

6. Description of circuits determining frequency

6.1. Block schemes of signal generation on transmission/ reception (TX / RX) for two operational modes are given in Fig. 6.1 (A) and (B) correspondingly.

6.2. Generation of signals on transmission/ reception is implemented by frequency source located on the REC GPS board. The reference frequency signal comes to the MOD 915M board through the circuit FREF with the following parameters:

- Signal magnitude Vp-p not less 1V;
- Frequency 20MHz;
- Relative frequency instability not worse than $-/+ 1.5$ ppm.

6.3. The following frequency sources are used in all operational modes:

- LO_RF;
- LO_IF;
- RF_MIX.

The mixers RX_FH_MIX and RX_DSS_MIX are used in the receiving paths on the intermediate frequency, while MIX_MOD is used in the transmitting paths. The MIX_MOD is the mixer at TX_FH operational mode and BPSK MODULATOR at TX_DSS operational mode. MSK-modulated signal generated by DDS and having the second IF equal to 10.7 MHz is applied to the input of MIX_MOD.

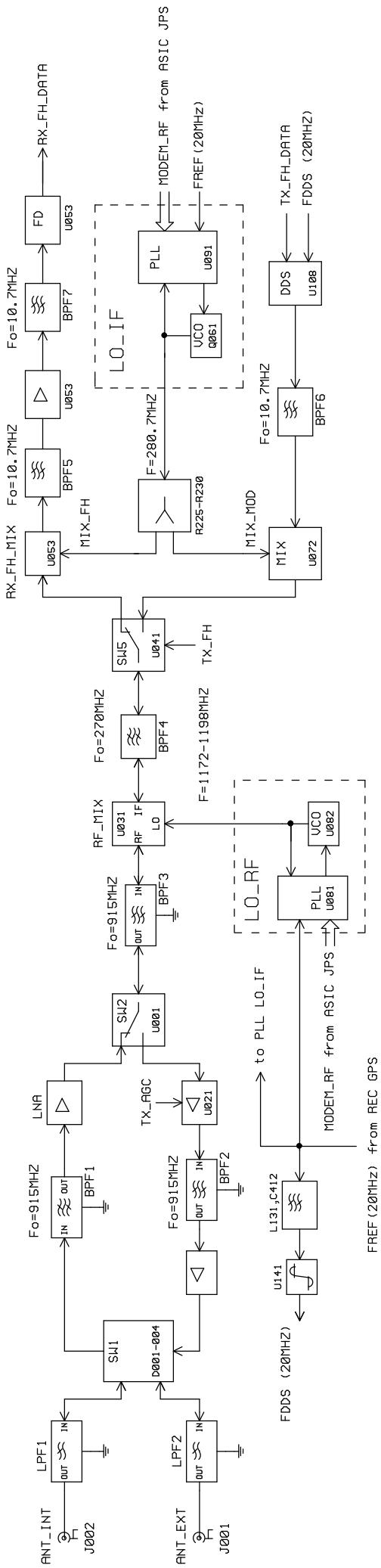
6.4. LO_RF generates the signal in the frequency band from 1172 to 1198 MHz. Under RX_DSS and TX_DSS operational modes the heterodyne generates the signal with a definite frequency equal to 1195 MHz. Under RX_FH and TX_FH operational modes the heterodyne generates the signal with frequencies whose values vary according to the pseudorandom law in the band of 1172.2 – 1197.8 MHz, across a 200 KHz band. Frequency control signals are generated by hardware and software and are applied to PLL LO_RF through MODEM_RF circuits from the REC GPS board. The bandwidth of the PLL is about 8 KHz.

6.5. LO_IF provides generation of the signal with a frequency in the frequency band from 280 to 290 MHz across a 0.1 MHz band. This heterodyne generates fixed frequencies in all operational modes:

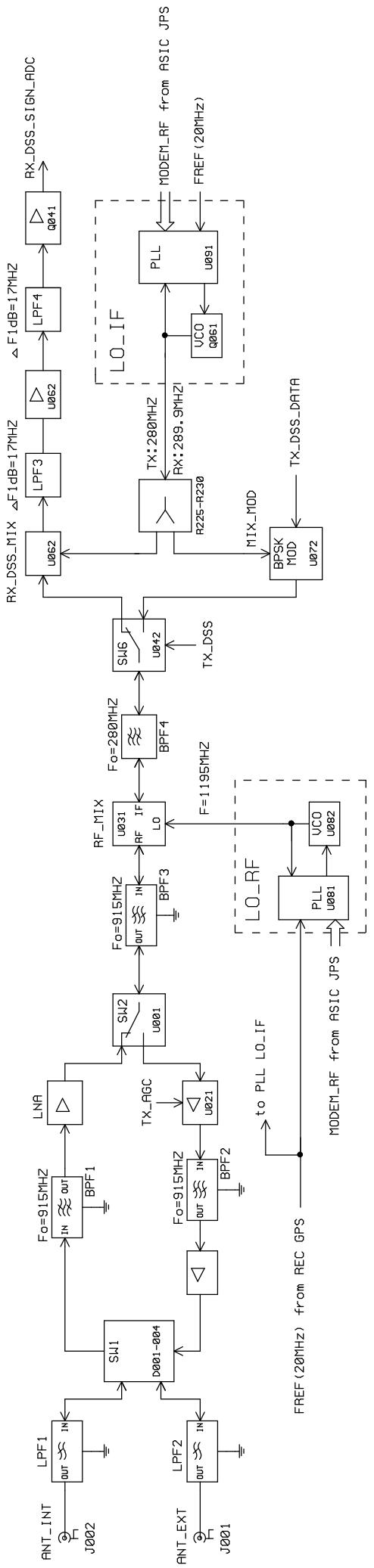
- 280.7 MHz for RX_FH è TX_FH;
- 289.9 MHz for RX_DSS;
- 280.0 MHz for TX_DSS.

Frequency control signals are generated in the same way as in LO_RF and come then to PLL LO_IF from the board REC GPS. The bandwidth of the PLL is about 6kHz.

6.6. RF_MIX is designed based on the double balanced diode mixer and operates like UP CONVERTER in TX operational mode and like DOWN CONVERTER in RX operational mode.



A. MODE FH



B. MODE DSS

Figure 6.1 Block Diagram MOD 915M.
 DSS-DIRECT SPREAD SPECTRUM
 FH-FREQUENCY HOPPING
 FD-FREQUENCY DISCRIMINATOR
 SW-SWITCH