

# **SIMRAD-NAVICO CIRCUIT DESCRIPTION**

<b>Circuit Diagram Part Number(s)</b> <b>E02955 : Rx / Tx</b>  <b>Product : RT1200 / RT1400 / RD68W</b>	<b>Page 1 of 3</b> <b>Date: 15/6/00</b> <b>Issue No. : 1</b> <b>Approved .....</b>
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## **References:**

E02955 schematic diagram.

## **Overview:**

The Rx / Tx assembly is the transceiver half of the RD68W 25W mobile radiotelephone. It contains all the circuitry required to receive and transmit signals in the marine band.

## **Circuit Description:**

**Receiver.** RF from the antenna socket passes through the low pass PA filter to a quarter wave match / switch L5, L6 and pin diode D1. During transmissions, D1 is switched on to protect the receiver. There then follows an optional attenuator and power splitter, to provide RF to the second receiver in the RT1400, which is bypassed by link LK1 in the RT1200. C214 is a 1nF coupling capacitor and L7, L8 and the associated capacitors form a bandpass filter at the input to the RF pre-amplifier TR1. L9 and L11 form a further bandpass section before the mixer TR2. The RF signal is fed to TR2 Source and the local oscillator to Gate 1. Low side injection is used, i.e. the LO, TR105 buffered by TR103 and TR104, is 21.4 MHz below the receive frequency. L13 forms the drain load before matching through C25 and C26 to the 4 pole crystal filter XTAL1 and XTAL2. The output of the filter is coupled by L14, C28 and C29 to the integrated IF amplifier / demodulator IC1. A second local oscillator running at 21.855MHz produces the second IF of 455KHz. XTAL4 is a 6 pole ceramic filter completing the necessary bandwidth definition with quadrature coil L16 providing demodulation.

Audio from pin 9 of IC1 is de-emphasised by R20 and C43, buffered by TR20 and distributed to the various audio stages on the control PCB. The audio from pin 9 is also passed through a very high gain amplifier, within IC1 and configured as a bandpass filter, to detector D2 to provide a voltage proportional to the received signal strength. This level is fed to the front panel to provide squelch control. The AF signal is returned from the control panel after the volume and squelch controls to 2 audio power amplifiers in bridge mode.

**Transmitter.** The LO switch / buffer TR102 switches the transmit signal for amplification by controlled transistors TR101 and TR100 to drive the hybrid PA module IC100 which is capable of generating the required 25 Watts. The output is switched through PIN diode D100 before passing through the PA filter L1 to L4. L4 of this filter, with diodes D101 and D102, forms a simple forward and reverse power detector to provide power control and transmitter status indication on the front panel display. The power control signal is fed to differential amplifier IC101 together with the reference power signal from VR100 and VR101, to set the high and low power levels. The output of this amplifier forms a regulated supply with TR113 and TR114 to supply the PA

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drivers TR100 and TR101. The reference input and supply for TR114 is fed from TR111 which is only turned on after the synthesiser is in lock.

**Local Oscillator / Synthesiser.** The main LO consists of TR105 connected as a Colpitts oscillator. Tuning is by L113, varactor VC102 and VC104. Band switching between receive and transmit is by PIN diode D103. The output of the oscillator is buffered by a cascade pair formed by TR104 and TR103 in receive and TR102 and TR104 in transmit., the supply to TR102 and TR103 being switched between the 2 modes. The output is also buffered by TR118 to the input of the synthesiser IC105. The reference frequency at 9.6 MHz is generated by TR119 and controlled by XTAL101. C200, C115 and R157 form the main loop filter with additional suppression of the reference frequency by R179 and C204. The synthesiser is controlled from the control panel via a 3 wire serial interface.

**Modulator.** Audio from the control panel is amplified by IC104b, the gain being configured by R169, R173 and C169 to give the signal pre-emphasis. The output of the stage is peak detected by D3 and detector TR1167 to provide a gain control signal to TR117 to enable limiting of high level input signals. Temperature compensation of the limiter is provided by thermistor TH1 and IC104a forms a high pass filter to meet the 14dB / octave roll-off above 6kHz. The final output is fed to the modulation diode VC101 via gain control VR102 which is set to a maximum of 5kHz deviation.

**Power Regulation and Switching.** The 12 volt supply is switched on the front panel and then feeds the audio amplifiers and regulators. The RF power module takes power before the switch to minimise voltage drops. Reverse polarity protection is provided by D104 and D105. A regulated 8v supply is provided by IC103 and 5v from IC107. The supplies for receive and transmit circuits are switched by TR106 and TR110 controlled from the synthesiser via TR107 to TR109. IC105 controls the switching of PIN diode D103 ensuring that there is a suitably high reverse bias across it in the OFF condition.

**NMEA Reception.** (RD68W only) Position and time information, from a GPS unit, is received in the form of NMEA data. This is opto-coupled into the radio via R225, D5 and IC4. The data is then routed through to the control PCB via PLG3.

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