Did you know that pipe-pounding and light-flicking intercom systems are obsolete? Try this efficient, all-electronic model and promote peace with the family.

- Lighthouse Larry

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Checking the operation of this "earphone chassis" model and run digging into my old junk box to find the necessary material. Out came a plastic-cased earphone instead of the metal one shown in the original model built by Edgar M. Wood, K2BO, of Morris Plains, N. J.

A pi from a mangled 2.5 mh RF choke was connected as a self-resonant coil in the illustrated circuit to receive the local broadcast station operating on the 1140 KC Crystal frequency. Another pi may be connected in series with the first for improved results if your local station operates below 1000 KC. For the "last ounce" in volume, a Miller type 70A slug-tuned antenna coil could be used in a large headphone case with the slug adjusted by a screwdriver through a hole in the case.

A "field" test was made by running around the neighborhood clipping the antenna lead onto fences, fire hydrants, unoccupied automobiles, and any other metal object. The antenna wire was even tossed over some tree branches with good results. (The same test would not yield until you want to convince your already skeptical neighbors that your favorite radio amateur has gone completely crazy.)

Practically all of the letters I have received for OPERATION CRYSTAL so far stress the fact that plenty of antenna is needed for maximum results when fishing for DX. The biggest idea along this line came from Herbert H. Eltz, WcJDT, of Juniata, Nebraska, where they apparently have plenty of wide open spaces for antennas like the one shown in the surrounding drawing. This "loop" antenna should make even the simplest circuit, shown below, a real DX getter.
Further from base-boards, cable S2 input might be used for the fifth position connecting the master station, otherwise the extra voltage drop through the heater current must be provided for the master station switch could be reserved for this application.

As a general-purpose audio amplifier, it is easy handy for checking the output of the tuner's crystal receiver. With it, one needed to make sure that it is not in the intended role. One position of the master station selector switch could be reserved for this application.

It is the off-duty of the master station to handle the occasion with an "occasional" phone man. It is also possible to design an electronic circuit that can fit with it, she is a master station for the kitchen.

Two types of construction, rack panel and table cabinet, are described to show how the master station could fit into most styles of ham shack arrangement.

CONTROL CIRCUITS

As shown in Fig. 1, the 3PDT relay and the station selector switch, Sb, form the heart of a control system that allows the master station amplifier to be activated from any remote station simply by pressing switch Sb to the "talk" position. This grounds one side of the heater winding and energizes the relay. A ground path provided by one relay contact then acts as a "holding" switch for the relay coil current. Heter and plate heater current flows through contacts. The amplifier is turned off by pressing Sb on the relay to the "off" position, and plate heater current must be isolated from the relay-cooling coil current. A metal ring around the external windings would affect the relay operation.

Two or more stations can be selected by Sb, the fifth position connecting all stations at once. One can even run a TV antenna relay and basement connections to this circuit. The operator can select any station at the remote terminal, regardless of the setting of Sb, when Sb is in the "listen" position. The operator can then turn on the volume control when he is ready to talk into the input of the amplifier whenever Sb is in the "listen" position.

If the master and one remote station are needed, Sb, and its associated wiring and terminal strips enclosed in the dotted lines on the diagram will not be necessary. Further simplification is possible by eliminating the control relay, if the amplifier runs continuously.

The TV antenna relay and basement connections to the remote terminal cabinet are used to connect the master and remote stations when the complete control system is desired. The rator cable is flat in cross-section and can easily be run between baseboards, pilot lights, and other vertical heat base-boards, under rugs or even fished through walls, if you are the ambitious type of person. Two or three-wire cable may be used with the simplified circuit.

A three-stage audio amplifier circuit is used, with the input signal from the speaker-microphones fed into one cathode of a 12AX7 twin-triode. This grounded-grid input circuit has less gain than conventional types, but eliminates the input matching transformer which would otherwise be necessary. Sufficient output to allow 100 plate volts is possible with the new 4CA3 family of pentode tubes in the power output stage. See G-E HAM NEWS, Volume 10, No. 4, for ratings and circuit diagrams. The coupling, cathode by-pass and shunt-coupling condensers are tailored to attenuate frequencies outside the normal speech range, reducing any stray hum pickup by the remote station cables. (See G-E HAM NEWS, Volume 10, No. 4, for details.)

Expensive instantaneous-heating tube types were deemed unnecessary because the amplifier was found to be capable of passing a signal about 8 seconds after the relay was energized.

A transformer-powered, half-wave, selenium-rectifier plate supply with an RC filter is used to minimize the shock hazard always possible with transformers type supplies. This also simplifies the tube heater and relay power problem. The power transformer, T1, runs all the time that the power switch, Sb, is in the volume control stage is off. After running several hours in the stand-by position, the transformer was hardly warm. The built-in power supply can be eliminated if a similar source is available in the shack.

Standard 3.3-ohm voice coil PE speakers could be used in place of the 4-ohm types designed especially for intercom service if each remote station does not require over 25 feet of connecting cable. Savings in original cost would be about .35 cents per speaker.

CONSTRUCTION

All new parts were used in the model stations, but either one could be built around a "defunct" table radio chassis and cabinet. The amplifier and power supply is built on a Bud CB-1620 miniature open-end aluminum chassis drilled according to Fig. 2. All parts are arranged so that the chassis can be mounted vertically in either a 6 x 9 or 6-5-inch, metal utility box, or on a 5+5-inch wide relay panel. Relay selector switch, T4, is mounted on the rear of the chassis. Relay selector switch, T4, is mounted on the rear of the cabinet. Connections made to the chassis at the places shown in the bottom view, Fig. 3, are shown in detail in Fig. 4. All parts are arranged so that the chassis can be mounted vertically in either a 6 x 9 or 6-5-inch, metal utility box, or on a 5+5-inch wide relay panel. Relay selector switch, T4, is mounted on the rear of the cabinet. Connections made to the chassis at the places shown in the bottom view, Fig. 3, are shown in detail in Fig. 4. Two or more stations can be selected by Sb, the fifth position connecting all stations at once. One can even run a TV antenna relay and basement connections to this circuit. The operator can select any station at the remote terminal, regardless of the setting of Sb, when Sb is in the "listen" position. The operator can then turn on the volume control when he is ready to talk into the input of the amplifier whenever Sb is in the "listen" position.

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Fig. 1 Schematic diagram

Fig. 3 Chassis bottom view
The above description also applies if the chassis will be housed in a small table radio cabinet, except that small blocks of 1/4-inch thick white plastic are glued to the inside of the panel and 1/2-inch long wood screws fasten the chassis to the blocks from the rear. A back cover of 1/4-inch thick tempered hard-board with the terminal strips mounted on it is then fastened.

**RELAY BACK MODULE**

The amplifier chassis bolts directly to the rear of the relay rack panel, with the control shafts located about 2 inches offcenter. The lower edge of the chassis comes flush with the same edge of the panel. The speaker, S1, power relay and pilot-light bracket are fastened to unused portions of the panel either side of the chassis.

The speaker is centered about 4-inches from one end of the panel and the relay positioned next to it. The pilot-light bracket and S1 are located in line with the control shafts between the chassis and relay. Talk-back switch, S2, mounts about 1 inch from the other end of the chassis. Ornamental-head screws are used wherever the heads show on the front of the panel.

A decorative pattern of holes drilled through the panel can be used as a speaker grille, or a small piece of "do-it-yourself" perforated aluminum sheet can be used as a grille, or a small piece of 1/4-inch thick perforated aluminum sheet can be used as a grille. The pilot-light button and S1 are located in line with the control shafts between the chassis and relay. Talk-back switch, S2, mounts about 1 inch from the other end of the chassis. Ornamental-head screws are used wherever the heads show on the front of the panel.

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**REMOTE STATIONS**

A Bud CS-1948-4 metal cabinet speaker cabinet houses each remote speaker and the call-in switch, S1. A Cinch-Jones No. 17-4 terminal strip for the external cable is mounted on the back of the box with a 6-32 x 1/4-inch machine screw. Note that the cabinet is screwed to the terminal strip.

Many other possible uses will probably occur that haven't been named in this description, although our few examples show that an intercom system is a necessity in many amateur radio installations.

**PARTS LIST**

- C0—1/2-mfd, 200-volt paper.
- C1—1/4-mfd, 150-volt microelectrolytic, Cinch-Jones No. 8400-5000, 600-volt ceramic.
- C2—10-mfd, 50-volt ceramic.
- C3—10-mfd, 50-volt microelectrolytic.
- C4—.02-mfd, 600-volt electrolytic.
- C5—220-ohm, 47-volt, 1/2-watt, 1/2-inch machine screw mounting.
- C6—200-ohm, 1-watt.
- C7—22-megohm, 1/4-watt.
- C8—130-ohm, 1-watt.
- C9—100-ohm, 2-watt.
- R1—180-ohm, 2-watt.
- R2—270-ohm, 6-watt AC relay puller & Broadfoot KR-114A 6-watt AC coil.
- R3—11,000-ohm, 1/4-watt.
- R6—410-ohm, 1/4-watt.
- R7—6-exact, 2-position, non-contacting, spring return lever switch.
- R8—0.2-megohm potentiometer with SPST switch.
- R9—0.22-megohm, 1/4-watt.
- R10—130-ohm, 1-watt.
- R11—390-ohm, 2-watt.
- R12—220-ohm, 1-watt.
- R13—22-megohm, 1/4-watt.
- R14—130-ohm, 1-watt.
- R15—180-ohm, 2-watt.
- R16—270-ohm, 6-watt.
- R17—410-ohm, 1/4-watt.
- R18—6-exact, 2-position, non-contacting, spring return lever switch.
- R19—SPDT, normally closed pushbutton switch.
- R20—120-ohm, 75 ma, half-watt selection resistor.
- R21—125-volt, 125 ma, 30 ma @ 0.3 volts @ 2 amp. secondary.
- C10—unwound unialloy transformer, connected to match speakers used.
- S1—4-terminal and leg chaotic switches.
- S2—optional switch when S1 is not needed.
- D2—diode plates (Mallory No. 375).
- (1) OFF and 10-position volume control plate (Mallory No. 2005).
- (2) Single gang lever-switch plates (Centurion F-1735).
Ben Hamilton, W6VFT, shown with XYL Flora Mae and son Richard at his La Mesa, Calif., home station (top), catches a moment’s relaxation from activities which consume more than 20 hours weekly in addition to his career as Industrial electronics instructor at San Diego Junior College and Vocational School. The Civil Defense central center (upper right) co-ordinates operation of nets for CD, Zone Warden, Red Cross disaster service, county road service, and AREC in 36 of 44 communities in 60 by 70-mile San Diego County. Four bands are used to insure adequate coverage of rugged mountains, coastal, and desert areas. Hamilton’s program of network planning, specifying, installing and maintaining equipment, personnel alerting system, and classwork training of operators (lower right) has given his 700,000 neighbors one of the best such services in the nation.

Ben is communications chairman for the Red Cross chapter, SCM for ARRL, communications officer in the 40th Division of the California National Guard, and is a veteran of World War II and the Korean War.
I sought our editor taking a peek at the acres of the first little closed-circuit teletext ever trolled at an I.R.E. Convention on March 25th here at the Power Tube Plant of General Electric in Schenectady, even though it took place after normal working hours. He also dug up the information that the show was the first inter-

A detail of closed-circuit teletext participant in by General Electric.

Manufacturing technique on a new line of metal-ceramic UHF Special Purpose and Transmitting tubes were shown to a private audience in the West Ballroom of the Waldorf-Astoria Hotel in New York City, 170 miles away. Particularly impressive was a demonstra-

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Look for the cover pictured at the right on the counter of your local G-E Tube Distributor, who should now have his copies of the new, completely revised, G-E Receiving Tube Essential Characteristics Handbook. Latest information on over 100 new miniature, sub-miniature, series-string, special purpose and television picture tubes, plus a separate section on germanium diodes, is packed into a compact 6 x 8½-inch size. A multi-ring binder allows the book to stay open and lie flat at any page. The type style used shows at a glance whether a tube is miniature, glass or metal. A bonus feature is the printing of the base diagram on the same page as the tube listing—no tedious thumbing back and forth for this information.

Function, maximum ratings, and typical operating conditions of over 1700 tube types are listed clearly. Outline drawings with dimensions allow you to determine whether or not that 5-tube receiver will fit into your favorite-brand coffee can. A section with circuit diagrams for most typical receiving tube applications brings up the rear.

Do not write to Lighthouse Larry for your copy! They are available only through authorized G-E Tube Distributors.