

# BARLOW WADLEY

## XCR 30 MARK II RECEIVER



## SERVICE MANUAL

---

**BARLOWS TELEVISION COMPANY.**  
29 SHEPSTONE ROAD — P.O. BOX 23  
NEW GERMANY — NATAL  
REPUBLIC OF SOUTH AFRICA



# BARLOW WADLEY COMMUNICATION RECEIVER

## XCR 30 Mk II

### SPECIFICATIONS

#### RF SECTION

Frequency Range                    500 KHz to 31 MHz

#### HF SECTION:

Overall Sensitivity:                Better than  $1 \mu\text{V}$  for 50 mW [− 19 dB (pW)]

Overall Selectivity:                6 KHz on AM  
3 KHz on SSB and CW

Overall Image Rejection:        50 dB on all movable images  
 $\geq 60$  dB on immovable images

IF Rejection:                      455 KHz }  
42,5 MHz } 50 dB  
45 MHz > 60 dB

IF Selectivity:                      For 42,5 MHz                    300 KHz  
For 45 MHz                      1,3 MHz } 10 dB  
For 455 KHz                      7,5 KHz

Clarify Range:                       $\pm 1,5$  KHz

#### POWER AND LF SECTION:

Max. O/P Power:                    400 mW

Speaker Impedance:                8 ohms

Frequency Response:               150 Hz to 3 KHz (3 dB points)

D.C. Power Consumption:        20 mA @ no signal  
200 mA peak

Ext. Power Supply:                6 to 12 volts D.C.; Positive Earth; Reverse Polarity Protection

#### SIGNAL SENSITIVITY – SERVICE GUIDE

Typical Input signal levels required for 50 mW Audio Output

INPUT LEVEL	FREQUENCY	TEST POINT
12,5 mV	1 KHz	Junction of R5 – R50
1,4 mV	455 KHz	TR 12 Base
130 $\mu\text{V}$	455 KHz	TR 11 Base
25 $\mu\text{V}$	455 KHz	TR 10 Base
5 $\mu\text{V}$	455 KHz	TP 3
12 $\mu\text{V}$	2,5 MHz	TP 3
2 $\mu\text{V}$	2,5 MHz	TR 8 Base
1 $\mu\text{V}$	15,5 MHz	TR 5 Collector
<1 $\mu\text{V}$	15,5 MHz	TR 5 Base

Input signal level to 42,5 MHz and 45 MHz Amplifiers with a D.C. mV meter connected to TP 2 via 4 K7 and C20 shorted out.

INPUT	LEVEL	FREQUENCY	OUTPUT
TP 1 via 1 K	3 mV	42,5 MHz	50 mV
TP 4 via 1 K	120 mV	45 MHz	25 mV

## GENERAL CIRCUIT DESCRIPTION

The R.F. signal is fed via C9 to the base of the R.F. amplifier TR5. (Either one of two micro-switches selects the required base circuit tuning coil by means of a cam on the shaft of the antenna trim control). The output from TR5 is fed via a low pass filter to the second balanced mixer (D6, D7) together with an output from the variable oscillator TR6 fed via C29. The output of the second balanced mixer, tuned to 45MHz, is fed to the 45MHz amplifier TR7.

A crystal controlled 1MHz harmonic generator feeds harmonics at 1MHz intervals to the input of the first balanced mixer (D2, D3) together with a second output tapped off TR6 via C35. The output of the first balanced mixer, tuned to 42,5MHz, is fed to the 42,5MHz amplifier chain comprising TR2, TR3 and TR4.

The 42,5MHz signal from TR4 and the 45MHz signal from TR7 are fed to the input of the third balanced mixer (D4, D5). The output of the third balanced mixer is fed to TR8 which is tunable over the frequency range 2MHz to 3MHz. TR8, TR9, TR10, TR11 and TR12 behave as a conventional superheterodyne, TR8 being the signal amplifier, TR9 the oscillator mixer and TR10, TR11 and TR12 the 455KHz I.F. amplifiers. In the collector circuits of TR10 and TR11 are two ceramic filters the bandwidths of which are widened by C63 and C64 when operating in the A.M. mode.

For S.S.B. reception the B.F.O. TR18 is switched in and its output together with the 455KHz signal fed via T3 is detected by D9 and D10. D8 is the conventional A.M. detector.

The audio input is fed via gain control R5 and C4 to the integrated circuit for A.F. amplification.

## ALIGNMENT

### Note:

1. The receiver is accurately aligned at the Factory and should not require any adjustment with normal handling. Should the receiver require alignment due to accidental damage or unauthorised attention, refer to all or part of the alignment procedures described hereafter, depending upon which section (s) of the receiver has/have been affected.
2. Test instruments required are:-
  - (a) RF signal generator terminated with 37 ohms and 10 nF capacitor.
  - (b) 0-300 mV DC Voltmeter 20 000 ohms/V.
  - (c) Accurate Crystal oscillators for 42,5 MHz and 45 MHz.
  - (d) 2 to 3 MHz Crystal controlled oscillator generating harmonics at 100 KHz intervals.
3. All measurements and applied voltages are with respect to P.C. Board common earth.
4. Refer to Circuit Diagram for all D.C. Voltage checks.  
Figures quoted are average and may vary slightly due to component tolerances.

### DISMANTLE THE SET AS FOLLOWS:

1. Pull off 4 control knobs.
2. Unscrew back-securing screws, open back 6 mm (¼") only and lift upwards to remove. Disconnect battery lead clips from battery holder.
3. Remove 9 securing screws shown in Fig. 4.
4. Remove die cast front panel. Both sides of the P.C. Board will now be fully accessible. It is not advisable and should not be necessary to remove the board from the cabinet. If it is necessary to do so, remove the three securing nuts and bushes and unsolder the five earth straps. Reverse this procedure to re-assemble.

## COMPLETE ALIGNMENT

**A.F. SECTION** – This section is only applicable to versions not fitted with an integrated circuit.

Output stage quiescent current should be approximately 2 mA at 21°C (70°F) 1 mA at 10°C (50°F) and 4 mA at 32,5°C (90°F). If output transistors are replaced, R21 may have to be reselected to correct quiescent current. **TO MEASURE QUIESCENT CURRENT** disconnect collector of TR15 and measure between collector and P.C. Board common earth.

### 455 KHz IF.

1. Connect Signal generator to base of interpolation oscillator (TR3) via 10 nF capacitor and tune for maximum deflection on AVC meter. The exact centre frequency is determined by the ceramic filters and may be  $\pm$  a few KHz off 455 KHz.  
**Note:** In the absence of an oscilloscope and sweep generator, the bandpass shape can be estimated by sweeping slowly with a normal signal generator whilst noting the output on the AVC meter. Should bandpass be unbalanced, displace generator to drooping side and re-peak to correct this. A slight centre trough is acceptable, as shown in Fig. 3 on the circuit diagram, and is dependent on the selection of the ceramic filters.
2. Adjust slugs in T2 and T3 for maximum output by observing built in AVC meter. To effect fine adjustment the input should be adjusted to give a reading of not more than one division on the AVC meter.
3. Set pre-set potentiometer R28 to give a reading of 4,3V at TP5.
4. Switch mode switch to side band and check that bandpass narrows to approximately half (3 KHz). The sideband bandpass should be smooth and free from troughs.

### B.F.O. ADJUSTMENT

1. Establish centre frequency of 455 KHz bandpass on AM position.
2. Displace Signal generator to read centre frequency + 3,5 KHz.
3. Switch to L.S.B. and adjust T4 to give a zero beat in audio.
4. Return Signal generator to centre frequency of AM bandpass again.
5. Switch to U.S.B. and adjust C90 to zero beat.
6. Repeat the foregoing until a separation of approximately 3,5 KHz is established between the zero beats of U.S.B. and L.S.B.
7. To check symmetry, alternate switch between L.S.B. and U.S.B. whilst noting white noise only. The pitch of the noise should remain constant in either position.

### 2 TO 3 MHz INTERPOLATION ALIGNMENT

(Should be carried out with front panel on)

- (a) This section is aligned with clarify control set to central position by tuning slugs at the low frequency end and trimmers at the high frequency end of the KHz dial, 0 KHz being the 3 MHz alignment point, and 1000 KHz being the 2 MHz alignment point. T1 and C44 are the oscillator adjustments, and inductances L10 and L11 together with trimmer C56 and C67 are the R.F. amplifier adjustments.
- (b) In order to reduce calibration errors which may occur between alignment points, the following procedure should be adopted:
  1. Loosen grub screws holding thumbwheel and calibrated KHz drum on the three-ganged capacitor shaft.
  2. Set tuning capacitor fully closed.
  3. Set clarify control to centre position.
  4. Set KHz drum to read 150 KHz and tighten grub screws.
  5. Set thumbwheel for equal overtravel at ends of scale.
  6. Re-align as in paragraph (a) above.
  7. Check the scale for calibration errors in the intermediate positions and if necessary re-set the KHz drum as in 1, 2, 3 and 5 above as follows:  
If the worst error reads **below** the scale reading, set the KHz drum to read 150 minus twice the error with tuning capacitor fully closed.



### ANTENNA TRIM CONTROL ALIGNMENT

1. String drive cord as shown in Fig. 1 with ferrite core free to slide on cord.
2. Turn knob fully clockwise, (cam drum fully anti-clockwise looking from rear of set) set core to protrude approximately 6 mm (¼ inch) from lower end of coil former.
3. Apply a small quantity of suitable quick drying adhesive (e.g. Bostik 1769) to the cord next to the core.
4. Slide core over adhesive and back to original position. Allow adhesive to become "tacky".
5. Slide core over adhesive again and turn control knob anti-clockwise to the switching position of the lower micro-switch (S.2, Fig. 1) and set lower end of core flush with the lower end of coil former.
6. Check upper and lower limits of antenna tuning range (approximately 550 KHz and 31 MHz) using built in meter and if necessary adjust core to correct. Allow adhesive to dry before operating set.

**NOTE:** Adjustable stops are only provided on models using Brass Antenna trim mechanisms. These are set correctly at the factory. Should re-setting become necessary the stop collar (located on circuit side of P.C. board behind front panel) should be adjusted to give even clearance between nose of cam and adjacent disengaged micro-switch at extremities of rotation. (This operation necessitates removal of front panel).

### CLARIFY CONTROL ALIGNMENT

String drive cord and glue core to cord as shown in Fig. 2.

### MINOR CALIBRATION DISCREPANCIES

On Models up to Serial No. 0600

These may be corrected without instruments or dismantling of the receiver as follows:

- 1) Open back cover.
- 2) **MHz Scale** - If a calibration error becomes noticeable on the MHz scale when tuning a station of known transmission frequency, set the MHz scale to the exact calibration mark for the whole number MHz portion of the frequency (e.g. frequency 16,33 MHz set scale to 16) and adjust trimmer C32 to give maximum signal strength reading on built-in meter.
- 3) **KHz SCALE** - Slight errors at either end of this scale may be deliberate to compensate for tracking in the middle of the scale. If however adjustment is necessary, set mode switch to USB; set KHz scale to 0 and adjust trimmer C44 to give zero beat in audio.

Set KHz scale to 1000 and adjust T1 to give zero beat in audio. Repeat these steps until satisfactory result is obtained.

### ZERO SET CONTROL

A zero set control is incorporated in all models from Serial No. 0600. This provides a means of zero setting the KHz dial to compensate for calibration errors due to temperature and/or humidity variations should this become necessary.

During alignment set this control in its central position.

Refer to complete alignment procedure if major calibration errors are encountered.

If the worst error reads **above** the scale reading, set the KHz drum to read 150 plus twice the error with tuning capacitor fully closed.

(e.g. If calibrated KHz drum reads 510 KHz for 500 KHz, reset KHz drum to read 130 KHz).

8. Reset oscillator alignment and re-peak R.F. stages.

**NOTE:** The KHz calibration should be checked against a stable crystal controlled generator having harmonics at 100 KHz intervals. The errors in this scale should not be greater than  $\pm 5$  KHz.

#### ALIGNMENT OF 42,5 MHz HARMONIC AMPLIFIER

1. Connect a D.C. 300 mV meter via 4 K7 between TP2 and chassis (R65 - C92 - D5).
2. Connect a 42,5 MHz signal from a crystal controlled oscillator source to the first 42.5 MHz coil (L4 - TP1) via a 1K isolation resistor, and peak L4, L8, L9, L12 and L13 for maximum output as indicated on 300 mV meter. This tuning is accomplished by compressing or expanding the coils with a non-metallic alignment tool. Ensure that output level of oscillator is low enough to detect peak. The bandpass should be approximately 300 KHz.

**NOTE:** If a reading is observed on the 300 mV meter without excitation from the signal generator, it should be attributed to one of the harmonics from the harmonic generator breaking through after mixing has taken place at the balanced mixer (D2, D3). This breakthrough will take place at every whole megahertz point on the MHz dial when alignment is completed, and can be easily removed by a slight rotation of the megahertz dial. The same breakthrough may be used as a sensitivity check of the 42.5 MHz amplifier, and should produce a reading of approximately 90 mV at the 3rd mixer, provided that the output from the harmonic generator is normal.

#### ALIGNMENT OF 45 MHz 1ST I.F.

1. Connect the D.C. 300 mV meter to TP2 as for 42,5 MHz alignment.
2. Connect a 45 MHz signal from a crystal controlled source to TP4, and peak L5, L7, L14 and L15, by compressing or expanding coils, taking care not to alter the coupling between pairs, which has been Factory preset. Overcoupling between pairs will result in a noticeable trough in the bandpass shape. (Bandpass approximately 1,3 MHz).
3. Check bandpass response by sweeping with variable generator, and re-peak if necessary until bandpass response conforms as closely as possible to that shown in fig. 2 of the circuit diagram.

#### ALIGNMENT OF FIRST OSCILLATOR

(Should be carried out with front panel on)

1. Loosen the grub screws holding the thumbwheel and the calibrated MHz drum on the two ganged capacitor shaft.
2. Set tuning capacitor fully open.
3. Set MHz drum to read 0 MHz and tighten grub screws.
4. Reset thumbwheel for equal overtravel at ends of scale.
5. Connect RF signal generator to base of RF stage (TR5) via a blocking capacitor, and use built in AVC meter to tune for maximum deflection.
6. Set KHz drum to read 500 KHz.
7. Use R.F. signal generator at two alignment points (1,5 MHz and 28,5 MHz) and set up oscillator circuit by adjusting L3 at the 1,5 MHz end of the scale, and C32 at the 28,5 MHz end of the scale.

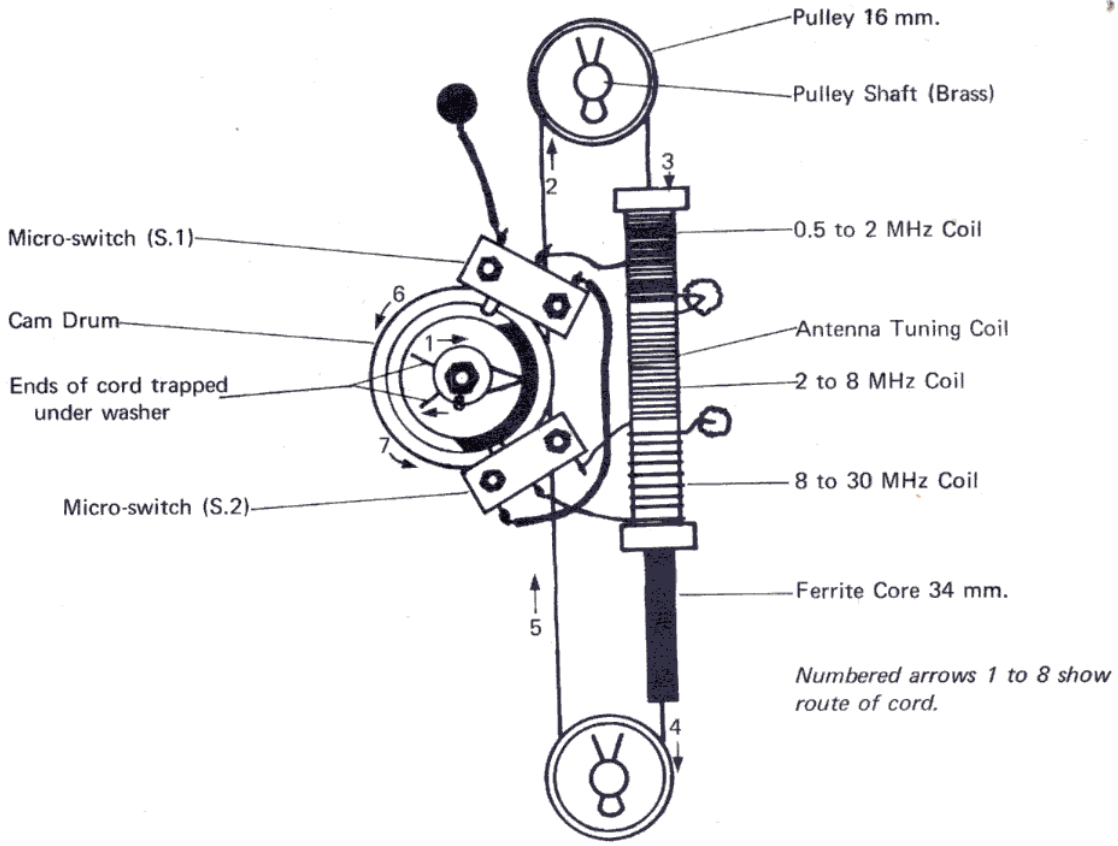
**NOTE:** Calibration of the intermediate positions of this scale has been corrected at the Factory to be within 1,5 mm (1/16 inch) of the dial scale readings. Further bending of the tuning capacitor plates to correct calibration is not recommended and should difficulty arise due to maladjustment or damage it is advisable to contact the authorised service agents.

#### HARMONIC GENERATOR

1. Tune receiver to known time signal, e.g. 5 MHz or 10 MHz or alternatively to any other accurate whole MHz frequency source, e.g. 2 MHz, 3 MHz, 4 MHz, etc.
2. Adjust trimmer C6 to produce zero beat in AF amplifier.

#### ANTENNA CIRCUIT

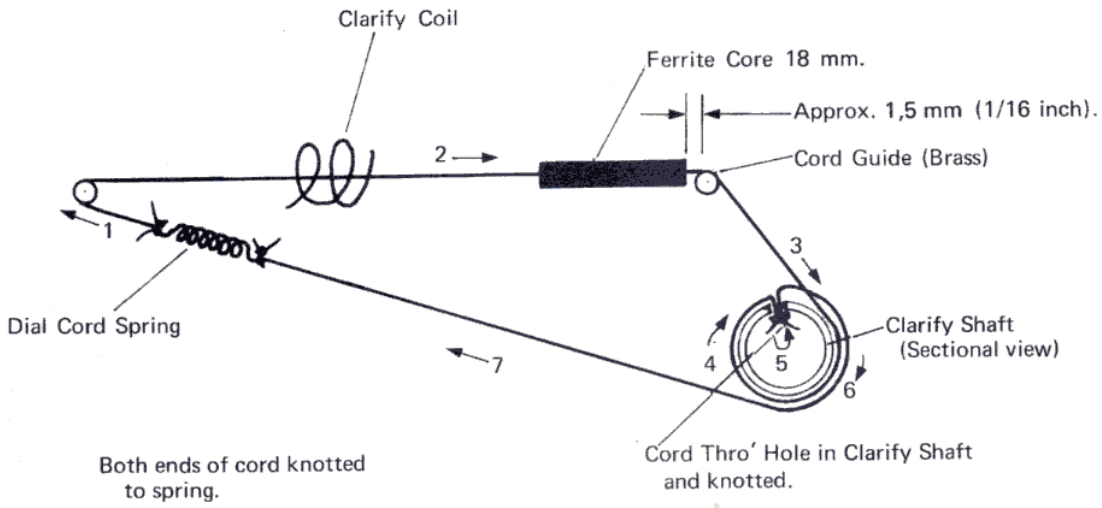
No alignment is required here as this circuit is tuned manually by the antenna trim control.



REAR VIEW OF ANTENNA TRIM MECHANISM SHOWN WITH KNOB TURNED FULLY CLOCKWISE (Cam Drum fully anti-clockwise looking from rear of set)

Fig. 1.

Numbered arrows 1 to 7 show route of cord.

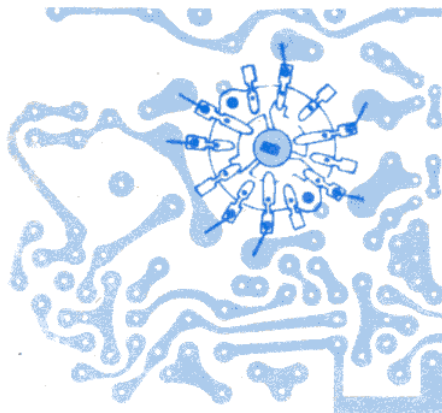
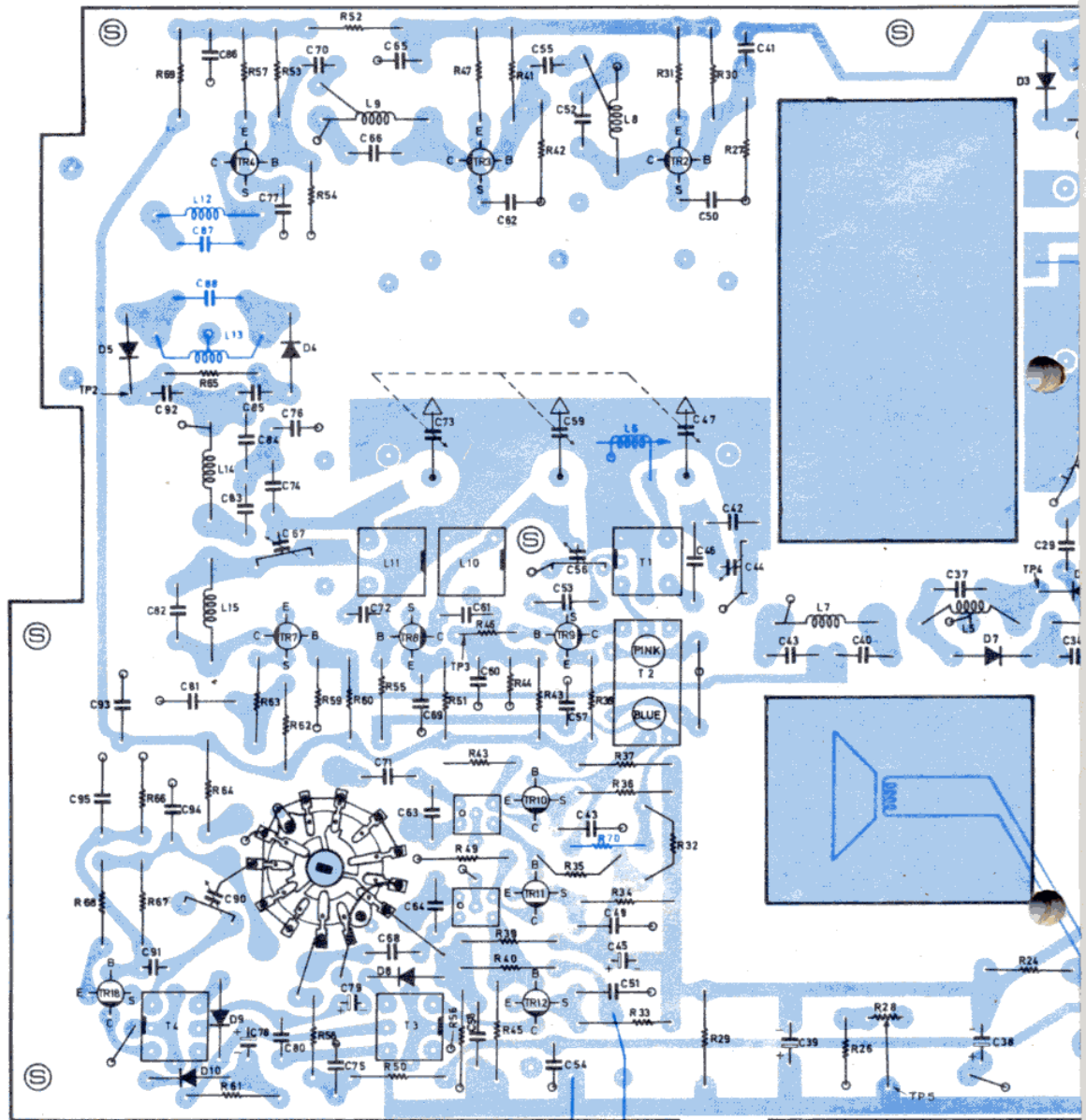


FRONT VIEW OF CLARIFY MECHANISM SHOWN WITH CLARIFY SHAFT FULLY CLOCKWISE. GLUE FERRITE CORE IN POSITION SHOWN, USING SIMILAR PROCEDURE OUTLINED IN ANTENNA TRIM CONTROL ALIGNMENT.

Fig. 2.



VIEWED FROM COMPONENT SIDE



NOTES :




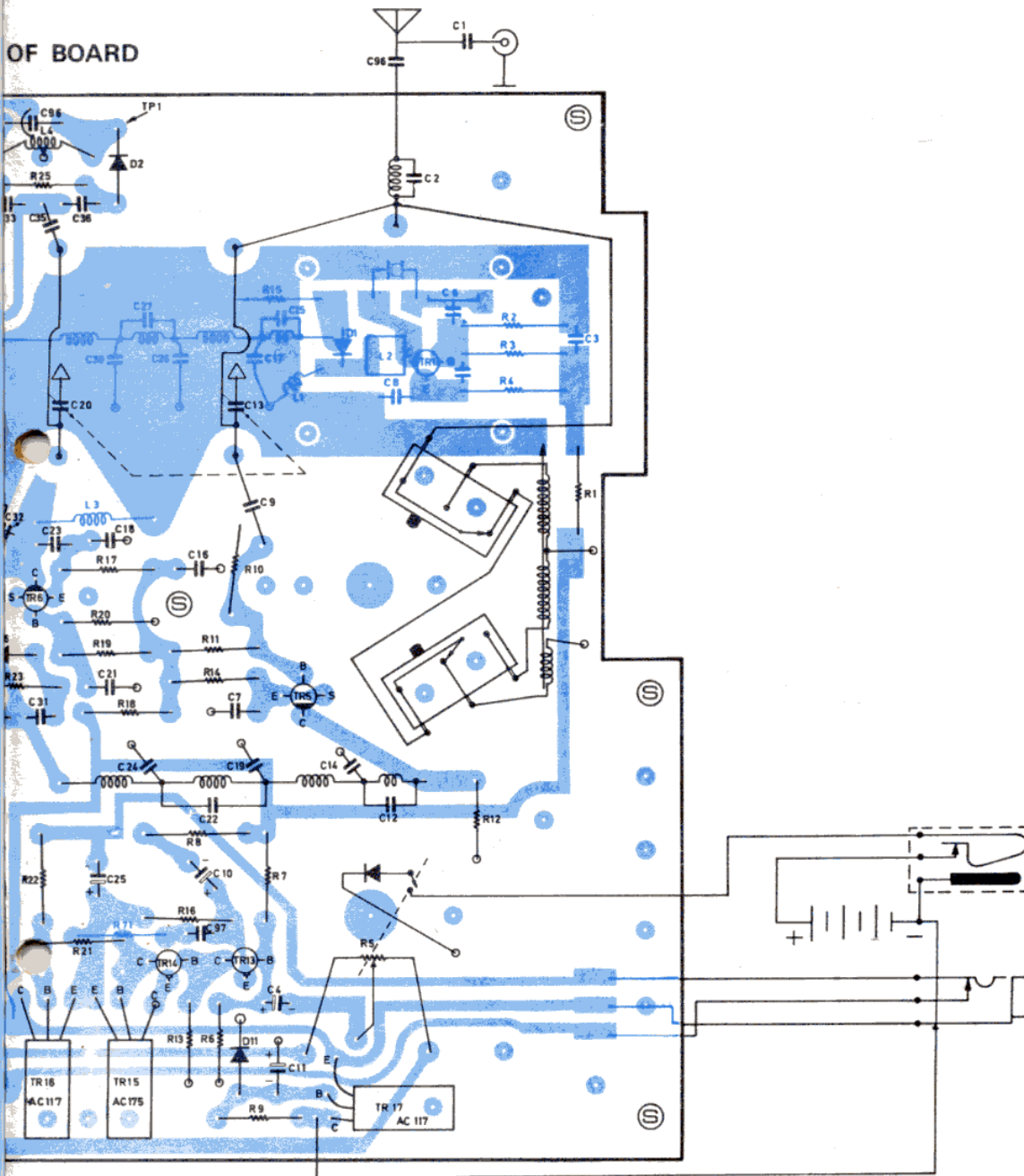
-  - Earthed by mechanical means (thro' screws etc)
-  - Soldered to copper on component side of board
-  - Indicates position of notch on base of can.

FIGURE 4A -- (Model up to Ju



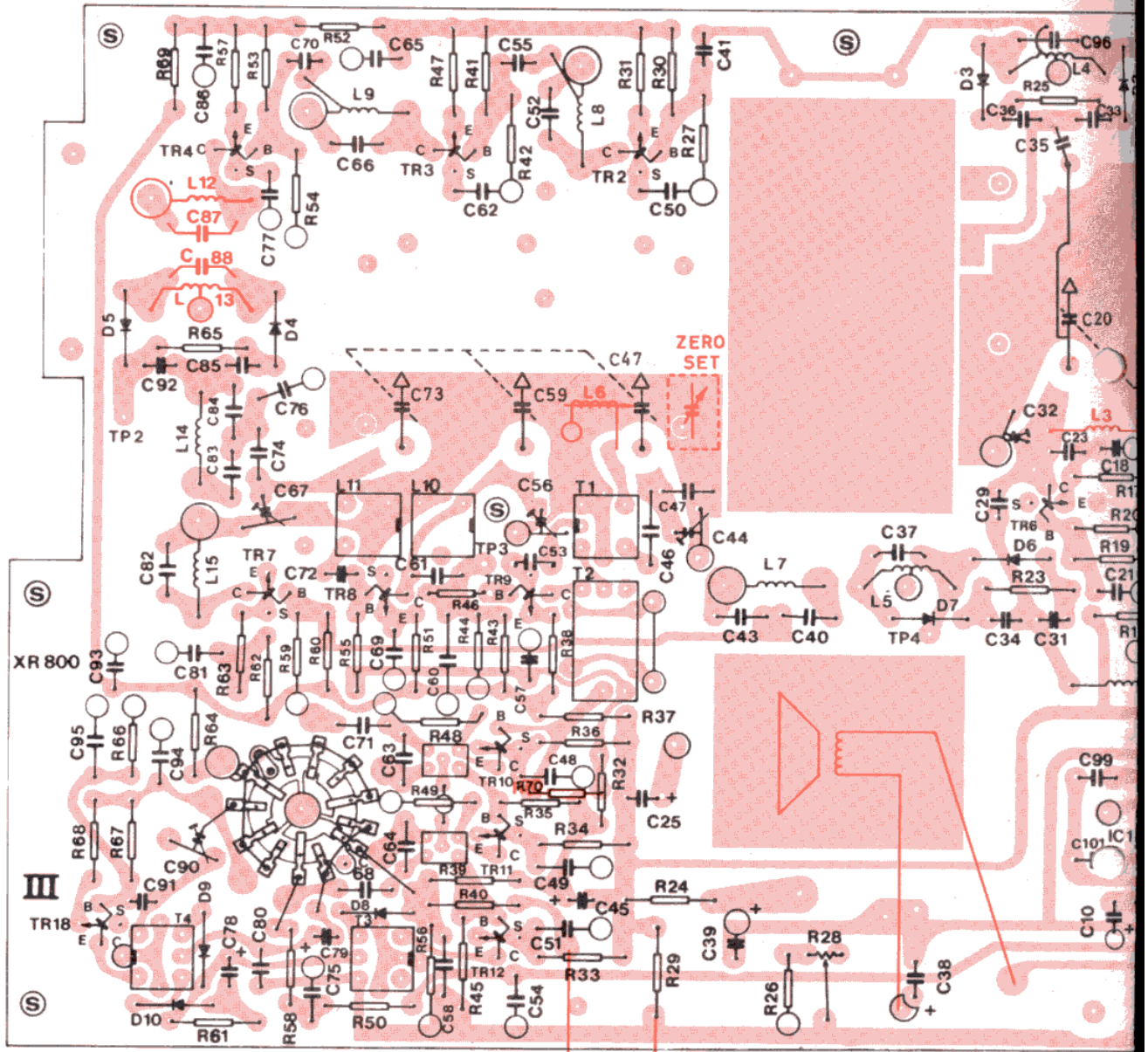
OF BOARD



Ⓢ - Indicates positions of nine mounting screws (front panel)

Components shown in BLUE are mounted on circuit side of board.

MAIN PC BOARD — COMPONENT



M

NOTES :




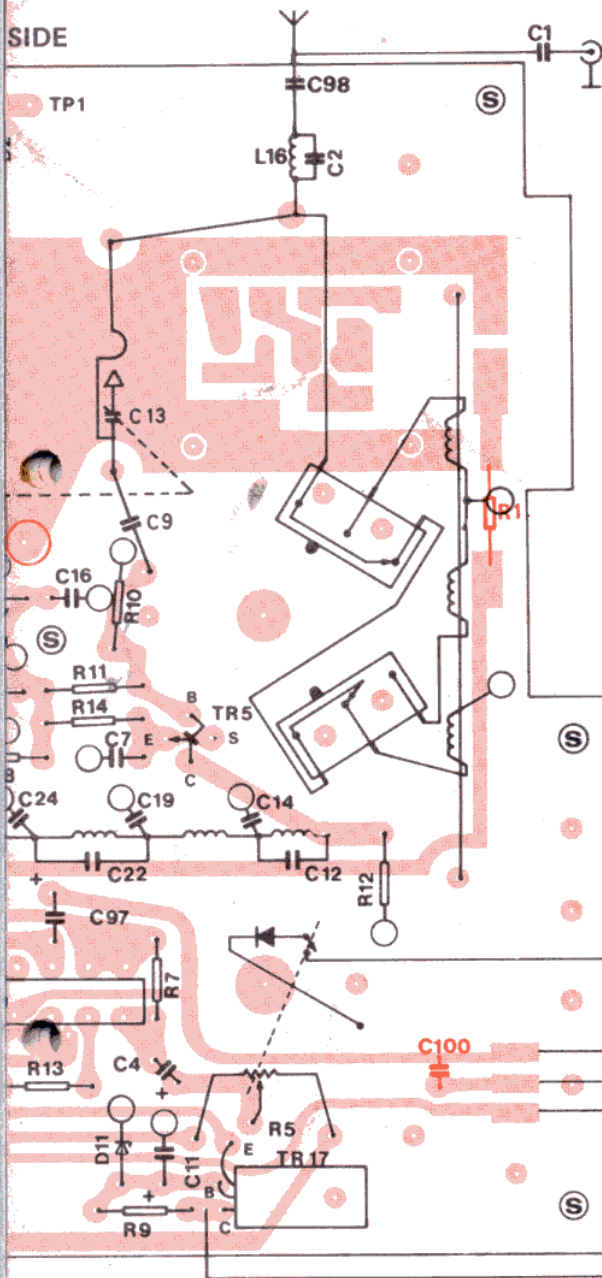
-  — Earthed by mechanical means (thro' screws etc)
-  — Soldered to copper on component side of board
-  — Indicates position of notch on base of can.

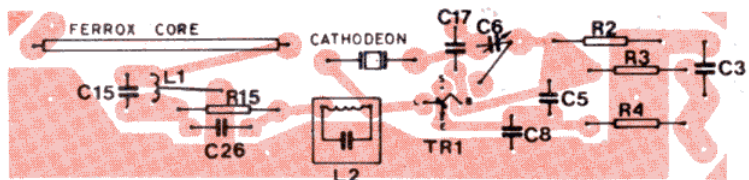
FIGURE 4B — (Model from July 1974)

SIDE



### HARMONIC GENERATOR (Circuit Side)

Affixed to Circuit Side of main PC board



Indicates positions of nine mounting screws (front panel)

Components shown in RED are mounted on circuit side of board.

# BLOCK SCHEMATIC DIAGRAM

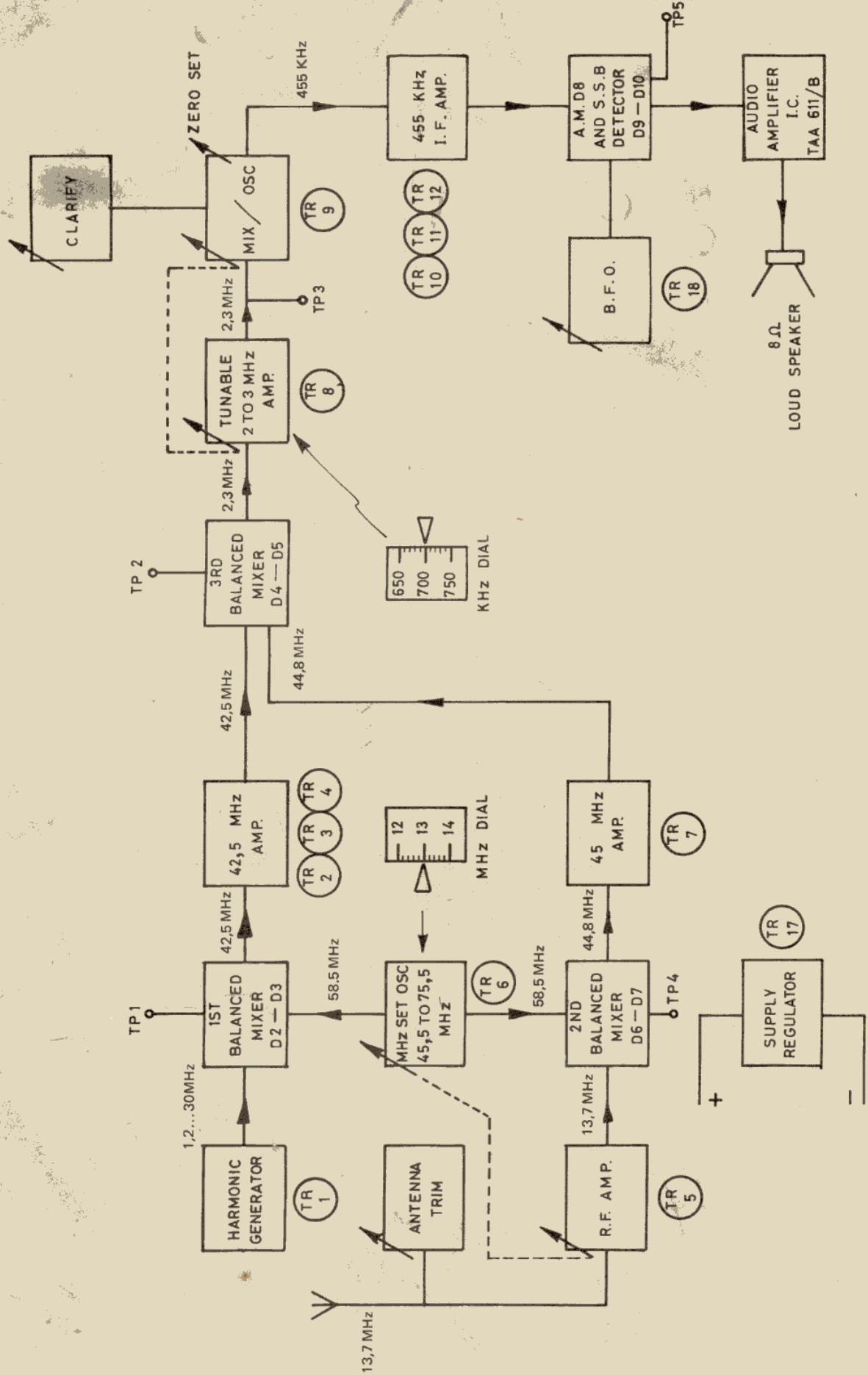
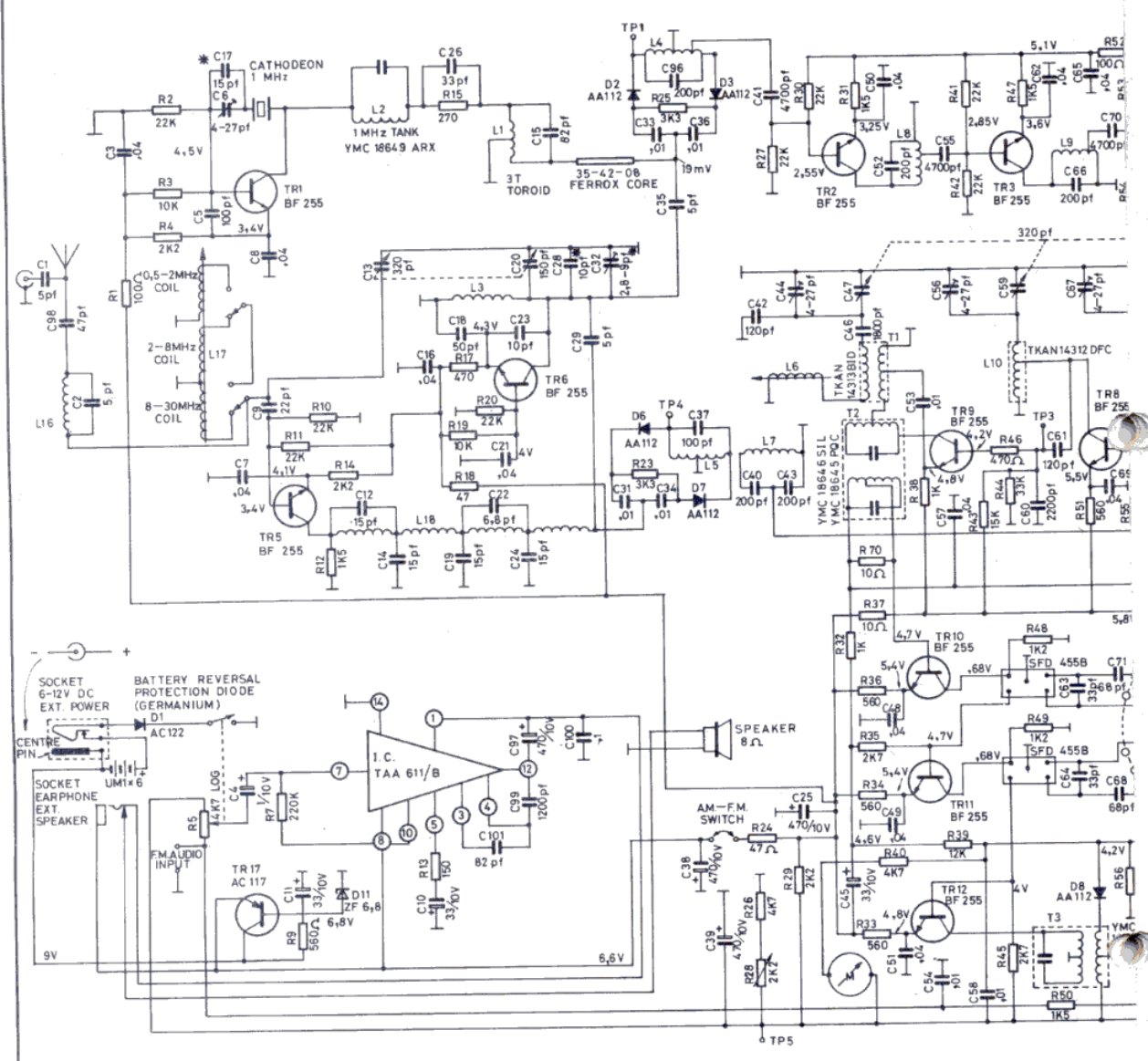


Fig. 3.



<u>Code No.</u>	<u>Description</u>	<u>Drawing No.</u>
AD-09-005	Antenna Bush	A-1989 A
AG-07-021	Handle Chrome	C-1853
AG-07-022	Handle Insert (Modified)	B-1988 A
AG-01-077	Front Panel Painted	D-1923
AG-01-076	Front Panel Chrome	D-1923
AG-11-203	L H Panel Trim	A-1996
AG-11-204	R H Panel Trim	A-1997
AG-11-025	Lower Trim Strip (Barlow Wadley)	A-1998
AD-06-103	Back Vent	
AD-05-401	Loudspeaker Gasket	A-1992
AD-04-815	Dial Scale Backing (Green)	A-1985
AD-04-221	Cam Drum	B-1926
AD-09-007	Cam Drum Bush	B-1927
AD-08-115	Cam Drum Shaft	B-1941
AD-09-009	Clarify Bush	B-1928
AD-08-023	Clarify Shaft	A-1940/B
AD-04-409	Clarify Cord Guide	A-1938
AD-11-012	Speaker Mounting Spacers	A-1939
AA-02-051	P C Board Mounting Fixture	A-1937
AE-01-010	Battery Box "Chitrose"	
AD-01-411	Antenna Coil Mounts	A-1936 A
AG-09-062	Thumbwheel	B-1924
AD-04-201	Dial Drum	B-1925
AD-08-201	Pulley Stud	A-1979
NB-01-201	Back Fixing Screw	A-1978
AA-02-055	Pivot Rod (Card Holder)	B-1931
AG-11-027	Barlow Wadley Badge	A-1999
AE-06-027	External Power Plug	
SA-09-017	Instruction Book	
SA-08-001	Log Card	
SA-11-009	Post Card (Radio/TV Handbook)	
SA-04-001	Frequency Card (Black)	
AE-06-025	Earphone Plug	
NC-02-071	Washer W2 (2mm Flat)	
NC-02-101	Washer SW 2 (2mm Lock)	
AG-01-011	Aerial Yokowa S G 387	
AD-02-001	Spring Clip 1100/8 (Pulley Retaining)	
AD-02-201	Push on Retainer 1/4"	
AG-09-061	Black Knob with Embellisher	
NA-02-003	Nut NN2 (2mm) (Micro Switch)	
NB-02-055	Screw M2 x 20 (2mm) (Micro Switch)	
NA-01-301	Rivnut 4 BA (Back Securing)	
AD-07-007	Plastic Pulley 16mm	A-3101
AG-05-001	Rubber Foot	A-1619 A
AD-13-010	Dial Scale Spring	
AD-13-011	Spring (Dial Cord) 28 swg. Closed Coil	
AE-09-021	Micro Switch Omron SS - 5G	
AE-09-208	Band Switch (Mode)	
NC-01-021	Retaining Clip 5 BA Nomel. (Back Screws)	
AG-01-071	Cabinet Trimmed	
AA-02-053	Earphone Socket Mounting Bracket	A-1981
AD-04-721	MHz Drum Scale	A-1984
AD-04-719	KHz Drum Scale	A-1984
AD-11-011	Earphone Socket Bracket Spacer	A-2178/A
NC-01-221	Part Pierced Washer (Ext. Aerial)	A-1983
AA-02-056	Card Holder Tension Plate	A-3009
AD-05-306	Rubber Cushion (Handle)	A-3105
AA-03-027	42 MHz Coil Shield	A-3027
AD-04-413	Cord Guide/Mounting Post	A-3033

C	1	2	3	6	7	8	9	12	13	14	15	26	19	21	23	97	99	100	29	32	34	36	38	40	41	43	44	45	46	48	49	52	54	56	58	60	61	63	65	67	68	69	71									
R	98	1	2	3	4	5	17	4	11	10	11	12	13	14	13	17	19	15	18	20	23	25	26	27	29	30	31	32	34	36	38	39	41	43	44	47	48	50	51	52	53	54	55	56	57	58	59	62	64	66	68	70



**DIODES**

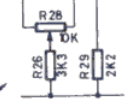
- D1 AC 122 PROTECTION DIODE
- D2, D3 AA 112 MATCHED PAIR(BALANCED MIXER N°1)
- D4, D5 AA 112 MATCHED PAIR(BALANCED MIXER N°3)
- D6 D7 AA 112 MATCHED PAIR(BALANCED MIXER N°2)
- D8 AA112 A.M. DETECTOR
- D9 D10 AA112 MATCHED PAIR SSB DETECTION
- D11 ZF 6.8 VOLTAGE REGULATOR

**TRANSISTORS**

- TR1 HARMONIC GENERATOR
- TR2, TR3, TR4 42.5 MHz HARMONIC AMP.
- TR5 R.F. AMP.
- TR6 FIRST OSC.
- TR7 45 MHz AMP.
- TR8 2 TO 3 MHz AMP
- TR9 2 TO 3 MHz OSC. MIXER
- TR10, TR11, TR12 455 KHz I.F. AMP
- TR17 D.C. SUPPLY REGULATOR
- TR18 B.F.O. OSCILLATOR

**\* MODIFICATIONS**

1. C75 - C80 2200 pF SERIAL N°s 0001 TO 0100 ONLY
2. C90 2.5 TO 6 pF SERIAL N°s 0001 TO 1100 ONLY
3. C32 7-35 pF (AND C28 NOT FITTED) ON EARLY MODELS
4. VALUE OF R40 ON EARLIER MODELS:-  
a) 1K5 WITH METER TYPE KISHO Y04 600  
b) 3K9 WITH METER TYPE TOYO MUSSSEN V81
5. C17 ADJUSTING CAPACITOR



6. APPLICABLE TO SERIAL N°s 0001 TO 0100 ONLY

**NOTES**

VOLTAGES SHOWN ON THIS DIAGRAM CAN VARY DEPENDING ON THE ACTUAL ZENER DIODE AND RESISTOR TOLERANCES, AND ARE NEGATIVE WITH RESPECT TO CHASSIS.

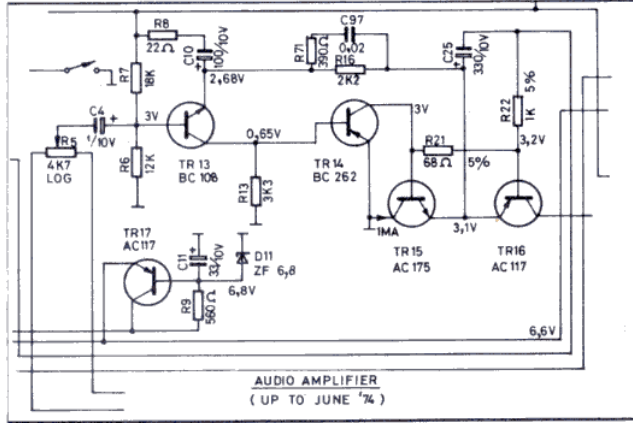
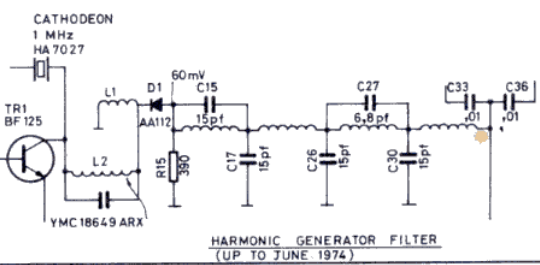
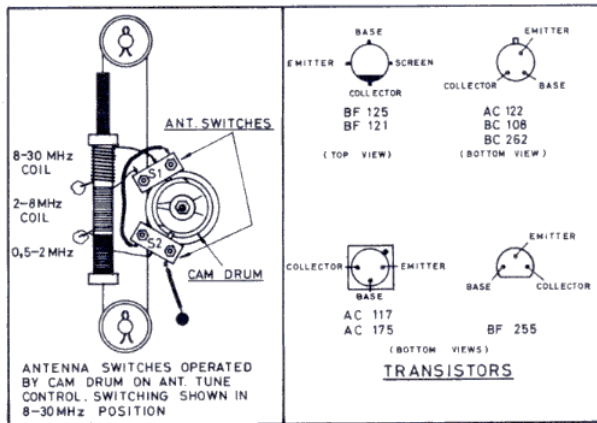
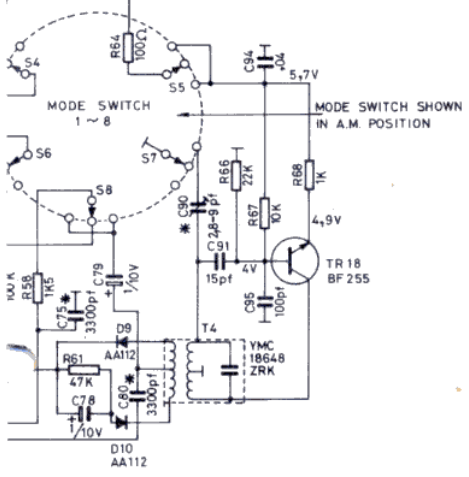
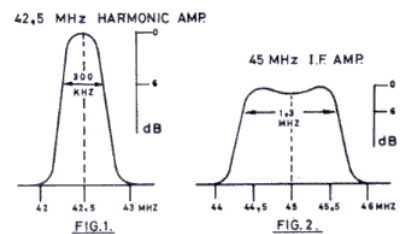
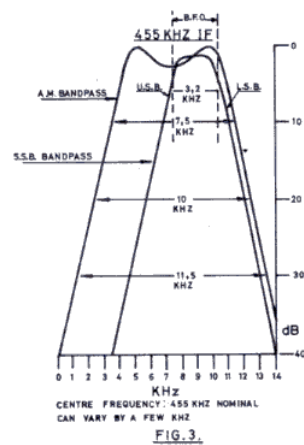
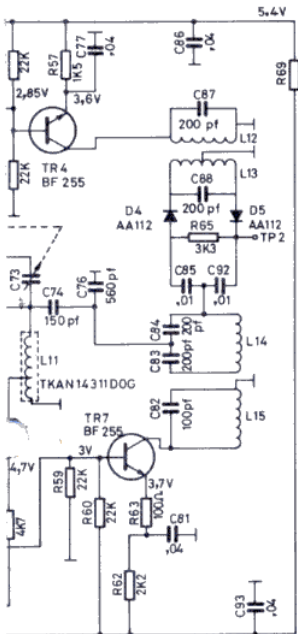
ALL CAPACITOR VALUES ARE SHOWN IN μF (MICROFARAD) EXCEPT THOSE INDICATED pF (PICOFARAD)

EVERY EFFORT IS MADE TO KEEP THIS DIAGRAM UP TO DATE—BUT THE RIGHT IS RESERVED TO USE DIFFERENT COMPONENTS OR AMEND THE CIRCUIT WITHOUT NOTICE.

NOTE: TRANSISTORS TR1—TR12 & TR18 WERE BF 121 & BF 125 ON EARLIER MODELS

Fig. 5.

71	73	75	76	78	80	81	84	86	88	90	92	93
72	74	77	79	82	83	85	87	89	91	94	95	
55	57	59	60	62	63		65	66		68		
56	58		61	64						67	69	



UNIT	mm	PROJECTION	DATE	MODIFICATION	DATE
TOLERANCES	1 = 0.4	MATERIAL		FINISH	
UNLESS OTHERWISE	1.0 = 1.0	INDICATED	1.00 = 0.1		
DRAWN	S. F. H.	DATE	14-6-74	TITLE	CIRCUIT DIAGRAM MKII
TRACED		DATE		DRG. No.	7470
MECH		DATE	31-7-74	MODEL	
ELEC		DATE	21-7-74	SCALE	
APP.				BARLOW WADLEY XR 800 C	
				NEW GERMANY	
				NATAL	

**BARLOWS TELEVISION COMPANY**