

## Section IV

# Control Section Description

The control console contains a number of electronic circuits that can be described as separate functional blocks.

### **Power Supply:**

This stage generates all the voltages necessary to operate the system. Diode bridge D6 produces +30vdc and -15vdc unregulated. D feeds U14 to generate +15vdc regulated.

### **Sawtooth Generator:**

This circuit generates a linear sawtooth waveform. Transistor Q1 is a constant current source to C7. While C7 is charging, +10vdc is fed to IC2-6. When C7 charges to approximately 10v, IC2-7 goes positive, turning Q2 on. This allows C7 to discharge. The process repeats, generating a sawtooth waveform that ranges from 0.2 to 9.2vdc. This waveform can be observed at TP2 with an oscilloscope.

### **Faders:**

This faders produce a linear adjustable voltage that can be varied from 0 to 10vdc. The time module is a unity gain amplifier with a time delay. A Signal of +10vdc is fed to R1 and R1 potentiometers. These voltages cab be varied and fed in conjunction with the time-delay signal to U3. The output of U4 follows the input, but with a delay determined by the time constant of the RC combination of R4, R8 and either C2 or C4. Potentiometer R9 balances the fade time between two sliders.

### **Comparator:**

At the comparator, the voltage generated by the faders, together with the sawtooth waveform, produces a non-regulated square wave. The fader voltage determines the duty cycle of the waveform. The comparators are similar in operation to a digital OR gate, traveling between 0 and +15vdc. The circuits work on a similar fashion, but turn on at different times. When the voltage at pin U2-13 is less than the voltage at U2-12, the output at pin U2-14 is high. In contrast, pin U2-10 must be at a higher voltage than pin U2-9 for a high output at pin U2-8.

### **Regulators:**

The regulators fix the level of the signal produced at the comparators in response to the control signal from the **Grand Master**. The regulators are unity gain amplifiers with two inputs: the square wave generated at the comparators is fed into the negative input, and the grand master output is fed into the positive input. The latter signal is conditioned through a precision resistor network to ensure consistency.

### **Display Drivers:**

The output of the comparators is fed to the display driver network U13 & U6. These signals are converted into analog voltage and fed into U8-5 and U9-5. These IC's convert the signal into discrete steps turning on the proper LED's.

#### **Time Adjust Circuitry:**

Voltage levels are set at the X or Y Faders. A time set will establish a voltage level at U4-1,7. The voltage out comparator U1-1 14 will be +/- 15vdc. These voltages will be clamped through U3 at the previously determined voltage set by U4-1,7 providing U4-8,14 with a signal that will feed the R4, R8, C2, C4 combinations. The capacitors will charge to a rate proportional to the voltage supplied by U4. Where the output of U1 reaches the level set by the X or Y fade, the process stops until some modification to the set up is made.

#### **Channel Amplifiers:**

These current amplifiers permit the potentiometers to control more than one dimmer at a time without affecting the output curve. The elements are formed by a 10K potentiometer and an emitter follower that amplifies the current so that more than one dimmer can be driven. The output of each unit varies linearly from 0 to 10vdc depending on the position of the individual control.

The control circuit is divided into an input stage, which buffers and filters the control voltage input so that the phase waveform of the control voltage do not affect the dimmer, and a regulating stage that modifies the bias voltage to the firing stage depending on the signal from the voltage regulating circuit.

A power supply line from the dimmer ac line input through an isolating transformer provided a synchronizing signal to the firing stage.

The dimmer is in series with the load so the neutral connection serves only the power supply and voltage regulating circuits. The control Circuit is isolated from both neutral and ground.