



VOL. X No. 1

ORANGE COUNTY AMATEUR RADIO CLUB

January 1969

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scanned copy

PRES: JERRY, W6GROF  
 V. PRES. DAVE, W6RVM  
 SECY: FRANK, W6TBU  
 TREAS: BILL, W6CQR

MEMBERS AT LARGE  
 DAVE, W6COJ  
 JACK, W6UDC

ACTIVITIES: JOHN, W6BNX  
 PUB. REL. : KEN, W6HHC  
 MEMBERSHIP: BILL, W6WOO  
 TVI : DAVE, W6GPR

\*\*\*\*\*

\*\*\* LAST MEETING \*\*\*

The December meeting was held on the 19th as the Christmas Party at Buffalo Bill's Family Resturant. It was a great success . There was a large turn-out of members, their wives, and children. After the delicious dinner, Santa appeared (he looked an awful lot like Max, DEY ) and passed out gifts to the kiddies.

Latter in the evening , Roy Maxson, W6DEY, was presented a plaque for being " AMATEUR OF THE YEAR" . The plaque was from all the radio clubs of Orange County and was presented by Jerry, R6F. Our sincerest congratulations to you, Roy, you certainly deserve it.

\*\*\*\*\*

HAMAD

LOOKING FOR A REAL PUNCH ON 40 METERS?....Hygain 2 element beam for sale. Only \$30 or will use as a partial payment for a linear amplifier.  
 Contact DAN, W6VOU at 5392660.

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CHANGE OF ADDRESS....Your new editor of the "RF" would like to hear from you, the reader. If you have any comments, suggestions, or articles, get in touch with me. Mynew address and telephone number are ;

2201 Eastwood st.  
 Santa Ana, Cal. 92701  
 541-6249

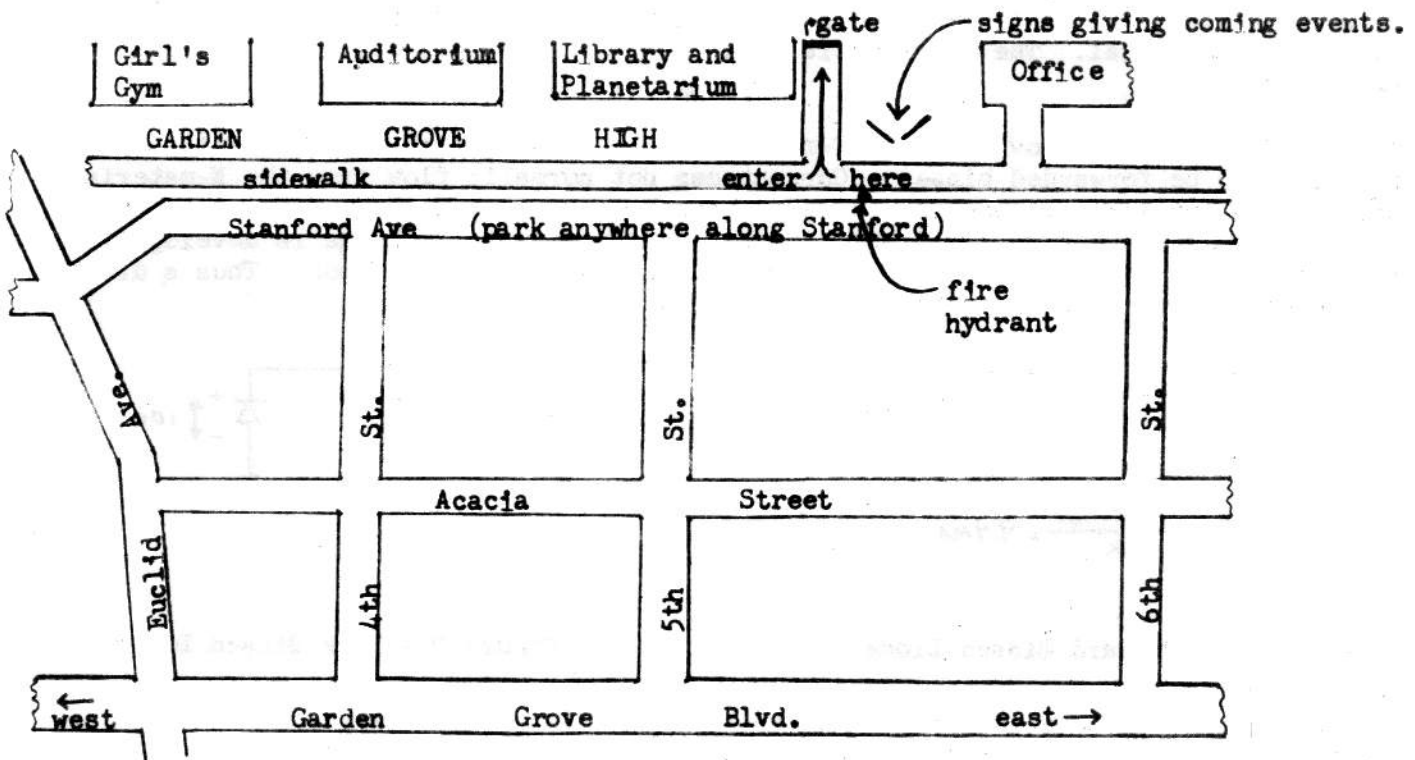
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"WE'VE COMPLETELY ELIMINATED THE POSSIBILITY OF HUMAN ERROR IN OUR DATA PROCESSING SYSTEM."

\*\*\*\*\* NEXT MEETING \*\*\*\*\*

V. Pres. Dave, RVM, has made arrangements with Bob, IXN, to conduct the January meeting in the Planetarium Classroom at Garden Grove High School. There, IXN will present a program an imaginary trip to the planets. Could we land on Jupiter right now? How old will we be in Mercurian years? How do we prevent loss of bone calcium in a weightless environment? Get the answers to these and many other interesting questions as we move from our prison, planet earth, to more exotic worlds in the solar system! Below, is a map to guide you to the planetarium classroom:



Please!! No smoking in the Planetarium Classroom! It is against fire regulations! A trash can will be placed outside entrance. Please deposit cigarettes upon entering. Thank you.

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BASIC TRANSISTOR OPERATION

By  
W6HHC

The editor plans to have monthly articles on operation of solid state devices. The emphasis will not be so much on solid state physics as on practical understanding and use of different devices. The first few articles will be on understanding transistor operation and how to design simple circuits. Later the use of Integrated Circuits will be discussed.

JUNCTIONS

The semiconductor junction is the heart of all solid state devices. Semiconductor material is usually germanium or silicon. The basic material is electrically neutral, but foreign material can be added to charge the semiconductor material. If the semiconductor is charged positively it is called P-material. Negatively charged material is called N-material. The junction is formed when P-material is located adjacent to N-material.

The current can then flow from the P-material into the N-material. The junction is then said to be forward biased. Current can not normally flow from the N-material to the P-material (this junction would be back-biased). When current flows through a forward biased junction a voltage drop called the junction voltage is developed. This voltage is usually 0.25 volts for germanium and 0.6V for silicon. Thus a diode is formed by attaching leads to both sides of a junction.

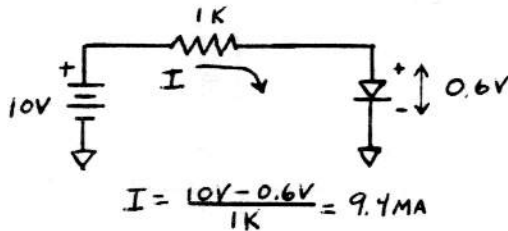


Figure 1 - Forward Biased Diode

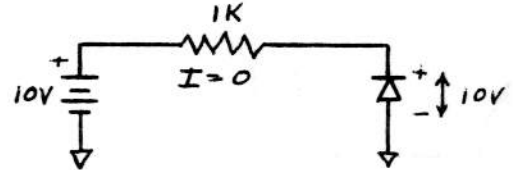


Figure 2 - Back Biased Diode

Figure 1 shows how to determine the current through a simple forward biased silicon diode. Figure 2 shows that no current flows through a back biased diode.

TRANSISTOR CONSTRUCTION

The NPN transistor is formed by sandwiching some P-material between two layers of N-material. The transistor then appears electrically as two diodes as shown in Figure 3.

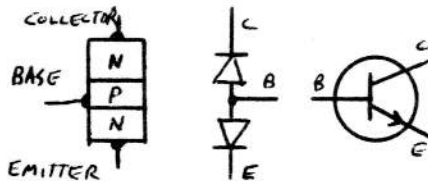


Figure 3 NPN transistor

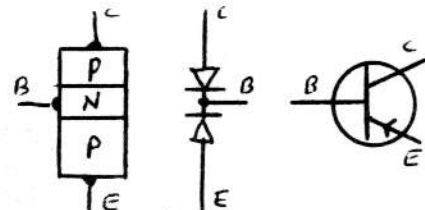


Figure 4 PNP transistor

BASIC TRANSISTOR OPERATION  
(continued)

The PNP transistor is made by sandwiching the N-material between two layers of P-material as shown in Figure 4. The base lead is attached to the sandwiched layer and the emitter and collector leads are attached to the two other layers.

HOW IT AMPLIFIERS

Most "ham operators" are familiar with how a vacuum tube operates as a voltage amplifier. The transistor is a current amplifier. The small base current is used to control a large collector current. The gain of a transistor is called beta or  $\beta$ . This gain means a change of one  $Ma$  in the base current will result in  $(\beta) \times (1Ma)$  change in the collector current.

Let's use an example to show what we mean. First, let's produce a known base current.



FIGURE 5

If an NPN transistor is connected as in Figure 5, the circuit looks identical to the diode circuit in Figure 1. The base current is  $9.4Ma$ . The voltage measured from the base to the emitter is 0.6 volts. Now let's connect a 50 ohm resistor from another 10V battery to the collector, as shown in Figure 6. The transistor action occurs and current can flow into the collector lead to the emitter lead.

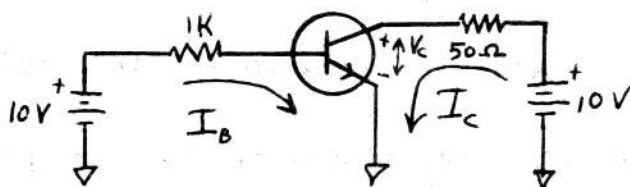


FIGURE 6

The collector current,  $I_C$ , is found by:

$$I_C = \beta \times I_b$$

If beta for this transistor is 10, then the collector current is:

$$I_C = (10) \times (9.4ma) = 94 ma$$

BASIC TRANSISTOR OPERATION  
(continued)

The 94ma flowing through the 50 ohms resistor drops 4.7 volts, so the collector voltage,  $V_C$ , is  $(10V - 4.7V) = 5.3$  volts.

To show how a small change in the base current causes a large change in the collector current, let's change the base battery to 9V. Figure 7 shows the calculations that lead to the solution of the collector current.

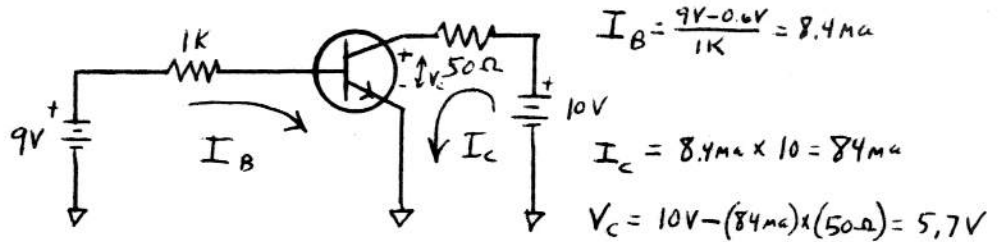


FIGURE 7

This example has shown how transistors can operate at current amplifier and how you can calculate different currents and voltages next month. Different basic transistor amplifiers will be covered and a simple audio amplifier will be designed.

\*\*\*\*\*

\*\*\*\*\*HAMAD\*\*\*\*\*HAMAD\*\*\*\*\*HAMAD\*\*\*\*\*HAMAD\*\*\*\*\*

LAFAYETTE HA-650 6 meter transistorized battery powered portable transceiver. Tunable superhet receiver covers 50 to 53 mhz. Input power to transmitter final is 2.5 watts with 6 crystal positions, Complete with 6 crystals, microphone, new batteries, leather carrying case and 54 inch whip antenna. Like new condition. Excellent for hill-topping.

Price \$60 WB6NRK 544-5369

HEATHKIT HW-30 2 meter transceiver. Less than six months old. no modifications made at all to this unit. Brand new condition.

Price \$35 WB6NRK 544-5369

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Amateur Radio Course covering theory and code practice for Novice, General and Advanced licenses at Santa Ana College Evening Classes. Begins January 7 at 6:30 pm., Bldg H, Santa Ana College Campus. For more information about fees, phone 545-0435.

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QST QST QST .....

WE recieved a letter from Bill Hall, WB6cqr, informing us of his resignation as the Orange County Emergency Coordinator (VHF). Other public service activities have severely interfered with his service as Emergency Coordinator. However he will still continue to be a member of the Emergency Corps. Wayne Burns, WB6TYX, has accepted the appointment as the new Emergency Coordinator, and it is good to know that the VHF AREC for Orange County will continue under such able leadership.

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Worked Delaware Award (W-DEL)

The Worked-Delaware (W-DEL) issued for confirmed QSOs with the three counties of Delaware which are New Castle, Kent and Sussex. Send QSLs or GCR list signed by two other amateurs stating QSLs have been seen, send this and 50¢ or 5 IRCs to John B. Wilson, 1005 Greentree Road, Newark, Delaware. There have been 1026 W-DEL certificates issued to date, most of these in the last 3 years due to more activity in the lower part of the state.



MARYLAND V.H.F. SOCIETY CERTIFICATE

BY: MARYLAND V. H. F. SOCIETY

Contact 5 members of the Maryland V.H.F. Society. Send Log data, stations worked, dates and times to Custodian.

C O S T: No charge.

IRC INFORMATION: IRC's not accepted.

E N D O R S E M E N T S: None.

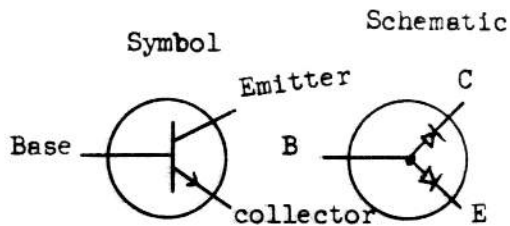
CUSTODIAN: HENRY HICKMAN, K3MMR, 108 EAST SEMINARY AVE., LUTHERVILLE, MARYLAND, 21093.

## \* \* \* TRANSISTOR CHECKING \* \* \*

By

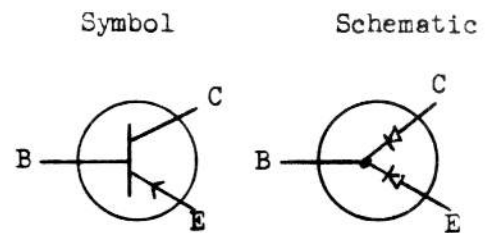
W6HHC

You can test transistors without any fancy instruments by simply using only a VOM or VTVM. The following technique will determine if the junctions are good or will detect shorted or open junctions.



NPN TRANSISTOR

Figure 1



PNP TRANSISTOR

Figure 2

All bipolar transistors (that's the common type) look like two diodes connected as shown in Figures 1 and 2. To test the transistor, simply take a VOM or VTVM and set the function to resistance X10.

Test #1 - Place the "common" probe on the base lead of the transistor and place the "ohms" probe on the emitter lead. Check the meter reading; it should either be around 50 ohms (between 30 and 70) or near  $\infty$  (above 10,000 ohms).

Test #2 - Reverse the meter probes and check the meter reading.

For most VTVM's and VOM's (some are backwards), if you had a reading of 50 ohms in Test #1 and a reading of  $\infty$  in Test #2, your transistor is a PNP and the base-emitter junction is okay. If you had a reading of  $\infty$  in Test #1 and a reading of 50 ohms in Test #2, then your transistor is an NPN and the junction is okay. If the readings in Tests #1 and #2 were both low (less than 500 ohms), then the junction is shorted and the transistor is bad. Likewise, if both readings were high (above 1,000 ohms), the junction is open.

Test #3 - Now place the "common" probe on the base and put the "ohms" probe on the collector. Check the meter reading.

Test #4 - Reverse the meter probes and check the meter reading.



\*\*\* TRANSISTOR CHECKING \*\*\*  
(continued)

The results of Tests #3 and #4 should be the same as for #1 and 2, except now you are checking the base-collector junction. If either junction is open or shorted the transistor is bad.

The table below summarizes the tests and can be used as a guide.

Test No.	VOM Probe		VOM Reading	VOM Reading	VOM Reading	VOM Reading
	common	ohms				
1	Base	Emitter	50 ohms	$\infty$	50 ohms	$\infty$
2	Emitter	Base	$\infty$	50 ohms	50 ohms	$\infty$
3	Base	Collector	50 ohms	$\infty$	50 ohms	$\infty$
4	Collector	Base	$\infty$	50 ohms	50 ohms	$\infty$

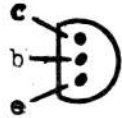
indicates good NPN transistor    indicates good PNP transistor    indicates both junction shorted    indicates both junction open

NOTE: The above readings were based on a meter having positive voltage on the "ohms" probe. If your meter has the positive voltage on the "common" probe then the readings for a PNP and an NPN are just the opposite of those shown.

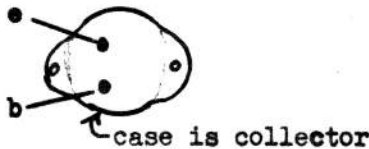
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LEAD LOCATION OF DIFFERENT TRANSISTOR CASES

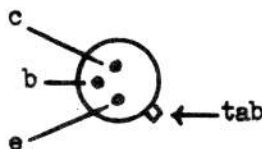
plastic case



power transistor



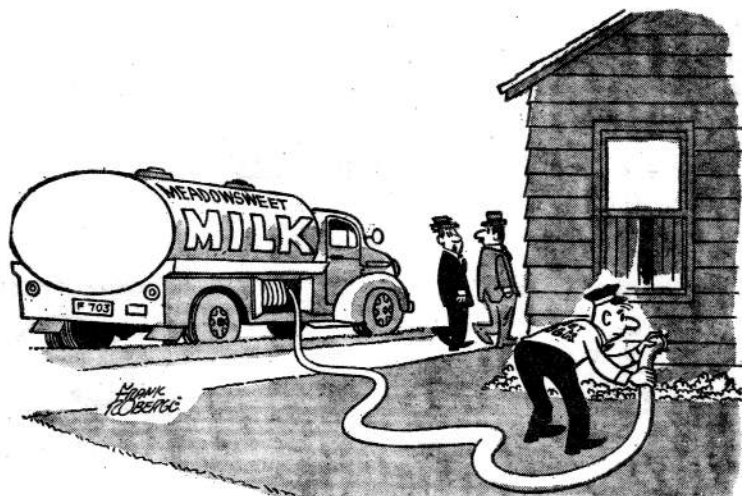
bottom view of case



ORANGE COUNTY AMATEUR RADIO CLUB, INC.  
P.O. BOX 95  
ORANGE, CAL. 92668  
VOL. X NO. 9 dated JANUARY, 1969

FIRST CLASS

DATED MATERIAL



THE AMERICAN LEGION MAGAZINE

" NRK says it really cools down those hot finals "