1. Power Supply:-

A power supply is a hardware component that supplies power to an electrical device or load. The primary function of a power supply is to convert one form of electrical energy to another.

- **DC Power Supply:-**

The aim of a DC power supply is to provide the required level of DC power to the load using an AC supply at the input. DC power supplies usually have the following parts: Transformer, Rectifier, Smoothing, and Regulation as shown in figure 1.1, the purpose of these parts are explained in table 1.1.

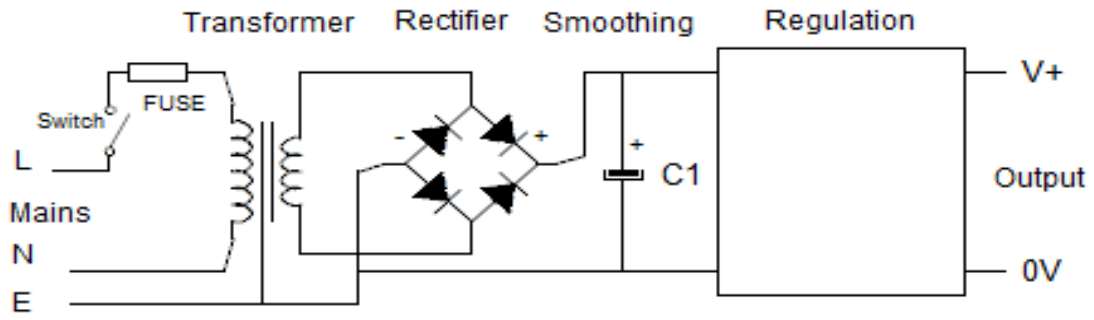

Fig. 1.1: typical design for DC power supply

Table 1.1: Parts of a DC power supply

Component or module	Purpose
Transformer	To change mains input voltage to provide voltage required
Rectifier	To convert AC to DC
Smoothing capacitor(s)	To reduce the amount of AC ripple on the DC voltage
Voltage regulation	To provide the required output voltage

- **DC Power Supply Design:**

Figure 1.2 shows a circuit of a dual DC power supply system. It provides +16V and -16V DC power supply with each rated at 1.8 A. The mains side of the power supply consists of a primary switch, an 110V/220V voltage selector, a primary fuse and a transformer. The transformer is of 50VA capacity with two independent primary windings that can be connected in series for 220V operation or in parallel for 110V operations. The fuse for the primary winding is a standard quick action 3A fuse. The fuses for the secondary windings are the resettable fuses. When the fuses are subject to a current overload, they rapidly switch from a low resistance state to a very high

resistance state. Once the fault condition has been removed, they automatically reset themselves within a short period of time, returning to the low resistance state.

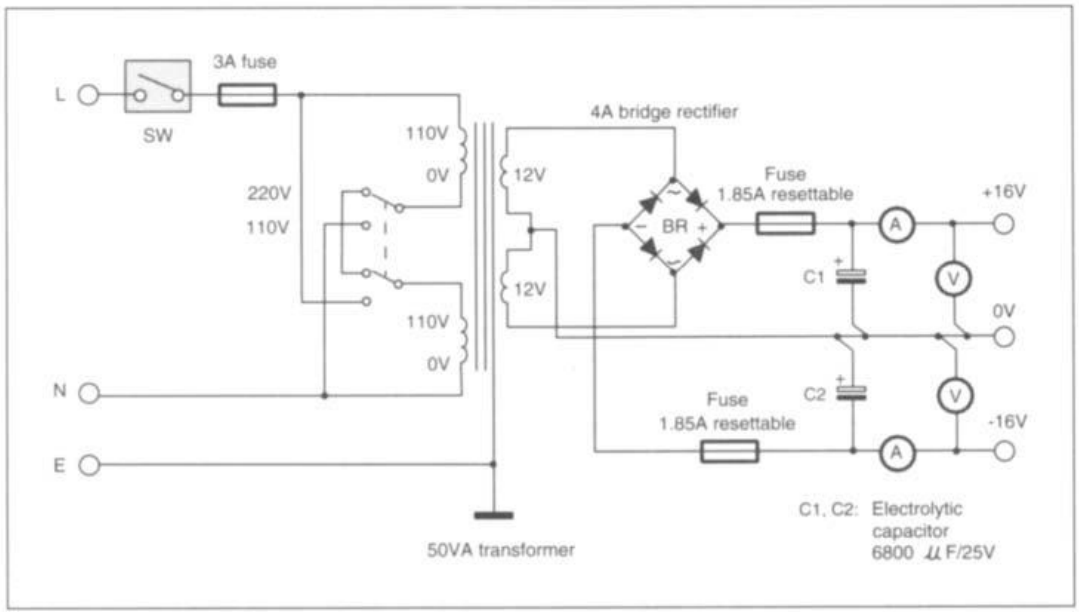

Fig. 1.2: +16V and -16V DC power supply

- **<u>+5V, -5V voltage supply :-</u>**

The simplest way of generating a fixed voltage is to use Zener diodes. The regulated voltage can vary from 2.4V to 75V using the BZX79 series diodes. The diodes in this series are rated at 500 mW and the tolerance of the stabilizing voltage is 5%. Figure 1.3 shows a circuit which converts a 16V DC voltage into 5.1V with a supply current of 20 mA.

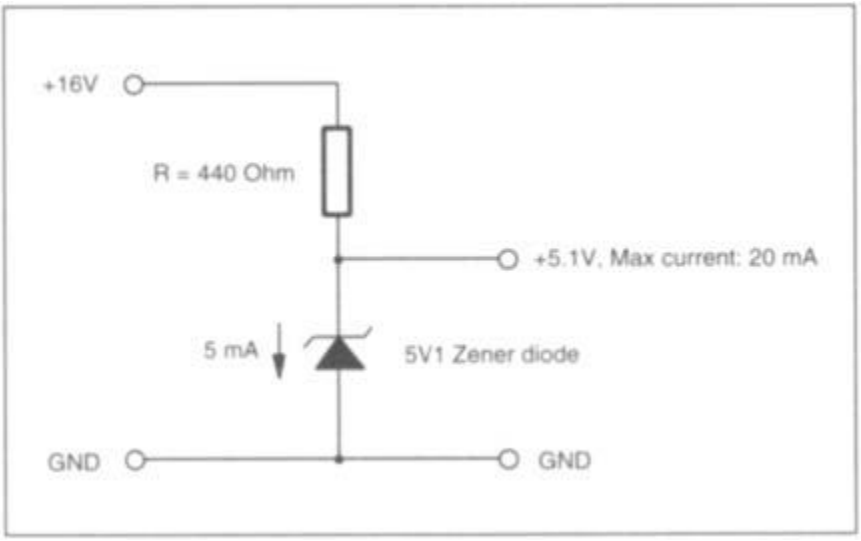

Fig. 1.3: +5V power supply using Zener diode

2. Voltage Regulator:-

Figure 1.4 shows a circuit using an L200C adjustable voltage regulator. It can supply a regulated voltage from 2.85 to 36V with an output current up to 2 A. It features current limiting, thermal shutdown and input over voltage protection up to 60V. The quiescent current is typically 4.2 mA.

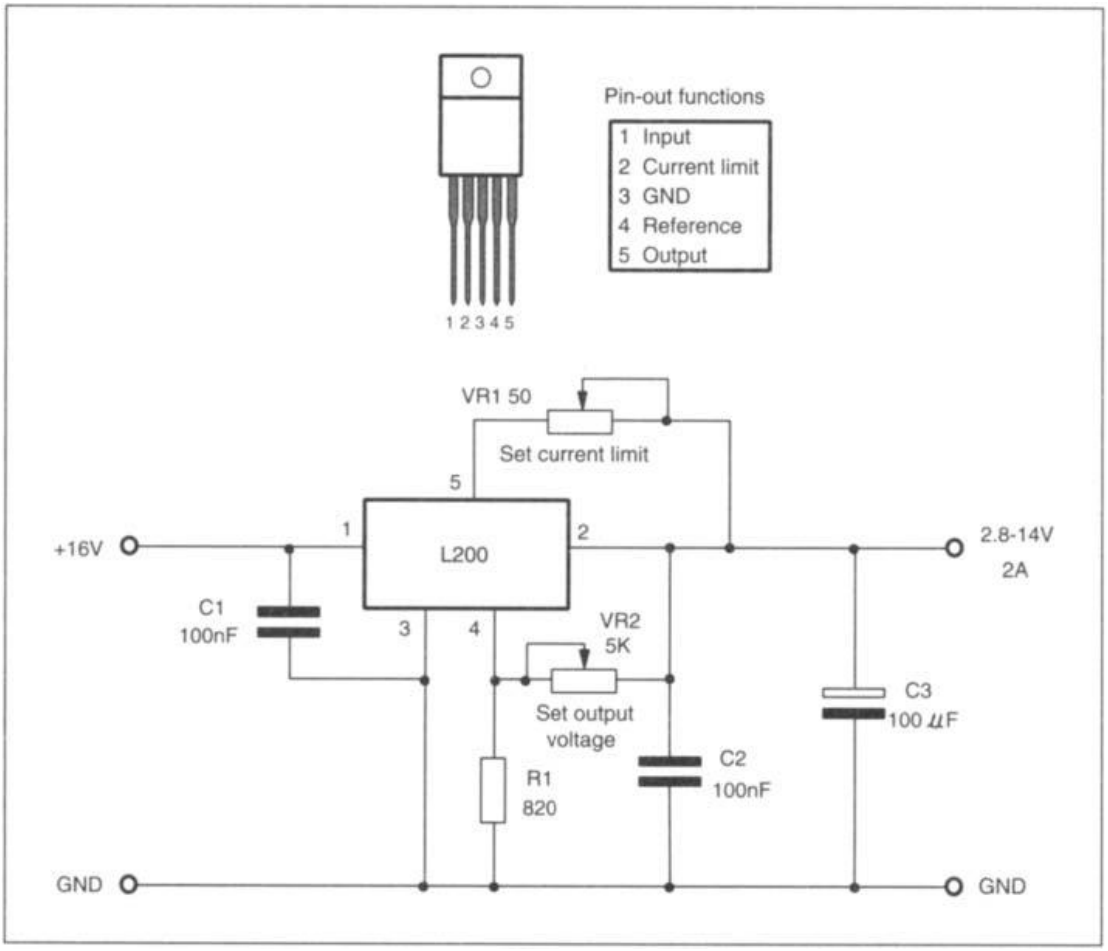

Fig.1.4: L200C adjustable voltage regulator

3. Voltage Converters:-

The circuit shown in Figure 1.5(a) is a voltage inverter which converts +5V voltage to-5V using an SI7660CJ voltage converter (Siliconix). The chip is able to generate a negative voltage output which is equal to the positive voltage input in the range 1.5V to 10V. Pin 7 should be tied to ground for a supply voltage below 3.5V. For supply voltages above 6.5V, a diode should be connected in series of the output. The output has an internal resistance of 70Ω. If a 10 mA current is drawn from the output, the voltage will be 4.3V. The quiescent current is 170μA and the maximum output current is 40 mA.

The circuit shown in Figure 1.5(b) converts a +5V voltage to +10V and-10V using a MAX680CPA voltage doubler and inverter (Maxim). The input voltage ranges from 2V to 6V. The internal resistances for the positive and negative output are 150 ~ and 90Ω respectively. If a 10 mA current is drawn from both outputs, the positive voltage falls to 7V and the negative voltage becomes -6.1V. The quiescent current of the device is typically 1 mA for a 5V power supply.

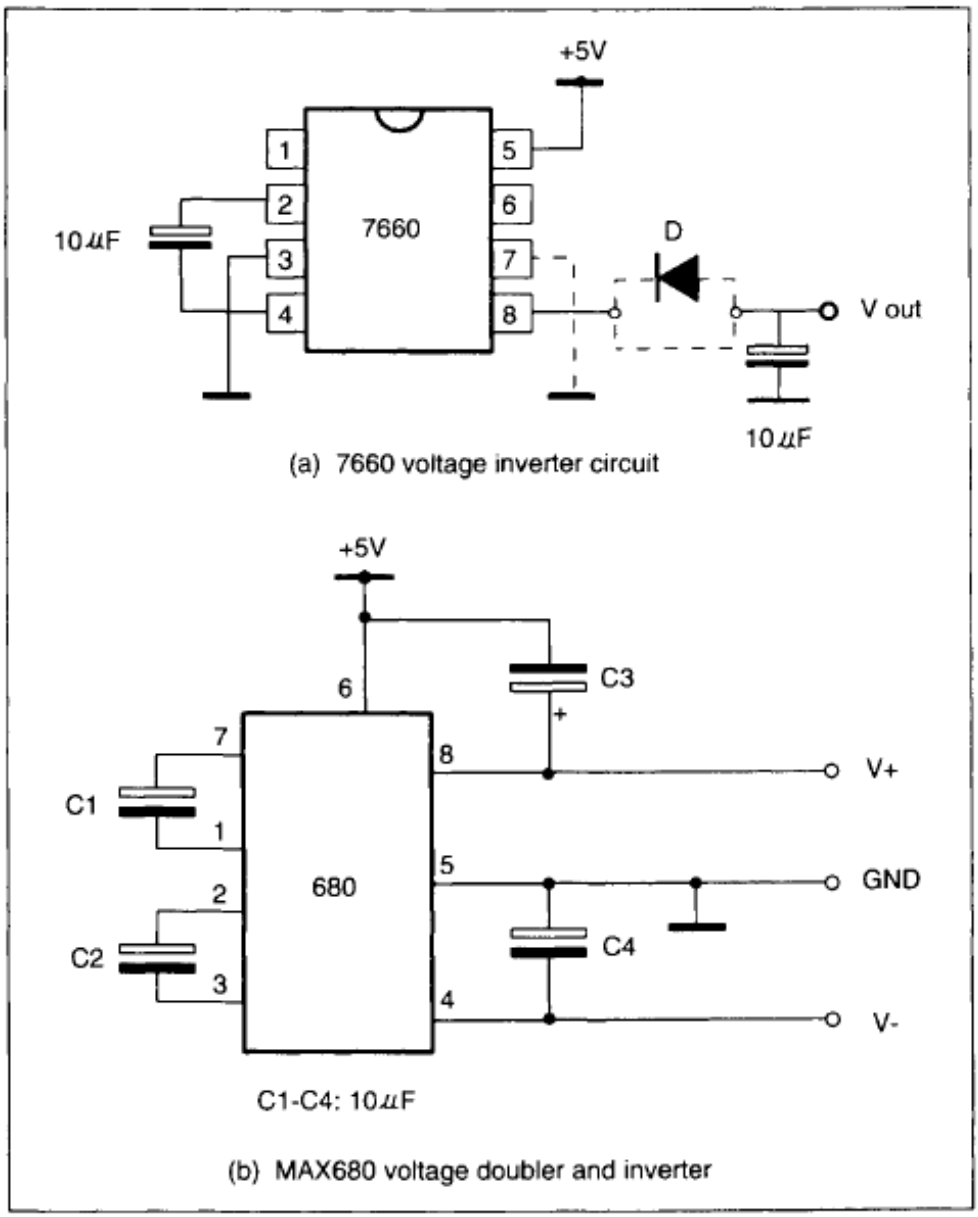

Fig.1.5: Voltage Converter Circuit.

4. Isolated voltage supply circuits:-

This circuit is used when a complete isolation between two circuits is required. NME and NMA series DC-to-DC converters are high efficiency voltage converters. The NME series operate from a 5V or 12V DC input and provide an isolated +5V,

12V or 15V output, depending on types. Up to 200 mA supply current is available from the 5V type, 84 mA from the 12V type and 67 mA from the 15V type. The NMA series provide dual +-5V, +-12V and +-15V DC supplies from a single 5V or 12V DC input. Up to 100 mA is available from the 5V type and 42 mA from the 15V type. The pin-out of the devices is shown in Figure 1.6.

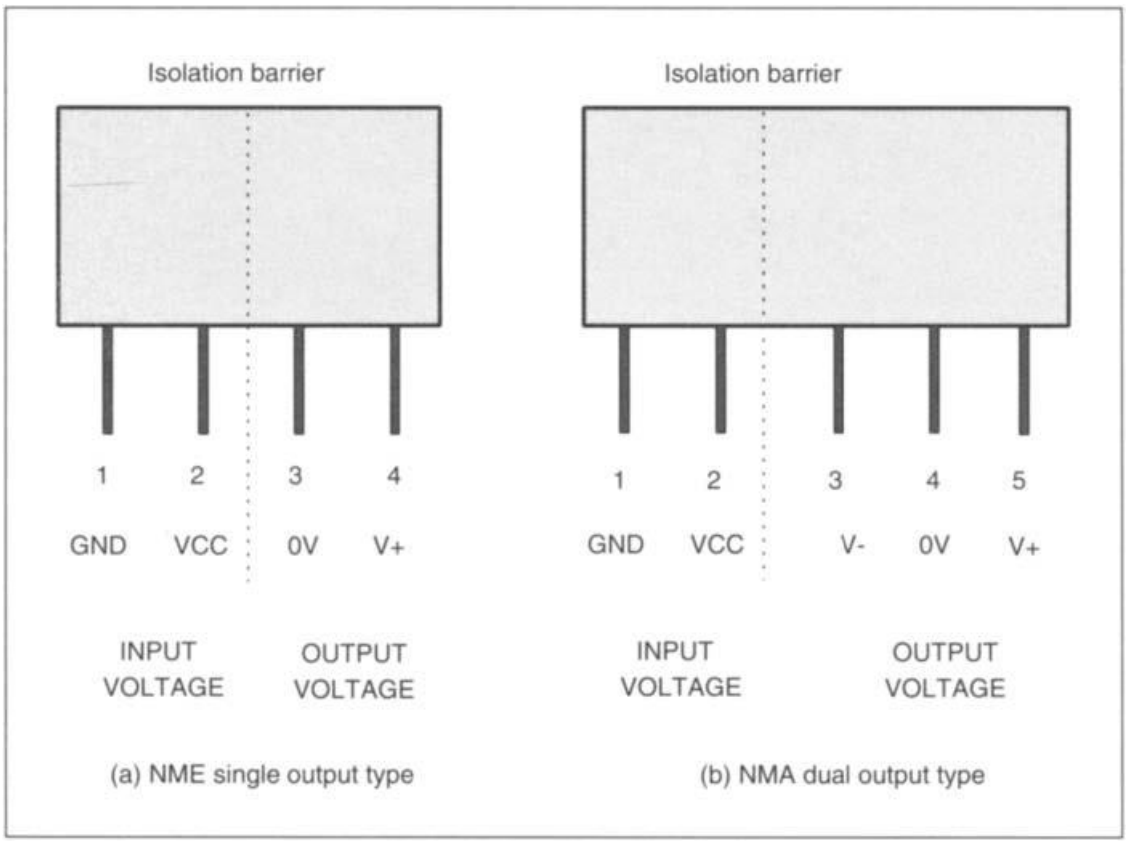

Fig.1.6: Isolated DC/DC converters

5. Digital signal generators:-

Figure 1.7(a) shows an eight-channel logic status generator circuit. It consists of eight single pole double throw (SPDT) switches and eight l k metal film resistors. When a switch is off, the status of the corresponding channel is high. When it is switched on, a logic low is generated. This logic generator suffers that the output signal is not 'clean' when it changes the status. When the switch changes position, the output signal does not change from one state to the other instantly. It consists of a number of oscillations within a very short period of time.

To solve this problem, a de-bouncing circuit is used. Figure 1.7(b) shows such a circuit using a Schmitt trigger inverter, 74LS14. When the switch is closed, the output gives logic 1. When the switch is open, the output gives logic 0.

Another logic generator is the toggle action switch. When a switch is pressed momentarily, the output changes status. The status is maintained until the switch is pressed again. Figure 1.7(c) gives such a circuit.

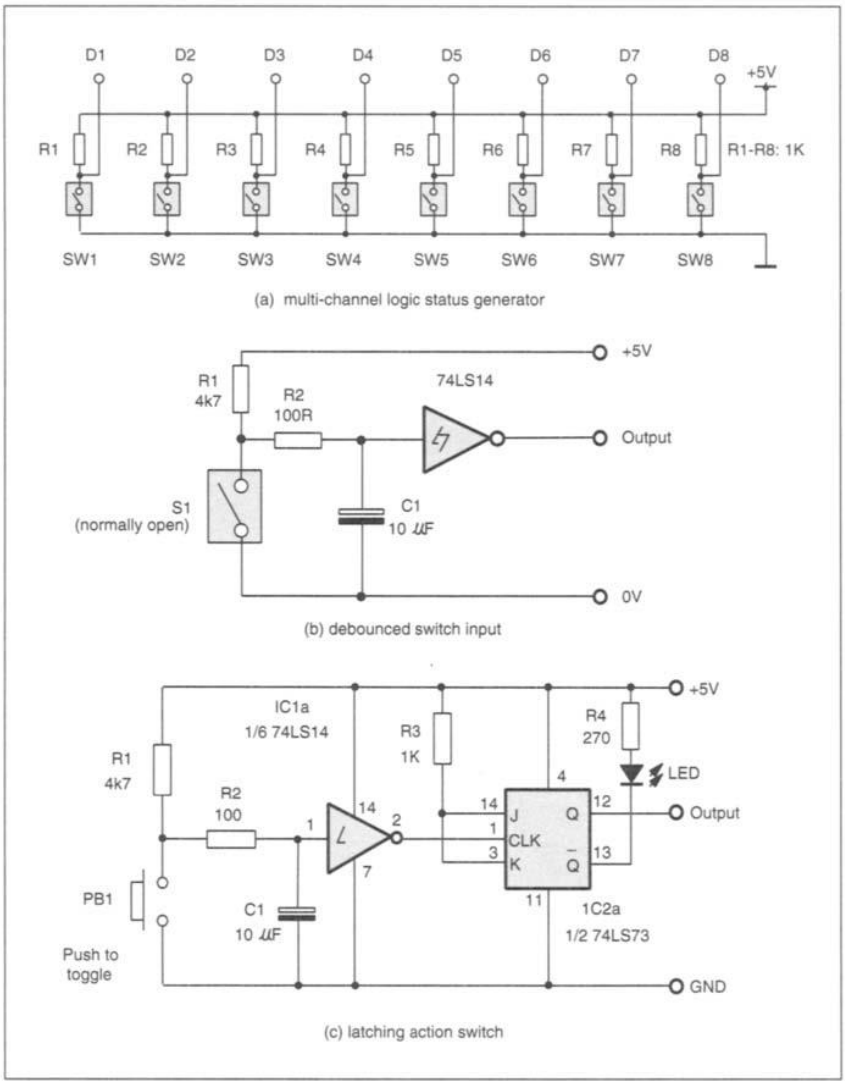

Fig.1.7: Logic status generator circuits