



SURVEILLANCE AND COMMUNICATIONS RECEIVER CR91

The Model CR91 is a synthesized, programmable, digitally tuned solid state SSB/ISB receiver, covering the frequency range of 10 kHz to 30 MHz. It is designed for continuous service in fixed, mobile or shipborne applications.

In designing this receiver great importance has been attached to its ability to be integrated into complex computer controlled communications systems.

The flexibility of the receiver is enhanced by the provision of a selection of optional items which may be added internally in the form of plug-in printed circuit boards or externally in separate 19" units.

The front panel layout and tuning speeds have been optimized for surveillance applications.

Specific channel settings can be preprogrammed with possibility of preprogramming during traffic.

Full remote control with revertive checking is provided at speeds of 50 – 2400 Baud. The remote control unit uses a front panel identical with that of the receiver itself. Hence, the operator will not notice any difference when operating either locally at the receiver or from the remote control position.

The receiver CR91 is built up with modules which plug into a mother board. All modules, with the exception of the power supply module, are printed circuit boards and are accessible from the rear of the receiver. No soldering or realignment is required when replacing them.

The front panel is connected to the receiver via a ribbon cable and can be used apart from the receiver.

CR 91 Receiver Features

- Synthesized tuning down to 1 Hz increments plus synthesized BFO.
- Tuning by single knob with three different speeds.
- Antenna selection from the front panel.
- Digital read out of all receiver settings on a LED display panel.
- Instantaneous keyboard selection of up to 100 preprogrammed channels as standard.
- Internal battery maintains stored settings in case of power failure.
- Modular construction with plug-in PC-boards.
- Computer controllable via RS232 interface using ASCII code.
- RF overload up to 20 W without damage.
- Fast-locking synthesizer.
- Excellent large signal handling capability.
- Automatic and manual scanning of stored channels.
- Rugged design with temperature range from -30 to $+55^{\circ}\text{C}$
- Internal frequency offset allows AFSK to be received with narrow IF filters
- Extensive range of accessories and additional features
- Easy maintenance, no soldering or realignment required when replacing modules.

TECHNICAL DESCRIPTION

The CR91 Receiver is a double superheterodyne using two high level double balanced FET mixers and a fast settling low noise synthesizer.

Signal path

The required input selectivity is obtained by nine suboctave bandpass filters in the frequency range 1.6 – 30 MHz and a low pass filter below 1.6 MHz.

The first mixer converts the input signal to 125.2 MHz. It is followed by a two pole crystal filter, an amplifier and a four pole crystal filter. The 125.2 MHz signal is then down-converted to the 2nd IF frequency 200 kHz and filtered in mechanical filters with piezo electric transducers. This type of transducers gives a minimum of intermodulation products.

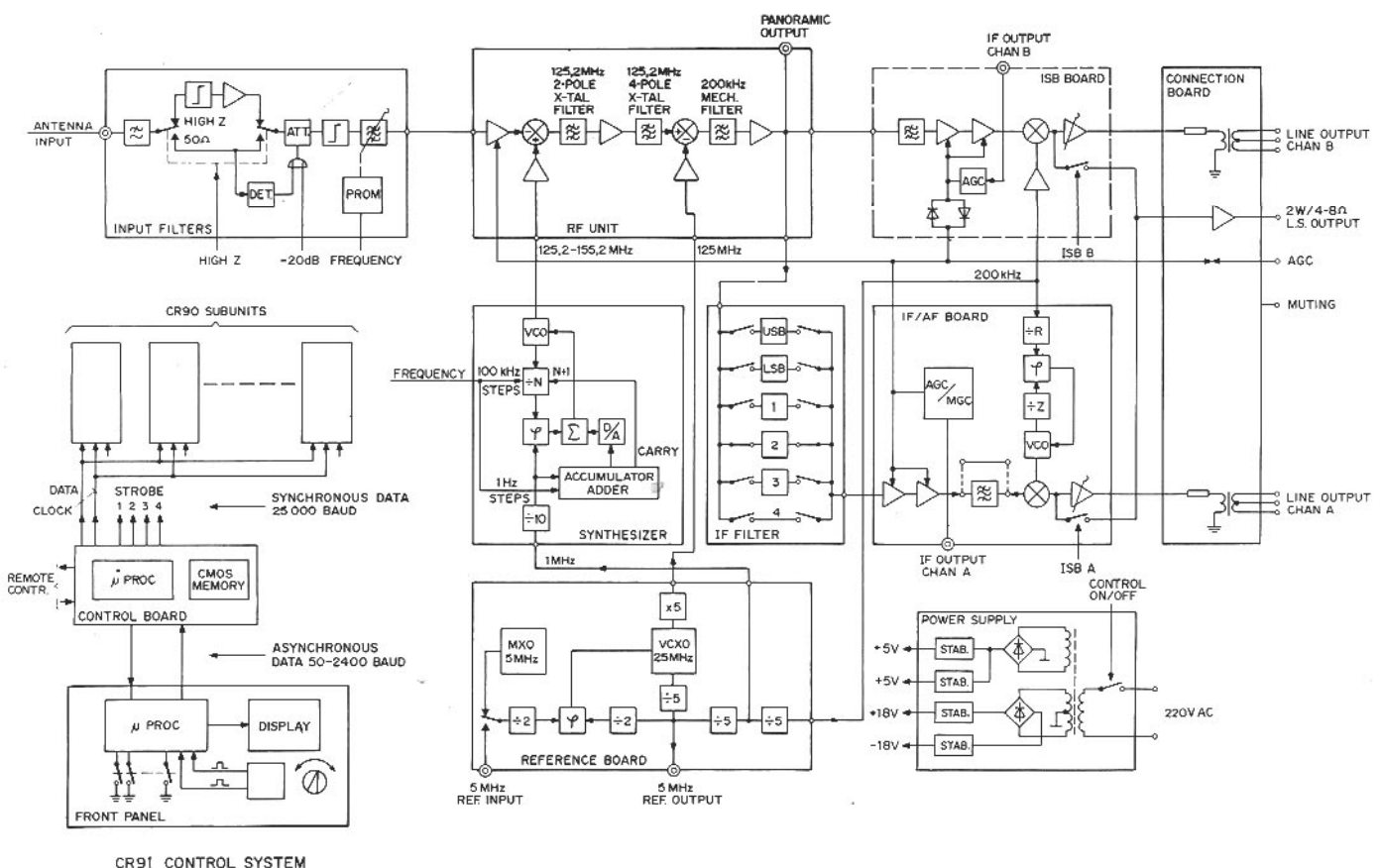
The 200 kHz IF signal is then amplified and fed to the low distortion AM/SSB detector.

In "Very Narrow" mode an extra 200 kHz mechanical filter is

connected in front of the detector to reduce broadband noise from the IF amplifier. The AGC voltage is derived from the 200 kHz amplifier and has a very fast attack time, which results in excellent transient response. For strong wanted input signals the AGC voltage activates a variable attenuator in the front end. The effect of this arrangement is that the receiver can withstand very strong interference signals without generating any cross modulation.

Frequency generation

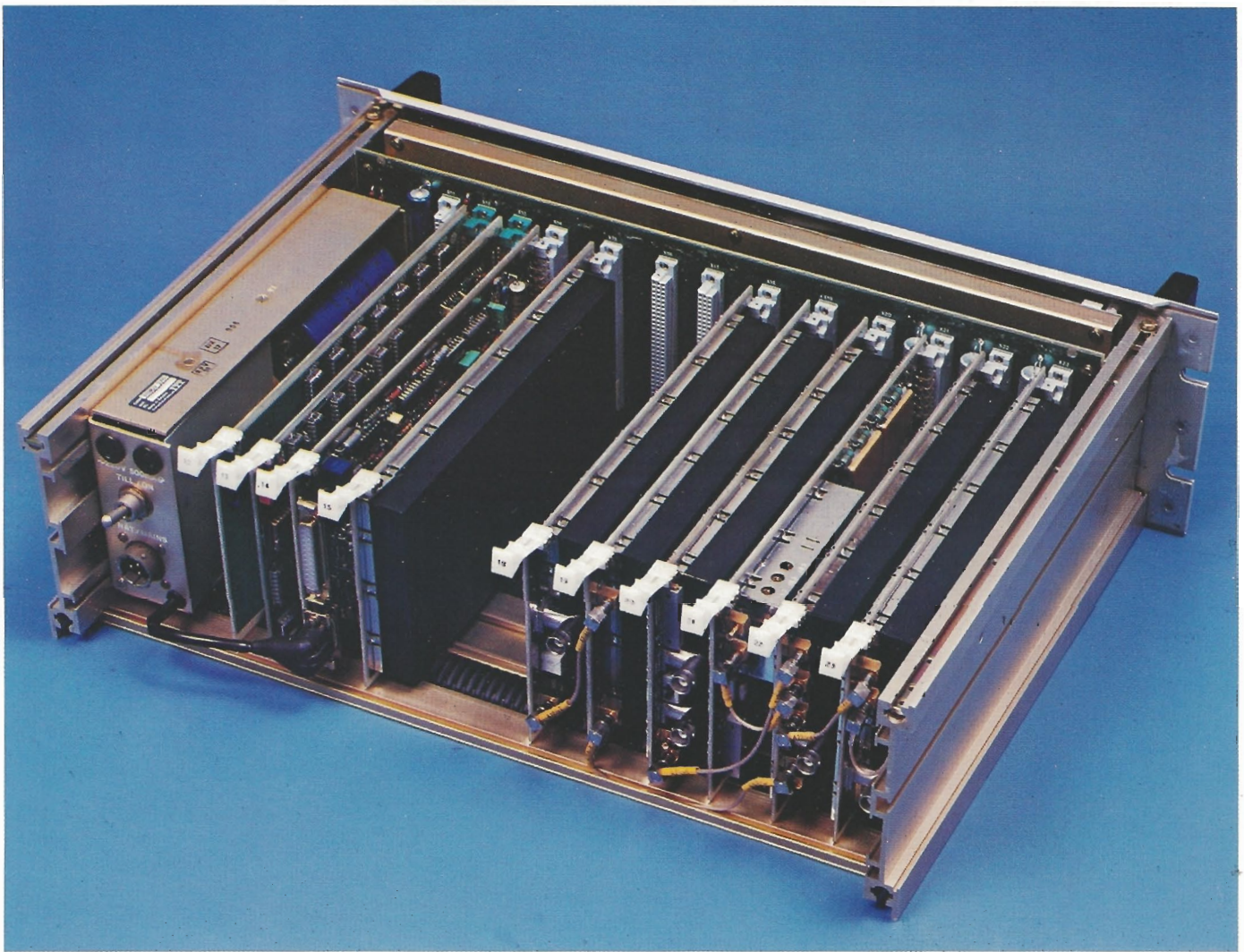
All frequencies generated including BFO and the 125.0 MHz signal are phase-locked to the built-in 5 MHz reference oscillator. The synthesizer covers the band 125.2 to 155.2 MHz in 1 Hz increments. The high Q LC-circuit in the voltage controlled FET oscillator is band switched in 32 steps by PIN-diodes and tuned continuously by two low loss varactor diodes. The VCO is controlled by a single phase-locked loop utilizing a new phase interpolating technique. Thick-film hybrid technology has made it possible to construct the complete synthesizer on a single PC board.



CR91 Functional block diagram

TECHNICAL DATA

Frequency range:	10 kHz – 30 Mhz.	IF attenuation:	More than 100 dB.
Frequency setting:	Digitally by push-buttons or continuously by single knob in 1 Hz, 10 Hz or 100 Hz steps over the entire frequency range.	Image rejection:	More than 100 dB.
Frequency accuracy:	1×10^{-7}	Spurious responses External:	Unwanted signals separated more than 20 kHz from the tuned frequency must be more than 100 dB above the wanted signal to produce an equivalent output.
Modes of operation:	CW, FSK, AM, SSB, AFSK, ISB	Spurious responses Internal:	Not exceeding an equivalent aerial input signal of $0.2 \mu\text{V}$ EMF.
Input impedance:	50 ohms SWR <3 or high impedance selectable.	AGC range:	An increase of 120 dB from $2 \mu\text{V}$ EMF will produce an output change of less than 3 dB.
Input protection:	30 V EMF behind 50 ohms continuously or 60 V EMF for up to 15 minutes.	AGC time constants:	Attack <2 ms. Decay 0.1, 1 and 5 seconds selectable.
Sensitivity:	A3 (Bandwidth = 6.8 kHz, m = 30%) = $3 \mu\text{V}$ EMF for 12 dB SINAD. A3J (Bandwidth = 3 kHz) = $0.6 \mu\text{V}$ EMF for 12 dB SINAD. (= 10 dB noise factor)	BFO:	Synthesized from the Master Oscillator. CW: Tunable in 100 Hz steps 300 Hz to 1800 Hz rel. f_0 FSK: Selectable in 100 Hz steps 300 Hz to 2800 Hz rel. f_0 AFSK = FSK but the receiver centre frequency is 1500 Hz (as standard) higher than the tuned frequency SSB/ISB: fixed at f_0
IF Selectivity:	VERY NARROW: -3 dB at ± 150 Hz, -60 dB at ± 500 Hz. NARROW: -3 dB at ± 300 Hz, -60 dB at ± 850 Hz. INTERMEDIATE: -3 dB at ± 750 Hz, -60 dB at ± 1250 Hz. WIDE: -3 dB at ± 3400 Hz, -60 dB at ± 4500 Hz. USB: -3 dB at +250 and +3000, -60 dB at -250 and +3500 Hz. LSB: -3 dB at -250 and -3000, -60 dB at +250 and -3500 Hz.	Line output (600 ohms balanced):	Adjustable up to +10 dBm, distortion <0.5%.
Cross modulation:	Wanted signal $300 \mu\text{V}$ EMF, unwanted signal more than 1 V EMF 30% modulation to produce an output of 20 dB below the wanted signal output.	Loudspeaker output:	2 W max. at less than 5% distortion.
Reciprocal mixing:	Wanted signal $100 \mu\text{V}$ EMF, unwanted signal 20 kHz removed will be 75 dB above the wanted signal to produce a noise level of 20 dB below the wanted output.	Channel memory:	100 channels as standard.
Intermodulation:	Two 30 mV EMF signals separated and removed 20 kHz from the tuned frequency will produce less than -90 dB third order intermodulation.	Remote control:	All front panel functions can be remote controlled via RS232 interface using ASCII code.
		Power supply:	220 or 110 V $\pm 20\%$ 45–400 Hz.
		Power consumption:	50 VA
		Temperature range:	Operational: -30 to +55°C Storing: -40 to +70°C.
		Relative humidity:	Max. 95% according to IEC 68-2-30.
		Vibration:	5–150 Hz 2 g According to IEC 68-2-6.
		Bumps:	4000 bumps 25 g- in main direction according to IEC 68-2-29.
		Dimensions:	Panel width: 482 mm (19") Height: 133 mm Depth: 320 mm
		Weight:	12 kgs.



Rear view – top cover removed

OPTIONAL ITEMS

Internal (PC boards)

- ISB-module
- FSK Demodulator
- Diversity Adapter
- Antenna Selector Controller

External

- Different types of operator's control units (OC 90-series)
- F1 demodulator
- F6 demodulator combiner
- Radio Telephone Terminal
- Remote Control Transmitter (CR91R)
- Device Address Units
- ARTRACS-Automatic Radio Traffic Control System
- Scanning units
- TTY adapter
- Channel unit for transceiver operation

Standard Radio & Telefon AB, Box 501, (Siktg. 11), S-16215 Vällingby, Sweden
 Phone: 08-739 40 00 (Int+46 8 739 40 00)
 Telex: 17850 ITTSRT S

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