

# **ARCAM**

**DELTA 70.2/170  
COMPACT DISC UNITS  
SERVICE MANUAL**

**ARCAM DELTA 70.2 / 170 CD PLAYER SERVICE MANUAL**

Issue 1 February 90

Arcam Drawing No. H04/0006

**CONTENTS**

<b>CIRCUIT DESCRIPTION .....</b>	<b>2</b>
<b>Disc Playing Mechanism .....</b>	<b>2</b>
<b>Decoder PCB .....</b>	<b>3</b>
<b>Display PCB .....</b>	<b>4</b>
<b>Transformer PCB .....</b>	<b>4</b>
<b>Audio PCB (D70.2 only) .....</b>	<b>4</b>
<b>Master clock .....</b>	<b>4</b>
<b>Power supplies .....</b>	<b>5</b>
<b>Digital to Analogue convertor (DAC) .....</b>	<b>5</b>
<b>Audio stages .....</b>	<b>5</b>
<b>Mute circuit .....</b>	<b>6</b>
<b>Optical Board (D170 only) .....</b>	<b>6</b>
<b>PLACING THE DELTA 70.2/170 IN SERVICE MODE .....</b>	<b>8</b>
<b>CHANGE OF MAINS VOLTAGE .....</b>	<b>9</b>
<b>LASER AND FOCUS OFFSET ADJUSTMENT .....</b>	<b>11</b>
<b>D70.3/ D170 SERVICE SHEET .....</b>	<b>13</b>
<b>CIRCUIT DIAGRAMS .....</b>	<b>14</b>

## CIRCUIT DESCRIPTION

### Disc Playing Mechanism CDM4 (CDM1 Mk II on Delta 170)

The CDM4 is contained within the loading mechanism over a floating suspension and consists of the turntable motor, laser swingarm assembly or RAFOC unit (Radial\Focus), and a control PCB. The CDM4 can be likened to a conventional analogue turntable in that it rotates the disc, follows track and produces a signal (the HF signal) which is

- H.F. High Frequency signal. An amplified signal from the photodiodes reading the information off the disc.
- H.F.D. High Frequency Dropout - signal from the CDM4 to the A chip that a dropout in signal has occurred. Automatic level setting in the data slicer and phase detector in the A chip are clamped to their present level on receipt of this signal.
- M.C. Motor control. This is a high frequency square wave for control of the turntable motor speed and direction. As a 1:1 mark/space square wave (i.e. a mean D.C. level of 50%) the motor is stationary.

If the M/S ratio alters so that the mean level rises then the disc will rotate clockwise (from above), the normal direction for playback. If the M/S ratio causes the mean level to fall below 50% then the turntable will turn anti-clockwise. Speed is governed by how far the mean level is from 50%. ("Hyperdrive" occurs when the M.C. signal is faulty and is at either 0V or +5V.)

### Decoder PCB

The decoder PCB carries the majority of the CD player digital circuitry. Key to the operation of the player is the servo microprocessor, MAB 8441 T157, which initiates start-up, track jumping and searching in the CDM4. It also has a certain degree of control over the A chip (SAA 7210P). In turn the A chip provides decoded Q channel data (disc time and track no. information) back to the microprocessor. The servo micro is also in two way contact with the control micro via the I<sup>2</sup>C bus which can request this Q channel data for display purposes. The servo micro can also receive commands from the control micro (e.g. start \stop \go to track ). In this situation the control micro merely passes on an instruction it has received from the keyboard or remote control receiver. On receipt of this instruction the servo micro carries out the appropriate routines for the instruction. The servo micro also controls tray in/out movements by use of the circuit consisting of Q4-Q7 and D3 and D4. The A chip demodulates the HF signal from the CDM4 into digital form, performs a series of decoding / error correcting functions on the data using the 64k DRAM as working space. It finally outputs a serial data stream containing the 16 bit audio samples (left and right alternately) to the B chip (SAA 7220P/B).

The A chip also passes the Q channel data extracted in the decoding process to the servo micro as mentioned earlier. The A chip governs the speed of the turntable motor by comparing the rate of data read off the disc with the master clock frequency then increasing or decreasing the turntable speed for the required data rate.

The B chip takes the recovered 16 bit audio samples from the A chip. It can "fill in" up to 8 missing samples, attenuate by 12dB's or mute the digital audio signal under control of the servo micro. The audio samples then pass through a 4 x oversampling digital filter and finally leave the B chip at 4 x the input data rate to go to the DAC. The B chip also contains an encoder and driving circuit for the serial digital output socket.

## DELTA 70.2/170 SERVICE MANUAL

of the servo micro. The audio samples then pass through a 4 x oversampling digital filter and finally leave the B chip at 4 x the input data rate to go to the DAC.

The B chip also contains an encoder and driving circuit for the serial digital output socket. The decoder pcb also contains the display/control microprocessor, XC 86606P. The control micro's function is to receive commands from the display board and to interpret any incoming data from the remote receiver for commands to pass on to the servo micro.

Display data is sent in serial form from the control micro to the display PCB.

The decoder board contains 3 regulated supplies and 2 unregulated. One of the supplies is regulated to +5 volts and is used for the decoder and display pcbs and the other

DELTA 70.2/170 SERVICE MANUAL

**Power supplies**

## Mute circuit

The audio output is disconnected on switch on, to allow time for the circuitry to stabilize, by the relay. This prevents thumps being transmitted to the amplifier. The circuit operation is explained below. On switch on rectified ac via D207,D211 charges up C224 until the voltage is sufficient to turn on transistors Q209,210 and energise the relay. On switch off Q209 turns off immediately and the relay opens.

## Optical Board (D170 only)

The optical pcb on the D170 contains the master clock for the decoder board and also the circuitry required to provide both optical and co-axial digital outputs. The pcb is powered by its own power transformer and 2 regulated +5 volt supplies are formed from it by the adjustable zener diodes,IC8 and IC9 and their associated resistor networks. A third +5 volt regulated rail is derived from the +12 volt supply which comes to the optical board via the 14 way jumper lead.

The master clock is based on the 11.2896 MHz crystal X1 and two of the inverters of IC3. This clock then passes through two more inverters of the same ic to provide sufficient current drive to supply opto-isolator IC2. R8 is a pull up resistor for the open collector output. It is then passed through one more inverter to clean the signal up before passing to the decoder board and pin 11 of the B chip.

Digital data from the decoder board (DOBM) passes through the parallel connected inverters of IC4 to drive the opto-isolator IC6. The data then passes through an inverter gate of IC7 and into the D-type latch, IC5. The data is clocked out on positive edges into the second half of the latch and is clocked out of this ic on negative edges. The output is fed into four parallel inverters to drive the transformer L2, for the co-axial digital output. R13,14,15 are used to limit the output level of the data. For the optical digital output data is fed direct from the bistable through an inverter to the optical transmitter IC10.

## SIGNALS BETWEEN DECODER AND OUTPUT BOARD

DAAB	Data A to B
CLAB	Clock A to B (1.4112MHz)
WSAB	Word select A to B
DABD	Data B to DAC
CLBD	Clock B to DAC (5.6448 MHz). Sourced direct from the precision clock circuit in the Delta 70.2/170.
WSBD	Word select B to DAC.

CIRC	Cross Interleaved Reed - Solomon Code.
DRAM	Dynamic random access memory. Re-useable memory.
DAC	Digital to Analogue convertor.
EFM	Eight to fourteen modulation. Sixteen bit audio amples are split into two 8 bit words which in turn are coded into 14 bit words incorporating error detection bits before encoding onto the disc.
FIFO	First in First out. Serial buffer in one section of the DRAM where data from the disc is read in one end then read out at the other. A "reservoir" for data that absorbs differences between the rate that data comes off the disc and the master clock frequency.
FRAME	Block of 588 bits of data on the disc containing 12 x 16 bit samples (6 left and 6 right) including error correction, synchronisation and sub coder.

## PLACING THE DELTA 70.2/170 IN SERVICE MODE

To put the unit into service mode the player should be switched on with the following buttons pressed in:

Forward search (>>>), Next track (>), Rem/Lap.

The display should now show just "0". This is the stand-by mode. In this state it is possible to move the arm by use of the foward and reverse search buttons. This enables a check to be made of the free movement of the arm across the disc.

### Service Position 1

From position 0 the player can be put into position 1 by pressing the next track button (>). In this state the laser emits light and the objective tries to focus. When the focal point has been reached "1" appears on the display. If there is no disc in the machine the objective tries to focus 16 times and then goes back to service position 0. As in position 1 the arm can be moved by use of the search buttons.

### Service position 2

This is reached by pressing the next track button after position 1 has been reached. The turntable motor starts to run and "2" appears on the display. The arm is sent to the centre of the disc in preparation for servicing position 3.

### Service position 3

Reached by pressing the next track button after position 2 has been reached. The radial control is switched on and other information is displayed. ~~such as disc type, MUCD, artist, title, date, etc.~~

## CHANGE OF MAINS VOLTAGE

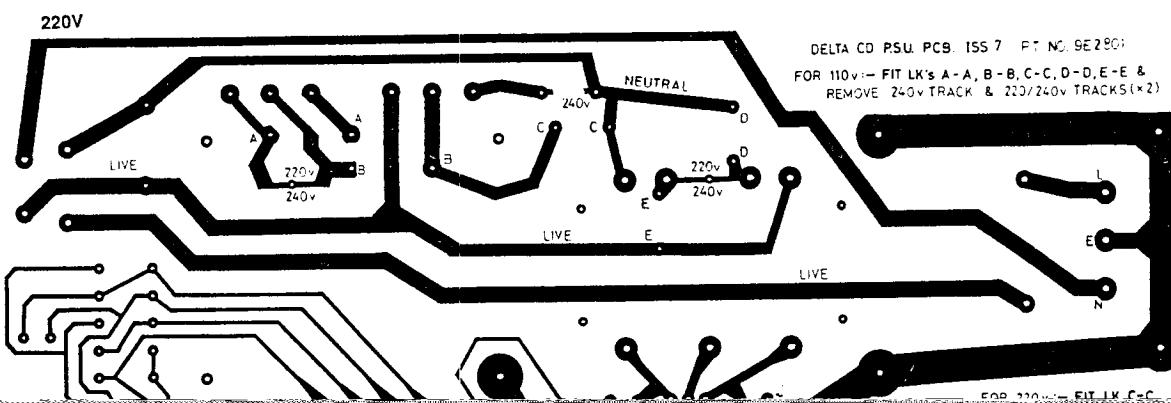
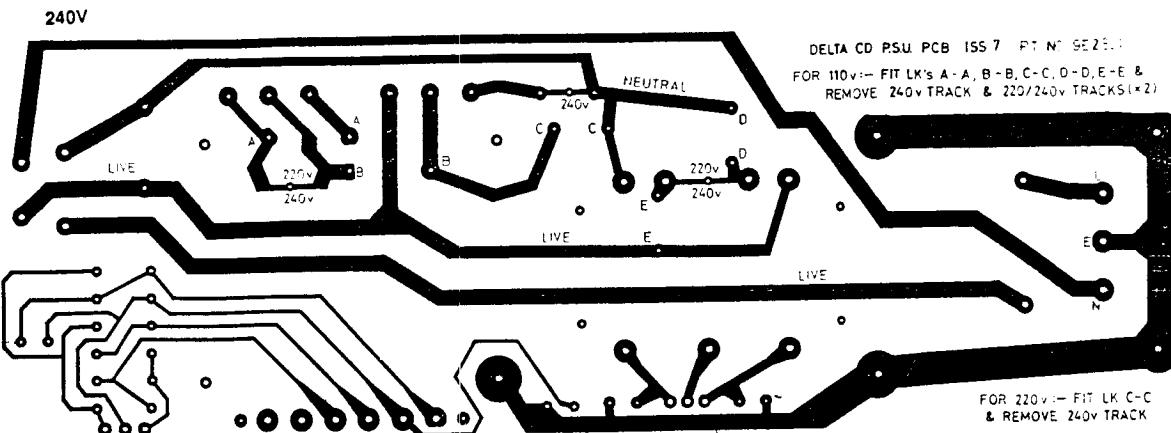
**WARNING** - The unit **must** be unplugged from the mains supply when changing the wiring or the fuse as the fuse and the mains inlet are at mains potential, even with the unit switched off.

The Delta CD players can be modified to work on other mains voltages by adding or removing links on the transformer pcb and if necessary replacing the mains fuse.

Remove the transformer board by undoing the 6 screws holding the board in place and pull off the button from the mains switch. Then remove all the connecting leads from the board noting where they go for replacing them later. Now modify the board by following the instructions on the underside of the board (which are duplicated overleaf).

Mains fuse rating: 240V/220V 315mA (T)  
120V/110V 630mA (T)

# DELTA 70.2/170 SERVICE MANUAL



## LASEB AND FOCUS OFFSET ADJUSTMENT

## Laser adjustment for CDM4/CDM1 MKII

Measure the resistance of R3105 + R3106 and adjust potentiometer R3106 so that the combined resistance is 1K ohms.

Put test disc 5 in the machine and press "Play". With a DC voltmeter measure the voltage across R3104. *Note: The voltage should be less than 1250mV.*

This voltage should be less than 1260mV.  
Check that HF is present. If not stop and analyse  
fault.

If HF is present play track 1 of test disc 5 and adjust R3106 so that the voltage across R3102 (TP1 and 2) is 50 mV.

Check that during the adjustment that the voltage across R3104 does not exceed 1260mV.

## Focus offset adjustment

### Coarse adjustment

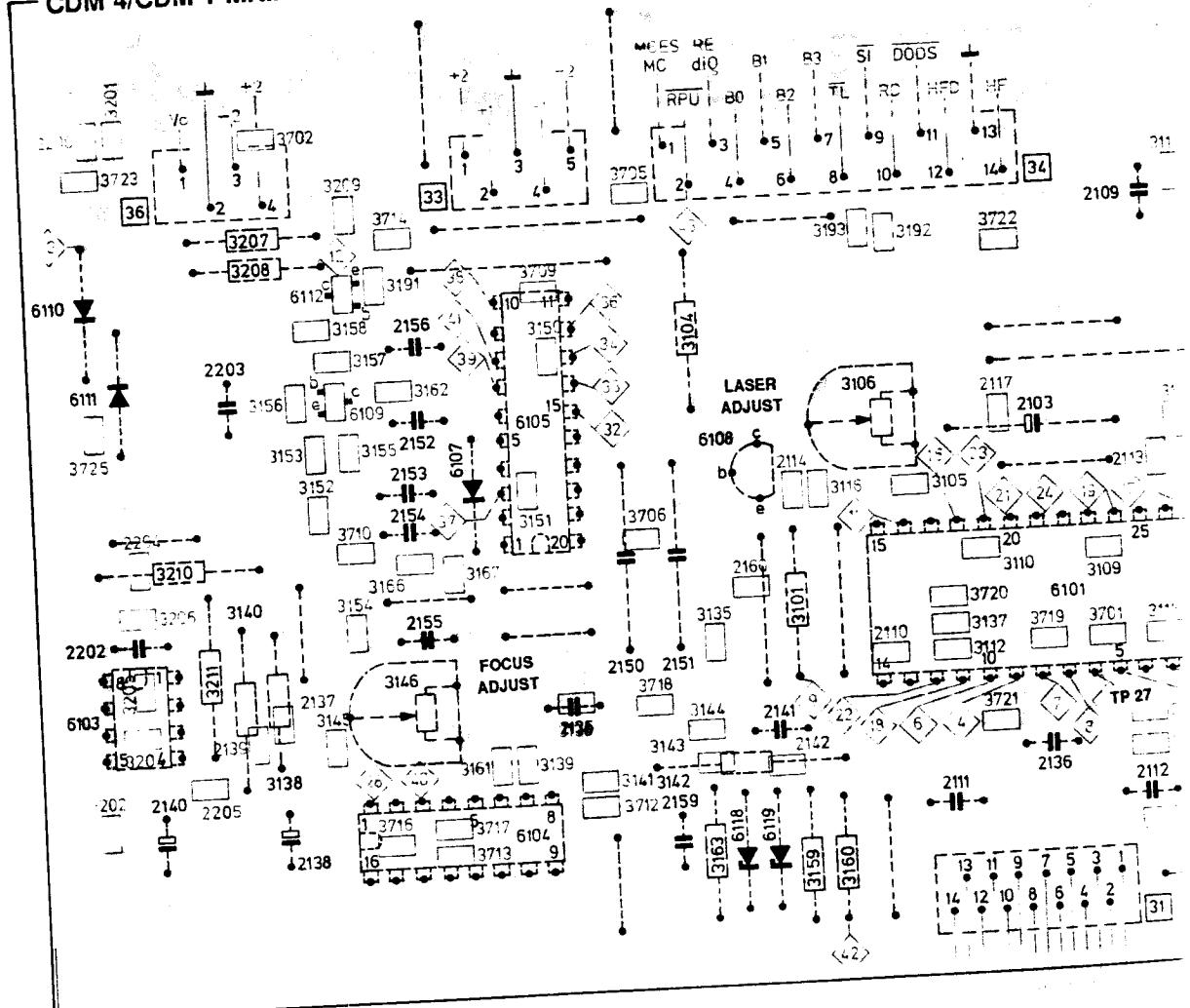
Set potentiometer 3146 to mid position and test disc 5 in unit.

Bring the player to service position 1.  
The focussing motor can now start focussing  
when it has found the focal point "1" will a  
on the display. If not then turn potentiometer  
3517 a little clockwise or anti clockwise. No  
adjustment has to be carried out.

## Fine adjustment

Bring the player to service position "2".  
Adjust potentiometer 3146 for a voltage  
2136(TP27 and ground) of 400mv +/- 40

## - CDM 4/CDM 1 MKII PCB UNDERSIDE VIEW



**BOARD MODIFICATIONS TO 06/11/91**

**DECODER PCB - 3 issues**

Issue 1

Issue 2 - Extra components added- R24,25,C32,33,D6 to improve tolerance to bad discs.

Issue 3 - Used in D70.3/170 only, (IC Z6 not fitted when used in D170), but can be retro-fitted in D70.2 if required.

**AUDIO PCB - 3 issues**

Issue 1

Issue 2

Issue 3 - D70.3 board (Bitstream). Can be retro-fitted in D70.2 if required for upgrade.

Early issue 1,2 boards had a white output relay with a 280R coil. Later boards have a blue relay with a 960R coil. To allow use of this relay the following components were changed- R211 changed from 390R to 1K, R212 changed from 220R to 390R.

**OPTICAL BOARD - 3 issues**

Issue 4

Issue 5 - Signals to IC5 were re-routed and a capacitor added in series with the crystal to provide a level 1 accuracy output. Can be retro-fitted to issue 4 boards.

Issue 6 - A variable capacitor was fitted instead of a fixed type to provide an adjustment of the clock frequency.

## DELTA 70.2/170 SERVICE MANUAL

Service Sheet A (in conjunction with D70.2 manual)

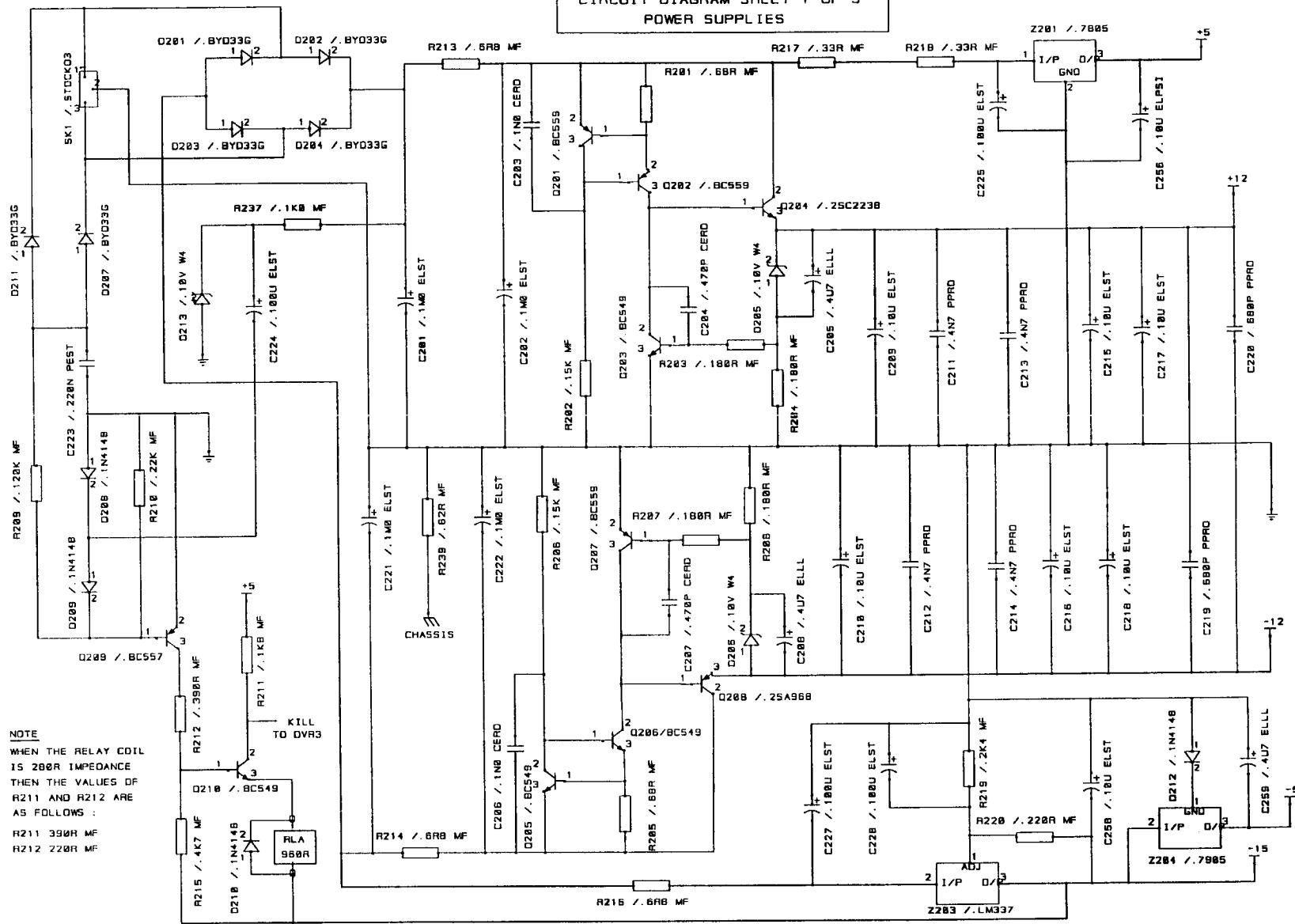
DELTA 70.2/170 SERVICE MANUAL

CIRCUIT DIAGRAMS

No.	Title of Circuit
1	D70.2/D170 Decoder Issue D1
2	D70.2/D170 Decoder Issue D2
3	D70.2/D170 Decoder Power Supplies Issue D1/D2
4	D70.2 Audio Board Power Supplies
5	D70.2 Audio Board Audio Stages
6	D70.2 Audio Board DAC & Master Clock
7	Delta CD Transformer PCB
8	Delta CD Display PCB
9	D70.2/D170 Display PCB

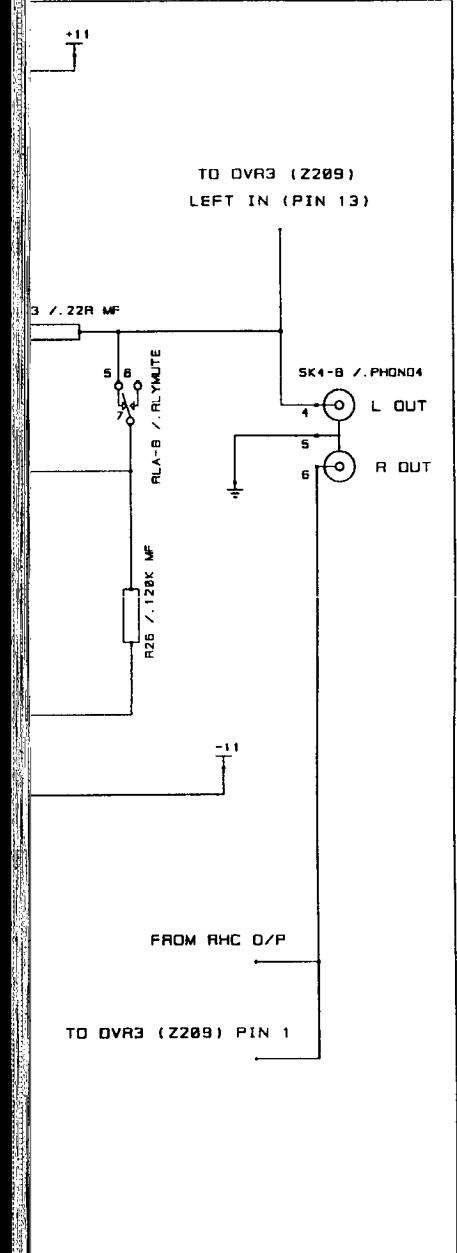
DELTA 70 MKII AUDIO BOARD  
ISSUE 5 26-7-90  
CIRCUIT DIAGRAM SHEET 1 OF 3  
POWER SUPPLIES

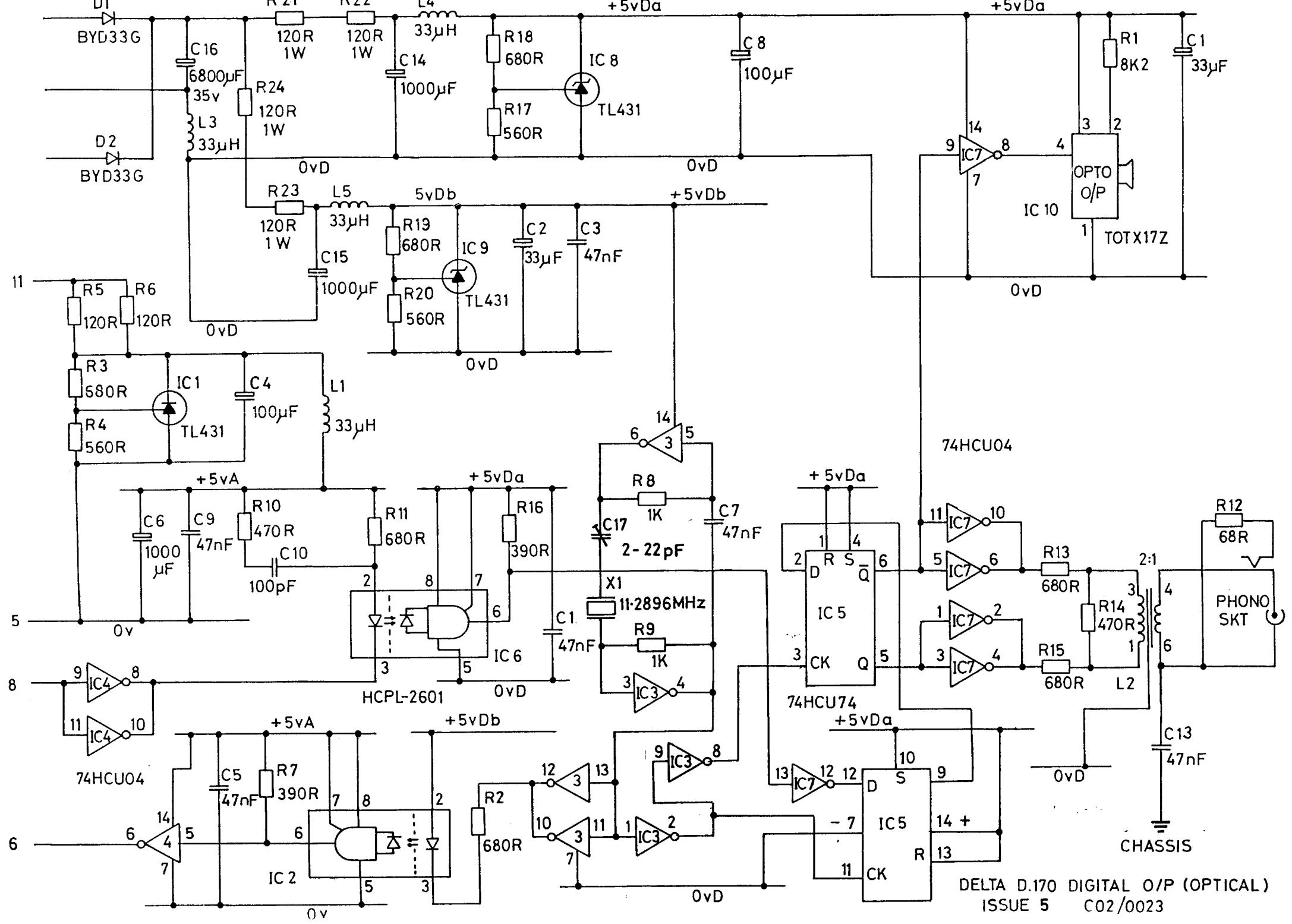
DRAWING DATE 16/1/92



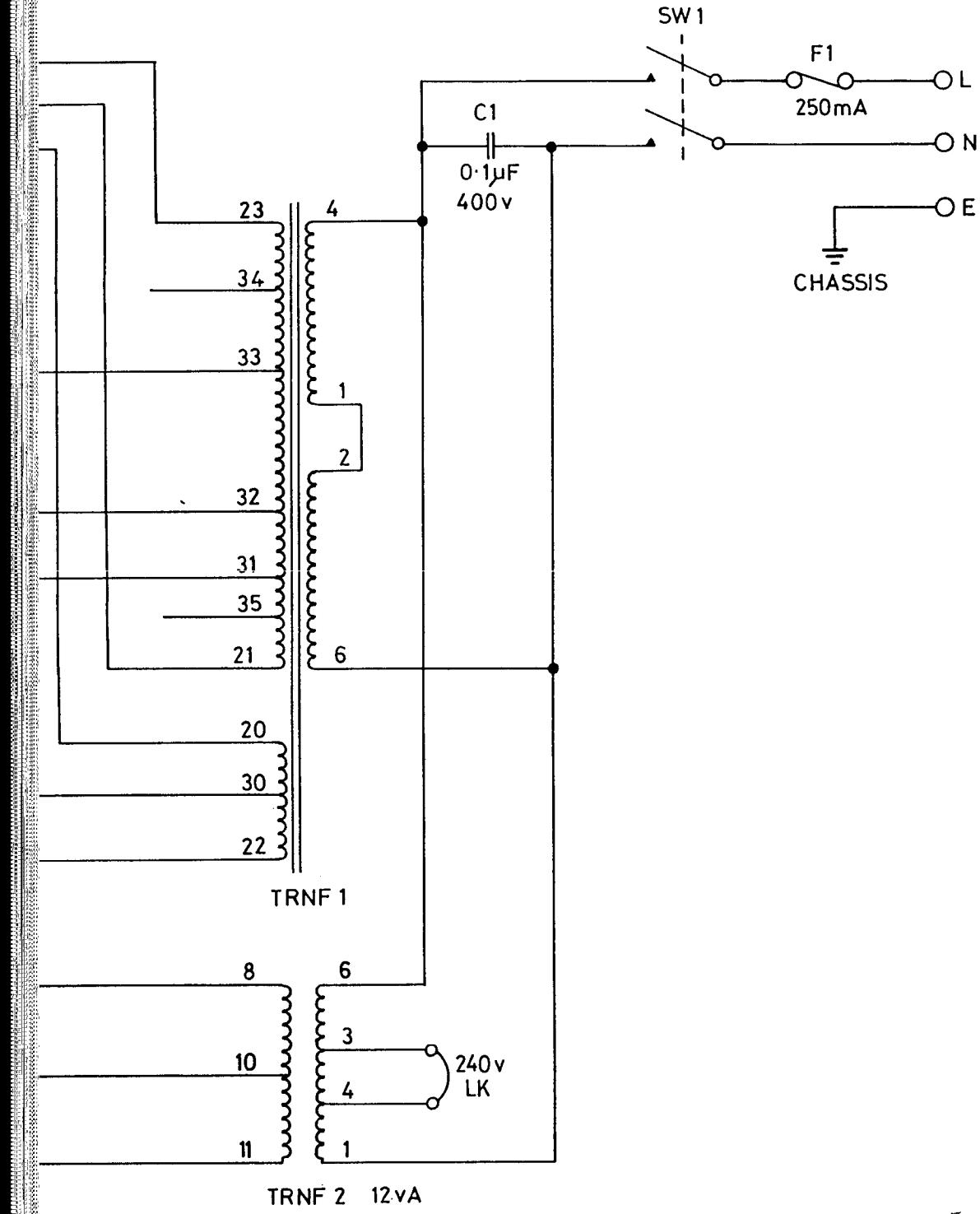
NOTE  
WHEN THE RELAY CO.  
IS 280R IMPEDANCE  
THEN THE VALUES OF  
R211 AND R212 ARE  
AS FOLLOWS :

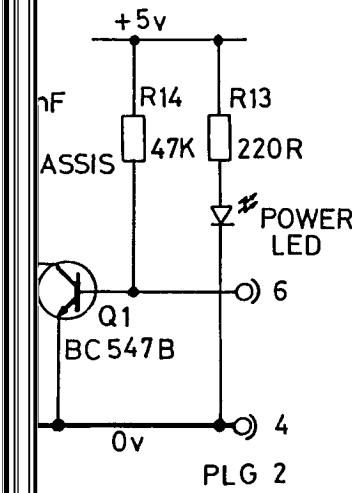
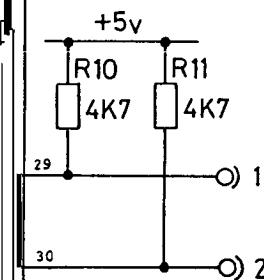
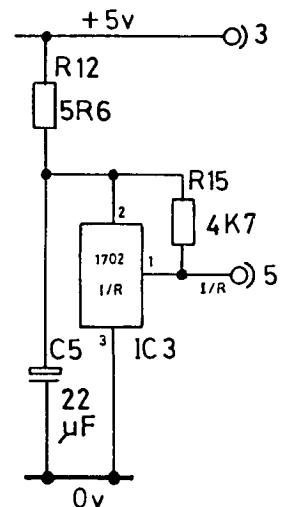
R211 390R MF  
R212 220R MF





DELTA D.170 DIGITAL O/P (OPTICAL)  
ISSUE 5 CO2/0023





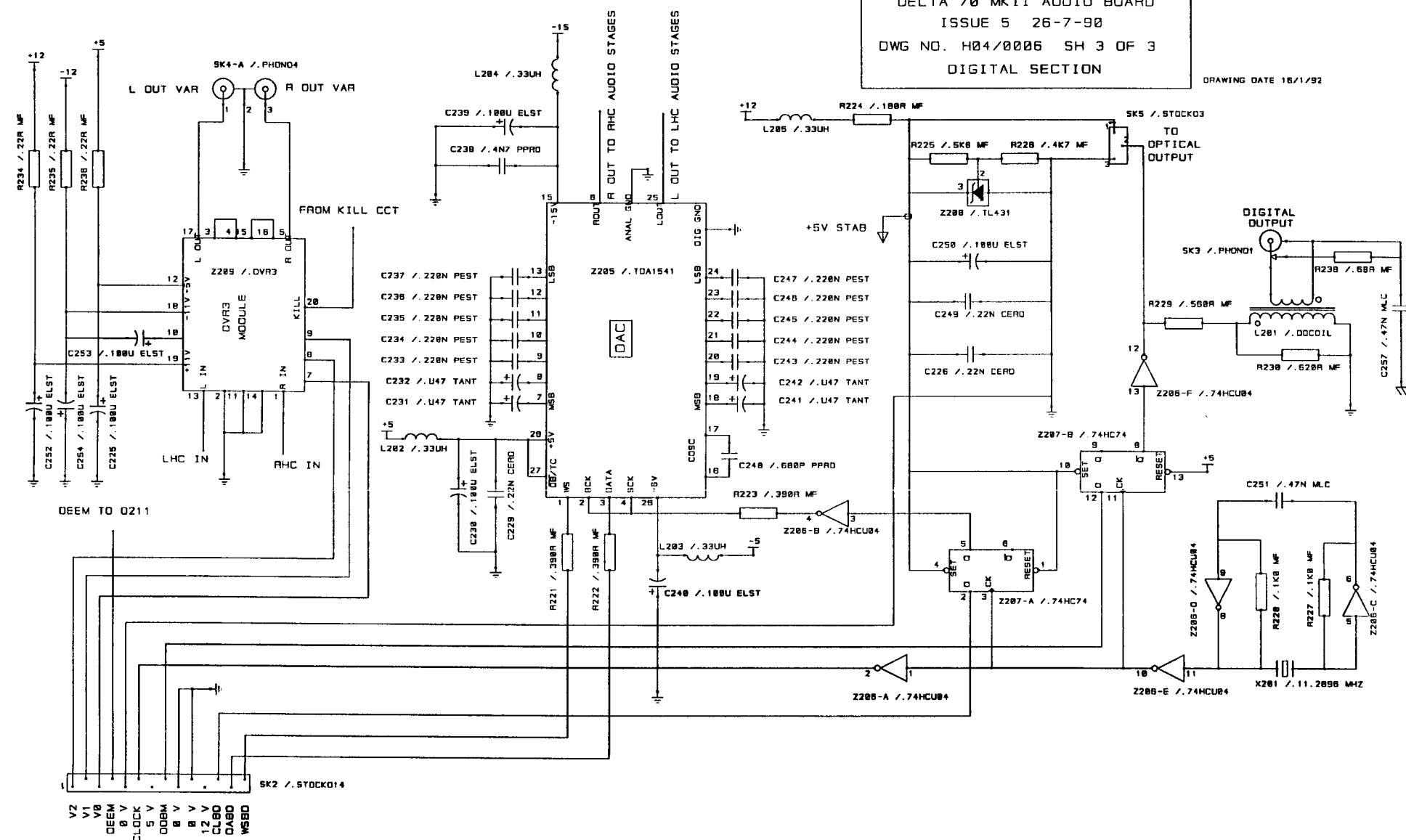
## DELTA 70 MKII AUDIO BOARD

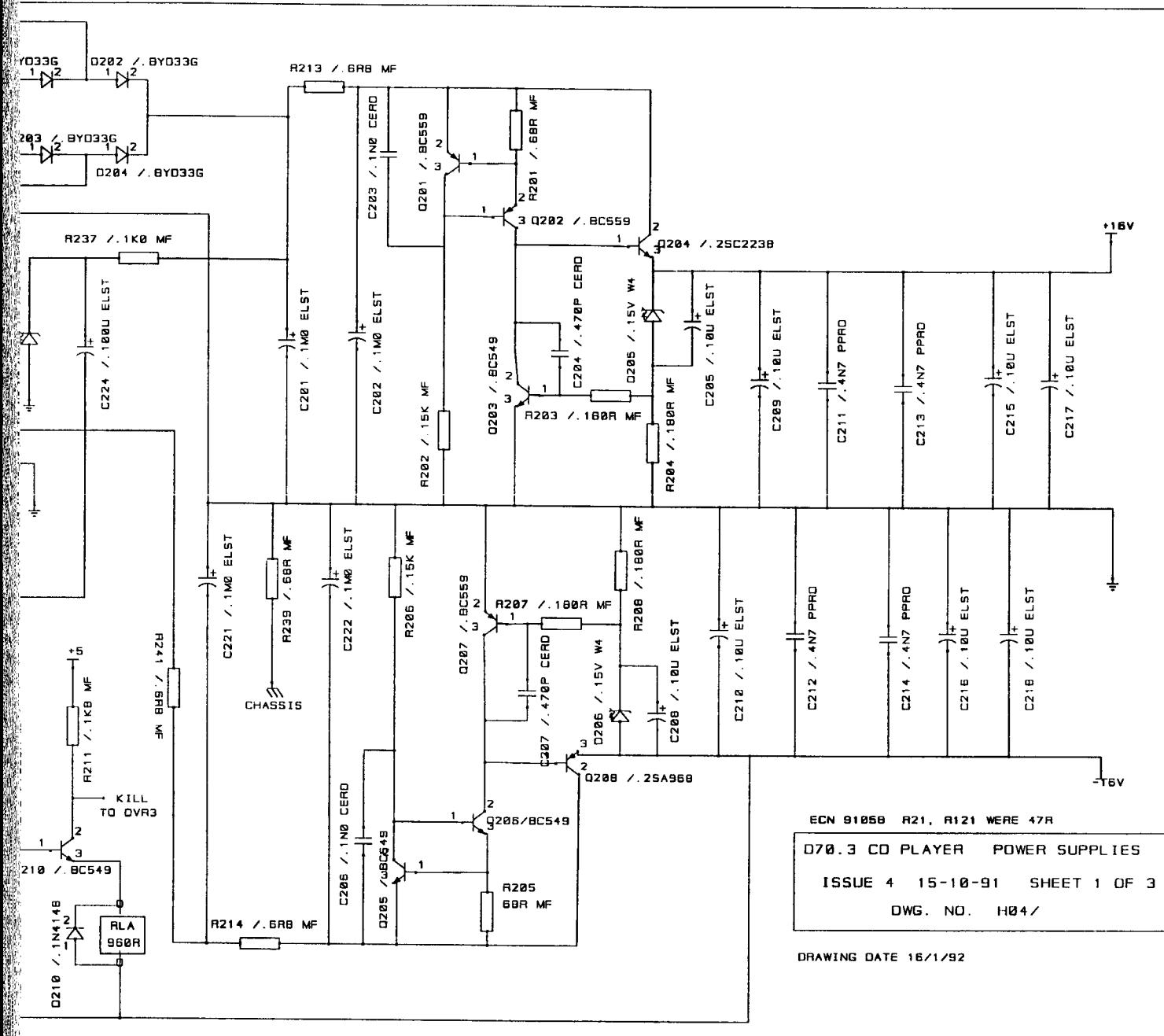
ISSUE 5 26-7-90

DWG NO. H04/0006 SH 3 OF 3

## DIGITAL SECTION

DRAWING DATE 16/1/92





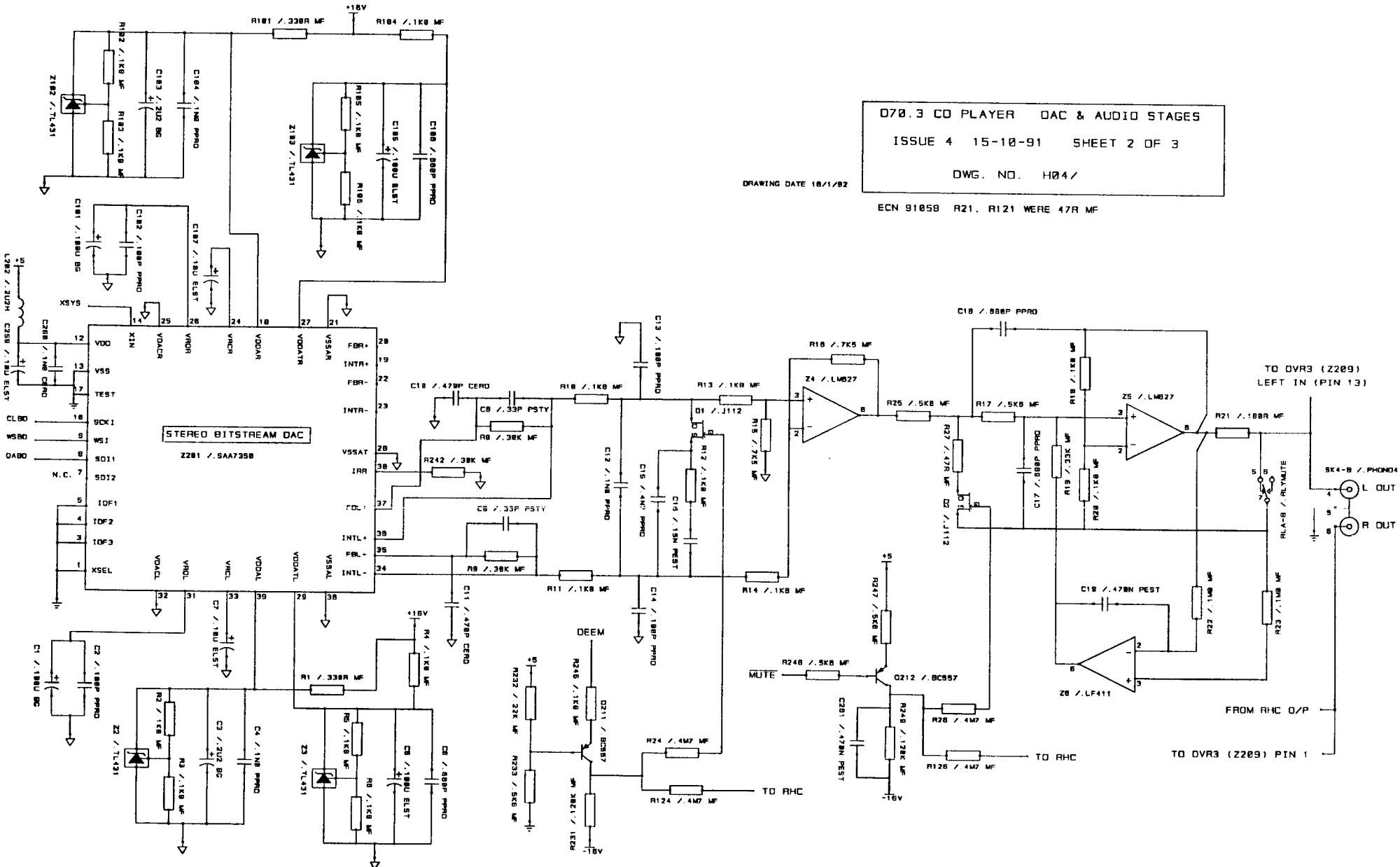
070.3 CD PLAYER DAC & AUDIO STAGES

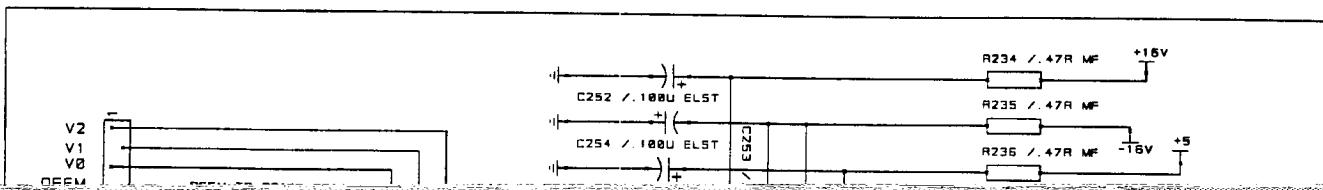
ISSUE 4 15-10-91 SHEET 2 OF 3

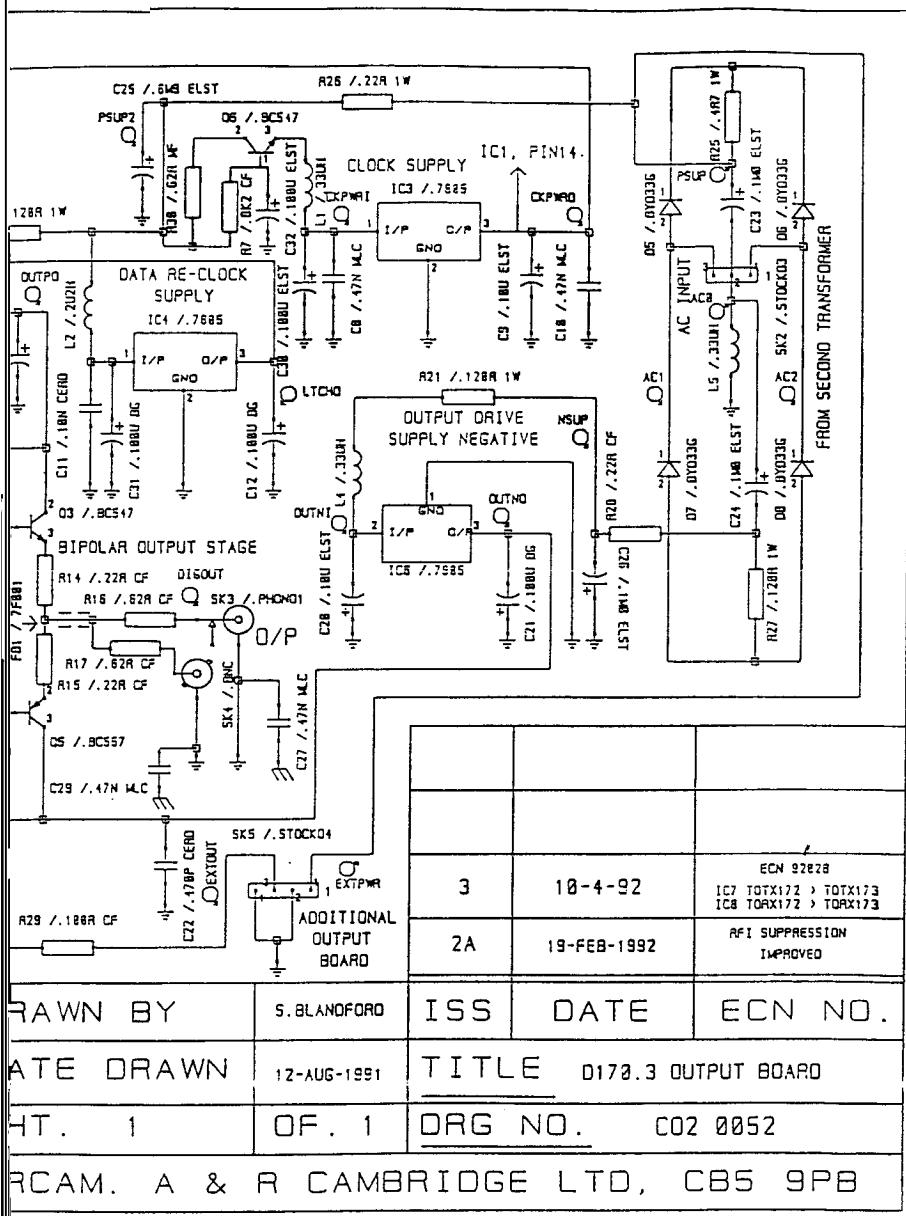
DWG. NO. H04/

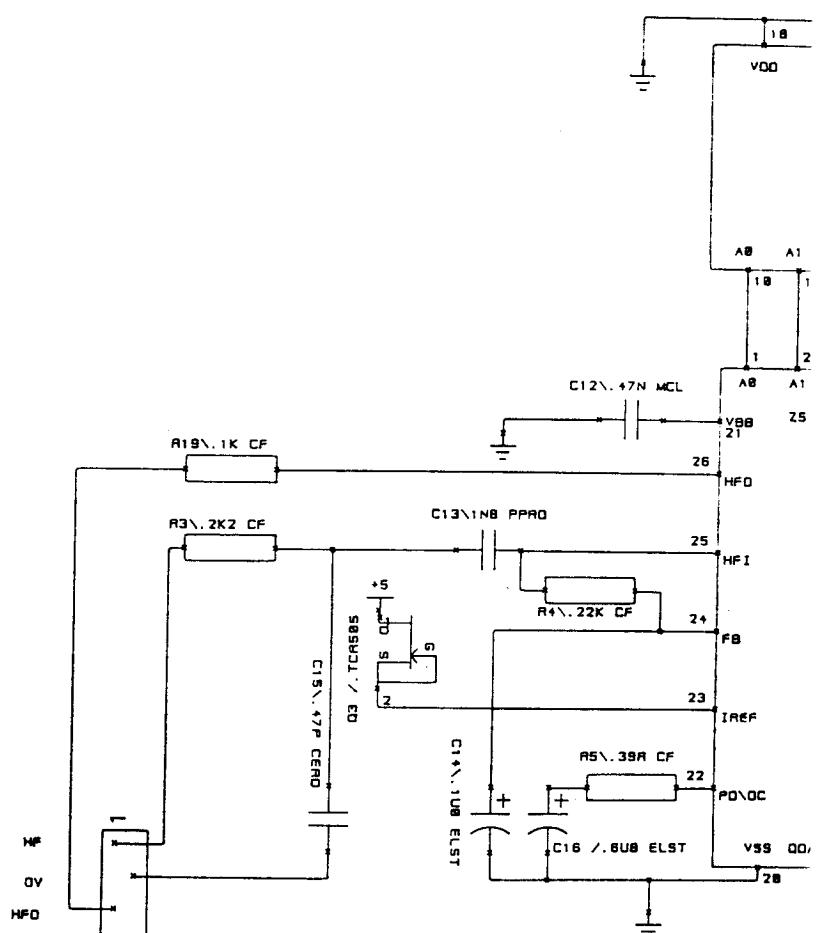
DRAWING DATE 18/1/82

ECN 91058 R21, R121 WERE 47R MF

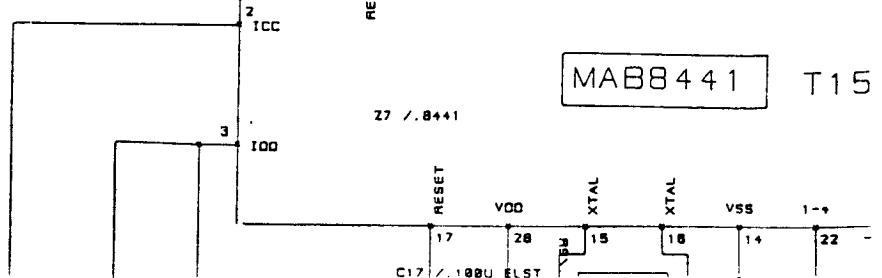
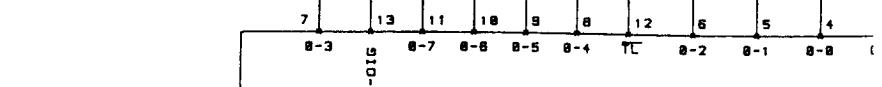






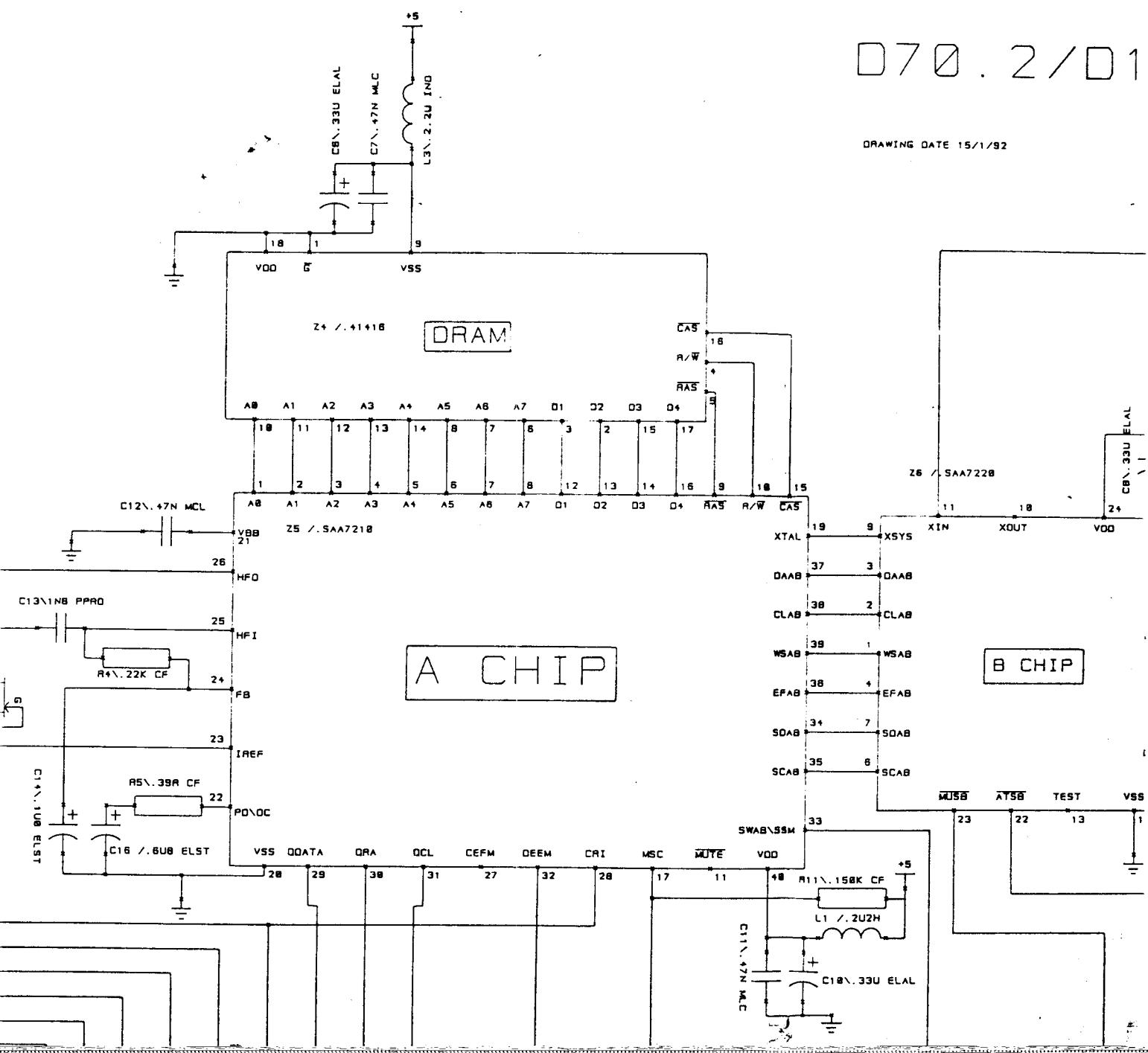


COM4 / COM1 MK 2



D70.2/01

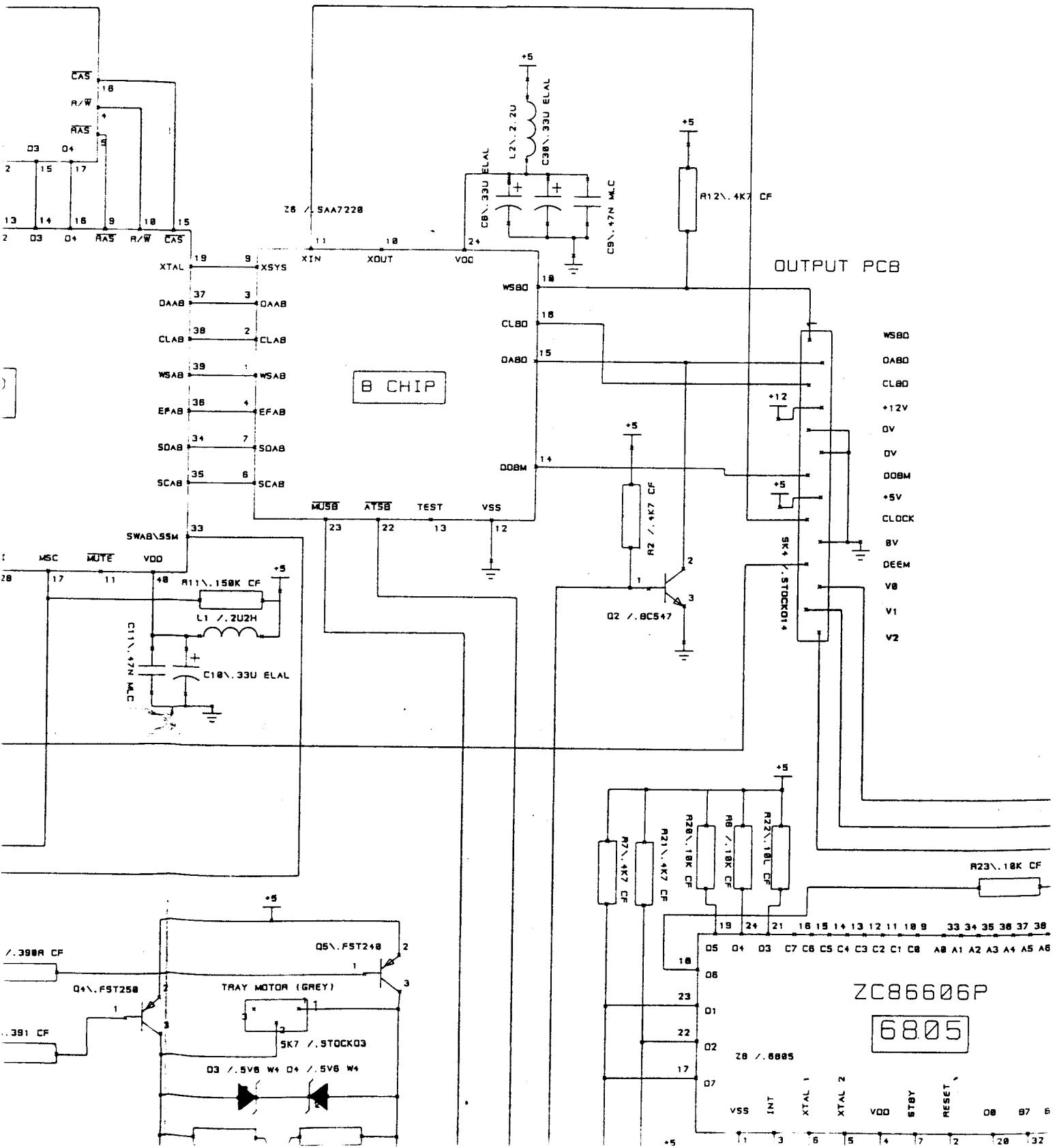
DRAWING DATE 15/1/92



070.2/0170 DECODER CIRCUIT

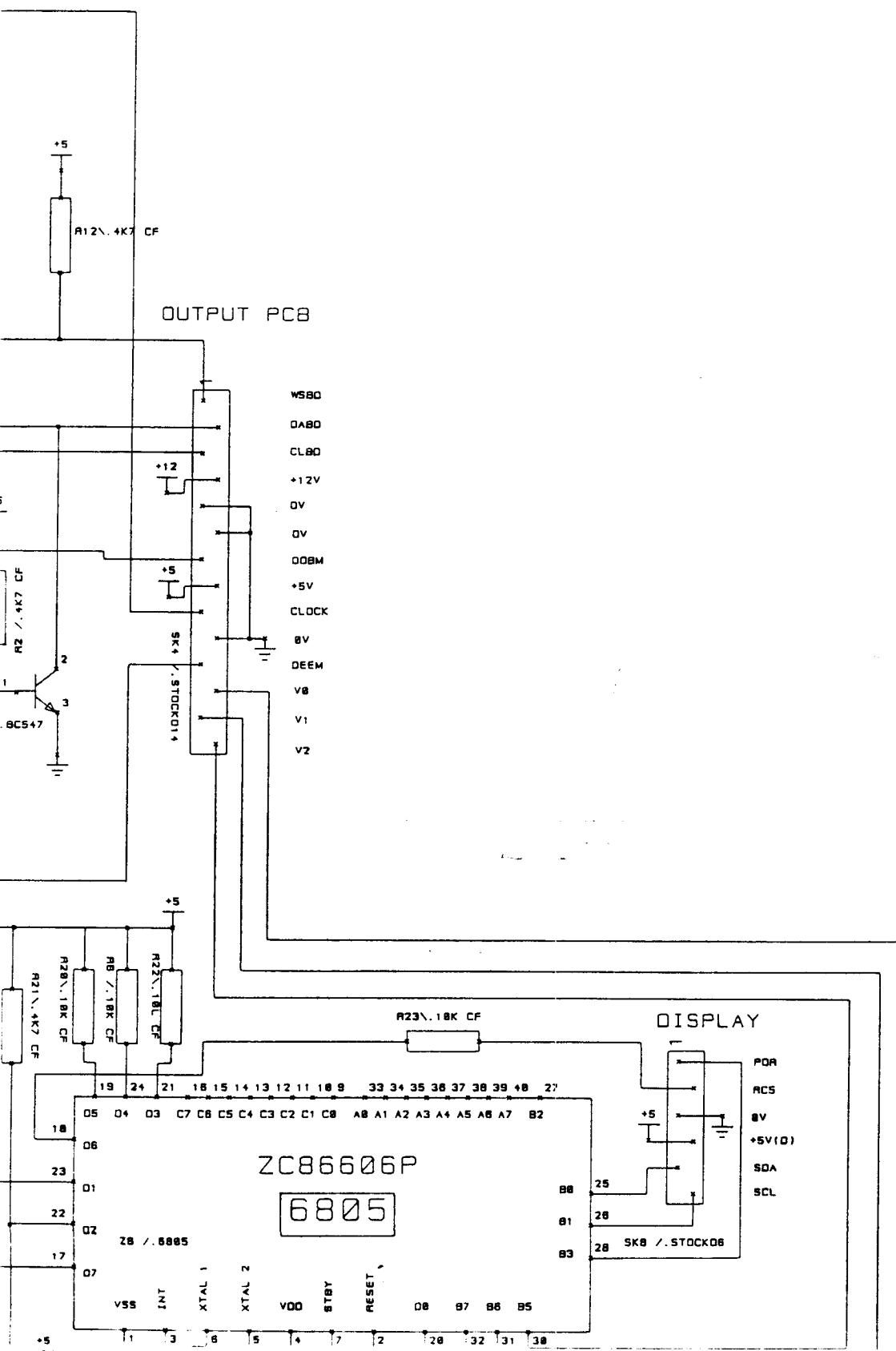
DRAWING DATE 15/1/92

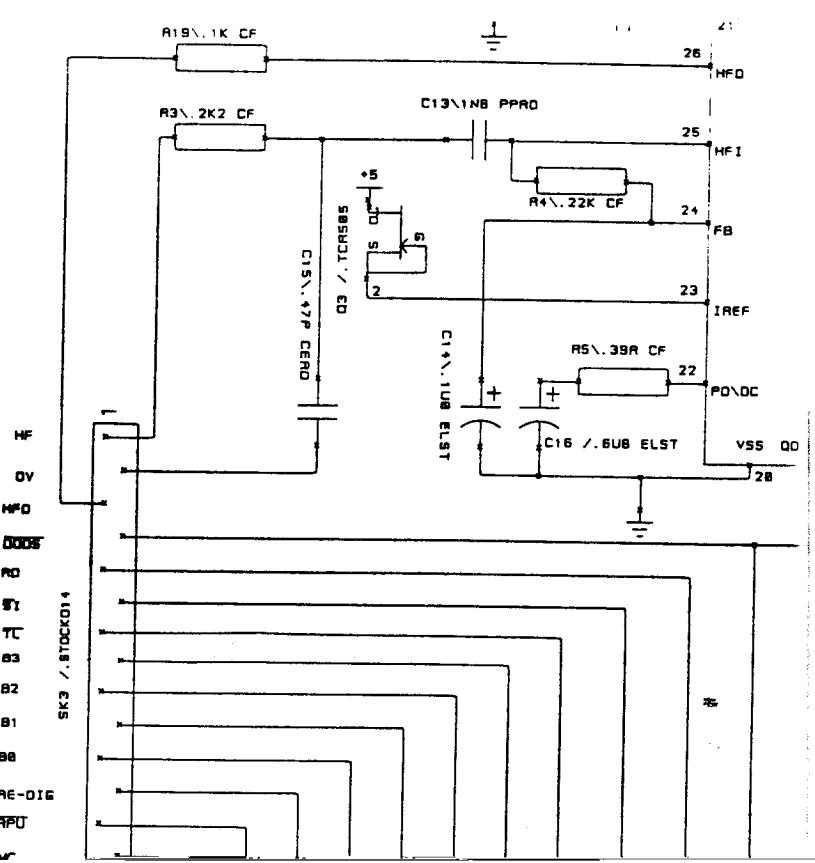
DWG NO. H04/0006 ST

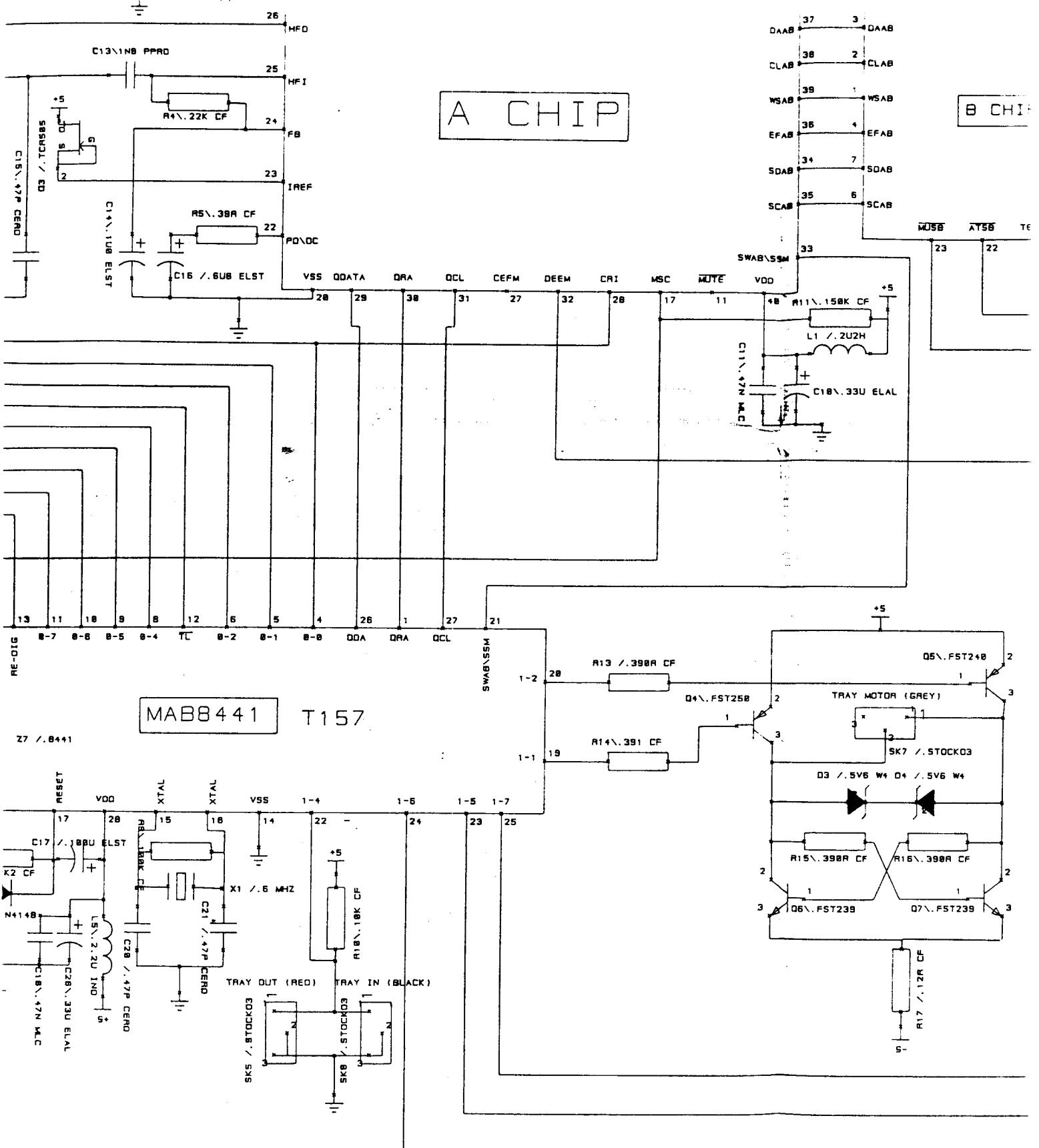


# DECODER CIRCUIT ISSUE 01

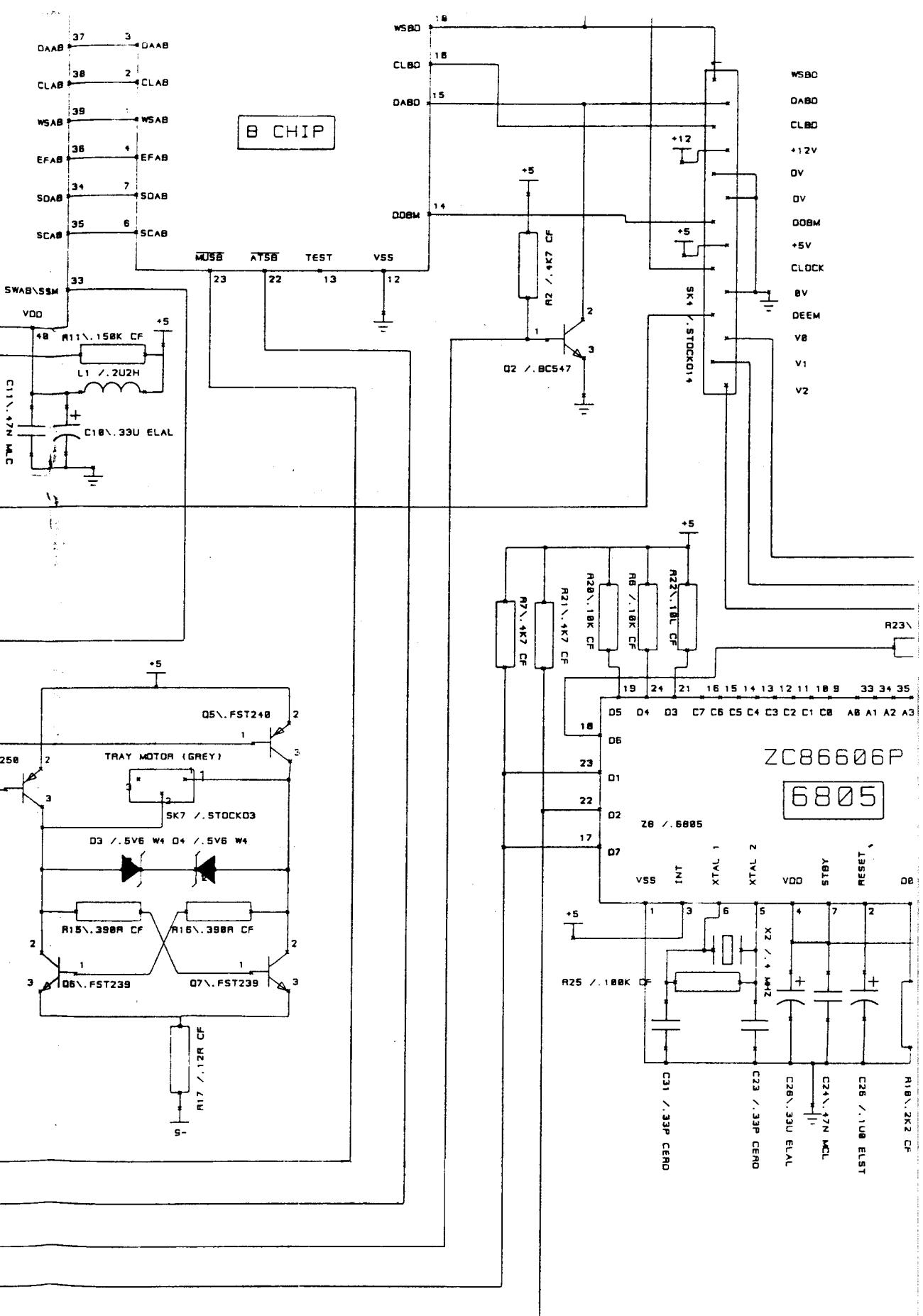
DWG NO. H04/0006 SHEET 1 OF 3

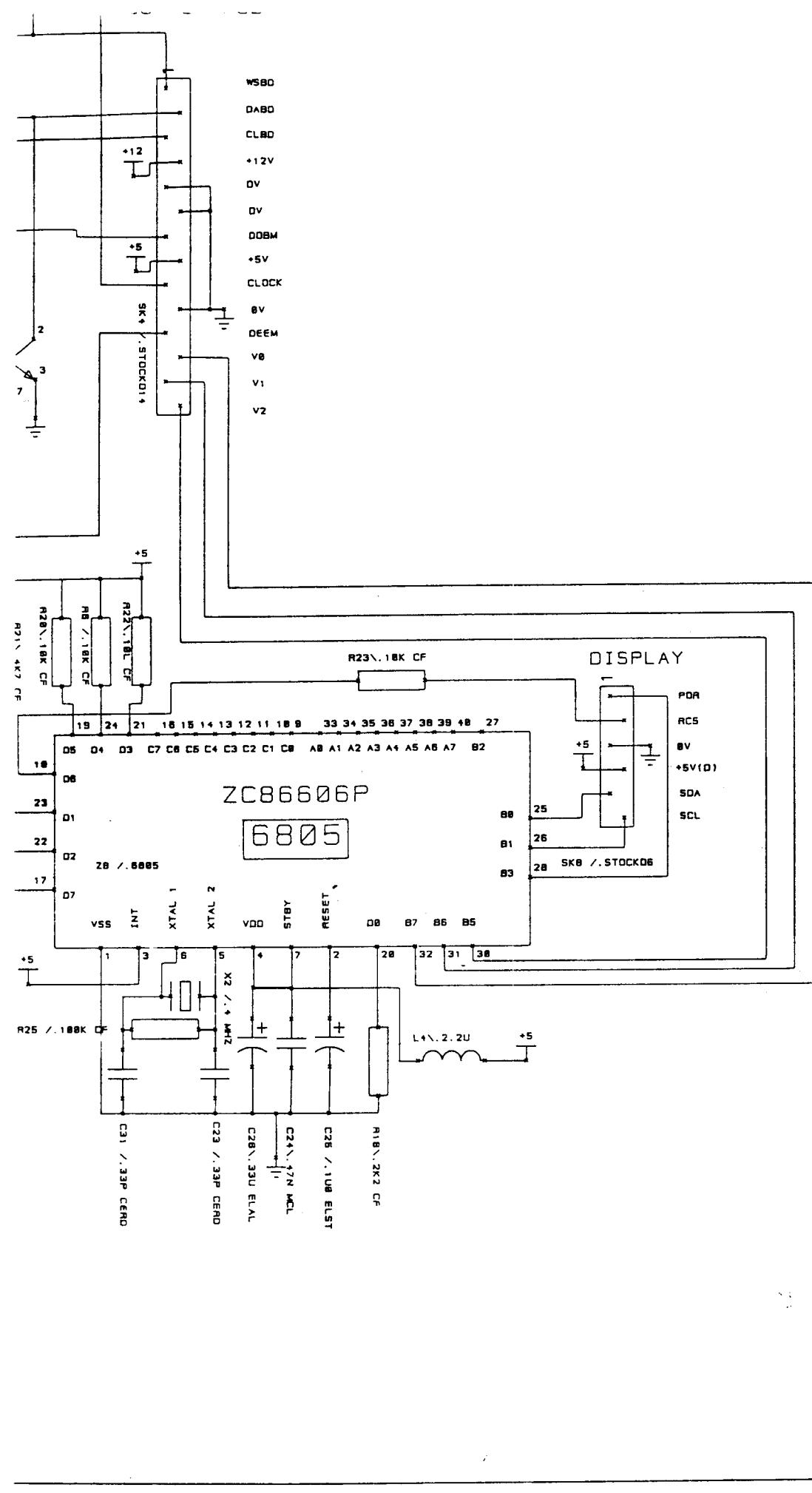






IP





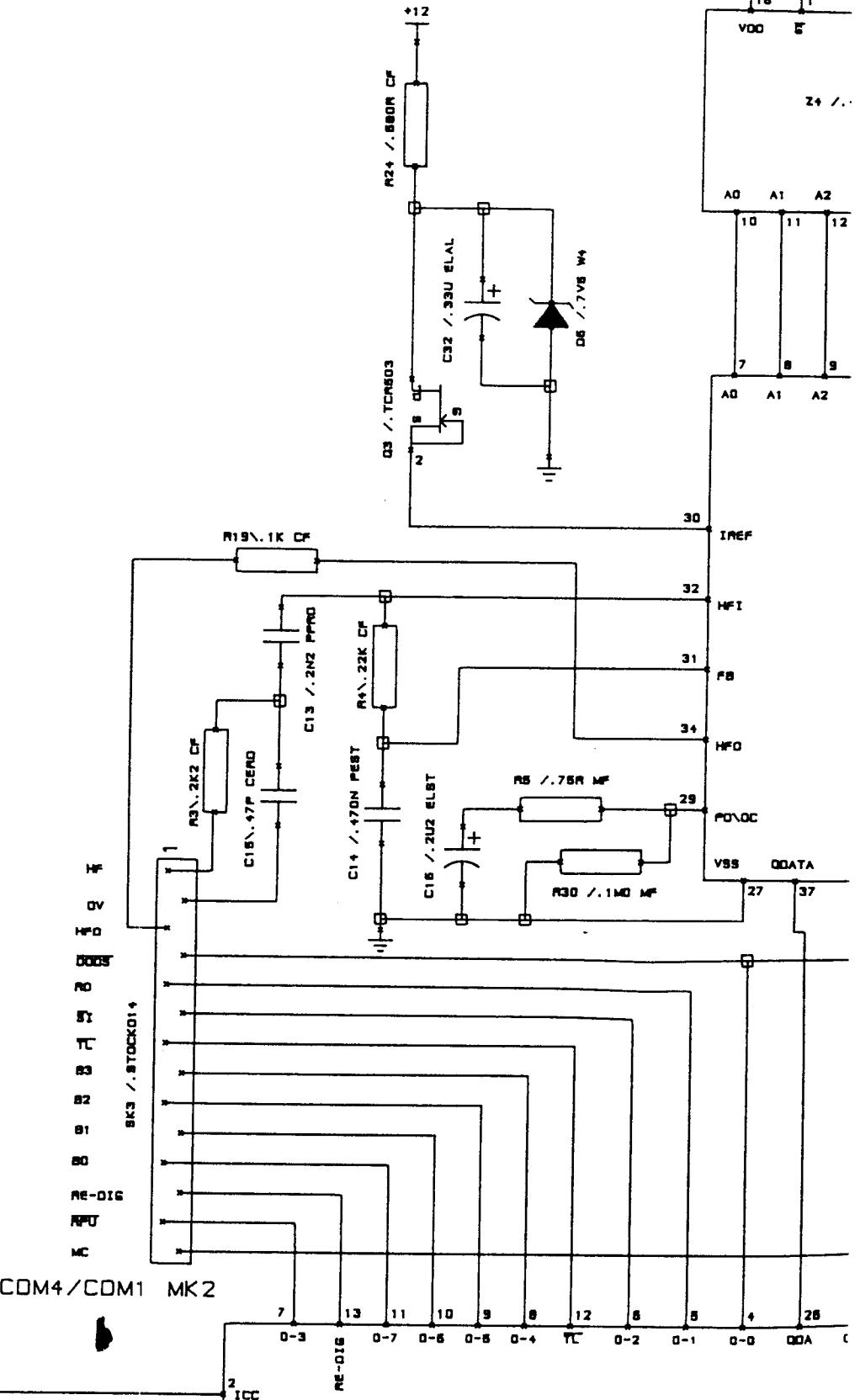
070-3/D170 DECODER BOARD

NOTE: ON DEC  
THE SA

ISSUE 3 7-2-91

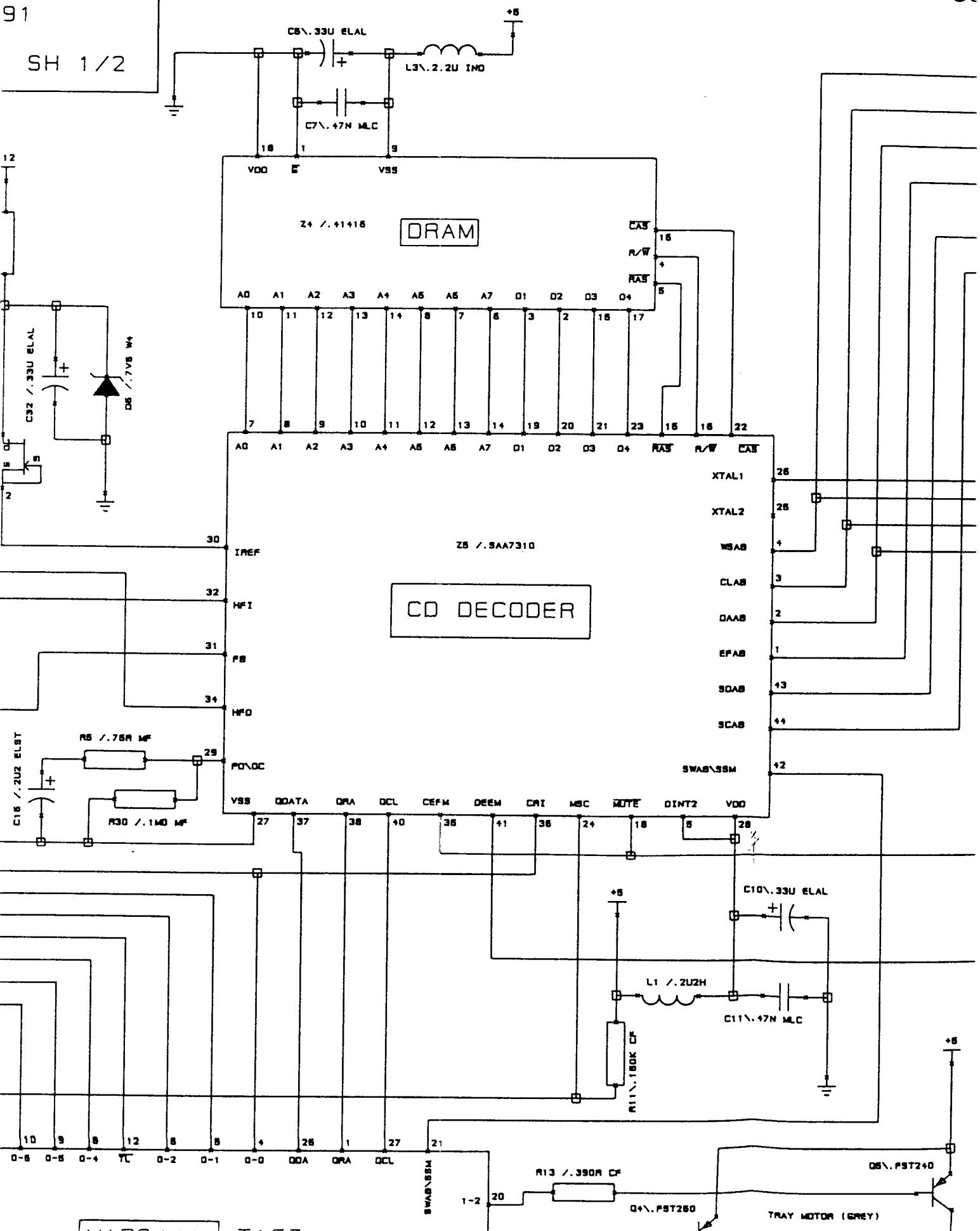
DWG. NO. H04/0006 SH 1/2

DRAWING DATE 15/1/92



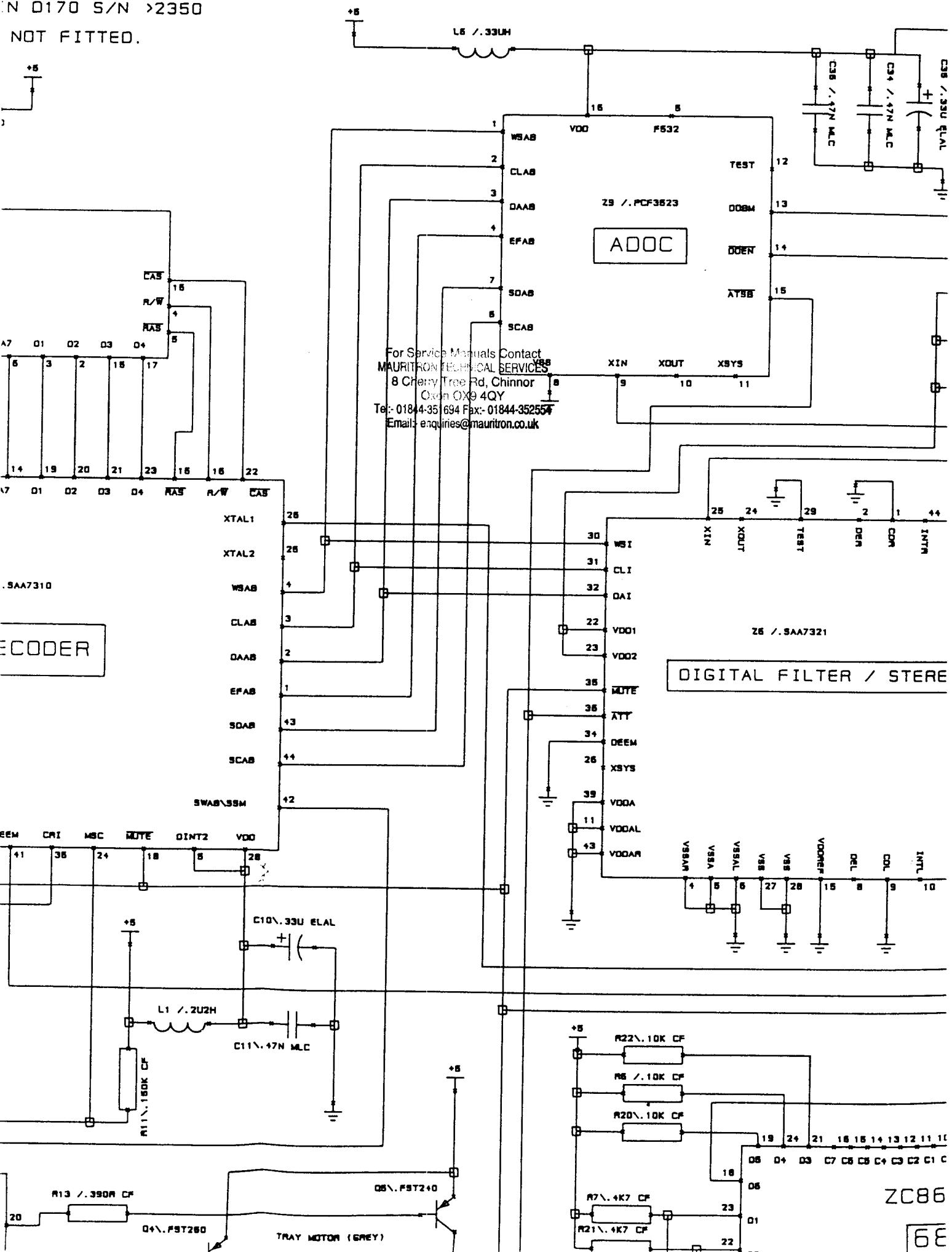
R BOARD

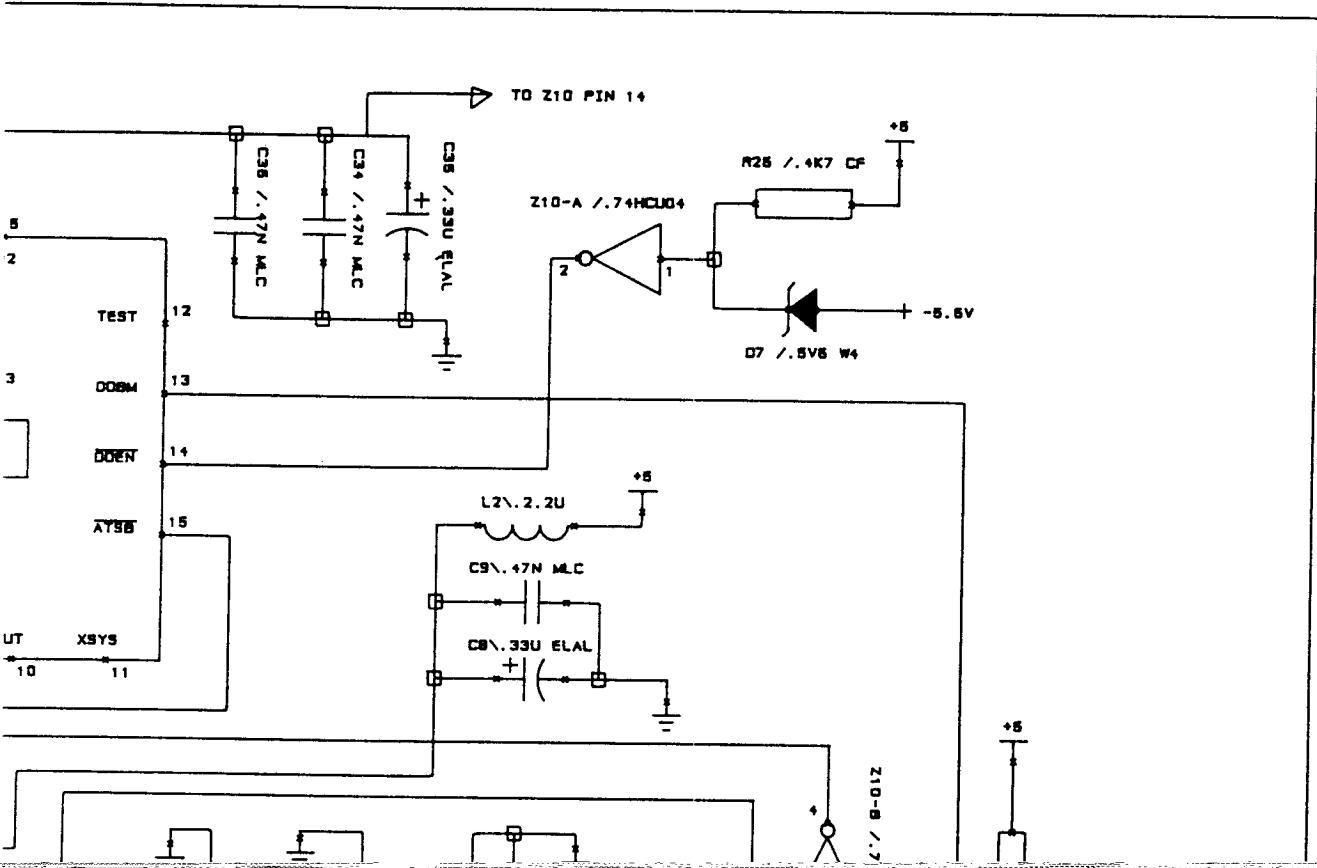
NOTE: ON DECODERS USED IN 0170 S/N >2350  
THE SAA7321 IC IS NOT FITTED.

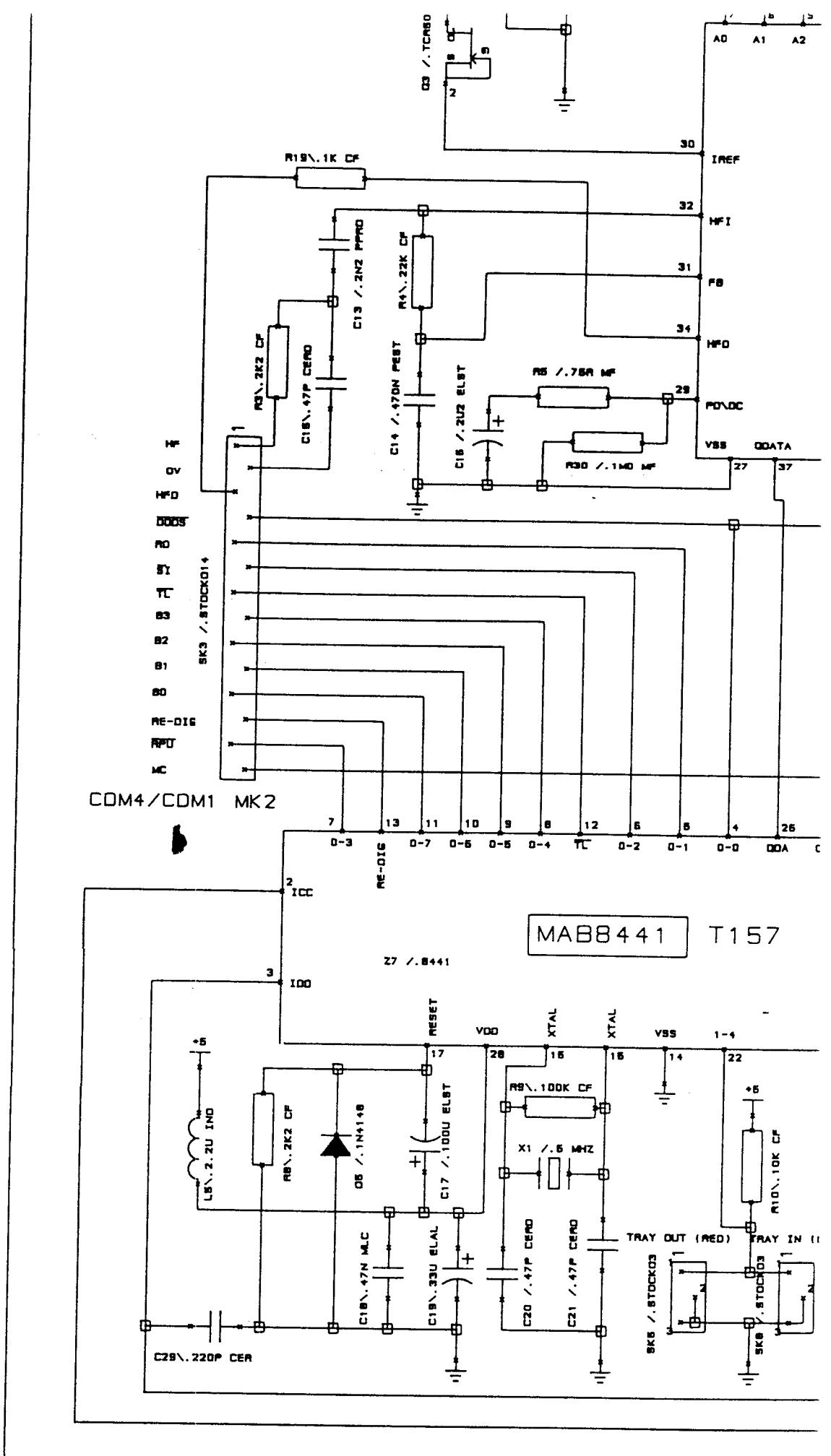


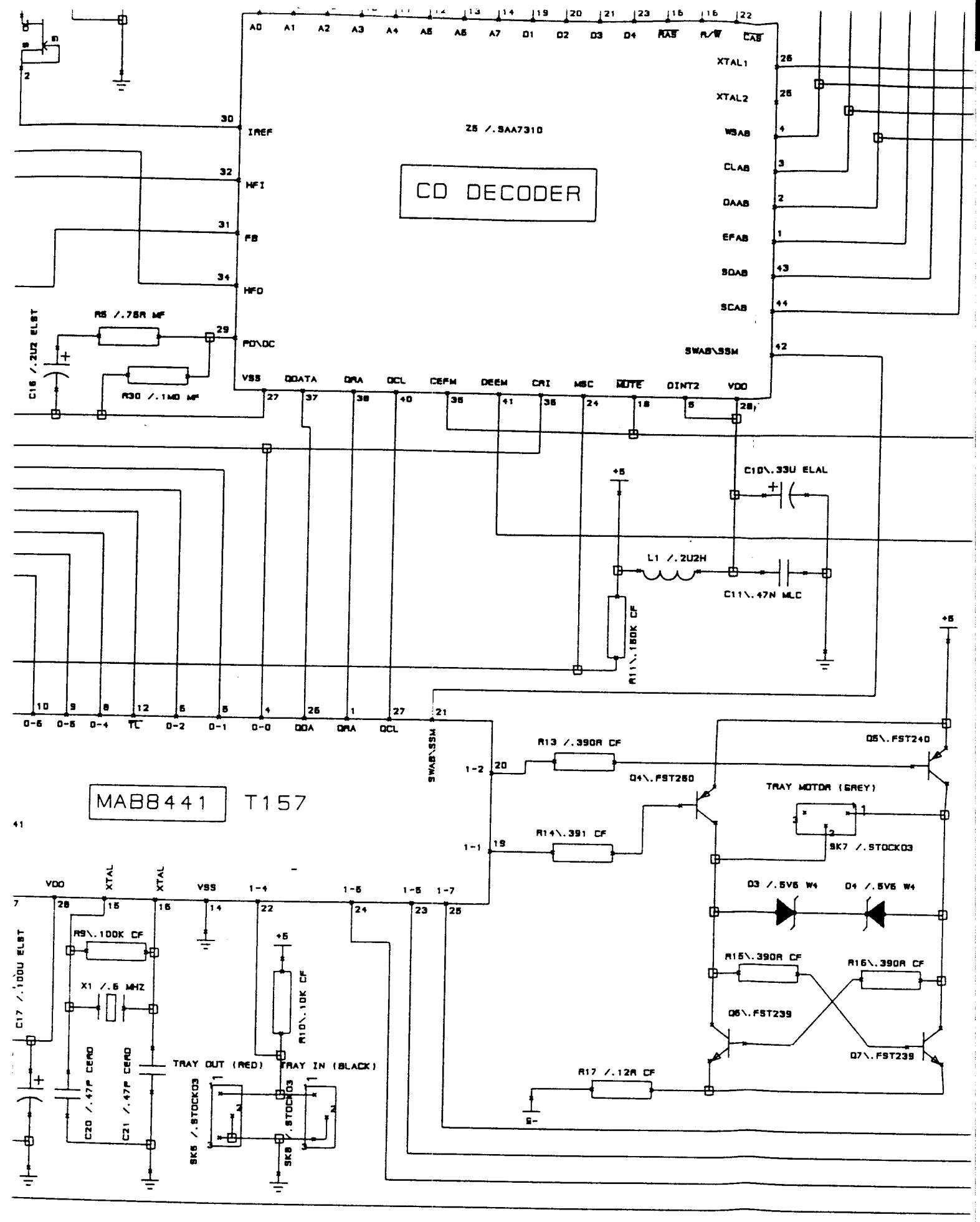
N 0170 S/N >2350

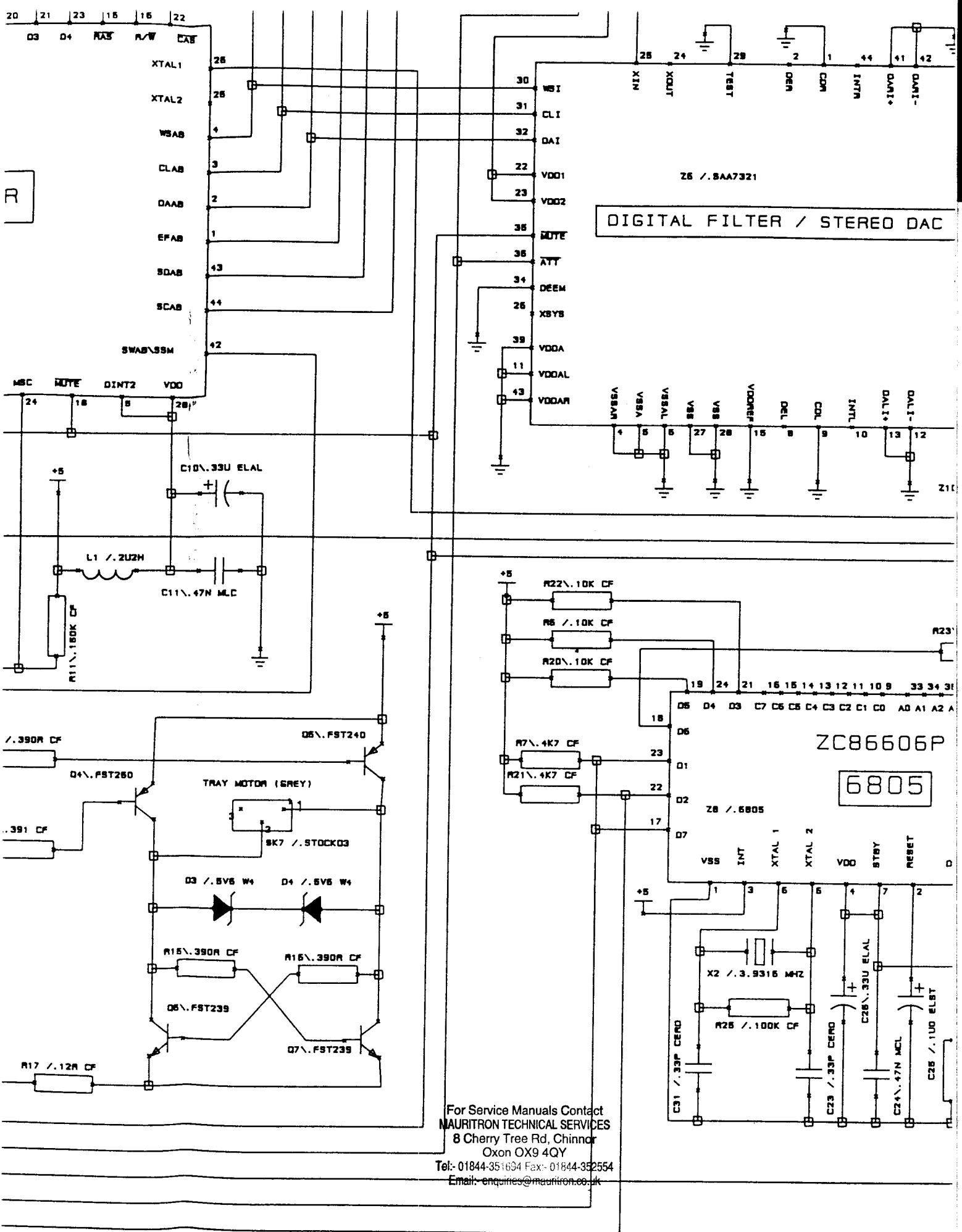
NOT FITTED.

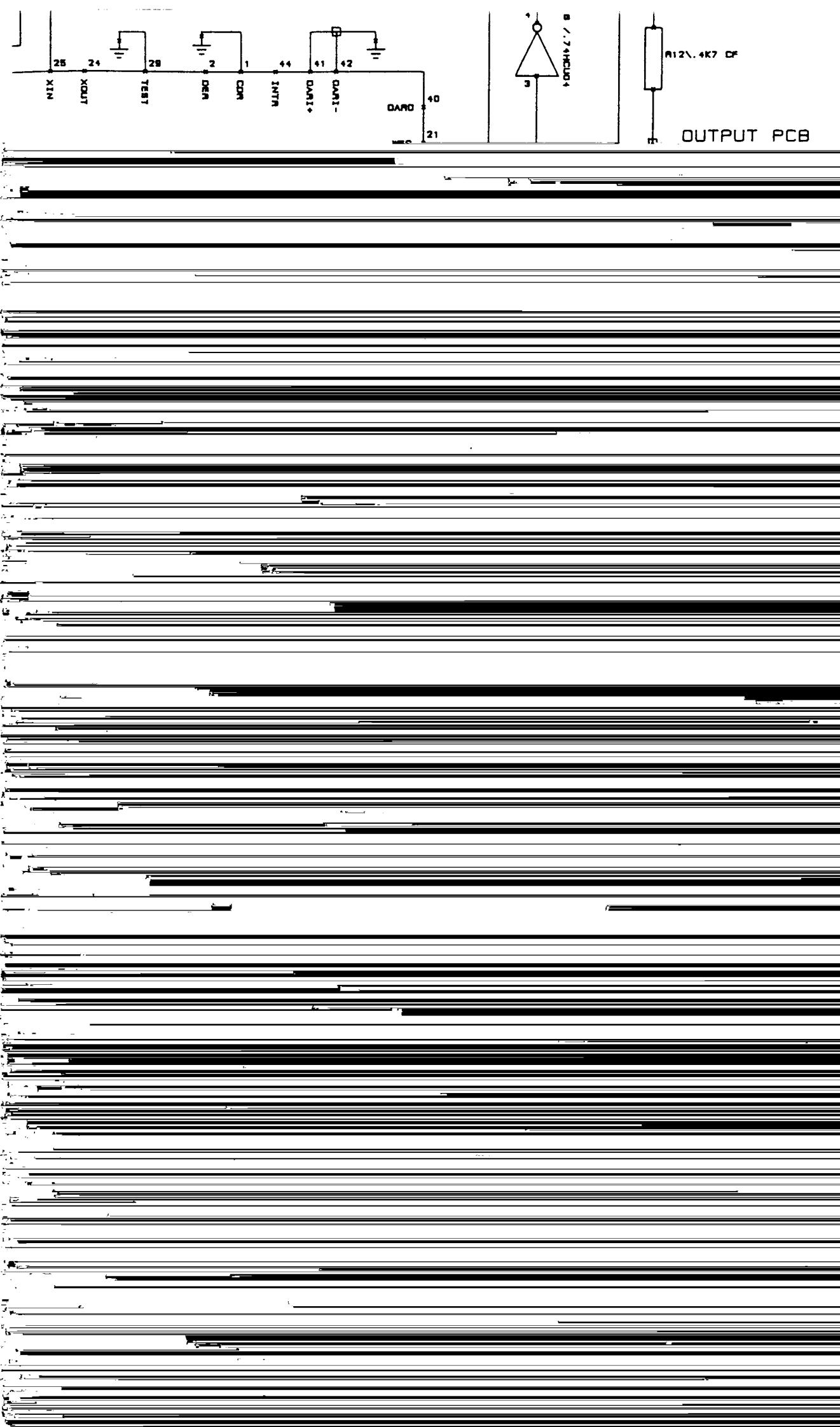


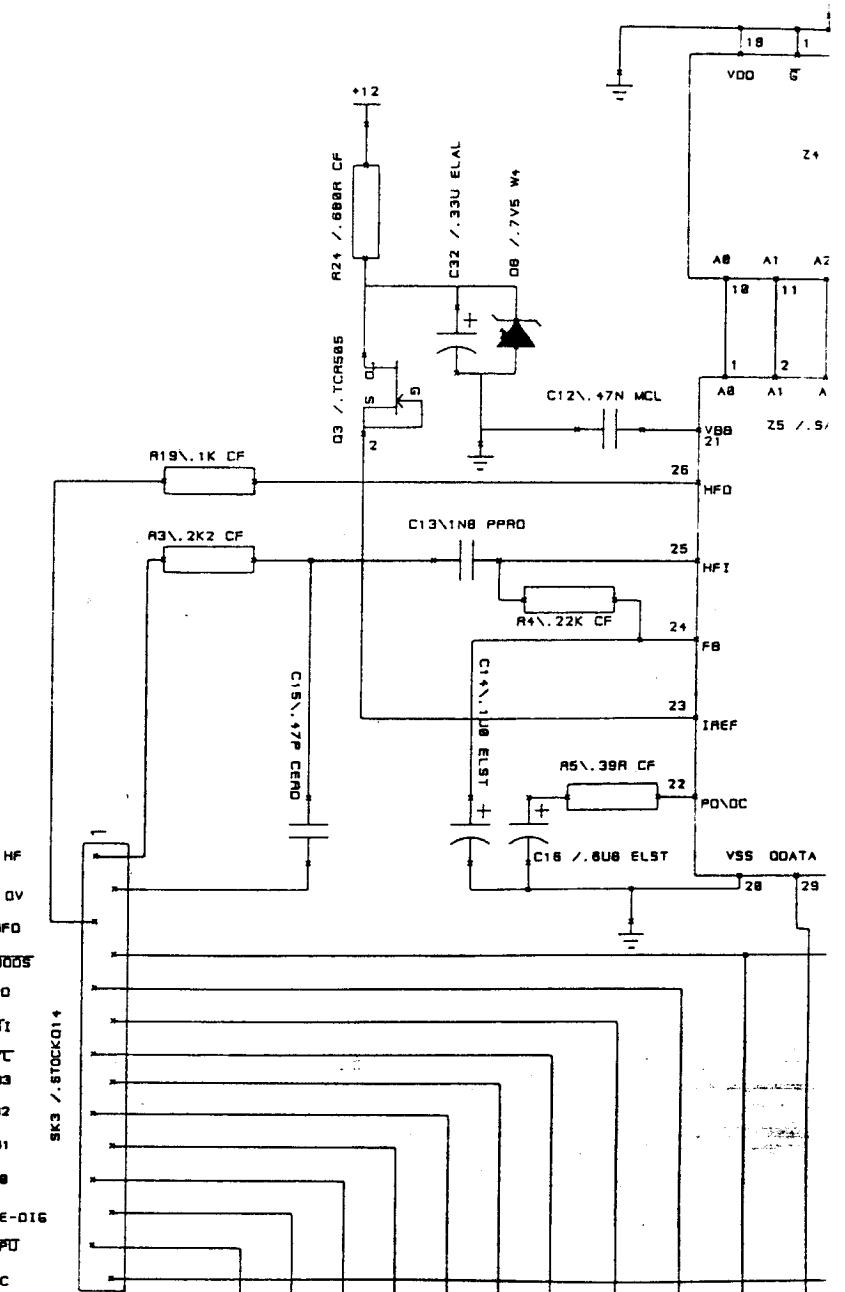




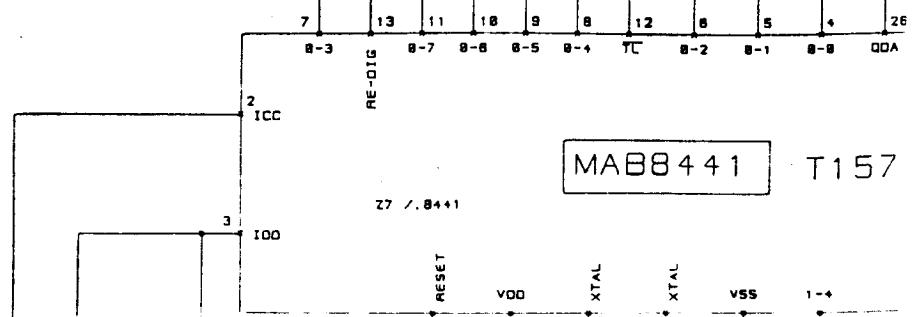








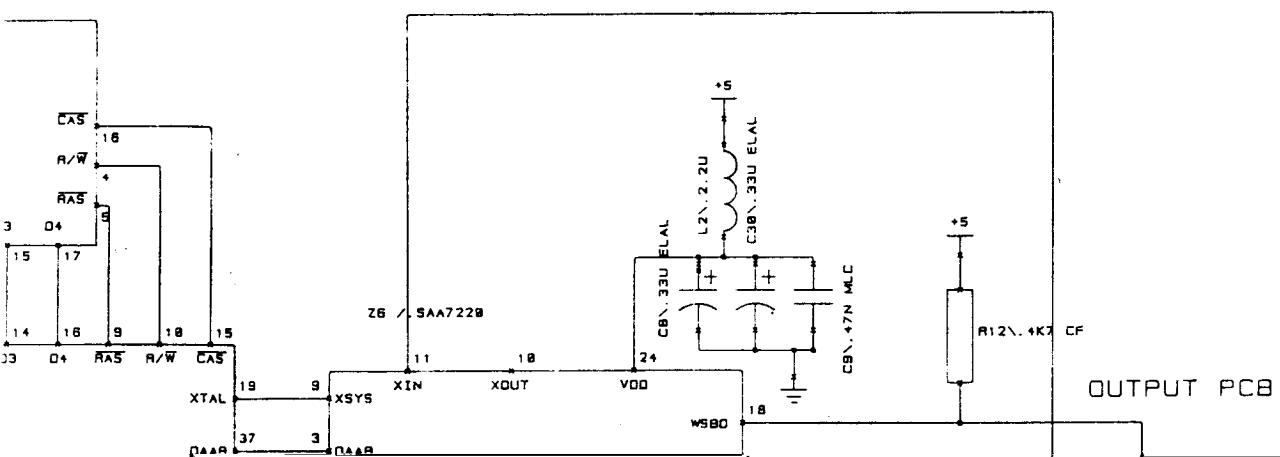
COM4 / COM1 MK2





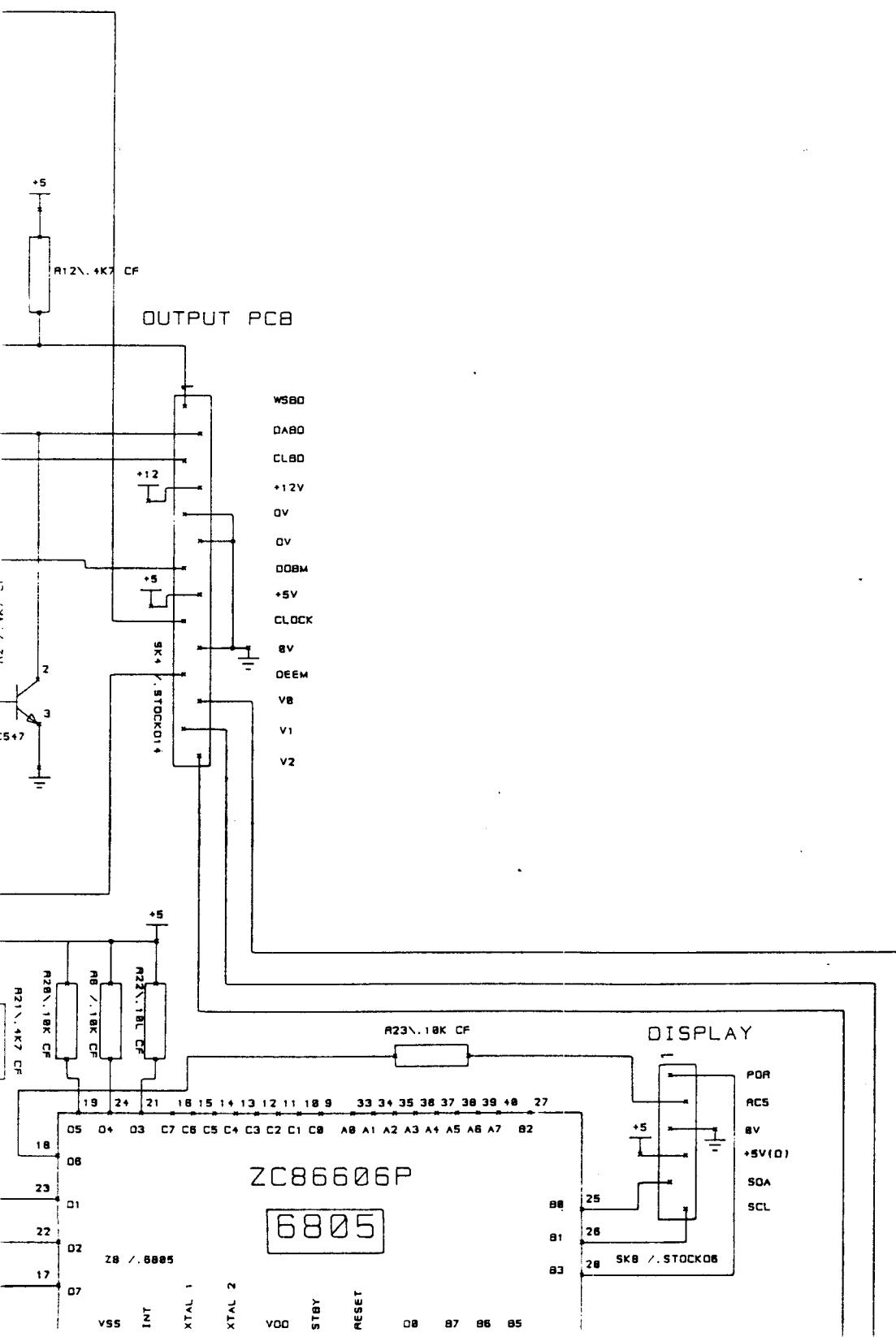
# 2/0170 DECODER CIRCUIT ISSUE

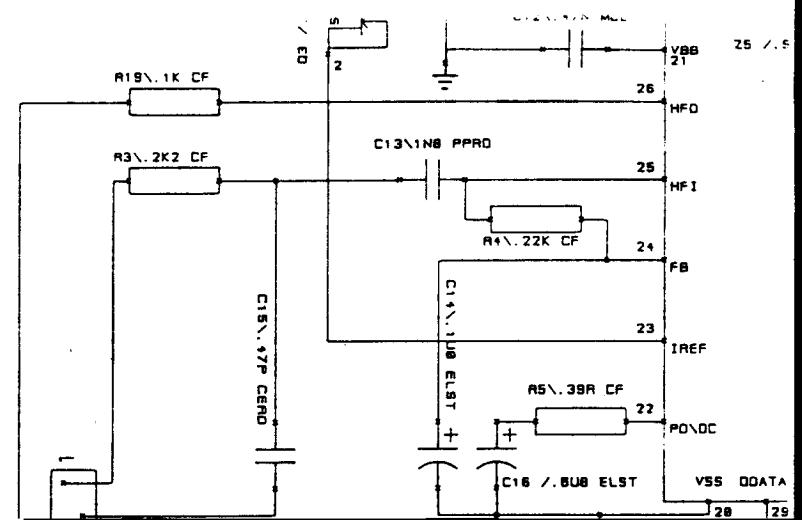
FIG DATE 16/1/92      DWG NO. H04/0006      SHEET 2 OF 3

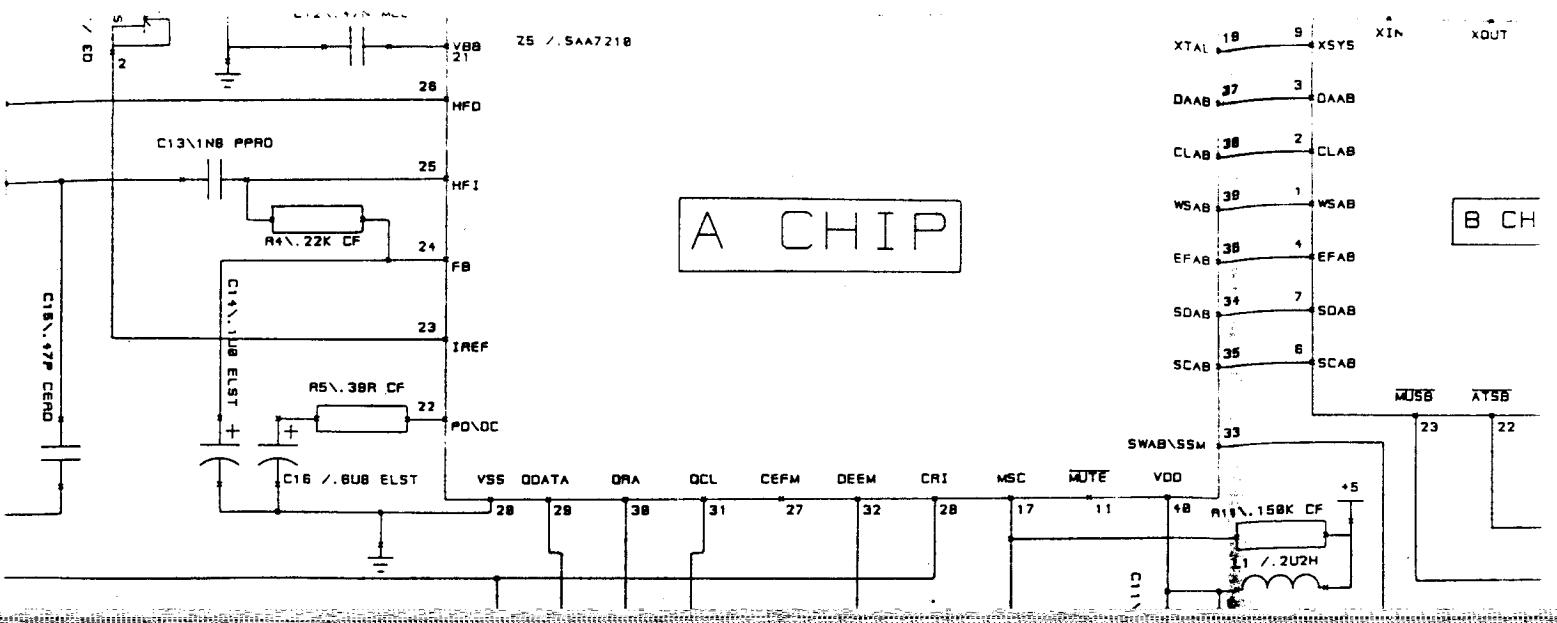


CIRCUIT ISSUE 02 FEB 1990

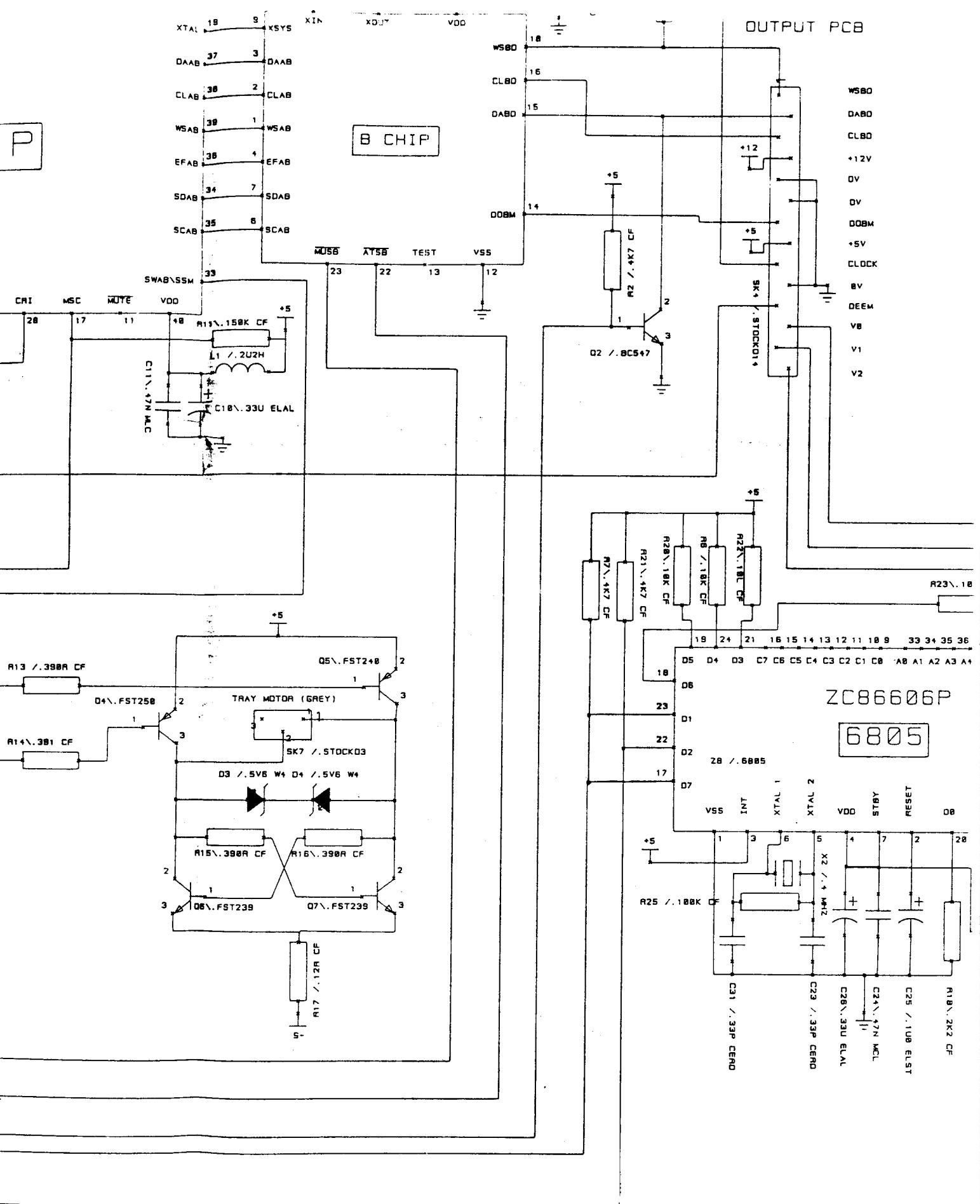
PAGE 2 OF 3







P



OUTPUT PCB

WS80  
DAB0  
CLBD  
+12V  
OV  
DV  
DDBM  
+5V  
CLOCK  
BV  
DEEM  
VB  
V1

