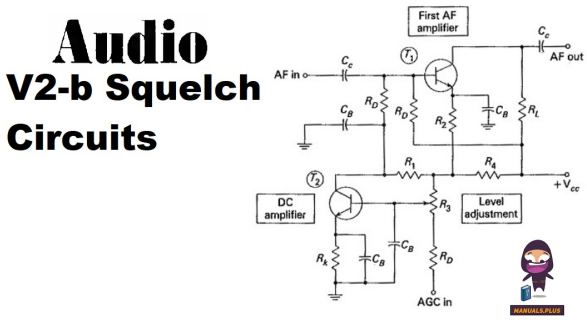
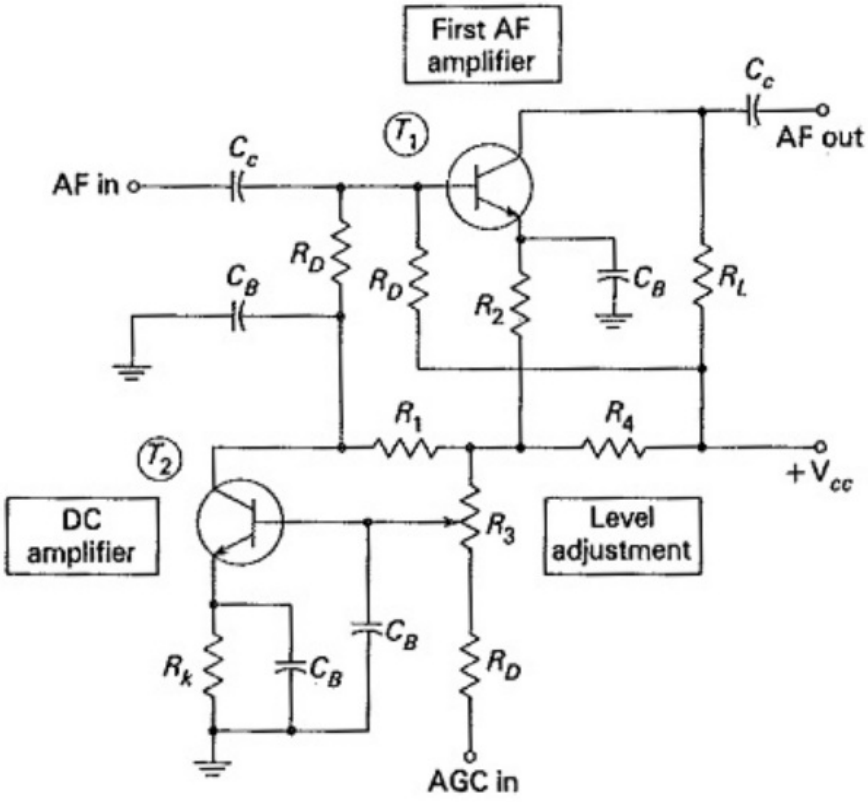


Audio V2-b Squelch Circuits Instructions

Contents

Audio

Audio V2-b Squelch Circuits



Specifications

- **Product Name:** Audio Squelch Circuits
- **Author**: John L. Gergen
- **Application**: Used in installations where a receiver must remain on for long periods of time
- **Usage:** Silences the receiver when no usable signal is being received

Product Usage Instructions

- **Overview**
  In installations where a receiver needs to stay on for extended periods without a signal, the Audio Squelch Circuit helps silence the receiver to prevent background noise amplification.
- **How It Works**
  The squelch circuit operates from the a.v.c. voltage and silences the receiver when no usable signal is being received. It is particularly useful for FM and broadcast reception.
- **Installation**
  Refer to the provided circuit diagrams for installation. Ensure proper connections are made as per the instructions.
- **Usage in High-Quality Equipment**
  Designers of high-quality receiving equipment can leverage the squelch circuit to enhance performance by silencing between-station noises while tuning.
- **Control and Adjustment**
  The squelch circuit can be adjusted using the provided controls to optimize the silencing effect based on the signal strength.

N installations where a receiver must remain on for long periods of time even though no signal is present at the

antenna, noise and background hiss (present in any receiver no matter how well designed) are amplified through the i.f. and audio stages and cause annoying noises at the loudspeaker. A squelch circuit is a control arrangement, usually operating from the a.v.c. voltage, that silences the receiver when no usable signal is being received.

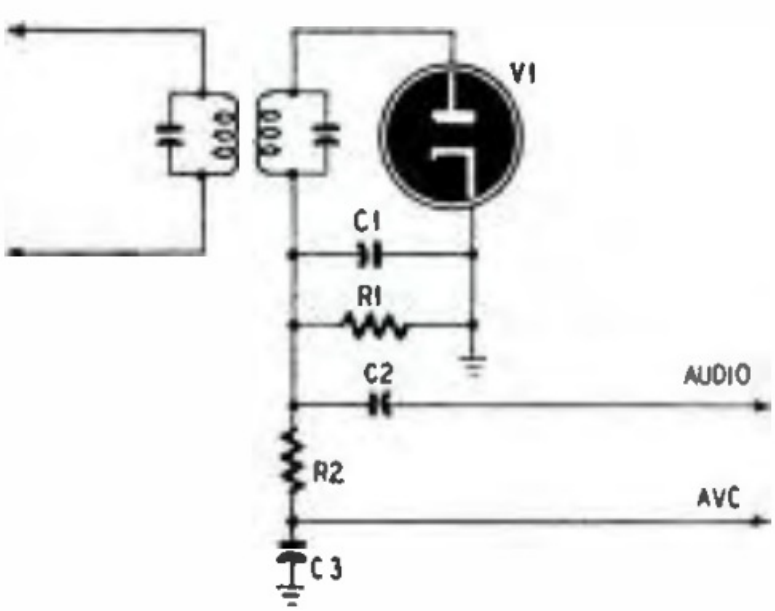


Fig. 1—The sources of a.f. and a.v.c.

- Squelch circuits are used frequently in military and police receivers; such equipment must remain on to receive unscheduled broadcasts. However, designers of high-quality receiving equipment can use the squelch circuit to good advantage to silence between-station noises while tuning.
- A squelch circuit would be impractical for this purpose in a communications receiver when listening to signals that fluctuate rapidly at random due to atmospheric conditions, but it offers improved performance for FM and broadcast reception. The diode detector VI of a conventional AM receiver, such as that in Fig. 1, furnishes two output voltages.
- An a.f. signal, from which r.f. has been removed by Cl, appears across Rl. This is applied through C2, which blocks the d.c. component, to the volume control (not shown), the arm of which is connected to the grid of the first audio amplifier. The rectified d.c., filtered by R2 and C3, is negative with respect to ground. It is brought back to one or more r.f. and i.f. stages as a.v.c.' Since the a.v.c. voltage is the result of rectifying the r.f. signal, its magnitude depends solely on the signal strength, not at all upon the modulation.
- The a.v.c. voltage may also be used to control a squelch circuit, as shown in Fig. 2. Only two additional tubes are required, the most convenient arrangement being to use a dual-triode. The 6SL7 -GT was chosen because it has a sharp change in plate current for a change in grid voltage of from 2 to 4 when the plate voltage is 250.

How the squelch works

- The circuit of the squelch is very much like that of a direct coupled amplifier: a voltage divider is placed across the power supply, and the two stages -plates, cathodes, and grids – are placed at various points along it. Fig. 2 is drawn so as to show clearly the voltage-divider effect provided by the three resistors R4, R5, and R9 across the power supply.
- The voltage appearing across R9 is applied as plate voltage to V2 -b, an ordinary cathode-follower amplifier.
- The a.f. signal from the detector is applied between the grid and the ground. Output is taken from across the cathode resistor.

- The bias on V2 -b, however, is controlled by V2 -a, which, in turn, is controlled by the a.v.c. voltage.
- When no signal is being received, there is no a.v.c. voltage; therefore there is no voltage between the grid and cathode of V2 -a, except for a small bias furnished by R4. The grid is connected to the negative end of the power supply (through R3, in which there is no current flow and therefore no voltage drop), while the cathode is connected to the top of R4, which is a more positive point on the voltage divider. The grid is slightly negative for that reason, but plate current flows.
- The plate current of V2 -a flows through its plate-load resistor R6, which has a high resistance. The current flows through R6 from the plate to the supply, which means that the plate end is negative with respect to the other end. The negative (plate) end of R6 is connected (through R7, in which there is no voltage drop) to the grid of V2 -b, and the positive end (through R8, in which there is no drop when V2 -b is not conducting) to the cathode of V2 -b.
- When V2 -a is conducting (when there is no a.v.c.), V2 -b is biased by the voltage drop across V2 -a. This is sufficient to cut V2 -b off completely.
- Therefore, it cannot amplify the audio signal impressed on its grid by the detector, and the loudspeaker is silent.
- When a signal appears, it creates a certain amount of negative a.v.c. voltage, which appears across R3. Enough of this is tapped off R3, by the setting of the movable arm, to cut off V2 -a. Since there is now no V2 -a plate current passing through R6, there is no voltage across it, and the cutoff bias it had applied to V2 -b is removed. Because the only resistors between the grid of V2 -b and the bottom of its cathode resistor are now carrying no current, these two points are at the same potential. The only D.C. voltage appearing between the grid and cathode of V2 -b is caused by the usual voltage drop across the cathode resistor R8, which gives the correct bias for normal operation.
- The a.f. plate current of V2 -b causes a.f. voltage variations across R8. The a.f. voltage is fed out to the following audio stage through C6, which blocks the d.c. component of the cathode voltage. The lower end of R8 is bypassed to ground for a.f. by C5, so that the audio output is effectively 10,000 ohms above ground, while the entire tube is actually far above ground for d.c., a condition necessary for operation of the d.c. circuits just described.

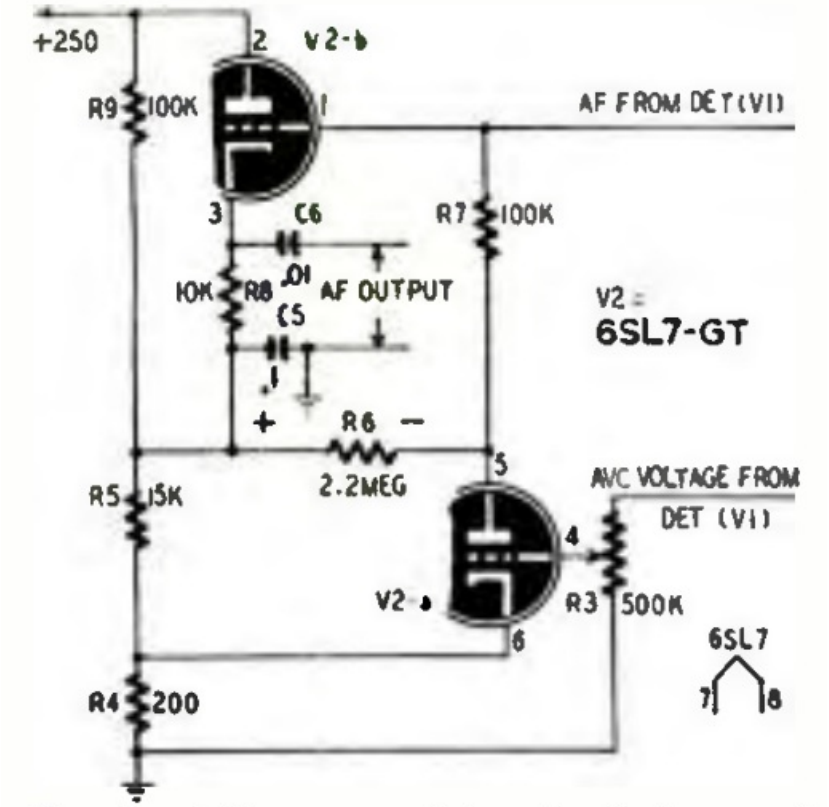


Fig. 2—Where squelch tube is inserted.

Construction

- The squelch circuit can be installed in any receiver that has a.v.c.; the detector need not be a diode. The 6SL7 – GT and its resistors and capacitors can usually be installed right on the chassis.
- Connections are made to the receiver's B- supply, filament supply, and to the detector's audio and a.v.c. outputs.
- The only actual change necessary in the receiver circuit is to disconnect the audio output of the detector from the top of the volume control and lead it instead to the grid of V2 -b. The a.f. output from the cathode end of R8 is then connected to the top of the volume control. Because V2 -b is a cathode follower, it has no gain and the output volume of the receiver will be about the same as before. It may be slightly less because the cathode-follower gain may be slightly less than 1, but there is not enough loss to cause trouble.
- Only one adjustment is needed. The magnitude of the a.v.c. voltage developed in the receiver depends on the proximity and power of the stations listened to. The weakest of these should be tuned in and R3 adjusted until V2 -a just cuts off -that is until normal audio is heard. Tuning off the station should silence the speaker. When any other station is tuned in correctly, it should be heard; but, when tuning between stations, all noise, hiss, interference, and so on should be inaudible.
- Though the diagrams show the squelch circuit used with an AM receiver, it can be especially valuable with an FM set, particularly to silence the loud hiss heard between stations on sets that use limiter-discriminator combinations. All that is necessary is a negative d.c. voltage which is present when there is a signal and absent when there is none. The grid voltage of the limiter satisfies this requirement and may be connected to the top of R3 to control the squelch. With other types of detectors that do not need limiters, there is generally a way of obtaining a d.c. voltage. Sets which have a.v.c. will, of course, present no problem, as R3 is simply connected to the a.v.c. line.

MATERIALS FOR SQUELCH

Resistors:

- 1 × 200 ohms
- 1 × 10,000 ohms
- 1 × 15,000 ohms
- 1 × 100,000 ohms
- 1 × 2.2 megohms
- 1 × 100,000 ohms, 1 watt
- 1 × 500,000-ohm potentiometer

Capacitors:

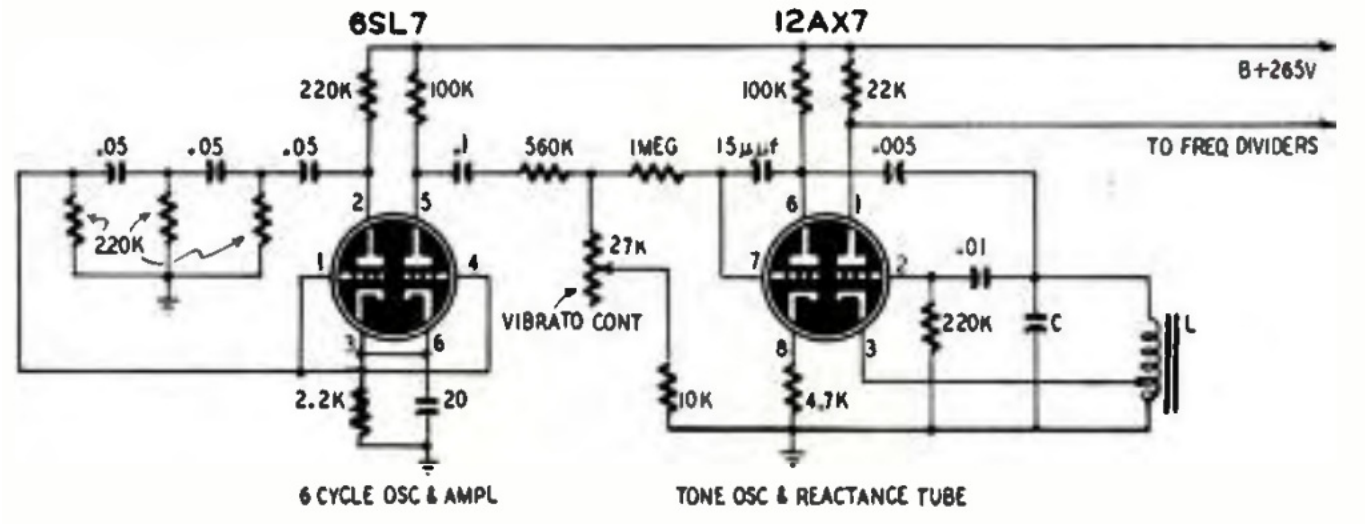
- 1 × 0.01 µF
- 2 × 0.1 µF, 600 volts, paper

Miscellaneous:

- 1 × 6SL7-GT tube
- 1 × octal tube socket
- Necessary hardware

New Electronic Music Vibrato Circuit

- This novel electronic musical instrument integrates traditional piano mechanics with electronic organ tone generation, offering a unique hybrid sound. It features 12 tone-generator channels and an audio amplifier. A switch frame, mounted across the piano's keyboard, allows each key to trigger corresponding circuits in the electronic tone generators, enabling simultaneous play of both instruments.
- Each tone-generator channel consists of an electron-coupled sawtooth oscillator followed by four cascade frequency-halving multivibrators, which generate lower octaves. The oscillators can be frequency-modulated to produce a vibrato effect. This modulation is achieved by applying a 6 Hz signal to the grid of a reactance tube within each tone-generating channel.
- A low-frequency oscillator and a single tone-generating oscillator, along with the reactance tube, are depicted in the system diagram. The vibrato signal is generated using one triode of the 6SL7 tube, configured as a phase-shift oscillator. Its frequency is determined by the combination of 220,000-ohm resistors and 0.05 µF capacitors. The second section of the 6SL7 serves as a buffer amplifier.
- Additionally, the 12AX7 tube plays a key role in signal modulation. One section functions as an electron-coupled oscillator, with its frequency dictated by the values of an iron-cored inductor (L) and a shunting capacitor (C). The buffer amplifier feeds its output into the grid of the remaining triode of the 12AX7. The vibrato signal's intensity is adjustable via a 27,000-ohm resistor, which can be modified by switching in parallel resistors.
- The buffer amplifier's output can also be routed to the suppressor grid of a voltage amplifier in an external audio system. This allows the vibrato or tremolo effect to be applied to electric guitars and other electronic instruments, expanding its potential use beyond the hybrid piano-organ setup. This innovation represents a significant advancement in electronic music synthesis, blending traditional acoustic elements with modern electronic tone manipulation.



FAQs

Q: What is the purpose of a squelch circuit in a receiver?
A: A squelch circuit silences the receiver when no usable signal is being received, preventing background noise amplification.

Q: In what type of receivers are squelch circuits commonly used?
A: Squelch circuits are frequently used in military and police receivers, as well as in high-quality receiving equipment for FM and broadcast reception.

Documents / Resources

	Audio V2-b Squelch Circuits [pdf] Instructions V2-b Squelch Circuits, V2-b, Squelch Circuits, Circuits

References

- User Manual