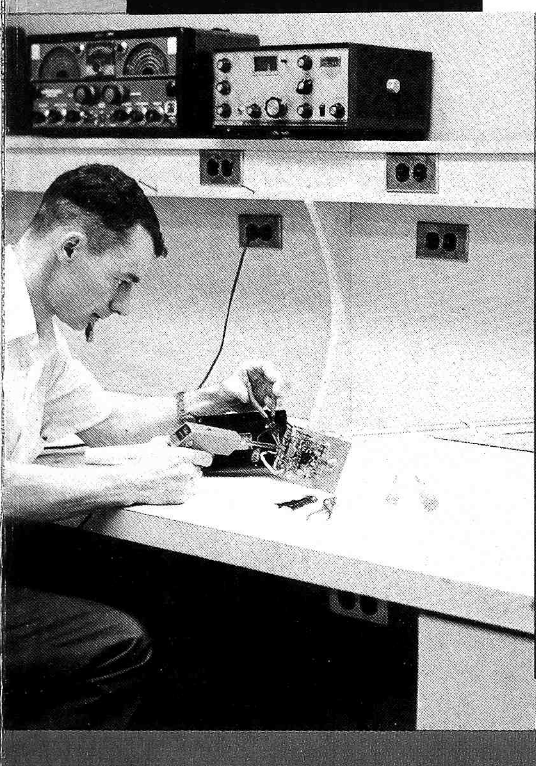
nri journal

featuring:

more from *tom dukes*
on
treasure at your feet

NAND/NOR gates
by
lou frenzel

ted beach's
ham news



JANUARY/FEBRUARY 1971

NEW FROM MIDLAND "DYNA-SPHERE" FM/AM CLOCK RADIO

Midland introduces a totally new design concept in an AM/FM clock radio. Perforated aluminum cover slides back to reveal even more new feature ideas. Full-range 2¾" speaker, control panel, and precision radar-sweep tuning dial are mounted on semi-circular panels trimmed in teakwood, black and silver-color. High-power solid state circuitry with AFC assures clear, drift-free FM listening. At the bottom of it all is a richly grained teakwood base housing a popular drum-type digital clock. Accurate lighted movement features large easy-to-read numbers, second indicator, choice of radio or tone alarm. This tasteful blend of spun aluminum, wood, and black trim is an eye stopper that's perfect for the home, student's room, or executive suite.

Handsome Decorative Piece, Fine Sounding Radio Plays with Cover Open or Closed

- FM (88-108 MHz); AM (540-1600 KHz)
- 9 transistors, 4 diodes, 1 thermistor
- 7 IFT's, RF stage on FM, push-pull audio amplification
- Controls: Volume, tuning, AM/FM/AFC selector
- Clock: Drum-type digital movement with on/off/radio/alarm, time/alarm set
- 2¾" PM speaker
- Appearance: Perforated spun aluminum cover, teakwood base. Black, silver-color, teakwood trim
- Size: 10" x 6¾" x 6¾"
- Shipping weight: 7½ lbs.

Stock # 368 RT

7½ lbs. Parcel Post Insured

$59.95

MIDLAND LEAF DIGITAL CLOCK FM/AM TABLE RADIO

$44.95

Stock # 366 RT

Weight 6 lbs.

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Perfect for the home or executive desk. Features today's popular leaf-type digital clock combined with a solid state FM/AM radio in one rakishly tapered cabinet. Precision leaf digital clock movement with 0-60 minute automatic shutoff, second indicator, alarm choice of radio or buzzer. IF and RF-boosted radio chassis with AFC to keep out FM drift. Sleek, textured high impact cabinet has tinted slide tuning dial, clock face.

- FM (88-108 MHz); AM (540-1600 KHz)
- 9 transistors, 5 diodes, 1 thermistor, 1 aux. transistor
- 8 IFT's, RF stage on FM, push-pull amplification
- Controls: Volume, tuning, FM/AM, clock controls
- 3½" full-range PM speaker
- FM line cord antenna, ferrite AM
- Clock: Leaf digital movement with on/off/alarm, buzzer on/off, 0-60 minute sleep, alarm and time set
- Appearance: Textured off-white polystyrene cabinet, black and chrome-color trim
- Size: 11⅞" x 3⅞" x 6¾"
- Shipping weight: 6 lbs.

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Treasure at your Feet

part II

by: Tom Dukes

Building your own metal detector can be simple and fun. The metal detector is easy to construct, lightweight, portable and easy to operate. It operates on the beat-frequency principle (described in the Nov./Dec. JOURNAL) and is capable of locating objects as small as a penny. The detector uses very little power; it can be operated all day on an ordinary, 9-volt transistor radio battery.

The circuit for the detector is shown in Fig. 1. Colpitts oscillators are used, with transistor Q_1 serving as the search oscillator and transistor Q_2 functioning as the local oscillator. The frequency of the search oscillator is controlled by search coil L_1 and the series combination of capacitors C_1 and C_2. The operating frequency of this oscillator will be approximately 500 kHz. The local oscillator functions in the same manner but its frequency is controlled by tuning coil L_2 and capacitors C_3 and C_4. The operating frequency of this oscillator may be adjusted above or below 500 kHz. Both oscillators use the same biasing configuration and therefore both circuits are affected equally by temperature changes.

During normal operation the local oscillator is tuned several hundred cycles above or below the search frequency. The output from each oscillator is fed through a small coupling capacitor (C_5, C_6) to potentiometer R_7. The combined signal is developed across potentiometer R_7 and applied through capacitor C_7 to transistor Q_3. Transistor Q_3 serves as a nonlinear mixer, detector and audio amplifier. The two original frequencies plus the sum frequency generated within the circuit are rejected by C_8; however, the audio difference frequency appears at the output and is applied to phone jack J_1. The large biasing resistor, R_8, effectively keeps transistor Q_3 operating near cutoff. The positive-going alternations of the input signal, however, cause Q_3 to conduct, and an output voltage is developed across load resistor R_9 and capacitor C_8. Capacitor C_8 effectively acts as a short to the high rf frequencies but offers a very high impedance to the low audio beat frequency (difference frequency) that is produced. Therefore, the output frequency is equal to the difference between the two oscillator frequencies. Capacitor C_9 effectively reduces the rf coupling between the two oscillators due to the common battery connection. Potentiometer R_7 determines the amount of signal applied to the mixer stage and therefore controls the volume.

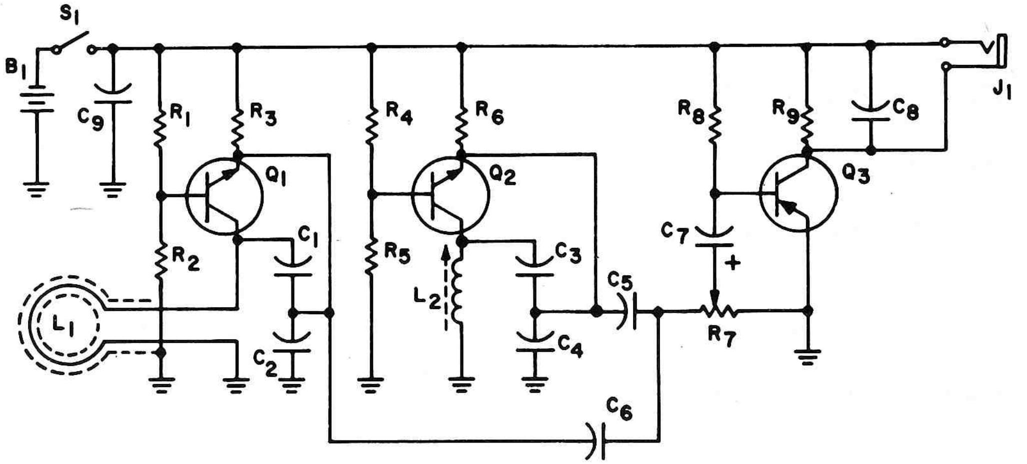


Fig. 1. Schematic of the metal detector.

B_1	9-volt transistor battery
C_1, C_2, C_3, C_4	.001 mfd, low-voltage disc ceramic capacitor
C_5, C_6	4.7 pfd, low-voltage disc ceramic capacitor
C_7	5 mfd, 15-volt electrolytic capacitor
C_8, C_9	.01 mfd, low-voltage disc ceramic capacitor
J_1	Open circuit phone jack
L_1	Search coil (see text)
L_2	0.18 to 1 millihenry coil (Miller 9002 or equiv.)
Q_1, Q_2	2N5134
Q_3	2N5138
R_1, R_4, R_9	4.7K, 1/2W, 10%
R_2, R_5	10K, 1/2W, 10%
R_3, R_6	1K, 1/2W, 10%
R_7	1K subminiature pot
R_8	1 meg., 1/2W, 10%
S_1	SPST toggle switch

The entire circuit may be mounted in a 6" X 3-3/4" X 2" plastic or aluminum utility box. Fig. 2 shows how I used a plastic box with an aluminum cover (Radio Shack Cat. No. 270-627) and mounted all components except the phone jack and battery on the underside of the cover. The aluminum cover amply shields the rf circuits against hand-capacitance effects when the detector is tuned.

All resistors, capacitors and transistors were mounted on three 7-lug terminal strips as shown in Fig. 2. The outer terminals serve as mounting brackets and provide a common ground connection to the cover. The three terminal strips, potentiometer R_7, switch S_1, and coil L_2 should be positioned on the chassis cover as shown before any other holes are drilled. Allow plenty of room for the remaining components which are still to be mounted on the terminal strips, but do *not* crowd components too close to the edge of the chassis cover. When complete, the cover and all its components must fit back into the chassis box. I found that a 1-1/2" spacing of terminal strips was adequate since I used a subminiature potentiometer and a small toggle switch.

After the terminal strips, potentiometer R_7, switch S_1 and coil L_2 are mounted, the remaining components may be installed. The small cable clamp, shielded cable, and solderless terminal lug shown in Fig. 2 are not installed until later.

The resistors and capacitors should be connected exactly as shown in Fig. 2. The two oscillator circuits are mounted on the outermost terminal strips and the mixer circuit is mounted on the center strip. This circuit arrangement will keep the stray rf coupling between the two oscillators to a minimum.

Notice that on the next-to-top lug of the center (mixer) terminal strip there are eight leads to be connected. Be very certain that all leads are soldered to this terminal. One way to assure a good connection is to solder each lead as it is installed, being careful to use only enough solder to cover the lead. This method will leave the terminal hole open for the remaining leads.

All components must be rigidly mounted since any vibration can cause erratic operation. All component leads should be kept short and all resistors and capacitors should be mounted close to the terminal strips. Use solid conductor hookup wire when connecting adjacent terminals on the strip and when connecting coil L_2 (the wires leading to L_2 should be twisted as shown). The wires leading to phone jack J_1 should be approximately

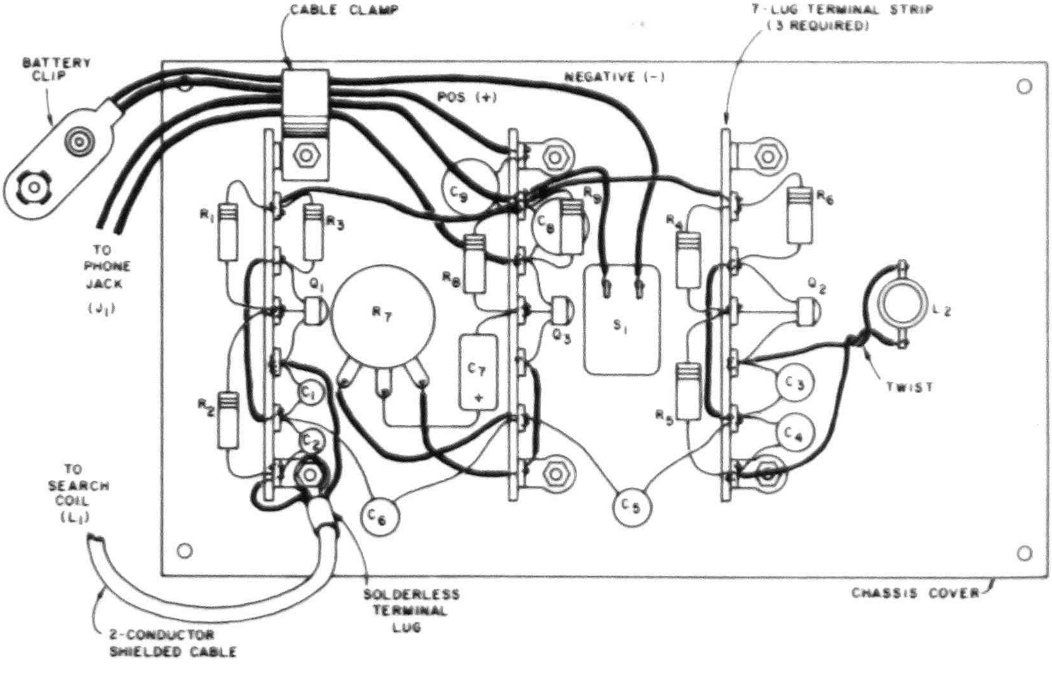


Fig. 2. Circuit layout.

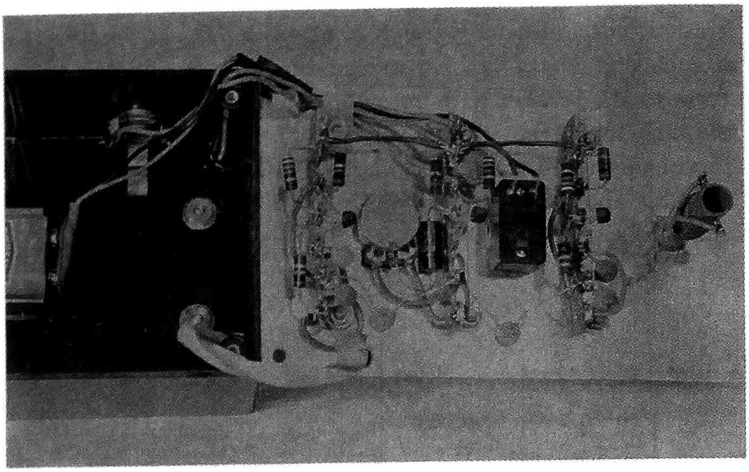


Fig. 3. Connections between top cover and box.

six inches long, but will not be connected to J_1 at this time. The wires to the battery clip should extend about nine inches. Use stranded wire for these connections. Now fabricate a small cable clamp from a piece of plastic and install it as shown in Fig. 2. Route the battery clip and phone jack wires through the cable clamp and tighten the clamp.

Now install phone jack J_1 in the chassis box as shown in Fig. 3 and connect the two 6″ wires to the phone jack. Leave enough slack in the wires to allow for opening and closing of the top cover.

Mount a battery holder in the bottom of the chassis box as shown in Fig. 3, then attach a battery clip to the two remaining wires. Be sure that you observe the proper polarity when connecting the battery clip. Also be sure that the battery clip will reach the battery when the top cover is opened.

Constructing the Search Coil

To make the search coil you will need two feet of 3/8″ aluminim or copper tubing; an element from an old TV antenna will do. Bend the tubing around a coffee can or some other round object to form a circle with a 6″ diameter. Continue to bend the tubing around the form for one and one-half turns. Now remove the tubing and spread it out until the inside diameter of the loop is 6-1/4″. Then cut across adjacent turns of the tubing with a hacksaw to obtain one complete loop that has an inside diameter of 6-1/4″. Some aluminum is wasted but the resulting loop will be more circular.

Using a hacksaw, cut a slot around the outside wall of the tubing. Then widen the slot to approximately 1/8″ with a small, flat file. Clean off metal slivers and round off sharp edges with the file. The coil form is now complete but it must be supported with a wooden bracket.

To make the bracket, cut a piece of wood 2″ X 6-5/8″ X 3/4″ as shown in Fig. 4. Hollow out a recess at each end of the bracket so that the coil form will fit snugly around it. Glue the coil form to the bracket with epoxy glue, allowing at least a 1/8″ gap between the ends of the coil form; the tubing must ***not*** form a continuous loop. After the assembly has thoroughly dried, drill a 1/4″ hole at the rear of the coil form as shown in Fig. 4. Make this hole about one inch deep. Then drill another 1/4″ hole at 45° so that it meets the first hole, as shown in Fig. 4.

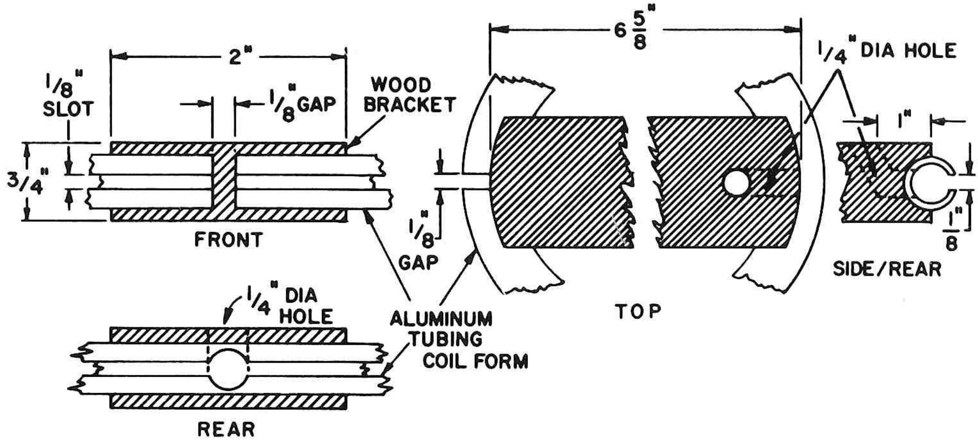


Fig. 4. Construction of search coil.

Take a three foot length of 2-conductor shielded cable and strip off 4″ of its plastic cover. Then strip off 3-1/2″ of the braided shield. Now push the prepared end of the cable through the 1/4″ hole in the wood bracket so the two wires protrude through the rear of the coil form. Pull the wires out until the braided shield is exposed. Then fan out the braided shield and slide the cable back into the hole until the braided shield touches and lies flat against the inside of the coil form. The shield must make good electrical contact with the aluminum tubing.

Now solder one of the wires to a 50′ length of No. 24 enameled copper wire. Insulate the bare connection with tape and wind twenty-five turns of the copper wire onto the coil form. Wind the wire tightly, being careful that the wire does not snag or scrape against the edges of the slot as you wind. At the end of the twenty-fifth turn, cut the copper wire and solder it to the portion protruding from the 1/4″ hole at the rear of the coil form. Insulate the connection and twist the wires together to take up any slack, then fold them down into the coil form. Using an ohmmeter or continuity tester, make sure there is no continuity between either conductor and the cable shield. The coil form should be completely insulated from the wire inside. Once you've painted the inside of the coil form with coil dope, your search coil is completely assembled.

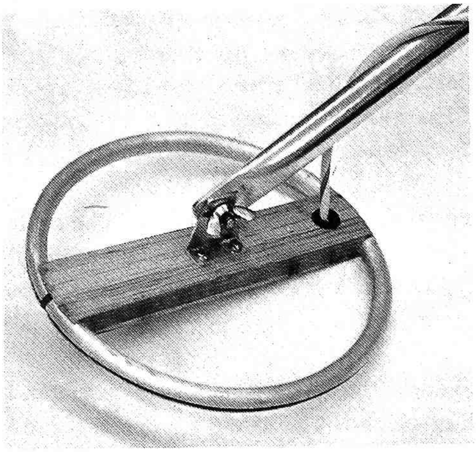


Fig. 5. The completed search coil attached to the exploring stem.

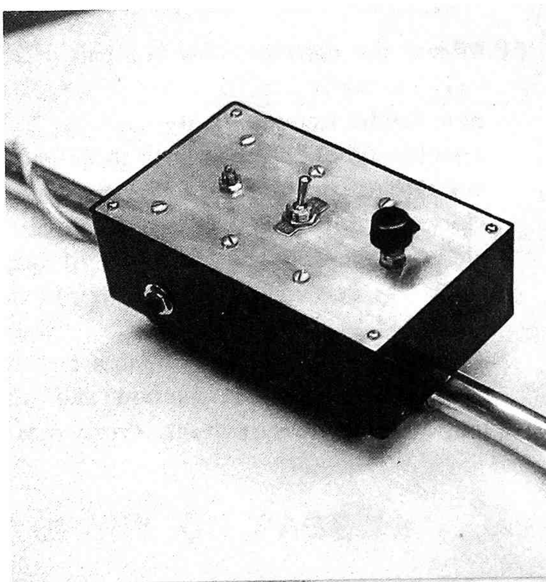
Final Assembly

To complete the assembly of your detector, you need three feet of 5/8" or 3/4" aluminum pipe for the exploring stem. One end of the tubing should be flattened as shown in Fig. 5. A 1/4" hole should be drilled in the center of the flattened area. The search coil can be attached to the exploring stem with a small, aluminum angle bracket as shown in Fig. 5. Screw the bracket to the center of the wooden coil support as shown. You can drill a 1/4" hole into the bracket, allowing the search coil to be attached to the exploring stem with a 1/4" bolt and wing nut.

Mount the assembled utility box approximately eight inches from the other end of the exploring stem. I mounted the box with two straps made from thin aluminum and four bolts to hold the box in place. Fig. 6 shows the installed box with the cover attached.

The 2-conductor shielded cable leading from the search coil should be wrapped around

Fig. 6. The fully assembled utility box mounted on the exploring stem.



the exploring stem in accordance with Figs. 5 and 6. Route the cable up the exploring stem by first drilling a 1/4" hole in the end of the box nearest the search coil, then running the cable through the hole (Fig. 3) and attaching the cable to the chassis cover (Figs. 2 and 3). You could drill a larger hole and use a rubber grommet. This would keep the cable from sliding in the hole.

Notice that the two wires (conductors) are connected to the left terminal strip. The cable and shield braid are held in place with a solderless terminal lug that has been crimped onto the cable and shield. The lug is screwed to the chassis plate with one of the screws that secures the left terminal strip to the chassis plate.

Be sure that there is enough slack in the cable to allow for opening the chassis cover and for adjusting the angle of the search coil at the other end. The shield must make good electrical contact with the chassis cover; the solderless terminal lug solves this problem nicely. An alternative would be to solder the braided shield to the bottom mounting lug (ground lug) along with one of the wires (conductors), then to solder the remaining wire to the third terminal from the bottom, as shown in Fig. 2.

Now install the battery, close the chassis cover, and put in the four mounting screws at the corners of the cover. Attach a small knob to the threaded shaft of the tuning coil and put a knob on the potentiometer shaft. The potentiometer I used required a screwdriver adjustment. This type of potentiometer works well since the volume seldom needs adjustment once it is set. A finishing touch would be to bend the handle slightly downward and put a bicycle handlebar grip on it. This makes the unit easy to carry.

Before you start detecting, test the two oscillators to make sure that they are operating. To do this, turn the unit on and place the search coil near an operating transistor radio. Even though the receiver is not tuned to the frequency of the search oscillator, the very strong rf field will produce interference in the receiver. You will hear numerous whistles and beats as you tune the receiver across the band. When you are satisfied that the search oscillator is working, place the radio near the tuning coil in the box to test the local oscillator.

To use the detector, plug in a pair of 2000-ohm earphones and turn potentiometer R_7 fully clockwise for maximum volume. Adjust tuning coil L_2 until you hear a loud beat note (audio frequency). By adjusting L_2 you should be able to reduce the beat note to zero (no tone) and then back to an audio beat note again as you continue to adjust the coil. When searching for metal, first tune L_2 for a zero beat, then turn the slug slightly clockwise until a low beat note is heard. Now place a coin or other small metal object close to the coil and the pitch of beat note should go up. It is this change in beat frequency that signals the presence of a metal object.

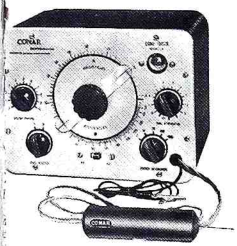
The operational description of a beat-frequency locater (Part I), when understood in conjunction with construction and searching techniques, should lead you to that long-awaited treasure hunt. Prosperous hunting!

VALUES FROM

CONAR

DIVISION OF NATIONAL RADIO INSTITUTE

MODEL 230



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CATALOG PRICE

KIT 280UK	$29.95
WIRED 280WT	$43.95

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KIT 280UK	$26.35
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MODEL 311

CONAR Resistor-Capacitor TESTER

The Model 311 gives fast, accurate, reliable test on all resistors and capacitors. Measures capacity of mica, ceramic, paper, oil-filled and electrolytics from 10 mmfd. to 1500 mfd., 0-450 volts. Checks for leakage, measures power factor and useful life. Shows exact value of resistors from 1 ohm to 150 megohms. Clearly indicates opens and shorts. Has "floating chassis" design to greatly reduce shock hazards. The Model 311 will also apply actual DC test voltage to capacitors to reveal break-down under normal circuit conditions, a feature far superior to many R-C testers which give low voltage "continuity" tests. Can be used for in-circuit tests in many applications and circuits.

CATALOG PRICE

KIT 311UK	$29.95
WIRED 311WT	$42.50

NRI STUDENT & ALUMNI PRICE

KIT 311UK	$24.40
WIRED 311WT	$33.85

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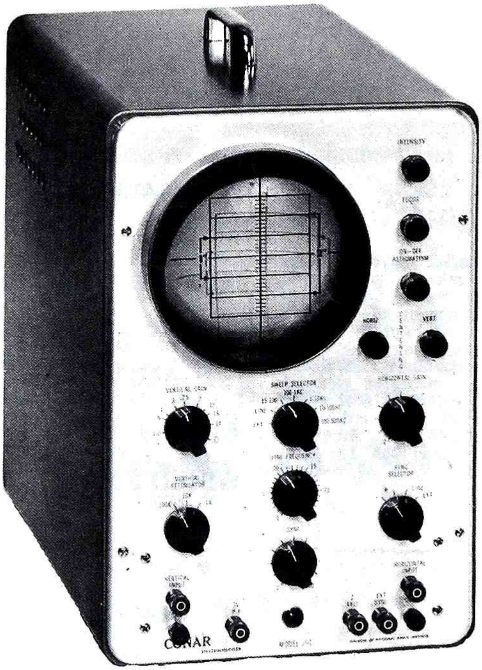

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• Has push-pull outputs balanced by separate phase splitter tubes in both horizontal and vertical amplifiers.

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• Sweep range—10 cps to 500 kc—**five times** the range of most other scopes, using special linearity circuit.

The Model 250 can be assembled in less than 15 hours—even by an inexperienced kit builder. Uses only top grade components. Most components are overrated, giving you an extra margin of dependability plus years of trouble-free service. And—there's no trouble finding replacement parts if ever needed. (Of course, we stock a complete inventory of parts, too.)

Step-by-step assembly instructions include big 17" x 22" picture diagrams plus 12 full pages of comprehensive operating instructions with more than 30 illustrations showing waveforms and connecting points.

SPECIFICATIONS

VERTICAL SENSITIVITY: .023 VRMS. VERTICAL FREQ. RESPONSE: Flat 13 cps to 2.5 mc, Down .05 db at 11 cps, Down 1.5 db at 3.58 mc (color burst), Down 3.5 db at 4.5 mc. HORIZONTAL SENSITIVITY: 1.0 VRMS. HORIZONTAL FREQ. RESPONSE: Flat 20 cps to 90 kc, Down .8 db at 12 cps, Down 3 db at 250 kc. RISE TIME: .05 ms. SWEEP FREQUENCY: 10 cps to 500 kc. TUBES: 11 (equivalent of 19 using dual types). PUSH-PULL ON-OFF does not upset other adjustments. CONTROLS: Intensity, Focus, On-Off, Astigmatism, Horiz. Centering, Vert. Centering, Horiz. Gain, Vert. Gain, Sweep Selector, Vert. Attenuator, Fine Frequency, Sync Selector, Sync. CABINET: Heavy gauge steel, baked-on rich blue finish, rubber feet, chrome handle. PANEL: Satin finish aluminum (not painted) with red lettering. BINDING POSTS: 5-way type to accommodate all connectors. DIMENSIONS: 9⅜" x 13¾" x 15½". POWER SUPPLY: 110-120 volts, 60 cycle AC, fused circuit. ACTUAL WEIGHT: 21 lbs.

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Appliance technicians (and apprentices)

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NEW PICTURE TUBE NUMBERING SYSTEM

Until 1967, the advertised size of a television screen was its diagonal measurement. Since many people felt that this was deceptive and unfair to consumers, the Federal Trade Commission declared that as of January 1, 1967, all TV receiver screen sizes must represent the ***viewable*** measurement. Unfortunately, this ruling applied only to TV receivers; CRT's still used the old numbering system.

Since then TV salesmen and servicemen have often had difficulty communicating with their different numbering systems. A person's new 23″ set would contain a 25″ CRT. Imagine the confusion when a serviceman tried to explain why he was installing a 25″ replacement tube in that set!

CRT's are at last being numbered in accordance with the new numbering system. The letter "V" (for viewable) is used in the type number to indicate this. Now if you need to replace the CRT in an 18″ color set, you could select either a 19FMP22 or the newer 18VACP22; they are exactly the same size.

Joe Dexter

NAND/NOR GATES

the third article in a series on digital techniques

by Louis E. Frenzel, Jr.

The three basic digital logic elements are the AND gate, the OR gate and the inverter. While any digital instrument or system can be constructed using just these three basic circuits, you will find that most digital equipment in use today is made up of NAND/NOR gates. These gates are simply improved variations of the basic AND/OR gates and can be readily used to perform virtually any digital operation. As an electronics technician you are sure to encounter NAND/NOR gates in your work sooner or later. This article will prepare you for that time.

HOW NAND/NOR GATES ARE FORMED

Fig. 1 shows how NAND/NOR gates are formed. In Fig. 1A we show an OR gate followed by an inverter. This circuit is known as a NOT-OR or NOR circuit. It produces exactly the same function as a

TABLE I

Inputs		Outputs	
A	B	OR	NOR
0	0	0	1
0	1	1	0
1	0	1	0
1	1	1	0

standard OR gate except that its output is inverted. Refer to the truth table of the two input OR and NOR gates in Table I.

Here we show all four possible input combinations that can occur and the outputs that OR and NOR gates will generate. The OR gate produces a binary 1 output when any one or both of its inputs is a binary 1. The NOR gate produces a binary 0 output if any one or both of its inputs is a binary 1. Note the relationship between the OR and NOR outputs. You can generate the output for

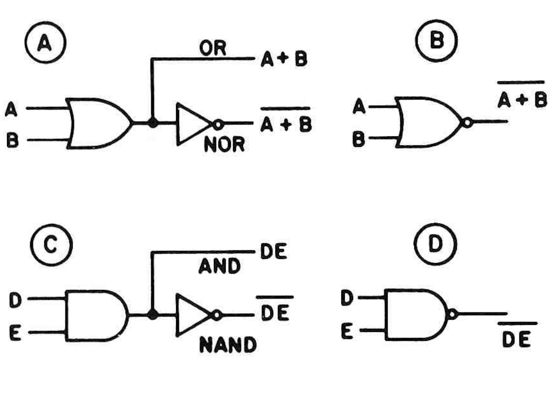


Fig. 1. How NAND/NOR gates are formed and designated with symbols.

a NOR gate by simply inverting or complementing each of the OR output states.

The NOR gate is a very widely used circuit, and it is generally available as one complete element rather than as an individual OR gate combined with an inverter shown in Fig. 1A. For that reason we use a special symbol for the NOR gate as shown in Fig. 1B. The circle at the output of the standard OR symbol represents the inversion. Note the output expression:

$$\overline{A + B}$$

The plus sign designates the OR logic operation of the two inputs A and B. The bar over the term indicates the inversion.

Another popular circuit configuration is the NOT-AND or NAND gate as shown in Fig. 1C. It is formed by combining an AND gate and an inverter. The inverter complements the output of the AND gate, DE, to produce the function $\overline{DE}$. The truth table in Table II summarizes the AND and NAND gate operation.

The AND output is a binary 1 only if both inputs are binary 1. The NAND output is simply the complement of the AND output. The symbol used for a NAND gate is shown in Fig. 1D.

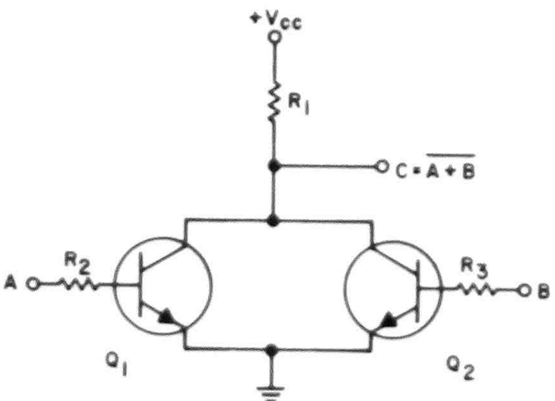
TABLE II

Inputs		Outputs	
D	E	AND	NAND
0	0	0	1
0	1	0	1
1	0	0	1
1	1	1	0

Most logic circuits used in digital systems today are integrated circuit (IC) NAND and NOR gates rather than individual AND gates, OR gates, and inverters made up of discrete transistors, resistors and diodes. Let's look at three of the most popular types of IC gates.

THE RTL GATE

One of the most widely used and simplest logic gates is the RTL gate shown in Fig. 2. RTL stands for resistor-transistor logic. The logic in this circuit is performed by two transistors and the associated resistors. Note in the circuit that the two transistors are connected in parallel and share a common load resistor, R_1. If a binary 0 or ground logic level is applied to both inputs A and B, both transistors

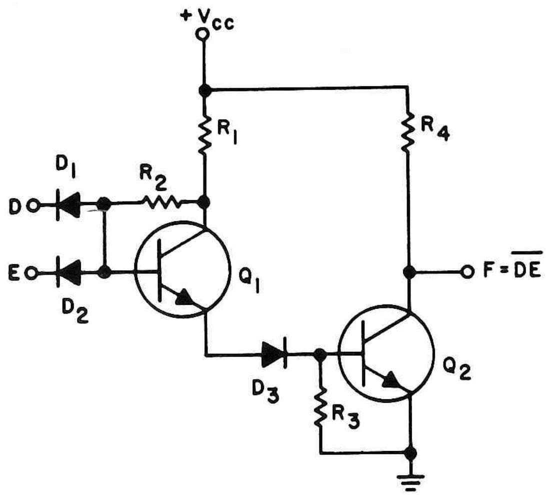


A	B	C
0	0	1
0	1	0
1	0	0
1	1	0

0 = GROUND OR ZERO VOLTS

1 = $+V_{cc}$

Fig. 2. An RTL NOR gate.



D	E	F
0	0	1
0	1	1
1	0	1
1	1	0

0 = GROUND OR ZERO VOLTS
1 = +V, A POSITIVE VOLTAGE

Fig. 3. A DTL NAND gate.

will be cut off so the output voltage will simply be the power supply voltage $+V_{cc}$ as seen through R_1. Applying a binary 1 input signal (a positive voltage) to either input will cause either transistor Q_1 or Q_2 to conduct. The transistor will go into saturation and act as a very low resistance, thus pulling the output, C, to near zero volts or ground, a binary 0 level. If both inputs are at binary 1, both transistors will conduct and bring the output to ground. This circuit produces the NOR function. The truth table showing the exact operation of the circuit is shown in Fig. 2 along with the circuit.

THE DTL GATE

The diode-transistor logic (DTL) gate is another widely used digital element. A typical circuit is shown in Fig. 3. The DTL gate performs the NAND function. The diodes D_1 and D_2 perform the AND logic while transistors Q_1 and Q_2 provide the inversion and output buffering.

The operation of the DTL gate is designated by the truth table given in Fig. 3. If either one or both of the inputs is at ground (binary 0), the base of Q_1 will be at approximately .7 volt, the voltage drop across the diode (D_1 or D_2) whose input side is at ground. Notice that the emitter-base junctions of Q_1 and Q_2 are connected in series with D_3. Since it takes about .7 volt across each emitter-base or diode junction to cause it to conduct, it will take a voltage of $3 \times .7 = 2.1$ volts or more at the base of Q_1 to cause Q_1, D_3, and Q_2 to conduct. With only .7 volt at the base of Q_1, both Q_1 and Q_2 will be cut off and the output will be $+V_{cc}$ as seen through R_4. The first three states in the truth table show this condition.

If both inputs rise to binary 1, some positive voltage level greater than 2.1 volts, then sufficient bias voltage exists to cause Q_1 and Q_2 to conduct. Q_1 supplies the base drive to Q_2 causing Q_2 to saturate and the output to drop to near zero volts (binary 0). The DTL gate, like most other logic gates, is available with 1, 2, 3, 4 and 8 inputs. A one input DTL NAND is simply an inverter.

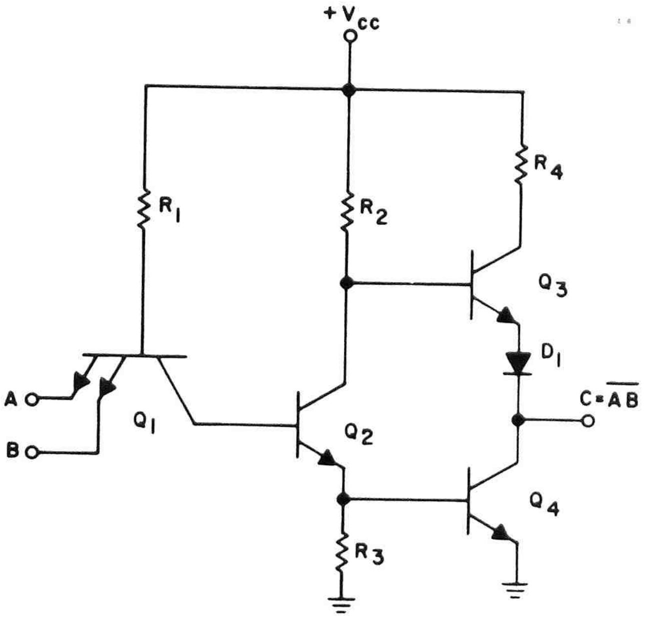
THE TTL GATE

Fig. 4 shows another very popular integrated circuit logic gate. This circuit is known as a transistor-transistor logic (TTL) gate. Like the DTL gate, this circuit performs the NAND function. Its big advantage over the DTL gate is its higher operating speed.

The logic itself is performed by the emitter-base (E-B) diode junctions of a multiple emitter transistor Q_1. If either one or both of the inputs A or B is brought to binary 0 or ground, the emitter-base junction of Q_1 will be forward biased. The voltage at the base of Q_1 will be approximately .7 volt, the drop across the E-B junction. This is insufficient voltage to forward bias all of the series connected junctions consisting of the collector-base junction of Q_1, the E-B junction of Q_2, and the E-B junction of Q_4. Each requires about .7 volt for a total of 2.1 volts.

Since their E-B junctions are not forward biased, Q_2 and Q_4 are cut off. Since Q_2 is cut off, it will not draw current through R_2. But R_2 does apply forward bias to transistor Q_3, turning it on and thereby applying the supply voltage through R_4, Q_3, and D_1 to the output.

If both inputs are at binary 1 (some voltage greater than 2.1 volts), then the E-B junction of transistor Q_1 will still conduct, but the base will be approximately .7 volt more positive than the emitters. This voltage will forward bias the base-collector junction of Q_1 and the E-B junctions of Q_2 and Q_4. With Q_2 *on*, base bias to Q_3 is shunted away, turning Q_3 *off*. With Q_4 *on*, the output will drop to near zero volts. As you can see, this circuit performs the positive NAND function.



A	B	C
0	0	1
0	1	1
1	0	1
1	1	0

0 = GROUND OR ZERO VOLTS
1 = +V, A POSITIVE VOLTAGE

Fig. 4. A TTL NAND gate.

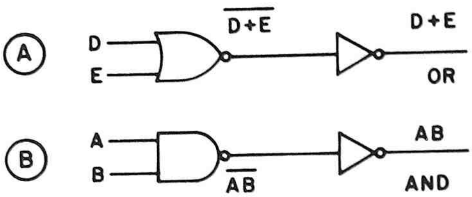


Fig. 5. Generating AND and OR functions with NAND/NOR gates.

THE DUAL NATURE OF NAND's AND NOR's

As mentioned earlier, most circuits use NAND and NOR gates almost exclusively. How then can we perform the simple AND and OR operations? Quite simply by using the basic gates as inverters. For example, to perform the standard OR operation with a NOR gate you place an inverter at the output of the NOR gate. The inverter effectively removes the bar from the NOR gate output expression to produce the pure OR operation. This is shown in Fig. 5A.

To perform the AND operation with a NAND gate, you simply pass the output of a standard NAND through an inverter to remove the complement bar as shown in Fig. 5B. A NAND or NOR gate using only one input is often used as an inverter in this application. Any NAND or NOR gate will perform as an inverter if only one of its inputs is used. This is handy since it eliminates the need for separate inverter circuits in most cases.

All NAND and NOR gates can be used to perform any logic function. Fig. 6A shows how a NOR gate can be used to perform the AND operation by simply adding two inverters to the inputs of the NOR gate. A NOR gate normally produces a binary 0 output when any one or both of the inputs is binary 1. It produces a binary 1 output when both inputs are binary 0's. If we invert both inputs, the result will be exactly the opposite. The output will be a binary 1 only when both inputs to the inverters are binary 1's. At all other times the output will be a binary 0. Of course, this is the definition of an AND gate.

By using two inverters ahead of the inputs on a NAND gate, the OR function can be performed. See Fig. 6B. Normally a NAND gate produces a binary 1 output if any one or both of the inputs is binary 0. When both of the inputs go to binary 1, the output will go to a binary 0. With inverters at both inputs, a binary 1 at either or both inputs will produce a binary 1 output. This, of course, is the definition of a standard OR gate.

This ability of either a NAND or a NOR to perform either logic function is extremely worthwhile for it permits the designer to construct all of his circuitry with just one type of gate. Most modern digital systems are implemented with just one type of gate, either NAND or NOR. The NAND gate is by far the most widely used.

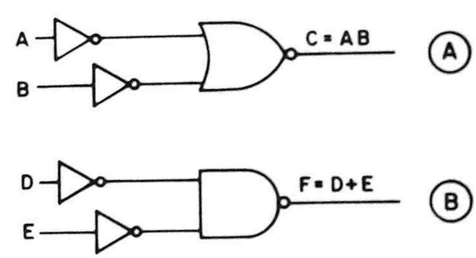


Fig. 6. Performing the AND operation with a NOR gate is shown at (A); performing the OR operation with a NAND gate is shown at (B).

In the next issue we will discuss flip-flops and their application.

How to Use TV Test

Because of the way TV sets are constructed, the amount of work the "outside man" can do is almost limited to making adjustments and changing tubes. As a result, the service technician must often cart the set off to the shop where it can be thoroughly checked. The smart serviceman brings to the shop only as much as he needs to do a good repair job. Almost always this means that the chassis will be taken to the shop.

When you get this chassis to your shop, what do you do with it? The chassis has no picture tube or loudspeaker. How do you service a piece of equipment when you can't see or hear what you're doing? The solution is provided by the TV test jig.

COLOR SETS

All you remove from a color set is the chassis. The deflection yoke, convergence assembly, and blue lateral/purity magnet assembly must stay in place; otherwise you'll have a complete purity and convergence setup to do before you can consider the job complete. Since these components stay with the CRT in the customer's home, you must provide substitutes for them at the shop. To allow the chassis to produce a picture, you need a substitute CRT, deflection yoke, convergence assembly (connection to the chassis for dynamic convergence is optional), and blue lateral/purity magnet assembly. For sound, add a small speaker similar to those used in TV sets. This conglomeration is called a color test jig. It is usually housed in a cabinet similar in size and shape to a table model color set.

The most popular color test jig is the RCA "Mark II" which sells for about $160, including an 18″ CRT. A portable version is also available for about the same price. A far less expensive way to provide yourself with a jig is to use your CONAR color TV set in conjunction with the adaptor cable set available from CONAR ($29.95). It is not necessary to remove the chassis from your CONAR set to make the connections for turning the set into a test jig.

Let's see what you need to do to check out a color chassis with a test jig. First connect the chassis to the jig by grounding the chassis to the CRT's external conductive coating. However, if the test jig is connected to the convergence socket of the chassis, the ground is automatic. In the case of the CONAR jig, the dynamic convergence connection is not made, so you must connect a ground wire from the chassis to the yoke mounting bracket (connected to the CRT) on the CONAR set. Next select the suitable adaptors and connect the CRT, deflection yoke, speaker, and finally the high voltage lead.

The next step is to confirm the customer's complaint by operating the set. Avoid adjusting any controls until you've seen what the trouble is. After this measure the high voltage. If it is not as specified by the set maker, adjust it to the required level right away. It is a good idea to check the high voltage periodically while you are working on the chassis. RCA has made a modification kit for its jigs (which I am sure will work with any setup, including the CONAR

"A

friend

is a

present

you

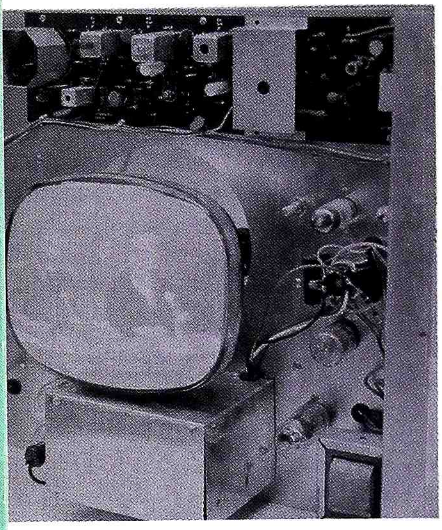
give

yourself."

—Robert

Louis

Stevenson



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BLACK-AND-WHITE TV'S

a simple matter to remove and re-
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: to get out your soldering iron or
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chassis!). Since there is no con-
ence yoke to worry about, the whole
is a lot simpler.

'll still need a test CRT, however. For
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will work with practically any B&W
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details about what is available in your
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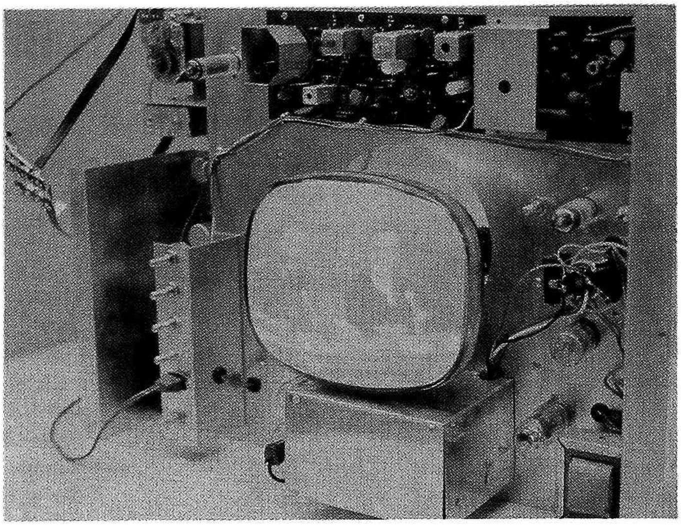
Jigs



by

Harold J. Turner, Jr.

one). It allows continuous monitoring of the high voltage.

If necessary adjust kine bias, brightness, screen and drive controls to produce a usable picture for your troubleshooting. Even if there is no picture when you first apply power, adjusting these controls may furnish you with important clues as to where the trouble is. Avoid adjusting any controls that would affect the purity or convergence: e.g., vertical linearity and height, vertical and horizontal centering and width controls. This will eliminate the need for more adjustments when the chassis is returned to its owner.

Since the chassis is now exposed and operating, you've made the physical part of the job easy. But the brainwork, the real troubleshooting, is still to be done. This won't be too bad if you arrange all your test equipment so the cables reach the TV chassis without stretching.

When you've finished repairing the chassis, leave it connected to the jig for a day or two if possible. This will enable you to test the permanence of your corrections. When your work is done, check the high voltage in the customer's home. This is the final step whenever you service any color TV. Remember, improperly adjusted high voltage circuits produce not only poor pictures but also possible X-radiation.

BLACK-AND-WHITE TV'S

It's a simple matter to remove and reinstall the B&W deflection yoke; take this component to the shop along with the chassis (on many B&W chassis, you would have to get out your soldering iron or diagonal cutters to unplug the yoke from the chassis!). Since there is no convergence yoke to worry about, the whole job is a lot simpler.

You'll still need a test CRT, however. For a long time there has been a need for a universal B&W test CRT. The 8YP4, shown in the photo, is a popular type that will work with practically any B&W chassis. Check with your local distributor for details about what is available in your area.

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City & State .... How long at this address? ....

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Allene J. Magann, 7620 Maple Ave., Takoma Park, MD 20012

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McGraw-Hill, Inc.	330 W. 42nd St., New York, NY 10036

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☐ Have changed during preceding 12 months

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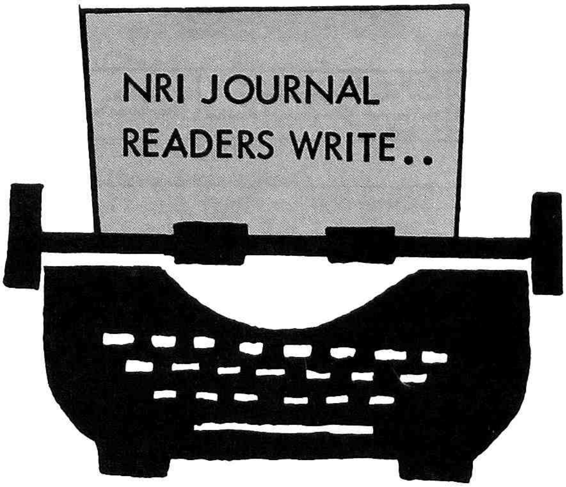
(Signature of editor, publisher, business manager, or owner) Allene J. Magann

POD Form 3526 May 1968



Got a brief? A grief?

A funny story? Idea?

Share it with us here.

87 Seaconnet Blvd.
Portsmouth, R.I. 02871

To The Editors:

I am a Chief Electronics Technician in the U.S. Navy and my present assignment is as an instructor at the Fleet Training Center, Newport, R.I. In two of the courses that we teach here, Basic and Advanced Test Equipment, I have found a couple of articles in the Journal that could be of great benefit to our students in this area.

What I would like to know is if permission from NRI is required to reprint these articles in the form of a handout to supplement our courses. The two articles I am interested in are: "A Refresher Course in Transistor Fundamentals" by Louis E. Frenzel, Jr. in the March/April 1970 issue and "Oscilloscope Probes . . . Who Needs Them?" by Harold J. Turner, Jr. in the September/October 1970 issue. These are two of the best articles on these subjects that I have seen, and these two men deserve a lot of credit for their outstanding understanding of the subjects and the simplicity in which they wrote the articles.

I noticed that the Journal has no statement that these articles are under copyright, but so as not to deprive these men of their rights, I would like to request permission to use these articles for the benefit of my students with the understanding that I will never try to use this privilege for my own gain.

I would appreciate a reply on this matter and any other information I should have about reprinting these articles, providing approval is granted. Thank you for your time and effort in consideration of this inquiry.

Respectfully,

John A. Sassone, Jr. B188-K882-VB

12512 Littleton St.
Silver Spring, Md. 20906

To The Editors:

The May/June 1970 issue of the NRI Journal contained an article, "How To Repair An Electronics Instrument?". The source was listed as "Unknown". This masterpiece was written by Mr. Fred B. Miller, an Electronics Technician at the David Taylor Model Basin, Carderock, Md. It was written sometime between 1949 and 1952, shortly after Mr. Miller transferred into the field of electronics after having been employed as a Naval Architect.

The article was widely distributed among electronics personnel at the AEC Nevada Test Site in 1952 and 1953, which may account for its being submitted by Mr. Skelton.

Mr. Miller has advanced to a Branch Head in the Central Instrumentation Division of the David Taylor Model Basin, now called the Naval Ship Research and Development Center.

I have known Mr. Miller since 1948 as a co-worker and friend and remember quite well the attention his article received when first written.

Sincerely, Charles W. Hoffman 222 HC 86 G

How to repair an electronics instrument?

1. Approach the ailing instrument in a confident manner. This will give the instrument the (often mistaken) idea that you know something. This will also impress anyone who happens to be looking, and if the instrument should suddenly start working, you will be credited with its repair. If this step fails to work, proceed to step two.

2. Wave the handbook at the instrument. This will make the instrument assume that you are at least somewhat familiar with the sources of knowledge. Should this step fail to work, proceed to step three.

3. In a forcible manner, recite Ohm's Law to the instrument. (Before taking this step, refer to some reliable handbook and be sure of your knowledge of Ohm's Law.) This will prove to the instrument beyond the shadow of a doubt that you do know something. This is a drastic step and should be attempted only after the first two steps fail.

4. Jar the instrument slightly. This may require anything from a three to six foot drop, preferably on a concrete floor. However, you must be careful with this step because, while jarring is an approved method of repair, we must not mar the floor. Again, this is a drastic step, and if it fails there is nothing to do but to proceed to step five.

5. Add a tube. This will prove to the instrument that you are familiar with instrument design. Also this step will give the instrument an added load to carry and will thereby increase your advantage. Should these five steps fail to work, you must proceed to the most drastic step of all. This step is seldom needed and must be used only as a final resort.

6. THINK.

Source unknown. Submitted by Louis Blaine Skelton
341 N. 2nd W.
Toele, Utah 84074

● ● ● ● ● ●

Box 8443
Det 3, 623 AC&W
APO San Francisco
CA 96235

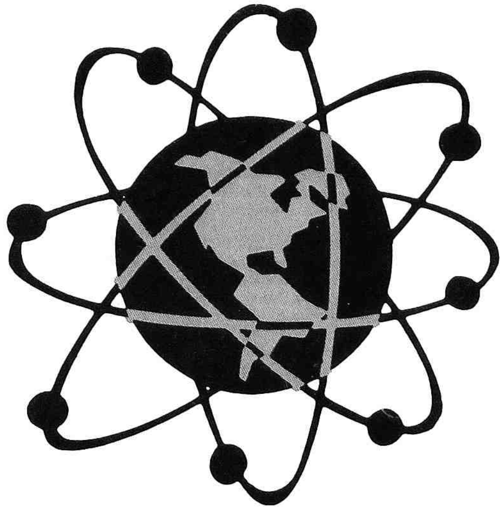
To the Editors:

In your March/April 1970 issue of the NRI Journal, you published an article by Louis E. Frenzel, Jr. titled, "A Refresher Course in Transistor Fundamentals".

This article caused much interest among the radar maintenance personnel at this site. As a matter of fact, so much interest has been shown that I and my fellow workers would like permission to reproduce the above article for distribution among the electronics maintenance personnel here.

Your permission will be greatly appreciated.

Sincerely,
Browning A. Robertson, TSgt USAF HC172-D787 VB



Ham News

BY TED BEACH, K4MKX

Happy New Year! We trust you all had an enjoyable Holiday Season and are ready for 1971.

As usual, things have been frantic around here – I get many personal notes and letters from NRI Hams, and, as much as I would like to, it is impossible for me to acknowledge all of them individually. Just rest assured that your call will be printed in the Journal (if my secretary doesn't lose your card) and any interesting information will also be passed along in these pages.

We have had several suggestions that we publish a directory or list of all NRI hams so you guys can know who is who on the air. Well, all I can say is hang onto your copies of the Journal – the continuing lists published each issue are about as close as we can get to a "directory". Remember, even after you graduate you can continue to receive the Journal by joining the NRI Alumni Association. You will be invited to join the Alumni Association as soon as you graduate.

As mentioned in the final paragraph of the last column, W9JWT has a suggestion for our Ham News column. We will pass it along to you and see what you guys think. Reid says we should have a short "buy/sell/swap/giveaway" listing in each issue to help prospective hams find inexpensive gear, let some of the oldtimers unload some excess from underfoot, and just generally help each other out. OK. We'll try it. Here are the rules:

1. No commercial listings.
2. Type or print your call, QTH, etc. on a post card or QSL (Zip code also) and send it to me at NRI.
3. No more than two items per ad. Keep it short. We may edit copy to fit space.

NEW, IMPROVED CONAR
MODEL 681 INTEGRATED CIRCUIT
COLOR GENERATOR

KIT 681 UK — CATALOG PRICE $89.50 — NRI STUDENT AND ALUMNI PRICE **$79.45**

WIRED 681 WT — CATALOG PRICE $121.50 — NRI STUDENT AND ALUMNI PRICE **$109.00**

Only The 681 Has All These Features At Any Price!

- **EXCLUSIVE Digital Integrated Circuits**
- **EXCLUSIVE 4 Crystal Controlled Oscillators**
- **Completely Solid State**
- **Color Amplitude Control**
- **Regulated Power Supply**
- **Stability Control**
- **TV Station Sync and Blanking Pulses**
- **Nine Patterns**
- **Red, Blue and Green Gun Killers**
- **Compact, Lightweight, Portable**

You can pay much more, but you can't buy more exclusive and up-to-date features than CONAR engineers have built into the new Model 681 Color Generator. CONAR is first with digital integrated circuits and 4 crystal-controlled oscillators. Compact and portable, the 681 weighs less than 5 lbs. Peak accuracy and stability are assured by cool all solid state circuitry, regulated power supply and stability control. The 681 incorporates a wide range of test patterns, including single and multiple vertical bar, horizontal bar and crosshatch patterns—all with horizontal lines only one raster line thick, as well as a standard 10-bar color pattern. The most modern and versatile color generator on the market, the 681 incorporates 27 semiconductors: 10 type 914 integrated circuits, 7 type 790 integrated circuits, 3 2N2369 transistors, 1 2N555 transistor, 5 silicon diodes and 1 zener diode. Oscillators include 189kc. timing generator, 3.56 mc. offset color subcarrier, 4.5 mc. sound carrier and 55.25 mc. or 61.25 mc. rf. carrier (channel 2 or 3 as ordered). Until now, no commercially available color generator has offered so many quality features in a single instrument. You get TV station quality composite video signals, including "back porch" color burst. All this, plus CONAR's low prices, make the 681 the absolute tops in dollar-for-dollar value.

Please specify Channel 2 or 3 when ordering the 681. Select the channel which is not broadcast in your area.

SPECIFICATIONS

OUTPUT:
R. F. only — low impedance
Approximately 50,000 microvolts into 300 ohm tuner
100% modulated carrier — composite video
Crystal controlled oscillators:
189 kc timing oscillator
3,563.795 kc offset color subcarrier oscillator
4,500 kc sound carrier oscillator
55.25 mc or 61.25 mc rf carrier oscillator

MODULATION:
Single dot
Single cross
Single vertical line
Single horizontal line
Full dot pattern
Full crosshatch pattern
Full vertical line pattern
Full horizontal line pattern
Keyed rainbow color pattern

POWER REQUIREMENTS:
120 vac — 1.0 watt

REGULATED POWER SUPPLY:
Silicon diode bridge rectifier
Zener diode stabilized transistor regulator

SEMICONDUCTOR COMPLEMENT:
10 type 914 integrated circuits
7 type 790 integrated circuits
3 type 2N2369 NPN silicon transistors
1 type 2N555 PNP power transistor
1 type 1N746A Zener diode
4 silicon rectifier diodes
1 modulator diode

GUN KILLER SWITCHES:
Permanently wired cable
Separate red, blue and green switches
Colored switches for rapid location

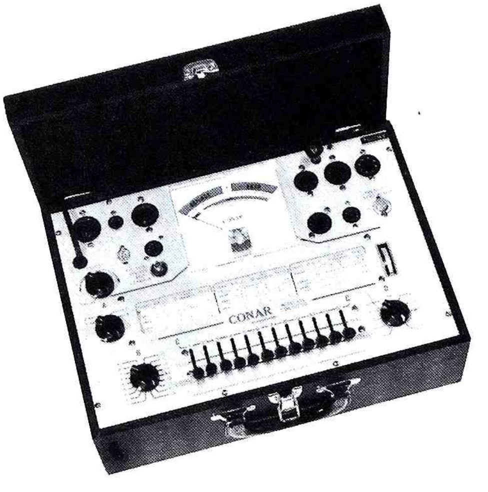
CONSTRUCTION:
Aluminum cabinet, chassis and panel for light weight
Printed circuit board, 6" x 9"

SIZE:
10" x 3" x 9" (WxHxD)

WEIGHT:
Less than 4 pounds

USE CONVENIENT ORDER BLANK ON PAGE 19

CONAR Cathode Conductance Tube Tester



Catalog Price $49.95
NRI Student and Alumni Price
KIT 223 UK $44.80
$5 DOWN, $5 PER MONTH

Catalog Price $75.95
NRI Student and Alumni Price
WIRED 223 WT $68.25
$7 DOWN, $7 PER MONTH
Express Collect

Completely new, modestly-priced Tube Tester Kit, designed by men with **unequalled** experience in training technicians -- understanding their equipment needs and servicing problems. No unnecessary frills added to the Model 223's specs. Only those features most essential to a technician's work are built in.

Every technician -- full or part time -- needs the Model 223 for his bench. Helps you make better job estimates and pays for itself quickly in extra profits. Perfect for experimenters and hobbyists, too.

Tests all series string and up-to-date tubes as well as the standard base types -- 4, 5, 6, 7-pin large octal, local, 7, 9 and 10-pin miniatures, 5 pin nuvistor, novar and Compactron. Checks 17 individual filament voltages from .75 to 110 volts. Tests multi-section tubes, gas rectifiers and remote control gaseous types. Has open-close "eye" tests for cathode ray indicator tubes, and visible filament continuity check to show up on filaments regardless of pin position.

12 level element selector-distribution system enables you to select the individual elements of the tube you're checking and simplifies cathode leakage tests and inter-element short tests. Most important this feature provides you with flexibility AND gives you insurance against obsolescence as new tubes reach the market.

Designed around the approved Electronic Industry Association's Emission Circuit, the Model 223 uses a precise, accurate, double-jeweled meter movement. It's balanced and factory calibrated within 2% accuracy. Large, easy to read -- with clear plastic case and two 2-color scales.

Test sequence set up to reveal quickly open filaments and shorts. The time-saving feature rejects an "open" or "shorted" tube and lets you proceed with more detailed checks right away. For maximum safety to you and the instrument, the test circuit transformer is isolated from the power line. Triple-window, high-speed, gear-operated roll chart is illuminated, easy to read, even in darkened areas. Lists over 2,000 tube types.

Durable, black, leather-fabric case makes the Model 223 attractive as well as functional. Hinged lid is removable. When the lid is on, a snap lock holds it securely.

Level switches and other controls conveniently grouped to eliminate wasted motion. This minor but thoughtful feature is typical of the care put into the Model 223.

The instruction manual for the Model 223 is written with the same high standard that went into the circuit design -- with HUGE picture diagrams to guide you every step of the way.

Building the Model 223 is easy. Using it is even easier. The operating simplicity makes it a pleasure to use. Just 10 lbs. -- it's a pleasure to tote along on service calls, too.

PICTURE TUBE ADAPTORS: 70°-90°, Stock 3AD; 110°, Stock 5AD – $3 Each

USE CONVENIENT ORDER BLANK ON PAGE 19

4. Ads will ***not*** be renewable.
5. All ads accepted on a first come basis and we assume no responsibility for accuracy or quality of items listed.

Remember, you will be reaching NRI students and graduates ***only*** and there is roughly a two and a half month lead time for publication. This means if you are in a ***hurry***, forget it. We'll try this out, but if we get swamped we may have to discontinue. Have at it, you guys!—

Now, on to the current crop of Hams enrolled in the NRI Course For Amateur Licenses. The most recent are:

R.G.	WN1NJK	N	Groton, CT
Henry	WB2GMN	G	Hartsdale, NY
John	W2JCV	G	Dover, NJ
Tom	WN2OUX	N	Macedon, NY
Marjorie	WA3LDB	G	Sparks, MD
Jim	WN4RLS	N	Charlotte, NC
Frank	WN4RPL	N	Florence, SC
Swede	WN4SFY	N	Bowling Green, FL
Dick	WN5AXI	N	Oklahoma City, OK
Howard	WN5BLQ	N	Warren, TX
Bill	WG6ASX	N	Agat, Guam
Foster	WN6BCK	N	Duarte, CA
Ronnie	WN6BGK	N	Port Hueneme, CA
Garland	WA6MRI*	T	Ventura, CA
Kit	WN6PWW	N	Cotati, CA
Bill	WB8DKE	T	St. Albans, WV
Tom	WN8ECF	N	East Liverpool, OH
Dana	WN9FBQ	N	Peoria, IL
Tim	WNØCSL	N	Kansas City, MO
Doug	WNØCUV	N	Berthold, ND
Jim	WØCWD	C	North Platte, NE

* Just upgraded – congratulations!

W2JCV would like to see the Ham News column expanded to include more news. Well, John, it is *you* guys who make the news, so let's have it.

WN2OUX enrolled in April of 1970, got his Novice ticket in July and plans to go for General in February. Since July, Tom has worked 31 states and 15 countries using a Heath HW-16 and a dipole. That's really going some for two months' work! I don't doubt that he will be ready for a General ticket by February!

We had a nice long letter from Howard, WN5BLQ, who operates from a commercial marine vessel currently plying the east coast. Since the run from the Gulf of Mexico to Delaware is so short, they are kept very busy all of the time and there is little time to get on the air.

WA6MRI just got his Technician license and says the code is the only thing holding up his General. Garland says our course really helped him and he thinks he scored 100 on the written exam.

WB8DKE ***really*** has a problem. His theory was good enough for General, but his code speed qualified him for Technician, so Bill took the Tech exam and made it. Now he finds that there is very little cw on the vhf bands and so he can't get "on-the-air" code practice. He can ***not*** get a Novice ticket without waiting a year ***after*** giving up his Tech call! What a predicament. About all we can suggest is to ***listen in*** on the hf bands (W1AW for instance) and get the code speed up to qualify for General or Advanced. And that's not too easy. What a problem!

WNØCUV uses the Conar rig on 40 at present but hopes to get on 15 soon. Doug has been getting very good signal reports from the stations he has worked, although the bad QRM makes it tough to hear the other guys. Sound familiar?

Just to show you how disorganized I can get, I have two notes, one from Robin Walls, one from Darryl Nicely, both asking for the WNØBEK modification for the Conar 500 receiver. And I can't remember if I sent them or not! I sure wish I had a ***good*** secretary.

That about wraps up the news from the NRI Amateur Course Hams. Now let's see who else we've heard from.

Ron	WA1JCK	T	Leominster, MA
Stanley	W3ZGG	A	Lansdale, PA
Rich	WN5BIB	N	San Angelo, TX
Walter	WN5BQB	N	Hunterville, TX
Carl	WN5OWR	N	Houston, TX
Al	WN6BTF	N	Eureka, CA
Joe	K6ESR	G	Tarzana, CA
Bob	WB6OIO	A	San Rafael, CA
Charles	W7IRA	G	Seattle, WA
Larry	WN8HMT	N	Marion, OH
Hub	WB9ALI	G	Granite City, IL
Ronald	WB9CEX	G	Indianapolis, IN
Gary	WBØASO*	A	Vincent, IA
David	WAØSVO	A	Lawrence, KS
Bob	WAØVUJ**	A	Jefferson City, MO

* just upgraded – congratulations
** Ex-KØGIN

Technician Ron, WA1JCK, started as a Novice using a Conar rig and now uses a Lafayette HA-460 with a 5 element beam on 6 and 2 meters. Ron said he has a lot of fun with the Conar rig.

W3ZGG has a very interesting and worthwhile part-time activity which he recommends highly to all hams. Stanley has a class of about 15 students from a local state mental hospital. The subject? The Novice class license. The instruction is a valuable part of the patients' therapy in preparation for normal life in the community. Stanley works two nights a week at the hospital as a volunteer and frequently finds himself there other nights as well giving extra help with code and theory on an individual basis. This is a *very* commendable program and Stanley says he would like to help anyone who might be interested in conducting a similar program. You can write him at:

Curtis Lane, R.D. 2
Lansdale, PA, 19446

or call him: (215) 584-6453. Stanley also suggested we keep a list of NRI hams who would serve as volunteer examiners. Well, in the November/December 1968 Journal (which *started* this column!) this was the prime reason for requesting NRI hams to send in their calls. In the two years since that time we have only had about a dozen requests for volunteer examiners, and were able to have an NRI volunteer in about three cases. So it *has* worked, and we do appreciate your cards.

WN5BQB is another one who wanted the WNØBEK modification for the Conar 500 receiver, and I'm not sure whether it was sent or not. Even without the mod, Walter has worked 21 states and is quite happy with his 25 watt rig (we'll send another copy anyway).

WB9CEX also has a station in Rhode Island, K1JYO. Ronald presently uses the WB9 call from Indianapolis and would also like to have a "directory" of NRI hams. As noted earlier, Ron, the Journal lists are "it". Sorry.

WBØASO writes proudly that he went from Novice to Tech (blew the code!) and didn't have any vhf gear so he studied the code, passed Advanced and is presently awaiting the ticket. Congratulations, Gary. WB8DKE take note.

As a final note, we got a nice letter from Gerald Little in Hamilton, Ontario, saying that he is very interested in becoming a ham. He has an SX-130 and likes to tune in the stateside hams, having heard stations as far south as North Carolina and Virginia and how come he hasn't heard me? Well, all things considered, we *still* haven't gotten on the air yet at our new QTH. The Ranger is fixed and gathering dust, the SX-100 is back at the office and we're doing about ninety other things, so the antenna is not yet quite right and – well you know how these things go! See you in a couple of months.

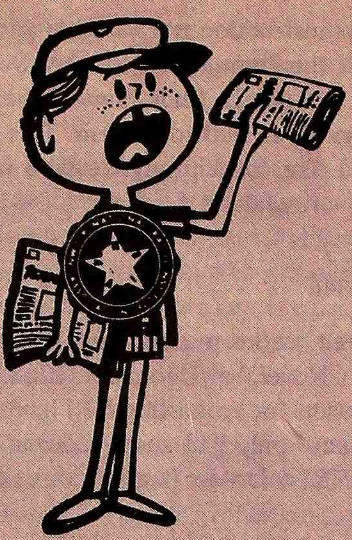
Vy 73 Ted K4MKX

AS WE GO TO PRESS

Duane Schnur, WB8EEJ, requests all those interested in activating 40 meters to write him at:

125 Gardner St.
Caro, MI 48723

Novices: send Duane a list of your 40M xtals and he will see about some cw activity for you guys, too. More later.



Alumni News

James Wheeler	President
Robert Bonge	Vice-Pres.
Graham Boyd	Vice-Pres.
Br. Bernard Frey	Vice-Pres.
Thomas Schnader	Vice-Pres.
T.F. Nolan, Jr.	Exec. Sec.

OFFICERS BEGIN NEW TERMS

If you received your November-December issue of the NRI Journal, you saw that Mr. James Wheeler of the Pittsburgh Chapter was elected National President of NRIAA. However, the names of the Vice Presidents were inadvertently left out of the November-December Journal. Therefore, we are running the complete election returns in this issue.

President

James Wheeler – Pittsburgh, Pennsylvania

Vice-Presidents

Robert Bonge – San Antonio, Texas
Graham Boyd – Los Angeles, California
Brother Bernard Frey – Springfield, Massachusetts
Thomas Schnader – Pittsburgh, Pennsylvania

The race was very close between the eight contenders for the Vice-Presidents of the NRIAA.

DETROIT Chapter has Good Turnout

The October meeting was visited by Mr. Tom Nolan the Executive Secretary. He gave a very good color TV alignment talk with slides and an actual demonstration on a chassis using an oscilloscope. Those students with problems on their color kits were sure glad to be able to talk over the troubles and get the answers on the spot. It is hard for them to write about their problems but easy to show Mr. Nolan where their trouble is and immediately get an answer they can understand.

After the meeting coffee and sandwiches were served.

FLINT-SAGINAW Chapter Entertains Executive Secretary

At the September meeting of the Flint-Saginaw Valley Chapter Mr. Gilbert Harris gave a demonstration on tape recorders. He also commented on the auto radio business and indicated it was a very successful business to be in today. Mr. Arthur Clapp gave a talk on the Civilian Air Patrol and their valuable service to the public.

Mr. Richard Moore invited the members to Saginaw to visit his marine repair shop. Members will take him up on this invitation after the hunting season is over.

Mr. Tom Nolan, the Executive Secretary of the Alumni Association, presented a program on TV alignment. The fall season was started out with a bang as NRIAA members came from as far away as 100 miles to hear Tom give his lecture. (Editor's Note: The Executive Secretary had a sample of Hungarian hospitality which was out of this world. Mrs. Jobbagy hosted a dinner that even the President of the United States would have liked to have sampled. The Secretary would like to express his profound thanks for such a hearty welcome. Next year's meeting will be looked forward to with enthusiasm.)

The November meeting found Steve Avetta, Andrew Jobbagy and Gilbert Harris all talking on various subjects.

NEW YORK Chapter Continues Color Course

At the September meeting Pete Carter discussed troubles in a horizontal circuit which led to the final trouble appearing in the agc circuit.

Jim Eaddy started the basic color series

Meeting of the Flint-Saginaw Chapter

with Pete Carter and Ontie Crowe showing where to look for trouble and how to check out sets with a scope. It was a very interesting session and before anyone realized it, it was 11 o'clock and they had to adjourn until the next meeting to continue the series.

At the following meeting Mr. Al Bimstein talked about customer relations and how to charge a fair price and guarantee your work when calling at a customer's home.

Pete Carter continued with the color series and he worked with Mr. Eaddy and Mr. Joe Bradley. All the members of the chapter had the schematic of the color set and were able to follow Pete as he described the circuits and what they were doing. A discussion followed. Everyone knew much more about color TV when they left the meeting than when they came.

At the October meetings Mr. Foggie set up his TV set with the Chapter's scope and his marker generator, and then showed, with the use of the oscilloscope, how to align the set. All of the fourteen members who were present enjoyed the program.

At the first November meeting Pete Carter had a Magnavox TV with a high B+ problem and after some discussion the solution was found in the horizontal circuit. Mr. Pete Carter and Mr. Foggie then continued on the convergence of a color set.

PITTSBURGH Chapter has Talks by Members

At the October meeting Tom Schnader, one of the members and a serviceman, described various types of diodes in TV and also had a discussion on how to stop high voltage Corona in the high voltage section.

He gave a tip on repairing plastic knobs using a material called Plastic Pair.

The November meeting found Jim Wheeler discussing the Sony Color TV set. He was especially intrigued by the number of parts in such a small set.

At the same meeting, Jack Benoit set up his triggered scope and showed how stable the waveforms are on that type of scope. In fact it is impossible to get them out of sync.

In December the chapter is planning on their annual party.

SAN ANTONIO Chapter Plans For Series of Speakers

San Antonio Chapter has commitments from October through Spring from speakers from various manufacturers including RCA, Zenith, Admiral, Packard Bell, and Electrotex. They also have a series of lectures on TV Servicing, on tapes and slides prepared by the Howard W. Sams Company.

At the October meeting Mr. H. E. Ruess, one of the chapter members, gave a very instructive program on tape recorder service. He used several late model tape recorders in his demonstration. All who attended were highly impressed.

Also, Sgt. Guy Alder joined the chapter. He read about the chapter in the NRI Journal while he was stationed in Alaska.

At the other October meeting three new members were welcomed. They are John Gray, Bernard C. Hipchen, and William W. Johnson, Jr.

The speaker was Mr. Dennis O'Neal, the Service Manager for RCA South Texas Distributor in San Antonio. The subject was the RCA CTC39 color chassis.

Mr. O'Neal used a special CTC39 chassis in which he could substitute various bad components and then question the audience as to what they thought was wrong with the receiver. The answer was then flashed on the screen and the reasons were explained as to how to locate that particular fault. This was an outstanding program and Mr. O'Neal is to be commended.

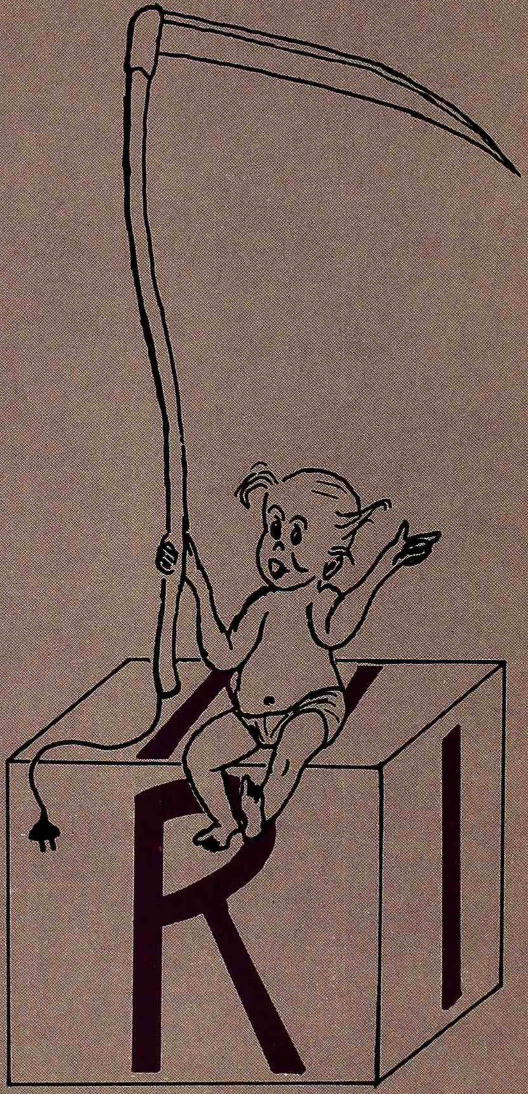
The paid-up membership of the Chapter is now 34 and enlarging at every meeting. San Antonio is really rolling.

SPRINGFIELD Chapter Has Talk on Transistors

Mr. Bob Allen, using the RCA Dynamic transistor board, demonstrated a signal passing through a receiver. He explained graphically the methods used in servicing.

Upon completion of the theoretical operation, defects were introduced for members to solve. After the introduced defects and a lengthy warm-up there developed a distortion which was not introduced. This proved very interesting. Using a signal tracer, it was found to be originating in the audio amplifier transistor. With the solving of this problem the meeting was concluded and the members proceeded to the refreshments which were enjoyed by all. The Chapter thanks Bob Allen for a splendid program.

new year



new graduates

new goals

DIRECTORY OF CHAPTERS

CHAMBERSBURG (CUMBERLAND VALLEY) CHAPTER meets 8 p.m. 2nd Tuesday of each month at Bob Erford's Radio-TV Service Shop, Chambersburg, Pa. Chairman: Gerald Strite, RR1, Chambersburg, Pa.

DETROIT CHAPTER meets 8 p.m., 2nd Friday of each month at St. Andrews Hall, 431 E. Congress St., Detroit. Chairman: James Kelley, 1140 Livernois, Detroit, Mich. VI 1-4972.

FLINT (SAGINAW VALLEY) CHAPTER meets 7:30 p.m., 2nd Wednesday of each month at Andrew Jobbagy's shop, G-5507 S. Saginaw Rd., Flint, Mich. Chairman: Andrew Jobbagy, 694-6773.

LOS ANGELES CHAPTER meets 8 p.m., third Friday of each month at Graham D. Boyd's TV Shop, 1223 N. Vermont Ave., Los Angeles, Calif., NO-2-3759.

NEW ORLEANS CHAPTER meets 8 p.m., 2nd Tuesday of each month at Galjour's TV, 809 N. Broad St., New Orleans, La. Chairman: Herman Blackford, 5301 Tchoupitoulas St., New Orleans, La.

NEW YORK CITY CHAPTER meets 8:30 p.m. 1st and 3rd Thursday of each month at 264 E. 10th St., New York City. Chairman: Samuel Antman, 1669 45th St., Brooklyn, N.Y.

NORTH JERSEY CHAPTER meets 8 p.m., last Friday of each month at Midland Hardware, 155 Midland Ave., Kearney, N.J. Chairman: William Colton, 191 Prospect Ave., North Arlington, N.J.

PITTSBURGH CHAPTER meets 8 p.m., 1st Thursday of each month in the basement of the U.P. Church of Verona, Pa., corner of South Ave. & 2nd St. Chairman: Tom Schnader, RFD 3, Irwin, Pa.

SAN ANTONIO (ALAMO) CHAPTER meets 7 p.m., 4th Friday of each month at Alamo Heights Christian Church Scout House, 350 Primrose St., 6500 block of N. New Braunfels St. (3 blocks north of Austin Hwy.), San Antonio. Chairman: R. E. Bonge, 222 Amador Lane, San Antonio, Texas.

SAN FRANCISCO CHAPTER meets 8 p.m., 2nd Wednesday of each month at the home of J. Arthur Ragsdale, 1526 27th Ave., San Francisco. Chairman: Isaiah Randolph, 60 Santa Fe Ave., San Francisco, Calif.

SOUTHEASTERN MASSACHUSETTS CHAPTER meets 8 p.m., last Wednesday of each month at the home of Chairman John Alves, 57 Allen Boulevard, Swansea, Massachusetts.

SPRINGFIELD (MASS.) CHAPTER meets 7 p.m., 2nd Saturday of each month at the shop of Norman Charest, 74 Redfern Dr., Springfield; and 4th Saturday at the shop of Chairman Al Dorman, 6 Forest Lane, Simsbury, Conn.

PHILADELPHIA-CAMDEN CHAPTER meets 8 p.m., 4th Monday of each month at K of C Hall, Tulip and Tyson Sts., Philadelphia. Chairman: John Pirrung, 2923 Longshore, Philadelphia, Pa.

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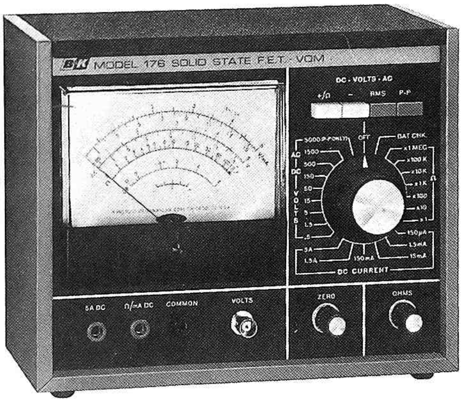

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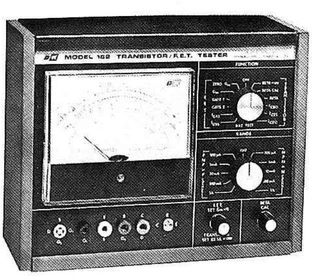

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