

Service log R-1490/URR , Serial number: 266

Date: 26-Aug-2003 , Service period May-Aug-2003, By: Virgil Cheng,vr2xgm

Symptoms:

- No reception on all modes, independent of receiving frequencies.
- Very low audio noise from speaker.
- Power consumption when powered by 115V AC measured 150 W which is three times higher than specification.
- Burning smell from inside of unit. The unit was inspected after power down.
- Voltage measurement from test terminals at the back of power supply modules:
24V-measured 18 Volts.
18V-measured 15 Volts.
5V-measured 4.1 Volts.
125V-measured 112 Volts.

Failure analysis/replacement :

Short circuited power rail capacitors causing overheating of series inductors.

Rear deck supply decoupling board A1A3A3

- L3, inductor 1mH, moulded, burnt, sign of overheating. Replaced with new wound part. 12mm Amorphous core, permeability 60, AWG29,110T
- C2,C3, Cap, Elec., 150uF, 30V, axial, electrolyte leaked. C2,3,4,5 Replaced with 220uF35V 105C axial.

Detector /AF Amplifier A1A2A7

- C27,C17,cap,elec,22uF30V,axial, electrolyte leaked. Replaced with 22uF35V Tantalum
- C23, Cap, Elec., 150uF, 30V, axial, electrolyte leaked. Replaced with 220uF 35V Axial.

Front end A1A2A2

- L3, inductor, 2.2uH, axial, burnt open circuited. Replaced
- L1, inductor, 2.2uH, axial, (larger size than L3),sign of overheating. Replaced
- C10, cap. wet Tantalum 22uF,30V, bursted open. Replaced with 22uF 35V Tantalum.
- C18,330pF NPO, replaced
- C20,1000p,X7R,replaced

Power Supply A1A3PS1

- C8,9,15,16,3,6, Cap, Elec., 150uF, 30V, axial, electrolyte leaked .Replaced with 220uF 35V 105C axial.

MHz tuning dial assembly

- Toothed belt disintegrated, plastic aging.
- Encoder S1,rotary switch S9 ,misaligned, toothed drive wheel incorrectly fastened.

Input filter A1A2A1

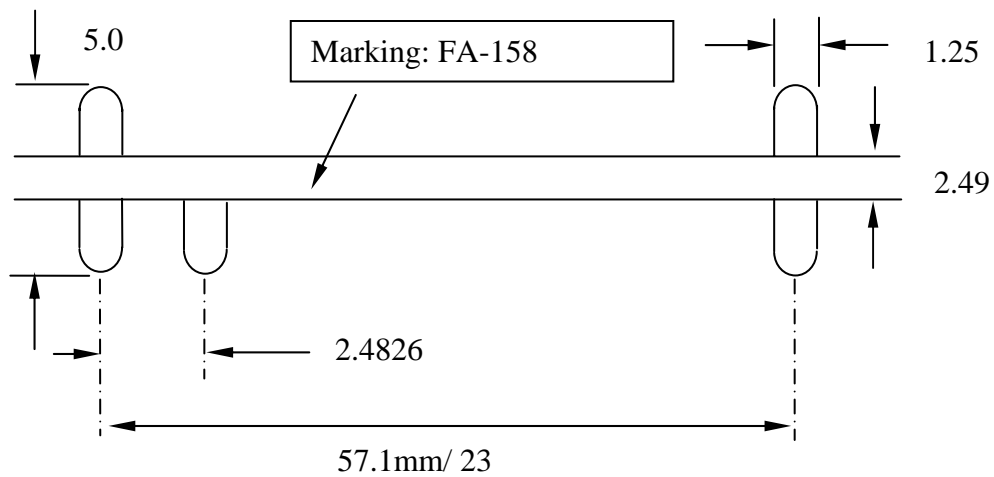
- S1 misaligned, toothed drive wheel incorrectly fastened.

Front panel

- Antenna connector centre pin broken.
- C2, capacitor,ceramic,10nF, 200 V, across RTTY output terminals on front panel rear, one lead broken. Replaced with Polyester part.

Appendix, Regenerated component specifications:

R-1490/URR MHz Tuning mechanism toothed belt,12-Jun-2003



Note: dimensions in mm

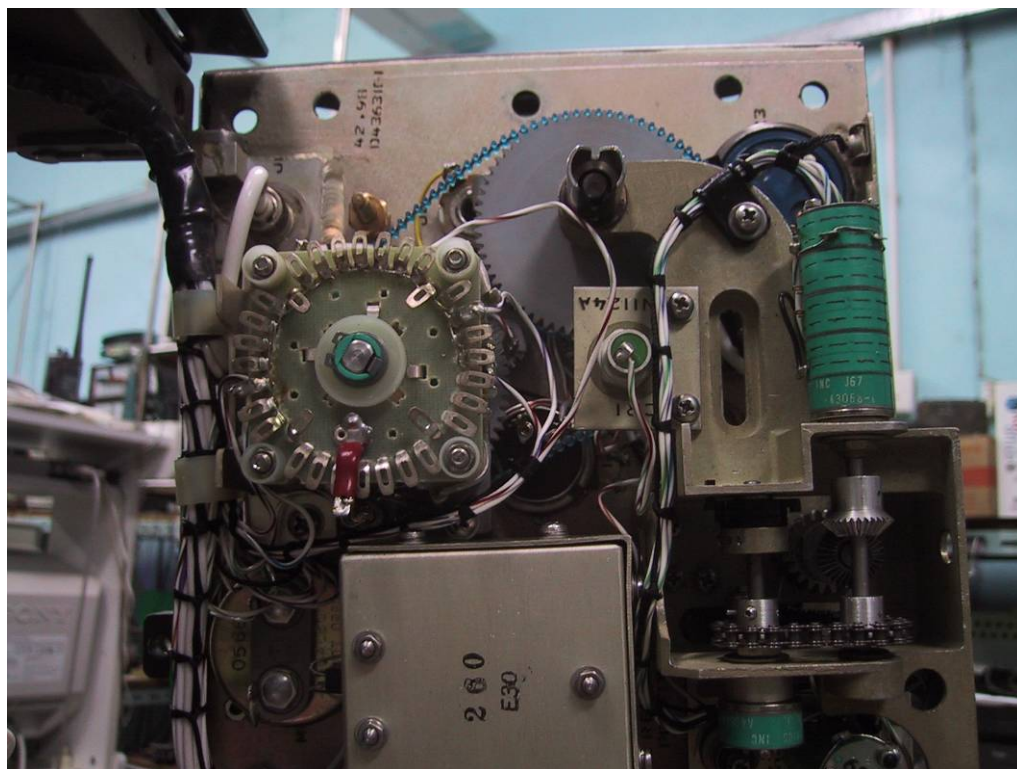
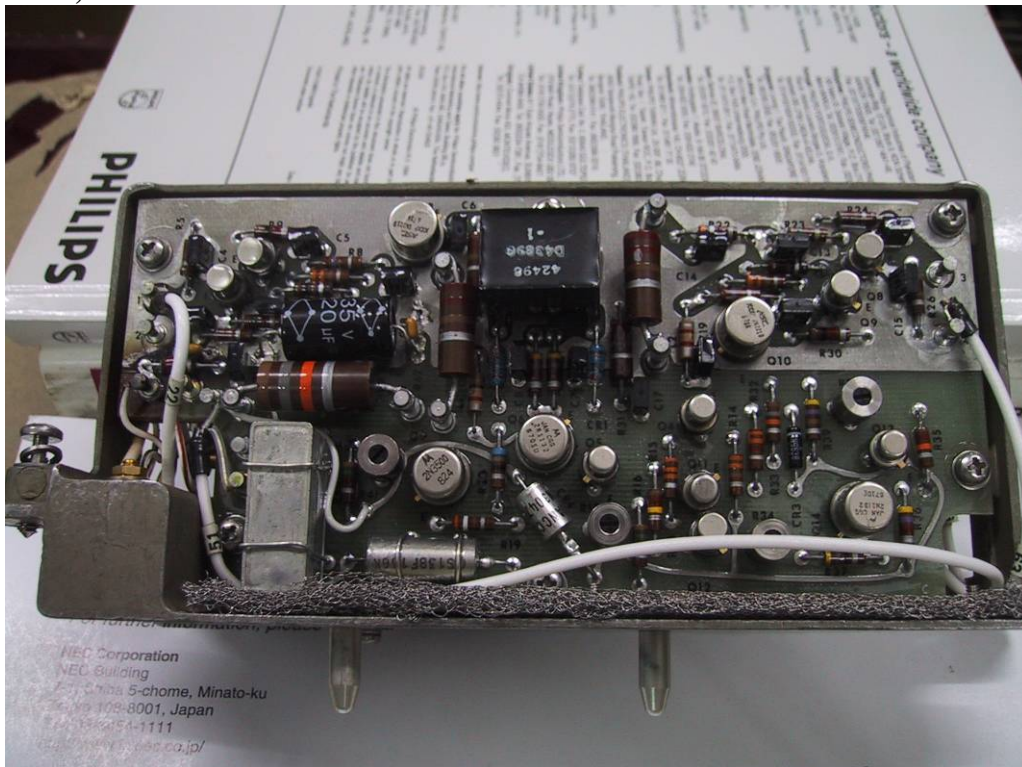
Measured total length: 394mm

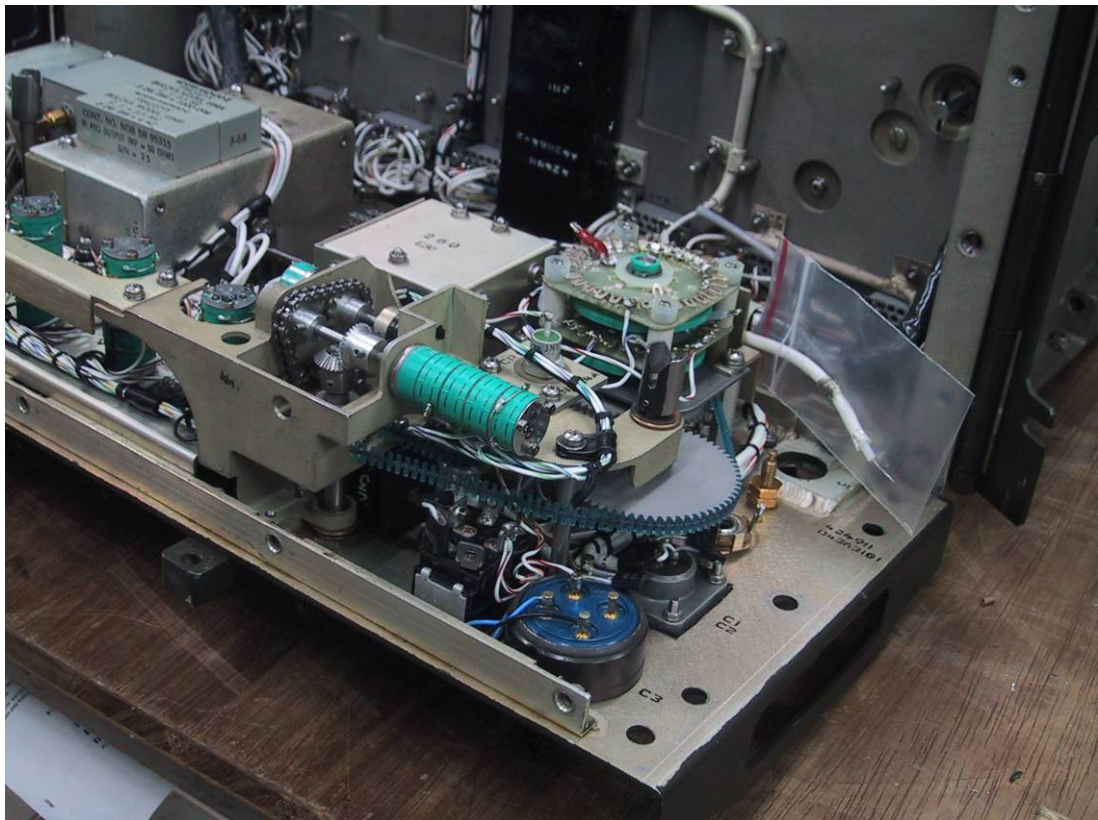
Calculated #teeth: 158.7, this matches marking "FA-158", select parts with 158 teeth.

Applicable Replacements:

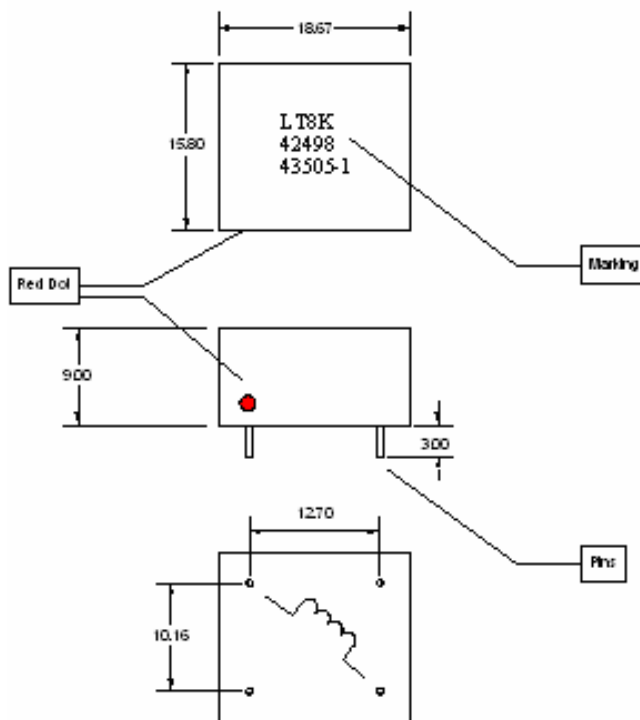
Supplier/Tradename	P/N	Pitch	Pitches	Length	Remark
Berg Manufacturing/ Flex-E-Belt	32GBF-158-E	2.494	158	394,1	Standard
Berg Manufacturing/ Flex-E-Belt	33GBF-158-E	2.494	158	394,1	Super Flexible - Light Load

Photo record, service work





Inductor, moulded, PCB mount, located on Rear deck supply decoupling board A1A3A3



Parameters and Internal Construction details

Core: Toroid
OD 11.3
ID 6.25
HT 4.24
Material: Unknown
Estimated MPP or amorphous
Winding: Dia 0.28 (AWG30), 105T
Wire length 1530mm
AL value: 90nH/Turn Sq

Inductance: 1mH
DC Current @80% inductance: 0.34A

DC Resistance: 0.65 Ohm

Unloaded Parallel resonance Frequency: 1.5MHz

Construction:
Wound toroid 90 deg cross-wrapped in two layers of fibre glass tape
Whole assembly was encapsulated with soft Epoxy inside a thin-walled package frame.



Original Part Exposed view

Service log R-1490/URR , Serial number: 466
Service period : Dec-2003 to Feb-2004, By: Virgil Cheng, vr2xgm

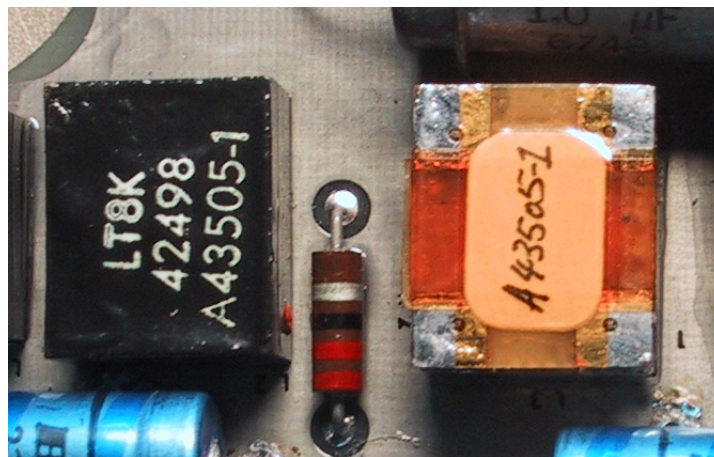
Unit originally operational , AC hum from speaker, periodic inspection found :

Severe E-cap deterioration in assemblies :
Assembly Detector /AF Amplifier A1A2A7,
Rear deck supply decoupling board A1A3A3,
Power Supply A1A3PS1

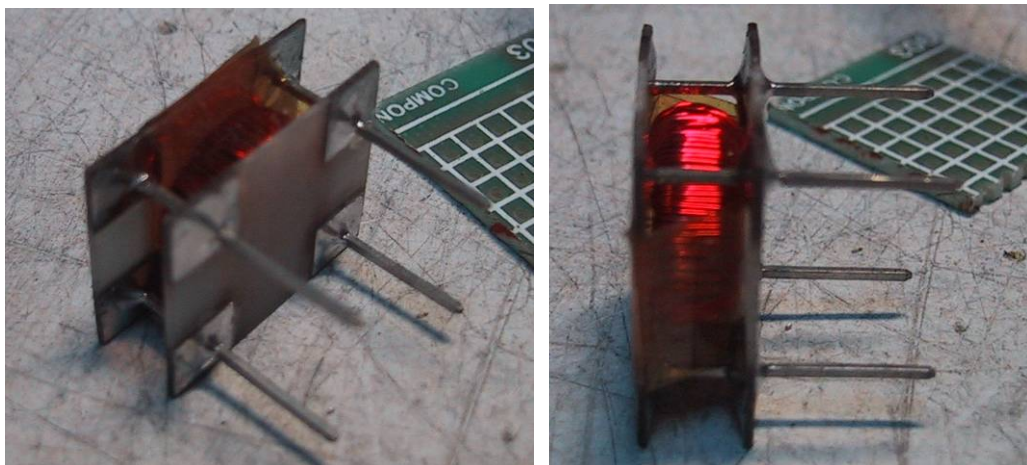
Improper servicing done on:
Front Deck Power supply decoupling board

Replace all bad E-cap and suspicious item with 125degC rated long life parts.

Inductor Replacement, Unit S/N:466

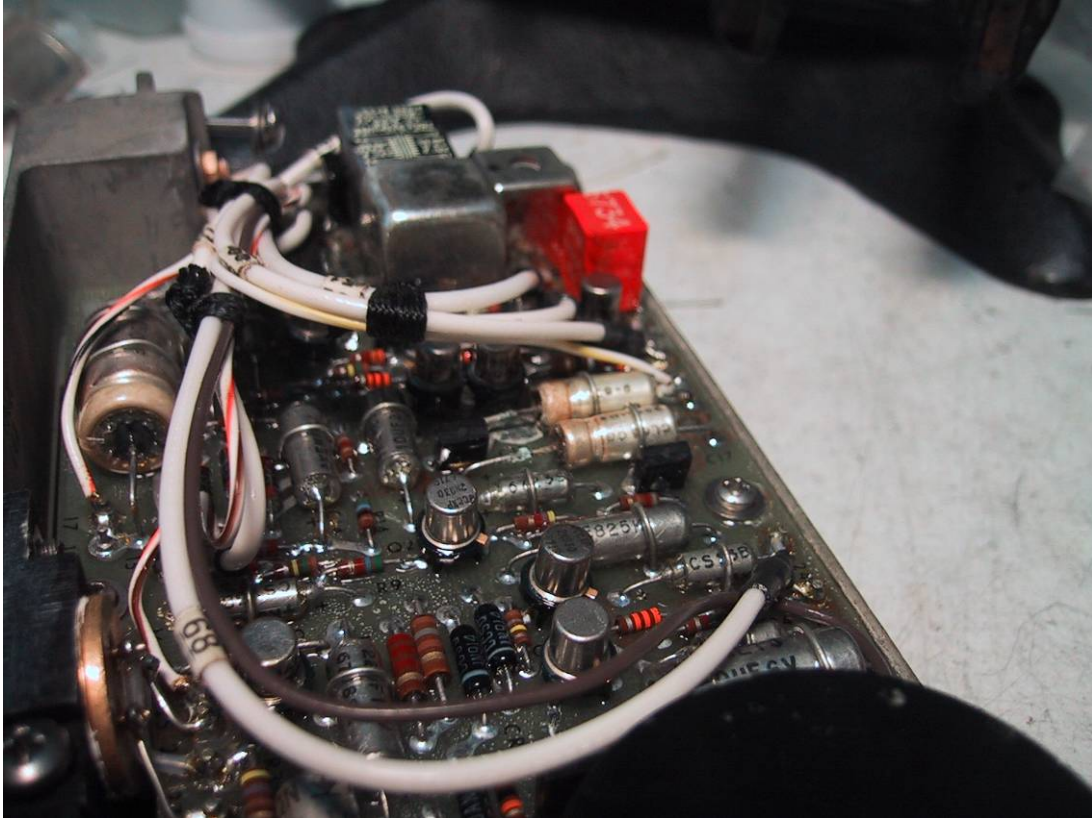


Original Part on Rear deck supply decoupling board A1A3A3 Together with Re-constructed part at location L3 on unit SN:466

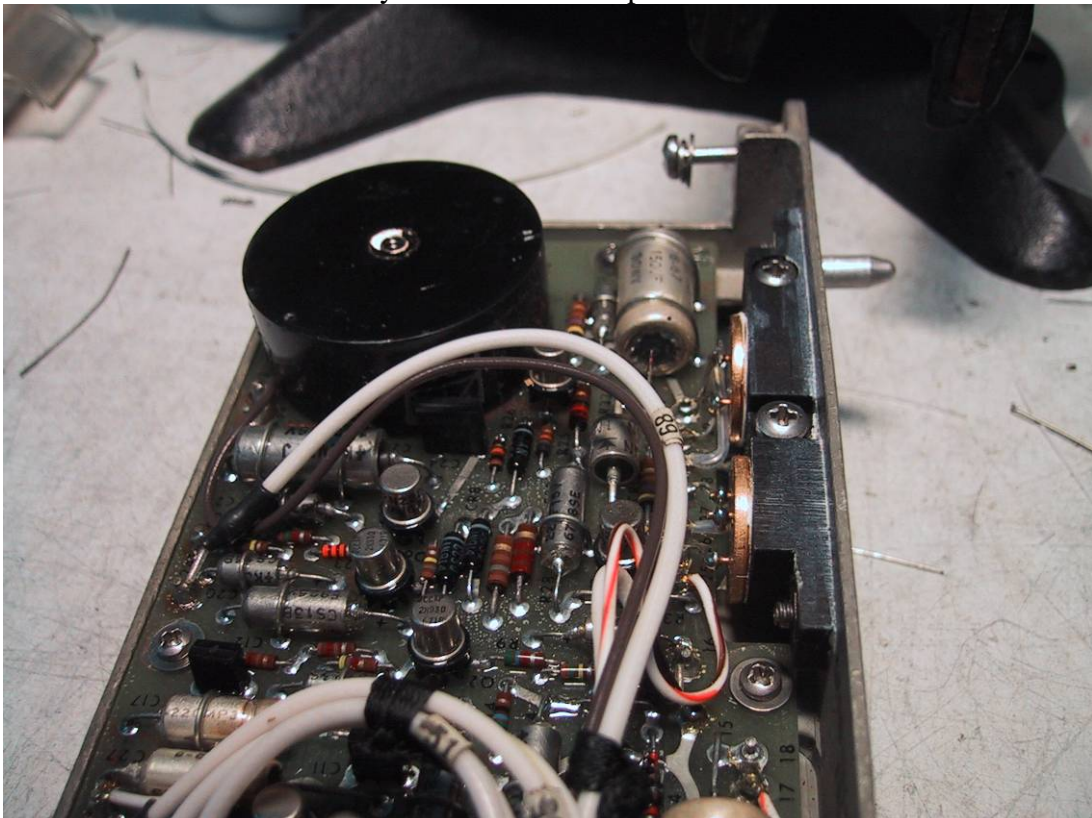


Rewound part and Re-constructed to fit existing footprint. Used on unit S/N:466

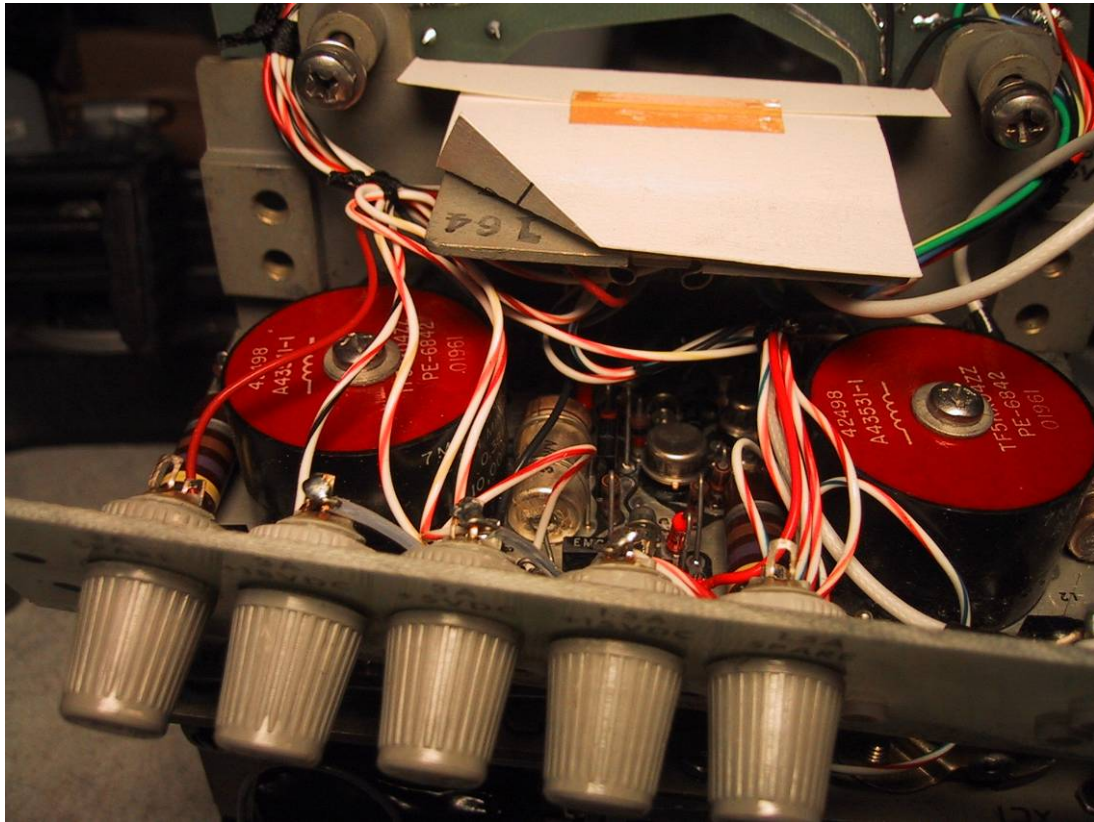
Photo record, service work



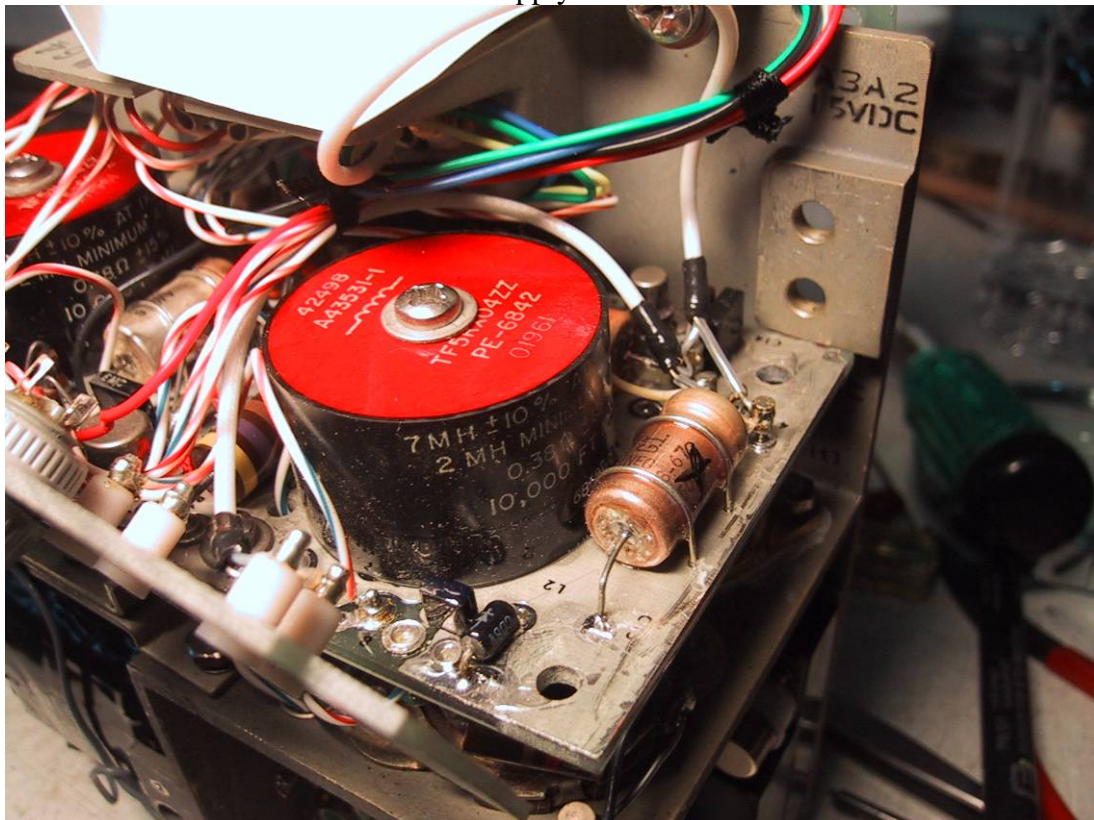
Assembly Detector /AF Amplifier A1A2A7



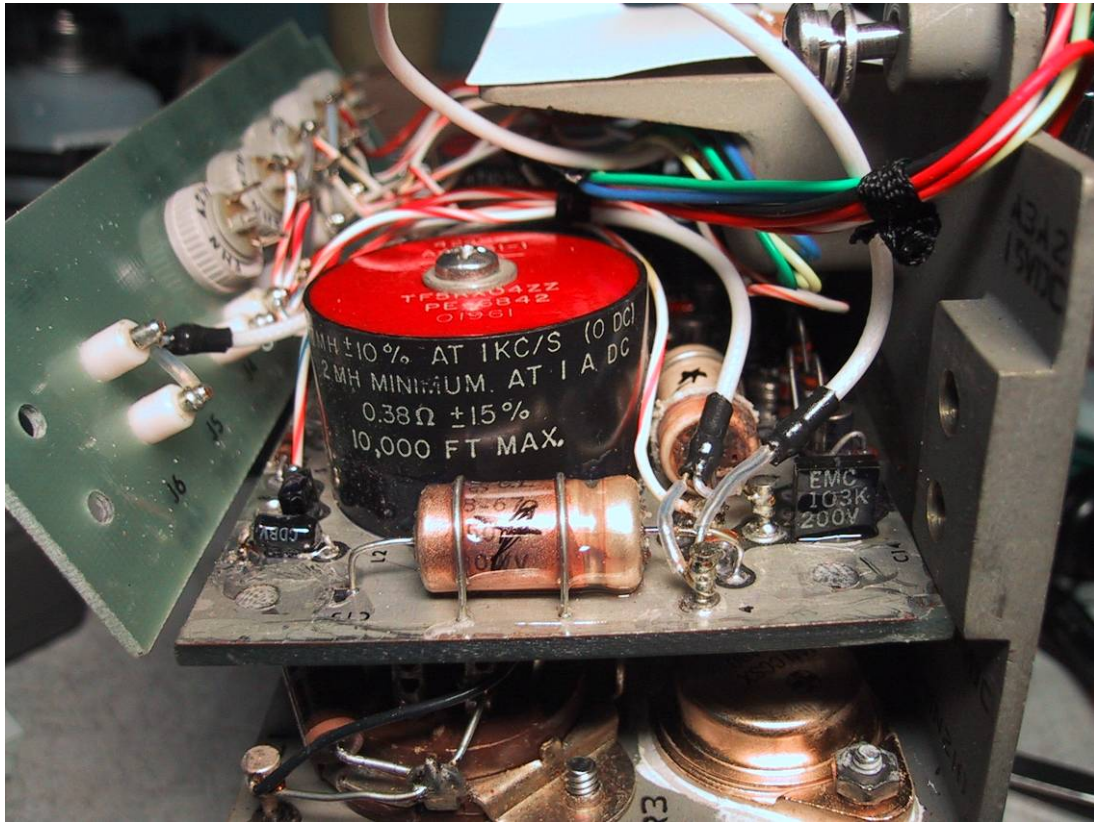
Assembly Detector /AF Amplifier A1A2A7



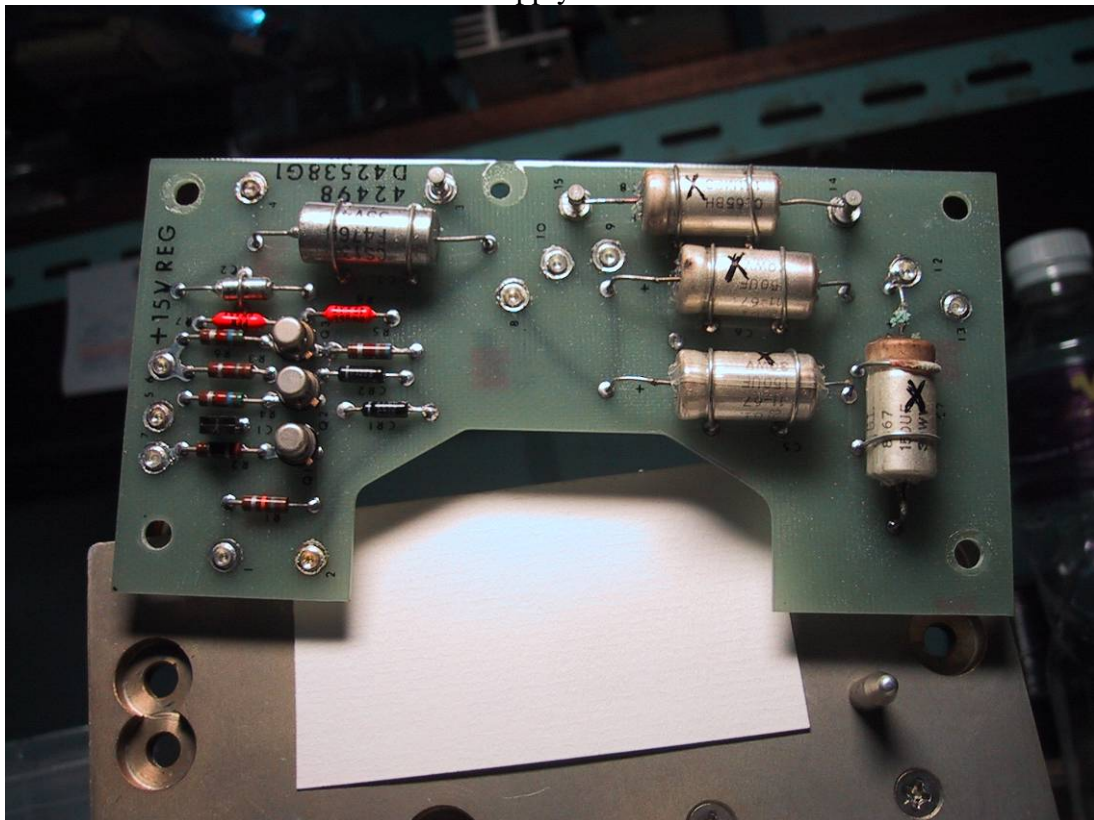
Power Supply A1A3PS1



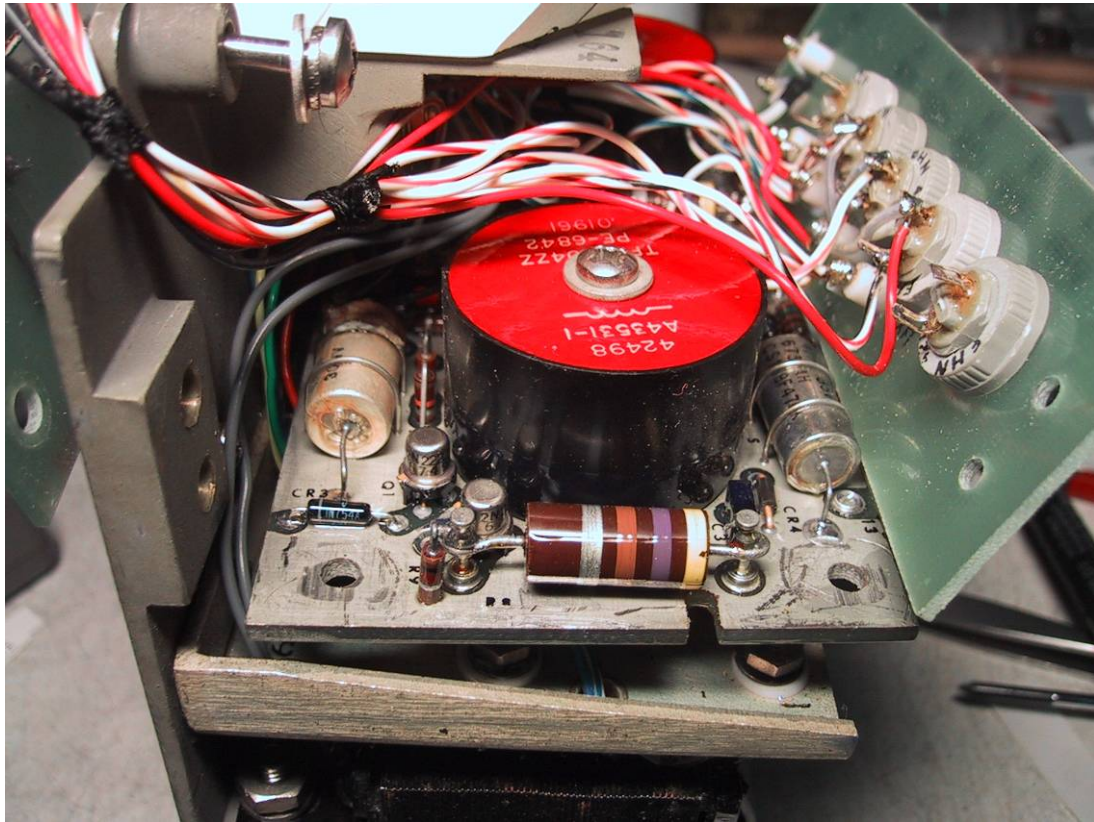
Power Supply A1A3PS1



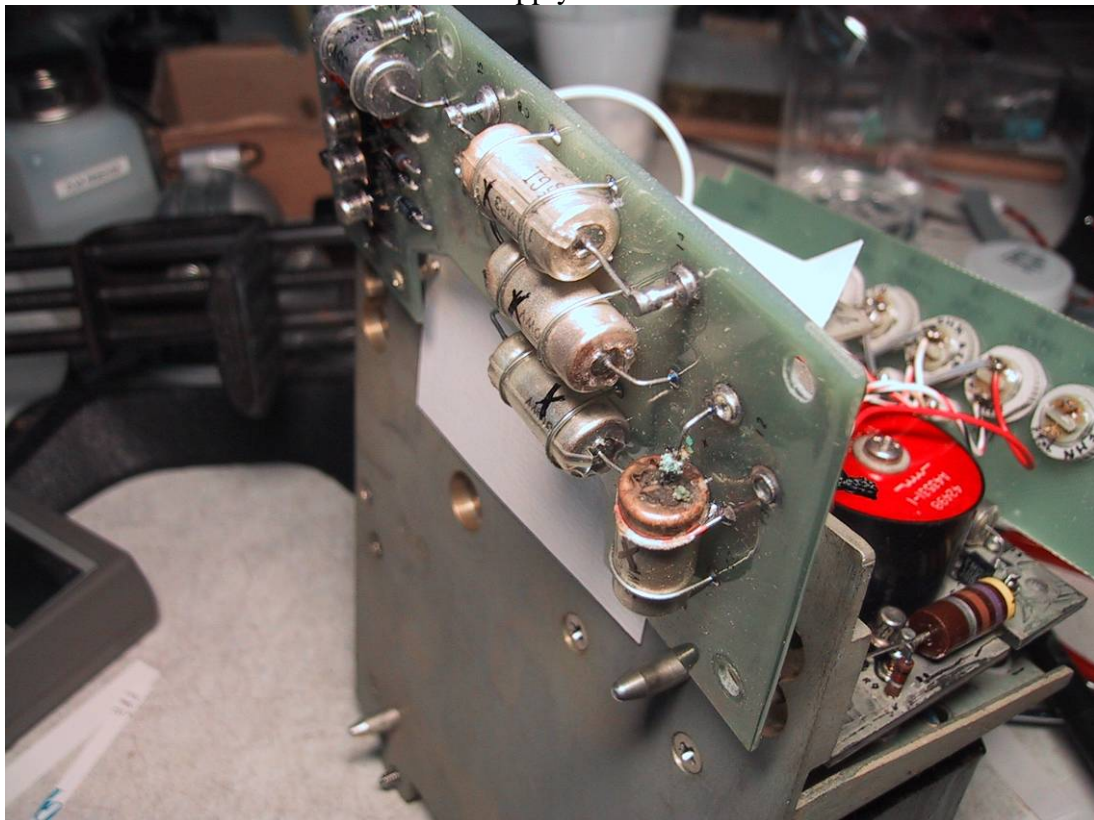
Power Supply A1A3PS1



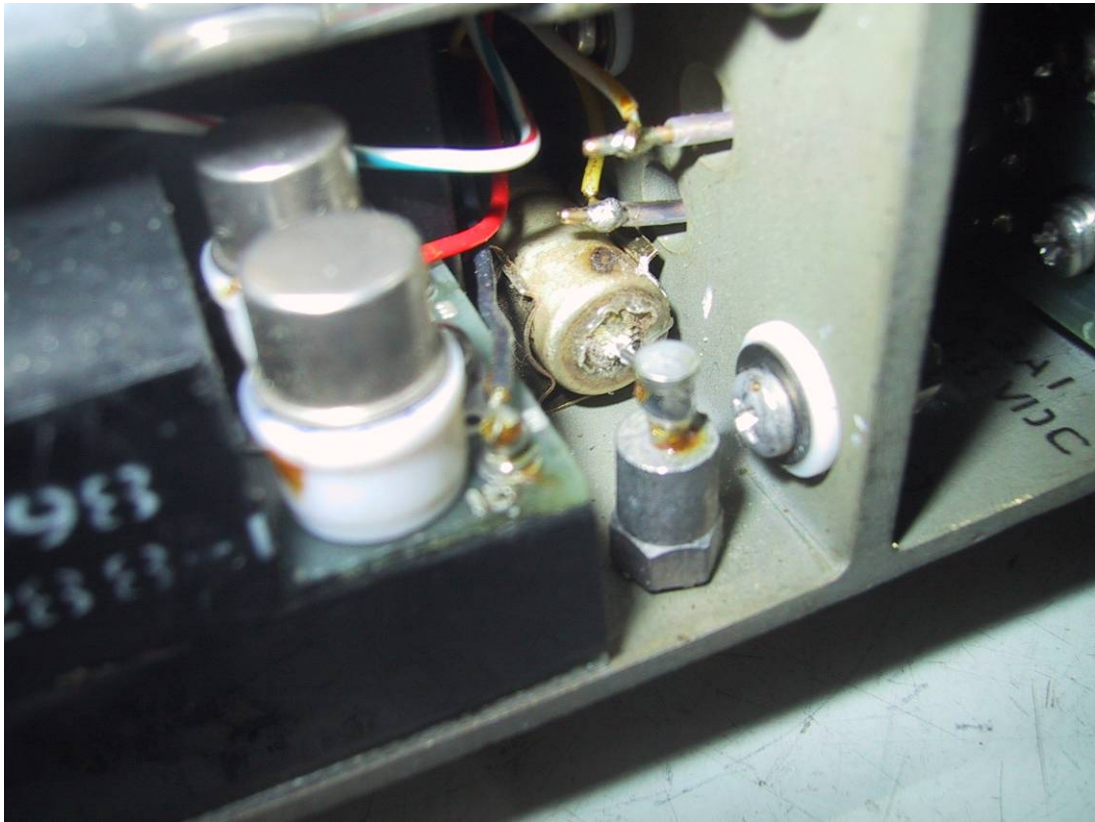
Power Supply A1A3PS1



Power Supply A1A3PS1



Power Supply A1A3PS1



Power Supply A1A3PS1

Service log R-1490/URR , Serial number: 466
Service period : 28/30-Dec-2006, By: Virgil Cheng, vr2xgm

Symptoms:

- Unit originally operational, intermittent contact problem found on 10KHz frequency selector.

Test/Inspection results:

- S3 suffers bad contact. One mounting shaft of switch S3 suffers stripped thread
- Problems with 1MHz,10MHz frequency selector knob
- Adhesive applied incorrectly on encoder S1, set screw didn't seat on flat surface of shaft.
- S1 Bevel gears fastened incorrectly
- S1 stop unable to replace, broken.
- Toothed belt partly disintegrated
- S9 spindle toothed wheel mounted incorrectly, set screw didn't seat on flat surface of shaft.
- Drive wheel for A1A2A1 S1 mounted incorrectly, set screw didn't seat on flat surface of shaft.
- 115V AC input Y-capacitor, C2 burnt open, disintegrated. Check manual page 5-93,5-94.

- Frequency Selector Check

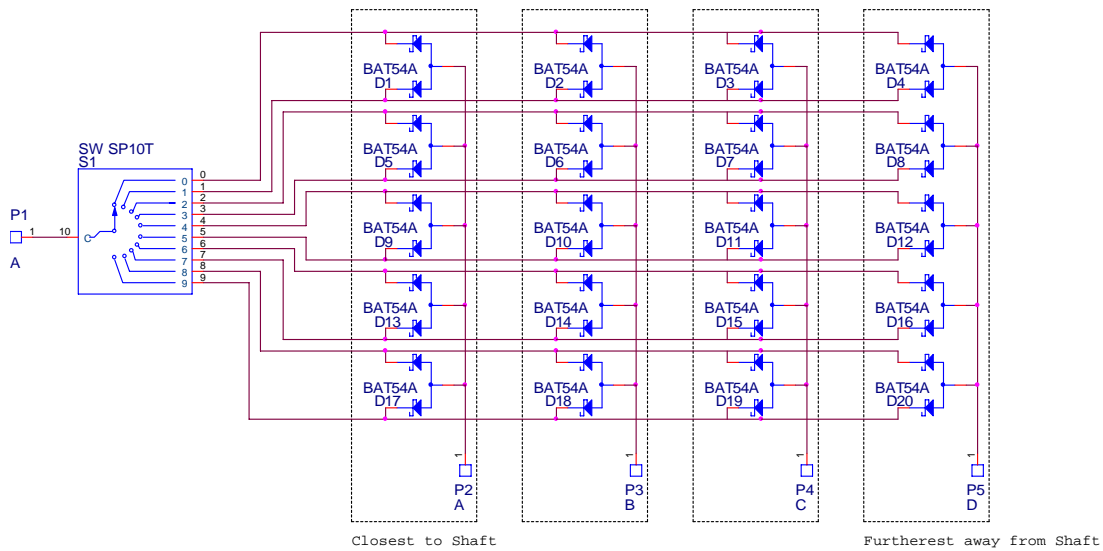
Switch 100Hz		Logic Level, 0 switch closed			
Freq Pos	Pos Marking	Rear side		Shaft side	
		D	C	B	A
0	1	0	0	0	1
1	2	1	0	0	1
2	3	0	0	1	1
3	4	1	0	1	1
4	5	0	1	1	0
5	6	1	1	1	0
6	7	0	1	0	0
7	8	1	1	0	0
8	9	0	0	0	0
9	0	1	0	0	0

Switch 1KHz		Logic Level, 0 switch closed			
Freq Pos	Pos Marking	Rear side		Shaft side	
		D	C	B	A
0	1	1	0	0	1
1	2	0	0	0	1
2	3	1	0	1	1
3	4	0	0	1	1
4	5	1	1	1	0
5	6	0	1	1	0
6	7	1	1	0	0
7	8	0	1	0	0
8	9	1	0	0	0
9	0	0	0	0	0

Switch 10KHz		Logic Level, 0 switch closed			
Freq Pos	Pos Marking	Rear side		Shaft side	
		D	C	B	A
0	1	0	0	1	1
1	2	1	1	0	1
2	3	0	1	0	1
3	4	1	0	0	1
4	5	0	0	0	1
5	6	1	1	1	0
6	7	0	1	1	1
7	8	1	0	1	1
8	9	0	0	1	1
9	0	1	1	1	0

Switch 100KHz		Logic Level, 0 switch closed			
Freq Pos	Pos Marking	Rear side		Shaft side	
		D	C	B	A
0	1	0	0	0	1
1	2	1	0	0	1
2	3	0	0	1	1
3	4	1	0	1	1
4	5	0	1	1	0
5	6	1	1	1	0
6	7	0	1	0	0
7	8	1	1	0	0
8	9	0	0	0	0
9	0	1	0	0	0

The 4 pole 10 throw switch used on the R1490 cannot be easily found from retail sources. An alternative is to use a single pole 10 throw switch combined with a diode matrix to generate the same binary code.



Remark:

5 pcs of Schottky diodes are required for each assembly of A,B,C and D.

A logic level of “0” requires population of one diode at corresponding position (manual page 4-79).

Close substitutes are:

<u>Grayhill P/N</u>	<u>NewarkInone P/N</u>	<u>Farnell P/N</u>	<u>Remark</u>
71AD36-01-1-AJN	14M6832	414-4715	1 deck
71AD36-02-1-AJN	14M6834		2 decks

Summary:

¼" mounting hole, 1/8" shaft diameter, ½" shaft length. 10 positions



The major difference is shaft length, this causes significant difficulty on adapting the switch to the existing R-1490 mechanical design.

A shaft adaptor was made from commercially available Brass test fixture pins, one end having 2.8mm diameter which serves as mounting shaft of the original control knob. The other end is a hexagonal standoff with a 3mm internal thread. The threads were carefully removed with a 1/8" HSS drill bit, making a smooth bore to fit the stainless steel shaft of the 71A36 switch. The result is a precise tight fit that allow extension of the shaft (see photos) without adhesive application.

- Adhesive on S1 was removed.

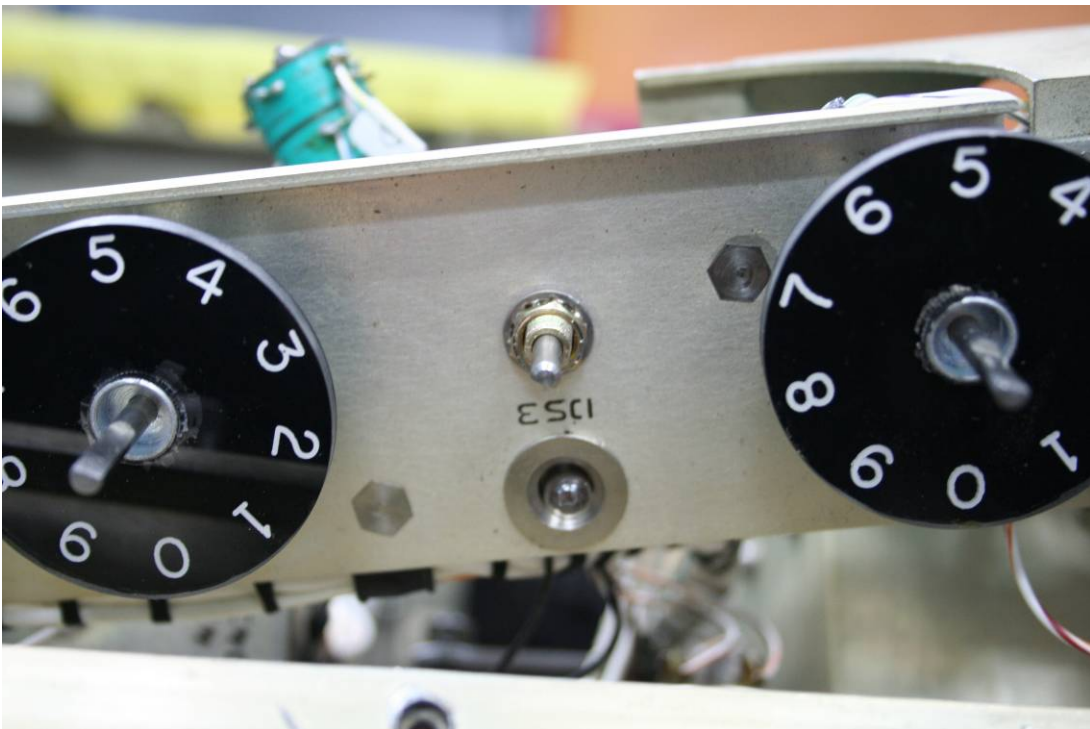
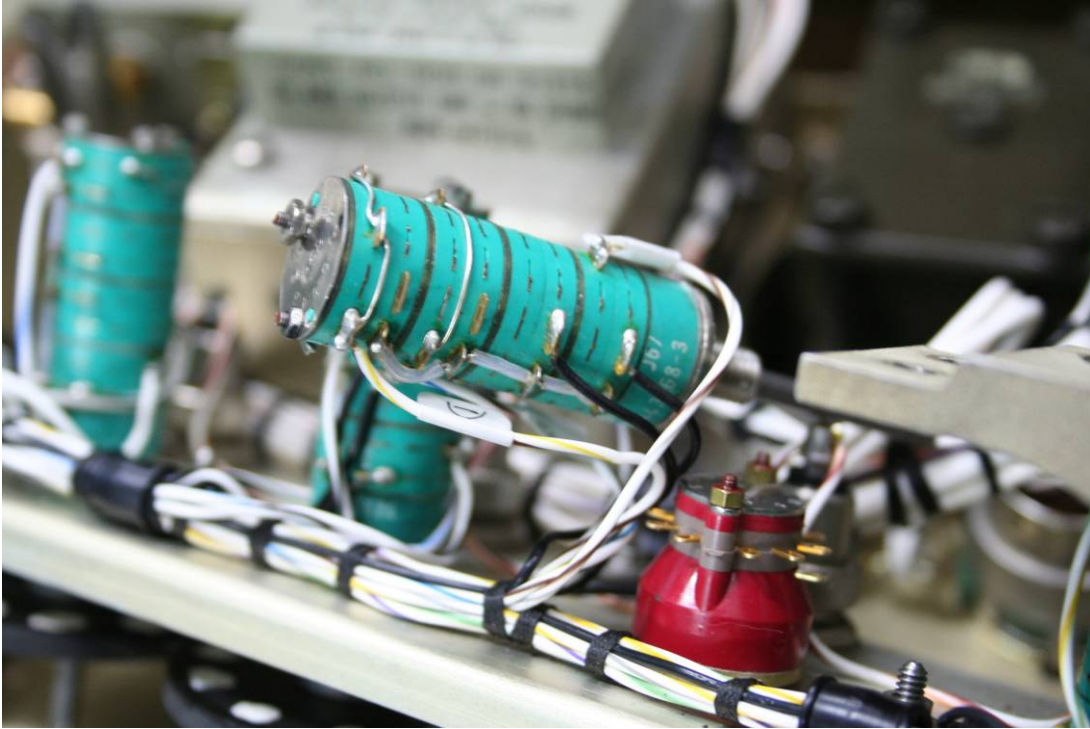
- Tooth belt removal

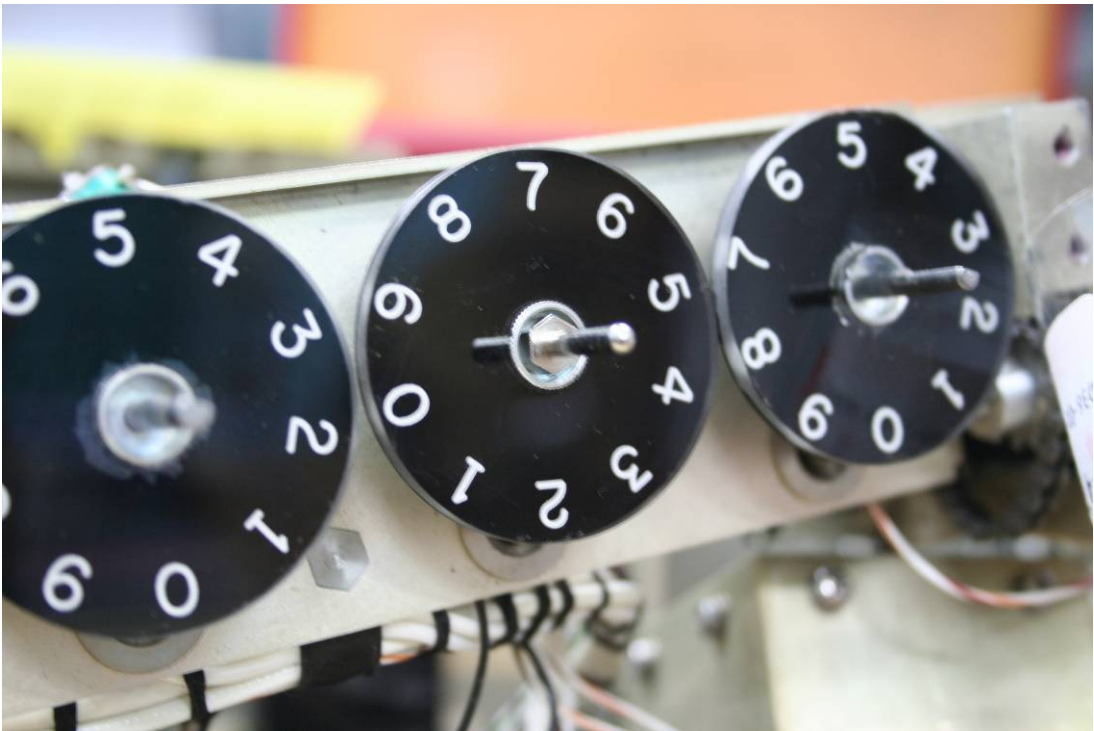
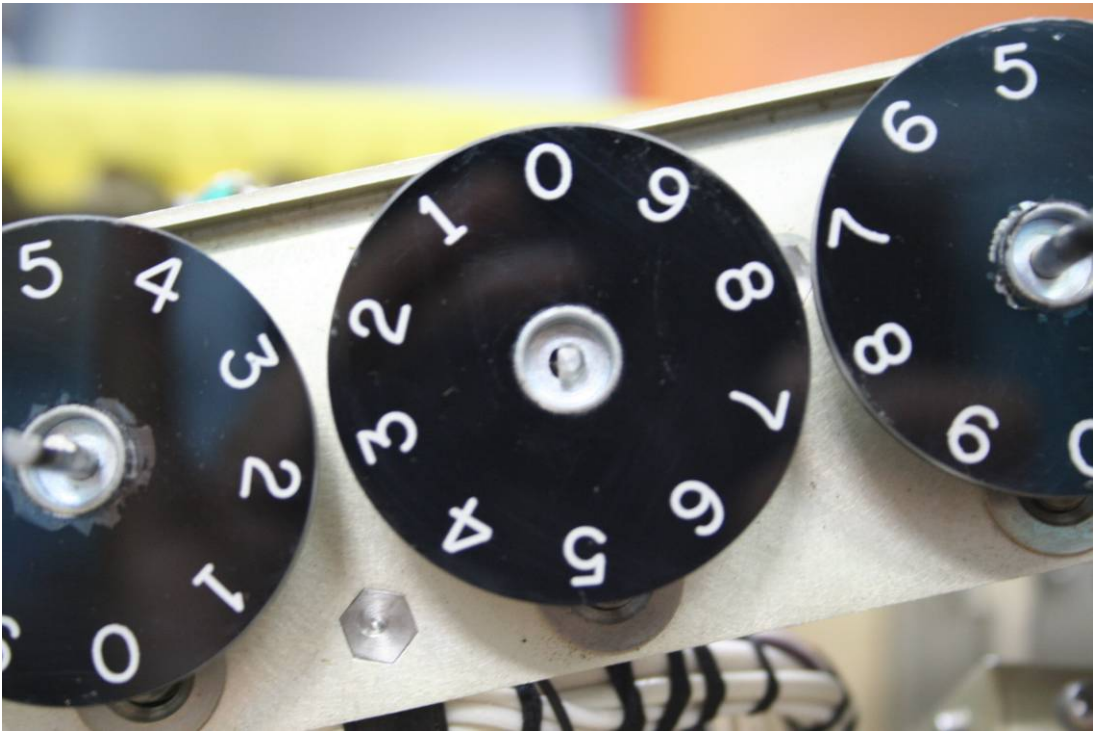
1. Loosen bevel gear on 1MHz/10MHz control knob shaft.
2. Loosen S1
3. Move the bevel gear on shaft towards panel side and Shift S1 to allow more clearance for toothed belt to pass through.
4. Loosen and remove all knobs from front panel.
5. Loosen all switch deck assembly mounting screws from front panel. One screw need to be removed from standoff near A1A2A1 driving wheel.
6. Loose toothed belt tensioner and release toothed belt from 1MHz/10MHz drive shaft and A1A2A1 driving wheel.
7. Release 3 mounting screws for S9.
8. Release toothed belt from S9

- Replacement switch S3 installation

1. De-solder and mark lead wires for S3 properly.
2. Remove digit dial from shaft
3. Remove S1 from switch assembly bracket.
4. Install digit dial such that position "0" appear on window align with position "10" on switch. Doing this display digit "1" will align with position "1" on switch.
5. Rotate shaft such that "0" align with window.
6. Tighten S3 mounting screw, inspect position of digit on window. Re-adjust mounting screw if needed.
7. Insert adaptor shaft.
8. Adaptor shaft is slightly smaller than original part, insert a 2.5mm shrinkable tube onto shaft to improve knob fitting.

9. Install switch assembly to front panel, proceed to toothed belt installation and alignment.

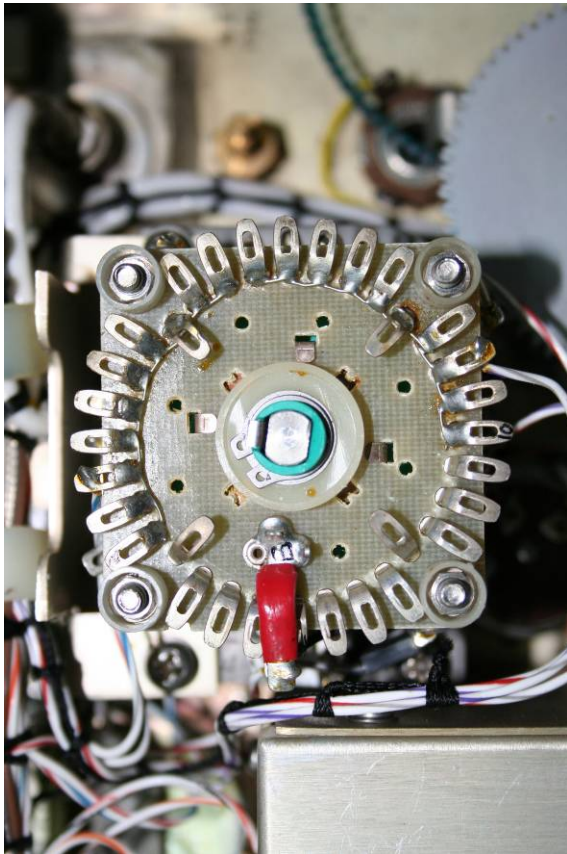






- Toothed belt installation and alignment of drive gears.

1. Loosen and release steel driving chain from 1MHz/10MHz encoder S1
2. Flip S1 to reflect logic state of 02MHz, S1D,C,B,A of 1,0,0,0 (1 means open).
3. Flip detent gear to minimum stop of 02MHz.
3. Carefully shift drive chain, without disturbing detent gear and encoder gear, such that 1MHz/10MHz counter display "02"
4. Replace steel drive chain on drive gears.
5. Shift steel chain tensioner , tighten steel chain, inspect display number and check S1 encoder logic state, re-adjust if needed.
6. Insert replacement tooth belt, Berg Manufacturing / Product: Flex-E-Belt , P/N 32GBF-158-E or 33GBF-158-E. Insert belt from bevel gear side.
7. Align S9 to position "2", check manual page 5-93,5-94
8. Roughly align A1A2A1 drive wheel to "02MHz" position which corresponds to the shaft rotation position of A1A2A1 with the thin guide pin pointing towards the side with two mounting screws and vertical.
9. Pass the belt around A1A2A1 drive wheel and S9 drive wheel
10. Do not turn 1MHz/10MHz knob before all obstacles are cleared, make sure belt does not interfere with brackets, standoffs, wires and solder joints.
11. Tighten tensioner and recheck position of S9 and A1A2A1 drive wheel.



- Engagement of 1MHz/10MHz tuning knob with mechanical counter

1. Position bevel gear on 1MHz/10MHz tuning knob shaft such that both setscrews are pointing towards the flat surfaces machined on the shaft.
2. Rotate both setscrews inward gently, let them just touch the shaft surface but allow the bevel gear to slide vertically.
3. With mechanical counter at "02", S1 at position "2" and A1A2A1 drive shaft at vertical correct orientation as described in step "8" in the previous procedure. Slide bevel gear towards S1 encoder shaft and engage both gears.
4. Manually maintain proper engagement using a proper tool (such as tweezers or screw driver) and rotate 1MHz/10MHz clockwise to position "05". This is a position that allows both screws to be tightened from above.
5. Tighten both setscrews on bevel gear, return to tuning position to "02", recheck all switch position and encoder code.
6. Check encoder S1 coding from position to "02" to "11".
7. Check S1 contact positions electrically for position "02" to "29". Correct if discrepancies found.

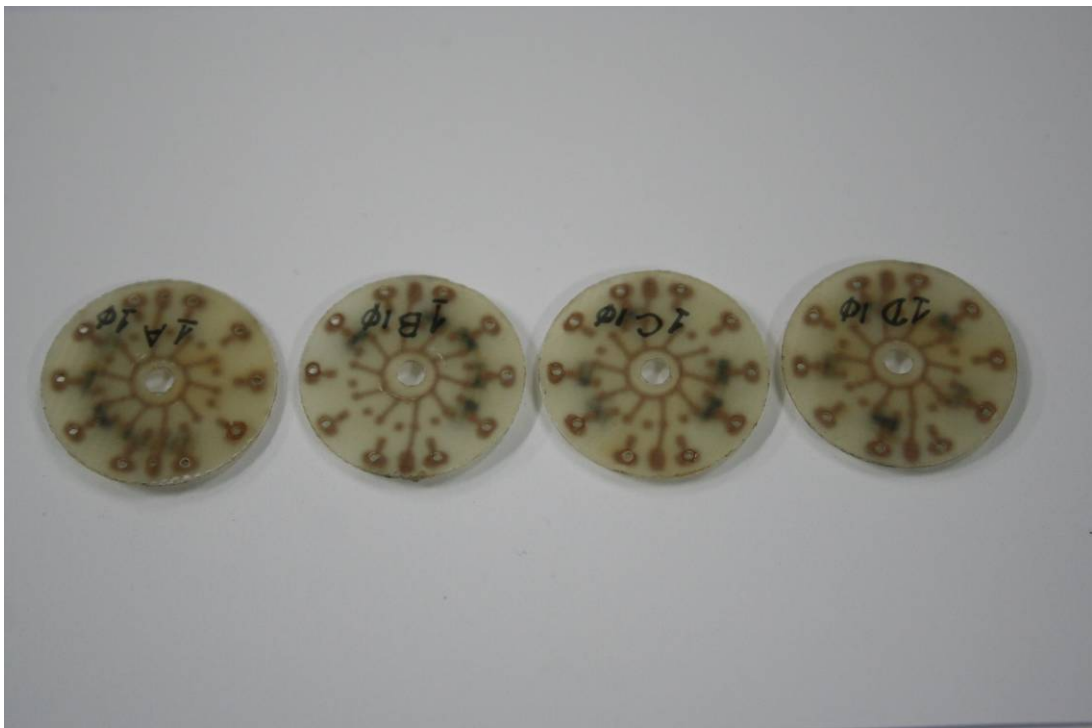
- Set screws for gears were seated properly after repair.

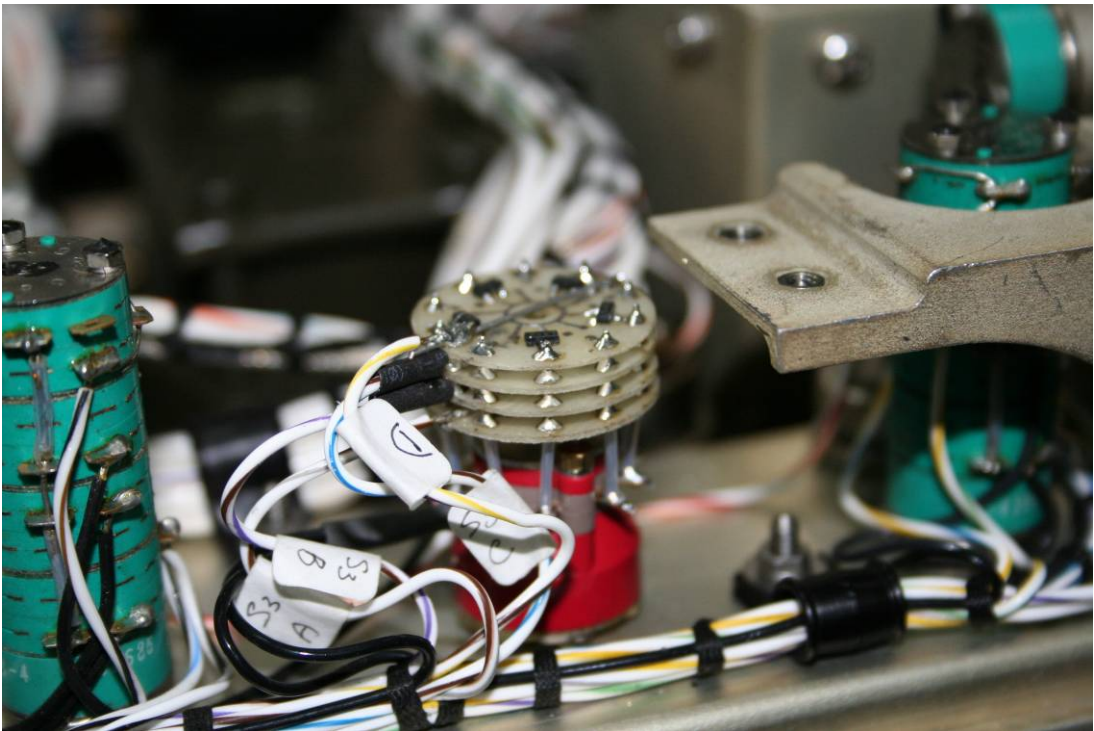
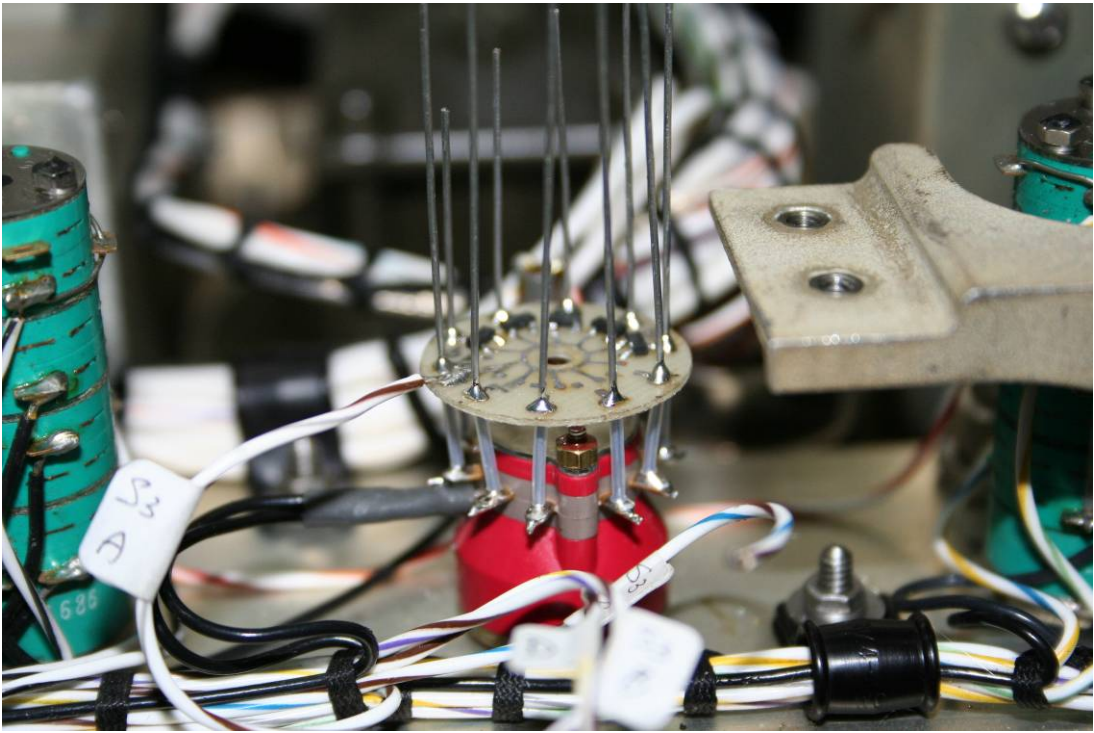
- Installation of encoding diode matrix on S3 replacement.

1. Prepare 4 diode matrix PCB assemblies, A,B,C and D. Each assembly requires unique population of diode corresponding to its logic pattern (manual page 4-79)
2. Solder common point (black wires) to pole position of S3.
3. Solder 10 pcs of 0.6mm diameter solid wire to throw positions. Adjust them to point vertically upward.
4. Insert 10pcs of 8mm insulation tube to the wires. They serve as spacers for diode matrix PCBs and prevent wires from shorting the S3 metal parts.
5. Inert diode matrix PCB for bit A. Solder all connection points to switch and S3A wire.

6. Check logic level for bit A against switch positions.
7. Repeat for bit B,C and D. Recheck logic levels.

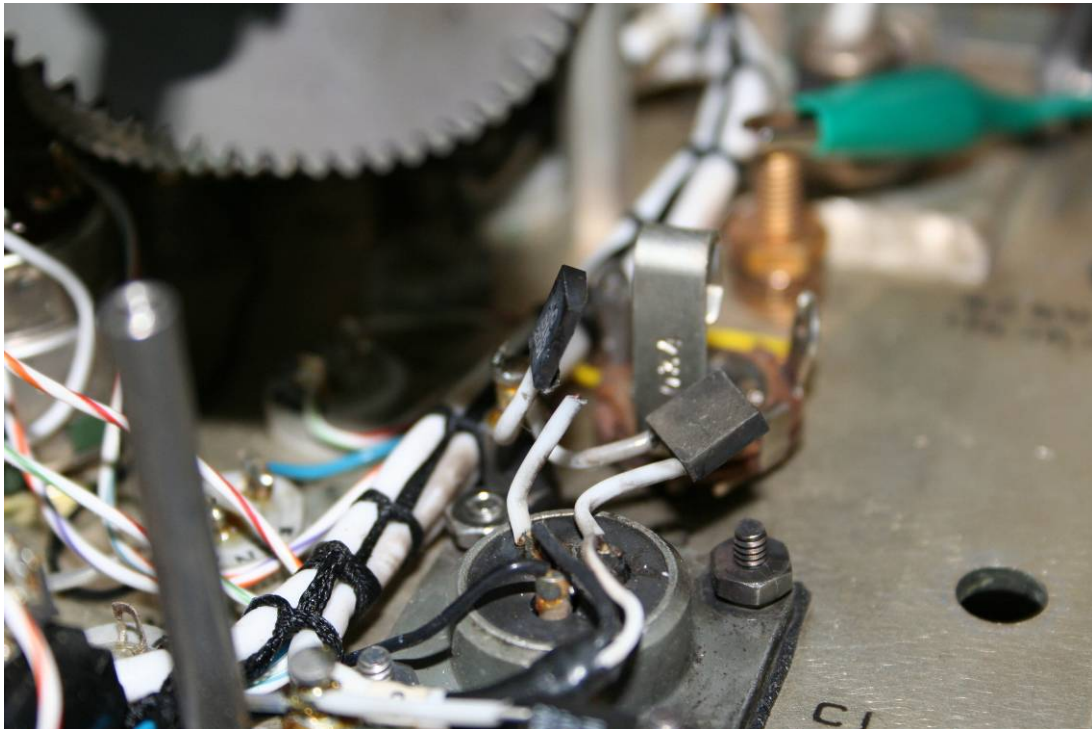
- Removed S3 to be check for possibility of restoration.





- 115V AC input Y-capacitors. manual page 5-93,5-94

200V ceramic capacitors were used, which is unsuitable for Line-Earth application by today's standard. 10n Y capacitors was not available at time of repair, 10n X2 capacitor was used instead. Both C1 and C2 were replaced for reliability reason.



- Phone jack was found loose and tightened.