

# **ARCAM**

## **D250/D270 CD UNITS SERVICE MANUAL**

**ARCAM DELTA D250/D270 SERVICE MANUAL**

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## CIRCUIT DESCRIPTION

The Delta CD players D250 and D270 share common boards with the only difference between the two being the output board which for the D270 is an audio output board and for the D250, which is the transport only version, an output board providing the coaxial and optical digital outputs.

### AUDIO BOARD (D270 only)

#### Digital filter and DAC

The WORD SELECT (WSAB), CLOCK (CLK) and DATA (DAAB) from the engine board are sent to the oversampling filter Z309 YSF210. WSAB is divided by 4 by the 'D' type flip flops in Z306 outputs from filter are then fed to the DAC Z308 (PCM69).

The master clock for the filter and DAC is provided by the 16.9344 MHz crystal X301 and its associated components.

To provide a 11.28MHz to drive the engine board the 16.9344MHz clock is divided down by 6 by Z302-b, Z303b and Z304a+b to produce a 2.83MHz square wave.

This is clipped and the signal passed through a 11.2897MHZ crystal which acts as a filter allowing only the 4th harmonic of the 2.8MHz through to produce a 11.2896MHz clock. This is reshaped by Z305 before passing to the engine board. This has to be done like this to ensure the engine clock is synchronized to the master clock.

The digital output signal (DOBM) is derived from the engine board and via exclusive or gates Z303 and coupling transformers L303, 303 provides a balanced output on two phono sockets.

#### Audio Section

Z1-A is configured to amplify the current source output from the DAC to produce a voltage level output. C5 in the feedback loop acts as the first stage of anti-alias filtering. A passive low pass filter, R6 and C8, provides another stage of anti-aliasing filter. The passive filter network C6,R7 and C7 may be switched into the signal path when Q1 is switched on. This is done when de-emphasis is required.

Z1-B buffers the output from the second stage filter/de-emphasis to drive audio line outputs directly.

#### D.C. Servo

To avoid the use of electrolytic capacitors in the audio signal path, Z401 is configured as a d.c. servo integrator to ensure that the audio line output is always kept at a mean d.c. level of 0V. The d.c. error signal controls a current source, Q2, which applies current to the current node at the input of Z1-A so as to ensure no d.c. voltage offset at the line outputs.

#### Power Supplies

The transformer board contains 2 transformers, one for the audio board supplies and the other for the digital supplies.

The output from the digital transformer is used to provide 6 smoothed and regulated supplies at +27V, +/-9V and three +5V supplies for the DAC, clock and engine.

The audio transformer is smoothed and rectified to give +/-12V and a +5V supply for the DAC also.

The mute circuit, based around Z210 is powered from the AC winding and half wave rectified and smoothed.

### **DIGITAL BOARD (D250 only)**

The data from the engine board arriving at SK301? is already in the correct format to send to an external DAC e.g. the Black Box. The main task of the digital output board is to remove jitter from the data then to buffer the data to drive a coaxial cable at the correct level and also drive the optical TOSLINK output. A crystal oscillator is also on this board. This is used as a low-jitter reference XTAL clock for the audio data and as a system clock by the decoder board.

A special feature of this board is the ability to override the XTAL clock with an external clock source via a TOSLINK input. This enables the audio data to be synchronized with a reference clock in the external DAC e.g. the Black Box 50.

To minimize any jitter on the clock and audio data signals, every section on this board has its own 5V power supply, hence the large number of voltage regulators and voltage dropping resistors.

### **Coaxial Outputs**

The coaxial outputs are driven by Z1 (LM6221). The level shifter and band pass filter network of R16, R17, C19 and C28 attenuates and level shifts the 0-5V signal from Z2 down to the +/- 0.3V levels required at the outputs. In addition, R16 and C19 form a low pass filter and C28 acts as a d.c. block.

### **Shift Register**

The shift registers, Z2 & Z3, is used to re-synch the audio data signal edges to the XTAL clock. This dramatically reduces any jitter on the data edges of the data from the decoder board. Each of the shift registers has 8 outputs, each being a successive tap on the shift register.

### **Clock Buffer**

The clock signal is used by the decoder board and the shift register. To prevent any interference to the shift register clock signal from any loading effects of the decoder board, two separate CMOS buffers are used, Z1-D and Z1-E.

### **XTAL clock**

The oscillator circuit is based around Z1-F CMOS buffer. This is a standard Pierce oscillator which, as it happens, is also one of the best circuits for producing a low jitter clock. The clock signal is taken from the buffer input rather than the output in the same way on-chip XTAL oscillators work.

### **Clock override switch and External clock detector**

If an external clock signal has been recovered, then the internal clock must be switched off and the new clock signal can replace it. Q1 is used as the switch when this

happens. When the signal detector, D3, D4, C4, R3 and C5 is charged up by the presence of a signal at the output of the CMOS buffer, Z1-C, then Q1 is switched on and connects this signal onto the unbuffered clock link. Because this line is connected to the input of the XTAL oscillator, not the output, the XTAL oscillator is overridden and simply resonates at the external clock frequency.

### **Frequency multiplier and XTAL filter**

The TOSLINK optical link only has a bandwidth of about 5MHz, so it is impossible to send a 11.2896MHz clock signal along it. To overcome this problem, a lower frequency is sent,  $11.2896\text{MHz}/4 = 2.8224\text{MHz}$ . A frequency multiplier is used to regenerate the 11.2896MHz clock.

The incoming clock signal is assumed to be a square wave, this waveform only contains odd harmonics i.e.  $f$ ,  $f*3$ ,  $f*5$ , etc. The required clock frequency is  $f*4$  which is an even harmonic. To obtain the even harmonics, a pulse shaper is used to generate a rectangular waveform which contains both odd and even harmonics. C1, R1 ensure that positive going pulses at the output of Z1-A, the 2.8224MHz signal, are cut short. D1 restores the 0V level for negative going pulses.

The  $f*4$ , 11.2896MHz component is extracted from the resulting pulses by use of an XTAL filter, this signal is then buffered by Z1-C to yield an 11.2896MHz clock signal.

### **Power Supplies**

The transformer board contains 2 transformers, one for the digital board supplies and the other for the digital supplies.

The output from the digital transformer is used to provide 6 smoothed and regulated supplies at +27V, +/-9V and three +5V supplies for the DAC, clock and engine.

The other smaller transformers output is rectified and regulated to give +/- 8V. This voltage is then fed to 4 +5v regulators, (Z5,6,7,8), and a -5v regulator, Z9. These regulated supplies are used to power the various ics on the digital board.

## **SERVO & ENGINE PCB's**

### **Servo Board**

The TDA8808(IC 7001) ic is the photo diode signal processors for the laser unit. The TDA8808 amplifies the photo-diode signals and processes the error signals for the focus and radial control network. IC 7003 (TCA0372) is a high power op-amp to drive the radial arm.

### **Engine Board**

The TDA8809 (IC7002) provides control signals for the radial motor. These signals are generated from radial error signals received from the TDA8808 and velocity control signals from the control processor.

IC 7131 (4560) is used to drive the turntable motor and IC7600 (TCA0372) drives the tray motor.

The A chip SAA7310 (IC7100) demodulates the HF signal from the servo board into digital form, performs a series of decoding / error correcting functions on the data using the 64k DRAM (IC7102) as working space. It finally outputs various signals to the digital output generating ic, PCF3523 and also to the audio/digital boards. 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.

## DISPLAY BOARD

The display board carries the key to the operation of the player the servo microprocessor, XC409032P (P304), which initiates start-up, track jumping and searching in the CDM9. It also has a certain degree of control over the A chip (SAA 7310P). 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 keyboard scan/display driver ic, Z601 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 Z601 (e.g. start \stop \go to track ). On receipt of this instruction the servo micro carries out the appropriate routines for the instruction.

The appropriate signals are passed to and from these ic's to the audio or digital board via connector SK301.

The meaning of the used signals is as follows:

- Si/RD: On/off control for the focus servo system. This line is continuously made low by the SERVO-uP during the stop condition. At starting up, the SERVO-uP forces this line in a high-Z state. In this case the focus servo system is enabled. After some time the Si/RD-signal is made low for a short period to indicate that the focus servo is ready.
- TL: Track loss. This signal is made low by the TDA8808 as soon as a track is lost.
- REdig: Digital radial error signal (Re2-RE1 ).
- BO:
- B1: Input control bits for off-, catch-, play-status and
- B2: DAC-output-current for radial motor.
- B3:
- RE:  $\frac{1}{2}$  bit DAC. This signal is normally held high-Z by the SERVO-uP. However when TL goes low the RE line can influence the proportional amplification of the radial servo (improved S-curve).
- CRI: Counter reset inhibit. This signal goes low during a real track loss (>600us) or during execution of a jump command. When low, this signal allows the divide-by-588 master counter in the DEMOD timing of the SAA7310 to run free. The signal becomes high during initialization of the "catch" status of the radial servo.
- DODS: Drop-out detector suppression. This signal is externally hard wired with the CRI-signal.

QRA:  
 QDA: Subcode channel.  
 QCL:

SWAB/SSM: Subcoding word clock and start/stop turntable motor. This line is continuously made low by the SERVO-uP during the stop condition. At starting up the SERVO-uP forces this line to the high-Z state. In this case the turntable motor is started and the subcoding word clock is connected to this line by the SAA7310. If this line is forced low by the SERVO-uP, a motor stop condition will be decoded by the SAA7310 and fed to the turntable motor control logic circuit.

MC: Motor speed control. The SERVO-uP uses this line to measure the turntable motor starting up time. This is necessary for the 8cm/12cm disk identification and for the software controlled brake of the turntable motor.

TTMO: Motor offset and bandwidth switch. At starting up the turntable motor, the SERVO-uP measures the starting up time (cfr. MCES). If this time is small (small moment of inertia), the TTMO line is turned high by the SERVO-uP. If this time is long (high moment of inertia), the TTMO line remains low. As the TTMO line is switched high the DC amplification is lowered and an offset is injected to the turntable motor circuit.

MUTE/MUSB: Digital filter mute signal. This line controls the muting of the digital filter. The MUTE line is made low by the SERVO-uP +/- 32ms before a point to point search is executed, the pause is initialized or the stop function is executed. When the MUTE line is made low, the data samples are decreased smoothly to zero following a cosine curve. 32 coefficients are used to step down the value of the data, each one being used 31 times before stepping onto the next. The MUTE signal is made high by the SERVO-uP as soon as the normal playing state is initialized (pause off, point to point search executed and audio mute off). When the MUTE signal is made high, the data samples are returned to full level again following a cosine curve with the same coefficients as before being used in reverse order.

ATSB: Attenuation. This signal is made low by the SERVO-uP as soon as a "set attenuate on" command or a "jump grooves forward/revers and set attenuate on" command is executed. Then this signal is made low, the data samples are multiplied by a coefficient that provides -12dB attenuation. The ATSB signal is made high again when a "set attenuate off" command or a stop procedure is executed.

Sin: Tray switch. This line is used by the SERVO-uP to control the loading. The Sin signal should be low if the tray is complete in or complete out. In all other cases this line should be high (pulled up). If the tray is complete out and the SERVO-uP detects a change of the Sin signal (from low to high), the tray is pulled inward (push tray).

TRMOT1: Tray motor drive. This line is used by the SERVO-uP to activate the tray motor.

When this line is low (-5v) the tray is going inward, when this line is high (0v) the tray is going outward. If the TRMOT line is set to a high-Z state by the SERVO-uP, the tray motor is stopped.

- DMUTE:** Digital mute. Goes low on mute on signal and does not affect the analogue outputs.
- ANI:** Analogue inhibit on. Mutes the data to the DAC but does not affect digital output.
- DIV4:** Divide by 4 signal. When low the fast jump feature is disabled, when high it is enabled. The servo uP controls the DIV4 line of the TDA8809 and if it becomes low the REdig signal is divided by 4 and redirected to the TL input of the servo uP. This is to provide an appropriate bandwidth for a fast jump.

## **DISASSEMBLY FOR SERVICE**

### **ANTI STATIC PRECAUTIONS MUST BE OBSERVED**

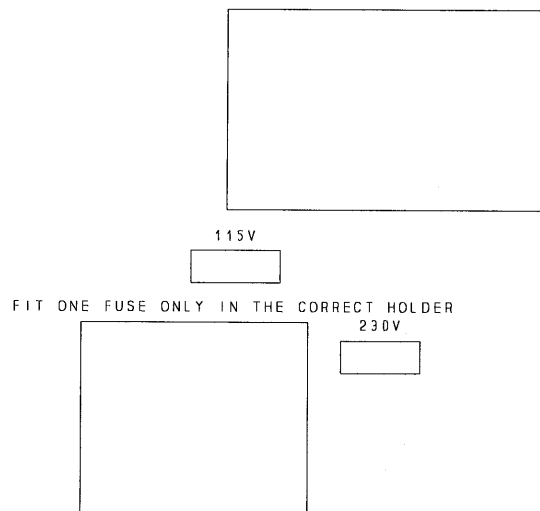
1. Remove the cover by removing 2 screws from each side & 4 from the rear panel.
2. Remove the front panel by removing 2 screws from each end of the front.
3. To remove the audio or digital board remove 1 screw from each of the output sockets ( & 1 extra screw on the D250). Now release the 4 connecting leads from the side of the board and the digital lead from the engine board. By squeezing the tops of the pcb pillars and pulling the board upwards the board can be removed from the unit.
4. The mechanism can be removed by sliding the tray forward to reveal the rear mounting screw. Remove this screw and the two holding the mechanism to the subfront. Release the connector from the pcb under the mechanism and the assembly of mechanism and servo pcb can be removed from the chassis by pulling it out backwards.
5. The engine board is under the audio or digital board dependant on the unit and can be removed once this board has been removed by simply unscrewing the pcb pillars that the audio/digital board was mounted on and lifting out.



## CHANGE OF MAINS VOLTAGE

**WARNING** - the unit **must** be unplugged from the mains when replacing the fuse as the mains inlet and fuse are at mains potential even with the unit switched off.

To change the mains voltage on the D270/250 requires removing the fuse from the original fuseholder and fitting a new fuse to the fuseholder marked with the required voltage (see diagram below).



The correct fuses are:     250mA antisurge for 230v  
                                      500mA antisurge for 115v

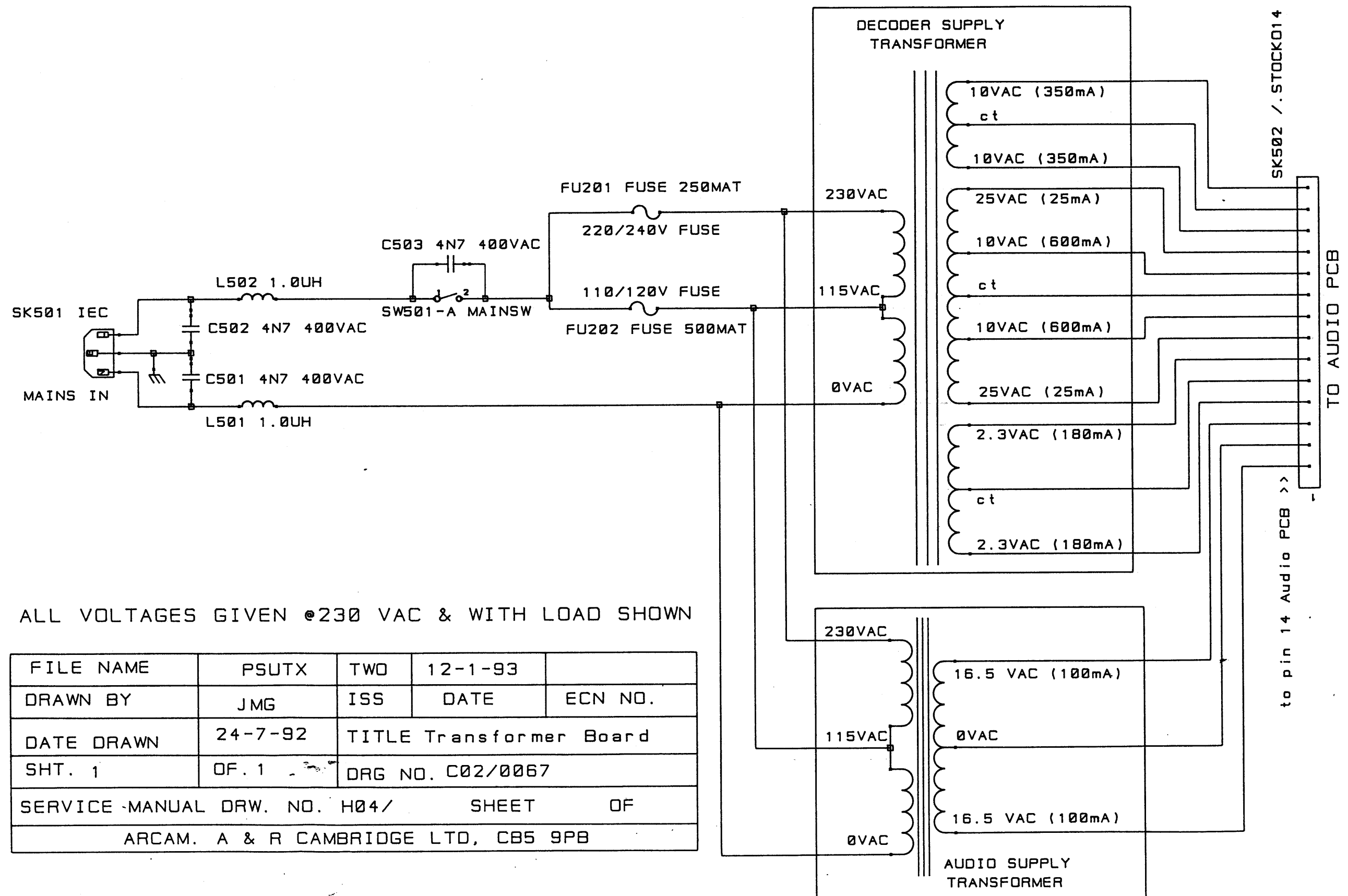
CIRCUIT DIAGRAMS
SERVO PCB
ENGINE PCB
D270 AUDIO BOARD: POWER SUPPLIES
D270 AUDIO BOARD: CLOCK & DAC
D270 AUDIO BOARD: AUDIO OUTPUT STAGE
D250 DIGITAL BOARD: OUTPUT STAGE
D250 DIGITAL BOARD: POWER SUPPLIES
DISPLAY BOARD: SERVO MICROPROCESSOR
DISPLAY BOARD: KEYBOARD SCAN
TRANSFORMER BOARD

1 of 1

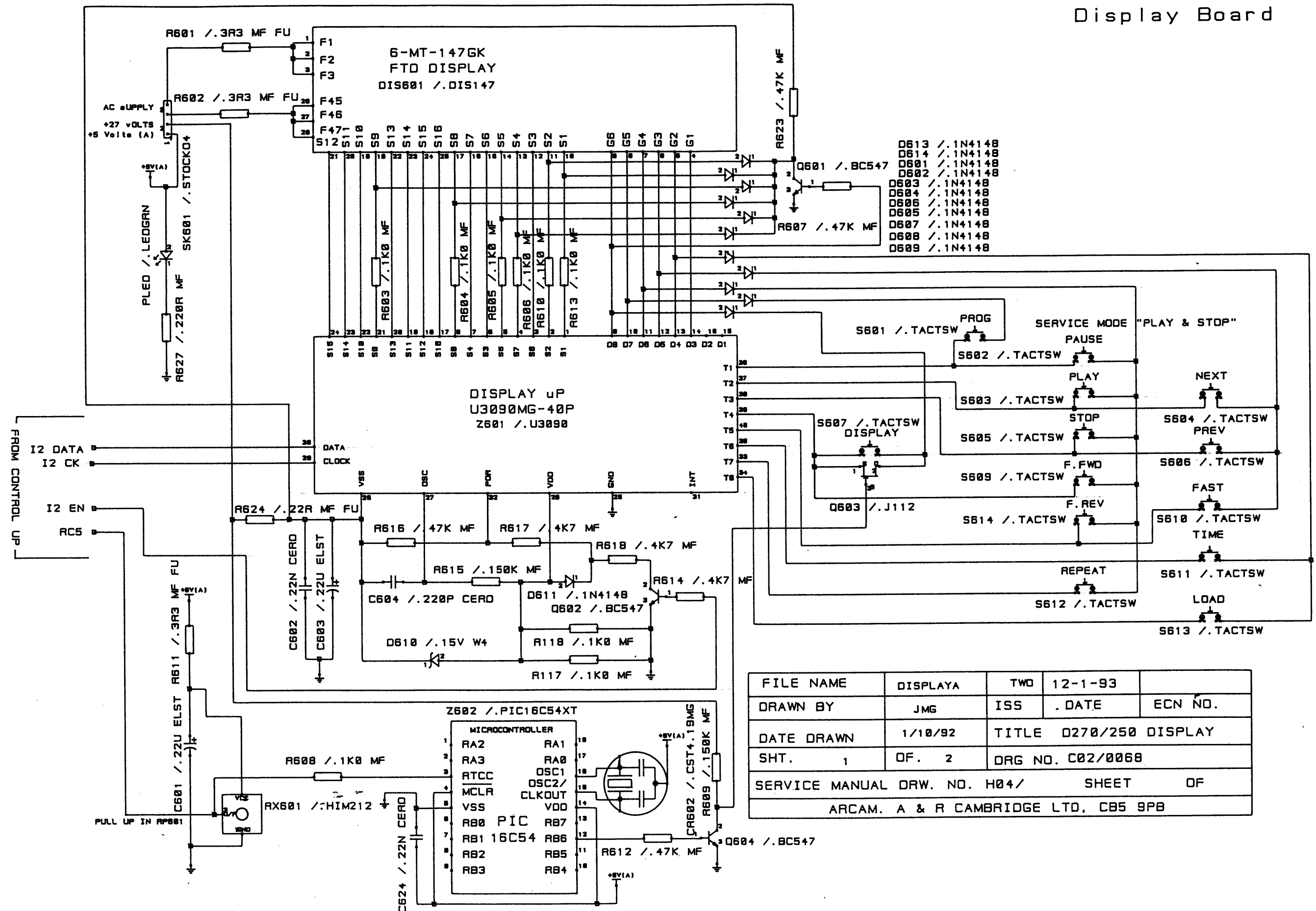
C02

0057

1) Transformer Board



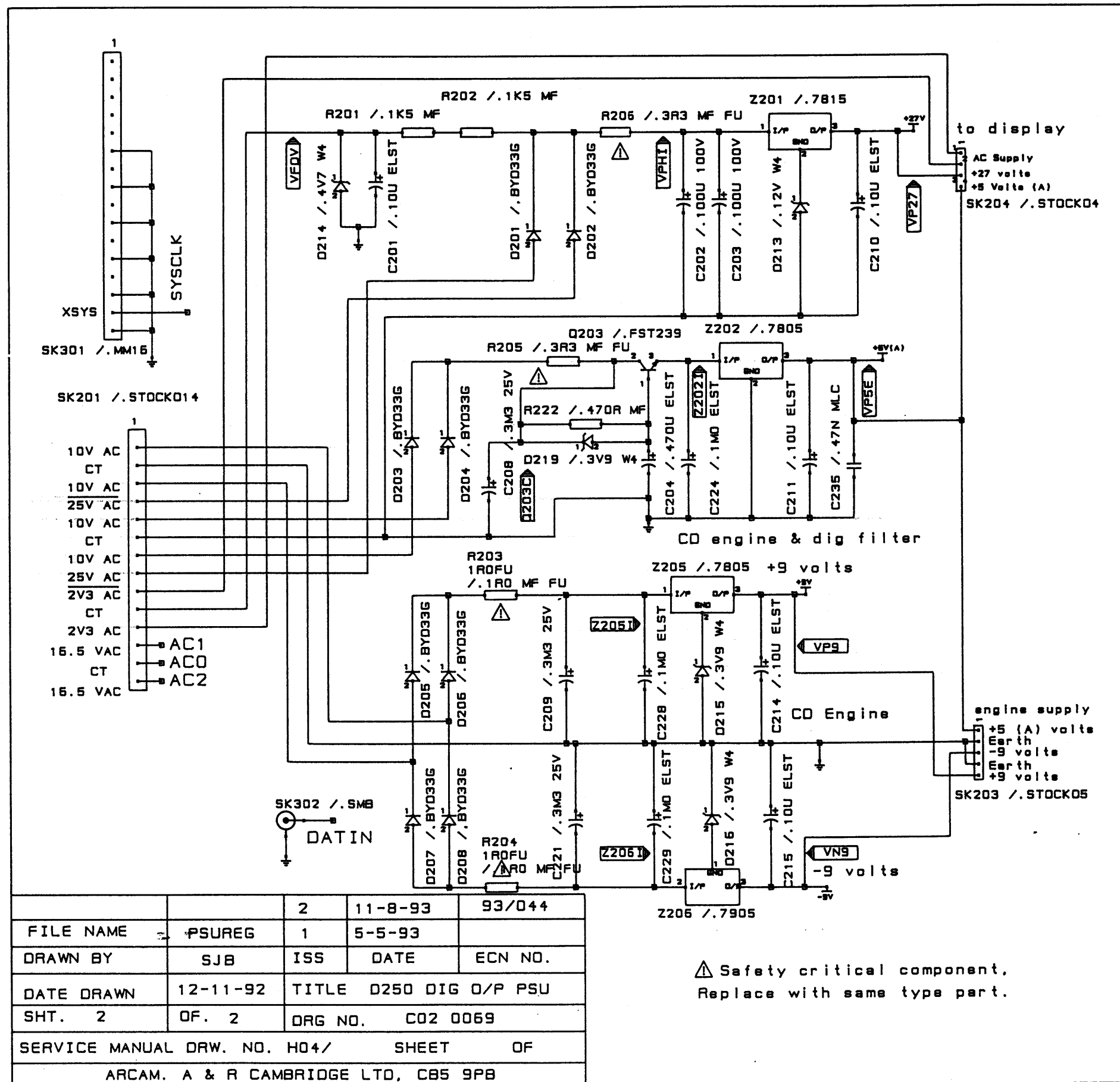
## Display Board

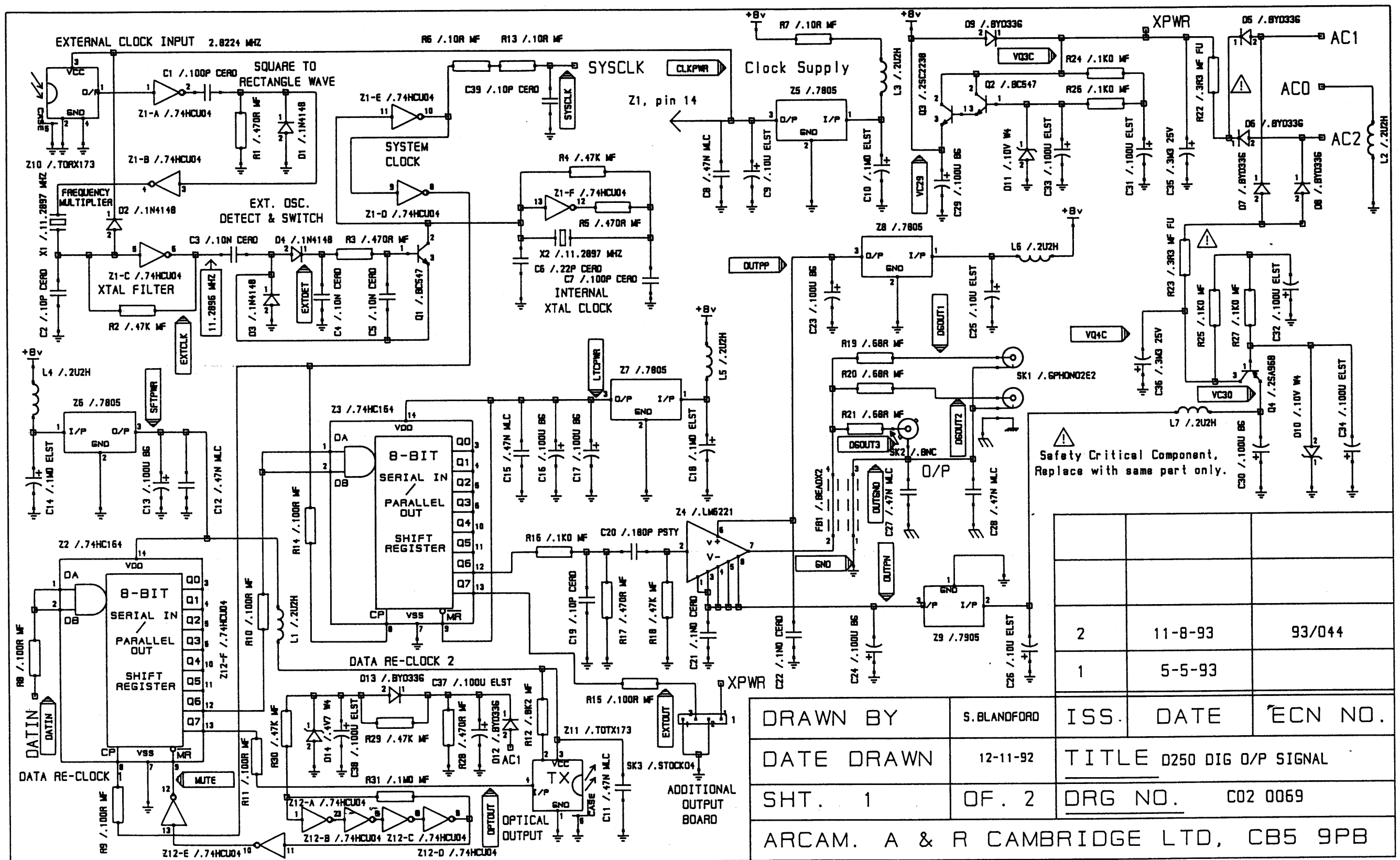


2507

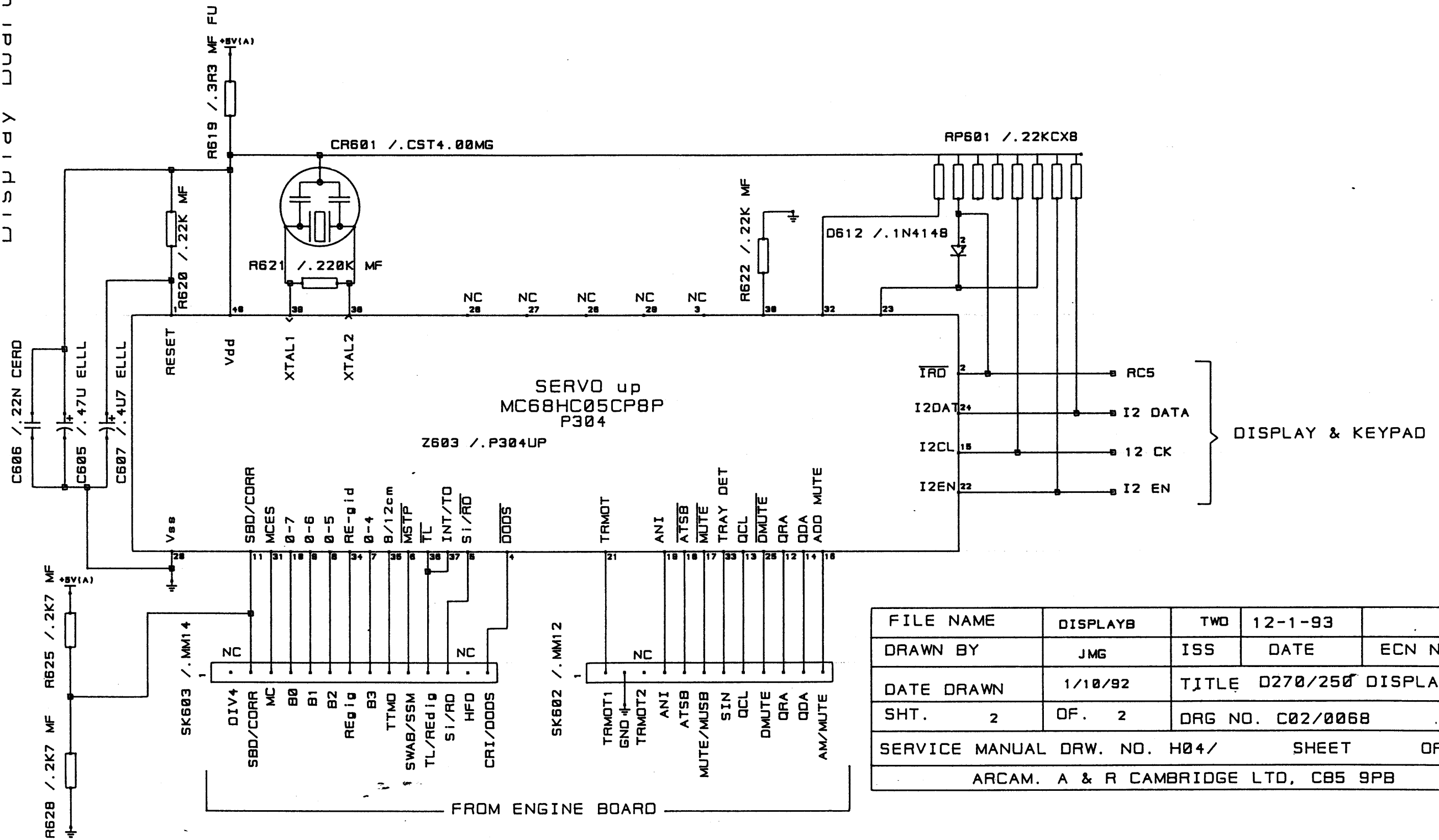
W2

0067



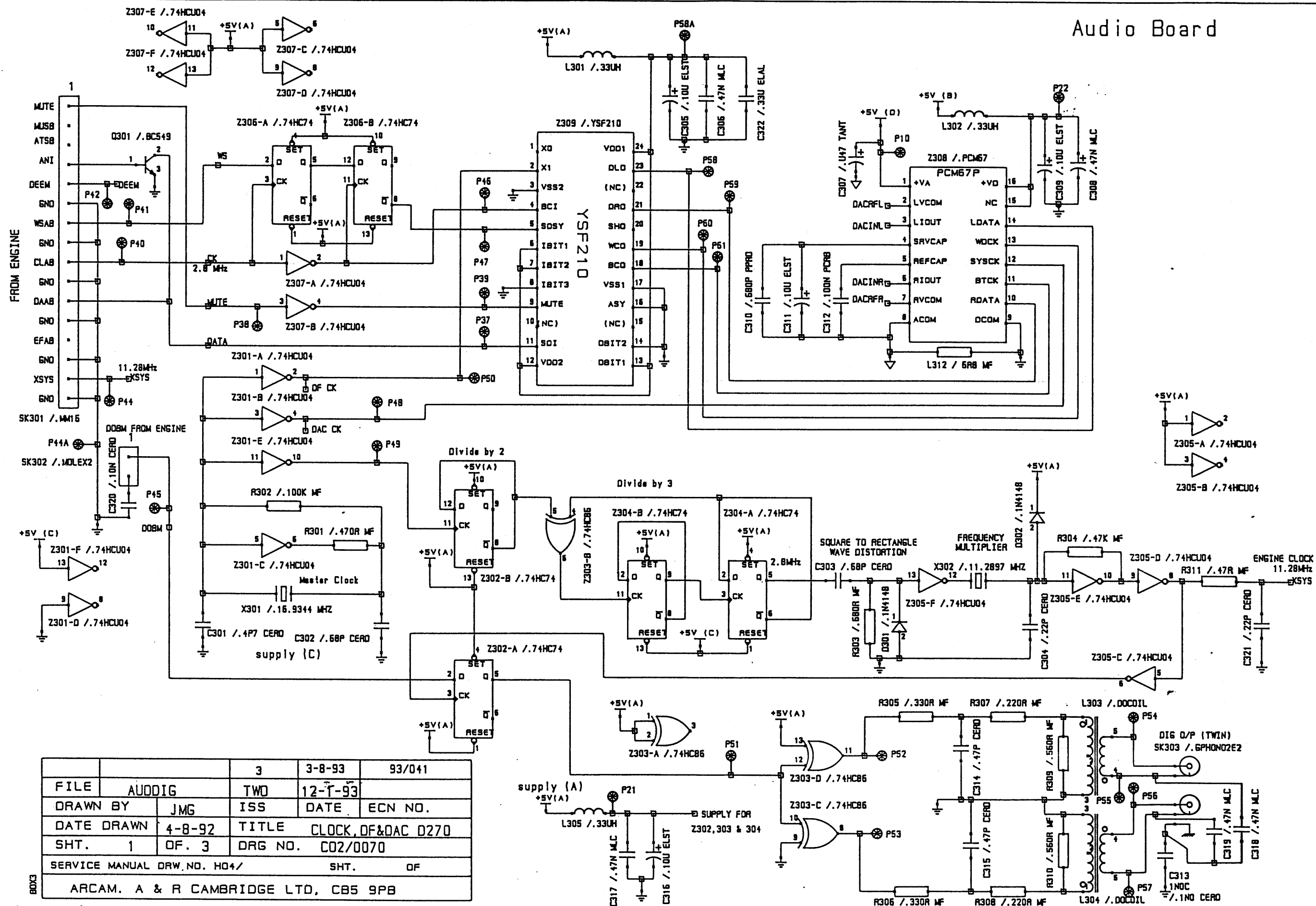


DRAWN BY	S. BLANDFORD	ISS.	DATE	ECN NO.
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SHT. 1	OF. 2			
ARCAM. A & R CAMBRIDGE LTD, CB5 9PB				

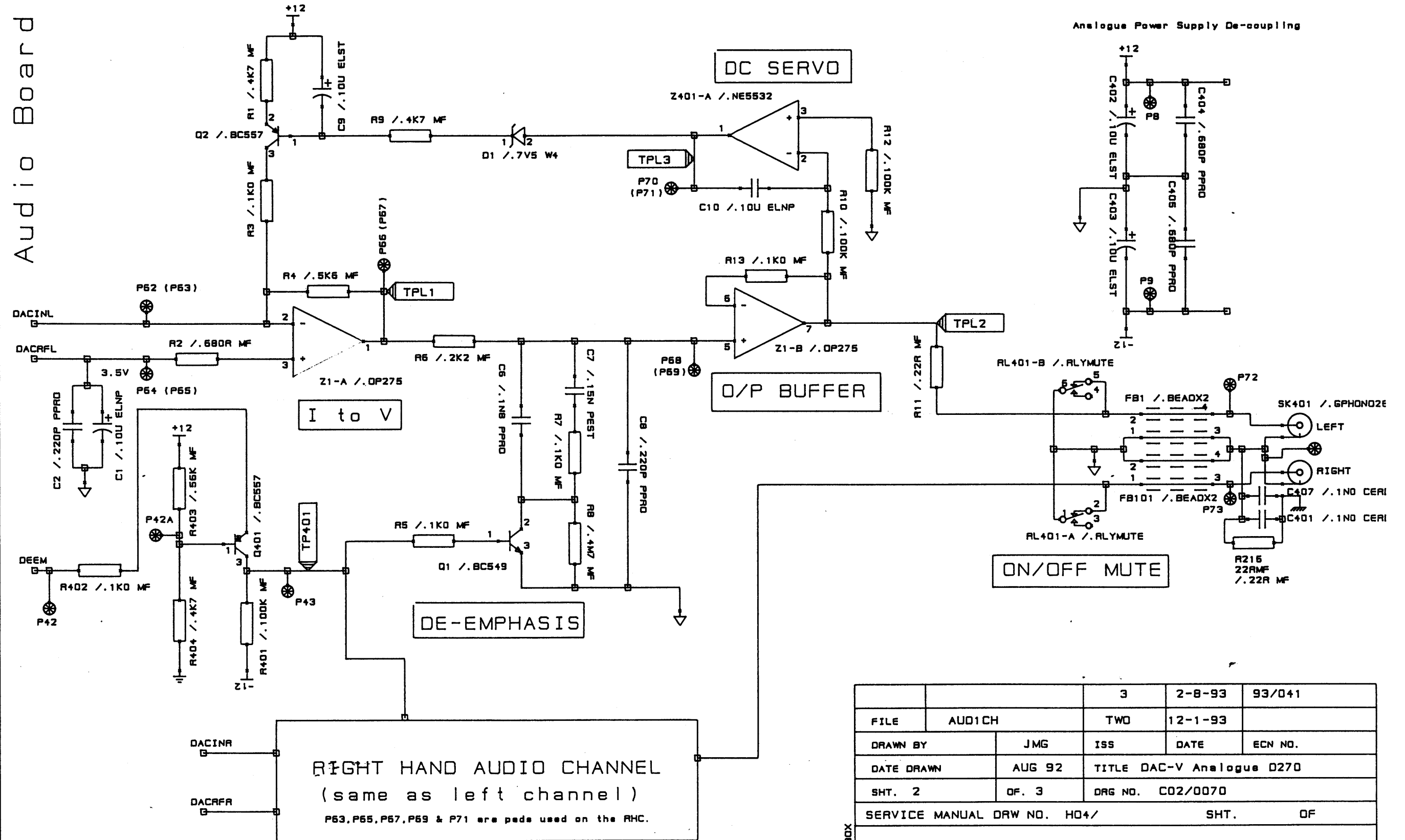


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SHT. 2	OF. 2	DRG NO. C02/0068		
SERVICE MANUAL DRW. NO. H04/ SHEET OF				
ARCAM. A & R CAMBRIDGE LTD, CB5 9PB				

# Audio Board



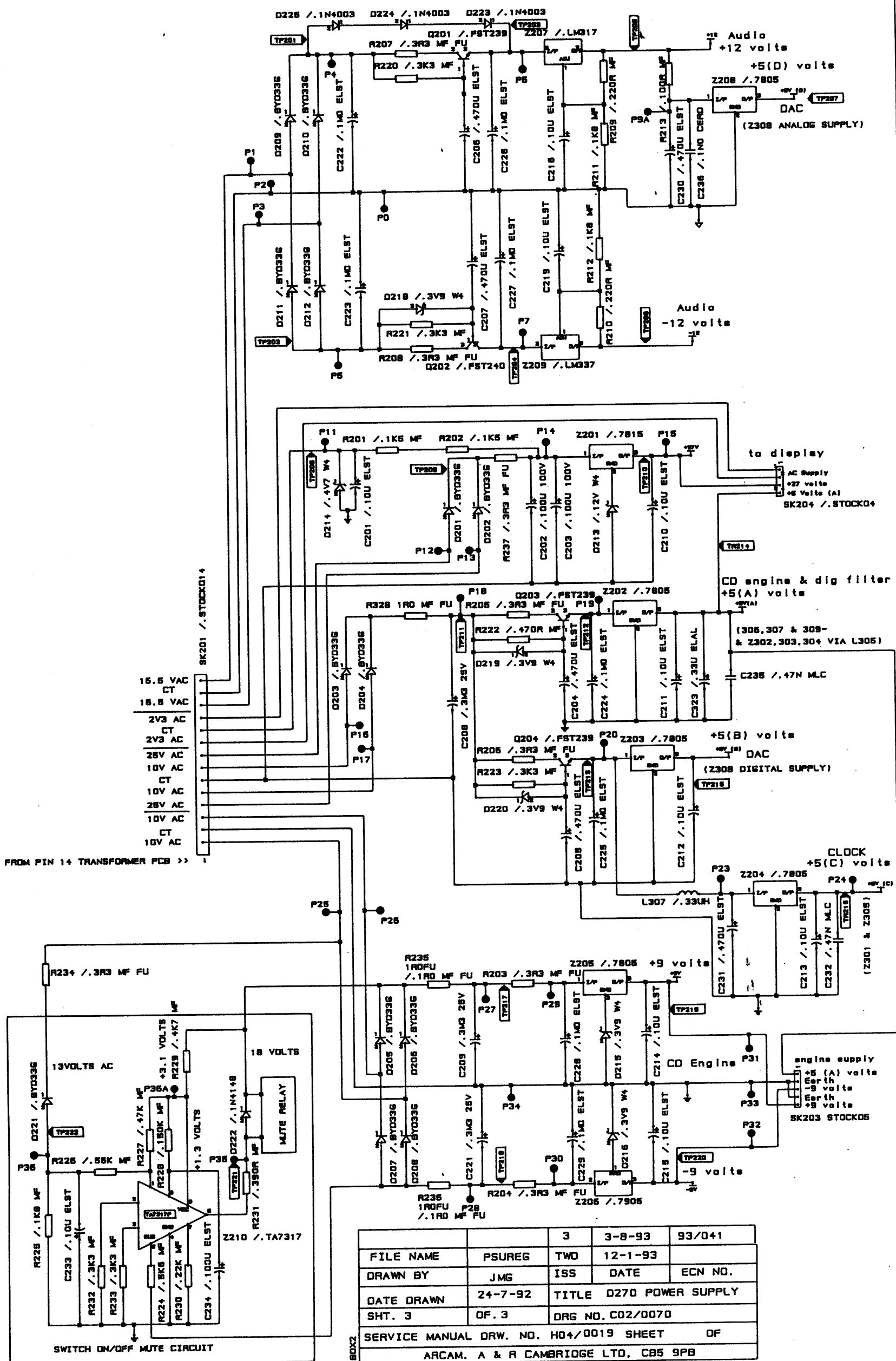
# Audio Board



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SERVICE MANUAL DRW NO.	HO4/	DRG NO.	C02/0070	
		SHT.	OF	
ARCAM. A & R CAMBRIDGE LTD, CB5 9PB				



## Audio Board



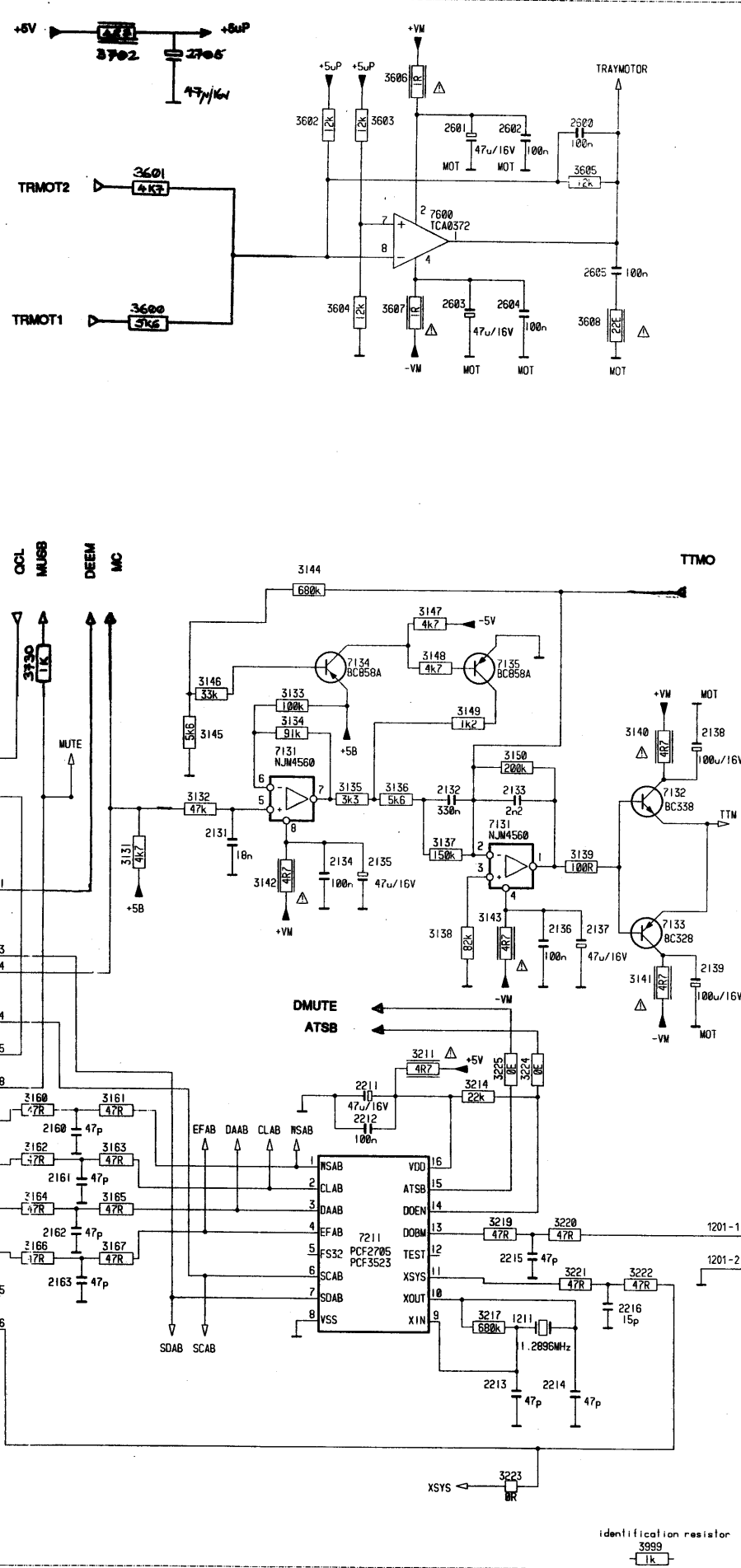
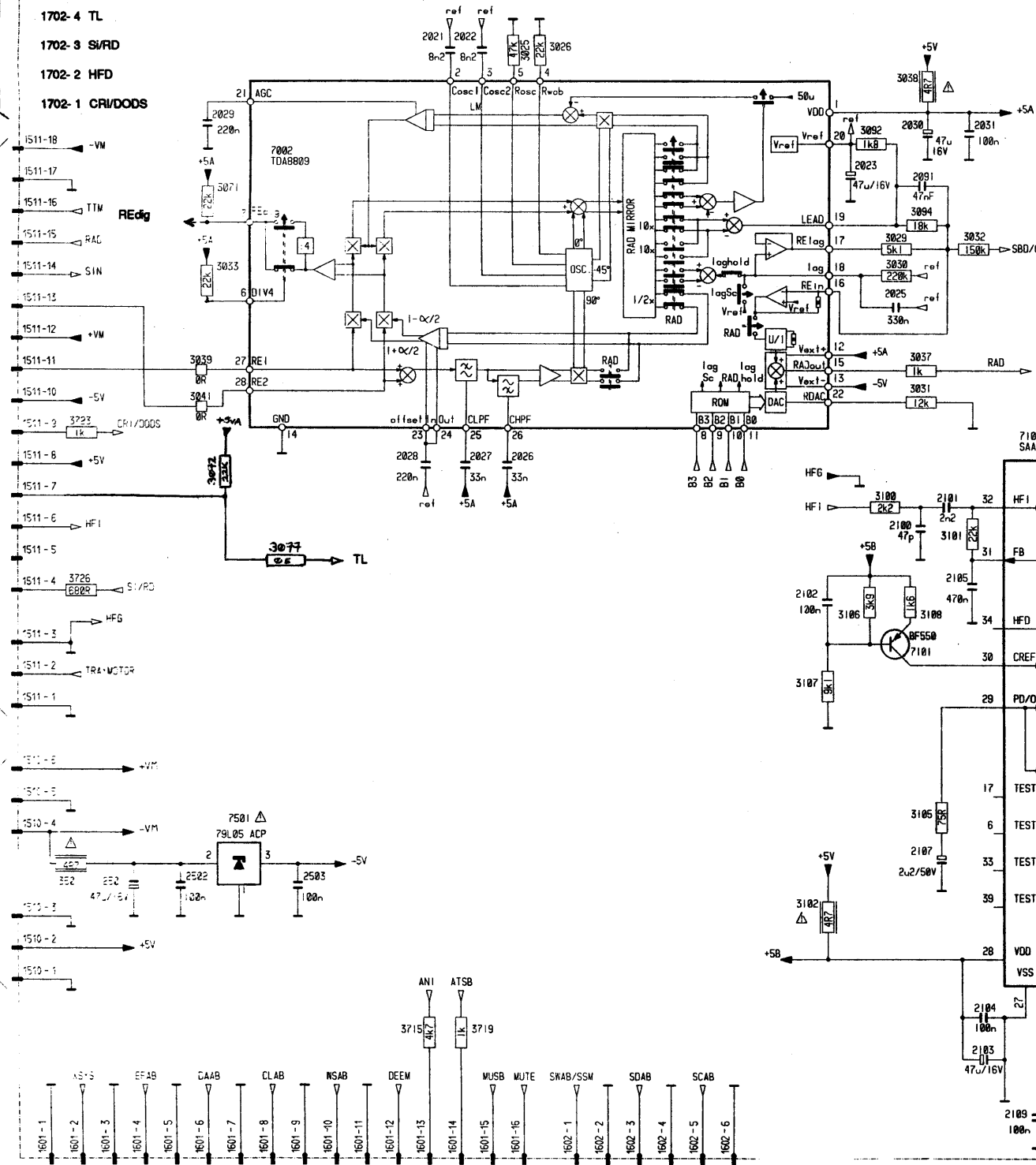
To Display Board SK802

To Display Board SK803

To SERVO BOARD

SHUTTLE

1702-14 DIV4  
1702-13 SBD/CORR  
1702-12 MC  
1702-11 B0  
1702-10 B1  
1702-9 B2  
1702-8 REdig  
1702-7 B3  
1702-6 TTMO  
1702-5 SWAB/SSM  
1702-4 TL  
1702-3 S/VRD  
1702-2 HFD  
1702-1 CR/DODS



130-1

3027

113

L3 A

PHILIPS

