

FDK

INSTRUCTION MANUAL

MULTI-700AX

2m FM 1-25W
PLL TRANSCEIVER

Fukuyama

ELECTRONICS CO., LTD.

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GENERAL INFORMATION

The Fukuyama Electronics Co., Ltd. (FDK) Model MULTI-700AX mobile and base station 2 meter transceiver is reliable and "MULTI" functionable amateur radio equipment. It is designed and assembled with selected components to give even characteristics and is all solid-state. In normal use, and with proper care it will give long and trouble-free service.

Communication range depends upon the usual factors such as antenna in use, operating location, RF output power level and band conditions. Read manual carefully before taking the equipment into use.

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OUTSTANDING FEATURES

- **Desirable Synthesizer Selection Plus Free One Memory Function:**

Full an 800 channel from 144.000MHz to 147.995MHz each 5KHz step with these rotary and one push switches free selection frequency. Also desired one channel free memorable frequency from entire the range.

- **Dependable R.F Output Power Module:**

Selectable an R.F Power output from 1 watt to upto 25 watts variable Power control type, employed high efficient hy-brid Power module with dependable performance and stability.

- **Much Improved Cross-modulation and Blocking:**

Employed dual stage an R.F helical-resonator section with dual-gate MOSFET in R.F top circuit.

- **Desirable Offset Function:**

The transmit frequency provided at +/-600KHz shift frequency before shipping factory and set an above frequency also available. Programmable offset frequency appropriated for your local repeater facility.

- **Built-in Automatic Protection:**

In the event of accidental high VSWR open or short circuit antenna output, there is automatic power→ module protection.

- **Employed Power Supply Noise Filter:**

The supply line from battery to the equipment is a common source of high noise level as a conductor of ignition and alternator interference. This is eliminated by an effective line filter associated with the Power unit.

SPECIFICATIONS

GENERAL;

Frequency range:	144.000 - 147.995MHz plus 143.950MHz
Channel capacity:	800 channels plus 143.950MHz, 1 channel
Mode:	F3 (16F3)
Antenna impedance:	50 - 52 ohm (unbalanced)
Supply voltage:	11 - 15 volts D.C (13.8V nominal) Negative GND.
Consumption power:	6.0 amps at 25W transmit, 1.8 amps at 1W transmit, 1.7 amps at Audio max. receive, 1.0 amp at squelched receive.
Temperature range:	-10°C to +60°C degrees
Frequency tolerance:	Within +/-0.002% ref, at 25°C.
Dimensions:	162mm W x 70.5mm H x 260mm D.
Weight:	Approx. 2.3 Kg

TRANSMITTER;

RF output power:	1 - 25 watts (continuous)
Modulation:	Variable reactance frequency
Frequency deviation:	+/-5KHz max. (factory preset)
Spurious and Harmonics:	Less than 65 dB
Offset frequency:	+/-600KHz and programmable frequency upto 1.6MHz
Optional tone function:	Burst: 1,750Hz +/-1Hz, approx. 1 second duration Squelch: Standard EIA frequency continuous
Microphone sensitivity:	-43 dBm dynamic, 600 ohm with PTT function switch

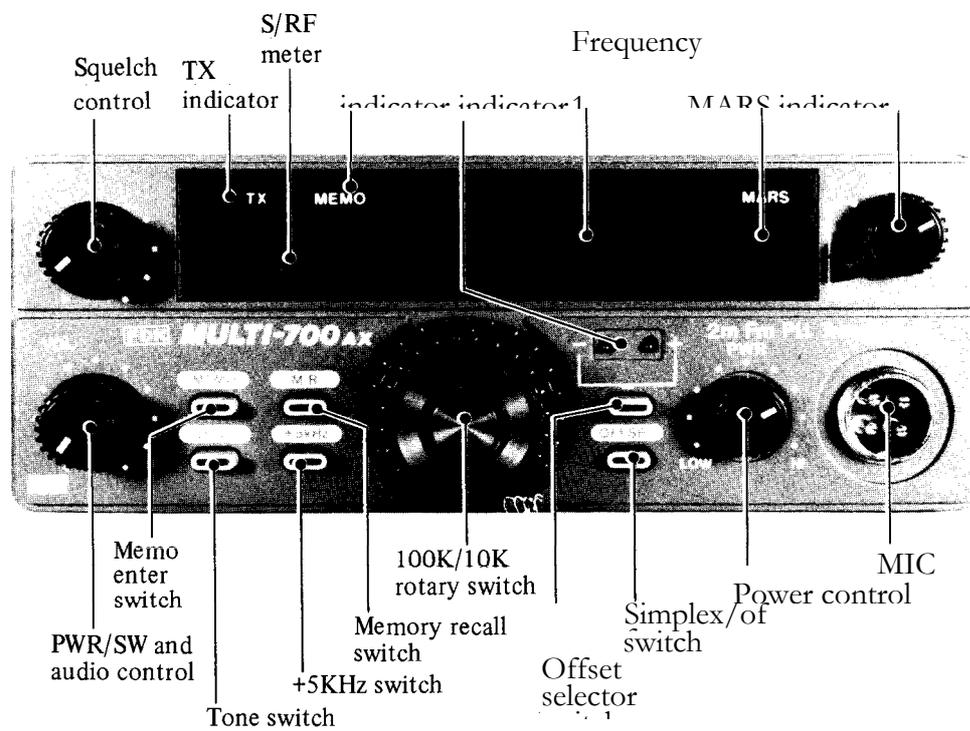
RECEIVER;

Receiving method:	Double superheterodyne
Sensitivity:	Less than 0.4mV at 20 dB N.Q.
Squelch sensitivity:	-5 dBu (threshold)
Intermediate frequency:	1st 16.9MHz 2nd 455 KHz
Spurious & image rejection:	Less than 60 dB
Selectivity:	More than +/-6KHz at -6 dB Less than +/- 12KHz at 70 dB
Audio output power:	Max. 1.8 watts at 10% THD.
Audio impedance:	an 8 ohms

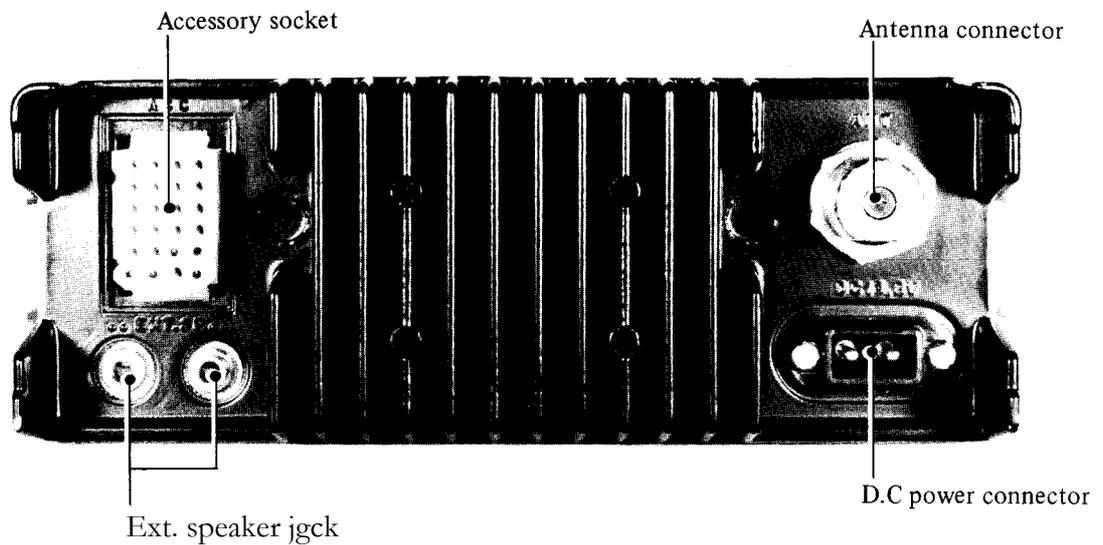
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CONTROL AND LAYOUT

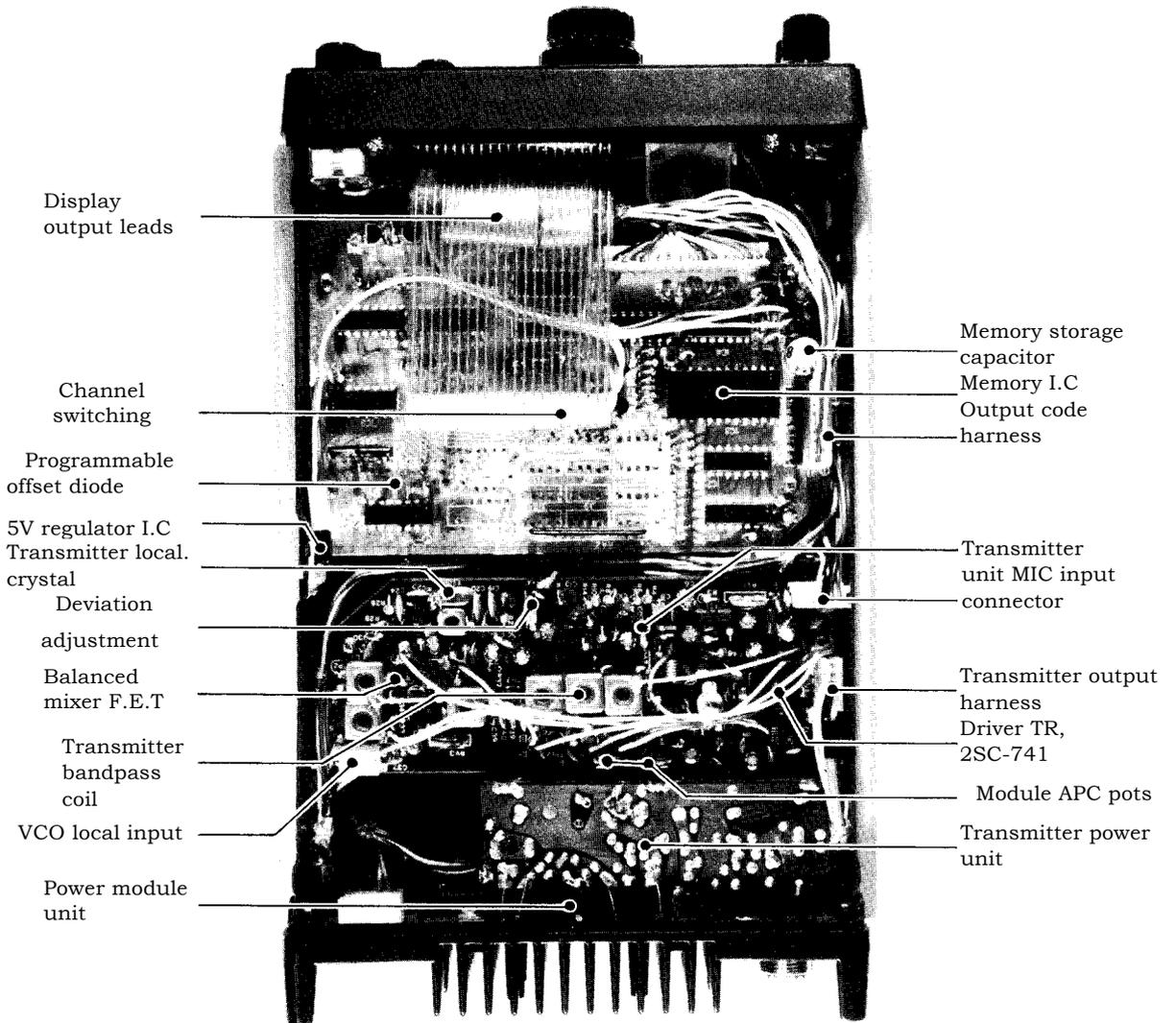
FRONT VIEW



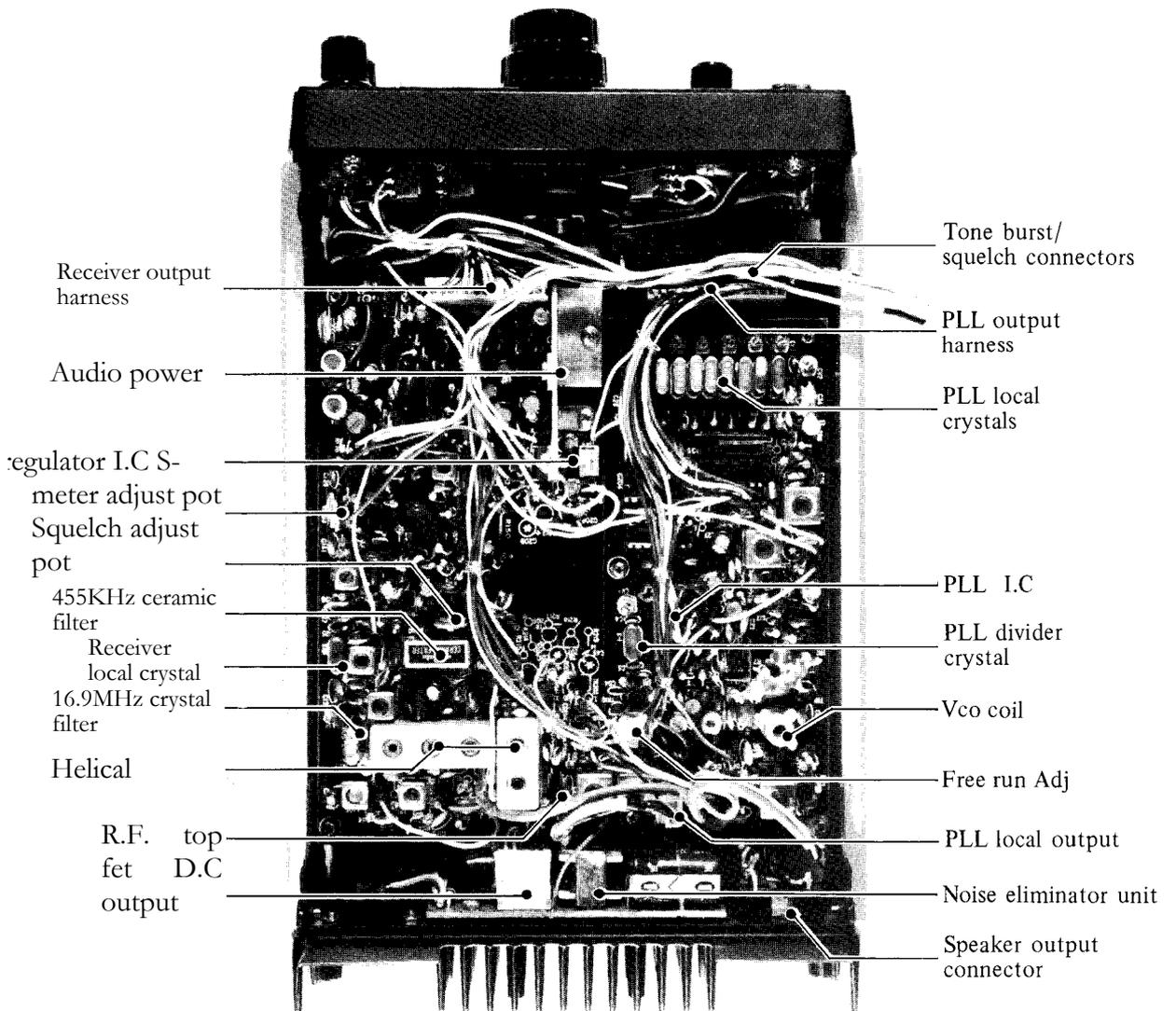
REAR VIEW



TOP VIEW WITH COVER REMOVED



BOTTOM VIEW WITH COVER REMOVED



NAME OF FUNCTION

* S/R/F METER

Indicates the strength of incoming signals on **receive, and gives a relative power output indication** on transmit.

The normal reading at full power output is approx. 80% of full scale but, can vary higher or lower if the antenna matching (SWR) is higher than usual.

* OFF/VOL CONTROL

This is combined ON/OFF power switch and volume control, which sets the received signals to a comfortable level.

* SQUELCH CONTROL

The squelch control is used to mute the receiver in the absence of incoming signals, and removes the annoying rushing sound that would otherwise be present. It is normally rotated clockwise until the background noise just disappears without an incoming signal. To advance the control beyond this point could mean missing a weak signal.

* MEMO/M.R FUNCTION

Desired a frequency into the memory function, selects the frequency from SYNTHESIZER channel. Then, push the M.R (Memory Recall) switch and depress the MEMO switch. Desired frequency has memorized with memory channel. Should be returned to SYNTHESIZER position when released the M.R switch.

* TONE SWITCH

Desirable installed a Tone-Burst or Tone Squelch unit (option) operable function switch give for repeater operation.

* +5KHz SWITCH

Synthesizer operation an additional 5KHz step push switch, direct shown on the last digit frequency display.

* 100K/10K SELECTOR SWITCH

In most usage 100KHz order outer and 10KHz inner knobs of synthesizer rotary switch gives Binary Coded Decimal programming PLL code shown direct LED frequency display.

* OFFSET SWITCH

Selects offset frequency -600KHz or +600KHz operation for local repeater use, if in simplex operation, should be released position at lower switch.

If required for local offset frequency program, shown above OFFSET FREQUENCY PROGRAM page.

* POWER CONTROL KNOB

This knob is an R.F output power control for continuously covering 1 watt minimum through upto 25 watts adjustable. As general indication, 12:00 at approx. 2-3 watts and 3:00 at approx. 10 watts obtained.

* MIC CONNECTOR

The unit supplied with a correct Push-To-Talk hand type microphone. When replacement, use dynamic type of 500600 ohms impedance will be suitable, but consult schematic diagram for further detail and wiring.

* SELECTOR SWITCH

Change the Megahertz frequency from 144MHz to 147MHz independently, plus factory provided 143.950MHz in simplex MARS frequency operation.

This 143.950MHz MARS simplex frequency may not gives offset facility and memory functions.

* FREQUENCY DISPLAY

Four digit red LED give an accurate frequency display from desired synthesizer frequency or memory channel, even offset transmission frequency if switched offset function. Except MARS frequency, MARS position only gives right hand a LED indicator.

*** ACCESSORY SOCKET**

This is for use with extension controls - see schematic diagram for connections.

*** EXT. SPEAKER JACK**

o Internal speaker disconnected.

99 Both Internal and External speaker live.

*** ANTENNA CONNECTOR**

This female SO-239 coaxial connector for connects to a suitable resonated 2 meter antenna. If the antenna or cable is open or shorted, will automatically operates transmitter power protection circuit.

*** D.C 13.8V POWER**

Battery voltage should be checked on transmit load as if this falls much below than 12 volts, an output power, stability and, quality will insufficient. Must be correct connection battery polarity with supply BLACK/RED twin cable.

When used power supply unit, it must be of a regulated type and capable of more than 6 Amps at 13.8 Volts for full 25 watts an output obtained.

ACCESSORIES

This transceiver with attached an accessories under following;

Microphone with connector	1
Black/Red power cord with plug	1
Mounting bracket with screws	1
Desk top angle	1
Speaker plug & fuse	ea 1
Microphone hanger with screws	1
Instruction manual	1

GENERAL OPERATION

Connection properly D.C power cable for power source, antenna connector for antenna and plug into the microphone before operates receiving and transmitting.

RECEIVER OPERATION:

The receiver becomes operative when the audio volume control is rotated clockwise. The power supply switch is a part of the volume control and power is "ON" unless turned fully counterclockwise. Adjust audio volume control to appropriate sound level.

The -squench control should be set either just below noise level, or at a setting that will open the receiver at a desired level of incoming signal.

The synthesizer MHz, 100K/10K rotary and offset normal or reverse and/or programming switches must be set in appropriate positions. Operation of the "+\$KHz" push button switch will give this facility if required.

REMOVAL OF TOP/BOTTOM COVERS AND FRONT/CHASSIS PANEL

TOP COVER:

When removed, this will give access to;

- 1) Channel switching selector board with OFFSET frequency program circuit.
- 2) Transmitter board.
- 3) Part of the Transmitter power board and Accessory connector.

Remove the four black screws. Slide back and lift to clear.

BOTTOM COVER:

When removed, this will give access to;

- 1) Main PLL board, with PLL local crystal and Main receiver board with Helical-resonator and optional Tone unit installation.
- 2) Power protect diode with Noise eliminator power board.

Remove the four black screws, slide way back to rear panel, and slightly lift. It may also be necessary to remove speaker connector leads from the receiver board.

TRANSMITTER OPERATION:

It is operating practice to use the minimum an R.F power output to secure good communication according to distance and back conditions. Output level is controlled by the "PWR" knob setting.

The transmitter becomes operative on FM(voice) with the microphone connected and Push-To-Talk switch depressed.

If memory channel operation, just depress the M.R (Memory Recall) push switch, also operates memory channel to be offset function if switched.

FRONT/CHASSIS PANEL:

It is necessary to remove both TOP/BOTTOM covers (see above) and both end hanger rails before removal of the Front panel and Front Chassis mount.

Removal of Front/Chassis panel gives access to;

- 1) VOL/SQ, BCD ROTARY SWITCH, PWR CONTROL and MHz SELECTOR switches.

If further access to Chassis is required, first remove the two Philips (metalized) top and bottom screws and the two black screws at both end mid-panel height.

Remove slowly with great care and it may also be necessary to disconnect the ribbon wires from their channel switching board connectors. (Straight slow pull from connectors. DO NOT BEND OR FOLD THESE WIRES.)

WARNING

THE ABOVE PANELS AND COVERS SHOULD BE REMOVED IF THE OWNER HAS THE NECESSARY TECHNICAL ABILITY TO CARRY OUT THE REQUIRED ADJUSTMENT ONLY. SUITABLE TEST EQUIPMENT AND TOOLS MUST BE AVAILABLE. OTHERWISE REFER TO DEALER FOR SERVICE OR MAINTENANCE.

OFFSET FREQUENCY PROGRAM

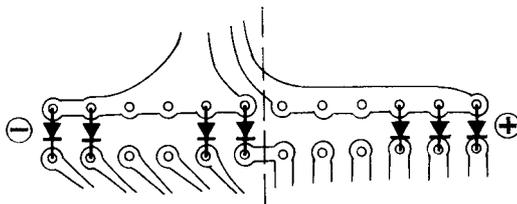
The offset frequency has been programmed +/-600KHz before shipping factory. If use your local repeater access frequency, modification method under above following.

MODIFICATION:

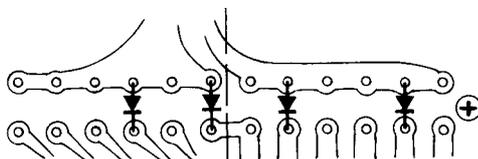
- 1) Remove the **an upper cover, upper** side right hand of the channel switching board, (see above illust.).
- 2) Further carefully remove the 3 terminal regulator I.C mounted plastic screw from chassis, (should be use fitted with the Philips type screw driver) and four edges of screws from channel switching board.
- 3) The channel switching board (program side) turn-up only 45 degrees from chassis surface (if necessary remove bottom side PLL output harness).

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2. +/-700KHz program



4. +/-1,200KHz program



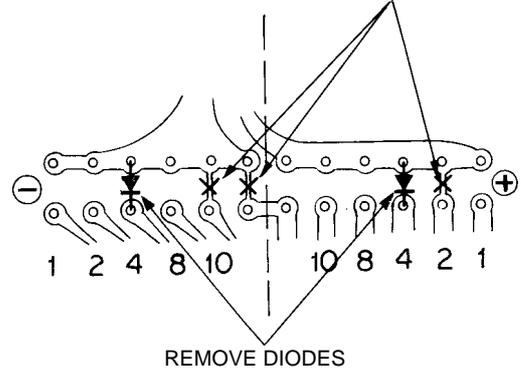
NOTE:

Modification diodes are not provided with the transceiver, could be use any kind silicon type diode (example; 1N-914, 1S-1588 etc.).

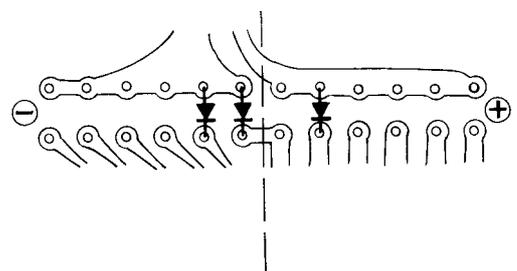
Programmable frequency each individual, may not necessary cut the pattern and remove diode, if required keep the "-600KHz" position left side from the dot line.

1. +/-600KHz (before modify)

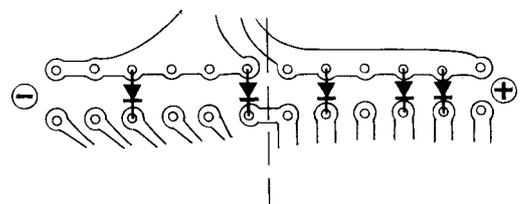
Cut the pattern and remove a diode. CUT



3. +/-1,000KHz program



5. +/-1,600KHz program

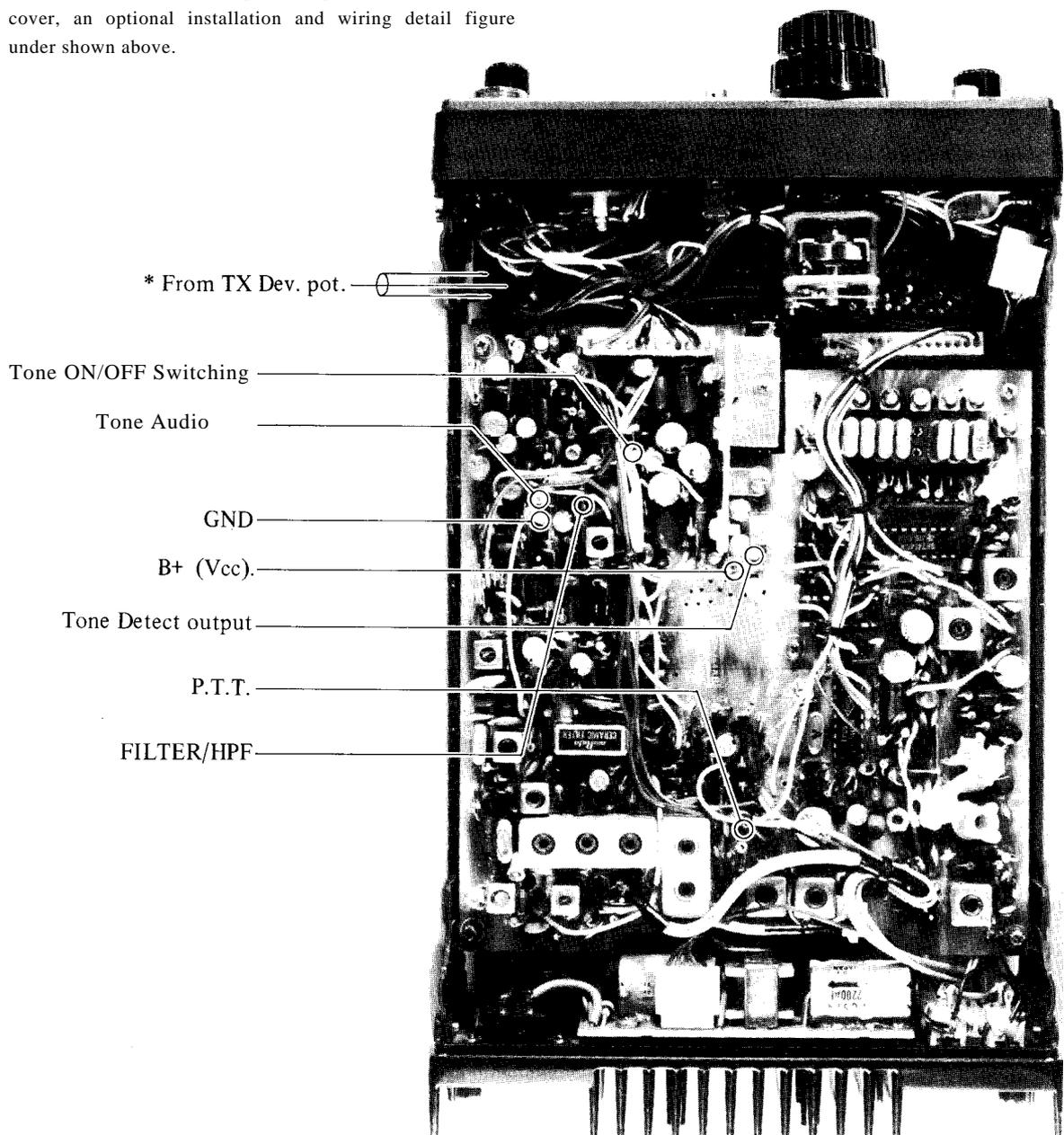


TONE SQUELCH/BURST INSTALLATION

This unit provide "Tone Squelch" a capability to exclude unwanted transmissions by allowing the receiver to respond only to an appropriate tone coded signal system or "Tone Burst" for an open the repeater station facility system for one of each unit are available to installation.

BOTTOM SIDE RECEIVER BOARD

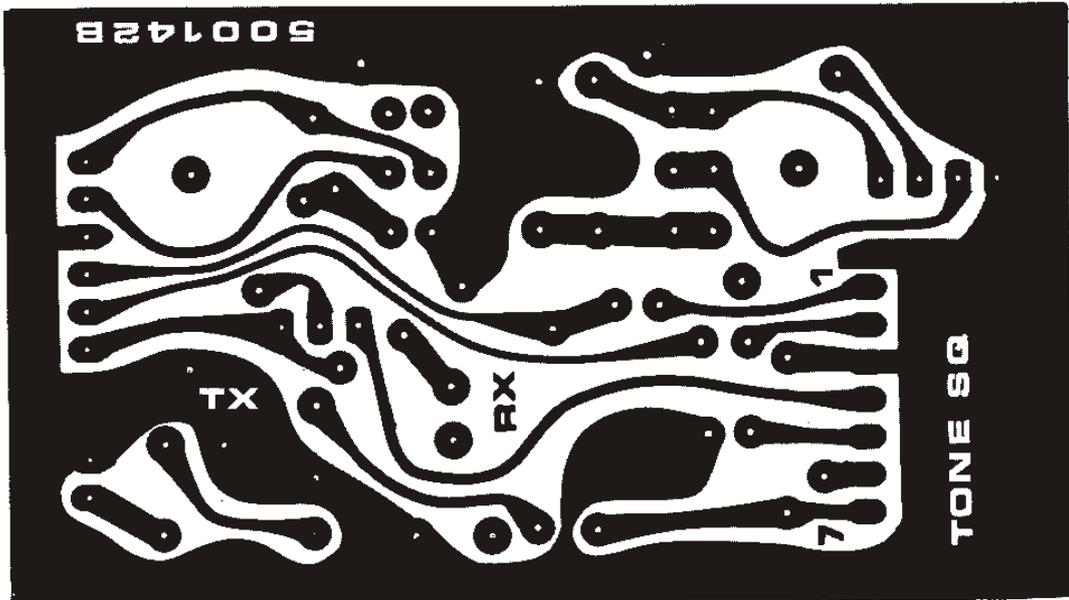
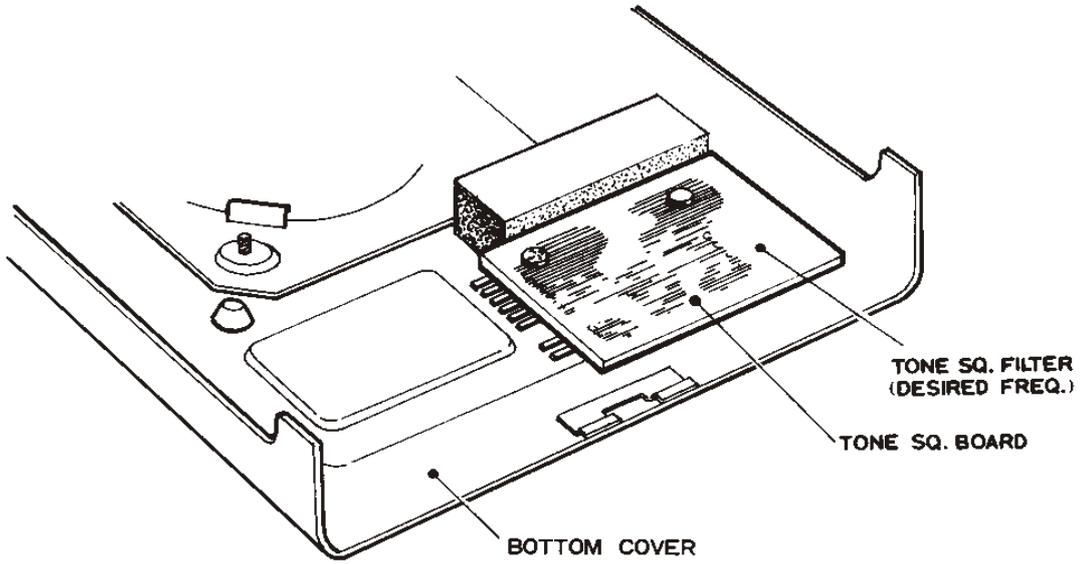
For both unit installation space at speaker side of bottom cover, an optional installation and wiring detail figure under shown above.



NOTE:

The Tone Squelch unit may also be available to use a TS-1 made by communication specialists co., wiring connection see above instruction sheet and above pin wiring schematic.

STONE SQUELCH/BURST INSTALLATION

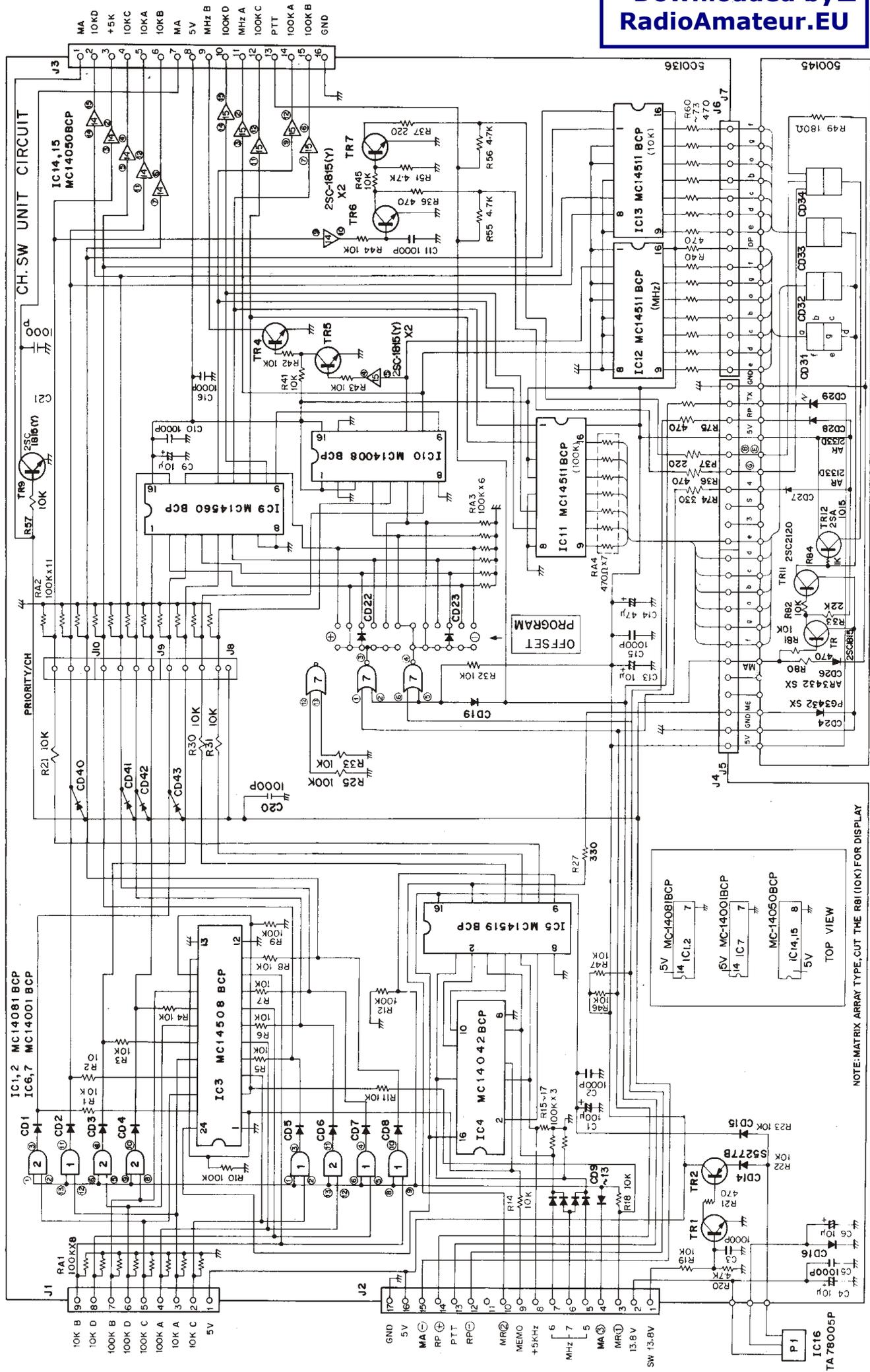


FILTER ELEMENT SOLDERING →

NOTE:

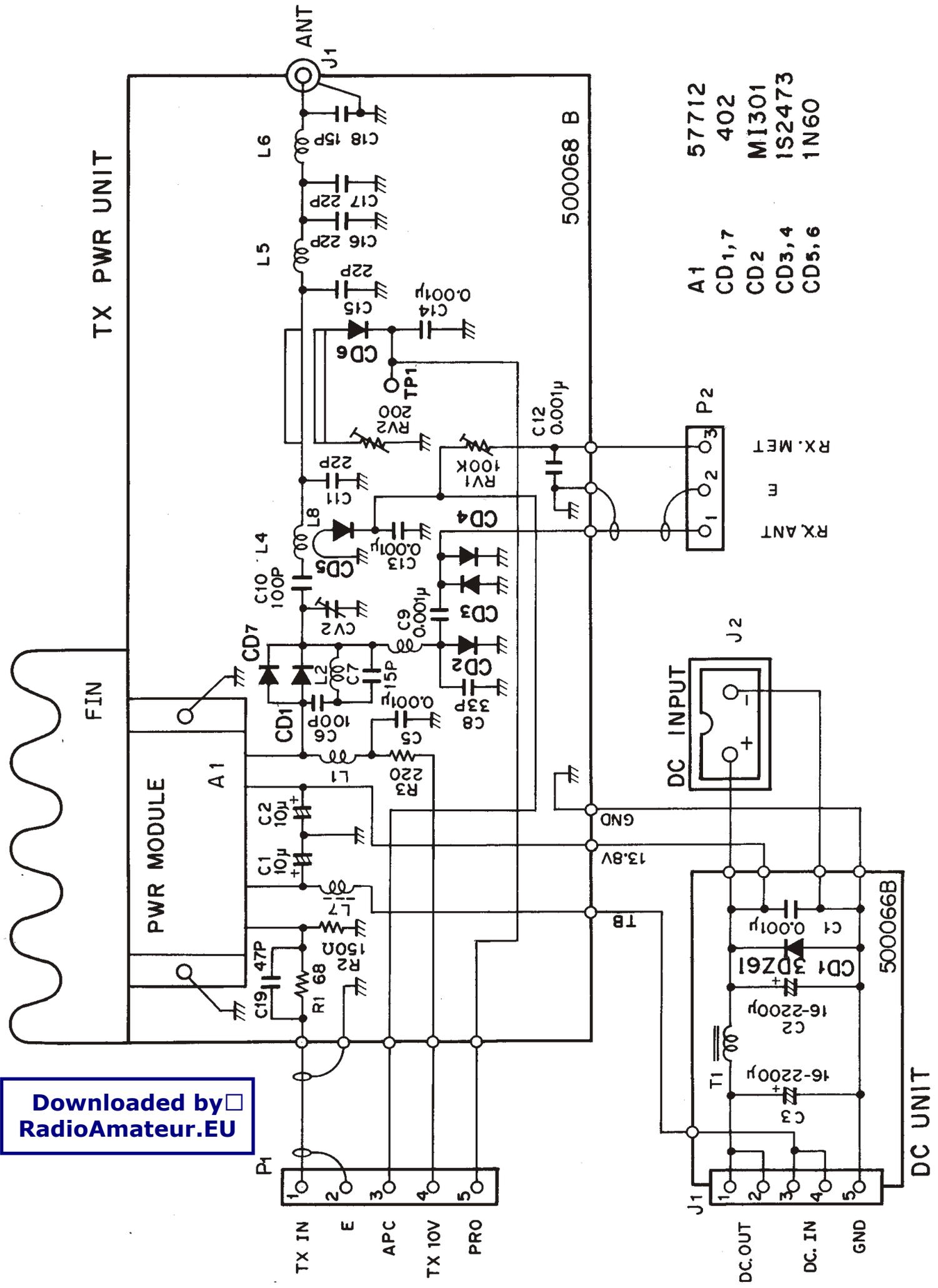
The installed board has normal an R.F power switching function board only. Should be exchanged a whole board and connections when instal above tone unit.

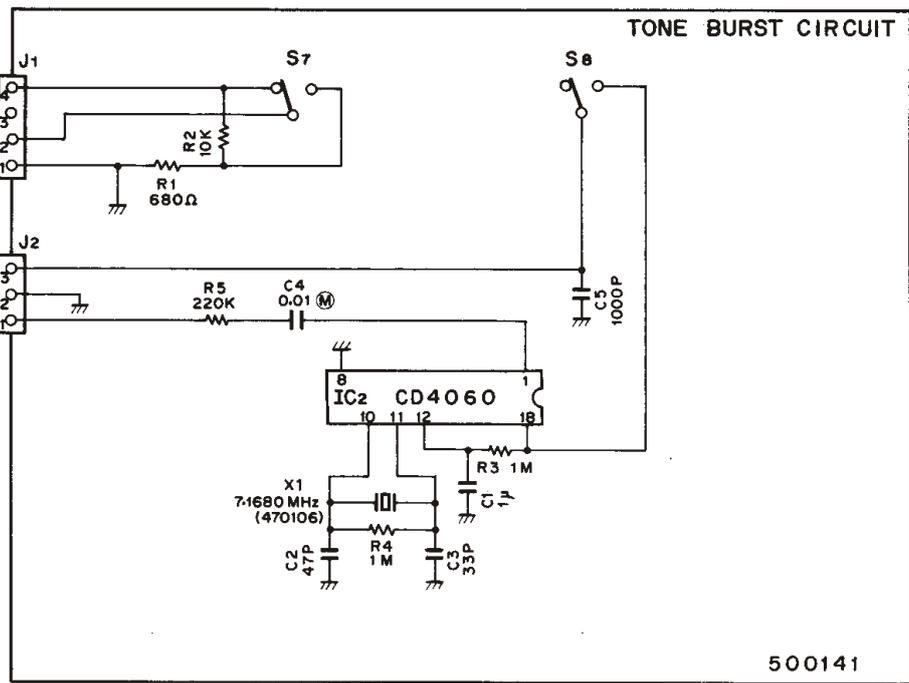
CH. SW UNIT



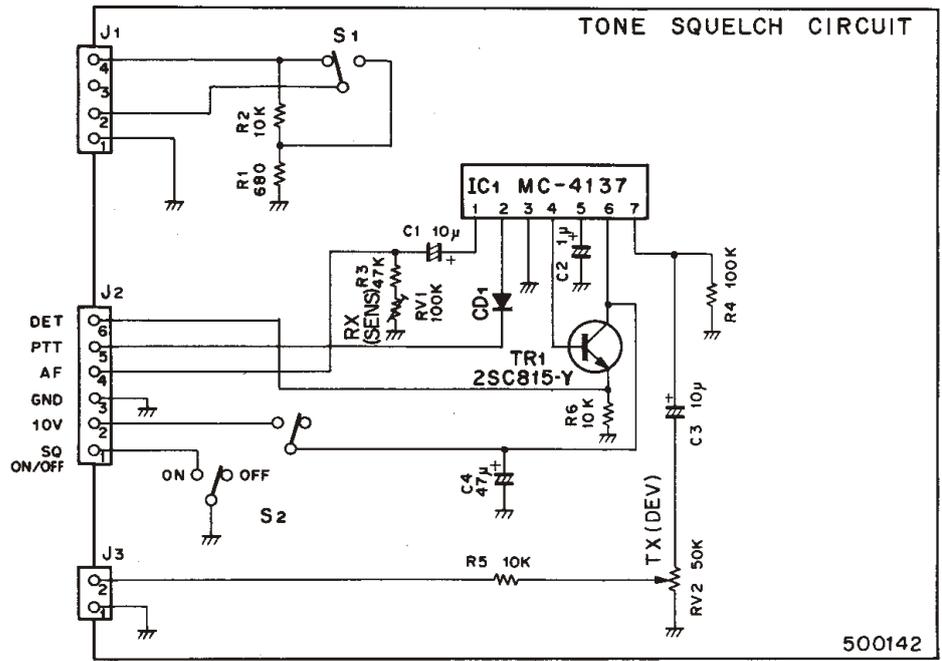
TR1, 3~7 2SC1815(Y) TR2, 2SA1020(Y) CD1~13, 15~23, 35 1S2075K CD31~34 TLR313

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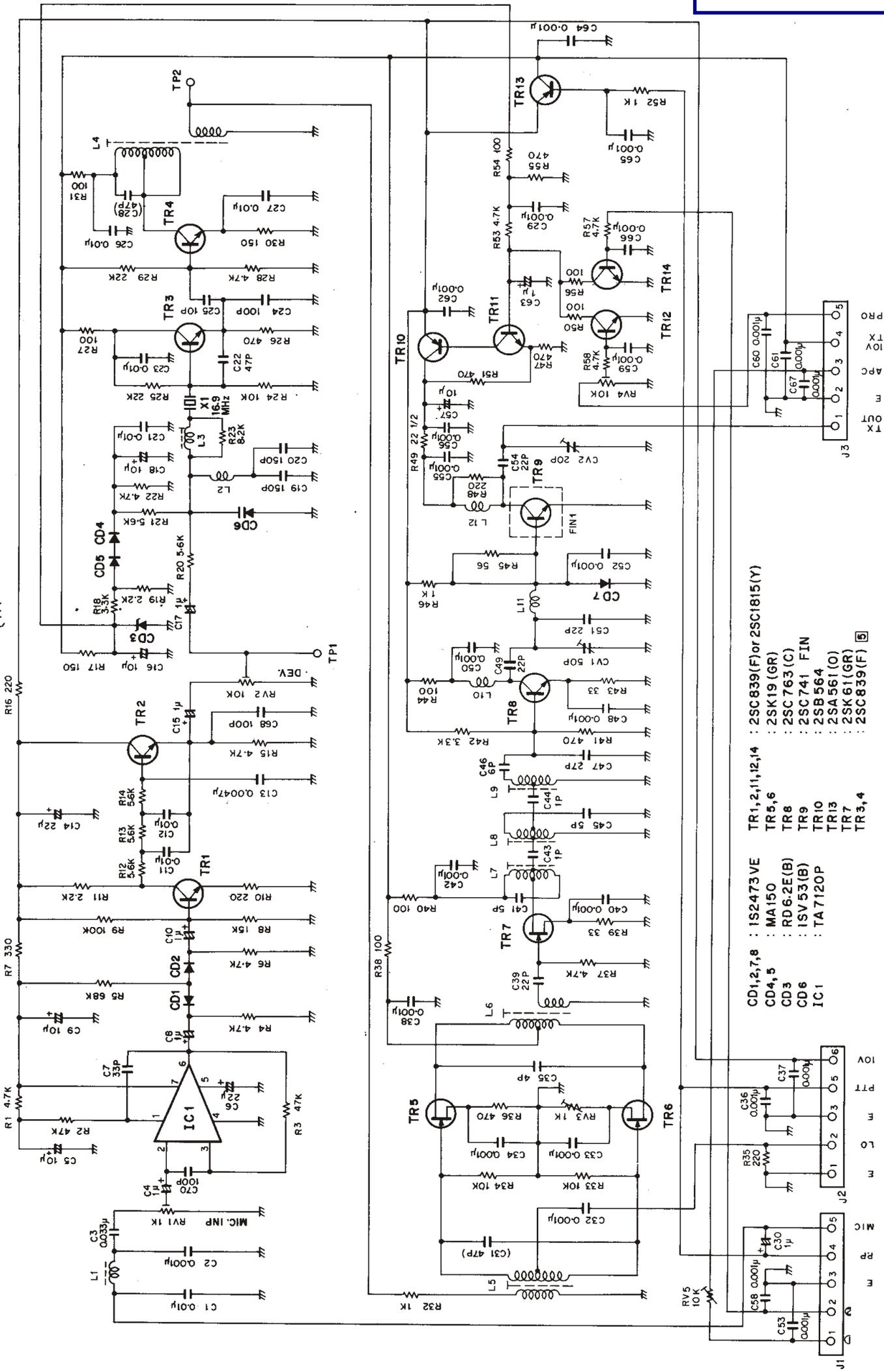




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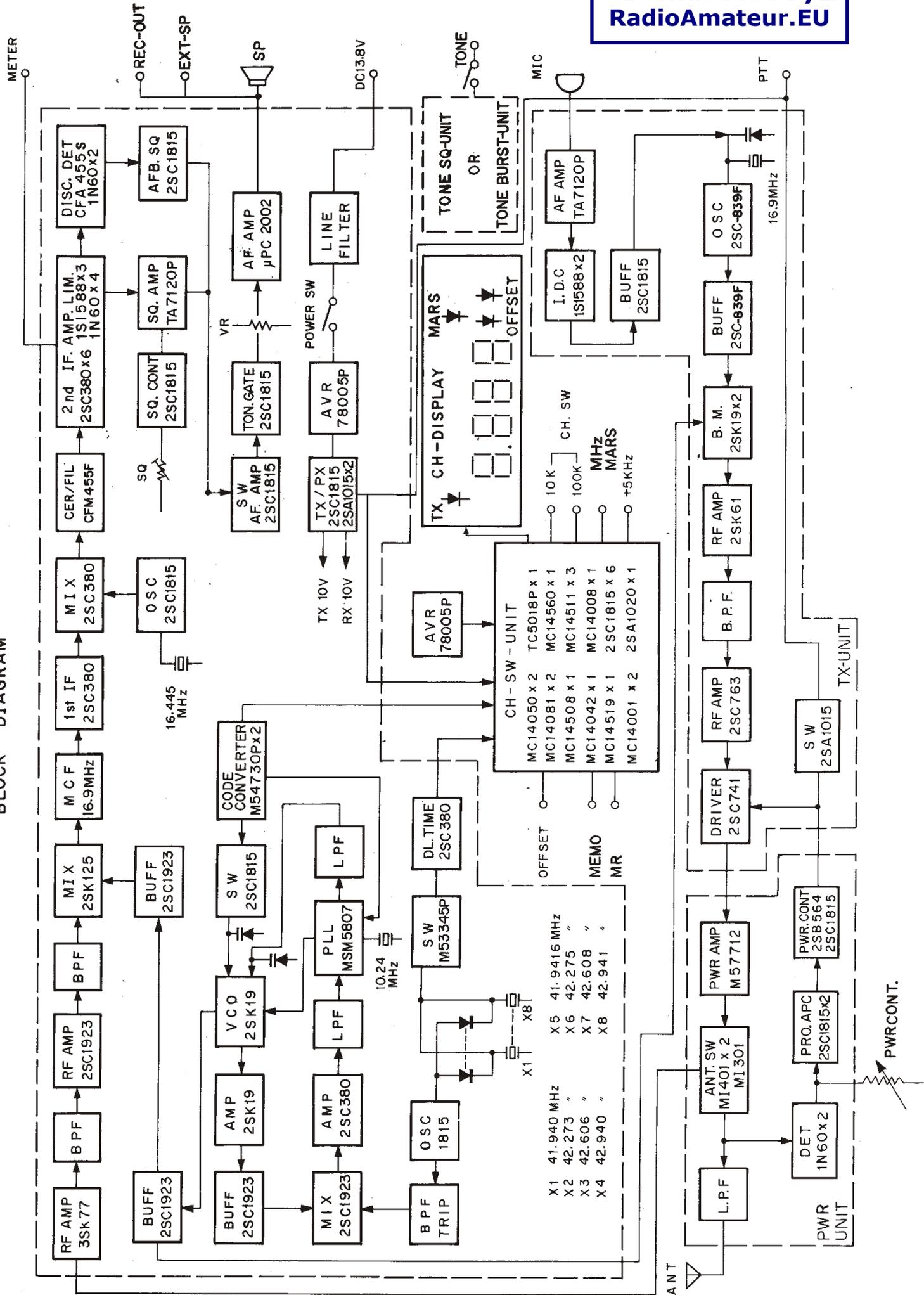


(TX UNIT)

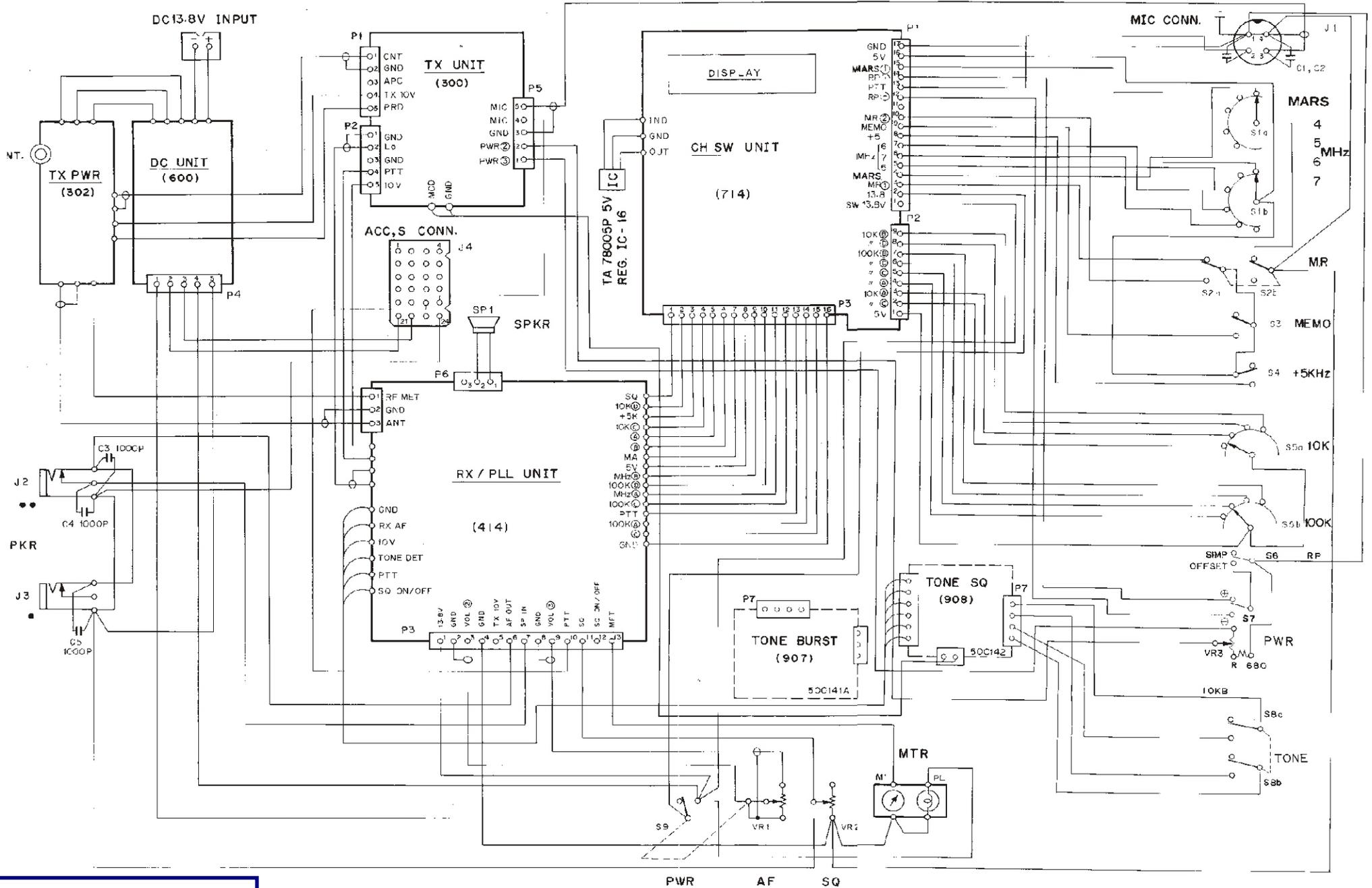


- CD1,2,7,8 : 1S2473VE
- CD4,5 : MA150
- CD3 : RD6.2E(B)
- CD6 : ISV53(B)
- IC1 : TA7120P
- TR1,2,11,12,14 : 2SC839(F) or 2SC1815(Y)
- TR5,6 : 2SK19(GR)
- TR8 : 2SC763(C)
- TR9 : 2SC741 FIN
- TR10 : 2SB564
- TR13 : 2SA561(O)
- TR7 : 2SK61(GR)
- TR3,4 : 2SC839(F)

BLOCK DIAGRAM



MULTI-700AX ASSEMBLY DIAGRAM



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