INSTRUCTION MANUAL
for
INOUE IC-700R
RECEIVER

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SUMMARY:

The IC-700R is an all transistorised receiver for amateur station use having exceptional sensitivity, selectivity and stability. Field effect transistors are used in many stages to ensure low cross-modulation and good age characteristics.

The receiver is a single conversion superhet employing a high grade 9 mc/s crystal filter in the I.F. stages.

Each amateur band is covered by a 500 kc/s tuning range and there are, in addition, three positions available for crystal control of the receiver. When used with the companion transmitter IC-700T, full transceive operation is possible with the facility of tuning the receiver + or — 5 kc/s away from the transmitter frequency (R.I.T.).

SPECIFICATION

RECEPTION MODES:
A1, A2, A3, A3a, A3j
(LSB on 3.5 and 7 mc/s bands
USB on 14, 21 and 28 mc/s bands)

FREQUENCY RANGE:
3.5 — 4.0 mc/s
7.0 — 7.5 mc/s
14.0 — 14.5 mc/s
21.0 — 21.5 mc/s
28.0 — 28.5 mc/s
28.5 — 29.0 mc/s
29.0 — 29.5 mc/s
10.0 — 10.5 mc/s

SENSITIVITY:
AM, CW, SSB. 50 mW o/p = 1uV for 10db S/N ratio

SELECTIVITY:
6 db B/W = 2.4 kc/s
60 db B/W = 4.5 kc/s
CW filter 6 db B/W = 500 c/s

IMAGE REJECTION:
▶60 db

SPURIOUS SIGNALS:
Lower than internal noise

STABILITY:
Better than + or — 100 c/s after warm-up

ANTENNA:
50 — 100 ohms

AUDIO O/P:
1W into 8 ohms

POWER SOURCE:
AC 240v.
DC 12/ 15v.

DIMENSIONS:
270 mm x 160 mm x 235 mm.

WEIGHT:
6 kg.

CIRCUIT DESCRIPTION

R.F. AMPLIFIER:

The RF amplifier stage employs two MK-10 F.E.T.'s in cascode. This provides high gain whilst maintaining low cross—modulation.

A 9 mc/s trap is provided in series with the input to minimise I.F. breakthrough.

RF gain control is achieved by varying the bias on the first MK-10 source. The input and output tuned circuits of this stage are ganged together and adjusted by the "preselector" control on the front panel. A combination of permeability and capacitor tuning is used which provides a substantially constant L/C ratio on all bands and simplifies the band switching circuitry. A.G.C. is applied to the gate of the first Mk-10.

MIXER:

The output from the R.F. amplifier is capacitively coupled to the gate of the mixer, an MK-10 F.E.T.

The VFO signal is fed in on the source and the drain is taken to a 9 mc/s tuned circuit for feeding to the I.F. amplifier.

The use of an F.E.T. in this stage again ensures low cross modulation due to the square—law characteristic of the transmitter.

VFO:

The VFO unit is built as a sub assembly having exceptional mechanical strength so as to obtain good frequency stability.

The VFO uses an MK-10 F.E.T. in a Colpitts circuit. The high input impedance of the F.E.T. ensures that the Q of the tuned circuit is maintained at a high value.

Output from the VFO source is fed to another Mk-10 F.E.T. used to isolate the VFO from the following amplifiers.

The oscillator signal is further amplified by a 2SC709 and 2SC773, both stages operating as emitter followers.

From the 2SC773 emitter, the VFO signal is fed to the receiver mixer stage and also to a socket on the rear panel for use in transceive with the IC-700-T transmitter.

The VFO tunes:

3.5 mHz Band	12.5 mHz — 13.0 mHz
7 mHz Band	16.0 mHz — 16.5 mHz
14 mHz Band	5.0 mHz — 5.5 mHz
21 mHz Band	12.0 mHz — 12.5 mHz
28 mHz Band	19.0 mHz — 20.5 mHz
10 mHz Band	19.0 (Used in the 28 mc/s position).

R.I.T.:

The R.I.T. function is provided by a variable capacity diode type. SC20 connected across part of the VFO tuned circuit. With the R.I.T. switch at "OFF" the diode is biassed by d.c. from a 5K ohm preset potentiometer and is thus fixed. With the R.I.T. switch "ON" the bias is fed to the diode from the R.I.T. control on the front panel, and variable.

D.C. for the R.I.T. control is stabilised by zener diode IN709.

FILTER:

Selectivity is obtained by the use of a high grade crystal filter having a shape factor of 1.8.

I.F. AMPLIFIER:

The 9 mc/s I.F. amplifier has three stages, the first two using neutralised MK-10 FET'S.

AGC is applied to both F.E.T. stages.

The S meter is connected in a bridge circuit and measures the change of source current in the second IF amplifier.

The third IF amplifier employs a neutralised 2SC709. From the collector of this stage the IF signal is fed to the AGC and AM detectors. The product detector is fed from a transformer in the collector circuit.

AGC AND DETECTORS:

Two A.G.C. lines are used, one for the third I.F. amplifier only and one for the F.E.T. stages. The diode which provides the F.E.T. A.G.C. also serves as the AM detector.

The a.f. output from the AM detector feeds a self adjusting noise limiter which clips noise pulses of greater amplitude than 100% modulation. SSB and CW demodulation takes place in a 2SC709 product detector, the I.F. signal being fed to the base, the demodulating carrier fed to the emitter.

A.F. AMPLIFIER:

For C.W. reception, a frequency selective a.f. amplifier is inserted between the product detector and the a.f. amplifier. This has a 6 db bandwidth of 500 c/s and it's centre frequency is 1000 c/s.

From the function switch, a.f. is fed to the a.f. gain control and then to a transformerless amplifier which provides 1W into 8 ohm.

The headphone socket on the front panel automatically disconnects the external loudspeaker when a plug is inserted. Low impedance headphones are recommended.

CRYSTAL OSCILLATOR:

The demodulating carrier at 8998.5 kc/s is generated by a 2SC709 crystal oscillator. This is followed by a 2SC709 emitter follower to isolate the oscillator from the product detector load.

POWER SUPPLIES:

A.C.:

The receiver is supplied connected for 240v. operation. The secondary of the mains transformer feeds a full wave rectifier followed by a capacitor input smoothing filter to give 12 volts for the a.f. amplifier. The 12 volts d.c. is also fed to the two series regulators which provide two 10 volt regulated supplies.

1— Feeds V.F.O. sub-assembly.

2— Feeds all other stages other than a.f. amplifier.

For d.c. operation, replacing the a.c. line cord by the d.c. cord automatically disconnects the mains transformer and rectifiers. Supplies from 12 to 15 volts may be used, but must be **negative earth** in mobile operation.

MUTING:

Muting is accomplished by operating relay RL. (joining pin 5 to pin 7 on rear panel B7G socket). This relay has four contacts.

1— Disconnects supply to 10V stabiliser feeding RF amp, IF amp and detectors.

2— Disconnects 12V supply to a.f. amplifier.

3— Disconnects loudspeaker.

4— Disables R.I.T. control thereby returning V.F.O. to frequency shown on main dial.

OPERATING INSTRUCTIONS

POWER SUPPLY:

Two power leads are provided, one for a.c. mains and a red/black lead for d.c. operation. Connecting the correct lead automatically makes all necessary circuit changes.

Ensure that d.c. supply is between 12 and 15 volts and **negative earth** is used in mobile operation.

Switch receiver "on" by switching on A.F. gain control.

Dial lamps should indicate that receiver is "on."

ANTENNA:

The antenna impedance should be between 50-100 ohms. A high impedance antenna should be fed via a matching unit.

SPEAKER:

The speaker impedance should be 3-15 ohms and is connected to the socket on the rear panel. Insertion of a plug in the front panel headphone socket will automatically disconnect the loudspeaker.

AM RECEPTION:

Function	—	AM
R.I.T.	—	OFF or "O"
RF Gain	—	Fully clockwise
AF Gain	—	As required
Band	—	Set to desired amateur band
Preselector	—	Set pointer to band segment in use.

The preselector control should be used to peak the received signal for maximum "S" meter reading. It is possible to tune the preselector control to spurious signals but these occur well outside the correct band segments. The tuning dial covers 50 kc/s per revolution, the black figures reading 0-50, the red figures reading 50-100 kc/s.

The R.I.T. control is normally used only when in transceive with the IC-700T. The noise limiter is switched in by turning the function control to "ANL". The limiter operates only on AM signals.

SSB RECEPTION:

Controls set as for AM except "function" which should be set to "SSB". The correct sideband is automatically selected i.e. LSB on 3.5 and 7 mc/s bands, USB on 14, 21 and 28 mc/s bands.

CW RECEPTIONS:

Controls as in AM except for function switch which may be set to "SSB" or "CW" position, the selective a.f. amplifier reduces the 6 db bandwidth to 500 c/s.

FIXED FREQUENCY RECEPTION:

Any frequency in the range 3.5—29.5 mc/s may be received except for the I.F. range 8.5-9.5 mc/s.

The crystals may be inserted in any of the three sockets marked A. B and C. Crysals should be HC25/U or HC18/U and the frequency should be calculated as follows:

AM or CW RECEPTION:

Xtal frequency = received frequency + 9 mc/s.

SSB (USB):

Xtal frequency = received frequency — 9 mc/s.

SSB (LSB):

Xtal frequency — received frequency + 9 mc/s.

The crystal sockets are mounted in the VFO box, the top socket corresponding to bandswitch position A.

OPERATION WITH IC-700T TRANSMITTER

Connect the receiver, transmitter and PSU together as shown in the diagram. The transmit frequency will be the same as receive frequency with R.I.T. control at "OFF" or "O". Moving the R.I.T. knob will shift the receive frequency + or — 5 kc/s from the main dial setting but on transmit, the transmitted frequency will always return to that shown on the main dial.

ADJUSTMENT

NOTE:

It is strongly recommended that you do not touch the various adjustments for two very good reasons.

1— It is not as easy as it looks.

2— Attempted alignment or servicing renders the guarantee null and void.

However, for the benefit of those with the necessary skill and access to laboratory test gear, the following notes are given for guidance. These notes are deliberately sketchy because if you feel the need for detailed instructions, you shouldn't attempt alignment, and would be well advised to return the receiver to the Sole Importers, Lowe Electronics of Matlock, who have the necessary equipment and experience.

R.I.T.:

Connect a frequency counter to the VFO output socket.

1— With the R.I.T. at "O" measure the frequency.

2— Short pins 5 and 7 on the control socket and adjust the variable resistor on the right side of the VFO base to obtain the same frequency reading.

V.F.O. ADJUSTMENT:

First of all, bear in mind that at the price of the Inoue IC-700-R, you will not get perfect V.F.O. linearity over the entire range, but you will nevertheless find it very good. The use of an **accurate** frequency standard is essential. Don't forget that an error of 10 cycles in your 100 kc/s crystal becomes 3 kc/s at 30 mc/s, so check your calibrator against a known frequency standard such as MSF. Also remember that the average crystal calibrator puts out such a whacking signal that it is possible to be misled by spurious signals and mixer products, so be quite sure that the signal you zero beat is the right one. Having satisfied yourself on these points, check through every range plotting the V.F.O. errors.

1— If the error is sensibly constant, it can be corrected by moving the tuning knob skirt relative to the knob and possibly lining up the cursor by moving the scale slightly.

2— If the error increases steadily from 80m to 10m, read the first paragraph again!

3— If there appears to be cause for VFO alignment, the following notes will be of help.

For each band (except 20m) there are two slugs as shown in the diagram. The B slug moves the frequency up or down without sensibly affecting the tuning range. The "A" slug also shifts the freqency but in addition expands or contracts the tuning range.

It is thus a question of expanding or contracting the range with slug "A" and then correcting with slug "B", repeating the adjustments until the best possible accuracy is obtained.

I.F. ALIGNMENT:

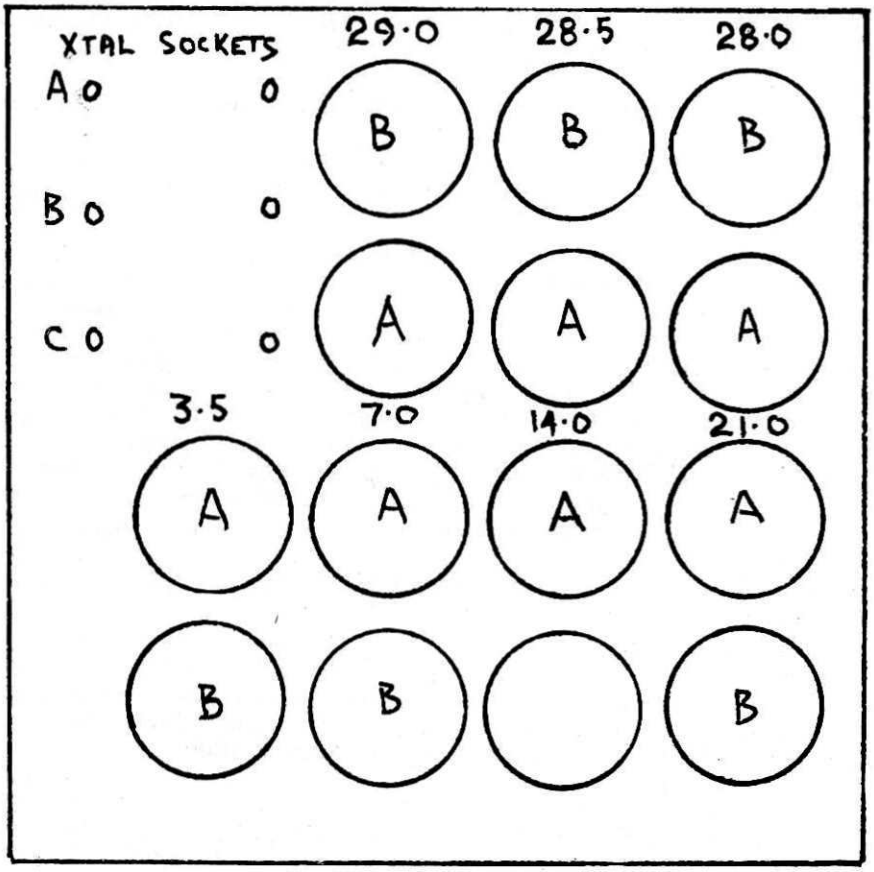
Use standard procedures bearing in mind the neutralizing capacitor on the underside of the I.F. strip.

R.F. ALIGNMENT:

With the R.F. capacitor fully meshed, the side bars which are part of the assembly carrying the R.F. coils, should just touch the capacitor shaft. Then, with the capacitor still fully meshed, peak up the two R.F. slugs on 3.5 mc/s and the rest of the range will fall into line.

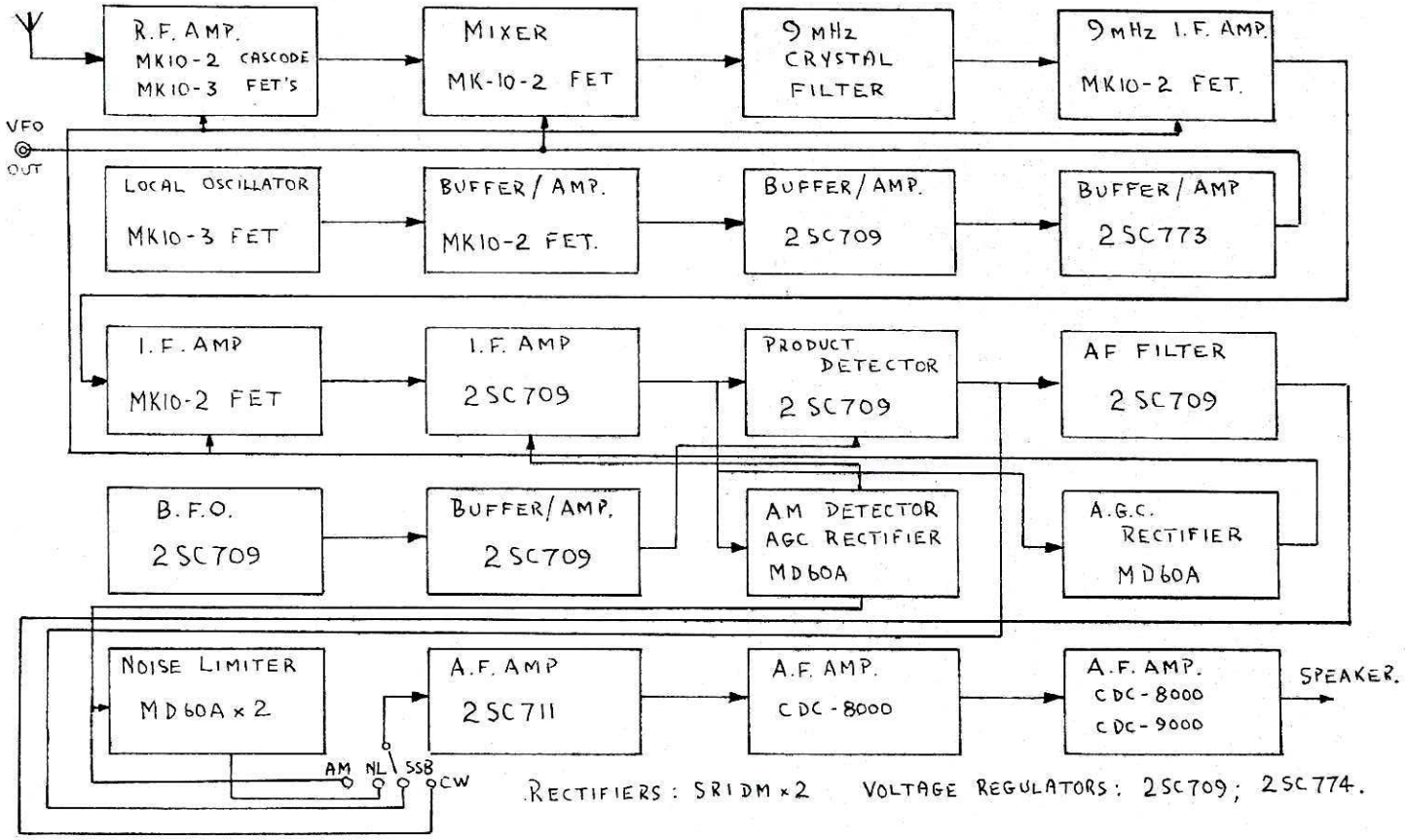
Note that these slugs have lock nuts which must be slackened and without special tools the simplest way is to remove the R.F. deck to get at them. As a check, peak up on 10m, the peaking should be clean. If there is a double hump, adjust **one** of the R.F. slugs slightly.

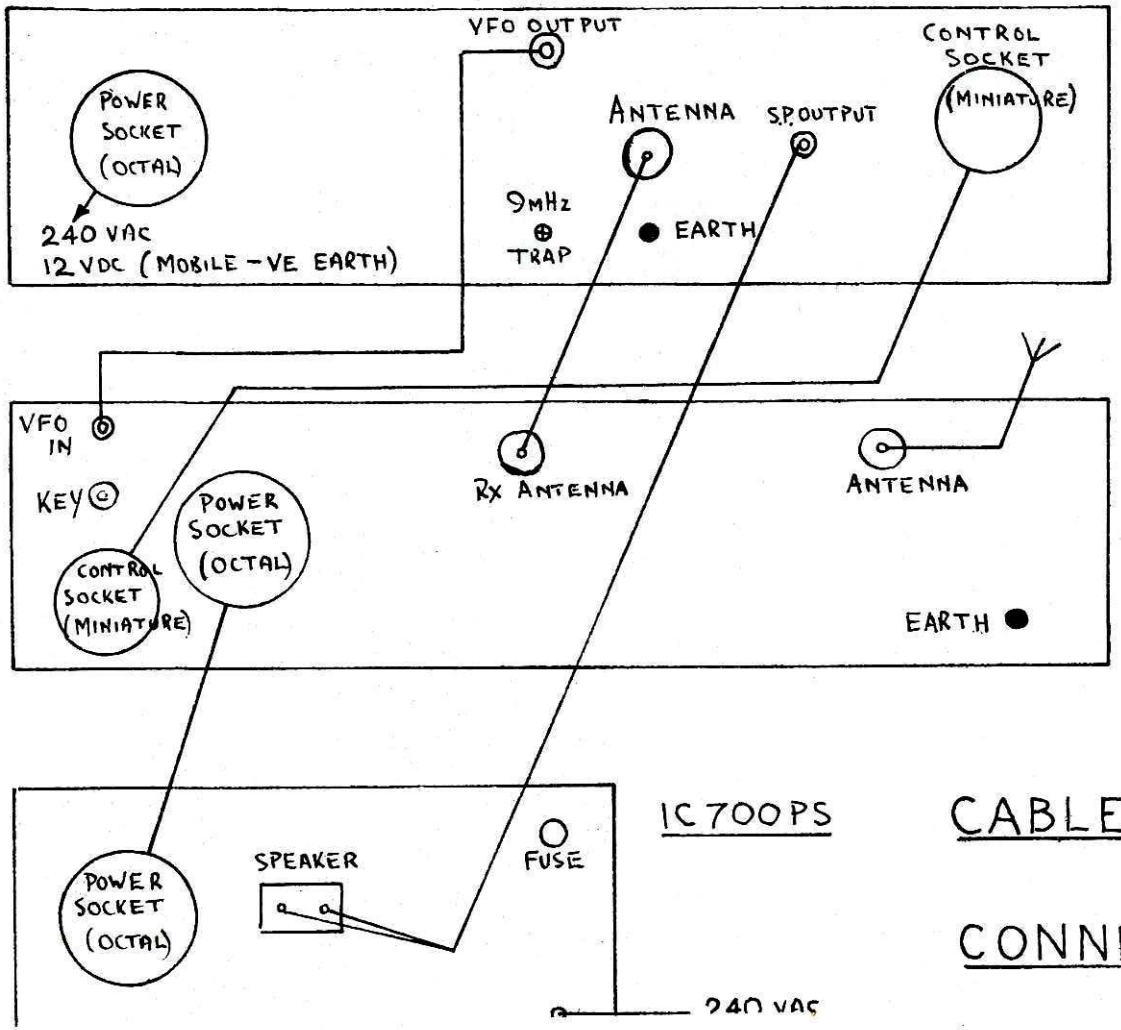
This completes the alignment procedure. If you need help or advice, contact Lowe Electronics of Matlock, who will be only too happy to be of service.



Location of VFO Slugs

BLOCK DIAGRAM



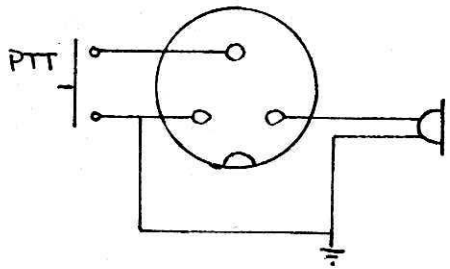


IC-700R

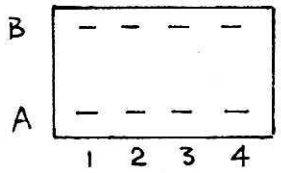
IC-700T

IC700PS

MIC CONNECTION.

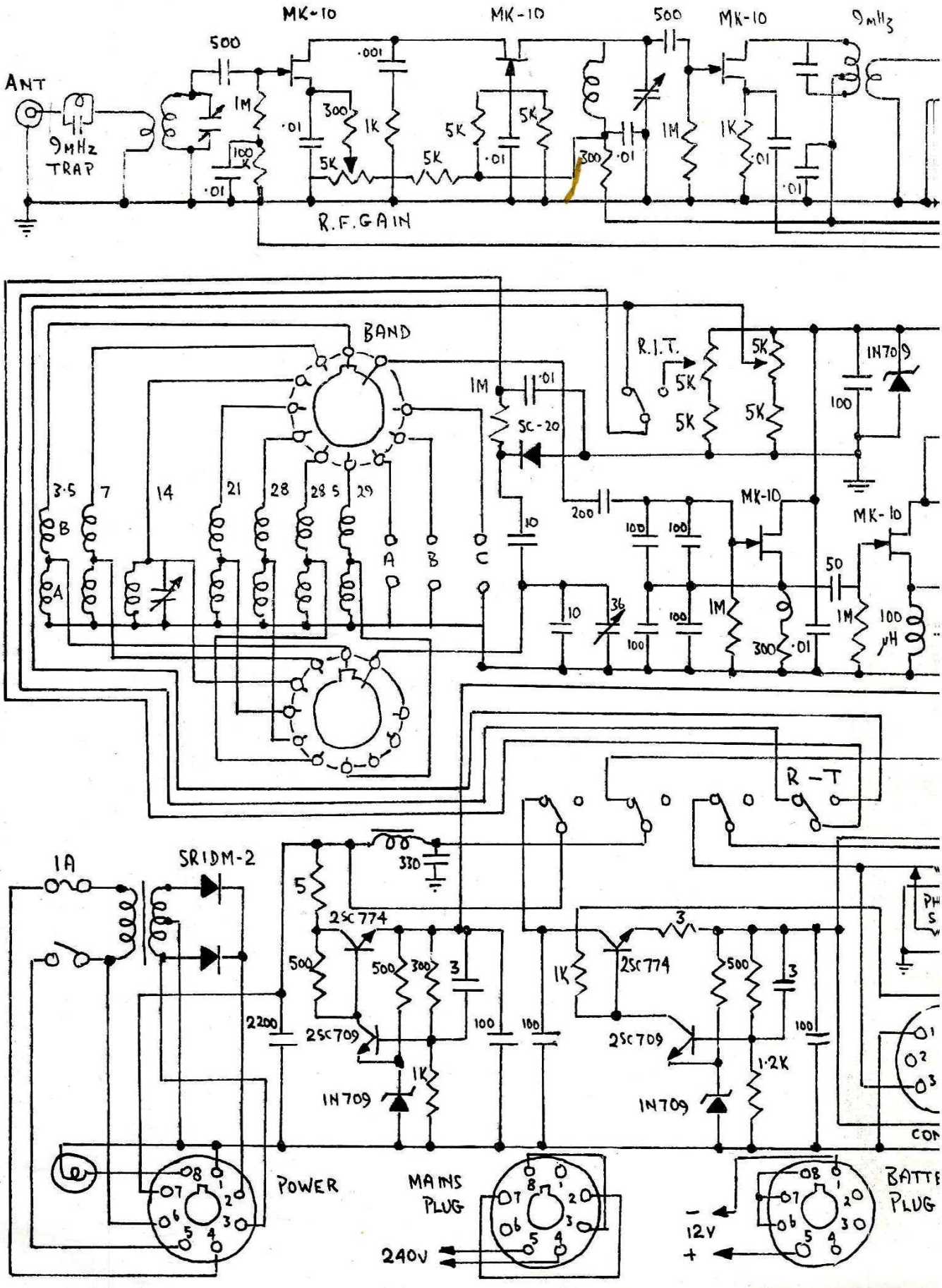


RELAY

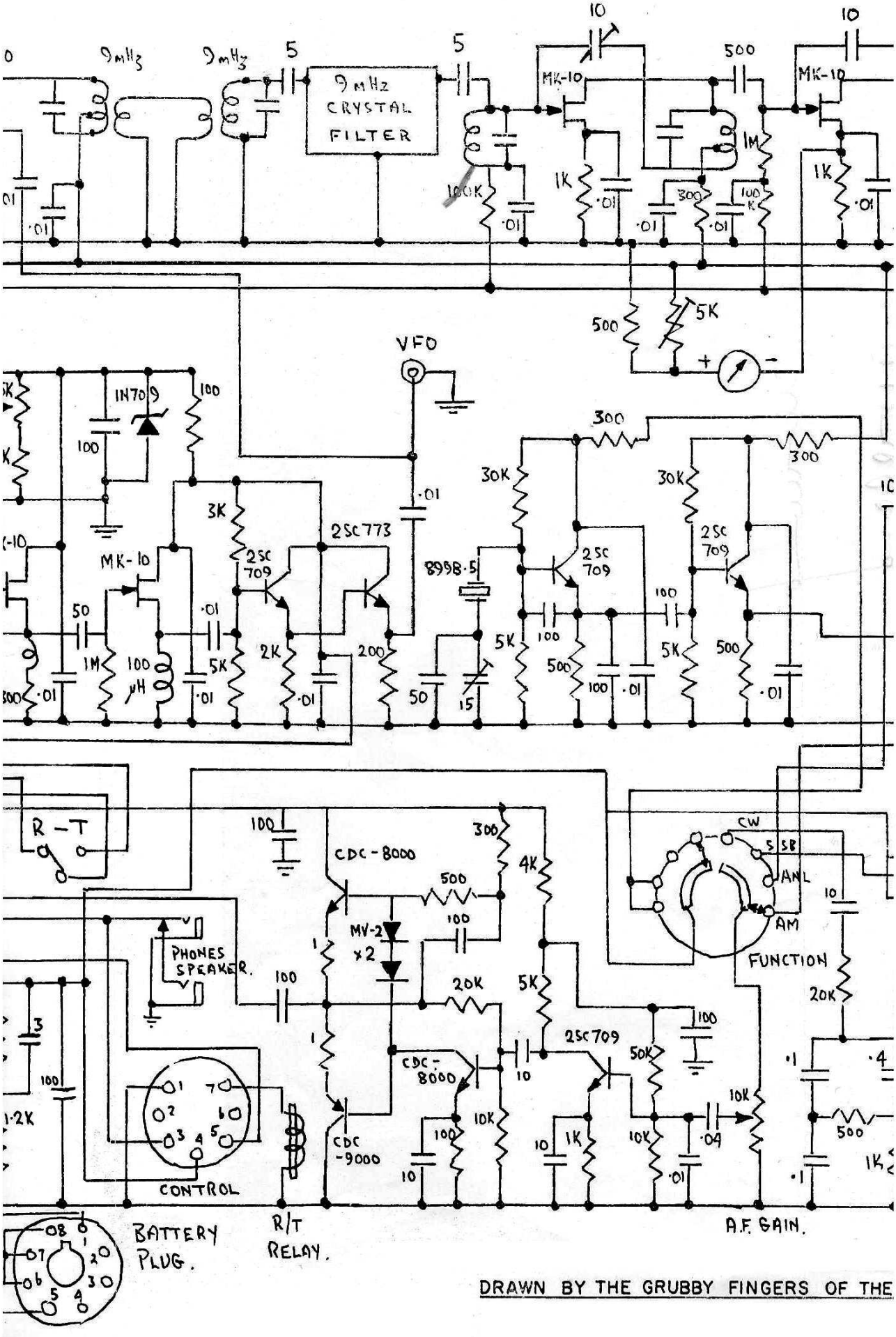


CABLE CONNECTIONS

LOWE ELEC


ANT
9MHz TRAP
500
1M
100K
.01
MK-10
.001
300
1K
5K
R.F.GAIN
5K
MK-10
500
MK-10
9MHz
BAND
3·5
7
14
21
28
28 5
29
A
B
C
R.I.T.
5K
IN709
100
SC-20
200
MK-10
MK-10
50
36
R-T
1A
SRIDM-2
330
2SC774
2200
2SC709
IN709
1K
1·2K
POWER
MAINS PLUG
240V
12V
BATTE
PLUG

LOWE ELECTRONICS IC-700R.



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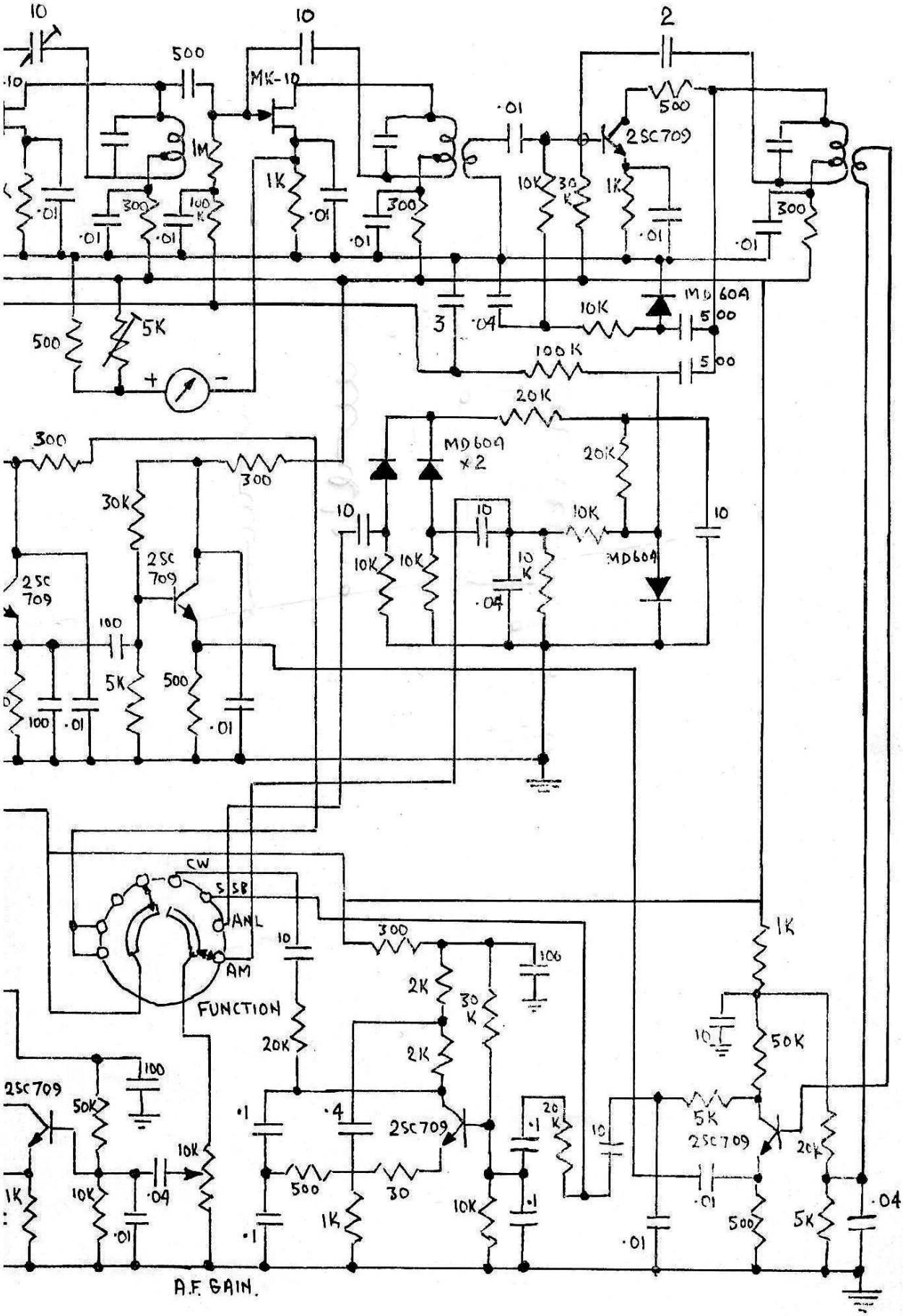

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