

**ABSTRACT:**

"A direct conversion receiver"

This Sheet Has Been Replaced



In known direct conversion receivers, e.g. for paging, for getting a correct polarity a.f.c. signal, the a.f.c. signal is derived from a series arrangement of a phase shifting arrangement and a multiplication arrangement, coupled to quadrature related signals (I, Q). At an output of the series arrangement a bipolar control signal is achieved having a relatively low frequency ripple component giving rise to a relatively slow a.f.c. loop response. The direct conversion receiver (1) according to the present invention comprises a.f.c. means with an offset frequency detector (17) for determining a signal (dct) as the a.f.c. signal (ct), of which an average value is proportional to a frequency offset ( $\delta f$ ) of a local oscillator with respect to an rf input signal, the frequency detector (17) having such series arrangement in both I- and Q-paths (4, 5), allowing for a fast a.f.c. loop response, therewith improving the a.f.c. performance. Due to the unipolar control signal, a series of positive or negative pulses, depending on the sign of the frequency offset, less demand is imposed upon signal averaging, i.e. upon the loop filter. Furthermore, the receiver (1) comprises out-of-range detection means (19, 42, 45, 47) for detecting whether a local oscillator frequency ( $f_L$ ) is outside a predetermined range with respect to a carrier frequency ( $f_C$ ).

Fig. 1