

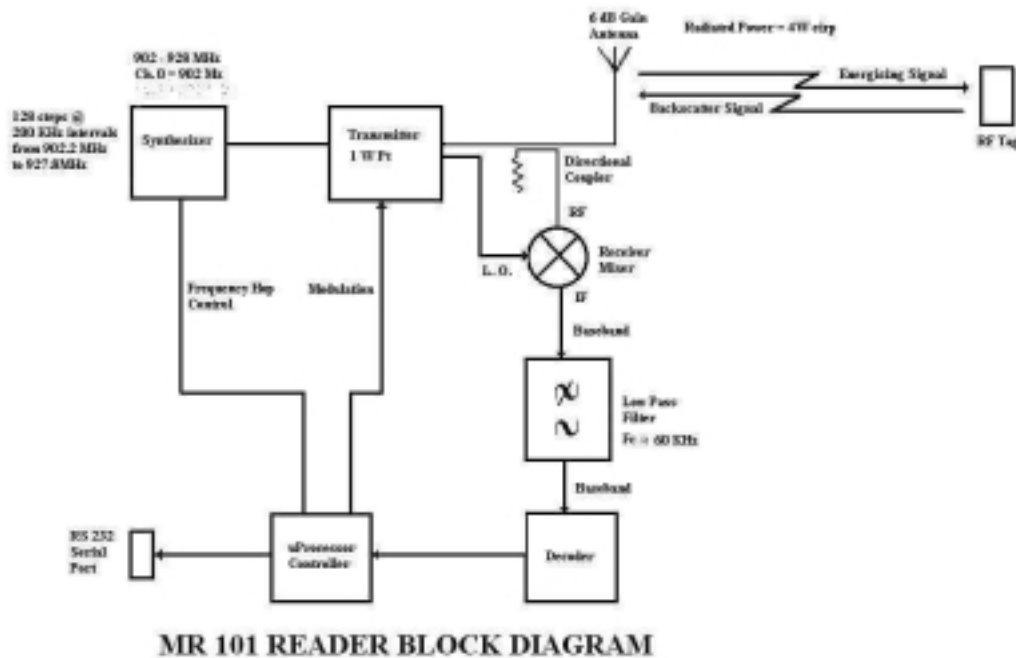
# BiStar MR-101 Mounted RFID Reader

## Circuit Description

The MR-101 is a UHF Radio Frequency Identification reader designed to operate in the 902 to 928 MHz licence free band. The reader comprises a full duplex transceiver which is connected to a circularly polarised panel antenna having a gain of approximately 5.4dBi.

Refer to the block diagram.

The transceiver consists of a number of modules, each module having specific function. This allows rapid repair of the reader without the need to employ specialised test equipment, because each module is separately repaired and calibrated at the factory, hence there is no need for any adjustment in the field.



### Frequency Synthesiser

The frequency synthesiser block is the heart of the reader and uses a low noise phase locked loop oscillator to generate an RF signal directly at the output frequency. A TCXO provides a high stability (2ppm) reference frequency, to which the PLL is locked. The synthesiser is designed for a reference step size of 100kHz and covers the frequency band of 902 to 928 MHz.

### Power Amplifier

The output of the synthesiser is coupled to an RF power amplifier which has automatic level control (ALC) and an amplitude modulator (AM). The RF output power may be adjusted for exactly 1 Watt and is maintained at this level by the ALC over temperature and voltage extremes. The modulation depth is nominally 50% negative going only. The amplifier output is routed through a low pass filter which reduces any harmonics and higher frequency out of band emissions to at least 70dB below the transmitted signal.

### Directional Coupler – Receiver

The transmitter's output is coupled through a directional coupler to the antenna. The directional coupler contains a pair of balanced mixers arranged in quadrature. A portion of the transmit energy is used as the local oscillator to mix the incoming backscatter RF Tag signals down to baseband.

The purpose of the quadrature mixer is to overcome the problem of nulls in the reader's field, due to the phase cancellation between the radiated signal and the received backscatter signal.

#### Lowpass filter – limiter

Two baseband signals (In-phase and Quadrature) derived from the mixers are filtered by a low pass filter to limit their bandwidth to 60kHz. The baseband signals are then amplitude limited before being combined and applied to the decoder.

#### Decoder

The decoder extracts the Tag's data from the baseband signal and passes it to the serial port by the microprocessor-controller. The decoder also verifies the integrity of the data by checking the data message length and the embedded CRC.

#### Microprocessor-controller

The uP controller manages the reader. Its primary functions are

- Communication with the host or controlling computer which is connected via an RS-232 serial communications link.
- Receiving data from the decoder and passing it on to the host
- Managing the reader functions, such as transmitter control, modulation and antenna switching.
- Controlling the frequency synthesiser hopping in a pseudo-random manner as described in the section on frequency hopping.