

# IC-756 Pro III vs. Pro II

**Improvements in the Pro III vs. the Pro II**

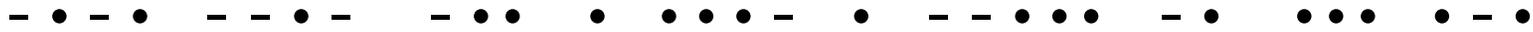
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**VA7OJ**

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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
  - ◆ “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 II Front End Redesign

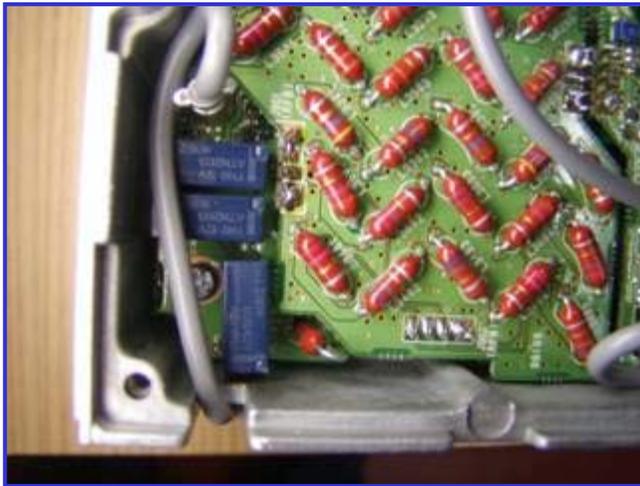


- **New RF BPF board**
  - ◆ larger inductors and better diodes, to reduce strong-signal IMD.
- **New RF Preamp 1 based on IC-7800 design**
  - ◆ Low-noise, push-pull BJT circuit with larger coupling transformers and negative feedback has better linearity and lower power gain without degrading noise 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 1<sup>st</sup> 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 1<sup>st</sup> mixer.
- **New 1<sup>st</sup> 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



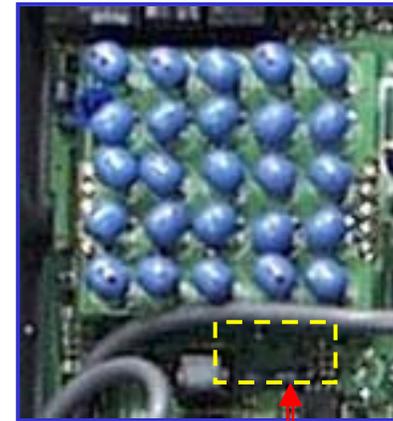
IC-756Pro III RF BPF Board



IC-756Pro III Preamp 1 Board



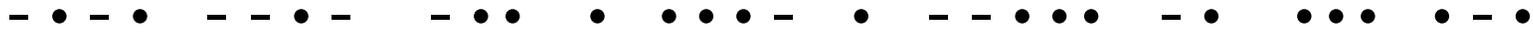
IC-756Pro II RF BPF Board



Preamp 1

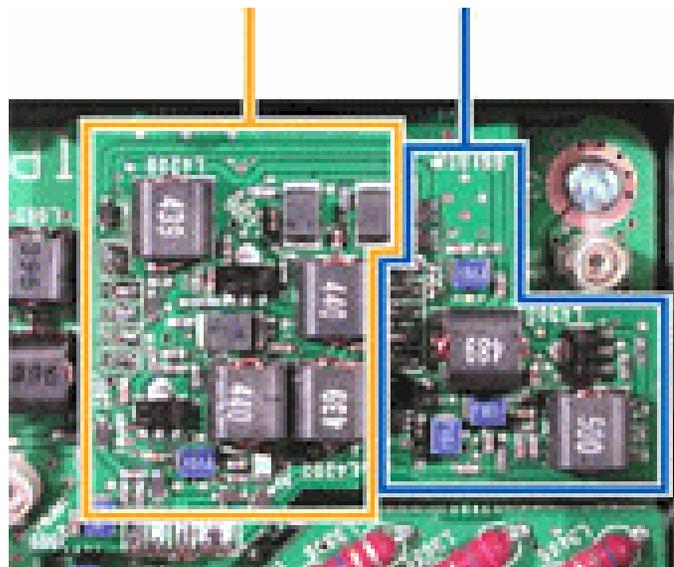
Note larger inductors and coupling transformers as compared to IC-756Pro II. This change reduces the risk of intermod due to core saturation at high signal levels.

# IC-756Pro III Preamps 1 & 2



## IC-756Pro III Preamps 1 & 2

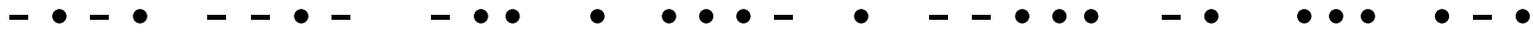
Pre-amp 1    Pre-amp 2



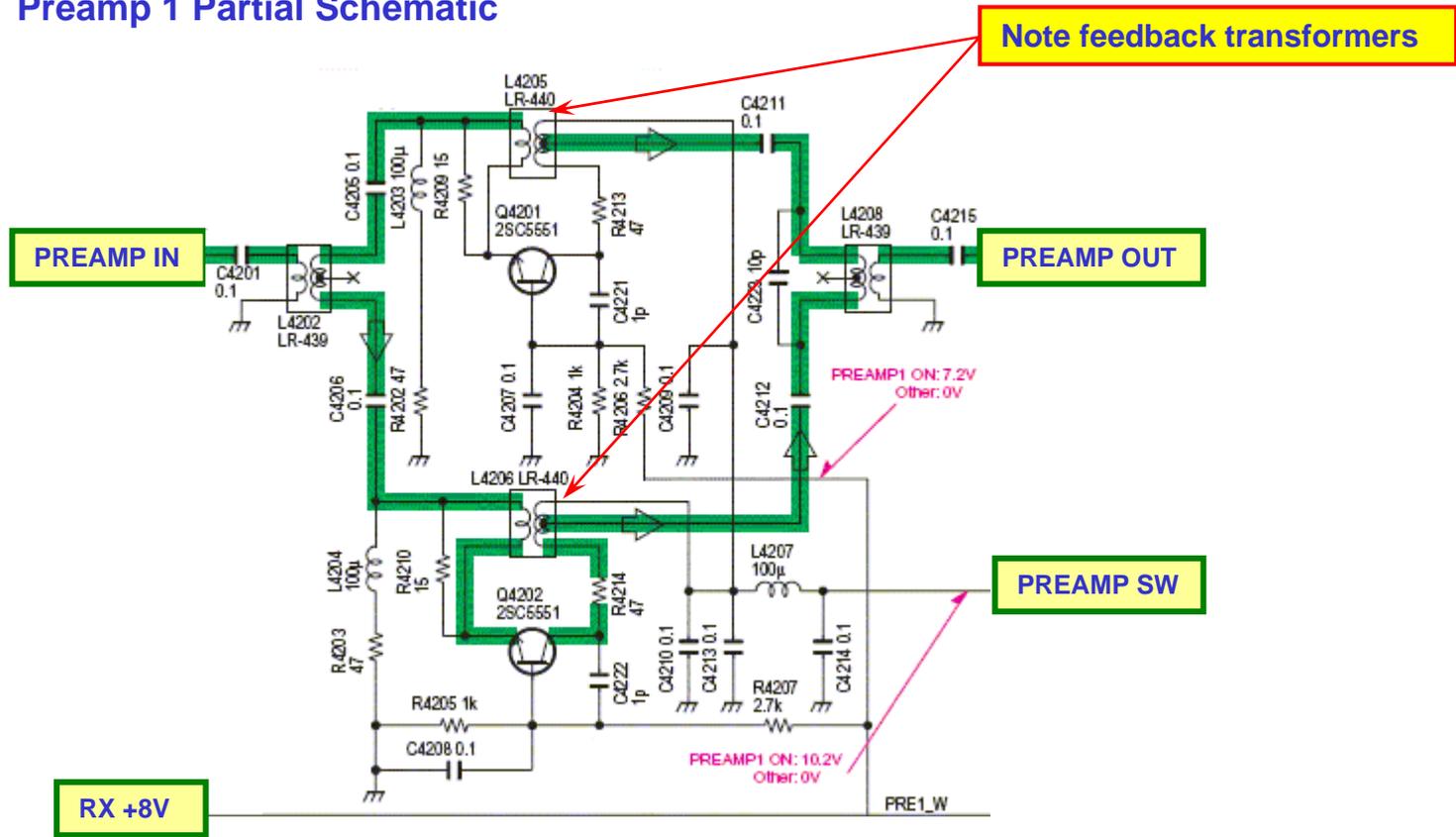
**Preamp 1** uses push-pull 2SC5551 BJT's ( $f_t = 3.5$  GHz) with large coupling transformers and negative feedback for better linearity, higher even-harmonic suppression and lower power gain without degrading noise figure. This design is superior to the push-pull JFET design (2 X 2SK2171) in the IC-756Pro 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  $\mu$ PC1658G MMIC in the IC-756Pro II.

# IC-756Pro III Preamp 1



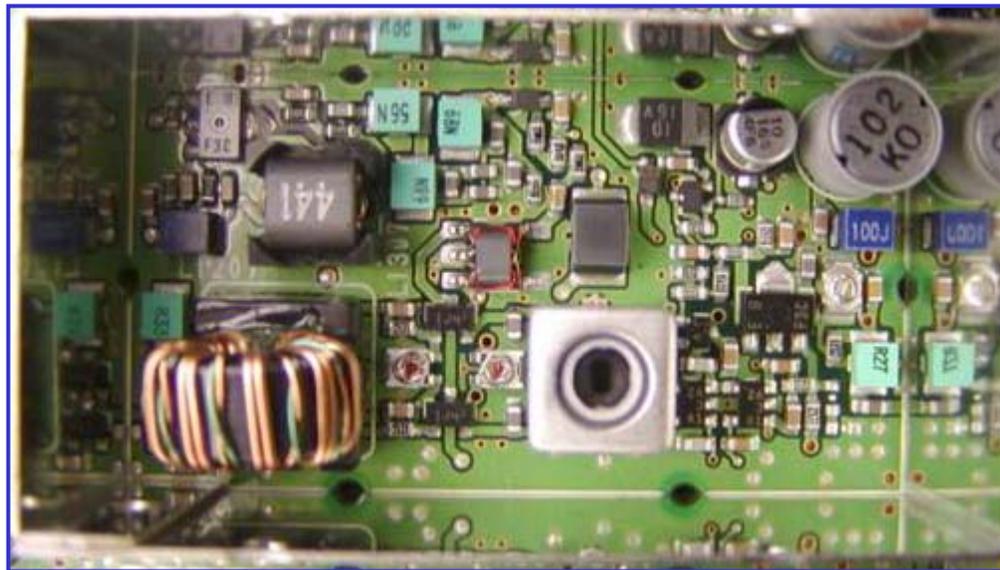
## Preamp 1 Partial Schematic



# First Mixer Comparison



IC-756Pro III 1<sup>st</sup> Mixer



IC-756Pro II 1<sup>st</sup> Mixer

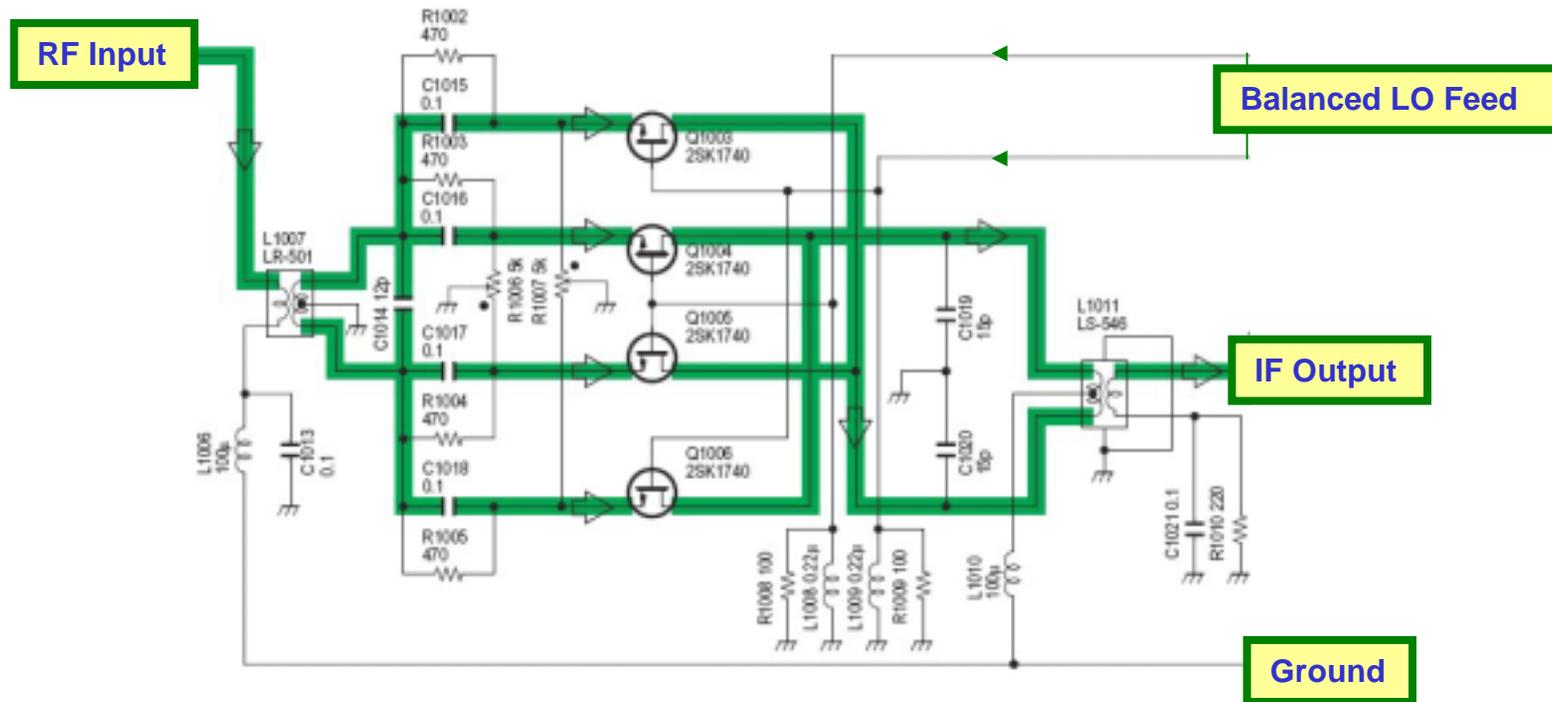


Note cleaner layout and larger transformers in IC-756Pro III 1<sup>st</sup> mixer. Large coil on lower left is RF input transformer L1007 or L1207. The 1<sup>st</sup> mixer has been completely redesigned, and employs 4 2SK1740 JFETs in a quad bridge.

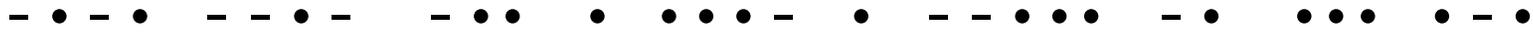
# IC-756Pro III Quad JFET 1st Mixer



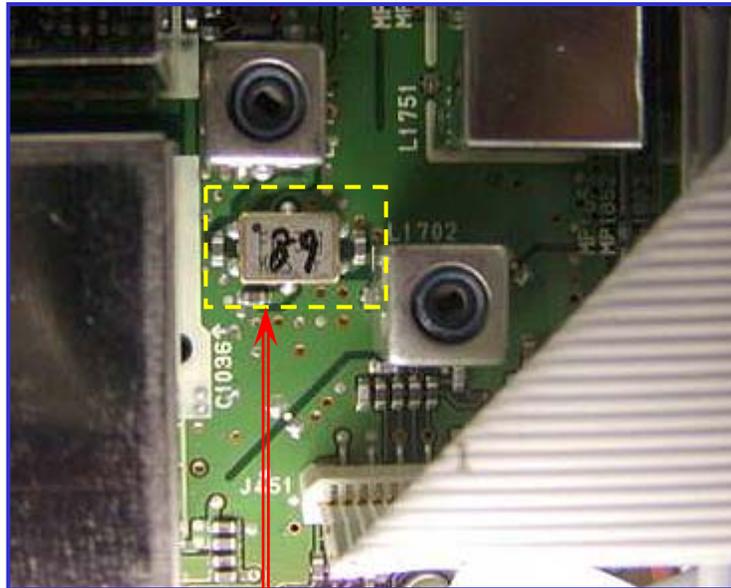
## 1st Mixer Partial Schematic



# 1<sup>st</sup> IF (64.455 MHz) Roofing Filter

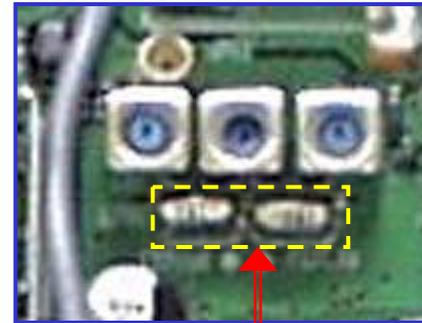


IC-756Pro III 1<sup>st</sup> IF Roofing Filter (“89”)



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

IC-756Pro II Roofing Filters



Cascaded 1-pole, 3<sup>rd</sup>-overtone cascaded MCF Filter Units.



# IC-756Pro III DSP Improvements



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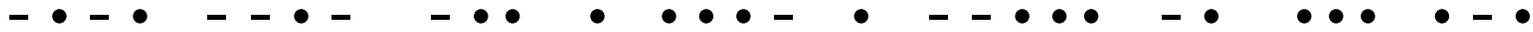
## ■ Noise Reduction (NR)

- ◆ 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



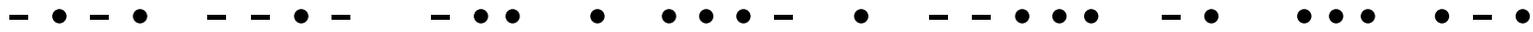
## ■ Improved CW filters

- ◆ 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.



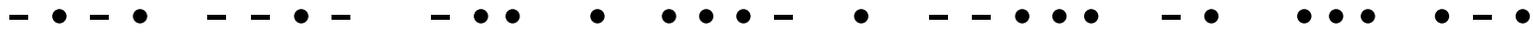
With Mini-Scope ON, a menu (or the bar-graph meter) displays in the lower field. The scope "shrinks" and displays in the centre field. With Mini-Scope OFF, display is identical to IC-756Pro II (right).

IC-756Pro II screen, with 2 fields.

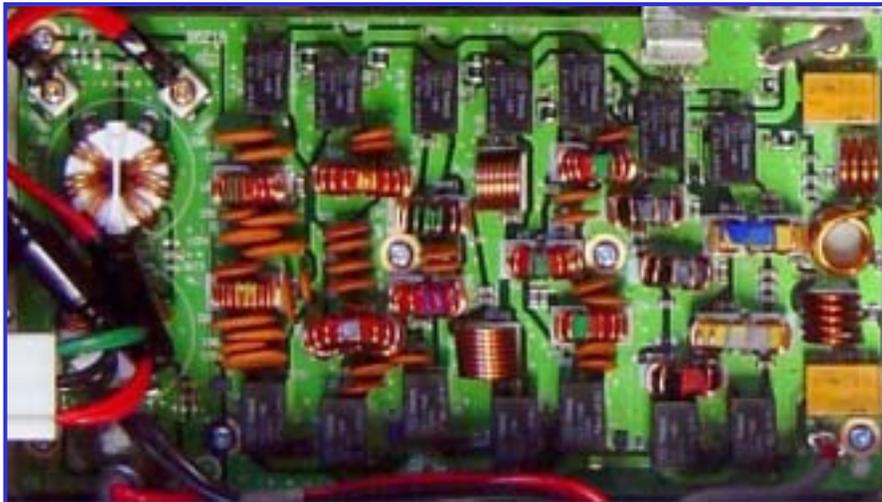


A menu (or the bar-graph meter) displays in the lower field instead of the spectrum scope. The scope is suppressed until the menu or bar-graph meter is closed.

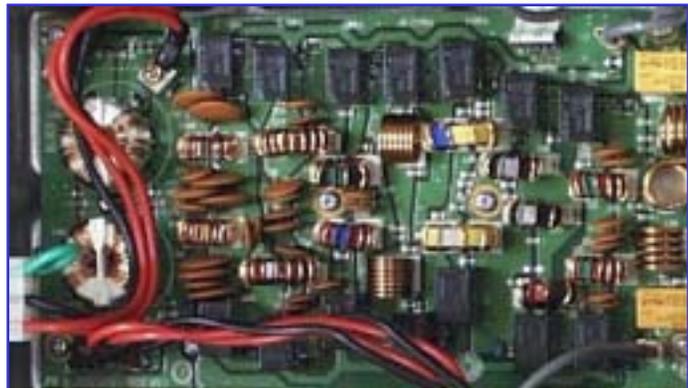
# EMC Filter & 60m Transmit



IC-756Pro III Transmitter LPF Board

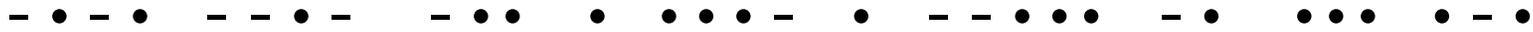


IC-756Pro III Transmitter LPF Board



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.

# IC-756Pro III dual clock & canned RTTY messages



## Dual Clock



Clock 1 (24-hour format)

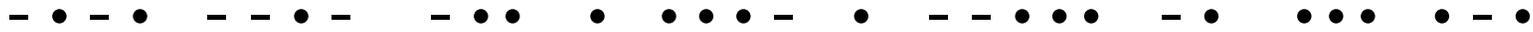
Clock 2 (can be offset from Clock 1 by up to ± 24 hours)

## 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.