

Operational Description of Pacific Microwave Research AT-100C3C3 Microwave Video/Audio Transmitter

Introduction

The AT-100C3 Series Microwave Video and Audio Transmitter from Pacific Microwave Research is a compact transmitter designed for short-range transmission applications under FCC Part 74, and Part 101. Common uses include law enforcement surveillance and electronic field production. The AT-100C3 is a compact unit designed for portable and field applications to transmit remote video to a central receive location. The AT-100C3 is designed to transmit one NTSC (or PAL) video signal plus two high quality audio signals. The AT-100C3 operates from a 12 Vdc power source and is capable of up to 2 Watts of output power. The AT-100C3 may be equipped with up to 16 channels consistent with parameters listed on the user's FCC station license.

Power Supply

The AT-100C3 power supply is housed in a common housing with the transmitter and produces all required DC voltages for the operation of the transmitter. Nominal input voltage is in the range of 11 – 14.5 Vdc with a typical current consumption of 1.2 Amps operating at the high power setting. Primary power is applied to J3 Pin 5 with the return on J3 Pin 9. Reverse polarity protection is provided by D3.

Voltage regulator U5 (LM2941S) regulates the primary input voltage to +7.3 Vdc. This is then converted to a negative voltage by switcher U3 (LT1054CS8) with an output of -7 Vdc. This negative voltage is regulated by U6 (LT117CS8-5) to provide -5 Vdc to the transmitter. Voltage regulator U4 (LM2940IMP-5.0) regulates the +7.3 Vdc derived from U5 to provide +5 Vdc to the transmitter. Voltage regulator U7 (LP2951ACM) is connected to the primary input and provides +10 Vdc to the transmitter.

Voltage regulator U2 (MIC2941ABU) is connected to the primary power and provides +8 Vdc to the transmitter. U2 is gated by transistors Q4 and Q3 to protect the RF output transistor. Voltage from U6 must be present before U2 will output regulated voltage to the transmitter. Voltage regulator U1 (LM2941S) provides +10 Vdc to the transmitter and is gated by Q4 and Q3 to provide protection to the RF output transistor. U1's voltage may be varied by the gating action of transistor Q2 and FET Q1 to switch between high and low power operation of the transmitter.

Frequency Generation

The output frequency of the AT-100C3 is generated by PLL U4 (MC145151DW). Frequency data is input to U4 by EEPROM U5 (AT27C1024TS). U5 contains the customer channel table and the frequency of operation is selected by hexadecimal switch S1 or by an optional connector for control in 1 MHz steps. Reference crystal Y1 operates at a frequency of 7.2 MHz and provides primary frequency stability for the transmitter.

The tuning voltage from U4 is amplified by U3:B (LMC6035IMM) and applied to VCO U1 (V674ME25). The output of U1 is amplified by U7 (SGA6286) and sampled for input to the PLL. The sample signal is divided by the prescaler U8 (UP81507) and applied to the PLL to maintain operating frequency.

Video Modulation

Video is applied to U2:B (CLC432AJE) through a 75 Ω pad and a pre-emphasis network conforming to either the NTSC or PAL standard. Potentiometer R17 controls the level to U2:B and the resultant transmitter deviation. Video modulation is applied to U1 through U2:A (CLC432AJE).

Audio Modulation

Audio for subcarrier one is applied to U11:A (LM833MM) which acts as a balanced to unbalanced amplifier. Level is controlled by potentiometer R59 which sets the deviation of the subcarrier. Audio pre-emphasis is applied at U11:B (LM833MM) conforming to either the NTSC or PAL standard. The audio output signal is applied to modulator diode D2 (ZDC833).

Subcarrier one's radio frequency energy is generated by U9 (MC145151DW). Crystal Y2 serves as the reference frequency. The frequency of operation of subcarrier one is typically 6.2 MHz and determined by the settings of N0 through N13. The RF output is amplified by U10:A and connected to D2. The modulated RF output is applied to amplifier U12 (OPA658N). The RF output level is set by R66, which determines the subcarrier injection level. The signal is summed with the video signal at the input of U2:A.

Audio for subcarrier two is applied to U14:A (LM833MM) which acts as a balanced to unbalanced amplifier. Level is controlled by potentiometer R85 which sets the deviation of the subcarrier. Audio pre-emphasis is applied at U14:B (LM833MM) conforming to either the NTSC or PAL standard. The audio output signal is applied to modulator diode D3 (ZDC833).

Subcarrier two's radio frequency energy is generated by U13 (MC145151DW). Crystal Y2 serves as the reference frequency. The frequency of operation of subcarrier two is typically 6.8 MHz and determined by the settings of N0 through N13. The RF output is amplified by U10:B and connected to D3. The modulated RF output is applied to

amplifier U15 (OPA658N). The RF output level is set by R92, which determines the subcarrier injection level. The signal is summed with the video signal at the input of U2:A.

RF Amplification

Modulated RF energy is applied to FET Q2 (SHF0186) from U7. Q2 provides 10 dB of gain. The output of Q2 is coupled to FET Q1 (FSX027WF) through a bandpass filter. The voltage to Q1 is controlled by the UNLOCK signal from the PLL in order to shut the transmitter down if the PLL should become unlocked. This prevents accidental transmission on an undesired frequency if a failure should occur.

The RF output of Q1 is applied to FET Q2 (FLC107WG). FET Q2 is the final amplifier stage providing a nominal output power of 2W (+33 dBm). The voltage to Q2 is controlled by the UNLOCK signal from the PLL in order to shut the transmitter down if the PLL should become unlocked. This prevents accidental transmission on an undesired frequency if a failure should occur. The output of Q2 is connected to a front panel female SMA connector.