IC-756 Pro III vs. Pro II
Improvements in the Pro III vs. the Pro II
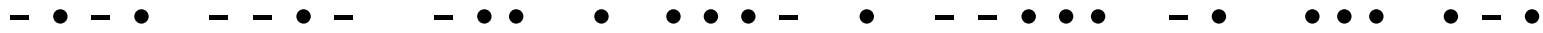
Adam Farson
VA7OJ
IC-756Pro3 Information & Links

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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 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
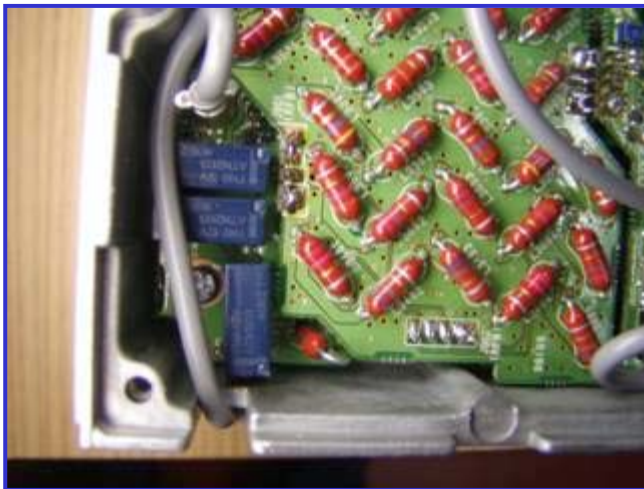
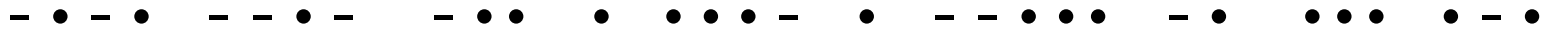**IC-756Pro III Preamp 1 Board**
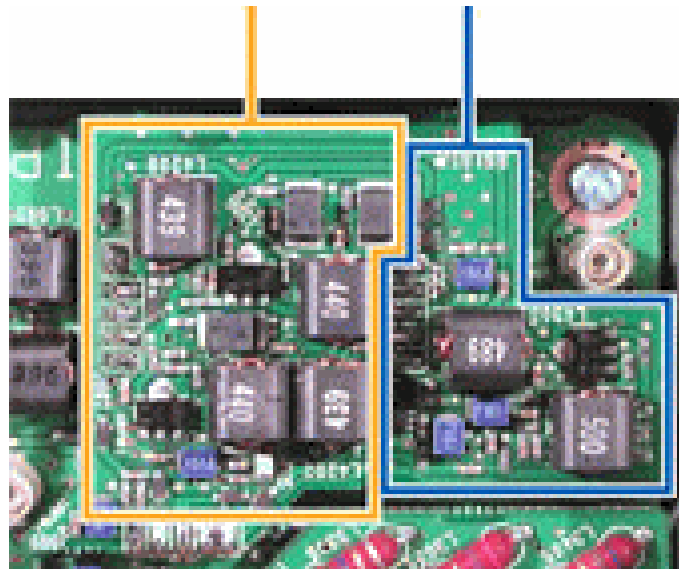

IC-756Pro II RF BPF Board

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.
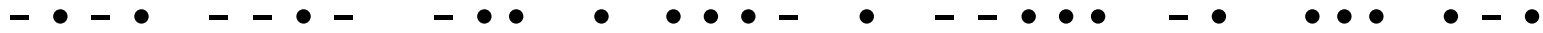
IC-756Pro III Preamps 1 & 2

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 μPC1658G MMIC in the IC-756Pro II.
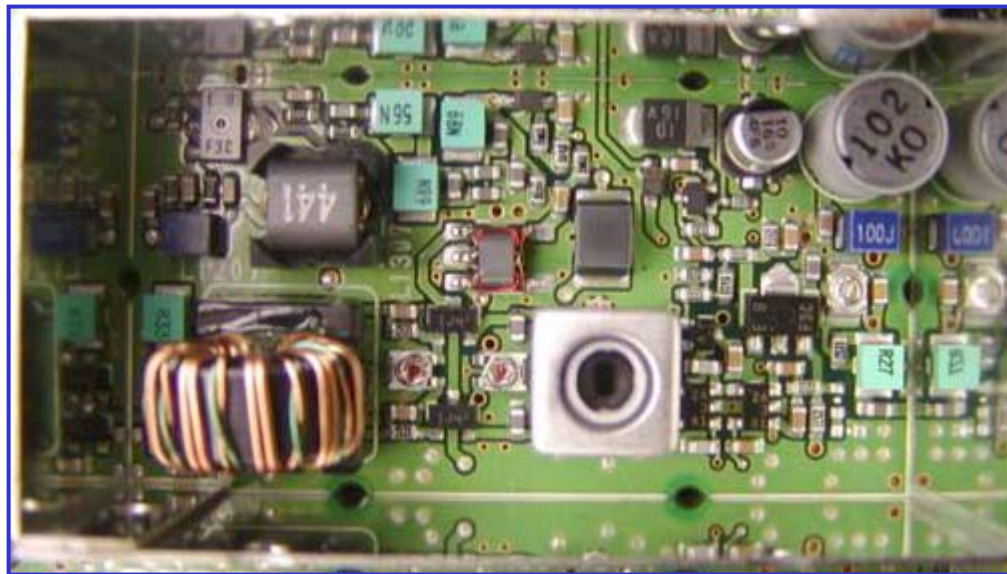
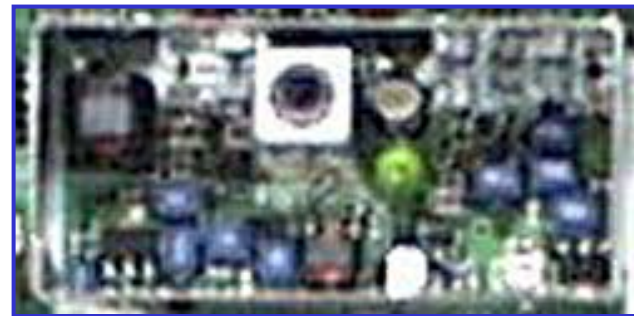# IC-756Pro III Preamp 1

Preamp 1 Partial Schematic

Note feedback transformers
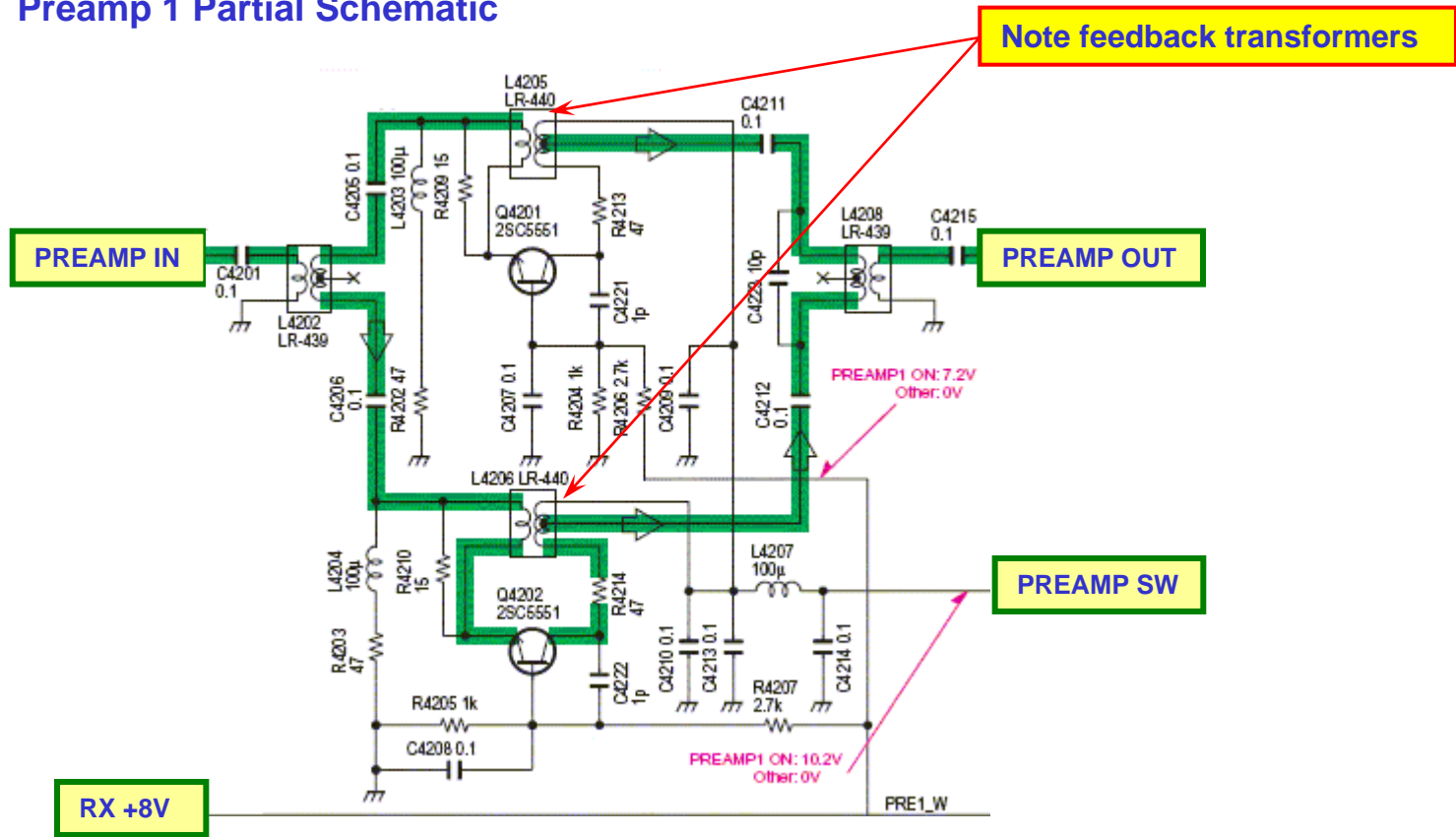
First Mixer Comparison

IC-756Pro III 1st Mixer
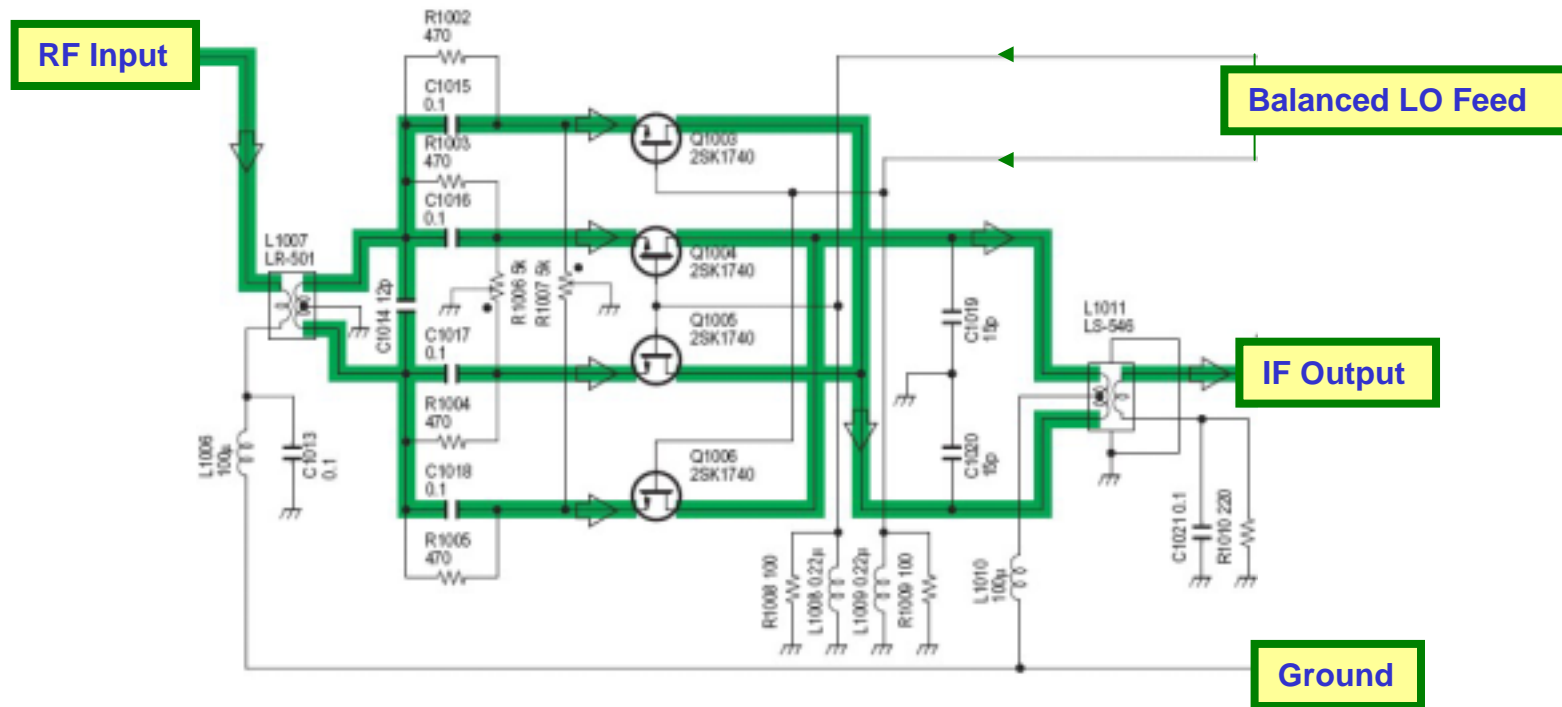
IC-756Pro II 1st Mixer

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.
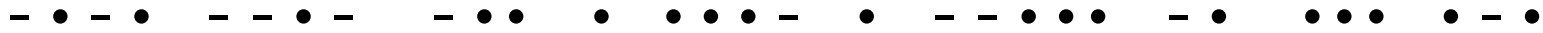
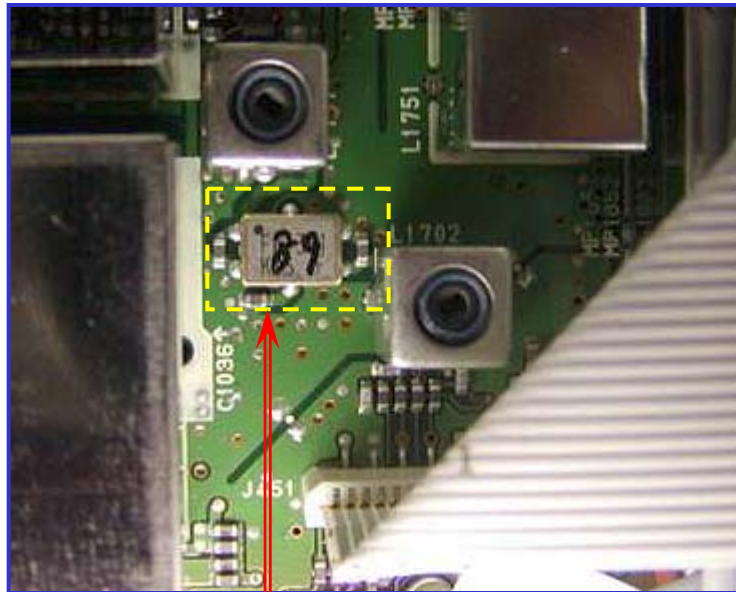# IC-756Pro III Quad JFET 1st Mixer

1st Mixer Partial Schematic
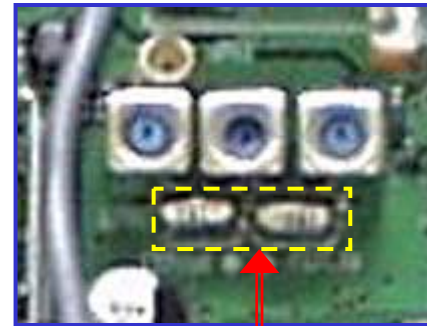
1st IF (64.455 MHz) Roofing Filter

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

IC-756Pro II Roofing Filters

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

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

IC-756Pro III DSP Improvements

- **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

– ▪ • – ▪ – – ▪ • – – ▪ • • • • • – • – – ▪ • • – • • • • • – ▪
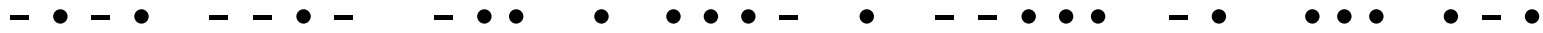
IC-756Pro III screen, with 3 fields.
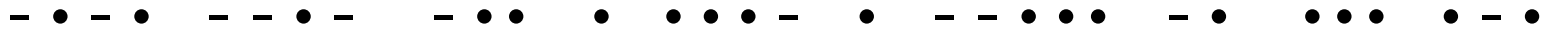
IC-756Pro II screen, with 2 fields.

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).

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.
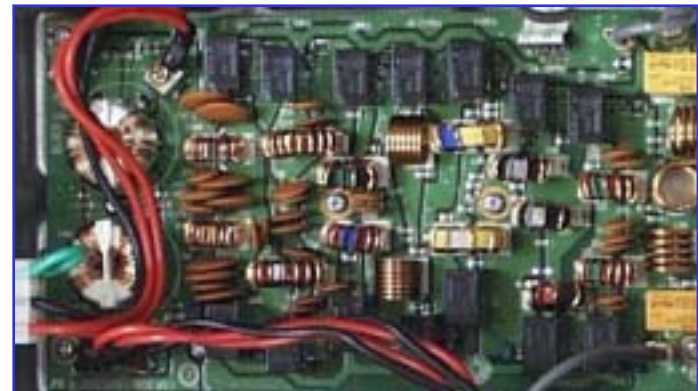
19 January 2006   NSARC HF Operators – 756Pro3 vs. Pro2   14

EMC Filter & 60m Transmit
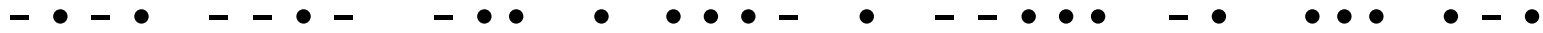
IC-756Pro III Transmitter LPF Board

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.

IC-756Pro III dual clock & canned RTTY messages

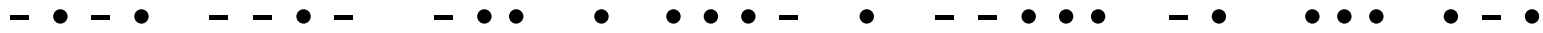**Dual Clock**

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.

VE7NSR

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