



# Hilberling PT-8000

Germany's new high-end HF/6m/2m transceiver

## Adam Farson

## VA7OJ

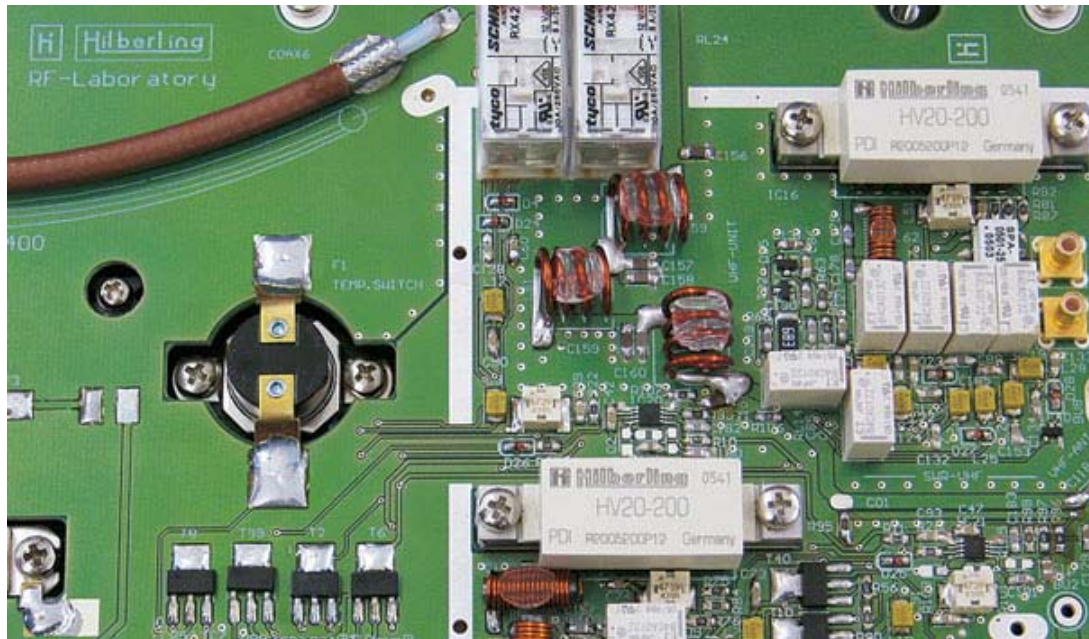
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# Introduction



- The new PT-8000 from Hilberling GmbH is a transceiver developed and manufactured in Germany. It represents the leading edge of RF design in ham radio. The PT-8000 incorporates certain technologies never seen in ham radio gear until now.
  - ◆ The PT-8000 architecture is hybrid (analogue/DSP), employing precision crystal roofing and selectivity filters in conjunction with a baseband-level DSP subsystem.

# RX RF Preamps – using custom GaAsFET hybrids



- **One transmitter and two identical, autonomous receivers** can be freely assigned to 3 antenna jacks. This allows the use of a separate, newly-developed GaAsFET hybrid preamplifier (on ceramic substrate) for each antenna input.

# HV20-200 Hybrid Preamp - Data Sheet



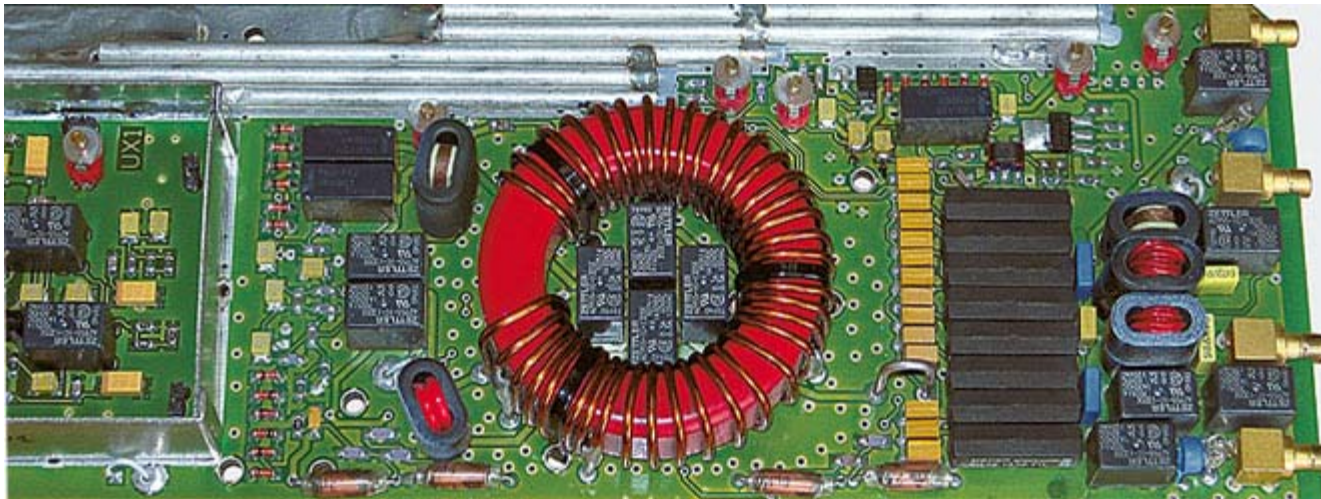
- **Output IP3: typically +50 dBm**
- **Current consumption: 350 mA/12V**
- **Noise figure: typ. 1.8 dB at 150 MHz**
- **Frequency range: 1.8 - 200 MHz**
  
- **Usage in PT-8000:**
  - **RX RF Preamp: 3x 10 dB HF/VHF**
  - **2x 10 dB 1st IF (at 1st mixer output), MAIN & SUB**
  - **1x TX-EXT Output Amp (+20 dBm output)**
  
- ***The S-meter reading does not change when the preamp is switched in.***

# The 600W PA Module



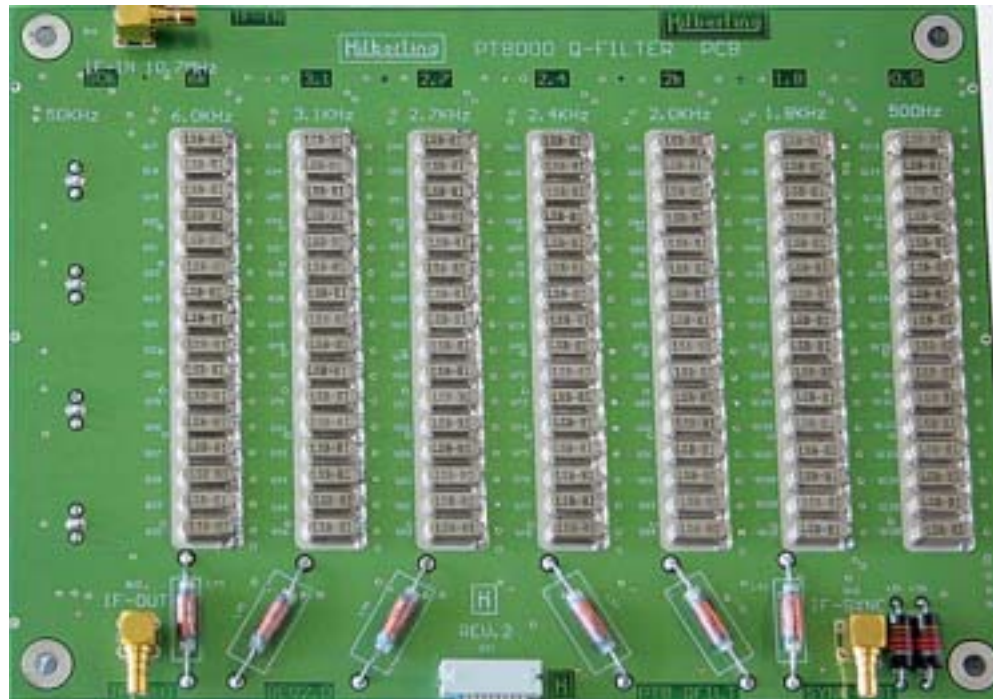
- **Never seen before** in a ham radio transceiver is the **600W PA** of the PT-8000B. Two SD3933 MOSFET power devices in push-pull deliver 600W CW or PEP SSB with  $V_{dd} = 100V$ .
  - ◆ PA efficiency up to ~70%
  - ◆ IMD3 typ. -36 dBc (referred to 2-tone PEP)
  - ◆ Current monitoring via Hall-effect sensors on all PA stages
  - ◆ 600W PA with 2 field-effect transistors

# Tracking RF Preselector



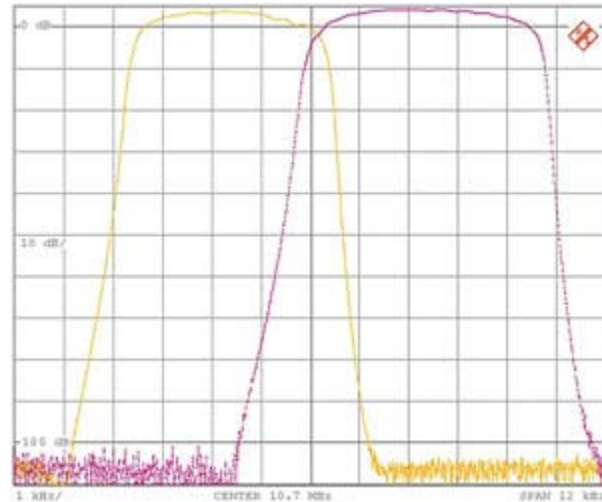
- The preselector is automatically tuned, thus providing the decisive first RF selectivity between 1.8 and 30 MHz. Basic studies at Hilberling GmbH confirmed the correlation between the achievable large signal tolerance (IMD) and the sheer mass of the toroid cores used in the LC circuit.
- Relay switching eliminates diodes – a source of IMD.

# IF Crystal Filters



- **Crystal filters** are used to the maximum extent possible in the PT-8000: Four 8-pole roofing filters and fourteen 16-pole discrete crystal ladder filters are utilized. Shape factor is 1.3 at 2.7 kHz BW. The transmitter employs three 16-pole crystal ladder filters (LSB/USB and analogue RF compressor clean-up).

# Hybrid Architecture



- The PT-8000 is equipped with two banks of **16-pole crystal filters** (LSB/USB). The filters are divided between MAIN and SUB RX, and can be configured independently to allow ISB operation.

- The **combination** of crystal filters, analogue audio filters and sophisticated baseband-level DSP guarantees the receiver's outstanding selectivity. The DSP is designed to improve the passband of the crystal filter, especially at its flanks, and to realize narrow bandwidths down to 50 Hz.
- The DSP supplements the 10.7 MHz analogue IF notch filter with a multiple-tone audio notch. It also offers excellent noise-reduction (NR) capability.

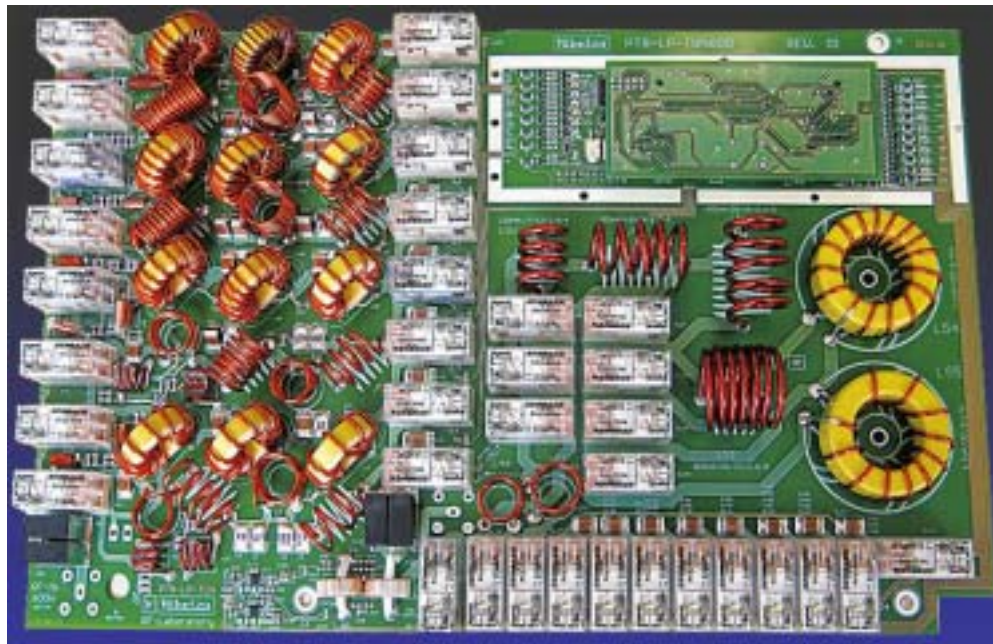


# Military-type modular packaging



- RF packaging is built to the highest industrial standard: completely shielded modules with  $50\Omega$  SMB coax connectors, mounted on FR4/G10 PCB cards. Note Teflon® coax jumpers.

# TX Diplexer/LPF and ATU



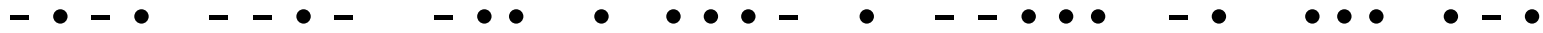
- Outstanding modulation and spectral purity of the transmitted signal are the hallmarks of the discriminating radio amateur. For the first time in ham radio equipment, the PT-8000 incorporates eight **DIPLEXER/ Low-Pass Filters** at the output of the PA. These prevent the reflection of harmonics at external low-pass filters and antennas.
- The relay-switched **automatic antenna tuner** guarantees optimum operating conditions and power transfer for the PA.

# PT-8000 Front Panel

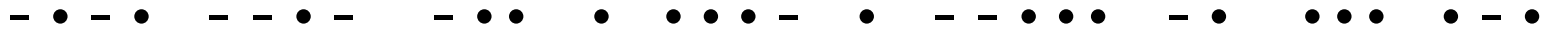


- Self-explanatory user interface
- “Menu-less” function selection by depressing control knobs
- Bar-graph meter scales; simple “spectrum scope” function

# Front Panel (charcoal)

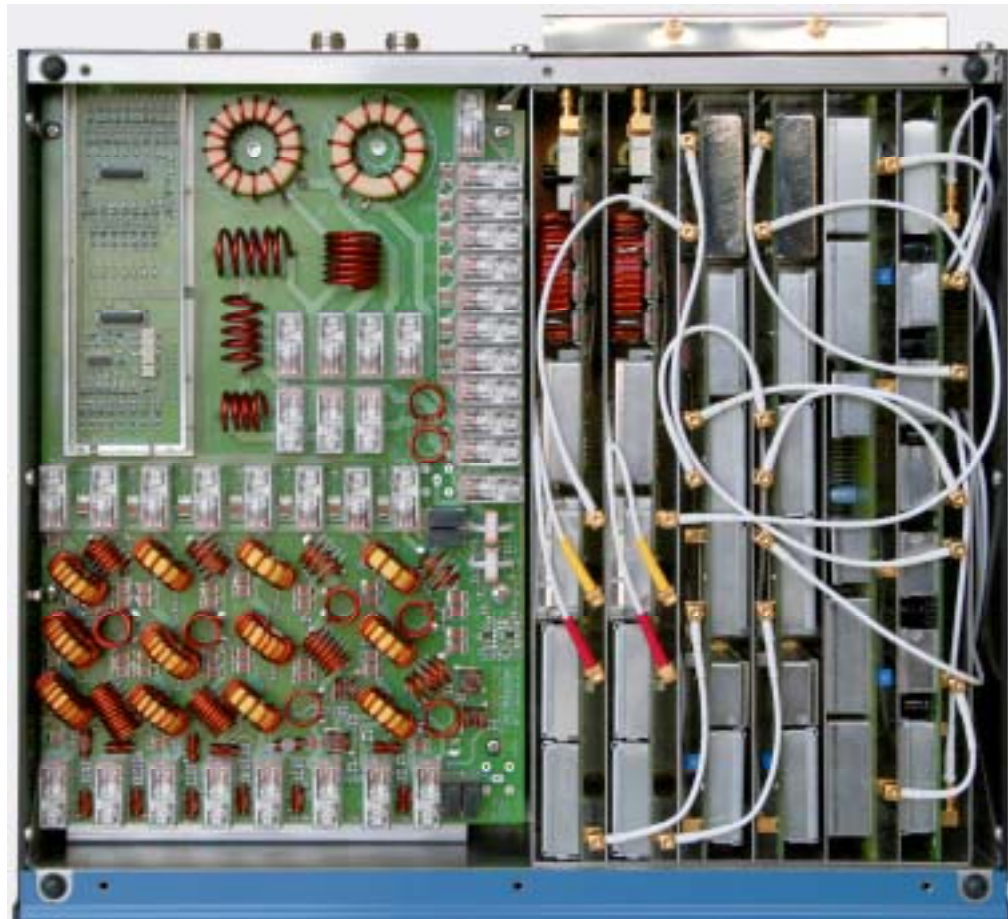
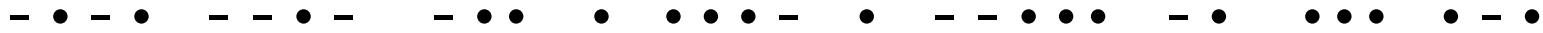


# PT-8000 Rear Panel View



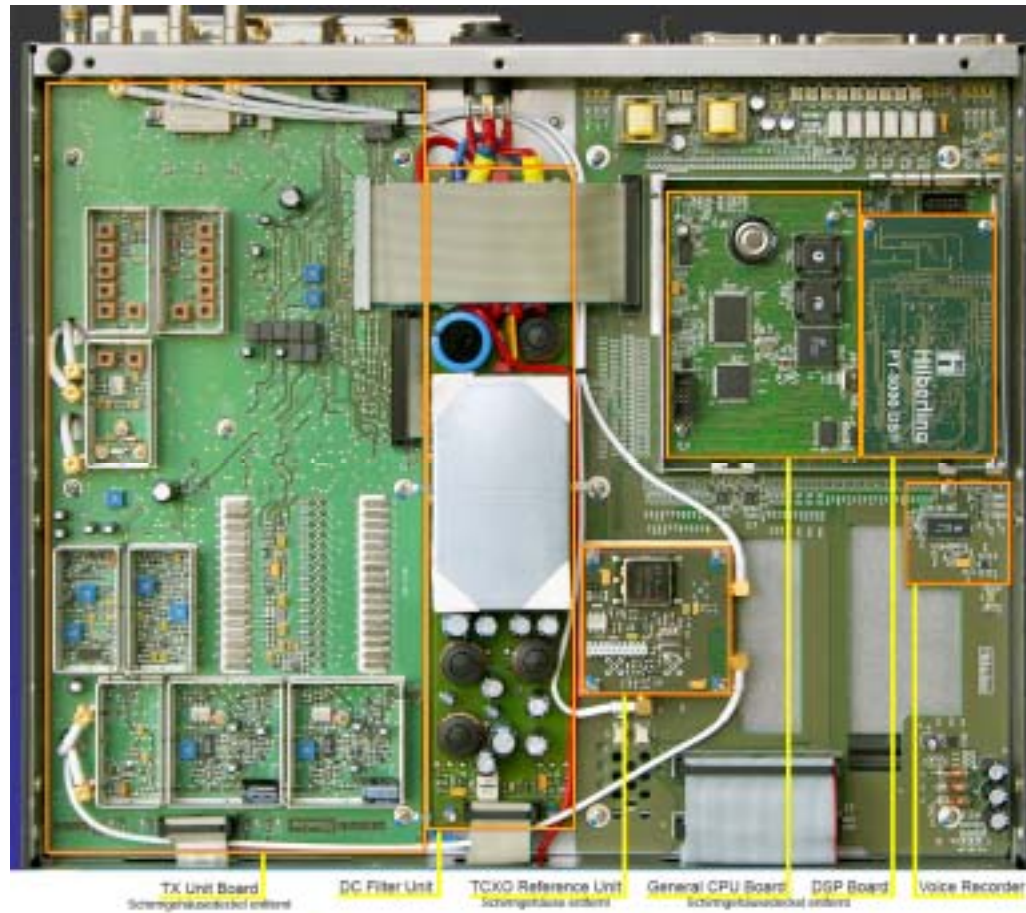
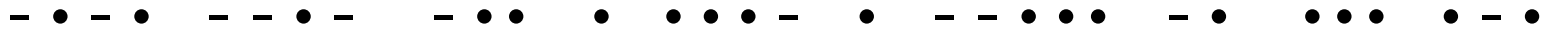
# PT-8000 Top View

L: Diplexer/LPF. R: RX/Exciter Modules



# PT-8000 Underside View

(module shield covers and bottom plate removed)



# Hilberling T9 Microphone



- 600 $\Omega$  dynamic element
- element acoustically isolated from body
- RFI-resistant
- optimized for close speaking distances
- Designed and built by Hilberling



# PT-8000 Specifications



PT-8000A/B/C Technical Specifications (summary)					
<b>RX: Double-conversion superhet</b>					
Operating frequency range	9 kHz...52 MHz (MAIN/SUB); 142...172 MHz (MAIN/SUB)				
IF with Crystal Filter (BW)	70.7 MHz (6/12 kHz); MAIN 10.698/SUB 10.702 MHz (0.6...6/12 kHz)				
10 dB (S+N)/N for Emission:	A3E (AM)	F3E (FM)	J3E (SSB)	B8E (ISB)	A1A (CW)
1.8...54 MHz (kHz BW/ $\mu$ V)	6/2	12/4	2.4/0.2	3.1/0.5	0.6/0.2
142...172 MHz (kHz BW/ $\mu$ V)	6/1.5	12/0.2	2.4/0.18	3.1/0.4	0.6/0.18
9 kHz...1.8 MHz (kHz BW/ $\mu$ V)	6/33	12/28	2.4/22	3.1/26	0.6/22
IP3 for frequency range	1.8...52 MHz		144...148 MHz		
(within amateur bands)	Typ. +39 dBm (20 kHz offset)		Typ. +35 dBm (20 kHz offset)		
DSP Signal Management (at baseband level)	Selectable filter BW to interpolate between crystal filters. Multi-tone auto-notch. New NR (noise-reduction) algorithms assure almost undistorted speech reproduction. TX audio equalizer.				
Audio power output	4.8W (2 x 2.4W MAIN/SUB)				
<b>TX: exciter generates USB and LSB independently for ISB service</b>					
Emission/Power Output	A3E/H3E/B8E/F3E	IMD3 typ.	J3E/A1A	IMD3 typ.	
1.8...52 MHz PT-8000A	2.5...25W 0.25...2.5W Class A	-45dBc	0.25...100W/PEP/13.8V	-36dBc	
PT-8000B	15...125W 0.25...2.5W Class A	-45dBc	1.5...600W/PEP/100V	-36dBc	
PT-8000C	0.25...2.5W Class A	-45dBc	0.25...10W/PEP/13.8V	-36dBc	
144...148 MHz A/B/C	0.25...2.5W Class A	-45dBc	0.25...10W/PEP/13.8V	-36dBc	
<b>Note: 0 dBc = PEP of 2 equal tones</b>					
Carrier suppression	J3E/B8E: -70 dBc				
Opposite-sideband suppression	-70 dB at 1 kHz offset				
F3E (FM) deviation	$\pm$ 2.5 kHz		FM repeater offset: 0...2 MHz (adjustable)		
Dimensions (H x W x D)	approx. 175 mm x 425 mm (543 mm with rack handles) x 465 mm				
Weight	approx. 25 kg				
<b>Accessories</b>					
Desk microphone "T9"	600 $\Omega$ dynamic, optimized for close-talking, acoustic & EMC isolation				
PSU (100...270V AC mains)	A: DC 13.8V/30A. B: DC 13.8V/10A, 100V/12A. C: DC 13.8V/10A				

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# References



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1. [Hilberling Web Site \(German, some English\)](#)
2. [PT-8000 Block Diagram](#)