

IC-756 Pro III vs. Pro II

Improvements in the Pro III vs. the Pro II

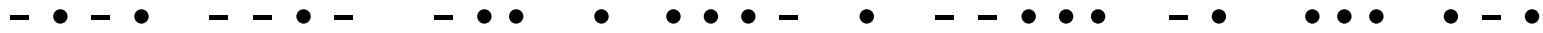
Adam Farson

VA7OJ

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Pro III and Pro II compared



IC-756Pro III



IC-756Pro II

Brief History of the Icom IC-756 Series



- **IC-756 (1997):** Hybrid design – analogue IF, crystal filters, 15 kHz IF-DSP. RX tasks: Demodulation (except AM/FM), Noise Reduction, Auto Notch, CW APF. TX tasks: Modulation (except FM), Mic Equalization. Also: 4.9” LCD display screen, Spectrum Scope, Dual Watch, ATU, DDS synthesizer.
- **IC-756Pro (1999):** First **100% IF-DSP** Icom transceiver. 36 kHz IF DSP. TFT LCD colour display screen. RX tasks: All above + AM/FM demodulation, variable IF filters & tunable notch (no crystal filters), RTTY decode. TX tasks: all above + FM modulation, compression, IF-level Monitor, selectable SSB occupied bandwidth & CW rise-time. More sensitive Spectrum Scope. Improved, quieter DDS. Voice record/playback.
- **IC-756Pro II (2001):** Many improvements over IC-756Pro. RX tasks: all above + improved front end, selectable DSP IF filter shape factors, CW filters available in data modes, dedicated RTTY filters. TX tasks: all above. Adjustable Noise Blanker threshold.
- **IC-756Pro III (2004):** Further improvements over IC-756Pro II. Complete front-end redesign for +30 dBm IP3 (50 kHz). ***More details follow...***

Summary of IC-756Pro III Improvements vs. IC-756Pro II



- **Technological & Performance Improvements:**
 - ◆ Much stronger receiver front end employing IC-7800 technology
 - ◆ Improved DSP algorithms: better Noise Reduction (NR), CW filters and QSK
- **New “Mini-Scope” screen presentation:**
 - ◆ Spectrum scope normally occupies lower half of screen, but can be switched to half-height to allow display of 3 fields instead of 2 (frequencies, scope and menu or bar-graph meter scales.)
- **Programmable SSB TX occupied-bandwidth settings**
 - ◆ Upper & lower cutoff frequencies of WIDE, MID, NAR TX audio response selections can be set independently:
 - ▶ Lower: 100, 300, 500 Hz.
 - ▶ Upper; 2.5, 2.7, 2.9 kHz.
- **Miscellaneous new features:**
 - ◆ Improved EMC filtering in DC power feed
 - ◆ Improved RX-ANT input excess-power protection
 - ◆ “Stock” 60m band SSB TX coverage (*5 US channels, 1 UK channel*)
 - ◆ Storage for 8 canned RTTY messages (*up to 62 characters each*)
 - ◆ Dual clock display with programmable time offset
 - ◆ New ITU Morse “@” symbol
 - ◆ Screen-saver (*black field with programmable owner callsign*)

IC-756Pro III Front End Redesign

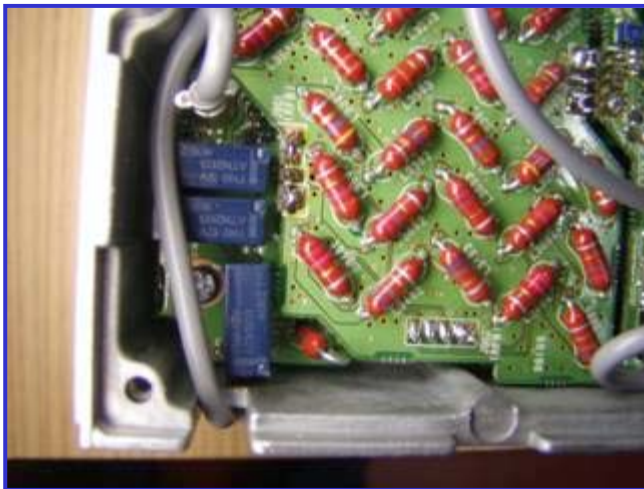


- **New RF BPF board**
 - ◆ larger inductors and better diodes, to reduce strong-signal IMD.
- **New RF Preamp 1 based on IC-7800 design**
 - ◆ Low-noise, push-pull BJT circuit with larger coupling transformers and negative feedback has better linearity and lower power gain without degrading noise figure.
- **New RF Preamp 2 with “hot” transistor**
 - ◆ $f_t = 3.5$ GHz. Improved noise figure & dynamic range on bands > 21 MHz.
- **New Quad-JFET 1st Mixer**
 - ◆ Doubly-balanced design with higher LO drive offers much-improved dynamic range & strong-signal handling. Gain is 6 dB less than that of IC-756Pro II 1st mixer.
- **New 1st IF roofing filter ($f_o = 64.455$ MHz, BW = 15 kHz)**
 - ◆ Daishinku fundamental-mode monolithic crystal filter (as used in IC-7800) has improved shape factor and is less susceptible to IMD than overtone-mode filters used in IC-756Pro II.
- **Gain distribution optimized for higher dynamic range**
 - ◆ Improved overall sensitivity; spectrum scope also 6 dB “hotter” than in IC-756Pro II.

RF BPF Board Comparison



IC-756Pro III RF BPF Board



IC-756Pro III Preamp 1 Board



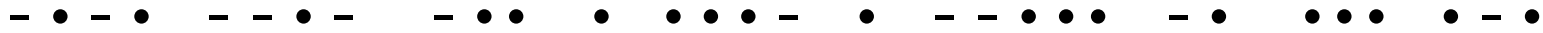
IC-756Pro II RF BPF Board



Preamp 1

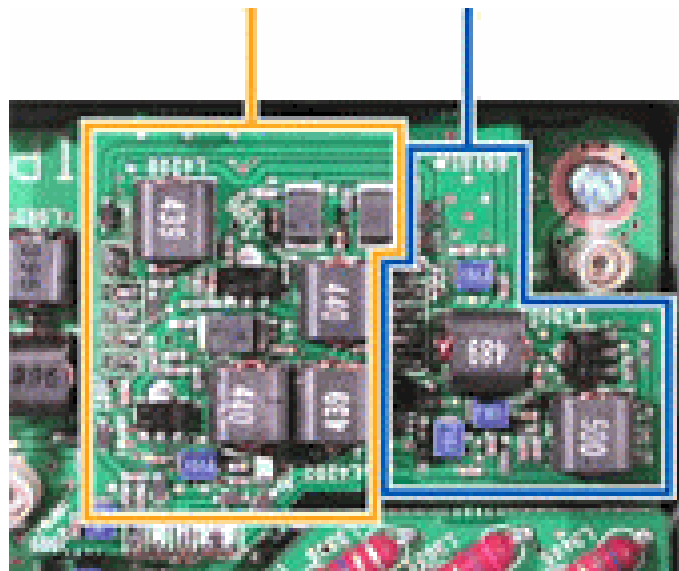
Note larger inductors and coupling transformers as compared to IC-756Pro II. This change reduces the risk of intermod due to core saturation at high signal levels.

IC-756Pro III Preamps 1 & 2



IC-756Pro III Preamps 1 & 2

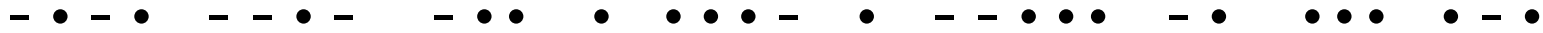
Pre-amp 1 Pre-amp 2



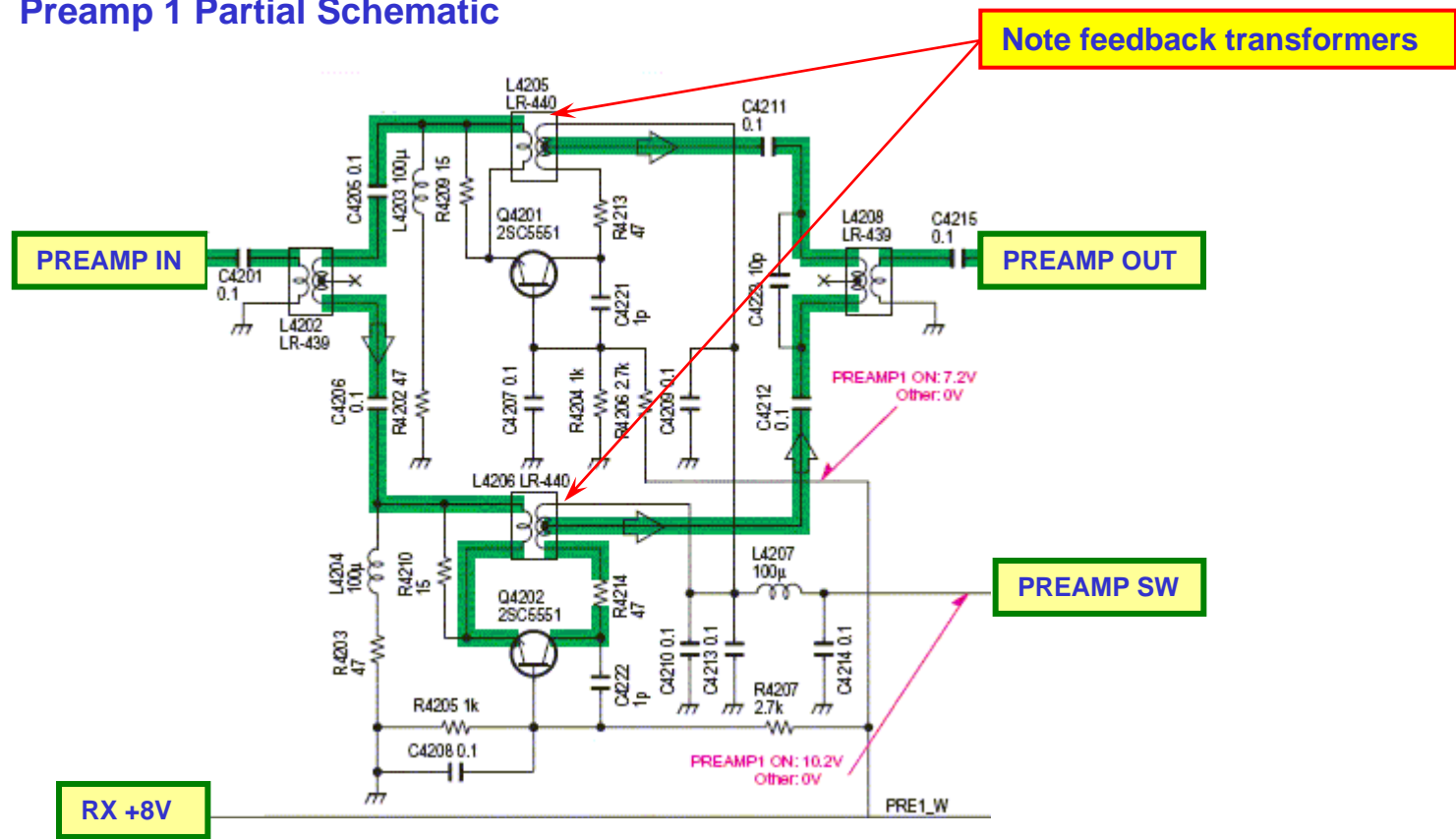
Preamp 1 uses push-pull 2SC5551 BJT's ($f_t = 3.5$ GHz) with large coupling transformers and negative feedback for better linearity, higher even-harmonic suppression and lower power gain without degrading noise figure. This design is superior to the push-pull JFET design (2 X 2SK2171) in the IC-756Pro II.

Preamp 2 is a single-ended 2SC5551 with larger coupling transformers. It offers improved noise figure & dynamic range on bands > 21 MHz as compared to the μ PC1658G MMIC in the IC-756Pro II.

IC-756Pro III Preamp 1



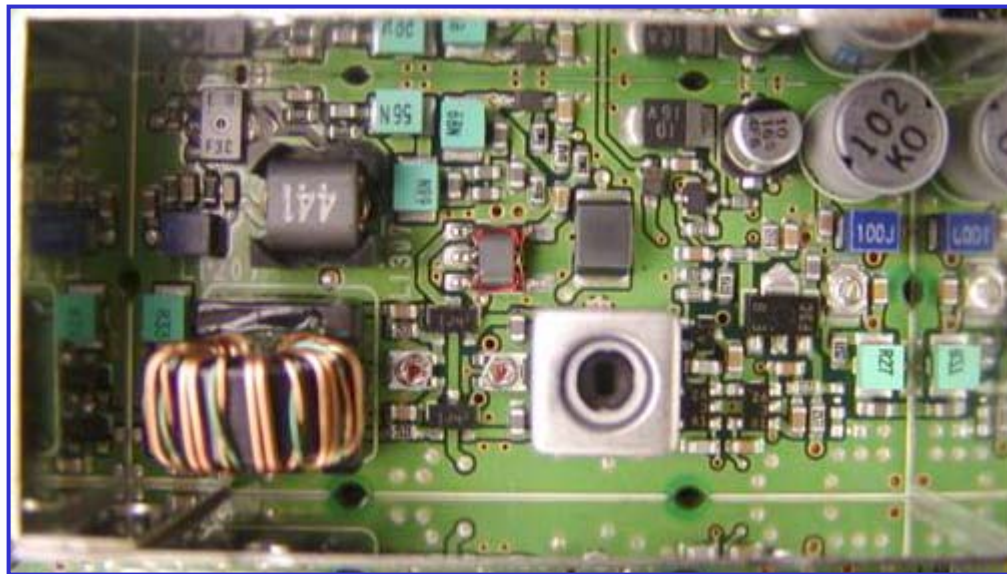
Preamp 1 Partial Schematic



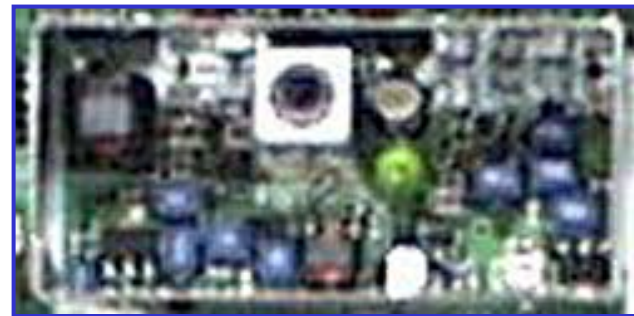
First Mixer Comparison



IC-756Pro III 1st Mixer



IC-756Pro II 1st Mixer

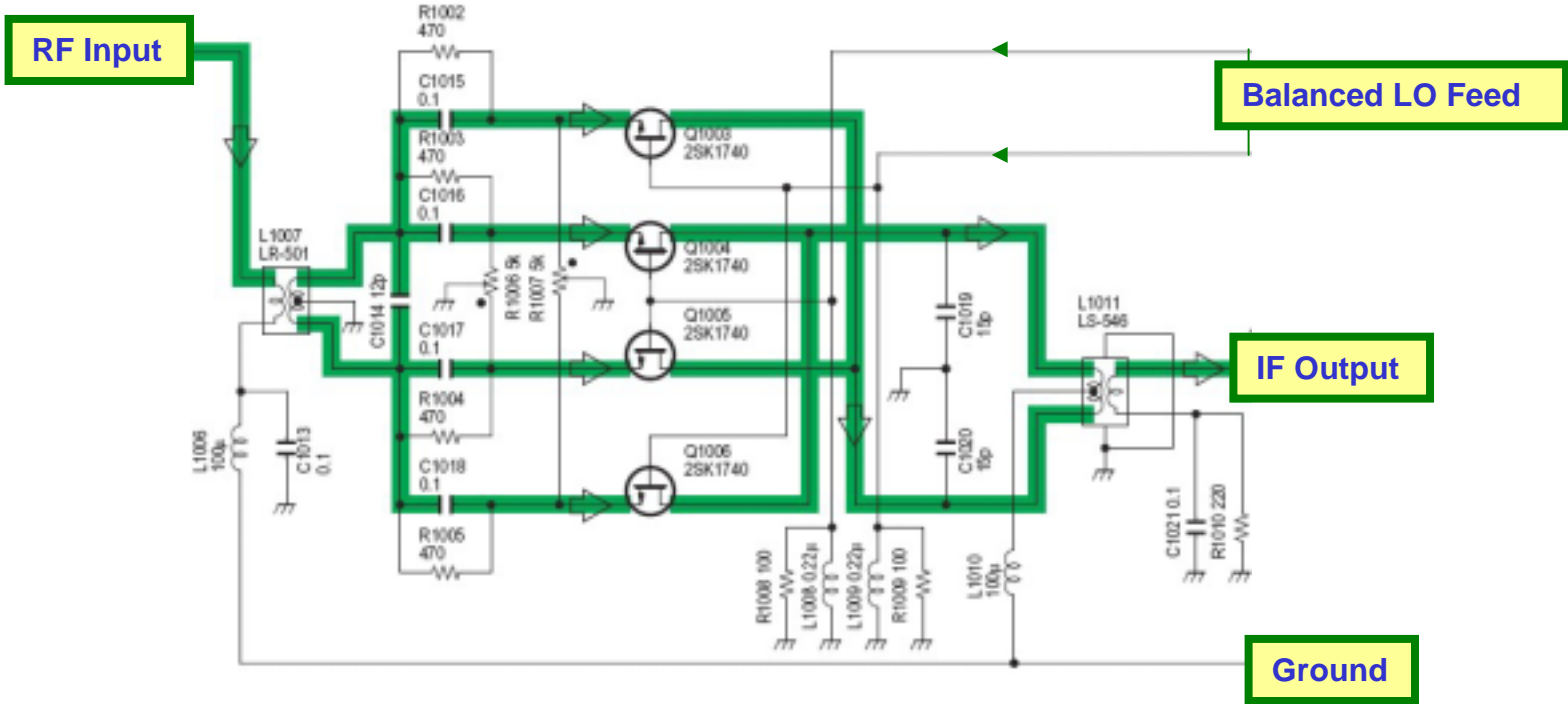


Note cleaner layout and larger transformers in IC-756Pro III 1st mixer. Large coil on lower left is RF input transformer L1007 or L1207. The 1st mixer has been completely redesigned, and employs 4 2SK1740 JFETs in a quad bridge.

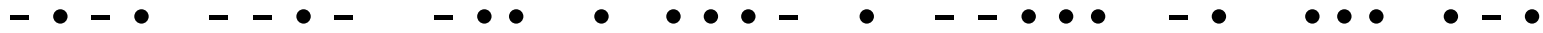
IC-756Pro III Quad JFET 1st Mixer



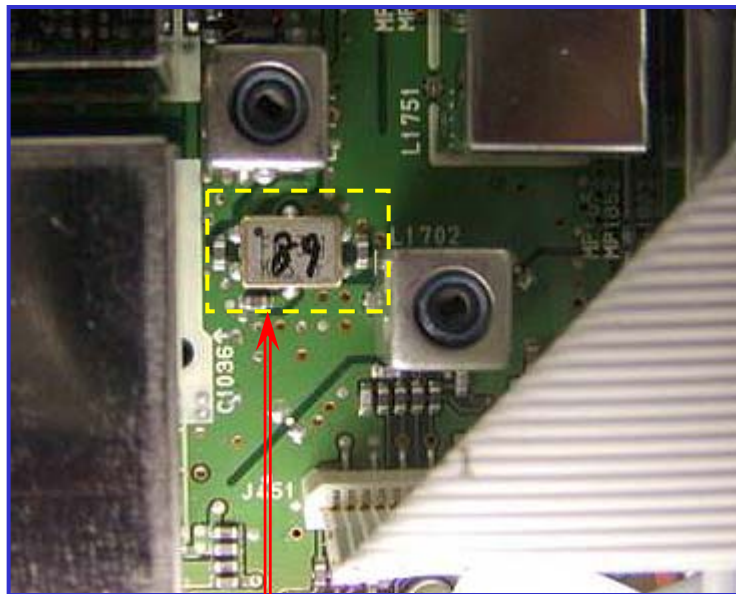
1st Mixer Partial Schematic



1st IF (64.455 MHz) Roofing Filter

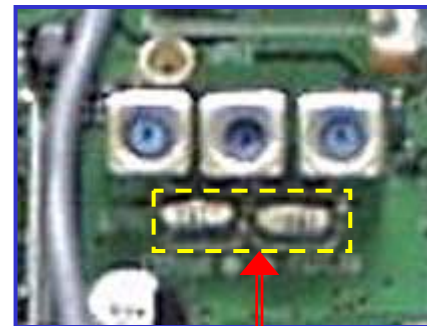


IC-756Pro III 1st IF Roofing Filter (“89”)



This is the same **Daishinku** fundamental-mode MCF filter as used in the IC-7800.

IC-756Pro II Roofing Filters



Cascaded 1-pole, 3rd-overtone cascaded MCF Filter Units.



IC-756Pro III DSP Improvements



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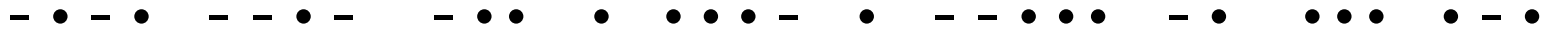
■ Noise Reduction (NR)

- ◆ NR is a **heuristic** (learning) correlation-discrimination process (correlated signals vs. non-correlated noise). It “gets used” to prevailing S/N ratio over time, and is perceived as less effective. Keying the transmitter or toggling NR off/on reinitializes the process.
- ◆ In the IC-756Pro II, users reported that NR became “less effective” over time during long listening periods, necessitating manual reinitialization.
- ◆ The NR process in the IC-756Pro III reinitializes itself automatically every ~ 15 sec.
- ◆ NR and front-end improvements yield superior weak-signal handling with NR on.

■ Programmable SSB TX occupied-bandwidth settings

- ◆ In the IC-756Pro III, upper & lower cutoff frequencies of WIDE, MID, NAR TX audio response selections can be set independently:
 - ▶ Lower: 100, 300, 500 Hz.
 - ▶ Upper; 2.5, 2.7, 2.9 kHz.

IC-756Pro III DSP Improvements



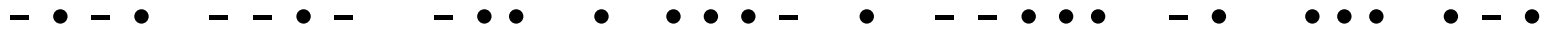
■ Improved CW filters

- ◆ CW receive audio is much more pleasant, and less fatiguing, than in the IC-756Pro II or IC-756Pro.
- ◆ Much quieter “background” yields very pleasant single-signal CW copy at narrow filter BW settings (even 50 Hz).
- ◆ “Ringing” reported in the IC-756Pro and IC-756Pro (especially with CW Pitch < 600 Hz) is almost inaudible in the IC-756Pro III.

■ Improved CW QSK (full break-in)

- ◆ The initial-element truncation (“dit-clipping”) reported in the IC-756Pro II when operating QSK CW has been eliminated in the IC-756Pro III.

New "Mini-Scope" Screen Presentation in IC-756Pro III



IC-756Pro III screen, with 3 fields.



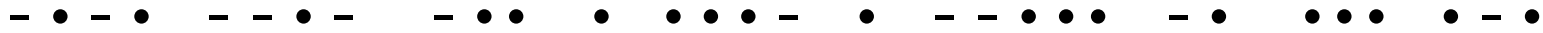
With Mini-Scope ON, a menu (or the bar-graph meter) displays in the lower field. The scope "shrinks" and displays in the centre field. With Mini-Scope OFF, display is identical to IC-756Pro II (right).

IC-756Pro II screen, with 2 fields.



A menu (or the bar-graph meter) displays in the lower field instead of the spectrum scope. The scope is suppressed until the menu or bar-graph meter is closed.

EMC Filter & 60m Transmit



IC-756Pro III Transmitter LPF Board

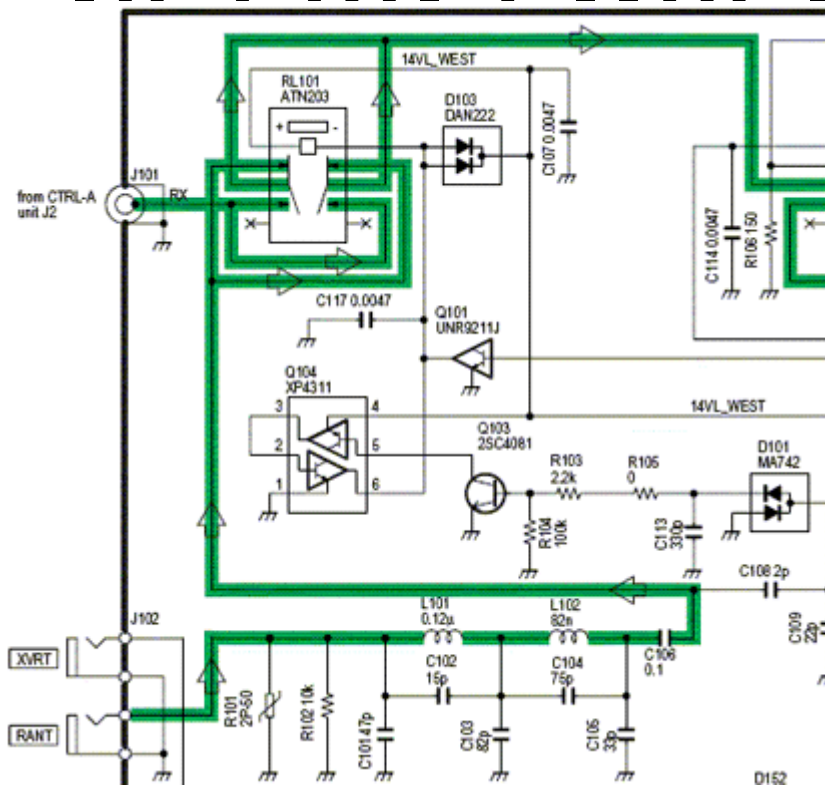


IC-756Pro II Transmitter LPF Board



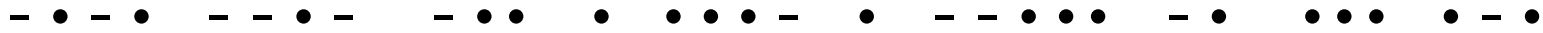
Note larger EMC filter toroids & ferrite beads in +13.8V DC feed (left) and additional filter inductors for 60m band (right), as compared to IC-756Pro II board. The 7 MHz LPF now also covers 5 MHz.

Improved RX-ANT input protection *from excess RF power*



- When ANT1 or ANT2 is selected, Q101 base is HIGH, operating RL101 and connecting J101 (ANT1/2 RF input). Selecting ANT1/R or ANT2/R sets Q101 base LOW, releasing RL101 and connecting RANT. Excessive RF voltage applied to RANT is rectified by D101, turning on Q103 and Q104. This operates RL101, switching RX signal path from RANT to J101. Input power for switchover is approx. +10 dBm.

IC-756Pro III dual clock & canned RTTY messages



Dual Clock



Clock 1 (24-hour format)

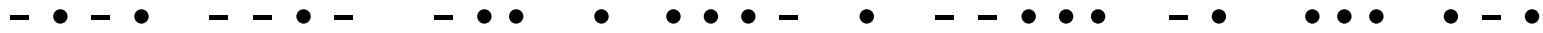
Clock 2 (can be offset from Clock 1 by up to ± 24 hours)

RTTY Memories



The IC-756PROIII has 8 channels of RTTY transmit memory. You can edit and send a **canned message** of up to 62 characters for each memory channel without a PC or other external unit.

IC-756Pro III Screen Saver



The screen saver delay is programmable (15 – 60 min).
The entered user callsign moves about on a black background.



While the screen saver is displaying, the NR button LED flashes. Pressing NR, operating any control or transmitting restores the normal screen.