

Module 6 Fourth Year

Powerful Energizers (Low Voltage Power Supplies)

What this module is about

Projects and activities make the difference in technical training. There is no easier, taster and more practical way of learning electronics than through kits or projects. Today, there are many interesting kits or projects you can assemble while learning the technical skills you need to start a chosen career. Through simple circuits and projects in this lesson, you can develop your skills by yourself. Theory alone, may be all that an engineer needs, but it is enough for a technician. What is important is how theory is put into practice, and how electronics really works. Moreover, the usual troubles in low voltage supply are explained, including the practical methods in troubleshooting or repairing work.

Upon completion of this module, you should have been able to do the following:

1. Cite the different types of low voltage power supply.
2. Identify the basic parts of a power supply.
3. Draw the schematic diagram of different low voltage power supplies.

How to learn from this module

Following are tips on how to use this module. This will guide you in learning the different lessons. You will find this module very helpful as you read through.

1. Read the objectives for you to know what you expect to learn from this module.
2. Be sure to work on each activity because each one prepares you for the next.
3. Answer the pretest before you go over the module to determine what you already know about the topics.
Use the key to correction at the back to check your answer, but do this only after completing the module.
Always answer the self-check after each activity to determine whether you understood what you are expected to do.
4. Read the lessons again if you were not able to answer the questions correctly.

Before you go through this module, try to answer the pretest. This will help you find out what you already know and what you still need to know about power supply. Good luck!

PRETEST

Directions: Read each statement carefully and place the letter of the best answer on the blank before each number.

- ____ 1. A device used to convert high voltage to low voltage.
 - a. junction diode
 - b. transformer
 - c. zener diode
 - d. fuse

- ____ 2. A component used to convert AC to DC.
 - a. switch
 - b. plug
 - c. rectifier diode
 - d. zener diode

- ____ 3. For better filtering action in power supply, what do we normally use?
 - a. resistor
 - b. ceramic capacitor
 - c. electrolytic capacitor
 - d. mylar capacitor

- ____ 4. Used as a circuit protector in any electronic equipment.
 - a. switch
 - b. coil
 - c. bulb
 - d. fuse

- ____ 5. Which is normally higher in voltage in power supply?
 - a. secondary voltage
 - b. primary voltage
 - c. DC voltage
 - d. Output voltage

- _____ 6. Power supply that uses one diode as rectifier.
- half-wave rectifier
 - full-wave rectifier
 - bridge-type rectifier
 - voltage doubler
- _____ 7. The rectifier that produces higher percentage of current.
- half-wave rectifier
 - bridge-type rectifier
 - full-wave rectifier
 - voltage doubler
- _____ 8. The power supply that uses four diodes.
- bridge-type rectifier
 - half-wave rectifier
 - converter
 - full-wave rectifier
- _____ 9. The normal frequency used in an AC input.
- 50 hertz
 - 120 hertz
 - 60 hertz
 - 40 hertz
- _____ 10. Insufficient filtering of this kind of voltage can cause hum in a radio or television receiver.
- AC ripple voltage
 - direct current
 - alternating current
 - pulsating DC

Did you fare well? If not, don't worry. Anyway you will be answering the same set of test after you have studied all the lessons in this module. By that time, you shall have been able to answer all the questions correctly.

Take note, if you need any resistance in carrying out the different activities, don't hesitate to ask the help of your teacher.

For enrichment, read more about the topics from books which you will borrow from your school or any public library.

Lesson 1

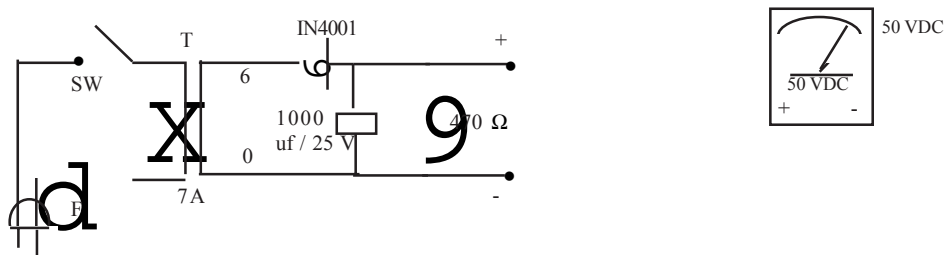
Types of Low Voltage Power Supply

Insufficient filtering of the AC ripple voltage can cause hum in radio or television receiver. The probable cause of this trouble is the open or leaky filter capacitor. With an AC input of 60 hertz, the hum frequency for a half-wave rectifier is 60 hertz, and the ripple frequency for full-wave rectifier is 120 hertz. The following types of rectifier circuits are frequently used for a DC rectified power supply operating from 100V or 220V 60hz AC power line.

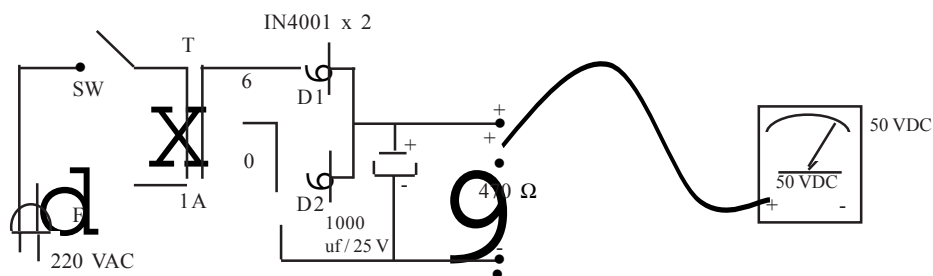
Types of Low Voltage Power Supply

1. Half-wave rectifier power supply - This is simple and economical power supply circuit which was only one diode. Ripple frequency is 60 hertz.
2. Full wave (center-tap) rectifier - A device which rectifies both half-cycles of an AC voltage to produce DC voltage. Two diodes can produce double the load current. Ripple frequency is 120 hertz.
3. Full wave (bridge-type) rectifier - Four diodes are interconnected for full wave AC rectification without a center tap in AC output. Ripple frequency is 120 hertz.

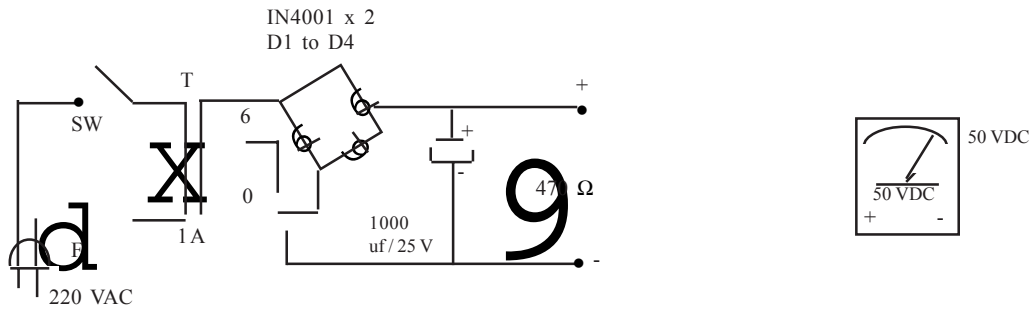
Schematic Diagram



Schematic Diagram of Full-wave Rectifier - Two Diodes



Schematic Diagram of a Bridge-type Rectifier (full wave with four diodes)

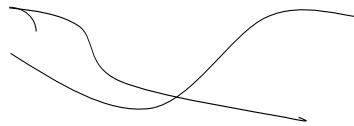


Activity 1

Draw the schematic diagram of the following power supply on an illustration board - half wave rectifier, full wave rectifier, and bridge-type rectifier.

Materials Needed

- 1 transformer 220 V primary 6V or 6V secondary
- 7 diodes IN4001
- 3 capacitors 1000 uf/25V
- 3 470 Ω 1/2 W
- 3 line cords with plug
- 3 switches - spst
- 3 fuse holder 1A small
- 3 fuse 1A small
- 1 illustration board size 1/8
- 5 meters stranded wire red
- 5 meters stranded wire black



Procedure:

1. Draw the schematic diagram of the different power suppliers.
2. Label each part, indicating the corresponding value.
3. Mount the different components on top of the components drawn on the illustration board.
4. Connect the leads of the different components using stranded wire, red for the positive side and black for the negative side of the power.
5. After connecting the wires at the illustration board, measure the output voltage of the half-wave rectifier, full wave rectifier and bridge type rectifier to determine if you succeeded in performing the activity by means of

the voltmeter, as shown in Figure 1, Figure 2 and Figure 3. Be sure to set your voltmeter to 50 VDC. Record results on Table 1.

Table 1

Power Supply	Output Voltage in DC
Half -wave rectifier	
Full-wave rectifier	
Bridge-type rectifier	

Self-check

1. What is the difference between a half wave and a full wave rectifier?
2. What component is normally used as a filtering device?
3. What is the main use of a transformer? diode? fuse? switch? electrolytic capacitor?
4. What is the difference between the AC and DC voltages?

LET'S SUMMARIZE

Low voltage power supply consists of the transformer, the rectifier, filter capacitor, and resistor and also the switch, fuse and the cord with its plug. When a power supply is operating into a load, it produces an output voltage. If the load is completely removed from the supply, the output voltage eventually increases. Usually, poor filtering action is the undesirable result of an open filter capacitor. With an open fuse, or diode in a half wave rectifier circuit, an open filter or resistor where there is no BT voltage. A common cause of reduced BT voltage and excessive hum is an open input filter capacitor.

POSTTEST

Directions: Read each statement carefully and place the letter of the best answer on the blank before each number.

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 - coil
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 - DC voltage
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 - full-wave rectifier
 - voltage doubler
- _____ 8. The power supply that uses four diodes.
- bridge type rectifier
 - half wave rectifier
 - converter

d. full wave rectifier

_____ 9. The normal frequency used in an AC input.

- a. 50 hertz
- b. 120 hertz
- c. 60 hertz
- d. 40 hertz

_____ 10. Insufficient filtering of this kind of voltage can cause hum in a radio or television receiver.

- a. AC ripple voltage
- b. direct current
- c. alternating current
- d. pulsating DC

KEY TO CORRECTION

- 1. b
- 2. c
- 3. c
- 4. d
- 5. b
- 6. a
- 7. b
- 8. a
- 9. c
- 10. a