Most-Needed Circuits

Most-often-requested items are power supplies, converters, r. f. heaters and diathermy equipment

OUR technical staff receives repeated requests for diagrams of oscilloscopes, receivers, converters, electronic controls, and power supplies. A few of those most in demand are presented here.

Power supply for BC-654-A

The BC-654-A, a part of the SCR-284-A, is a receiver and transmitter tunable from 3700 to 5800 kc. The receiver and transmitter are designed to operate with power units PE-104-A and PE-103-A, respectively. These operate from 6- or 12-volt vehicular storage batteries and supply the receiver and transmitter with plate, bias, and filament voltages.

The PE-103-A is available on the surplus market and delivers 500 volts at 160 ma while drawing 21 amperes at 6 volts d.c. or 11 amperes at 12 volts d.c. These units are equipped with circuit breakers and are ideal for marine, mobile, and emergency transmitters or amplifiers.

The a.c.-operated supply shown in Fig. 1 is designed to replace the battery-operated units. The codes on the output terminals refer to connectors and their respective pin numbers on the BC-654-A. *Connections to pins 3 and 8 on connector 1K3 are reversed on sets with serial numbers below 9,500, and power-supply connections should be made accordingly.*

Full-wave dry rectifiers are used in the low-voltage sections of the supply. Rec 1 and Rec 2 are Mallory types 1B12C3 and 1BR4, respectively. Other makes may be used if manufacturers' specifications are followed closely.

The voltage across terminals 3 and 4 should not exceed 10.8 volts with no load. If the output from the rectifier with full load exceeds 6 volts, remove turns from Sec. 1. Maximum permissible a.c. voltage across terminals 1 and 2 is 3.6, and the output of the rectifier should not exceed 1.5 volts under load. Remove turns from Sec. 2 until voltage is normal.

These secondary windings supplying the dry rectifiers can be replaced with filament transformers altered to deliver the required output voltage. For example: Sec. 2 may be replaced with a 6.3-volt, 2-ampere center-tapped filament transformer. The halves of the secondary are connected in parallel.

Choke Ch 1 must carry at least 3 amperes. Its resistance should not be greater than 0.6 ohm. Ch 2 has a maximum resistance of 1.3 ohms and should carry 800 ma safely. Both chokes may be made by winding new coils on cores of old 200-ma chokes. Use No. 16 s.c.e. magnet wire on Ch 1 and No. 22 s.c.e. on Ch 2. Wind on as many turns as space permits and adjust the air gap for best filtering. The .013-henry, 4-ampere chokes currently available on the surplus market may be used for Ch 1 and Ch 2.

All-band converter

A number of surplus receivers tune to 455 kc. Some tune from about 600 kc down as low as 15 kc. Others cover portions of the long- and short-wave bands. The converter shown in Fig. 2 is designed to extend the range of the RAK-7, BC-453, RBL-3, and similar receivers through the broadcast band to 18 mc.

Oscillator and antenna coils are standard commercial 3-band assemblies designed to tune from about 540 kc to 18 mc when used with 365-μμf condensers and 455- or 456-kc i.f. amplifiers. Oscillator padders Cp are selected for use with the average assemblies tuning 540- to 1700-kc, 1700- to 5500-kc and 5.5- to 18-mc ranges. The capacitance of the padder increases with frequency range.

Other bands can be covered by selecting separate coils for the desired ranges. Follow manufacturer's specifications on oscillator padders. One set of broadcast coils and a set of 12- to 36-mc coils can be used to extend the range of the BC-348, BC-779, and similar receivers to include the broadcast and 10-meter bands.

The converter-output transformer T1 is a standard 455- or 456-kc i.f. transformer with the secondary coil and trimmer removed. The output of the converter is capacitance-coupled to the receiver antenna posts through a .006-μμf mica condenser.

Low-voltage D.C. supplies

Low-voltage d.c. supplies are handy for operating electroplating equipment, pipe and electronic organs, generator fields, testing automobile radios, and numerous other applications.

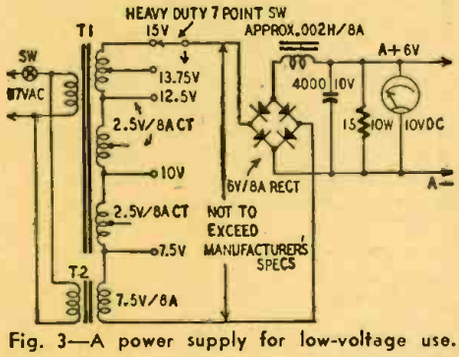

Fig. 3—A power supply for low-voltage use.

The circuit shown in Fig. 3 is designed to deliver 6 to 8 volts at up to 10 amperes, depending on the rectifier unit used. Operating conditions for dry rec-

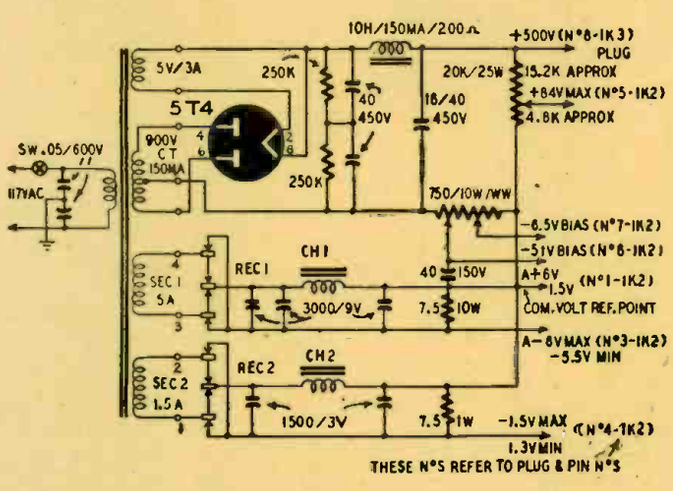

Fig. 1—Line-operated power pack for BC-654-A or similar receivers.

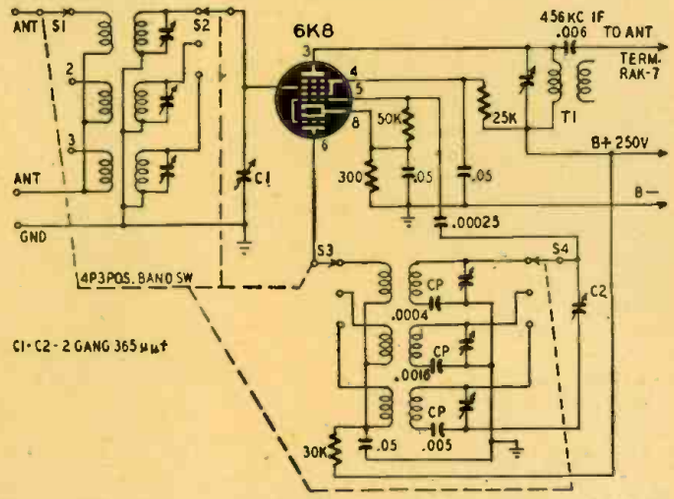

Fig. 2—This all-wave converter has an output frequency of 456 kc.

tifiers are comparatively critical, and manufacturer's specifications should be followed closely to avoid overloading or applying excessive input voltage when the unit is operating without a load.

Not too much data is available on the various types of commercial dry rectifiers although they are now in great demand for use in high-current supplies. The unit shown is a Mallory 1S16B7. Equivalents will work equally well. Just be sure that the rectifier selected is capable of delivering the required current. Do not permit the a.c. no-load voltage input to exceed manufacturer's specifications. Maximum no-load voltage for the 1S16B7 is 14.4 a.c. Do not use the 15-volt tap on the transformer unless line voltage is lower than normal.

T1 is a filament transformer with three 2.5-volt center-tapped, 8-ampere windings. T2 is a 7.5-volt, 8-ampere transformer. A heavy-duty 7-point switch is used to control the input voltage. This combination permits use of standard parts, though a specially wound transformer would be more convenient.

The filter choke is made by replacing the winding of a 200-ma choke with 100 turns of No. 14 enamel wire or No. 12 wire if space permits. Reassemble the choke and adjust the air gap for best operation.

Induction heater

Judging from the number of requests received, r.f. heating has become very popular with experimenters. A 1-kw dielectric heater was described in the February, 1948, issue of RADIO-CRAFT.

Fig. 4 is the circuit of a 1-kw induction heater. A unit of this type can be constructed from tubes and parts readily available on the surplus market. If a 304TH is unavailable at surplus prices, you may use a 304TL by changing the fixed portion of the grid leak to 4,000 ohms and adjusting the 1,500-ohm control for best operation.

Power input is adjusted with a Variac or similar control. A time-delay relay in the power line prevents application of plate voltage until rectifier and oscillator tubes have reached operating temperature.

L1 is 30 turns of 3/16-inch copper tubing wound with an inside diameter of 7 5/16 inches and spaced to occupy 12 inches. L2 is a 1-turn winding around L1. It is 13 inches long and has an inside diameter of 8¼ inches. It is formed in a cylindrical shape from 1/32-inch sheet copper. A ½-inch gap lengthwise through the coil prevents shorting. The coils are constructed as shown in Fig. 5. Heavy leads to L3 are connected to both sides of the gap. The size and shape of the work coil L3 depends on the application. Experiment with the size of tubing and number of turns to obtain best results.

Crystal-Controlled Diathermy

The FCC ruled recently that users of diathermy and r.f. heating equipment must either reduce radiation from their apparatus to a negligible degree by shielding or *operate within narrow specified bands.* In most cases, adequate shielding is impractical—making operation on the *diathermy bands* the only alternative.

The crystal-controlled diathermy circuit shown in Fig. 5 operates on 27.32 mc. It was designed and constructed by members of the Application Engineering Department of Eitel-McCullough, Inc., and described in the October, 1946, issue of *Electronics.*

The circuit uses a 6AG7 oscillator doubling in its plate circuit from a 6.83-mc crystal, followed by a 6L6 doubler driving the 4-250A final amplifier on 27.32-mc. Coils are wound as follows:

L1—12 turns No. 16 on 1-inch form, spaced to 1½ inches.

L2—10 turns No. 16 on 1-inch form, spaced to 1¼ inches.

L3—5 turns ¼-inch tubing on 2½-inch form, spaced to 4 inches.

L4—1 turn No. 8 around ground end of L3.

L5 and L6—6 turns No. 8 on 1-inch form, spaced to 2 inches.

L7 and L8—4 turns No. 8 on 1-inch form, spaced to 1½ inches.

L9—1 turn No. 8 mounted between output jacks.

Applicator pads for diathermy machines can be obtained from most electro-medical supply dealers.

Editor's note

(We have enough material on hand to run another article of this type covering receivers, transmitters and oscilloscopes if readers desire it.

There seems to be considerable interest in electronic controls such as photoelectric and capacity relays and timing, pulsing and counting circuits. Two or more of these circuits can be combined to produce some novel and interesting results. We may have just the circuit you are looking for. Let's hear from you.)

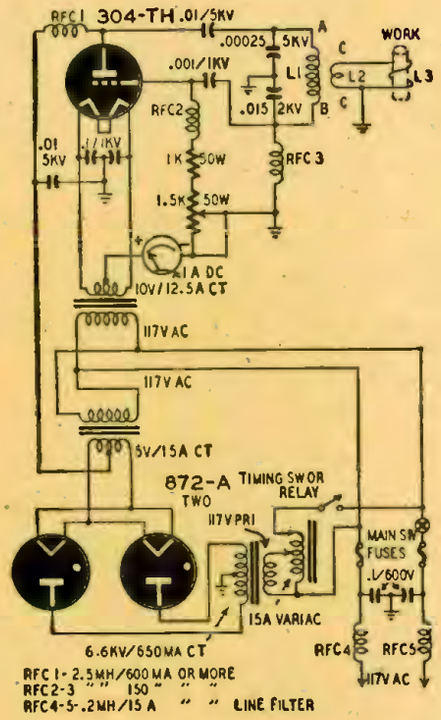

Fig. 4—A 1-kw r.f. induction heater.

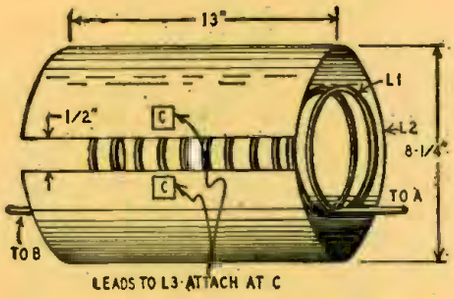

Fig. 5—The output coil is sheet copper.

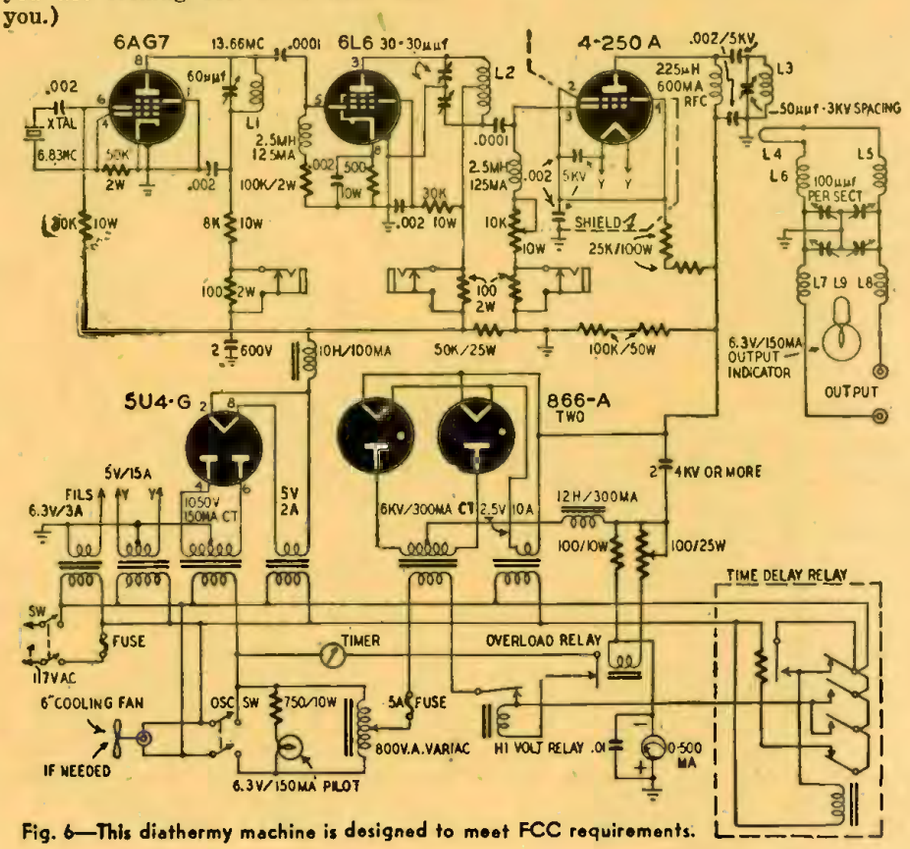

Fig. 6—This diathermy machine is designed to meet FCC requirements.