

# HF Receiver Mark II

## *Design Features and Technical Data*

Mario Hellmich<sup>1</sup>, Salzgitter

<b>Receiver Frequency Range</b>	10 kHz...30 MHz (−3 dB range) 1 kHz...30 MHz tuning range															
<b>Tuning Resolution</b>	1 Hz, receiver can be tuned by knob or by direct frequency entry on numeric keypad, tuning steps from 1 Hz to 100 kHz, frequency indication on 8-digit LED display															
<b>Tuning Knob</b>	128 steps/revolution, tuning speeds 10 Hz, 100 Hz, 1 kHz, 10 kHz, 100 kHz															
<b>Time Base</b>	TCXO at 40 MHz, ±0.28 ppm over commercial temperature range															
<b>Antenna Input</b>	Type N, 50 Ω															
<b>Input Attenuator</b>	Switchable, 0 dB, 20 dB															
<b>Preamplifier</b>	Switchable 25 dB low noise amplifier (currently not implemented)															
<b>Preselector</b>	Selectable, six automatically switched octave bands															
<b>IF Frequencies</b>	1st IF 86.85 MHz, 2nd IF 10.7 MHz, in FM mode 3rd IF 455 kHz															
<b>IF Output</b>	BNC 50 Ω, 10.7 MHz, −30 dBm level, approx. 25 kHz bandwidth															
<b>Roofing Filter</b>	Dual SAW filter at first IF (86.85 MHz) with 25 kHz bandwidth															
<b>IF Bandwidths</b>	Four multi-pole crystal filters, electronically switched, at second IF (10.7 MHz)  <table><thead><tr><th><i>Filter designation</i></th><th><i>Filter bandwidth</i></th><th><i>No. of Poles</i></th></tr></thead><tbody><tr><td>BW1</td><td>500 Hz</td><td>6</td></tr><tr><td>BW2</td><td>2.4 kHz</td><td>10</td></tr><tr><td>BW3</td><td>5 kHz</td><td>10</td></tr><tr><td>BW4</td><td>15 kHz</td><td>8</td></tr></tbody></table>	<i>Filter designation</i>	<i>Filter bandwidth</i>	<i>No. of Poles</i>	BW1	500 Hz	6	BW2	2.4 kHz	10	BW3	5 kHz	10	BW4	15 kHz	8
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<b>Detection Modes</b>	AM synchronous SSB (upper and lower sideband) FM															
<b>BFO</b>	Offset range ±3.5 kHz, tuning resolution 1 Hz, tuning steps 1 Hz, 10 Hz and 100 Hz, or direct keypad entry															
<b>Gain Control</b>	Automatic (fast, slow, hang), manual, approx. 120 dB range, distributed between first IF (−10 dB... + 30 dB) and second IF (0 dB... + 80 dB)															

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## *Performance Test Results*

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<b>AM Sensitivity</b> for 10 dB SINAD 2.4 kHz bandwidth AM at 60 % depth with 1 kHz attenuator out, preamp out, preselector out	$\leq -110$ dBm
<b>SSB Sensitivity</b> for 10 dB SINAD 2.4 kHz bandwidth input signal at 1 kHz offset from tuned frequency attenuator out, preamp out, preselector out	$\leq -116$ dBm
<b>CW Sensitivity</b> for 10 dB SINAD 500 Hz bandwidth receiver set up for 1 kHz beat note attenuator out, preamp out, preselector out	$\leq -123$ dBm
<b>FM Sensitivity</b> for 10 dB SINAD FM at 2.5 kHz deviation 15 kHz bandwidth attenuator out, preamp out, preselector out	$\leq -96$ dBm
<b>Second Order Intercept Point</b> $\Delta f = 50$ kHz antenna input referred, gain control manual, attenuator out, preamp out, pre-selector out	$\geq 57$ dBm
<b>Third Order Intercept Point</b> $\Delta f = 50$ kHz antenna input referred, gain control manual, attenuator out, preamp out, pre-selector out	$\geq 30$ dBm
<b>Image Rejection</b> gain control manual, attenuator out, preamp out, preselector out	$\geq 110$ dB
<b>IF Rejection</b> gain control manual, attenuator out, preamp out, preselector out	$\geq 100$ dB
<b>LO Isolation</b> measured at antenna input when terminated into $50 \Omega$ attenuator out, preamp out, preselector out frequency range 56.85 MHz . . . 86.85 MHz	$\leq -95$ dBm
<b>Return Loss</b> measured at antenna input, 100 kHz . . . 30 MHz attenuator out, preamp out, preselector out	$\geq 15$ dB ( $\geq 20$ dB typ.)

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**Distortion**

1 mV input signal  
AM at 50% depth with 1 kHz  
attenuator out, AGC slow

$\leq 0.7\%$  THD  
with 30 kHz bandwidth

**SSB Unwanted Sideband Rejection**

input signal at 1 kHz offset from tuned frequency  
bandwidth 2 (2.4 kHz)

$\geq 38$  dB

**RSSI Readout Accuracy**

bandwidth 2 (2.4 kHz)  
attenuator out, preamp out, preselector out  
unmodulated carrier

$\leq 3$  dB  
in the range from  
-110 dBm to -10 dBm