000	680	18000
11250 - 11500	432000	220	18000	220	18000
11500 - 11750	442000	1800	16000	2700	15000
11750 - 12000	453000	1500	16000	5600	12000
12000 - 12250	464000	1100	16000	2200	15000
12250 - 12500	475000	750	16000	4700	12000
12500 - 12750	487000	8200	8200	1500	15000
12750 - 13000	499000	100	16000	1000	15000
13000 - 13250	499000	820	15000	680	15000
13250 - 13500	511000	510	15000	470	15000
13500 - 13750	523000	200	15000	220	15000
13750 - 14000	536000	3900	11000	---	15000
14000 - 14250	536000	700	12000	2700	12000
14250 - 14500	549000	2400	12000	2200	12000
14500 - 14750	562000	1200	13000	2200	12000
14750 - 15000	576000	910	13000	3900	10000

Resistor and capacitor values for PPE-2410 band 2 frequency circuit using SA1010 or AD7524JN. In general, PPE's with an ID-code > 121 use E12-range capacitor values.
Resistor values are in ohms, capacitor values are in picofarads.

		— (ID≤121) —		— (ID>121) —	
DAC range (Ω)	R17,R18	C21,C25	C22,C26	C21,C25	C22,C26
5000 - 5250	174000	160	15000	150	15000
5250 - 5500	182000	1500	13000	2700	12000
5500 - 5750	191000	820	13000	1800	12000
5750 - 6000	200000	220	13000	1200	12000
6000 - 6250	210000	680	12000	680	12000
6250 - 6500	215000	200	12000	2200	10000
6500 - 6750	226000	750	11000	1800	10000
6750 - 7000	237000	300	11000	1200	10000
7000 - 7250	243000	910	10000	1000	10000
7250 - 7500	249000	560	10000	560	10000
7500 - 7750	261000	200	10000	180	10000
7750 - 8000	267000	750	9100	---	10000
8000 - 8250	280000	470	9100	2700	6800
8250 - 8500	287000	180	9100	4700	4700
8500 - 8750	294000	820	8200	2200	6800
8750 - 9000	301000	560	8200	3300	5600
9000 - 9250	309000	330	8200	1800	6800
9250 - 9500	316000	100	8200	1500	6800
9500 - 9750	332000	560	7500	1200	6800
9750 - 10000	340000	360	7500	1000	6800
10000 - 10250	348000	180	7500	1000	6800
10250 - 10500	357000	300	6200	680	6800
10500 - 10750	365000	510	6800	470	6800
10750 - 11000	374000	360	6800	330	6800
11000 - 11250	383000	180	6800	180	6800
11250 - 11500	392000	620	6200	---	6800
11500 - 11750	392000	470	6200	1000	5600
11750 - 12000	402000	330	6200	1800	4700
12000 - 12250	412000	200	6200	1800	4700
12250 - 12500	422000	680	5600	680	5600
12500 - 12750	432000	560	5600	560	5600
12750 - 13000	442000	430	5600	470	5600
13000 - 13250	453000	820	5100	330	5600
13250 - 13500	453000	220	5600	220	5600
13500 - 13750	464000	100	5600	100	5600
13750 - 14000	475000	300	4300	---	5600
14000 - 14250	487000	200	4300	2200	3300
14250 - 14500	487000	300	5100	1500	3900
14500 - 14750	499000	220	5100	560	4700
14750 - 15000	511000	120	5100	560	4700

Resistor and capacitor values for PPE-2410 band 3 frequency circuit using SA1010 or AD7524JN. In general, PPE's with an ID-code > 121 use E12-range capacitor values.
Resistor values are in ohms, capacitor values are in picofarads.

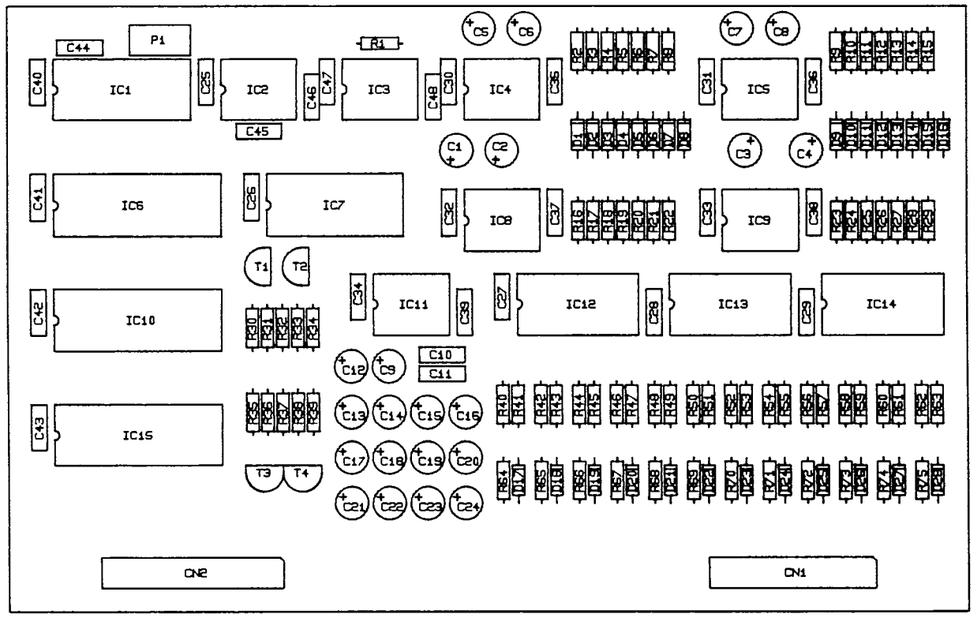
		— (ID≤121) —		— (ID>121) —	
DAC range (Ω)	R26,R27	C34,C38	C35,C39	C34,C38	C35,C39
5000 - 5250	205000	910	3000	---	3900
5250 - 5500	215000	130	3600	1000	2700
5500 - 5750	221000	270	3300	270	3300
5750 - 6000	232000	110	3300	120	3300
6000 - 6250	243000	270	3000	560	2700
6250 - 6500	255000	150	3000	470	2700
6500 - 6750	261000	330	2700	330	2700
6750 - 7000	274000	220	2700	220	2700
7000 - 7250	280000	110	2700	120	2700
7250 - 7500	294000	510	2200	---	2700
7500 - 7750	301000	430	2200	470	2200
7750 - 8000	309000	150	2400	330	2200
8000 - 8250	324000	270	2200	270	2200
8250 - 8500	332000	390	2000	1200	1200
8500 - 8750	340000	130	2200	120	2200
8750 - 9000	348000	750	1500	470	1800
9000 - 9250	365000	200	2000	---	2200
9250 - 9500	374000	130	2000	330	1800
9500 - 9750	383000	270	1800	270	1800
9750 - 10000	392000	430	1600	220	1800
10000 - 10250	402000	180	1800	180	1800
10250 - 10500	412000	130	1800	120	1800
10500 - 10750	422000	390	1500	390	1500
10750 - 11000	432000	240	1600	330	1500
11000 - 11250	442000	200	1600	---	1800
11250 - 11500	453000	160	1600	560	1200
11500 - 11750	464000	130	1600	220	1500
11750 - 12000	475000	390	1300	180	1500
12000 - 12250	487000	150	1500	150	1500
12250 - 12500	487000	120	1500	120	1500
12500 - 12750	499000	390	1200	390	1200
12750 - 13000	511000	360	1200	560	1000
13000 - 13250	523000	330	1200	330	1200
13250 - 13500	536000	200	1300	---	1500
13500 - 13750	536000	270	1200	270	1200
13750 - 14000	549000	150	1300	270	1200
14000 - 14250	562000	120	1300	220	1200
14250 - 14500	576000	100	1300	390	1000
14500 - 14750	576000	270	1100	180	1200
14750 - 15000	590000	150	1200	150	1200

Resistor and capacitor values for PPE-2410 band 4 frequency circuit using SA1010 or AD7524JN. In general, PPE's with an ID-code > 121 use E12-range capacitor values. However, values with an "*" are E24.
Resistor values are in ohms, capacitor values are in picofarads.

		— (ID≤121) —		— (ID>121) —	
DAC range (Ω)	R35,R36	C47,C51	C48,C52	C47,C51	C48,C52
5000 - 5250	169000	270	1300	390	1200
5250 - 5500	178000	200	1300	---	1500
5500 - 5750	187000	240	1200	220	1200
5750 - 6000	191000	270	1100	180	1200
6000 - 6250	200000	120	1200	120	1200
6250 - 6500	210000	270	1000	270	1000
6500 - 6750	215000	120	1100	220	1000
6750 - 7000	226000	180	1000	180	1000
7000 - 7250	232000	130	1000	120	1000
7250 - 7500	243000	180	910	100	1000
7500 - 7750	249000	150	910	390	680
7750 - 8000	261000	120	910	470	560
8000 - 8250	267000	240	750	---	1000
8250 - 8500	274000	150	820	270	680
8500 - 8750	280000	120	820	470	470
8750 - 9000	294000	160	750	220	680
9000 - 9250	301000	130	750	330	560
9250 - 9500	309000	110	750	180	680
9500 - 9750	316000	160	680	150	680
9750 - 10000	324000	200	620	150	680
10000 - 10250	332000	120	680	120	680
10250 - 10500	340000	100	680	100	680
10500 - 10750	348000	200	560	200 *	560
10750 - 11000	357000	120	620	180	560
11000 - 11250	365000	110	620	330	390
11250 - 11500	374000	150	560	150	560
11500 - 11750	383000	130	560	220	470
11750 - 12000	392000	120	560	---	680
12000 - 12250	402000	110	560	100	560
12250 - 12500	402000	180	470	180	470
12500 - 12750	412000	130	510	180	470
12750 - 13000	422000	120	510	150	470
13000 - 13250	432000	110	510	150	470
13250 - 13500	442000	130	470	270	330
13500 - 13750	453000	120	470	120	470
13750 - 14000	453000	110	470	120	470
14000 - 14250	464000	100	470	100	470
14250 - 14500	475000	130	430	---	560
14500 - 14750	475000	120	430	220	330
14750 - 15000	487000	110	430	150	390

Resistor values for PPE-2410 Q-factor circuit using SA1010 or AD7524JN

DAC resistance range (Ω)	R2, R11, R20, R29	R4, R22, R13, R14 R5, R23, R31, R32
5000 - 5250	255000	16900
5250 - 5500	267000	17800
5500 - 5750	274000	18200
5750 - 6000	287000	19100
6000 - 6250	301000	20000
6250 - 6500	316000	21000
6500 - 6750	324000	21500
6750 - 7000	340000	22600
7000 - 7250	348000	23200
7250 - 7500	365000	24300
7500 - 7750	374000	24900
7750 - 8000	383000	26100
8000 - 8250	402000	26700
8250 - 8500	412000	27400
8500 - 8750	422000	28000
8750 - 9000	432000	29400
9000 - 9250	453000	30100
9250 - 9500	464000	30900
9500 - 9750	475000	31600
9750 - 10000	487000	32400
10000 - 10250	499000	33200
10250 - 10500	511000	34000
10500 - 10750	523000	34800
10750 - 11000	536000	35700
11000 - 11250	549000	36500
11250 - 11500	562000	37400
11500 - 11750	576000	38300
11750 - 12000	590000	39200
12000 - 12250	590000	40200
12250 - 12500	604000	40200
12500 - 12750	619000	41200
12750 - 13000	634000	42200
13000 - 13250	649000	43200
13250 - 13500	665000	44200
13500 - 13750	665000	44200
13750 - 14000	681000	45300
14000 - 14250	698000	46400
14250 - 14500	715000	47500
14500 - 14750	715000	47500
14750 - 15000	732000	48700

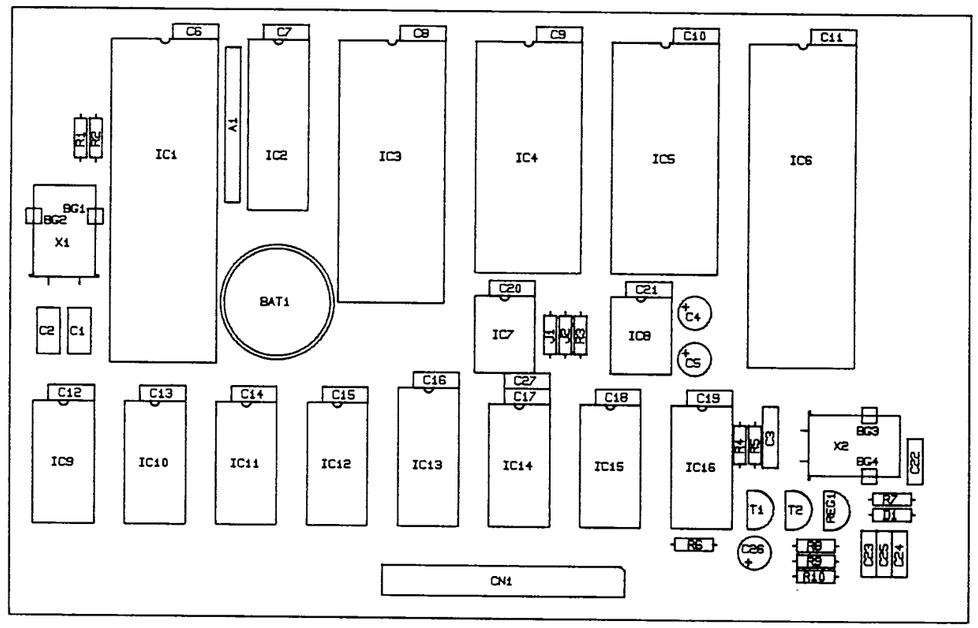


CLIP & LEVEL
PAGE 32 DETECTION BOARD

IC15 74HC273
RESET
CLK LATCH
CH1 +10DB
CH1 0DB
CH2 +10DB
CH2 0DB
T1 BC547B
T2 BC547B
T3 BC547B
T4 BC547B
R30 4K75
R31 4K75
R32 4K75
R33 4K75
R36 475E
CH1 BYPASS
CH2 BYPASS
IC7 CD40S
IC1 SA1010
IC2-A LF353N
IC2-B LF353N
IC3 LM311P
IC6-A 74HC244
IC11-A LF353
IC11-B LF353
CH1 3V
CH2 3V
R34 23K7
R39 4K75
C9 10U 35V
C10 100N
C11 100N
P1 10K 10T
C44 100
C45 33P
R1 221E
C1 4U7 35V
C2 4U7 35V
C3 4U7 35V
C4 4U7 35V
R2 6K49
R3 10K0
R4 20K0
R5 10K0
R6 10K0
R7 20K0
R8 15E
D1 1N4148
D2 1N4148
D3 1N4148
D4 1N4148
IC4-A LF353N
IC4-B LF353N
CH1 INPUT PPM
R9 6K49
R10 10K0
R11 20K0
R12 10K0
R13 10K0
R14 20K0
R15 15E
D9 1N4148
D10 1N4148
D11 1N4148
D12 1N4148
IC5-A LF353N
IC5-B LF353N
CH2 INPUT PPM
R16 6K49
R17 10K0
R18 20K0
R19 10K0
R20 10K0
R21 20K0
R22 15E
D5 1N4148
D6 1N4148
D7 1N4148
D8 1N4148
IC8-A LF353N
IC8-B LF353N
CH1 OUTPUT
R23 6K49
R24 10K0
R25 20K0
R26 10K0
R27 10K0
R28 20K0
R29 15E
D13 1N4148
D14 1N4148
D15 1N4148
D16 1N4148
IC9-A LF353N
IC9-B LF353N
CH2 OUTPUT
C7 22U 35V
C8 22U 35V
C254 100
C359 100
C46 100N
C47 100N
C48 100N
C40-43 100N
R36 13K0
R37 10K0
C12 10U 35V
CH1 IUT
CH2 IUT
CH1 OUTPUT CLP
CH2 OUTPUT CLP
D17 1N4148
D18 1N4148
D19 1N4148
D20 1N4148
R64 10K0
R65 10K0
R66 10K0
R67 10K0
R47 10K0
R45 10K0
R43 10K0
R41 10K0
IC12 LM339N
R40 100K
R42 100K
R44 100K
R46 100K
C13 2U2 16V
C14 2U2 16V
C15 2U2 16V
C16 2U2 16V
IC6-B 74HC244
I70
CH1 BOOST 1
CH1 BOOST 2
CH1 BOOST 3
CH1 BOOST 4
D21 1N4148
D22 1N4148
D23 1N4148
D24 1N4148
R68 10K0
R69 10K0
R70 10K0
R71 10K0
R55 10K0
R53 10K0
R51 10K0
R49 10K0
IC13 LM339N
R48 100K
R50 100K
R52 100K
R54 100K
C17 2U2 16V
C18 2U2 16V
C19 2U2 16V
C20 2U2 16V
IC10-A 74HC244
CH2 BOOST 1
CH2 BOOST 2
CH2 BOOST 3
CH2 BOOST 4
D25 1N4148
D26 1N4148
D27 1N4148
D28 1N4148
R72 10K0
R73 10K0
R74 10K0
R75 10K0
R63 10K0
R61 10K0
R59 10K0
R57 10K0
IC14 LM339N
R56 100K
R58 100K
R60 100K
R62 100K
C21 2U2 16V
C22 2U2 16V
C23 2U2 16V
C24 2U2 16V
IC10-B 74HC244
B70
CN2
CH2 BYPASS
CH2 0DB
CH1 0DB
B7C
ADC
D7
D6
D5
D4
D3
D2
D1
+5
RESET
CH1 BYPASS
CH2 +10DB
CH1 +10DB
I70
CLK LATCH
CN1
CH2 3V
CH2 OUTPUT
CH2 INPUT PPM
CH2 OUTPUT CLIP
CH2 INPUT
CH2 BOOST 3
CH2 BOOST 1
CH1 BOOST 3
CH1 BOOST 1
CH1 3V
CH1 OUTPUT
CH1 INPUT PPM
CH1 OUTPUT CLIP
CH1 INPUT
CH2 BOOST 4
CH2 BOOST 2
CH1 BOOST 4
CH1 BOOST 2

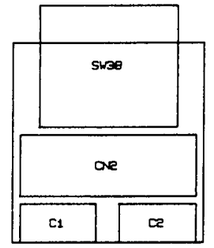
CLIP & LEVEL DETECTION BOARD
PAGE 33

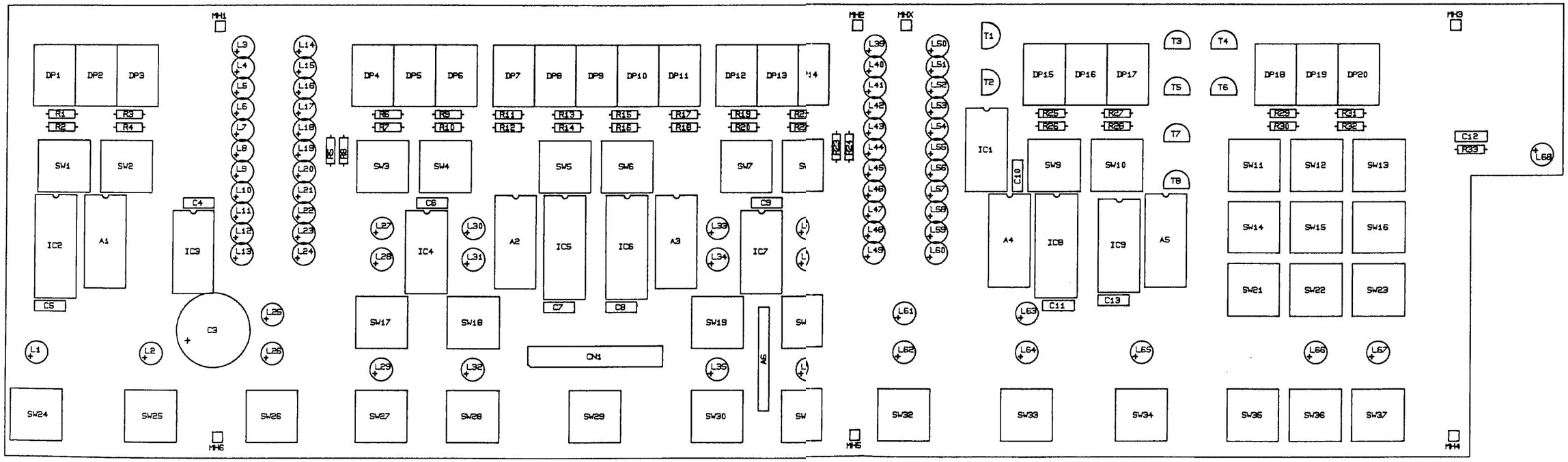
STAGE ACCOMPANY
TITLE : PRE 2410 CLIP + PPM CIRCUIT
REVISIONS
DRAWN : R.K.
A1
DATE 1-10-00
SHEET OF



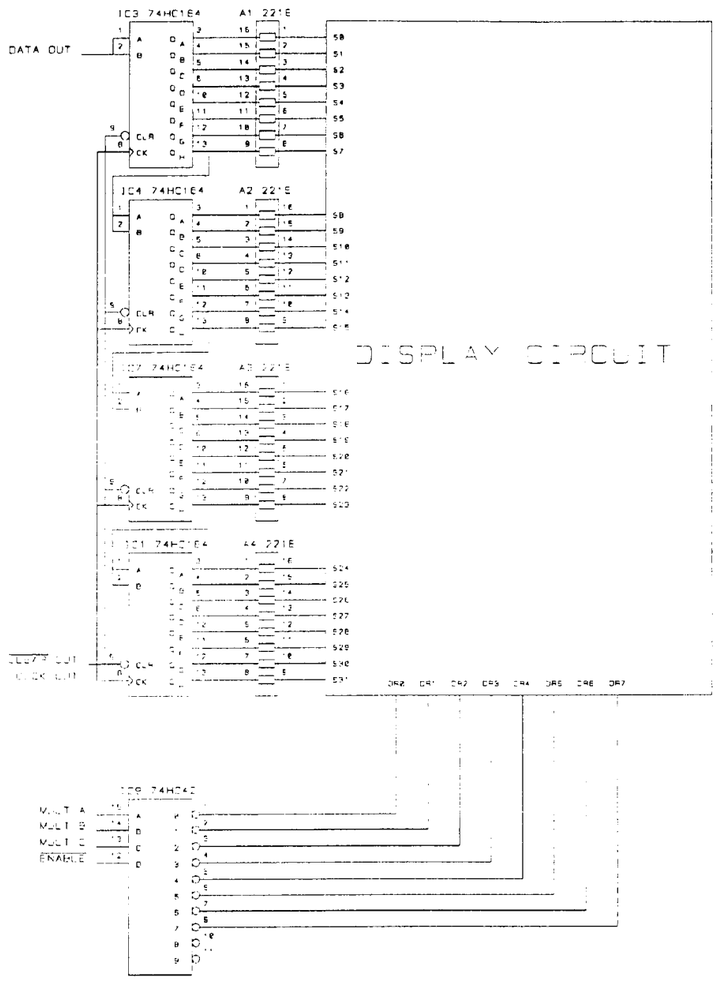
PROCESSOR BOARD

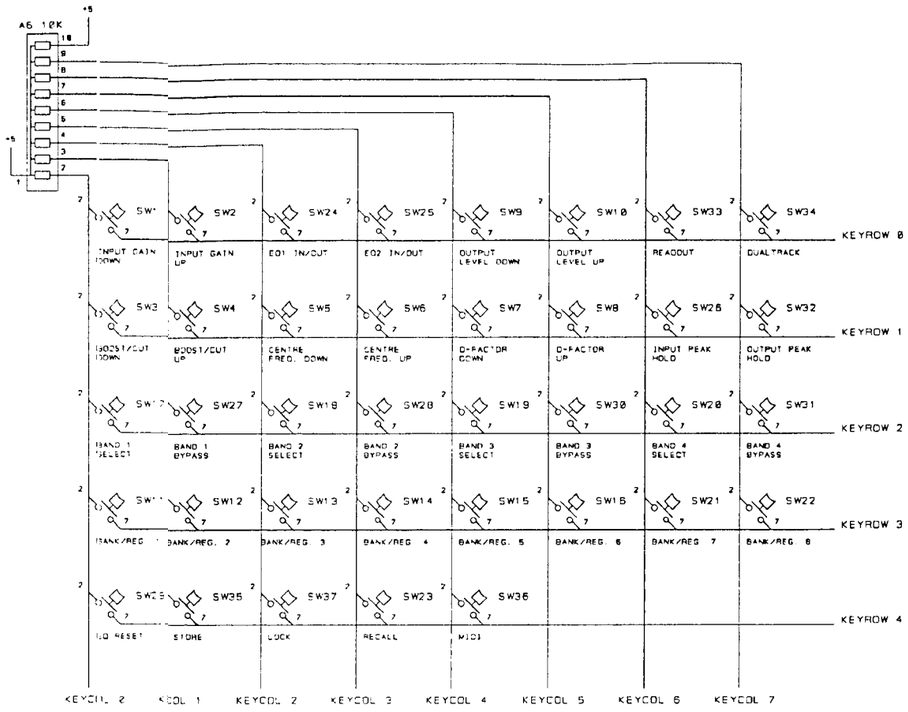
IC1 INTEL 8344
P1.0
P1.5
RTS
CTS
RST
I/O
DATA
INT0
INT1
T0
T1
WR
RD
XTAL1
XTAL2
GND
VCC
AD0
AD7
EA
ALE
PSEN
A15
A8
P 1.0
P 1.1
P 1.2
P 1.3
IC16-A 74HC04
VIDEO INT
R1 10K0
R2 10K0
C1 33P
C2 33P
X1 12MHZ
IC15-A 74HC00
IC12-B 74HC86
RD
R3 321E
IC2 74HC373
A1 10K
IC3 D28F256
FLASH
EEPROM
J1
J2
REG1 78L12
+18V
VIN
VOUT
COMM
C23 100N
C25 100N
C26 1U 35V
T1 BC557
T2 BC547
R9 10K0
R10 4K75
R8 4K75
R6 1K00
P 1.3
IC16-B 74HC04
C6,7,9 100N
C8 10U 35V
C11-22 100N
IC4 2764
IC5 5564
RESET
IC7 DS1231
IC12-A 74HC86
IC14-A 74HC74
IC1 :-C 74HC86
IC1 :-D 74HC86
A15
IC13-A 74HC139
IORD
C27 330P
IC15-B 74HC00
IC10-F 74HC04
WR
IC8 DS1210
BAT1 LITHIUM 3 V
C5 10U 35V
C4 1U 35V
C10 100N
IC16-F 74HC04
R4 332E
R5 332E
X2 4MHZ
C3 10N
IC16-E 74HC04
IC16-D 74HC04
CLOCK
IC14-B 74HC74
IC6 Z8530 SCC
SCC CS
B-PART
MIDI IN
MIDI OUT
IC16-C 74HC04
IC13-B 74HC139
IC9 74HC164
IC11 74HC30
IC15-C 74HC00
IC15-D 74HC00
IC10-E 74HC04
IC10-A 74HC04
IC10-B 74HC04
IC10-C 74HC04
IC10-D 74HC04
CN1
PROCESSOR BOARD
PAGE 35
STAGE ACCOMPANY
TITLE: PPE 2410 PROCESSOR CIRCUIT
REVISIONS
DRAWN: R.K.
A1
DATE 30-11-98
SHEET OF

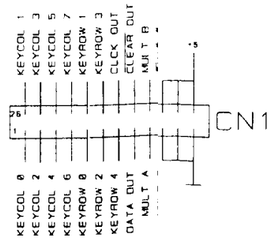


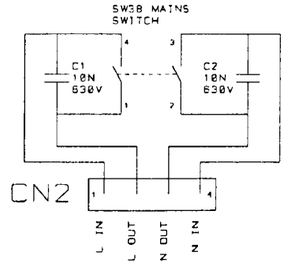


PAGE 36 FRONT BOARD

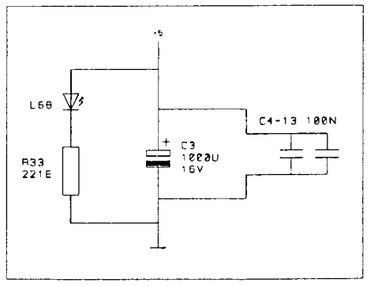




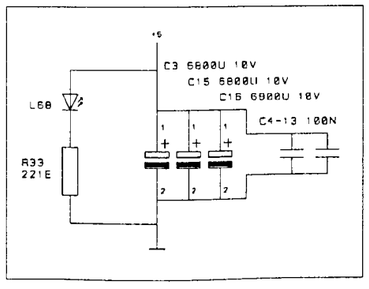




BEFORE SERIAL NUMBER: 226940313



FROM SERIAL NUMBER: 226940313



FRONT BOARD /1
PAGE 37

STAGE ACCOMPANY		
TITLE : PPE 2418 FRONT CIRCUIT		
REVISIONS		DRAWN R.K.
A	A1 DATE 1-12-88	SHEET OF

AS 47E

DR7 DR6 DR5 DR4 DR3 DR2 DR1 DR0

T1 BC640 T2 BC640 T3 BC640 T5 BC640 T8 BC640 T6 BC640 T4 BC640

DISPLAY REPLACED BY AN 7-SEGMENT DISPLAY AND PIN D NOT CONNECTED FROM SERIAL NO: 424020353

+5

DUAL TRACK L65 · LOCK L67 · MIDI L66

DP 1 INPUT GAIN 1 · DP 2 INPUT GAIN 2 · DP 3 INPUT GAIN 3 · DP 4 BOOST/CUT 1 · DP 5 BOOST/CUT 2

EQ IN CHAN1 L1 · EQ IN CHAN2 L2 · READ-OUT1 L63 · READ-OUT2 L64 · CLIP 1 L.1 L3 · CLIP 1 L.2 L14 · CLIP 0 L.1 L39 · CLIP 0 L.2 L50

-20DB L13 · -12DB L12 · -8DB L11 · -3DB L10 · 0DB L9 · +2DB L8 · +4DB L7 · +6DB L6

PEAK METER INPUT LEVEL CHANNEL 1

IC2 CA3251 R1-7 75E

S0 S1 S2 S3 S4 S5 S6 S7 E NC

DP 6 BOOST/CUT 3 · DP 7 CENT. FREQ 1 · DP 8 CENT. FREQ. 2 · DP 9 CENT. FREQ. 3 · DP 10 CENT. FREQ. 4

BAND1 SEL L29 · BAND2 SEL L31 · BAND3 SEL L34 · BAND4 SEL L37 · BAND1 BYP. L20 · BAND2 BYP. L32 · BAND3 BYP. L35 · BAND4 BYP. L38

-20DB L24 · -12DB L23 · -8DB L22 · -3DB L21 · 0DB L20 · +2DB L19 · +4DB L18 · +6DB L17

PEAK METER INPUT LEVEL CHANNEL 2

IC5 CA3251 R9-16 75E

S8 S9 S10 S11 S12 S13 S14 S15 E NC

DP 11 CENT. FREQ. 5 · DP 12 Q-FACTOR 1 · DP 13 Q-FACTOR 2 · DP 14 Q-FACTOR 3 · DP 15 OUTPUT LEVEL 1

BAND1 CLIP L27 · BAND2 CLIP L30 · BAND3 CLIP L33 · BAND4 CLIP L36 · P.H.1 55SEC INF L25 · P.H.1 INF L26 · P.H.2 55SEC L61 · P.H.2 INF L62

-20DB L43 · -12DB L42 · -8DB L47 · -3DB L46 · 0DB L45 · +2DB L44 · +4DB L43 · +6DB L42

PEAK METER OUTPUT LEVEL CHANNEL 1

IC6 CA3251 R17-24 75E

S16 S17 S18 S19 S20 S21 S22 S23 E NC

DP 16 OUTPUT LEVEL 2 · DP 17 OUTPUT LEVEL 3 · DP 18 BANK/REGISTER 1 · DP 19 BANK/REGISTER 2 · DP 20 BANK/REGISTER 3

PEAK METERS

INPUT LEVEL CHANNEL 1 · INPUT LEVEL CHANNEL 2 · OUTPUT LEVEL CHANNEL 1 · OUTPUT LEVEL CHANNEL 2

+10DB L5 · +15DB L4 · +10DB L16 · +15DB L15 · +10DB L41 · +15DB L40 · +10DB L52 · +15DB L51

-20DB L60 · -12DB L59 · -8DB L58 · -3DB L57 · 0DB L56 · +2DB L55 · +4DB L54 · +6DB L53

PEAK METER OUTPUT LEVEL CHANNEL 2

IC8 CA3251 R25-32 75E

S24 S25 S26 S27 S28 S29 S30 S31 E NC

ALL DISPLAYS TFK812 EXCEPT DP4: TFK605
ALL LEDS TLSR3201, TLSG3201 AND TLSY322

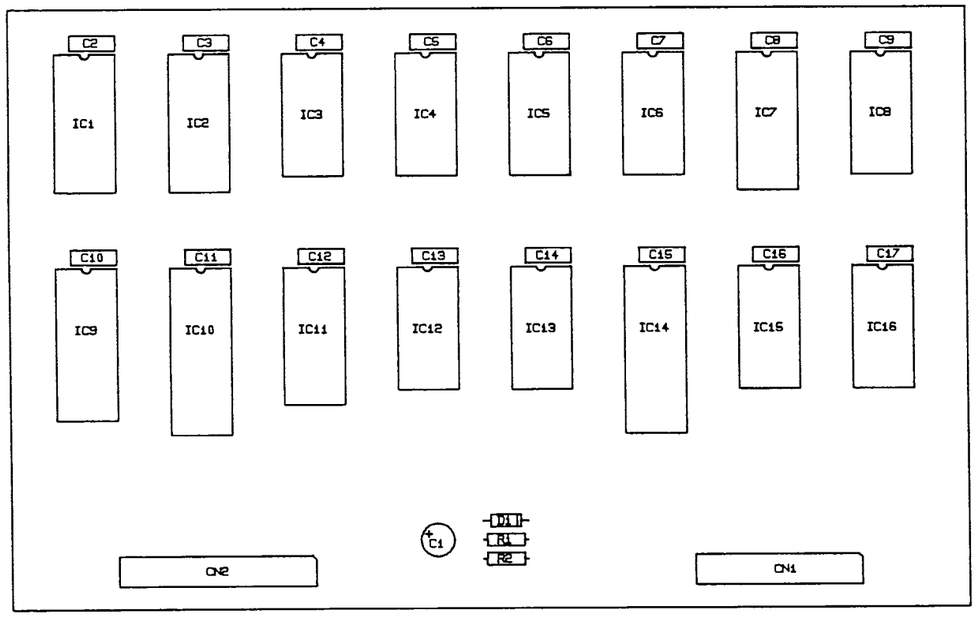
FRONT BOARD /2
PAGE 38

STAGE ACCOMPANY

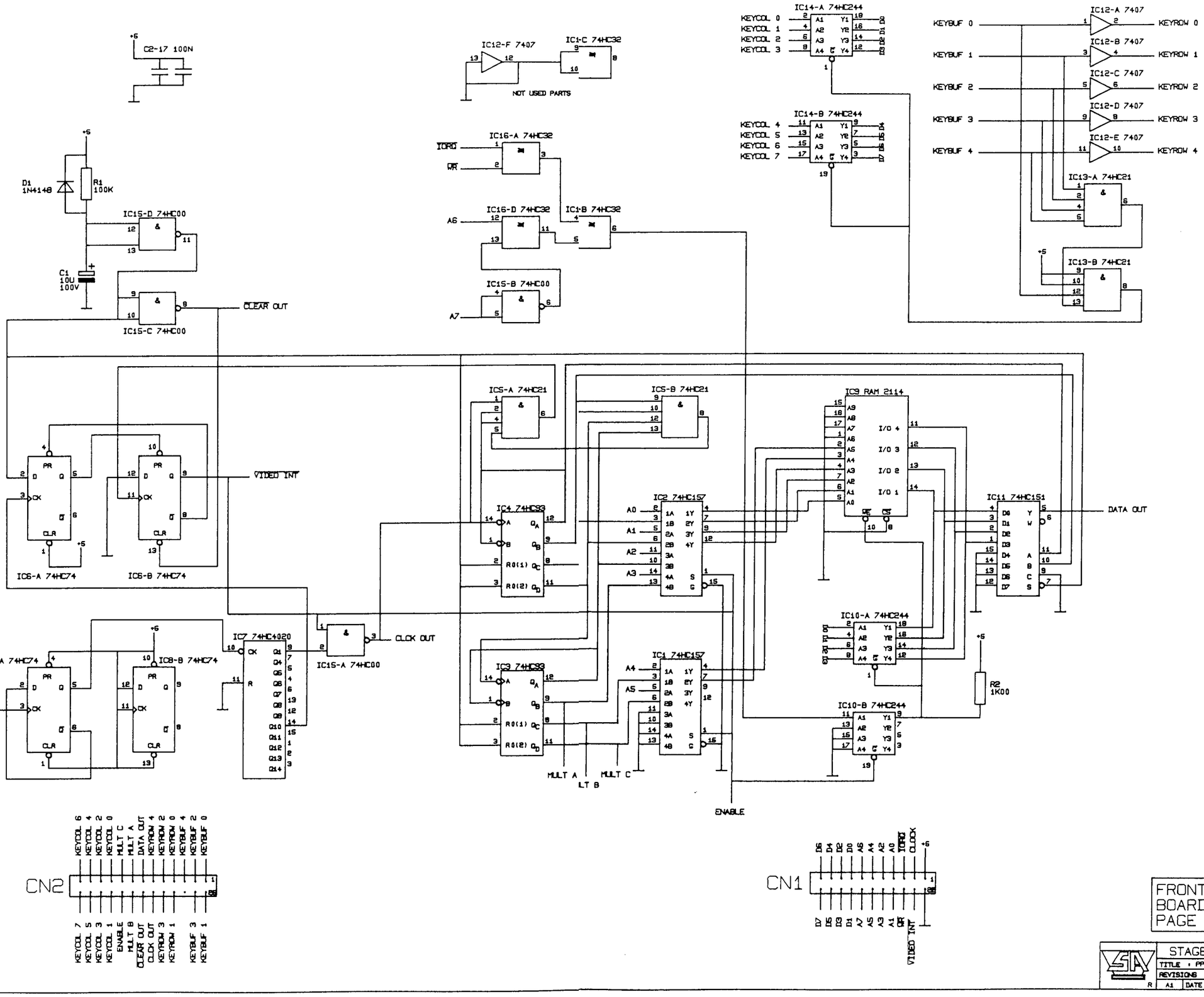
TITLE PPE 2418 DISPLAY CIRCUIT

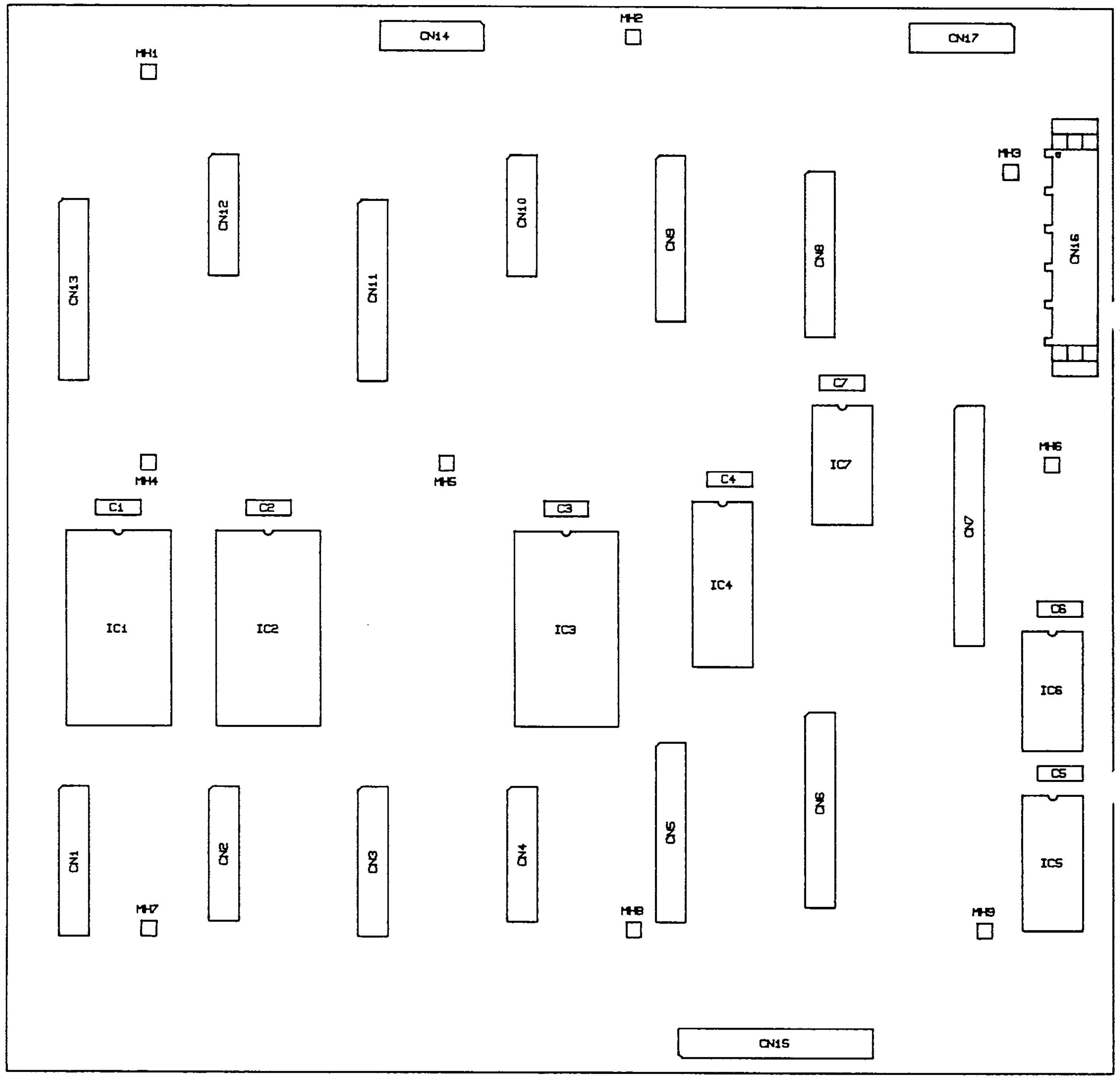
REVISIONS | DRAWN R K

A1 | DATE 1-12-88 | SHEET OF

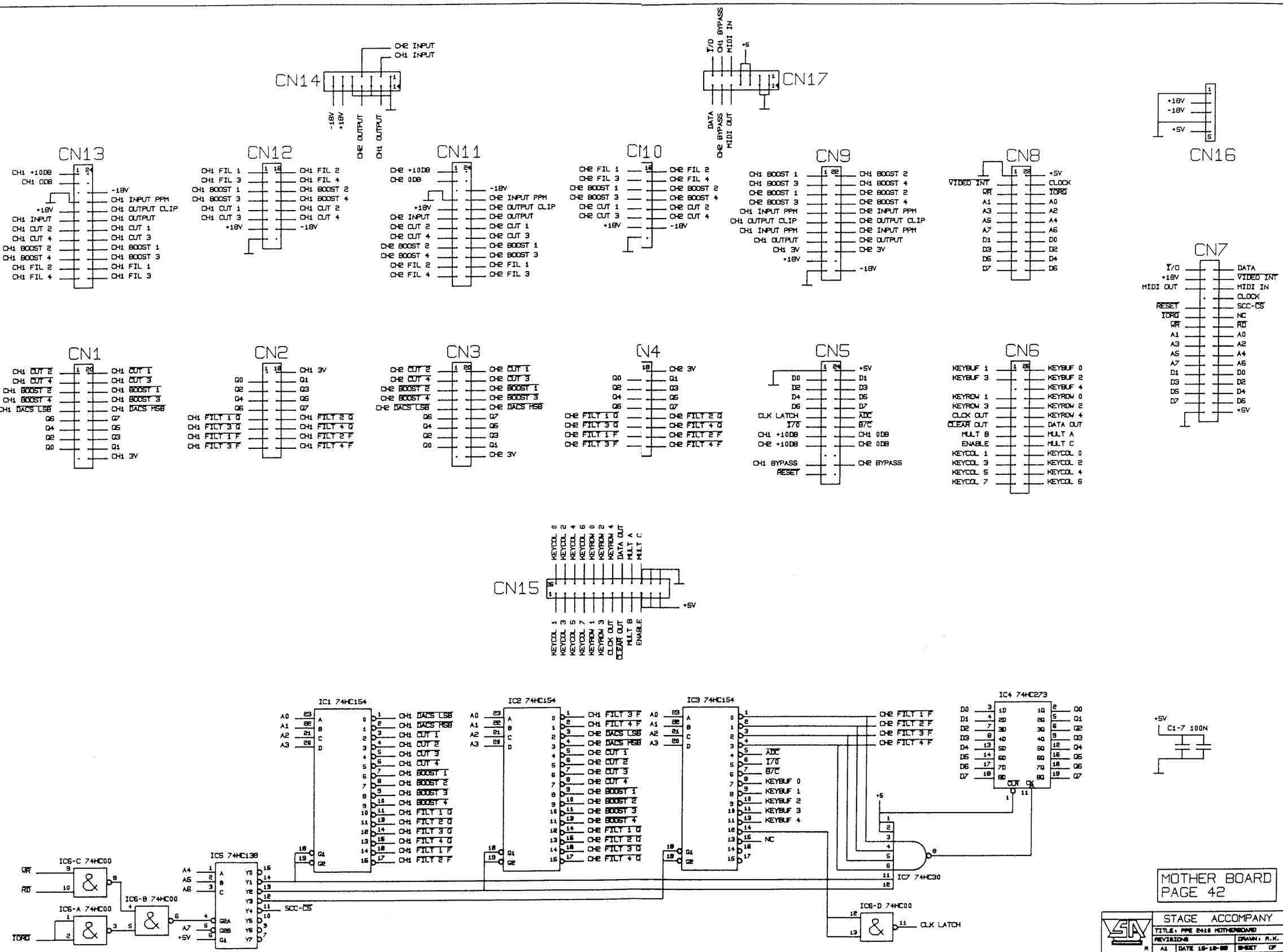


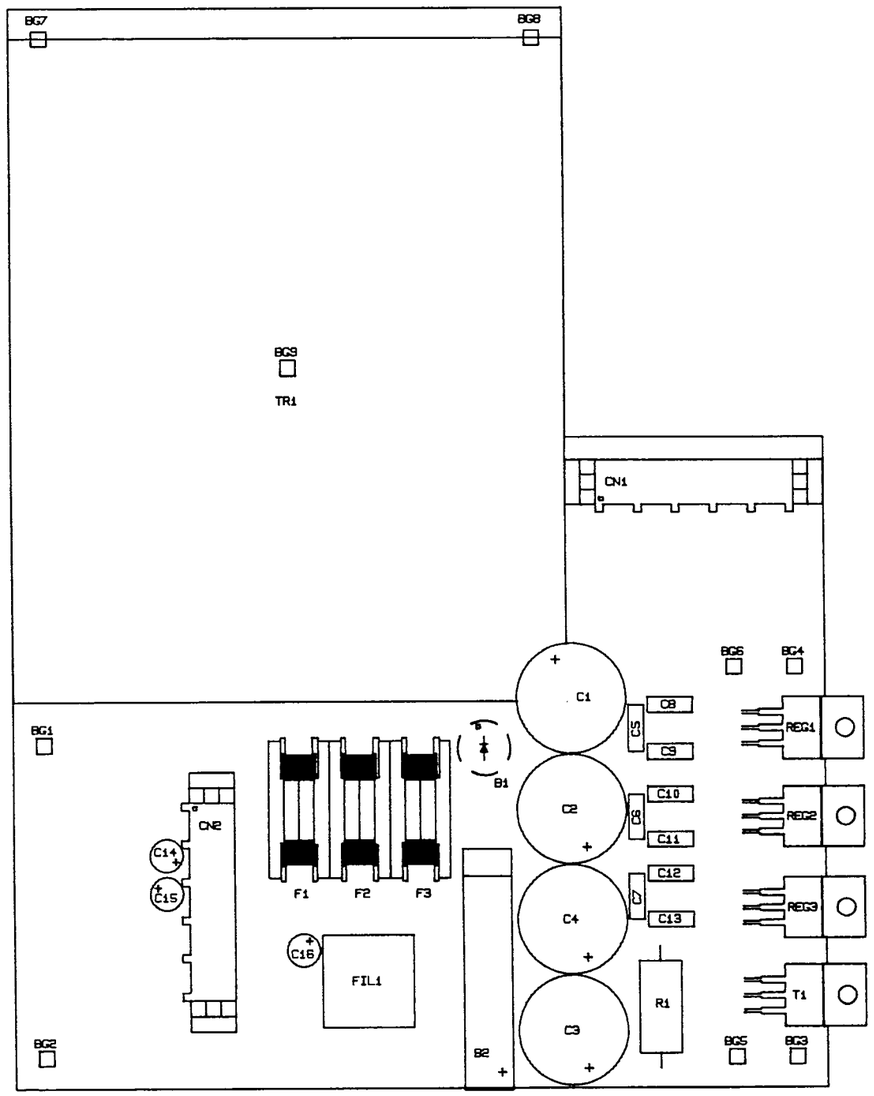
FRONT CONTROL BOARD


+5
C2-17 100N
IC12-F 7407
IC1-C 74HC32
NOT USED PARTS
IC14-A 74HC244
IC14-B 74HC244
KEYCOL 0
KEYCOL 1
KEYCOL 2
KEYCOL 3
KEYCOL 4
KEYCOL 5
KEYCOL 6
KEYCOL 7
IC12-A 7407
IC12-B 7407
IC12-C 7407
IC12-D 7407
IC12-E 7407
KEYBUF 0
KEYBUF 1
KEYBUF 2
KEYBUF 3
KEYBUF 4
KEYROW 0
KEYROW 1
KEYROW 2
KEYROW 3
KEYROW 4
IC13-A 74HC21
IC13-B 74HC21
D1
1N4148
R1
100K
C1
10U
100V
IC15-D 74HC00
IC15-C 74HC00
CLEAR OUT
IC16-A 74HC32
IORQ
WR
IC16-D 74HC32
IC1-B 74HC32
AS
IC15-B 74HC00
A7
IC5-A 74HC21
IC5-B 74HC21
IC9 RAM 2114
I/O 4
I/O 3
I/O 2
I/O 1
IC6-A 74HC74
IC6-B 74HC74
VIDEO INT
IC4 74HC393
IC2 74HC157
IC11 74HC151
DATA OUT
A0
A1
A2
A3
IC10-A 74HC244
IC10-B 74HC244
R2
1K00
IC8-A 74HC74
IC8-B 74HC74
CLOCK
IC7 74HC4020
IC15-A 74HC00
CLOCK OUT
IC3 74HC393
IC1 74HC157
A4
A5
MULT A
MULT C
LT B
ENABLE
CN2
KEYCOL 6
KEYCOL 4
KEYCOL 2
KEYCOL 0
MULT C
MULT A
DATA OUT
KEYROW 4
KEYROW 2
KEYROW 0
KEYBUF 4
KEYBUF 2
KEYBUF 0
KEYCOL 7
KEYCOL 5
KEYCOL 3
KEYCOL 1
ENABLE
MULT B
CLEAR OUT
CLOCK OUT
KEYROW 3
KEYROW 1
KEYBUF 3
KEYBUF 1
CN1
D6
D4
D2
D0
A5
A4
A2
A0
IORQ
CLOCK
+5
D7
D5
D3
D1
A7
A5
A3
A1
WR
VIDEO INT
FRONT CONTROL
BOARD
PAGE 40
STAGE ACCOMPANY
TITLE : PPE 2410 FRONT CONTROL
REVISIONS
DRAWN : R.K.
R
A1
DATE 1-12-88
SHEET OF

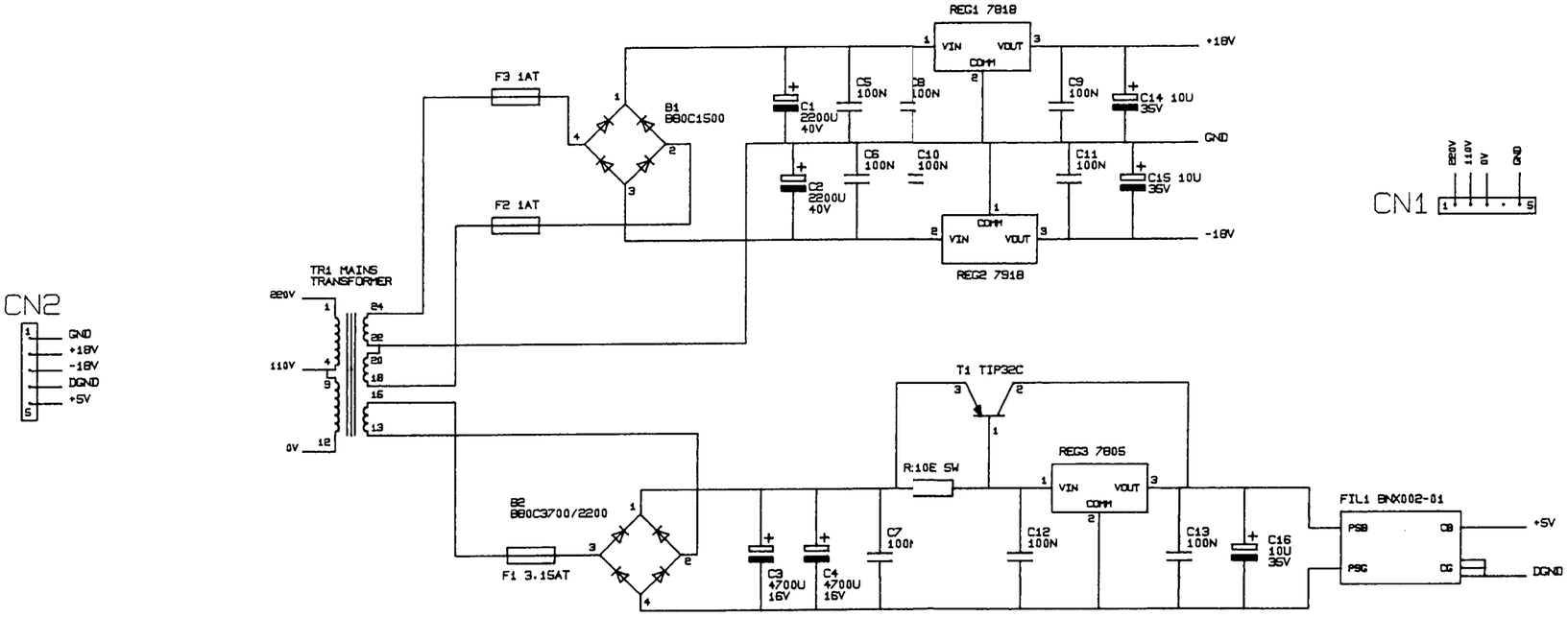


PAGE 41 MOTHER BOARD


CN14
CH2 INPUT
CH1 INPUT
-18V
+18V
CH2 OUTPUT
CH1 OUTPUT
CN17
I/O
CH1 BYPASS
MIDI IN
+5
DATA
CH2 BYPASS
MIDI OUT
CN16
+18V
-18V
+5V
CN13
CH1 +10DB
CH1 ODB
-18V
CH1 INPUT PPM
+18V
CH1 OUTPUT CLIP
CH1 INPUT
CH1 OUTPUT
CH1 CUT 2
CH1 CUT 1
CH1 CUT 4
CH1 CUT 3
CH1 BOOST 2
CH1 BOOST 1
CH1 BOOST 4
CH1 BOOST 3
CH1 FIL 2
CH1 FIL 1
CH1 FIL 4
CH1 FIL 3
CN12
CH1 FIL 1
CH1 FIL 2
CH1 FIL 3
CH1 FIL 4
CH1 BOOST 1
CH1 BOOST 2
CH1 BOOST 3
CH1 BOOST 4
CH1 CUT 1
CH1 CUT 2
CH1 CUT 3
CH1 CUT 4
+18V
-18V
CN11
CH2 +10DB
CH2 ODB
-18V
CH2 INPUT PPM
+18V
CH2 OUTPUT CLIP
CH2 INPUT
CH2 OUTPUT
CH2 CUT 2
CH2 CUT 1
CH2 CUT 4
CH2 CUT 3
CH2 BOOST 2
CH2 BOOST 1
CH2 BOOST 4
CH2 BOOST 3
CH2 FIL 2
CH2 FIL 1
CH2 FIL 4
CH2 FIL 3
CN10
CH2 FIL 1
CH2 FIL 3
CH2 BOOST 1
CH2 BOOST 3
CH2 CUT 1
CH2 CUT 3
+18V
CH2 FIL 2
CH2 FIL 4
CH2 BOOST 2
CH2 BOOST 4
CH2 CUT 2
CH2 CUT 4
-18V
CN9
CH1 BOOST 1
CH1 BOOST 3
CH2 BOOST 1
CH2 BOOST 3
CH1 INPUT PPM
CH1 OUTPUT CLIP
CH1 INPUT PPM
CH1 OUTPUT
CH1 3V
+18V
CH1 BOOST 2
CH1 BOOST 4
CH2 BOOST 2
CH2 BOOST 4
CH2 INPUT PPM
CH2 OUTPUT CLIP
CH2 INPUT PPM
CH2 OUTPUT
CH2 3V
-18V
CN8
VIDEO INT
WR
A1
A3
A5
A7
D1
D3
D5
D7
+5V
CLOCK
IORQ
A0
A2
A4
A6
D0
D2
D4
D6
CN7
I/O
+18V
MIDI OUT
RESET
IORQ
WR
A1
A3
A5
A7
D1
D3
D5
D7
DATA
VIDEO INT
MIDI IN
CLOCK
SCC-CS
NC
RD
A0
A2
A4
A6
D0
D2
D4
D6
+5V
CN1
CH1 CUT 2
CH1 CUT 4
CH1 BOOST 2
CH1 BOOST 4
CH1 DACS LSB
Q6
Q4
Q2
Q0
CH1 CUT 1
CH1 CUT 3
CH1 BOOST 1
CH1 BOOST 3
CH1 DACS MSB
Q7
Q5
Q3
Q1
CH1 3V
CN2
Q0
Q2
Q4
Q6
CH1 FILT 1 0
CH1 FILT 3 0
CH1 FILT 1 F
CH1 FILT 3 F
CH1 3V
Q1
Q3
Q5
Q7
CH1 FILT 2 0
CH1 FILT 4 0
CH1 FILT 2 F
CH1 FILT 4 F
CN3
CH2 CUT 2
CH2 CUT 4
CH2 BOOST 2
CH2 BOOST 4
CH2 DACS LSB
Q6
Q4
Q2
Q0
CH2 CUT 1
CH2 CUT 3
CH2 BOOST 1
CH2 BOOST 3
CH2 DACS MSB
Q7
Q5
Q3
Q1
CH2 3V
CN4
Q0
Q2
Q4
Q6
CH2 FILT 1 0
CH2 FILT 3 0
CH2 FILT 1 F
CH2 FILT 3 F
CH2 3V
Q1
Q3
Q5
Q7
CH2 FILT 2 0
CH2 FILT 4 0
CH2 FILT 2 F
CH2 FILT 4 F
CN5
D0
D2
D4
D6
CLK LATCH
I/O
CH1 +10DB
CH2 +10DB
CH1 BYPASS
RESET
+5V
D1
D3
D5
D7
ADC
B/C
CH1 ODB
CH2 ODB
CH2 BYPASS
CN6
KEYBUF 1
KEYBUF 3
KEYROW 1
KEYROW 3
CLOCK OUT
CLEAR OUT
MULT B
ENABLE
KEYCOL 1
KEYCOL 3
KEYCOL 5
KEYCOL 7
KEYBUF 0
KEYBUF 2
KEYBUF 4
KEYROW 0
KEYROW 2
KEYROW 4
DATA OUT
MULT A
MULT C
KEYCOL 0
KEYCOL 2
KEYCOL 4
KEYCOL 6
+5V
CN15
KEYCOL 0
KEYCOL 2
KEYCOL 4
KEYCOL 6
KEYROW 0
KEYROW 2
KEYROW 4
DATA OUT
MULT A
MULT C
KEYCOL 1
KEYCOL 3
KEYCOL 5
KEYCOL 7
KEYROW 1
KEYROW 3
CLOCK OUT
CLEAR OUT
MULT B
ENABLE
+5V
IC1 74HC154
A0
A1
A2
A3
G1
G2
CH1 DACS LSB
CH1 DACS MSB
CH1 CUT 1
CH1 CUT 2
CH1 CUT 3
CH1 CUT 4
CH1 BOOST 1
CH1 BOOST 2
CH1 BOOST 3
CH1 BOOST 4
CH1 FILT 1 0
CH1 FILT 2 0
CH1 FILT 3 0
CH1 FILT 4 0
CH1 FILT 1 F
CH1 FILT 2 F
IC2 74HC154
CH1 FILT 3 F
CH1 FILT 4 F
CH2 DACS LSB
CH2 DACS MSB
CH2 CUT 1
CH2 CUT 2
CH2 CUT 3
CH2 CUT 4
CH2 BOOST 1
CH2 BOOST 2
CH2 BOOST 3
CH2 BOOST 4
CH2 FILT 1 0
CH2 FILT 2 0
CH2 FILT 3 0
CH2 FILT 4 0
IC3 74HC154
ADC
I/O
B/C
KEYBUF 0
KEYBUF 1
KEYBUF 2
KEYBUF 3
KEYBUF 4
NC
CH2 FILT 1 F
CH2 FILT 2 F
CH2 FILT 3 F
CH2 FILT 4 F
IC4 74HC273
CLR
CK
IC5 74HC138
A4
A5
A6
A7
+5V
G2A
G2B
G1
Y0
Y1
Y2
Y3
Y4
Y5
Y6
Y7
SCC-CS
IC6-A 74HC00
IC6-B 74HC00
IC6-C 74HC00
IC6-D 74HC00
WR
RD
IORQ
CLK LATCH
IC7 74HC30
+5V
C1-7 100N
MOTHER BOARD
PAGE 42
STAGE ACCOMPANY
TITLE: PPE 8410 MOTHERBOARD
REVISIONS
DRAWN: R.K.
A1
DATE 16-10-88
SHEET OF



POWER SUPPLY BOARD



CN1

CN2

POWER SUPPLY
BOARD
PAGE 44

	STAGE ACCOMPANY	
R	TITLE : PPE 8410 POWER SUPPLY	
	REVISIONS	DRAWN : R.K.
	A1 DATE 1-12-88	SHEET OF

7 Basic operation of the software

This chapter explains the basic changes in the PPE 2410 when a button is touched.

Input level down

The processor decreases the digital value presented to DC1 on the boost/cut board. The analog result is increased attenuation in dB steps and this attenuation is displayed in the input level display.

Input level up

The processor increases the digital value presented to DC1 on the boost / cut board. The analog result is decreased attenuation in dB steps and this attenuation is displayed in the input level display. Pressing the up and down buttons at the same time causes the input stage to switch to another amount of gain. The gain is determined by SW1 on the boost/cut board. The extra gain is displayed in the input level display.

Boost / cut down

Depending on the selected band and its previous level the digital value of one of the DAC's DC3..DC10 on the boost / cut board is increased or decreased resulting in 0.5 dB steps attenuation or amplification. For example: if the previous level was -5 dB in band 2 the digital value of DC3 will be increased. Or : if the previous level was + 4 dB the digital level of DC7 will be decreased. The changed level is displayed in the boost/cut display.

Boost / cut up

Depending on the selected band and its previous level, the digital value of one of the DAC's DC3..DC10 is increased or decreased resulting in 0.5 dB steps attenuation or amplification. For example: if the previous level was -5 dB in band 2 the digital value of DC3 will be decreased. Or : if the previous level was + 4 dB the digital level of DC7 will be increased.

Frequency down

Depending on the selected band, the digital value of DC2/DC3, DC5/DC6, DC8/DC9 or DC11/DC12 on the filter board will be decreased. The new frequency value is displayed in the frequency display.

Frequency up

Depending on the selected band, the digital value of DC2/DC3, DC5/DC6, DC8/DC9 or DC11/DC12 on the filter board will be increased. The new frequency value is displayed in the frequency display.

Q-factor down

Depending on the selected band, the digital value of DC1, DC4, DC7 or DC10 on the filter board is increased. Its new value is diplayed in the Q-factor display.
In the MIDI program table mode the MIDI program number is decreased.
In the MIDI channel number selection mode, the MIDI channel number is decreased.
In the MIDI omni selection mode, the omni mode is toggled on and off.
In the preset only selection mode, the preset only mode is toggled on and off.
In the leveller threshold selection mode, the threshold level is decreased.

Q-factor up

Depending on the selected band, the digital value of DC1, DC4, DC7 or DC10 on the filter board is decreased. Its new value is displayed in the Q-factor display.
In the MIDI program table mode, the MIDI program number is increased.
In the MIDI channel number selection mode, the MIDI channel number is increased.
In the MIDI omni selection mode, the omni mode is toggled on and off.

In the preset only selection mode, the preset only mode is toggled on and off.
In the leveller threshold selection mode, the threshold level is increased.

Output level down

The processor decreases the digital value presented to DC2 on the boost/cut board. The analog result is increased attenuation in dB steps and this attenuation is displayed in the output level display.

Output level up

The processor decreases the digital value presented to DC2 on the boost/cut board. The analog result is decreased attenuation in dB steps and the attenuation is displayed in the output level display.
With both up and down buttons pressed at the same time, the output is muted (DC2 set to zero).

Keyboard 1 to 8

With these buttons presets can be selected. After selection, settings can be either compared, stored, monitored, connected to a midi program, recalled etc, etc.
Although nearly all changes have effect on the display readings, only the recalling of presets has effect on the hardware in the signal pad.
When a keyboard button is pressed for more than 2 seconds, special functions are selected:

button	1	select MIDI program table
	2	select MIDI channel number
	3	select MIDI omni mode on/off
	4	MIDI reset
	5	select preset only mode
	6	select leveller mode
	7	reset presets
	8	select system information
	4 & 7	unlock while the PPE 2410 is turned on

EQ in/out

The channel 1 button affects relay 1 and 3 on the input/output board.
The channel 2 button affects relay 2 and 4 on the input/output board.
When EQ out is activated, the relays are set in their unactivated state (electronics bypassed). The relays are latched and buffered by IC15 and T3 / T4 on the clip and level detection board.
The state of the switches are indicated by leds.
Pushing the channel 1 EQ in/out button while turning the PPE 2410 on makes the display show the total signal present time.

Input level peak hold

With this switch, peak hold of the input volume display can be set on or off, and when on, two hold times can be selected: 5 seconds and infinite. The functions are completely software controlled and only affect the update time of the ledbars.

Band select

Activating one of these buttons causes the displays show the parameters of the selected band. All changes made with one of the boost / cut, center frequency or Q-factor buttons are related to the selected band.
Pressing the channel 1 and 4 band select buttons at the same time while turning the power switch on causes the boot mode to be activated. "Boot E" or "Boot P" appears in the center display and three flashing dots in the input level display.

Band bypass

The processor sets the boost and cut DAC's of the related channel on logic zero level when one of the band bypass buttons are activated. A led indicates bypass. When the band bypass button is pressed again, the settings in the center display are valid again.

EQ reset

All equaliser settings are reset to their initial values, being:

All boost/cut levels 0 dB
All Q-factors 1.0
All center frequencies to their minimum value

Output level peak hold

With this switch, peak hold of the output volume display can be set on or off, and when on, two hold times can be selected: 5 seconds and infinite. The functions are completely software controlled and only affect the update time of the ledbars.

Readout

This button selects whether the settings of channel 1 or channel 2 are displayed.

Dual track

Dual track couples the controls or copies the settings from one channel to the other.
When the dual track led is on, all changes made with the up/down buttons affect both channels. When the led is off, all changes only affect the channel selected at readout select.
When dual track is pressed for more than one second, all settings of the channel selected at readout select are copied to the other channel.

Store

Store is a pure software function and causes the current settings to be saved in the currently selected memory. After pushing the button for one second, "---" appears in the bank / register display to indicate that the process has been finished.
When pushed together with lock, a new lock code can be entered.

MIDI

This button toggles MIDI on and off. On is indicated by a led.

Lock

After pushing lock, the led will lit and all controls that can change settings have become inactive. All other buttons can be used.
Pushing lock for a second time, the bank register display indicates "___" and the lock code can be entered in the keyboard section.
Pushing lock for a third time unlocks the controls.

Recall

After pushing recall for the first time, the memory contents of the location indicated by the bank / register display are shown in the displays. This location is now displayed as x x.
Pushing recall for a second time causes the settings to become active. The location is now displayed as x-x.
Pushing recall for a third time makes the previous preset y-y active. The recall button now toggles between the x-x and y-y presets.

8 Downloading software

Downloading of the software can be necessary in two cases:

- when the Flash EPROM has unfortunately broken down and been replaced.
- when a new software version has been released.

When the Flash EPROM has broken down, Stage Accompany can supply you with a programmed or an empty replacement. In the first case, a software download is not necessary.
A new version can contain corrections or improvements of a previous version but also new features that were not possible before.
For a software download you need:

- An IBM or IBM-compatible personal computer with a SAnet interface card installed.
- A Stage Accompany software program called PROGDEV.EXE.
- A file called PPExxxxx.DPF

PROGDEV.EXE is the program that contains the software for the communication between PC and flash EPROM.
PPExxxxx.DPF contains the actual software for the PPE 2410. xxxxx is a name that tells you more about the software version that the file contains. For instance PPE1_1.DPF contains software version 1.1 or PPE1_1sp could contain a special version of 1.1.

The downloading procedure is as follows:

* Make the connection between the PC and the PPE 2410's SAnet connector.
* Turn the PPE 2410 on while pushing the band select 1 and 4 buttons.
  Now "BOOT P" or "BOOT E" is displayed in the center display and three flashing dots in the input level display.
* Follow the instructions of the PROGDEV program manual.
* When the downloading procedure is completed, all the displays start blinking. The PPE 2410 is ready for use after turning it off and on again.

A more detailed description of the procedure can be found in the instruction manual of the PROGDEV program.

9 Adjustments

After repair, all adjustable signals should be checked and re-adjusted if necessary.

*1 AD converter reference voltage

input voltage:	0
output load:	open
adjustment location:	P1 on the clip and level detection board
instrument:	DC volt meter
measure location + :	IC1 pin 15
measure location - :	IC1 pin 3
value:	-10.24 V ± 0.05 V

*2 Low frequency common mode rejection channel 1

input voltage:	5 Veff, 400 Hz on pin 2 and pin 3 in phase
output load:	open
adjustment location:	TR2 on the preamp board
instrument:	AC volt meter or scope (floating input)
measure location + :	equaliser channel 1 output pin 2
measure location - :	equaliser channel 1 output pin 3
value:	minimal reading, ≤ 0.5 mVeff

*3 High frequency common mode rejection channel 1

input voltage:	5 Veff, 20 kHz on pin 2 and pin 3 in phase
output load:	open
adjustment location:	TR1 on the preamp board
instrument:	AC volt meter or scope (floating input)
measure location + :	equaliser channel 1 output pin 2
measure location - :	equaliser channel 1 output pin 3
value:	minimal reading, ≤ 1 mVeff

*4 Low frequency common mode rejection channel 2

input voltage:	5 Veff, 400 Hz on pin 2 and pin 3 in phase
output load:	open
adjustment location:	TR4 on the preamp board
instrument:	AC volt meter or scope (floating input)
measure location + :	equaliser channel 2 output pin 2
measure location - :	equaliser channel 2 output pin 3
value:	minimal reading, ≤ 0.5 mVeff

*5 High frequency common mode rejection channel 2

input voltage:	5 Veff, 20 kHz on pin 2 and pin 3 in phase
output load:	open
adjustment location:	TR3 on the preamp board
instrument:	AC volt meter or scope (floating input)
measure location + :	equaliser channel 2 output pin 2
measure location - :	equaliser channel 2 output pin 3
value:	minimal reading, ≤ 1 mVeff

*6 Output symmetry channel 1

input voltage:	5 Veff, 400 Hz
output load:	600 Ω
adjustment location:	TR5 on the preamp board
instrument:	scope (dual channel, add mode)
measure location 1+ :	equaliser channel 1 output pin 2
measure location 2+ :	equaliser channel 1 output pin 3
measure location - :	equaliser channel 1 output pin 1
value:	minimal reading, ≤ 1 mVeff

*7 Output symmetry channel 2

input voltage:	5 Veff, 400 Hz
output load:	600 Ω
adjustment location:	TR6 on the preamp board
instrument:	scope (dual channel, add mode)
measure location 1+ :	equaliser channel 2 output pin 2
measure location 2+ :	equaliser channel 2 output pin 3
measure location - :	equaliser channel 2 output pin 1
value:	minimal reading, ≤ 1 mVeff

10 Final test after servicing

For a final test, a signal generator, a level meter/distortion analyser, a PC fitted with a SAnet interface card and a software program called TESTDEV.EXE is needed.

First check frequency response. This should be done at an input/output level of 1 V (unity gain) with a 600 Ω load. A typical frequency response is shown in figure 9.
Final test norms are:

20 Hz -> 50 kHz -0.25 dB
10 Hz -> 200 kHz -2 dB

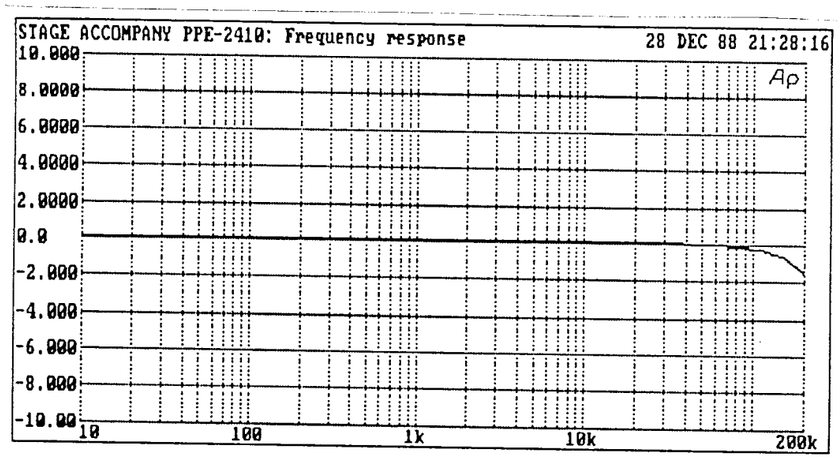


Fig 9 Typical frequency response

Next check harmonic distortion. Final test norms are:

U_{out} = 2.45 V into 600 Ω (+ 10 dBm)
THD + N 10 Hz -> 100 kHz ≤ 0.005 %

A typical distortion graph is shown in fig. 10. An 80 kHz low pass filter is used to eliminate HF processor noise out of this test.

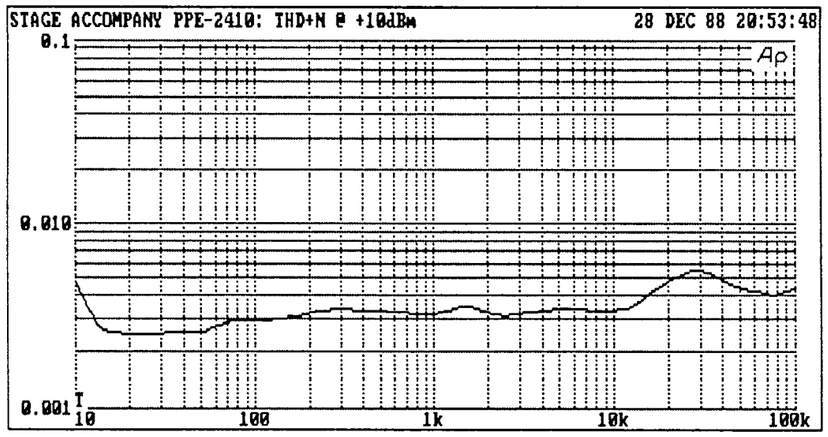


Fig 10 Typical harmonic distortion at + 10 dBm

The total noise level of the PPE 2410 should be less than 90 dB under 0 dBm output level. For this test, a 600 Ω resistor should be placed between pin 2 and pin 3 of the XLR input connector. The best way to test output noise is to measure frequency response without an input signal. A typical graph is shown in fig. 11.

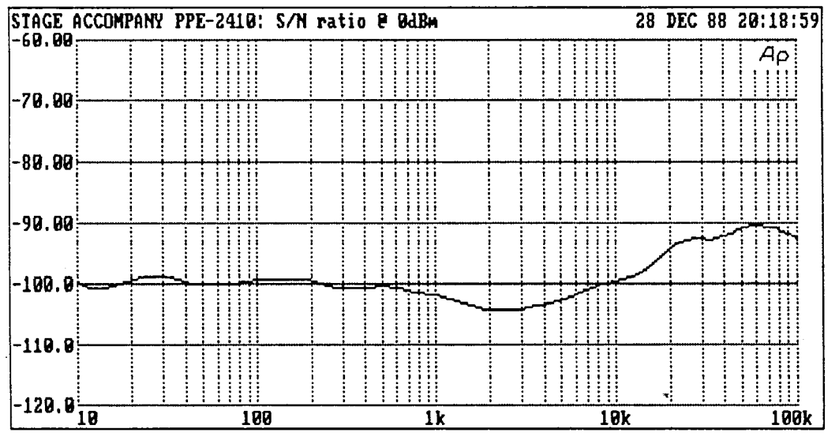


Fig 11 Output noise versus frequency, @ 0 dBm

Next test the common mode rejection. A typical performance graph is shown in fig. 12. The norms are:

CMRR: ≥ 80 dB 20 Hz - 20 kHz

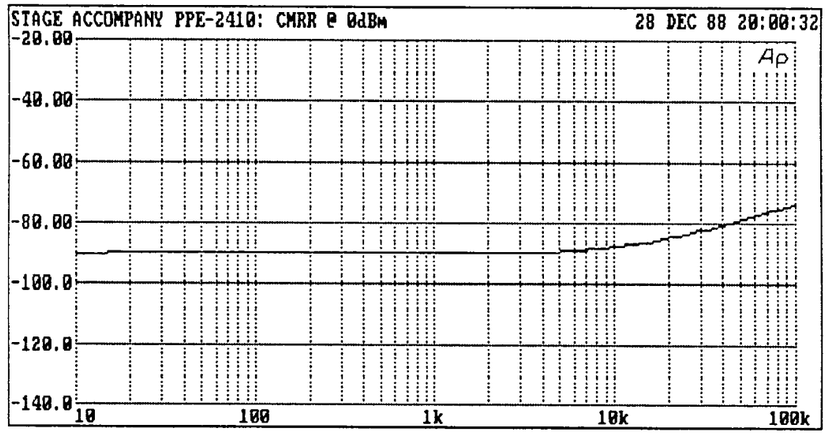


Fig 12 Typical CMR versus frequency

Next make the SAnet connection between the PPE 2410 and the PC and run the TESTDEV.EXE program. Follow the instructions on your screen. Testdev runs a variety of tests on the PPE 2410, such as display tests, button tests and tests on the filter characteristics. The program automatically tells you if the equaliser is ok or not.

11 Specifications

Maximum input level:	+20 dBm (0 dBm = 0.775 V)
Maximum output level:	+20 dBm
Extra input gain:	0 dB, +10 dB, +20 dB
Input impedance:	24 kΩ each leg (30 kΩ unbalanced)
Output impedance:	25 Ω each leg (50 Ω unbalanced)
Frequency response:	20 Hz - 20 kHz, -0.25 dB 10 Hz - 200 kHz, -2 dB
S/N ratio:	> 90 dB, 10 Hz - 100 kHz @ 0dBm typical 100dB @ 1 kHz
CMR ratio:	> 80 dB, 10 Hz - 100 kHz typical 90 dB @ 1 kHz
Channel separation:	> 80 dB, 10 Hz - 100 kHz typical 90 dB @ 1 kHz
THD + N:	< 0.005 %, 10 Hz - 100 kHz (+10 dBm) typical 0.003 % @ 1 kHz
IMD:	< 0.01 %, 2 kHz - 20 kHz (+10 dBm)
TIM:	<0.005 % @ 15kHz (+10 dBm)
Slew rate:	7V / uS
Maximum boost / cut per band:	19.5 dB
Power consumption:	50 VA

12 Serial boost/cut board

The boost/cut board that is described in paragraph 5.2 contains a parallel filter configuration in which case the filter outputs are all added to or subtracted from the original signal.
A disadvantage of this configuration is that the output signals of the filters affect each other when they are summed at the input of IC2-a. This results in frequency curves that would not be expected on the basis of the programmed equaliser parameters. Furthermore the individual amplifications and attenuations in dB's of bands adjusted to the same frequency may not be added to calculate the overall response.

A different filter configuration is the series filter configuration in which case the filter outputs are individually added to or subtracted from the original signal. This configuration is shown in the new basic diagram on page 59.

All PPE-2410's with an ID-code from 1 up to and including 91 have a parallel boost/cut board factory installed. PPE-2410's with an ID-code > 91 will have a series boost/cut board factory installed. The parallel board however can easyly be replaced by the series board.

The board type numbers are as follows:

(old) parallel board : 880601RK
(new) series board : 1531.2409-3

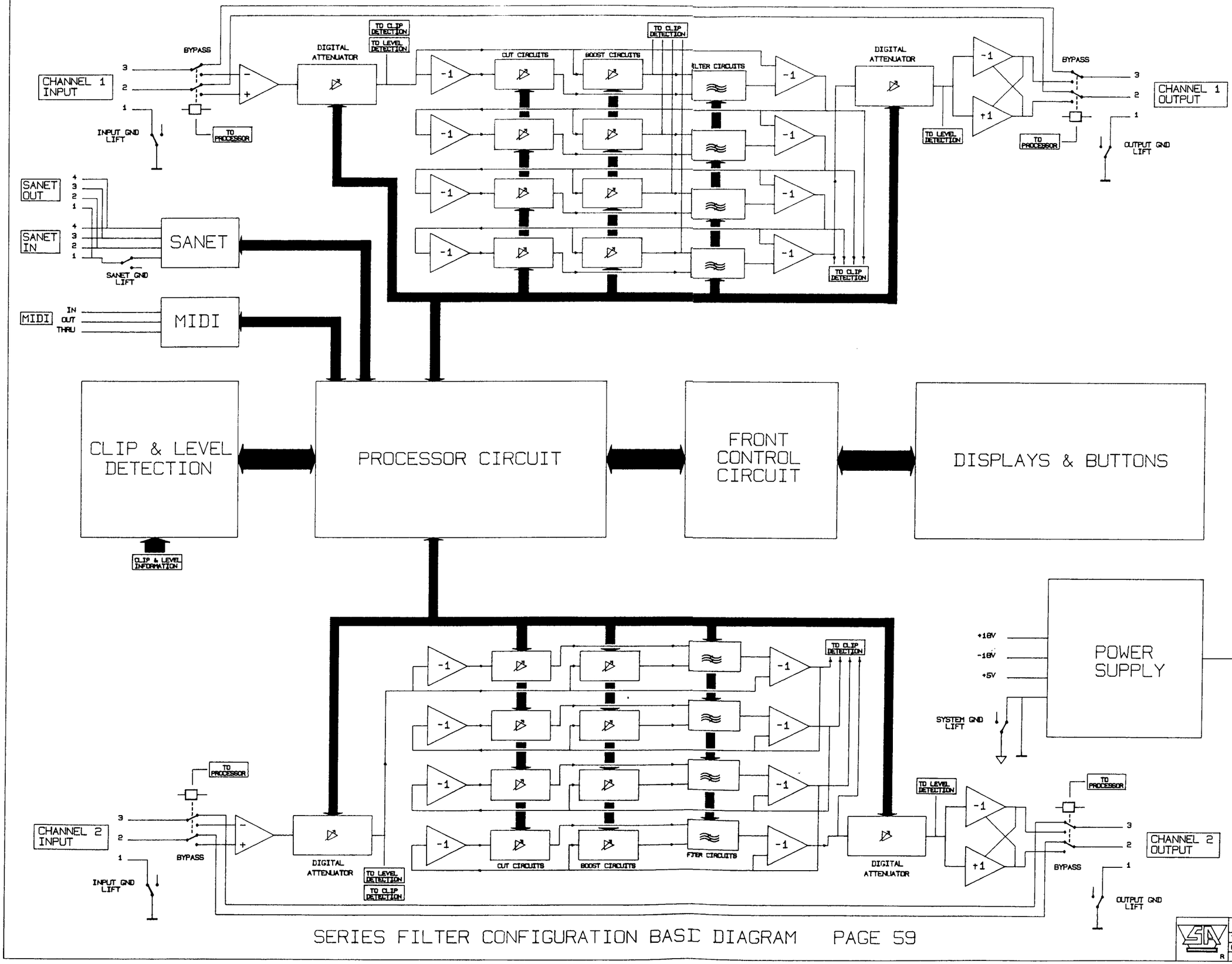
Series boost/cut board installation instructions:

Be sure that the PPE-2410's mains plug has been removed from the receptacle and remove the top cover as described in chapter 3 on page 6 of the service manual.

Take a look at figure 2 on page 7 of the serice manual. Remove the first and the third board (indicated as boost/cut circuits) from the left. Replace them with the new series boards. Be sure that the connectors (headers) are well repositioned in the receptacles.

Place the top cover again. Be sure that the boards all fit in the slots of the cover-foam. The replacement of the boost/cut board has now been completed.

Turn the PPE-2410 on and push the "8" key of the numeric keypad until the <OUTPUT LEVEL> display shows the software version, the ID-code and possibly the software filter configuration. Only if the PPE-2410's software version is 1.2 or higher you have to change the software filter configuration.



SERIES FILTER CONFIGURATION BASIC DIAGRAM PAGE 59

STAGE ACCOMPANY	
TITLE	PPE 2410 BASIC DIAGRAM
REVISIONS	DRAWN R.K.
A1	DATE 16-12-88 SHEET OF

Press the <OUTPUT LEVEL UP> key to alter the configuration to "Ser". However, to do this, you must also press both EQ IN/OUT keys at the same time as you press the <OUTPUT LEVEL UP> key. Finally press the <STORE> button for one second to preserve the new software filter configuration.

For the description of the series configuration circuit please refer to the text of paragraph 5.2. The new series circuit and board layout are included with this supplement (pages 62 and 63). The only difference is that the four filters each have an individual summing input so the signal route has become slightly longer with two more OPAMPs.

Also the clip detection circuits have been changed. In the parallel case the single summing OPAMP is checked for clipping. However in the series case a clip can occur at the outputs of all four summing OPAMPs. These four outputs are combined by IC10 in an OR-wise manner to create one clip signal.

Because the four bands are now arranged in series (cascaded), a gain in one band may cause clipping of another band. The consequence is that you have to check the boosts of all previous bands if one band is clipping.

Please note that the highest band (4) comes first in the boost/cut circuit, then band 3 and so on. In this way the (high frequency) filter noise of previous bands is amplified as little as possible in case of boosting.

The input gain resistors to be matched to the DA converters are R9, R10 and R11. Their values can be found on page 64. The values of the boost resistors (R1, R3, R5 and R7) and the cut resistors (R2, R4, R6 and R8) can be found on page 66.

Brief explanation of parallel and series filter configurations

First we take one filter band to show some general calculations.

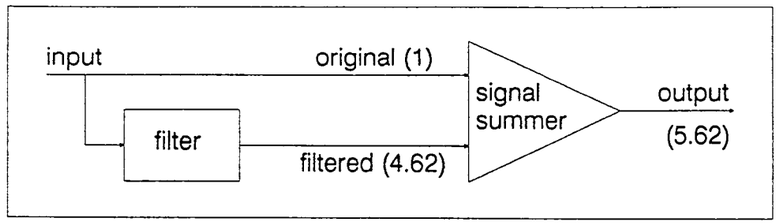


Fig 13 filter summation

Suppose we want to boost a signal with 15 dB. A 15 dB amplification relates to a gain factor of 5.62. Because the original signal represents a value of 1, the filter output must have a signal of 4.62 times the original signal (5.62 - 1). When the filter output signal is added to the original signal, the total amplification of the signal will be 5.62 (4.62 + 1) which represents 15 dB of amplification.

Now we want to use two bands adjusted to 15 dB and the same frequency to get more boost. The filter outputs of a parallel configuration are added together so the total amount of signal becomes 10.24 (1 + 4.62 + 4.62). The gain factor 10.24 represents an amplification of 20.2 dB which is far from 30 dB.

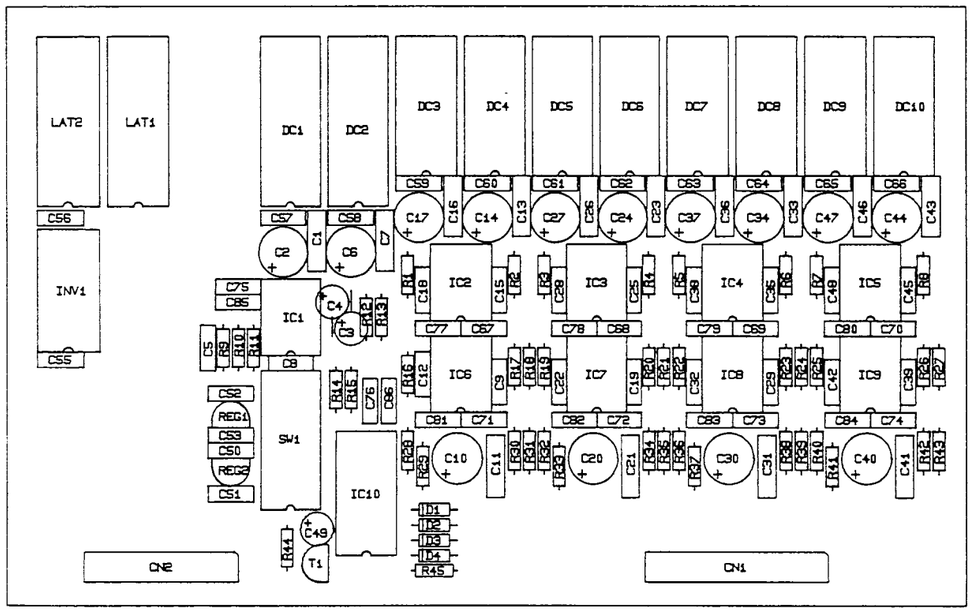
A 15 dB attenuation relates to a gain factor of 0.18. Because the original signal represents a value of 1, the filter output must have a signal of -0.82 times the original signal (0.18-1). When the filter output is added to the original signal, the total amplification of the signal will be 0.18 (-0.82 + 1) which represents 15 dB attenuation.

The situation gets worse when you try to get an attenuation of more than 19.5 dB. We take three bands that are all adjusted to -15 dB and the same frequency. The total amount of signal becomes -1.46 (-0.82 + -0.82 + -0.82 + 1). The factor -1.46 represents an amplification factor of 3.29 dB which is very far from -45 dB! We expected an attenuation but we got an amplification of the signal. The phase of the signal has been inverted as well (the minus sign). This example shows that you have to be very careful when adjusting different equaliser bands to (nearly) the same frequency. The resulting frequency response can be very different from the expected response.

Now we are going to repeat the experiment with a series filter configuration to show that this configuration does not have the previous mentioned problems.

Because the filters are cascaded the amplification factor of 5.62 must be multiplied in stead of summed. The total factor becomes 5.62 x 5.62 = 31.58 which represents an amplification of 30 dB.

The procedure is exactly the same for attenuation. The total factor becomes 0.18 x 0.18 x 0.18 = 0.0058 which represents an attenuation of 45 dB.



SERIAL BOOST/
PAGE 62 CUT BOARD

SW1-C CD4053BE

SW1-D CD4053BE

-5V +5V

R9, R10, R11 SEE GAIN RESISTOR TABLE

SW1-A CD4053BE

SW1-B CD4053BE

INPUT PPM

+10 DB

0 DB

R13 10K0

R12 10K0

R10

R9

R11

C4 1U 35V

C3 1U 35V

C5 22P

INPUT

C2 100N

C1 100U 35V

INPDAC

DC1 AD7545JN

IC1-A NE5532AN

C7 100N

C6 100U 35V

OUTPDAC

DC2 AD7545JN

C8 10P

OUTPUT

OUTPUT PPM

IC1-B NE5532AN

C16 100N

C17 100U 35V

DC3 SA1010

IC2-B NE5532AN

BOOST 4 OUT

R1 SEE BOOST RESISTOR TABLE

C18 10P

R1

C9 10P

R17 10K0

C13 100N

C14 100U 35V

R18 10K0

IC6-A NE5532AN

DC4 SA1010

IC2-A NE5532AN

CUT 4 OUT

R2 SEE CUT RESISTOR TABLE

C15 10P

R2

C11 100N

C10 100U 35V

FILTER 4 IN

R30 3K01

R31 10K0

C12 10P

R16

IC6-B NE5532AN

R28 10K0

CLIP4

R29 10K0

C26 100N

C27 100U 35V

DC5 SA1010

IC3-B NE5532AN

BOOST 3 OUT

R3 SEE BOOST RESISTOR TABLE

C28 10P

R3

C19 10P

R20 10K0

C23 100N

C24 100U 35V

R21 10K0

IC7-A NE5532AN

DC6 SA1010

IC3-A NE5532AN

CUT 3 OUT

R4 SEE CUT RESISTOR TABLE

C25 10P

R4

C21 100N

C20 100U 35V

FILTER 3 IN

R34 3K01

R35 10K0

C22 10P

R19 10K0

IC7-B NE5532AN

R32 10K0

CLIP3

R33 10K0

R15 10K0

R14 13K0

C49 10U 35V

CLIP1

IC10-A TL074

R44 10K0

R45 10K0

D3 1N4148

T1 BC557

OUTPUT CLIP

CLIP2

IC10-B TL074

D1 1N4148

CLIP3

IC10-C TL074

D2 1N4148

CLIP4

IC10-D TL074

D4 1N4148

C31 100N

C30 100U 35V

FILTER 2 IN

R38 3K01

R39 10K0

C32 10P

R22 10K0

IC8 NE5532AN

R36 10K0

CLIP2

R37 10K0

C41 100N

C40 100U 25V

FILTER 1 IN

R42 3K01

R43 10K0

C42 10P

R25 10K0

IC9-B NE5532AN

R40 10K0

CLIP1

R41 10K0

C29 10P

R23 10K0

C33 100N

C34 100U 35V

R24 10K0

IC8-A NE5532AN

DC8 SA1010

IC4-A NE5532AN

CUT 2 OUT

R6 SEE CUT RESISTOR TABLE

C36 10P

R6

C39 10P

R26 10K0

C43 100N

C44 100U 35V

R27 10K0

IC9-A NE5532AN

DC10 SA1010

IC5-A NE5532AN

CUT 1 OUT

R8 SEE CUT RESISTOR TABLE

C45 10P

R8

C36 100N

C37 100U 35V

DC7 SA1010

IC4-B NE5532AN

BOOST 2 OUT

R5 SEE BOOST RESISTOR TABLE

C38 10P

R5

C46 100N

C47 100U 35V

DC9 SA1010

IC5-B NE5532AN

BOOST 1 OUT

R7 SEE BOOST RESISTOR TABLE

C48 10P

R7

LAT1 74HC373

LAT2 74HC373

INPDAC

OUTPDAC

DACS LSB

DACS MSB

INV1-A 74HC04

INV1-B 74HC04

INV1-C 74HC07

INV1-D 74HC07

INV1-E 74HC07

INV1-F 74HC07

CN2

+3V D1 D3 D5 D7 DACS MSB BOOST 3 CUT 3 CUT 1

D0 D2 D4 D6 DACS LSB BOOST 4 BOOST 2 CUT 4 CUT 2

REG1 78L05

REG2 79L05

+18V +5V -18V -5V

CS2 100N CS3 100N CS5 100N CS6 100N

CS0 100N CS1 100N

CN1

FILTER 3 IN FILTER 1 IN BOOST 3 OUT BOOST 1 OUT CUT 3 OUT CUT 1 OUT OUTPUT OUTPUT CLIP INPUT PPM -18V

FILTER 4 IN FILTER 2 IN BOOST 4 OUT BOOST 2 OUT CUT 4 OUT CUT 2 OUT INPUT +18V 0 DB +10 DB

SERIAL BOOST / CUT BOARD PAGE 63

-18V C67-76 100N

+3V C57-66 100N

+18V C77-86 100N

STAGE ACCOMPANY

TITLE	PPE 2410 BOOST/CUT CIRCUIT		
REVISIONS	SERIAL	DRAWN	R.K.
R	A3	DATE 14-12-00	SHEET OF

PPE-2410 resistor values for input gain circuit (serial boost/cut board) using AD7545JN

DAC resistance range (Ω)	R10 (Ω)	R9 (Ω)	R11 (Ω)
5000 - 5250	23700	5620	51100
5250 - 5500	24900	5900	53600
5500 - 5750	26100	6190	56200
5750 - 6000	27400	6490	59000
6000 - 6250	28000	6810	61900
6250 - 6500	29400	6980	63400
6500 - 6750	30900	7320	66500
6750 - 7000	31600	7500	69800
7000 - 7250	33200	7870	71500
7250 - 7500	34000	8060	73200
7500 - 7750	35700	8450	76800
7750 - 8000	36500	8660	78700
8000 - 8250	37400	8870	82500
8250 - 8500	39200	9310	84500
8500 - 8750	40200	9530	86600
8750 - 9000	41200	9760	88700
9000 - 9250	42200	10000	90900
9250 - 9500	43200	10500	93100
9500 - 9750	44200	10700	97600
9750 - 10000	45300	11000	100000
10000 - 10250	46400	11300	102000
10250 - 10500	47500	11500	105000
10500 - 10750	48700	11800	107000
10750 - 11000	49900	12100	110000
11000 - 11250	51100	12400	113000
11250 - 11500	52300	12700	115000
11500 - 11750	53600	13000	118000
11750 - 12000	54900	13000	118000
12000 - 12250	56200	13300	121000
12250 - 12500	57600	13700	124000
12500 - 12750	59000	14000	127000
12750 - 13000	59000	14300	130000
13000 - 13250	60400	14700	133000
13250 - 13500	61900	14700	133000
13500 - 13750	63400	15000	137000
13750 - 14000	64900	15400	140000
14000 - 14250	64900	15800	143000
14250 - 14500	66500	15800	143000
14500 - 14750	68100	16200	147000
14750 - 15000	69800	16500	150000
15000 - 15250	69800	16900	150000
15250 - 15500	71500	16900	154000
15500 - 15750	73200	17400	158000
15750 - 16000	73200	17800	158000
16000 - 16250	75000	17800	162000
16250 - 16500	76800	18200	165000

16500 - 16750	76800	18200	165000
16750 - 17000	78700	18700	169000
17000 - 17250	78700	19100	174000
17250 - 17500	80600	19100	174000
17500 - 17750	82500	19600	178000
17750 - 18000	82500	20000	178000
18000 - 18250	84500	20000	182000
18250 - 18500	84500	20500	182000
18500 - 18750	86600	20500	187000
18750 - 19000	86600	21000	191000
19000 - 19250	88700	21000	191000
19250 - 19500	90900	21500	196000
19500 - 19750	90900	21500	196000
19750 - 20000	93100	22100	200000

Resistor values for PPE 2410 serial boost and cut circuits using SA1010 or AD7524JN

DAC resistance range (Ω)	R1, R3, R5, R7 (Ω)	R2, R4, R6, R8 (Ω)
5000 - 5250	43200	4640
5250 - 5500	45300	4870
5500 - 5750	47500	4990
5750 - 6000	49900	5230
6000 - 6250	52300	5490
6250 - 6500	53600	5760
6500 - 6750	56200	5900
6750 - 7000	57600	6190
7000 - 7250	60400	6340
7250 - 7500	61900	6650
7500 - 7750	64900	6810
7750 - 8000	66500	7150
8000 - 8250	68100	7320
8250 - 8500	71500	7500
8500 - 8750	73200	7680
8750 - 9000	75000	8060
9000 - 9250	76800	8250
9250 - 9500	78700	8450
9500 - 9750	82500	8660
9750 - 10000	84500	8870
10000 - 10250	86600	9090
10250 - 10500	88700	9310
10500 - 10750	90900	9530
10750 - 11000	93100	9760
11000 - 11250	95300	10000
11250 - 11500	95300	10200
11500 - 11750	97600	10500
11750 - 12000	100000	10700
12000 - 12250	102000	11000
12250 - 12500	105000	11000
12500 - 12750	107000	11300
12750 - 13000	110000	11500
13000 - 13250	110000	11800
13250 - 13500	113000	12100
13500 - 13750	115000	12100
13750 - 14000	118000	12400
14000 - 14250	121000	12700
14250 - 14500	121000	13000
14500 - 14750	124000	13000
14750 - 15000	127000	13300

13 New operational amplifier

Upto serial number 90, the Signetics **NE5532AN** dual operational amplifier is generally used in the PPE 2410.
From serial number 91, the PPE 2410 will be either equiped with the **NE5532AN** or the **MC33078**. This dual opamp can be exchanged or mixed with the **NE5532AN** without any problem.
The general advantages of the **MC33078** are a somewhat lower noise level and improved offset characteristics.
However, because of better drive capacities in low impedances, **IC6** and **IC8** on the input / output board should remain **NE5532AN**'s.

For repair work, the best choice for replacement is the **MC33078**.
They can be obtained at Stage Accompany (part no: 1264.3078).
Signetics **NE5532AN** are possible as wel but Texas Instruments **NE5532AN**'s should in all cases be avoided.

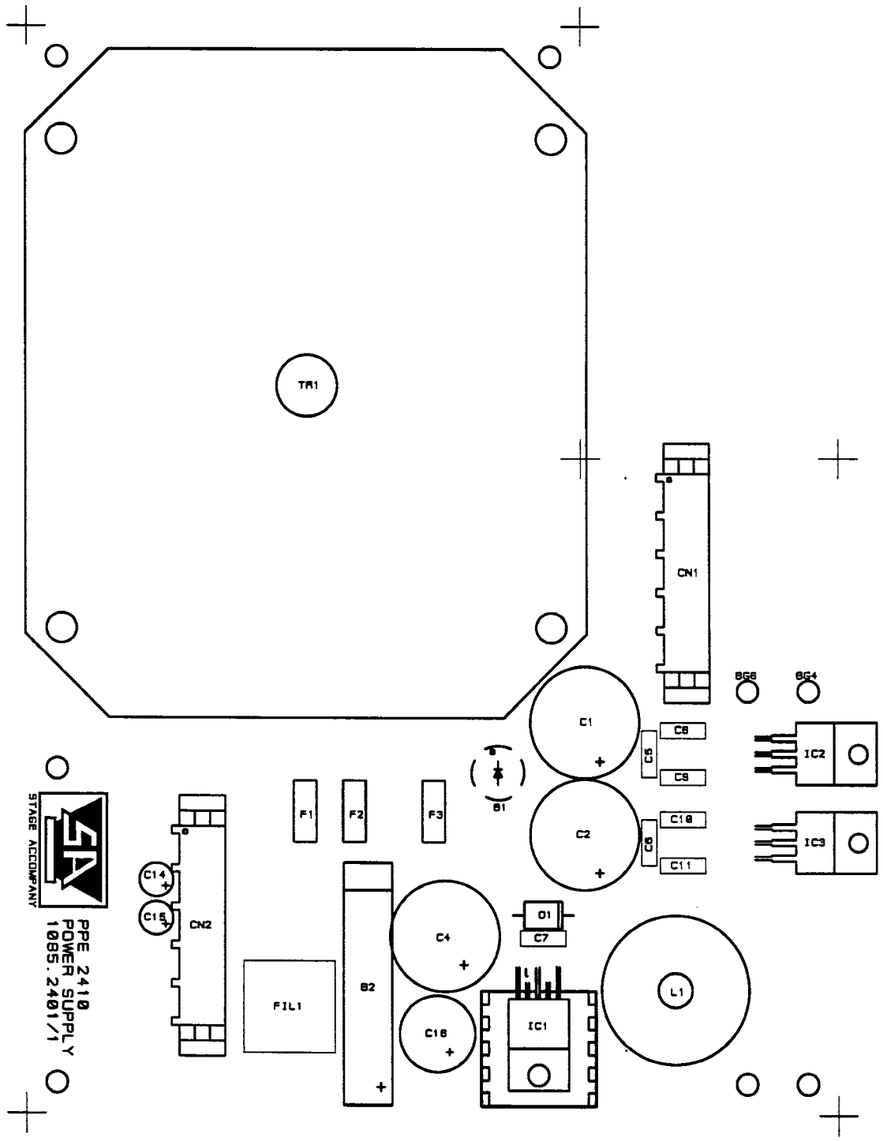
14 Power supply update

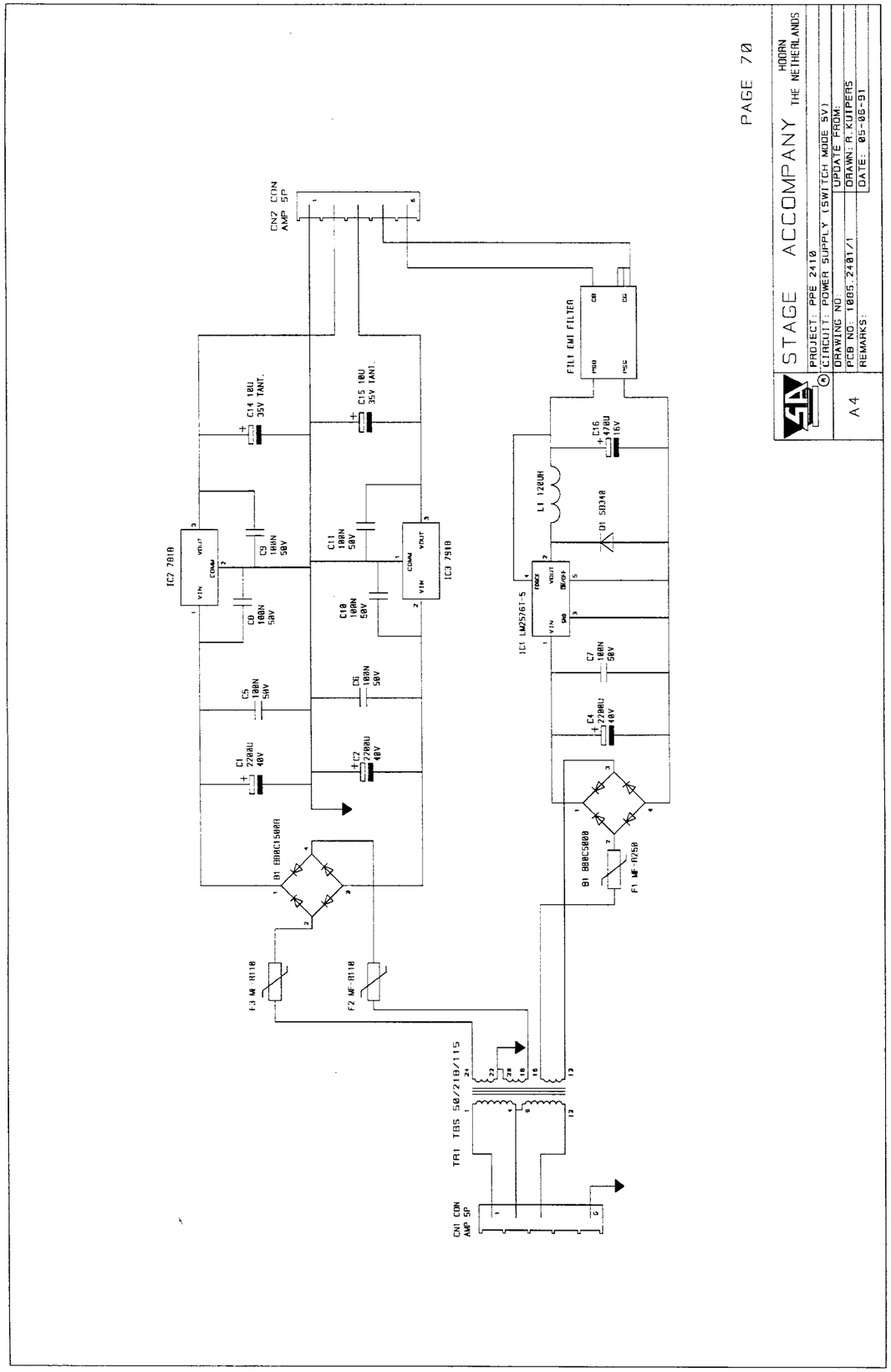
From serial number 206940313, the PPE 2410 is equiped with a switch mode power supply (SMPS) for the 5 volts voltage.
The new board layout and schematics can be found on the pages 69 and 70.
This new power supply replaces the old power supply circuit with update board.

Together with this change of power supply, the motherboard has been redesigned as well. The track layout has been modified and a copper screen has been added on the component side. Both the schematics and the component layout remain the same. The 74HC154 IC's on this board are now mounted in a smaller version (NT suffix).

Older PPE 2410's can be updated with this new power supply. Note however that the SMPS can only be installed together with the new motherboard. Combinations of new power supplies with old motherboards result in a noisy equaliser!

The new supply has improved the efficiency of the PPE 2410, so the mains fuse has changed to 500 mAT (220 volts operation) and 1 AT (100-110 volts operation).





15 Frontboard Update

From serial number 427120392, the PPE 2410 will be built with a redesigned frontboard. This board was redesigned to process all the updates which have been made through the time. This new PCB, with ordernumber 1085.2408/4, can replace all earlier frontboards in combination with software version 1.8. A drawing of the new PCB can be found on page 72.

The functionality of the frontboard has not been changed, but some important earlier updates have been integrated:

1. The extra capacitors which were needed to avoid noise from the new SMPS, which has been integrated from serial number 206940313 (see also supplement 3 in this manual). The 1000uF/16V capacitor has been removed.

2. The frontboard is updated to be used with a standard 7-segment display, instead of a +1 display. Note that software version 1.8 is necessary for right functionality.

3. The ON/OFF LED has been rotated to match with all the other LED's on the PCB.

4. A silk screen has been applied to indicate which number the components have in the schematics

***** PPE 2410 special functions ****

"BANK/REGISTER" functions

These functions can be selected by pushing the corresponding BANK/REGISTER button for at least 1 second.
They can be terminated by pushing either the RECALL or STORE button. Use the RECALL button if you want to ignore the changes, use the STORE button if you want to save them.

* BANK/REGISTER function 1 MIDI program table

  Incomming program numbers can be connected to a PPE 2410 preset by means of the MIDI program table. The program number can be selected with the Q-FACTOR UP/DOWN buttons and the relating preset can be subsequently selected with the BANK/REGISTER buttons.

* BANK/REGISTER function 2 MIDI channel number

  The MIDI channel number can be selected with the Q-FACTOR UP/DOWN buttons.

* BANK/REGISTER function 3 MIDI omni mode

  The MIDI omni mode can be switched on/off with the Q-FACTOR UP/DOWN buttons.

* BANK/REGISTER function 4 MIDI reset

  This function resets all MIDI parameters. MIDI program number 1 is connected to preset 1-1, program number 2 to preset 1-2 and so on until program number 63 which is connected to preset 8-8. Program number 64 is again connected to preset 1-1, 65 again to preset 1-2 and so on until program number 127. The MIDI channel number is initialised on 1, the omni mode is selected.

* BANK/REGISTER function 5 "Preset only" mode

  The "preset only" mode can be switched on/off with the Q-FACTOR UP/DOWN buttons with both the EQ IN/OUT buttons depressed at the same time. In the "preset only" mode, presets or settings can not be changed, only presets can be activated.

* BANK/REGISTER function 7 Preset reset

  This function resets the PPE 2410 presets. This means that all input and output attenuators are set "off",input gain is set 0 dB, all boost/cut values are set 0 dB, all Q-factors become 1 and all frequencies are set on their minimum value. The EQ in/out relais are

  set in and all filters are activated. Afterwards, the PPE 2410 itself can be resetted by recalling a preset.

* BANK/REGISTER function 8 Configuration information

  The input level readout shows the software version number. The identity code is shown in the frequency/level/Q-factor display. This number is related to the last four figures of the serial number at the back of the PPE 2410.

* "Signal present time" readout

  The accumulating time that signal has been present can be shown by pushing the channel 1 EQ IN/OUT button while switching the PPE 2410 on. The unit is hours.

* Copying the settings from one channel to another

  All settings can be copied from one channel to another. First select the channel that you want to copy with the READOUT button. Then push the DUAL TRACK button until both the readout leds and the dual track led are lit. The settings are now copied to the other channel.

* Changing the speed of the center frequency selection

  The speed of the center frequency selection can be changed by pushing a BANK/REGISTER button (1 for slow to 8 for fast speed) while pushing one of the CENTER FREQUENCY UP/DOWN buttons. Another way is to push the BANK/REGISTER button first and then a FREQUENCY UP or DOWN button.

* Recalling presets

  Recalling presets is slightly different from the PPE 2400 procedure. When the dash between the bank and the register indication is at the bottom of the display, again a preset can be selected. After pushing on the RECALL button, the dash at the top of the display will lit. At that moment, a preset can be changed without affecting the audio output. These changes can even be stored. After pushing RECALL for a second time, the preset will be active and the output signal will be changed according to the preset information.
  A blinking dash means the contents of the preset are different from the actual situation.

* Boot mode

  The PPE 2410 is put in "boot mode" (for downloading software) by pushing the BAND SELECT buttons 1 and 4 while turning the equaliser on.

* BANK/REGISTER function 6, "level" mode
The PPE 2410 leveller function can be switched on and off with keypad function 6; The threshold of the leveller can be set with the Q-factor up and down buttons, while keeping both the EQ IN/OUT buttons depressed. The threshold ranges from 0 dB to + 15 dB. The output level readout starts blinking whenever the limiter is active.

* Unlocking the PPE 2410 and resetting the lock code
The PPE 2410 can be unlocked by pusing the BANK/REGISTER buttons 4 and 7 simultaneously while switching the PPE 2410 on. The lock code is initialised to 1.