

# **ARCAM**

## **D280/ALPHA 3/5 TUNER SERVICE MANUAL**

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(Paul Newton May 93)

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## **CIRCUIT DESCRIPTION**

The D280/Alpha 3/5 tuners share a common printed circuit board with parts added or omitted to produce the required model. The components with references beginning 9\*\* are used on Alpha 3/5 only and 8\*\* on the D280 only. Any other references refer to common parts. The Alpha 5 tuner is basically an Alpha 3 tuner in the new style case with some slight circuit modifications.

### **Front End**

The front end is a pre-aligned unit consisting of a voltage tuned RF amplifier, voltage tuned local oscillator and mixer plus output filter.

The front end in the Alpha 5 tuner is of a different type and not interchangeable.

The RF amplifier amplifies the desired signal and reduces the image frequency at 10.7 MHz above the local oscillator frequency (LO) which otherwise would pass straight through. The local oscillator is tuned to 10.7 MHz above the received frequency. The mixer provides sum and difference frequencies of the RF and LO.

### **IF Stage**

The IF output from the front end is filtered by ceramic filters CF1 and CF3 which are tuned to 10.7 MHz. The D280 has an additional filter circuit based around CF801, Q807 and associated components to provide a selectable IF band width which can be useful for discriminating between two adjacent stations.

### **IF Demodulator and Birdie Filter**

The signal enters the IF demodulator ICZ1 on pin 1 is amplified and detected by a quadrature coil L3.

Z1 also provides the following functions:

Deviation mute.

Interstation mute.

Signal strength output.

The audio output of Z1 is filtered by R30, 31, 32 and C28, 29, 30 and Q3 which forms the 'birdie' filter. This prevents any frequencies above 53 KHz from reaching the stereo decoder and appearing as 'birdies' on the audio outputs.

## Signal Strength Meter

Pin 13 of Z1 outputs a voltage proportional to the received radio signal strength. This is fed to a bar-graph driver, Z301, that turns on a series of five LEDs. These are lit at approximately the following aerial signal strengths (emf):

LED	Colour	Signal
1	Red	10uV
2	Red	50uV
3	Green	200uV
4	Green	500uV
5	Green	2mV

On the Delta 280, when the 'Display' off function is selected, the signal strength meter is extinguished.

## Stereo Decoder and Audio Outputs.

The signal from the IF demodulator once filtered passes onto the stereo decoder Z2 and enters on pin 2.

The decoder detects the pilot tone of stereo broadcasts and via the inverter formed by transistor Q13 outputs a high to the display microcontroller IC Z101 to ultimately drive the stereo led.

There are two identical networks on the left and right outputs which provide the gain, de-emphasis and 19 KHz filtering R40, R41 sets the gain. R44 and C40 provides de-emphasis. The addition of C42 provides 75µs de-emphasis.

L4, C44, C45, 47, R48 and Q4 form the 19 KHz notch filter to remove the pilot tone from the output. On Delta 280 an additional 38 KHz filter formed by L801 and C805 is used to reduce the level of unwanted signals.

JFETs Q6 and Q7 provide muting of the audio output at switch on and switch off, and also when switching between presets.

## Stereo Phase Lock Loop

The VCO of Z101 is accurately controlled by a ceramic resonator, removing the need for alignment and eliminating the possibility of drift over time. The VCO is defeated, forcing into mono mode by the 'MONO' control line from the microcontroller.

RV3 is used to optimise the stereo separation of the unit.

## Power Supplies

The mains transformer can be configured for 230V or 115V mains input. A bridge rectifier feeds regulators Z3 (12V for RF and audio stages) and Z108 (5V for the microcontroller). The unregulated DC is used to power the display drivers although in the Delta 280 this is semi-regulated to reduce noise.

A 'bleed' circuit consisting of D1, D2, D3 etc. is employed to 'top up' the memory back-up capacitor when the unit is switched off (but still connected to the mains).

Additionally, in the Delta 280, there is an extra 12V supply (Z108) that powers the audio stages only. The original 12V regulator is then used solely for the RF stages.

## Microcontroller

The microcontroller (Z101) serves three main purposes:

### 1) Keyboard reading & control functions

Key presses are decoded by Z101 and processed to control tuning, memory presets etc. The Delta 280 has a second microcontroller Z802. This device reads and decodes RC5 information from the remote control receiver, sending commands directly to the keyboard interface of the main microcontroller.

### 2) Display driving

The display outputs of Z101 (D0-D6 & A-H) are processed by Z104 and Z105 in order to send the correct information to the LED display. Z107 and Z106 are high-current LED display drivers.

### 3) Control of the Phase Locked Loop device Z102.

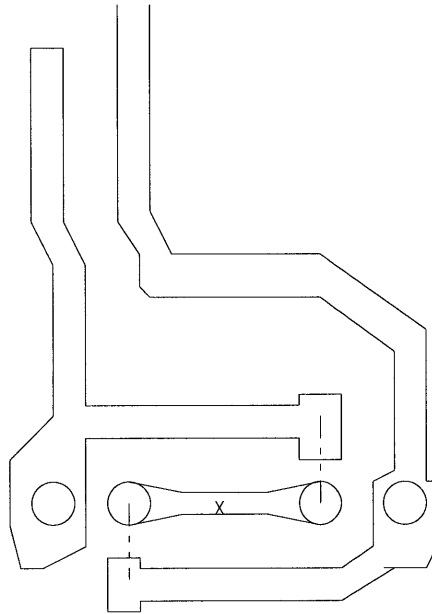
Z102 is the Phase Locked Loop control IC. The microcontroller Z101 sends the required tuned frequency to Z102 by means of a data link (SO, SI & CK). Z102 generates its own internal clock from this data and compares it to the output from the local oscillator in the front end. After allowing for IF offset the difference between the two frequencies is converted to an output at DO1 (pin 16). Once the PLL system has settled down this output is proportional to the required tuning voltage.

Z103 and its surrounding components filter this signal to produce a stable, clean and accurate tuning voltage.

## CHANGE OF MAINS VOLTAGE ALPHA 3 & D280

**WARNING** - The unit must be unplugged from the mains supply when changing the wiring or the mains fuse since the fuse is at mains potential even with the unit switched off.

To convert the tuner to work at a different mains voltage requires cutting one track under the pcb and adding 2 links (See diagram below).



CUT TRACK MARKED WITH X

ADD LINKS AS SHOWN BY DASHED LINE

## CHANGE OF MAINS VOLTAGE ALPHA 5 TUNER

**WARNING** - The unit must be unplugged from the mains supply when changing the wiring or the mains fuse since the fuse is at mains potential even with the unit switched off.

These units have 2 mains fuseholders fitted, only one of which has a fuse fitted. These fuseholders are marked 230V and 115V. To change the mains voltage on these units requires removal of the fuse from the fuseholder which has one fitted (the 230V one for European units) and fitting the correct fuse into the other fuseholder.

**NOTE:** Only one fuse should be fitted at a time.

The correct fuses are as follows:

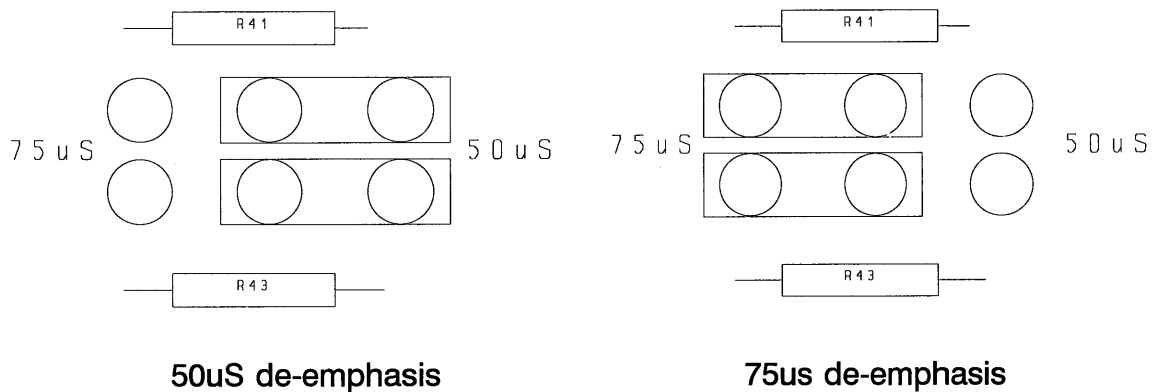
230v units 100mA antisurge  
115V units 250mA antisurge

## CHANGE OF DE-EMPHASIS

To change the de-emphasis on the D280 or Alpha 3 tuners requires changing the value of 2 capacitors.

These capacitors are C42 & C43 which are 220pF for 50us and 560pF for 75us.

To change de-emphasis on the Alpha 5 tuner requires repositioning of a 2 way socket on a 3 pin connector, one socket per channel (See diagram below).



## ALPHA 5 TUNER DISASSEMBLY

1. Remove the **cover** by removing the 4 side screws and 4 rear screws. Slide the cover backwards and up.
2. Undo 5 screws holding the **front panel**, 2 at each end, plus one in the centre of the front panel, from inside the unit. Remove the front panel elsewhere to avoid cosmetic damage.
3. Undo 2 screws holding the **rear panel** to the chassis at the bottom of the rear.
4. Remove 4 screws from around the transformer and one other from the centre of the printed circuit board.

The **tuner assembly** should now be removable from the chassis by lifting up on the transformer and sub panel and easing out upwards.

## D280 DISASSEMBLY

1. Remove the **cover** by removing the 4 side screws and 4 rear screws. Slide the cover backwards and up.
2. Undo 4 screws holding the **front panel**, 2 at each end. Remove the front panel elsewhere to avoid cosmetic damage. Undo 4 screws, 2 at each end, holding the sub front in place.
3. Undo 2 screws holding the **rear panel** to the chassis at the bottom of the rear.
4. Remove 6 screws from the printed circuit board.

5. Release the 3 connectors connecting the display pcb to the main board if necessary.

The **tuner assembly** should now be removable from the chassis by lifting up on the transformer and sub panel and easing out upwards.

### ALPHA 3 TUNER DISASSEMBLY

1. Remove 2 screws holding the top plate on. The top can now be removed by pulling the plate upwards slightly and backwards.
2. Repeat the above for the base plate.

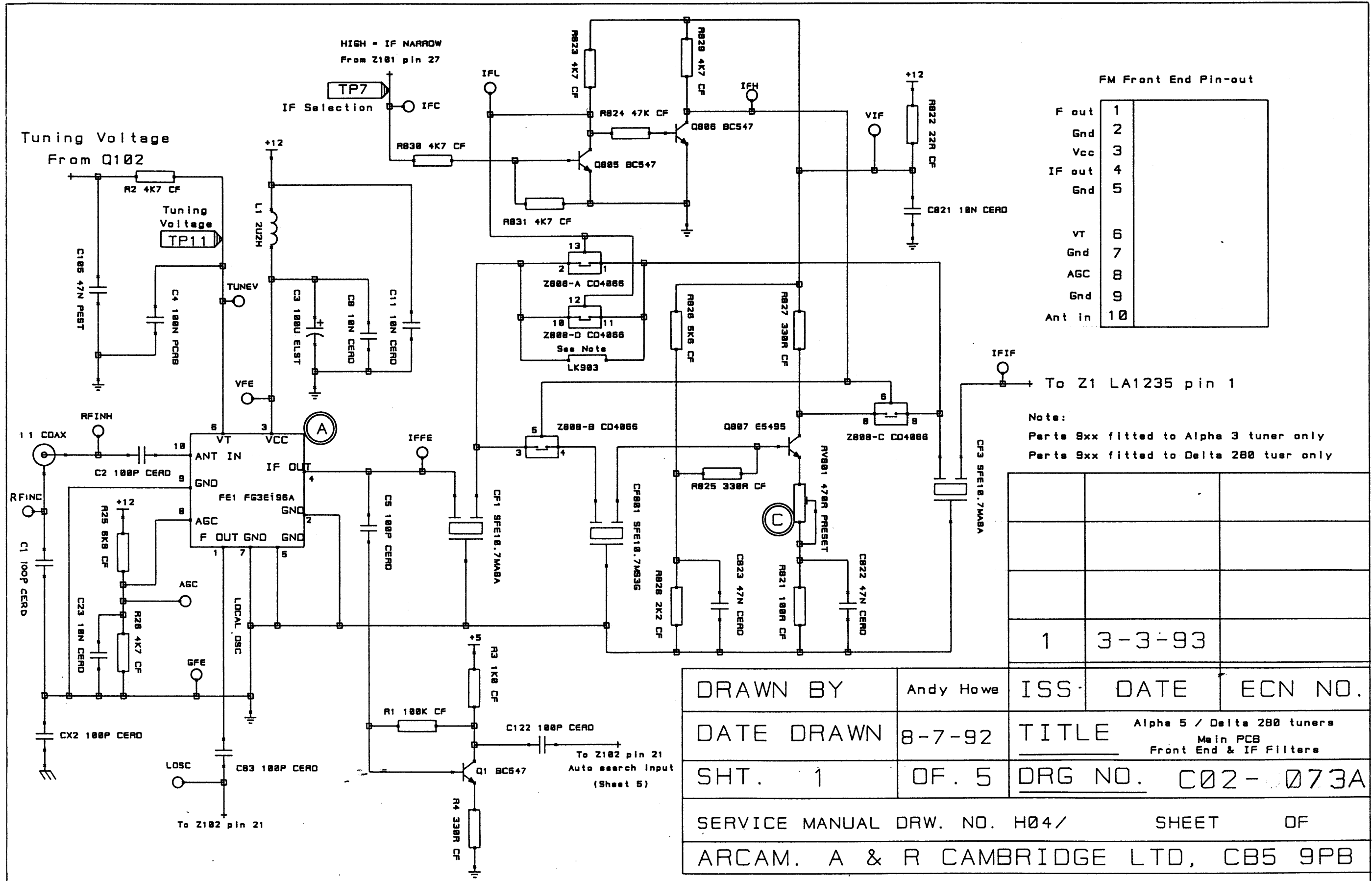
The unit is now accessible for most servicing needs. If the display pcb has to be removed then follow the instructions below.

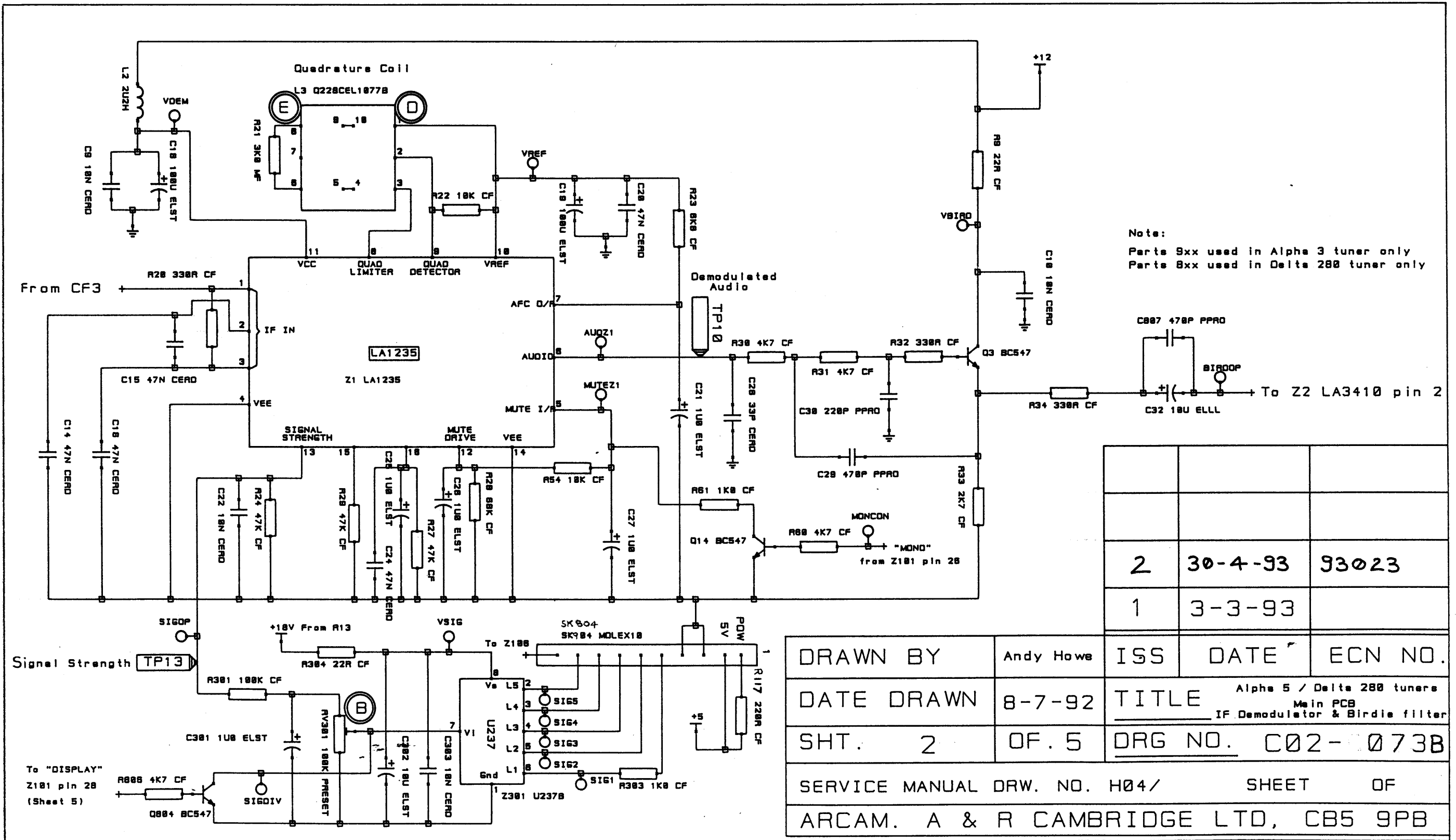
1. Release the 3 clips holding the front panel in place and remove the front.
2. Remove 5 screws holding the display pcb in place from inside the unit and 4 screws holding the subplate to the side panels. Now by pulling the display pcb and subfront apart and pulling the display pcb off the connectors on the main pcb the display board should come out clear of the subfront.

CIRCUIT DIAGRAMS
Delta 280 Display Board
Alpha 3/5 Tuner Display Board
Front End & IF Filters
IF Demodulator & Birdie Filter
Stereo Decoder & Audio Output
Power Supplies
Microcontroller



# ALPHA 3 + 5 TUNER D280





Note:  
 Parts 9xx used in Alpha 3 tuner only  
 Parts 8xx used in Delta 280 tuner only

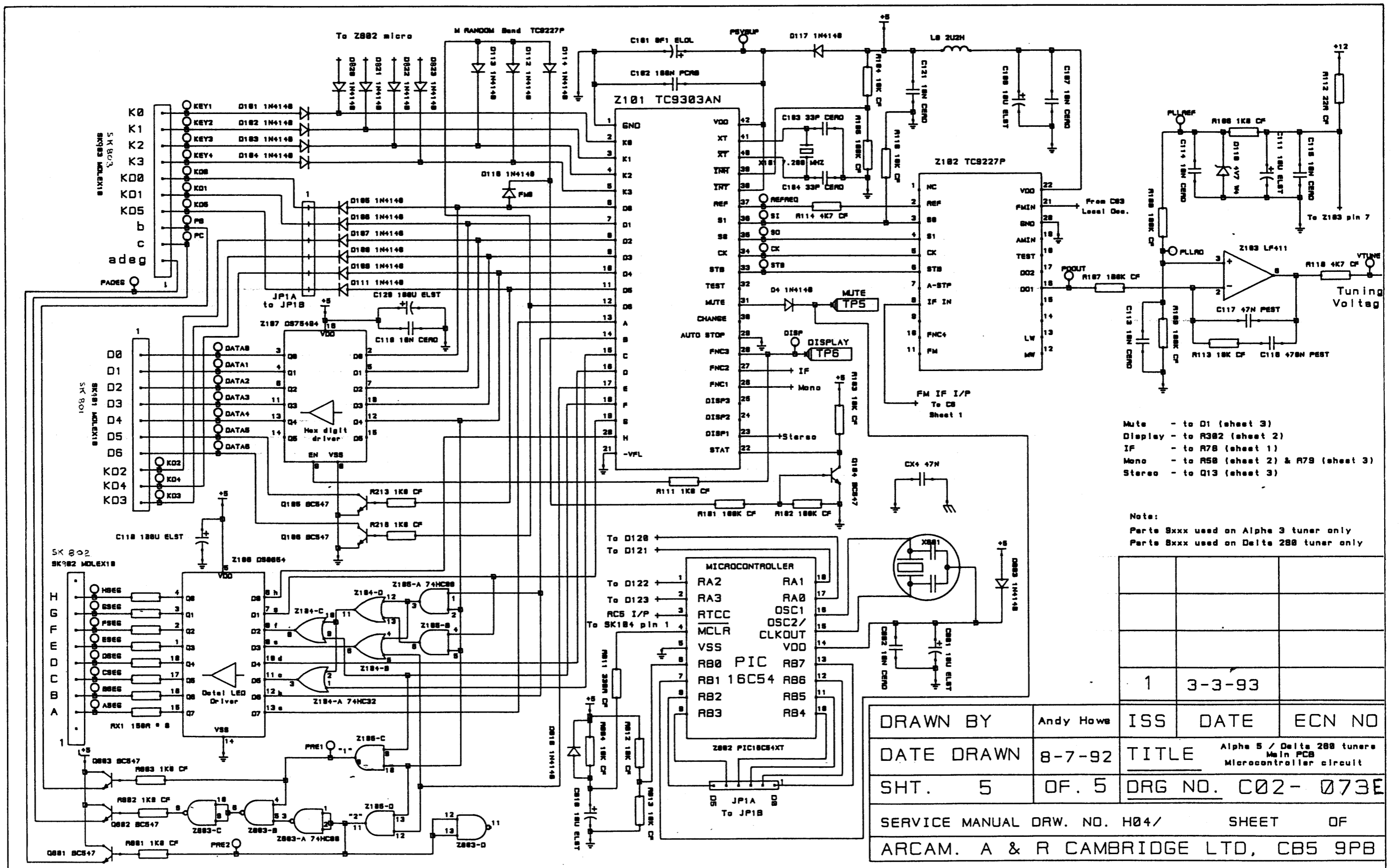
2	30-4-93	93023
1	3-3-93	

DRAWN BY	Andy Howe	ISS	DATE	ECN NO.
DATE DRAWN	8-7-92	TITLE Alpha 5 / Delta 280 tuners Main PCB IF Demodulator & Birdie filter		
SHT.	2	OF.	5	DRG NO. C02-073B
SERVICE MANUAL DRW. NO. H04/		SHEET OF		
ARCAM. A & R CAMBRIDGE LTD, CB5 9PB				

To "DISPLAY"  
 Z181 pin 28  
 (Sheet 5)





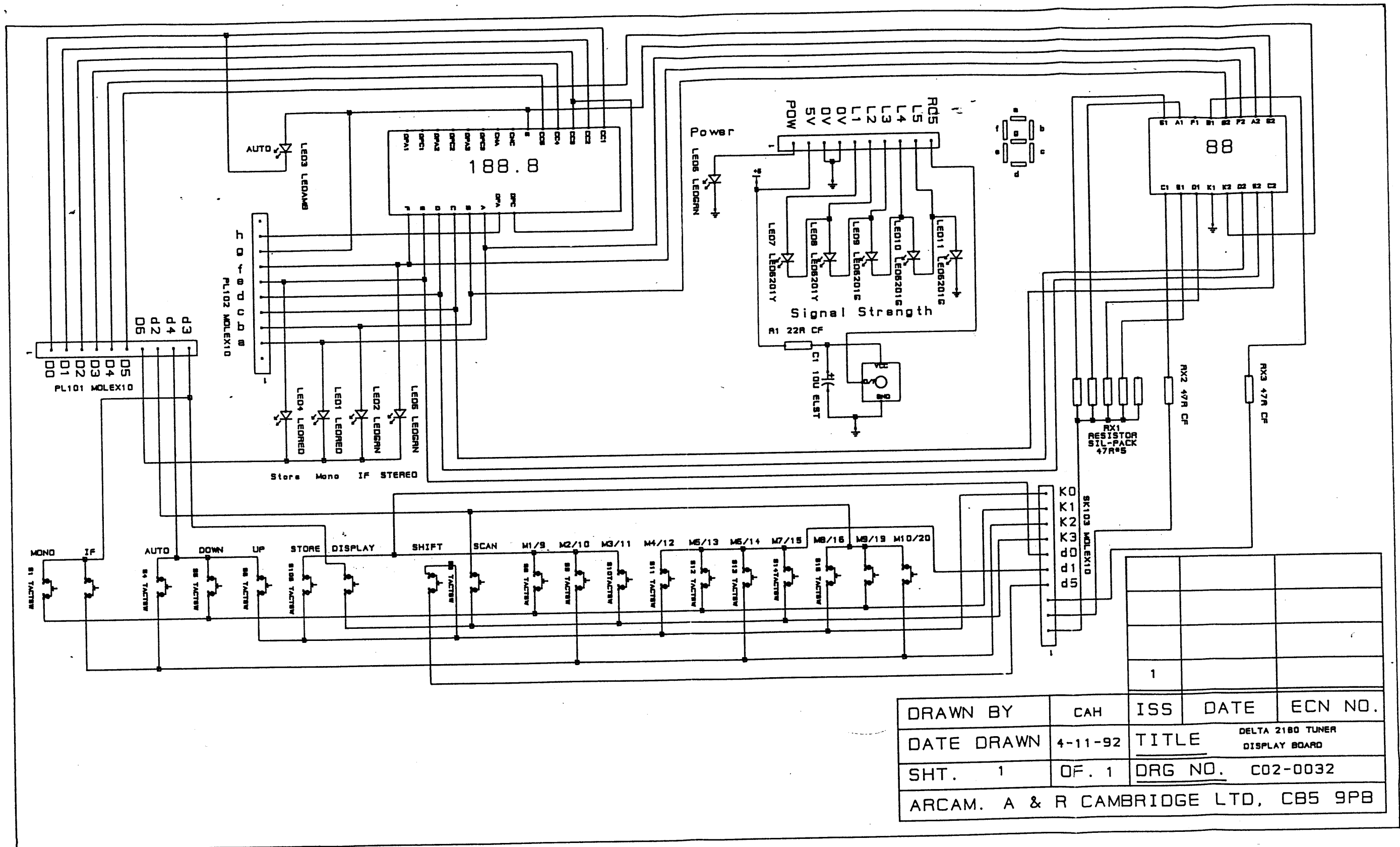


- Mute - to D1 (sheet 3)
- Display - to R302 (sheet 2)
- IF - to R78 (sheet 1)
- Mono - to R58 (sheet 2) & R78 (sheet 3)
- Stereo - to Q13 (sheet 3)

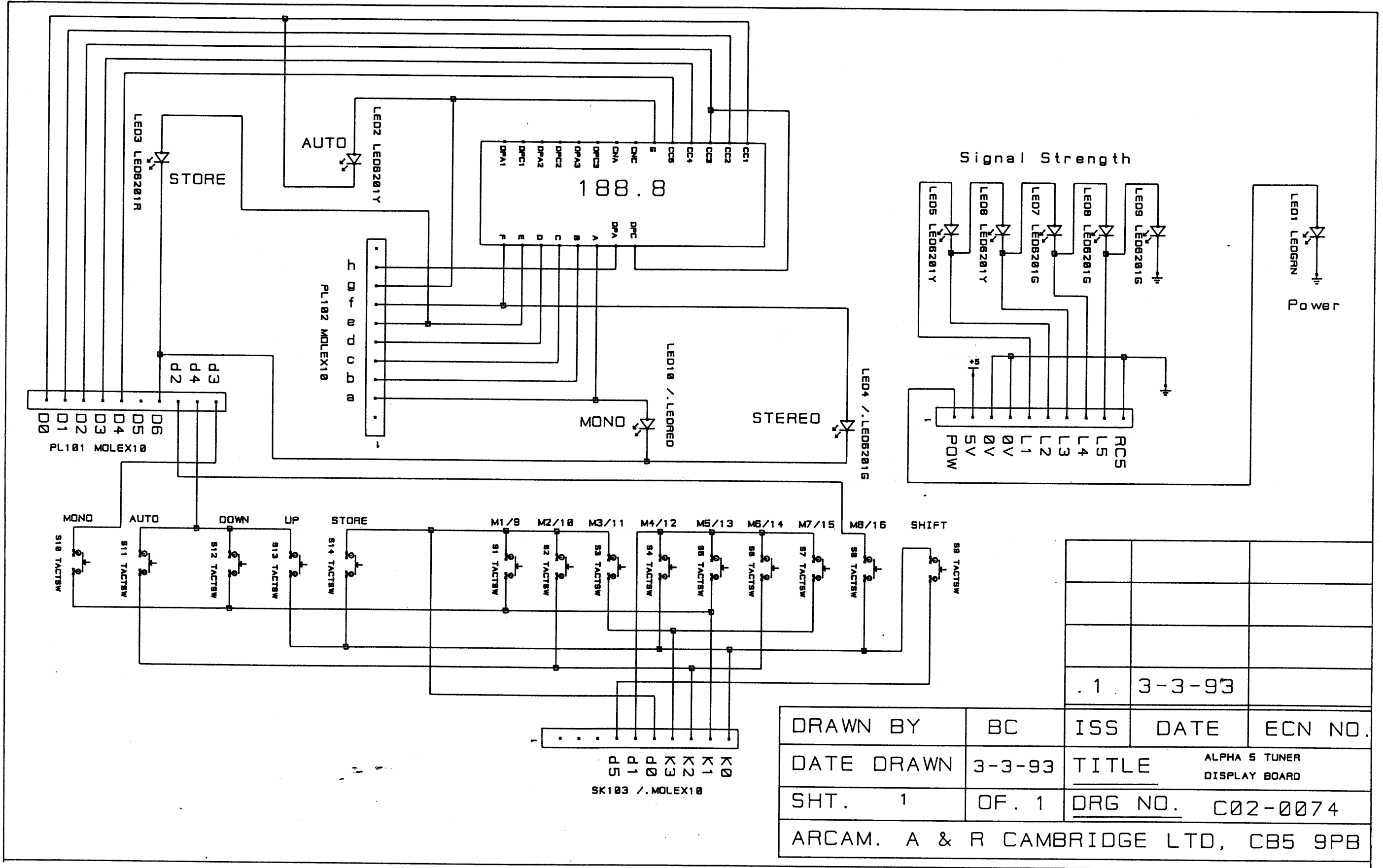
Note:  
 Parts 8xxx used on Alpha 3 tuner only  
 Parts 8xxx used on Delta 280 tuner only

1	3-3-93	
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DRAWN BY	Andy Hows	ISS	DATE	ECN NO
DATE DRAWN	8-7-92	TITLE	Alpha 5 / Delta 280 tuners Main PCB Microcontroller circuit	
SHT.	5	OF.	5	DRG NO. C02-073E
SERVICE MANUAL DRW. NO. H04/		SHEET OF		
ARCAM. A & R CAMBRIDGE LTD, CB5 9PB				



DRAWN BY	CAH	ISS	DATE	ECN NO.
DATE DRAWN	4-11-92	TITLE	DELTA 2180 TUNER DISPLAY BOARD	
SHT. 1	OF. 1	DRG NO.	C02-0032	
ARCAM. A & R CAMBRIDGE LTD, CB5 9PB				



. 1	3-3-93		

DRAWN BY	BC	ISS	DATE	ECN NO.
DATE DRAWN	3-3-93	TITLE	ALPHA 5 TUNER DISPLAY BOARD	
SHT. 1	OF. 1	DRG NO.	C02-0074	
ARCAM. A & R CAMBRIDGE LTD, CB5 9PB				