Radtec's Implementation Of Dual Polarity Radar

Radtec's implementation of dual polarity transmits horizontally and vertically polarized pulses simultaneously. This technology is licensed to Radtec under US Patent No. 5,500,646 issued to Dr. Dusan Zrnic.

A power splitter is used to divide the transmitter's output equally between the horizontally and vertically polarized antenna feeds. A separate receiver is used for each polarity. The major advantage of this method is that it is entirely electronic, and therefore highly reliable. The disadvantage is that the transmitter output is reduced by 3 dB for each of the polarities.

It is worth noting that the Radtec TDR 43-250 has the highest average power output of any commercially available weather radar; 1,250 W maximum. This is the result of the exclusive Radtec solid state DC switch type modulator. This modulator can support the maximum duty cycle of the Klystron. Other commercially available Klystron radars use conventional modulators which cannot take full advantage of the Klystron's high duty cycle. The end result is that a TDR 43-250 can deliver more average power in dual polarity mode, even with the 3 dB reduction, than other radars can deliver in single polarity mode.

A bypass arrangement is included to bypass the power splitter and provide full transmitter output for operation in conventional single polarity, horizontally polarized mode.

The received signals are converted to a dual frequency I/F, one frequency for the horizontally polarized component, and the other frequency for the vertically polarized component.

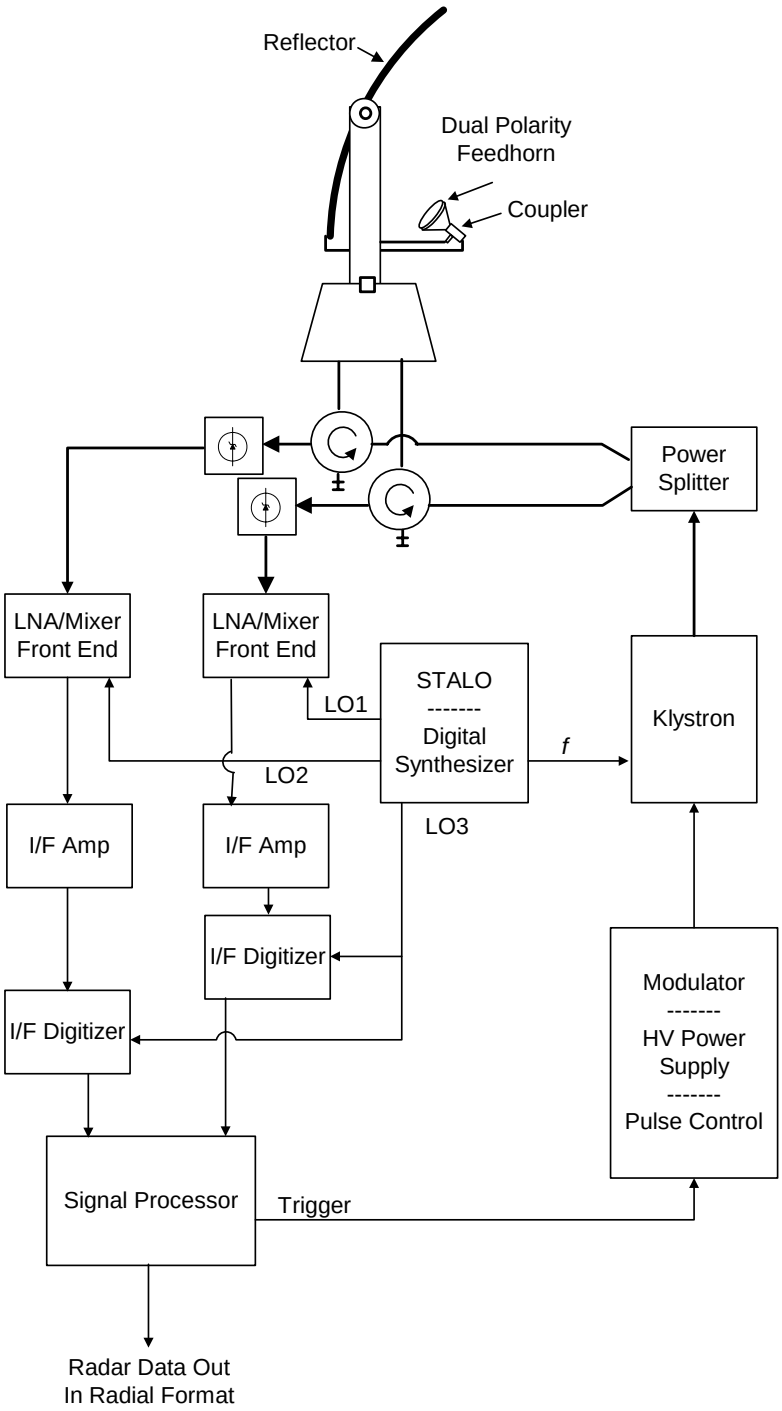
These two components are added and input to the signal processor. The signal processor digitally separates and processes the two data streams simultaneously in real time.

A simplified block diagram is shown on a following page. For the sake of clarity, the power splitter bypass is not shown.

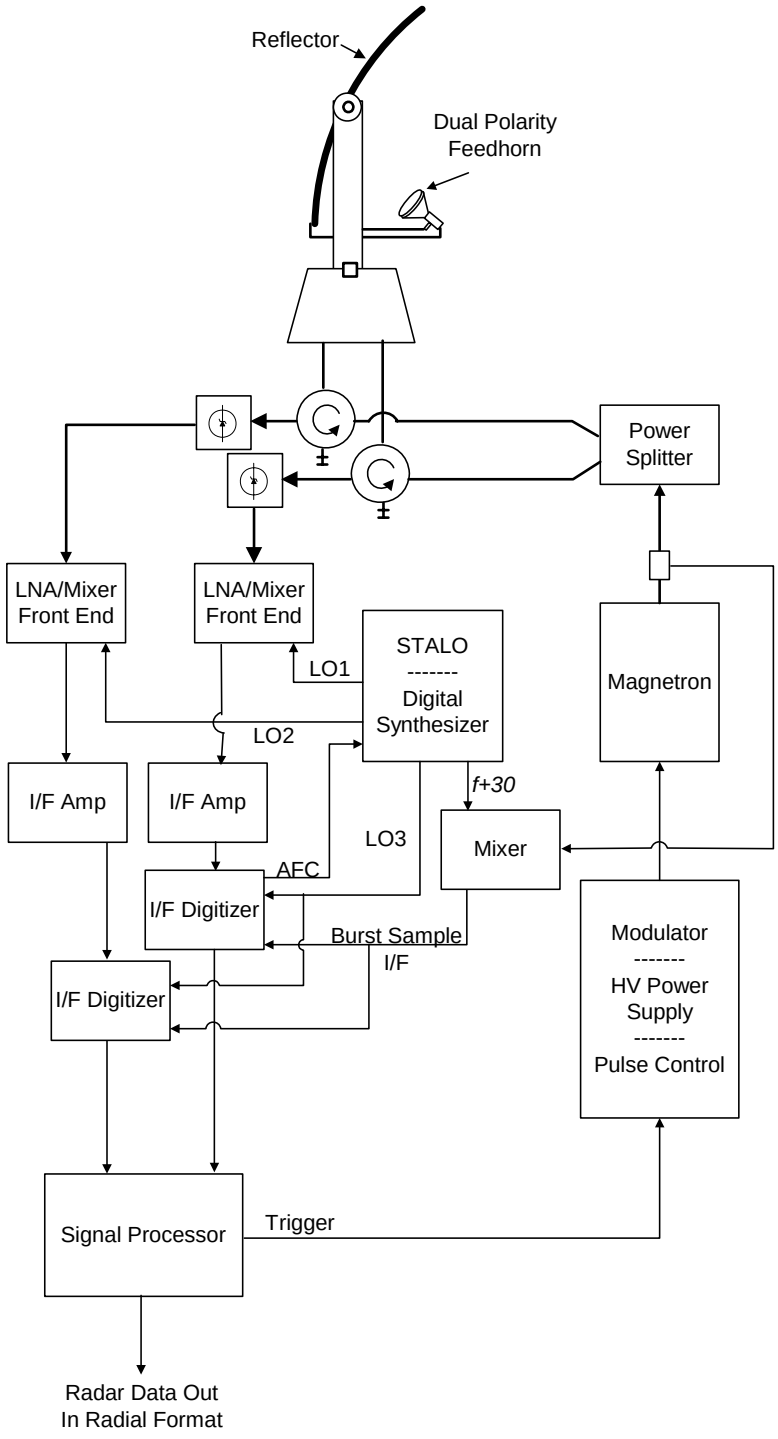
The output from the signal processor is a real-time data stream in radial format. Each radial of data includes an ID (radar ID, azimuth and elevation angles, time, etc.) followed by the data for each range bin in the radial. Each radial is a complete data set for that radial.

Note that when operating in dual polarity mode, the output data rate is significantly higher than in single polarity mode. In single polarity mode, the data includes reflectivity (Z), velocity (V) and spectrum width (W) data values for each range bin. In dual polarity mode, the data includes Z, V and W as well as data values for Z_{DR}, K_{DP} and ρ_{HV}. To preserve full real time operation, the data link between the radar and the central site must

have sufficient bandwidth to handle the additional products. In most cases, this will require the full bandwidth of a T1 (1.544 Mbits/sec) circuit.



Block Diagram – TDR Series Fully Coherent Dual Polarity Operation



Block Diagram – RDR Series Coherent On Receive Dual Polarity Operation