SECTION IV

PRINCIPLES OF OPERATION

4-1. INTRODUCTION.

4-2. This section provides a functional description of the Stereo 5 Console and a detailed circuit description. Refer to the block and schematic diagrams contained in Section VII. Location of major assemblies and components is shown in figure 6-1.

4-3. FUNCTIONAL DESCRIPTION.

4-4. The Stereo 5 is a five-channel stereo console featuring two mixing channels for low level sources and three mixing channels for medium level sources. Two input stations are provided for each low level channel; three input stations are provided for each medium level channel. Selector switches are provided for all input stations.

4-5. The right and left channel signals from the selected source inputs are coupled through isolation transformers. The output from each medium level transformer is applied directly to the mixing channel attenuator. Low level mixing channels include preamplifier circuits. The output from each attenuator is applied to a key switch which is used to direct the signal to either the program channel or audition channel through a booster amplifier circuit. In the center position, the key switches for the medium level mixing channels provide signal to the Cue system.

4-6. When any mixing channel key switch is in the program position, that signal is applied to the left and right program channels. Both program channels are identical, each consisting of a master gain control, output amplifier and a VU meter for monitoring the output level. Coupling to the program line is accomplished by an output transformer.

4-7. When any mixing channel key switch is in the audition position, that signal is amplified by the left and right audition booster amplifiers, and then applied to the audition output terminals. The output from the audition booster amplifier is also available for monitoring. The monitor circuitry includes an amplifier and a switch which provides a selection of three input signals: program, audition, and external source. The amplified output is applied to terminals for connection to control room, lobby, and studio speakers. A muting circuit, which operates in conjunction with the microphone input switches (ch. 1 and 2), disables the control room/studio speakers when the associated microphone is selected for input.

4-8. When any medium level channel key switch is in the center position, that signal is applied to the cue system which provides an amplified sum (mono) signal to the internal cue speaker and headphone jack. The Stereo 5 Console is self-contained and includes internal dual bipolar power supplies.

4-9. CIRCUIT DESCRIPTION.

WARNING: Disconnect primary power prior to servicing.

4-10. PREAMPLIFIER.

4-11. The microphone input signal is applied to the primary of transformer 2T1. This transformer inverts the phase of the signal and provides a step-up factor of 10. Resistor 2R1 and capacitor 2C1 provide high frequency compensation, and resistor 2R105 and capacitor 2C93 provide low frequency compensation. The output from the secondary of 2T1 is applied to the noninverting input of preamplifier stage 2U1. This signal is amplified by a factor of 16 and applied to the mixing channel attenuator through coupling capacitor 2C21.

4-12. Negative feedback is accomplished by divider resistors 2R2 and 2R3 and the connection to the inverting input of 2U1 which sets the gain at 16. Low frequency power supply decoupling is provided by resistors 2R109 and 2R110, capacitors 2C25 and 2C26 and zener diode 2CR15. High frequency power supply decoupling is provided by resistors 2R109 and 2R110 and capacitors 2C4 and 2C5. High frequency compensation for the operational amplifier is provided by capacitor 2C2.

4-13. PROGRAM BOOSTER AMPLIFIER.

4-14. The input signal to the program booster amplifier is applied through the mixing channel key switch and input summing resistors 2R13, 2R14, 2R15, 2R16, and 2R17. The input signal is coupled through capacitor 2C29 to prevent dc bias shift in the operational amplifier when more than one input is present. The booster amplifier is an inverting type amplifier; therefore, the input and feedback signals are both applied to the inverting input of 2U5. The noninverting input is not used for signal purposes. Resistor 2R23 provides only a dc bias for the unused input. Capacitor 2C31 provides a low source impedance for ac signals to obtain a lower noise figure. Resistor 2R121 prevents a charge from developing on capacitor 2C29 when all the mixing channel key switches are in the OFF position, thereby preventing a "pop" from being heard when a key switch is closed.

4-15. The input signal is amplified by a ratio of the value of the input resistor to the value of the feedback resistor (2R25, 100K ohm), thereby increasing the input signal by 16.1 or 17.7 depending upon which input is used. The amplified output signal is direct coupled to the master gain control, 2R27. High frequency power supply decoupling is provided by resistors 2R13 and 2R14 and capacitors 2C46 and 2C47. Low frequency power supply decoupling is provided by resistors 2R13 and 2R14, capacitors 2C33 and 2C35 and zener diode 2CR17. High frequency compensation for the operational amplifier is provided by 2C34. RFI protection is provided by capacitor 2C39.

4-16. AUDITION/MONITOR BOOSTER AMPLIFIER.

4-17. This amplifier is very similar to the amplifier described in paragraph 4-13. The basic difference is that instead of driving the master gain control, these amplifiers provide a single-ended output through resistor 5R2 to the audition output terminals and an input signal to the monitor select switch.

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4-18. PROGRAM OUTPUT AMPLIFIER

4-19. The output signal from the master gain control is coupled through capacitor 2C41 to the noninverting input of amplifier 2U7. Resistor 2R30 provides the bias for this input of the operational amplifier. The amplified output signal is fed to the junction of bias diodes 2CR1 and 2CR2 which set the no signal quiescent current in output transistors 2Q1 and 2Q2. DC stability is provided by emitter resistors 2R36 and 2R37. Short circuit protection is provided by output transformer 2T5 and series drive resistor 2R38. Capacitor 2C91 provides a slight amount of frequency compensation.

4-20. Negative feedback is provided by divider resitors 2R31, 2R29; capacitor 2C43 and the connection to the inverting input of 2U7 which set the gain at 31.3. Resistors 2R33 and 2R34 are for parasitic oscillation prevention for output transitors 2Q1 and 2Q2. High frequency compensation for the operational amplifier is provided by capacitor 2C48. RF1 protection is provided by capacitor 2C45. Power supply decoupling is provided by the same components described in the program booster amplifier. Two additional outputs are provided; one through resistor 2R97 to the program headphones and another through resistor 2R101 and 2R102 for the internal program monitor.

4-21. MONITOR OUTPUT AMPLIFIER.

4-22. The basic circuit is the same as that described in paragraph 4-18. The gain of monitor amplifier is set at 34.3. Due to the low value of resistors 2R70 and 2R71, it is necessary to select the value of resistor 2R130 to set the no signal bias current through output transistors 2Q5 and 2Q6 to a nominal 15 milliamperes. Capacitor 2C54 provides additional high frequency compensation. Short circuit protection is provided by the combined effects of fuse 2F1, collector resistors 2R125 and 2R126, and the extra margin of operating safety associated with output transistors 2Q5 and 2Q6.

4-23. CUE AMPLIFIER.

4-24. The input signal is derived from the center position of the mixing channel key through a resistive divider network consisting of R7, R8 R9, R10, R11, R12 and cue gain control AT7. A high frequency roll-off is provided by the action of capacitor C7. The gain of the cue amplifier is set at 300. The rest of the circuit is basically the same as the program output amplifier.

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4-25. POWER SUPPLY.

4-26. The power supply is composed of a split-winding primary and a dual winding secondary transformer. This allows 117/234V ac 50/60 Hz operation providing two sepearate unregulated $\pm$15V dc supplies. One secondary winding provides 24.5V ac to diode bridge 2CR11 which provides a rectified plus and minus 15V dc to filter capacitors 3C1 and 3C2. The other secondary provides 24.5V ac to diode bridge 2CR12 which provides a

rectified plus and minus 15V dc to filter capacitors 3C3 and 3C4. Power line protection is provided by fuse 3F1. RF1 protection is provided by line capacitors 2C5 and 2C6. Changing line voltage from 117V ac to 234V ac is accomplished by means of jumpers at terminal strip 3TB1.

WARNING: Disconnect primary power prior to servicing.