

Master Tech Engineering, Inc.

Technical Description of
Superregenerative Receiver in the
MASTER TECH Essential Tools™ Vehicular Data Recorder

The MASTER TECH Essential Tools™ Vehicular Data Recorder is a piece of commercial test equipment for use in motor vehicles, for the purpose of recording and identifying electronic malfunctions within the motor vehicle. Due to its use in motor vehicles and as commercial test equipment, the digital device within the Vehicular Data Recorder is an exempted device per 15.103(a) and 15.103(c) respectively.

The superregenerative receiver is installed in the Vehicular Data Recorder to provide wireless control of the recording process, when used in conjunction with the MODEL ACT-21 transmitter from LINEAR CORPORATION (FCC ID: EF4 DNT00057), which is an amplitude modulated garage-door-type transmitter operating at 318 MHz.

An external antenna (9 inch wire antenna is supplied with the receiver) is coupled to the RF pre-amp, which provides amplification and isolates the antenna from the superregen oscillator. This isolation serves to minimize loading of the oscillator as the antenna impedance varies – primarily due to changes in the proximity to metal surfaces, and to minimize the amount of superregen oscillator energy that is coupled to the antenna. The signal at the output of the RF pre-amp is coupled to the superregen oscillator, which is free-running at or close to the operating frequency of 318 MHz. The quench oscillator, which operates at approximately 65 kHz, is also coupled to the superregen oscillator, and acts to power the free-running oscillator on and off at an approximately 65 kHz rate. With an applied RF signal from the RF pre-amp, the superregen oscillator reaches its equilibrium amplitude sooner than it does on thermal noise alone. The effect of the applied RF signal is to increase the average area under the RF envelope according to the level of the applied signal.

The output from the superregen oscillator is applied to an amplifier to boost its level and square up the signal, and the output of the amplifier is coupled to a microcontroller. The microcontroller, which contains an internal clock oscillator controlled by an external 4.005 MHz resonator) performs the demodulation of the RF signal by pulse-width demodulation, as well as performing the decoding function by comparing the received data with one or more stored “activation codes”. When a demodulated data structure matches a stored “activation code”, the microcontroller briefly activates an open-collector switch, causing the receiver output to be forced to ground, which triggers the recording function of the Vehicular Data Recorder.

The receiver ground connects to a metal box at the power ground input and at the antenna connector, and the receiver is encased within a metal shield. Thus, the metal box/shield serves as ground for the receiver circuit and as the ground reference for the antenna. The supplied antenna is a 9 inch (approximately 1/4 wavelength at 318 MHz) wire antenna, which couples to a TNC connector attached to the receiver box. The TNC connector allows for user replacement of the antenna in the event that the antenna is damaged.