PRICE 15 CENTS

RCA

PRACTICAL TRANSISTOR CIRCUITS

FOR THE HOBBYIST AND EXPERIMENTER

2N307*

*2N307 — OPTIONAL RETAIL PRICE $1.50

1. 12-Watt Power Amplifier
2. Light Flasher
3. Regulated Power Supply
4. Regulated Power Supply with Amplified Correction Signal
5. Intercommunication System
6. Sinusoidal Power Oscillator
7. Electronic Photoflash Power Supply
8. Push-pull DC-to-DC Converter
9. DC-to-AC Inverter

RCA-2N307

POWER TRANSISTOR

Germanium p-n-p Alloy Type

The RCA-2N307 is an alloy-junction power transistor of the germanium p-n-p type designed for use by hobbyists and experimenters in a wide variety of circuits such as class A or class B audio-frequency amplifiers, class A driver amplifiers, low-frequency oscillators, converters, inverters, power supplies, light flashers and intercommunication systems.

GENERAL DATA

ELECTRICAL:

Mounting-Flange Temperature of 25°C

Maximum DC Collector Cutoff Current:
For dc collector-to-emitter voltage of −35 volts
and base-to-emitter circuit resistance of 30 ohms ..... −15 ma

Maximum DC Collector-To-Emitter Saturation Voltage:
For dc base current of −20 milliamperes and
dc collector current of −200 milliamperes ..... −1 volt

Minimum DC Current Gain (h_{FE}):
For dc collector-to-emitter voltage of −1.5 volts
and dc collector current of −200 milliamperes 20

Minimum Alpha-Cutoff Frequency ($F_{\alpha E}$):
For dc collector-to-emitter voltage of −1.5 volts
and dc collector current of −200 milliamperes ..... 3 Kc

Maximum Thermal Resistance ..... 5°C/watt

MECHANICAL:

Operating Position ..... Any
Maximum Overall Height ..... 0.980″
Maximum Seated Height ..... 0.500″
Case and Mounting Flange ..... Metal
Envelope Seals ..... Hermetic
Terminal Arrangement ..... See Dimensional Outline

AF AMPLIFIER SERVICE

— Class A and B

Maximum Ratings, Absolute-Maximum Values

PEAK COLLECTOR-TO-BASE VOLTAGE ..... −35 max. volts
PEAK COLLECTOR-TO-EMITTER VOLTAGE ..... −35 max. volts
PEAK COLLECTOR CURRENT ..... −1 max. ampere
PEAK EMITTER CURRENT ..... 1 max. ampere
TRANSISTOR DISSIPATION:
At a mounting-flange temperature of 25°C or below ..... 10 max. watts
MOUNTING-FLANGE TEMPERATURE
(During Operation) ..... 75 max. °C
STORAGE-TEMPERATURE RANGE ..... −65 to +75 °C

OPERATING CONSIDERATIONS:

In *class B push-pull amplifier service* it is necessary to insulate the mounting flange (collector) of each transistor from the chassis and from each other to prevent short circuiting the collector load. A suggested mounting arrangement which will insure good electrical contact and maximum transfer of heat is shown in Fig. 1.

This transistor utilizes The Loranger Mfg. Corp., Socket No. 2149 or equivalent. *Electrical connection* can also be made to the base and emitter pins by soldering directly to the pins. Soldering of connections to the pins may be made close to the pin seals provided care is taken to conduct excessive heat away from the pin seal, otherwise the heat of the soldering operation will crack the glass seals of the pins and damage the transistor.

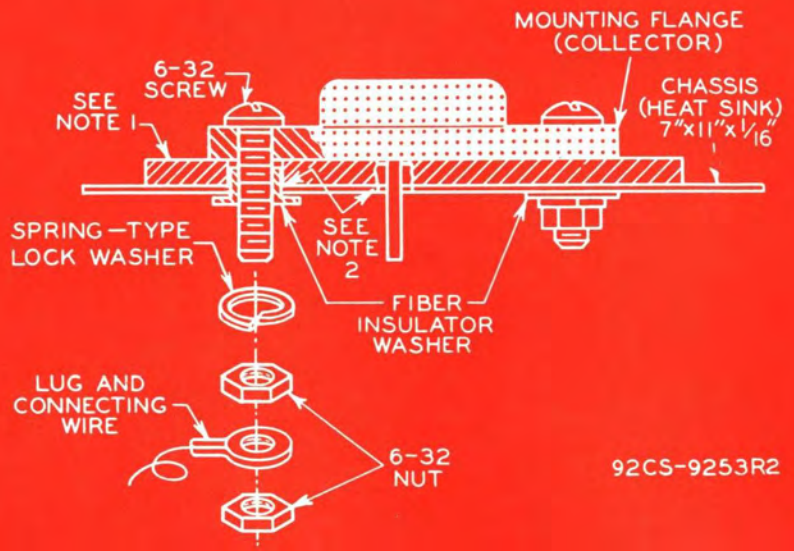
In applications where the chassis is connected to the positive terminal of the voltage supply, it will be necessary to use an anodized aluminum insulator having high thermal conductivity, or a 0.002″ mica insulator between the mounting flange and the chassis.

It is important that *the mounting flange* which serves as the collector *be securely fastened to a heat sink*. Depending on the application, the chassis (heat sink) may be connected either to the positive or negative terminal of the voltage supply.

It is to be noted that *the metal shell of this transistor operates at the collector voltage*. Consideration, therefore, should be given to the possibility of shock hazard if the metal shell of this transistor is to operate at a voltage appreciably above or below ground potential. In such cases, suitable precautionary measures should be taken. Under no circumstances should the mounting flange be soldered to the heat sink because the heat of the soldering operation will permanently damage the transistor.

The 2N307 should not be connected into or disconnected from circuits with the power on because high transient currents may cause permanent damage to the transistor.

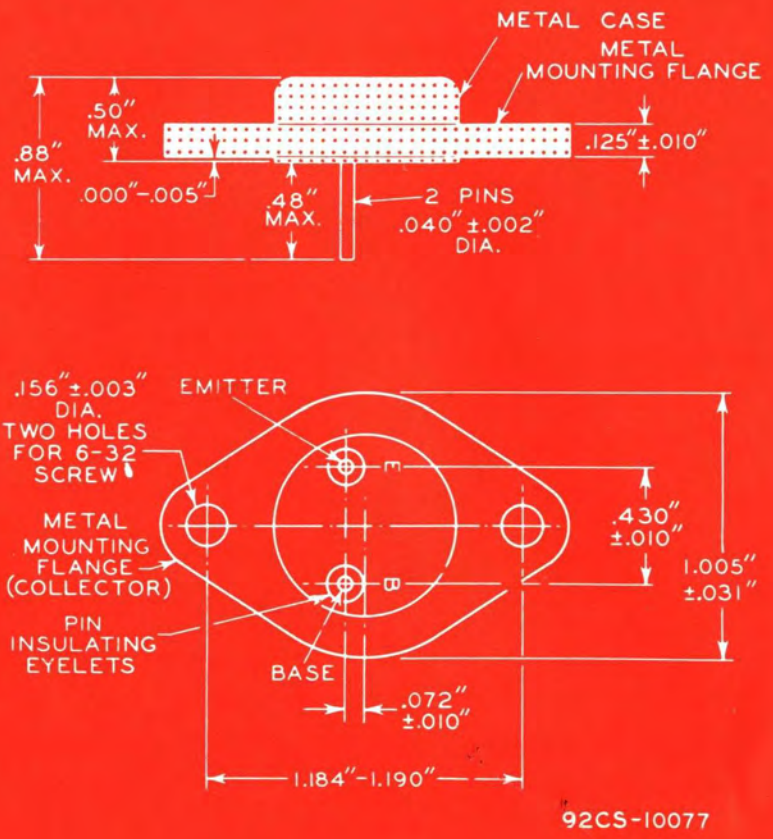
FIG. 1 — SUGGESTED MOUNTING ARRANGEMENT FOR TYPE 2N307.



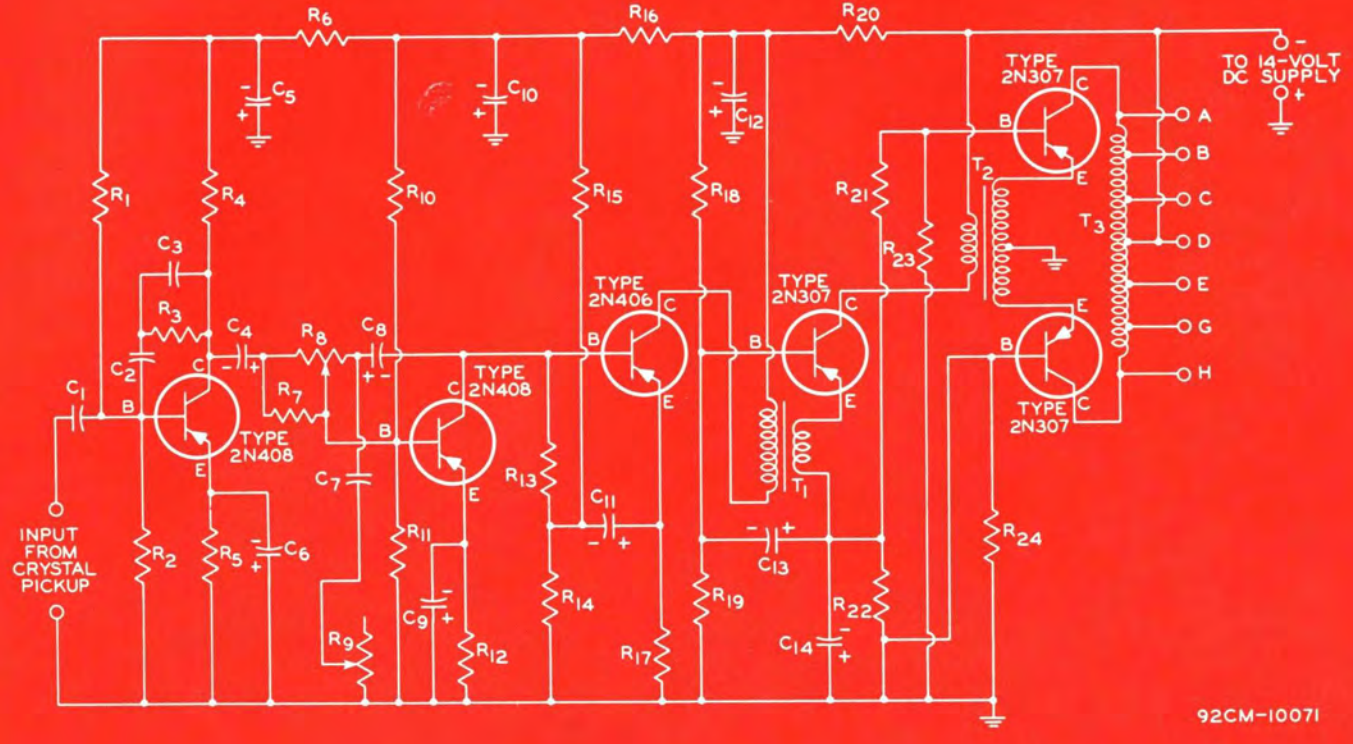
NOTE 1: 0.002" mica insulator or anodized aluminum insulator (drilled, or punched with burrs removed).

NOTE 2: Remove burrs from chassis holes.

FIG. 2 — DIMENSIONAL OUTLINE FOR TYPE 2N307.



12-WATT POWER AMPLIFIER



C1 = 0.01 μf, paper, 50 v
C2 = 0.06 μf, paper, 50 v
C3 = 0.01 μf, paper, 50 v
C4 = 5 μf, electrolytic, 6 v
C5 = 50 μf, electrolytic, 12 v
C6 = 200 μf, electrolytic, 3 v
C7 = 0.25 μf, paper, 50 v
C8 = 5 μf, electrolytic, 3 v
C9 = 200 μf, electrolytic, 3 v
C10 = 200 μf, electrolytic, 12 v
C11 = 100 μf, electrolytic, 3 v
C12 = 200 μf, electrolytic, 12 v
C13 = 200 μf, electrolytic, 3 v
C14 = 500 μf, electrolytic, 3 v
R1 = 56,000 ohms, 0.5 watt
R2 = 6,800 ohms, 0.5 watt
R3 = 12,000 ohms, 0.5 watt
R4 = 5,600 ohms, 0.5 watt
R5 = 1,200 ohms, 0.5 watt
R6 = 1,000 ohms, 0.5 watt
R7 = 12,000 ohms, 0.5 watt
R8 = Volume Control, potentiometer, 500,000 ohms, 0.5 watt
R9 = Tone Control, potentiometer, 25,000 ohms, 0.5 watt
R10 = 22,000 ohms, 0.5 watt
R11 = 3,300 ohms, 0.5 watt
R12 = 270 ohms, 0.5 watt
R13 = 680 ohms, 0.5 watt
R14 = 390 ohms, 0.5 watt
R15 = 270 ohms, 0.5 watt
R16 = 68 ohms, 0.5 watt
R17 = 270 ohms, 0.5 watt
R18 = 270 ohms, 0.5 watt
R19 = 100 ohms, 0.5 watt
R20 = 47 ohms, 0.5 watt
R21 = 15 ohms, 0.5 watt
R22 = 15 ohms, 0.5 watt
R23 = 2 ohms, 0.5 watt
R24 = 2 ohms, 0.5 watt

T1 = Interstage transformer, primary impedance of 1,300 ohms, secondary impedance of 1.5 ohms.

T2 = Driver transformer, primary impedance of 40 ohms (for a dc primary current of 250 ma), secondary impedance of 2.5 ohms (center-tapped). DC secondary resistance = 0.2 ohm.

T3 = Output transformer, primary impedance (tap A to tap H) of 32 ohms (center-tapped), secondary impedances: from tap B to tap G, 16 ohms; from tap C to tap G, 8 ohms; from tap D to tap G, 4 ohms. No connection is made to tap E.

TRANSFORMER WINDING DIRECTIONS:

T1 – A 6.3-volt, 1-ampere (secondary center-tapped) filament transformer may be used as the interstage transformer although only one-half of the secondary will be utilized. After the circuit has been constructed, reverse the primary lead connections. The reversed connections should be retained if more gain and better low-frequency response are provided. If reversing the connections decreases overall performance, return the primary leads to their original positions.

T2 – Using the laminations and form of a 6.3-volt, 3-ampere filament transformer, the driver transformer should be wound as follows: Number each wire to be wound. Label one end of each wire with the letter "S" (for start) and the number assigned to the wire. Label the other end of each wire with the letter "F" (for finish) and the number assigned to the wire. For example, the first wire will have its ends marked "F1" and "S1", the ends of the second wire will be designated "F2" and "S2". Construct the windings according to the directions below.

Winding Number	Wire Type	Number of Turns
1	#22, Formex, Insulated	30
2	#22, Formex, Insulated	30
3	#26, Formex, Insulated	240

Clean the insulation from the wire ends. Connect S1 to the emitter lead of one of the type 2N307's. Connect F1 and S2 to ground. Connect F2 to the emitter lead of the other type 2N307. S3 and F3 are the primary leads.

T3 – Using the laminations and form of a 6.3-volt, 3-ampere filament transformer, the output transformer should be wound as follows: Number and label each wire according to the directions given for T2. Wind as instructed below.

Winding Number	Wire Type	Number of Turns
1	#26, Formex, Insulated	48
2	#26, Formex, Insulated	48
3	#22, Formex, Insulated	75
4	#22, Formex, Insulated	75
5	#22, Formex, Insulated	45
6	#22, Formex, Insulated	45

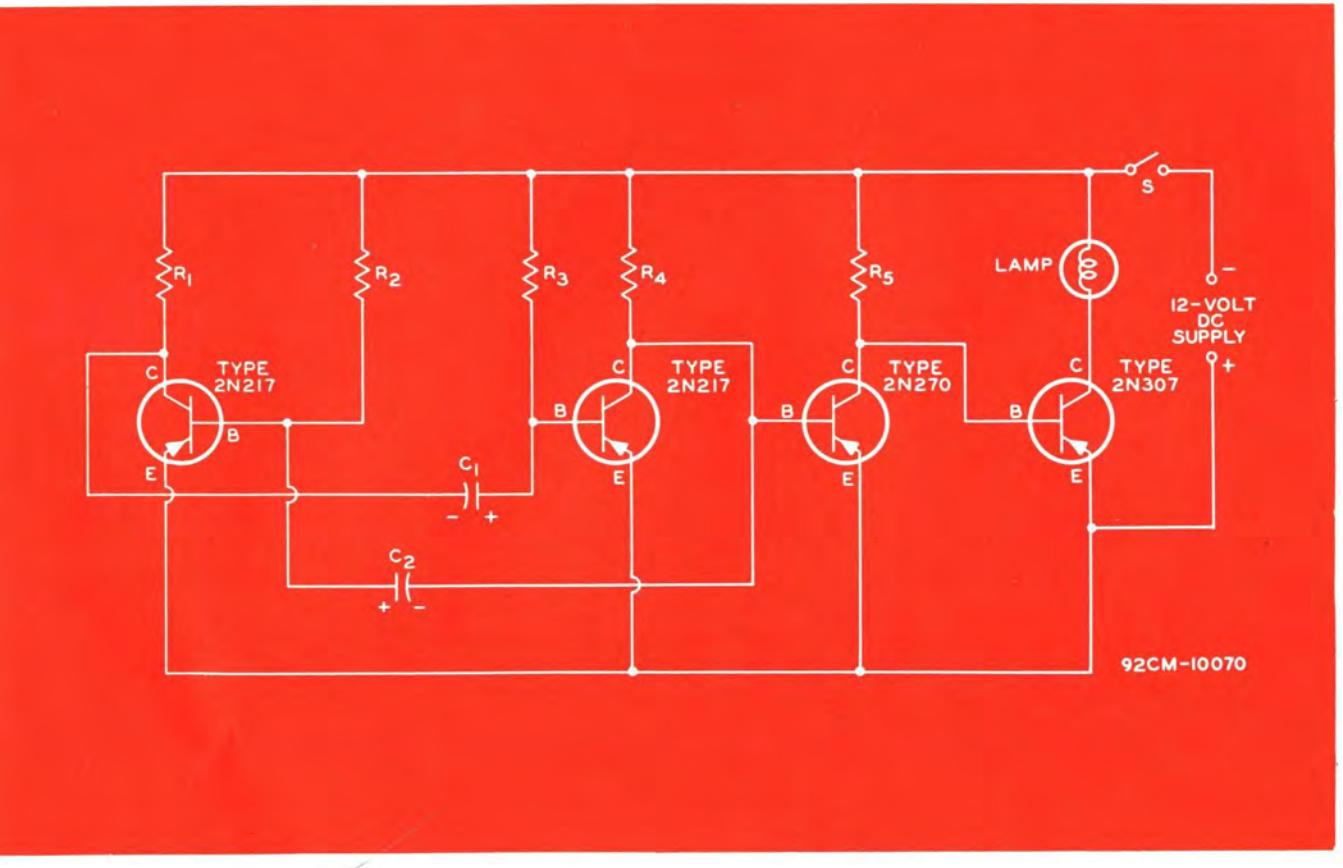
Do not provide insulation between windings. Clean the insulation from the ends of the wires. Connect Point A to S1, B to F1 and S3, C to F3 and S5, D to F5 and S6, E to F6 and S4, G to F4 and S2, and H to F2. Connect F6 and S4 at E. Point E is not used as a tap and should be marked "NC" (no connection).

NOTE ONE: 120 feet of #22 wire and 120 feet of #26 wire are required for Transformers T1, T2, T3.

NOTE TWO: An audio taper potentiometer should be used for the volume control. A reverse audio taper potentiometer is preferred for use as the tone control but a linear taper potentiometer may also be used.

NOTE THREE: If shielded cable is used for the speaker leads, it is recommended that cable containing two conductors and a shield be employed. Shielded cable containing a single conductor may also be used, provided the shield is not grounded.

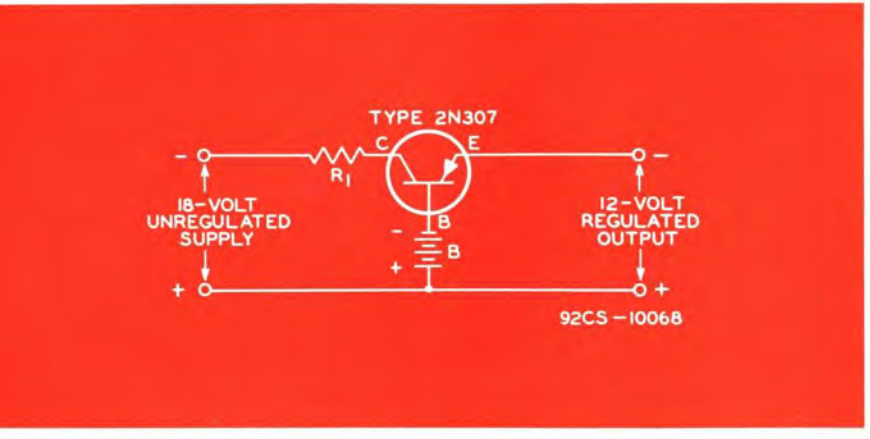
TOWER LIGHT FLASHER



C1 = 25 μf, electrolytic, 12 v.
C2 = 100 μf, electrolytic, 12 v.
LAMP = Bulb, 12 volts, 1 ampere
R1 = 2,000 ohms, 0.5 watt
R2 = 100,000 ohms, 0.5 watt
R3 = 100,000 ohms, 0.5 watt
R4 = 2,000 ohms, 0.5 watt
R5 = 120 ohms, 0.5 watt
S = Switch

NOTE: Flashes per minute = 60 (To change rate vary C1 and C2). This circuit may be used with bulbs and other resistive loads handling currents up to one ampere, but should not be used with inductive loads.

REGULATED POWER SUPPLY



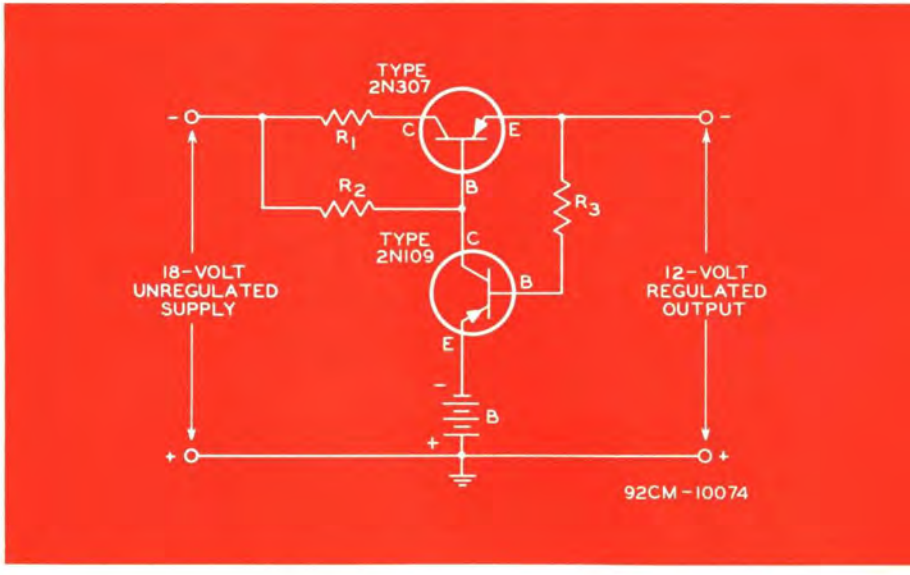
B = 12 volts
R1 = Resistor, see Note One

NOTE ONE: Sum of R1 and internal resistance of unregulated supply should be 12 ohms.

NOTE TWO: Output current = 0.5 ampere.

NOTE THREE: To obtain a 6-volt regulated output, change the battery to 6 volts and the unregulated supply to 12 volts.

REGULATED POWER SUPPLY WITH AMPLIFIED CORRECTION SIGNAL



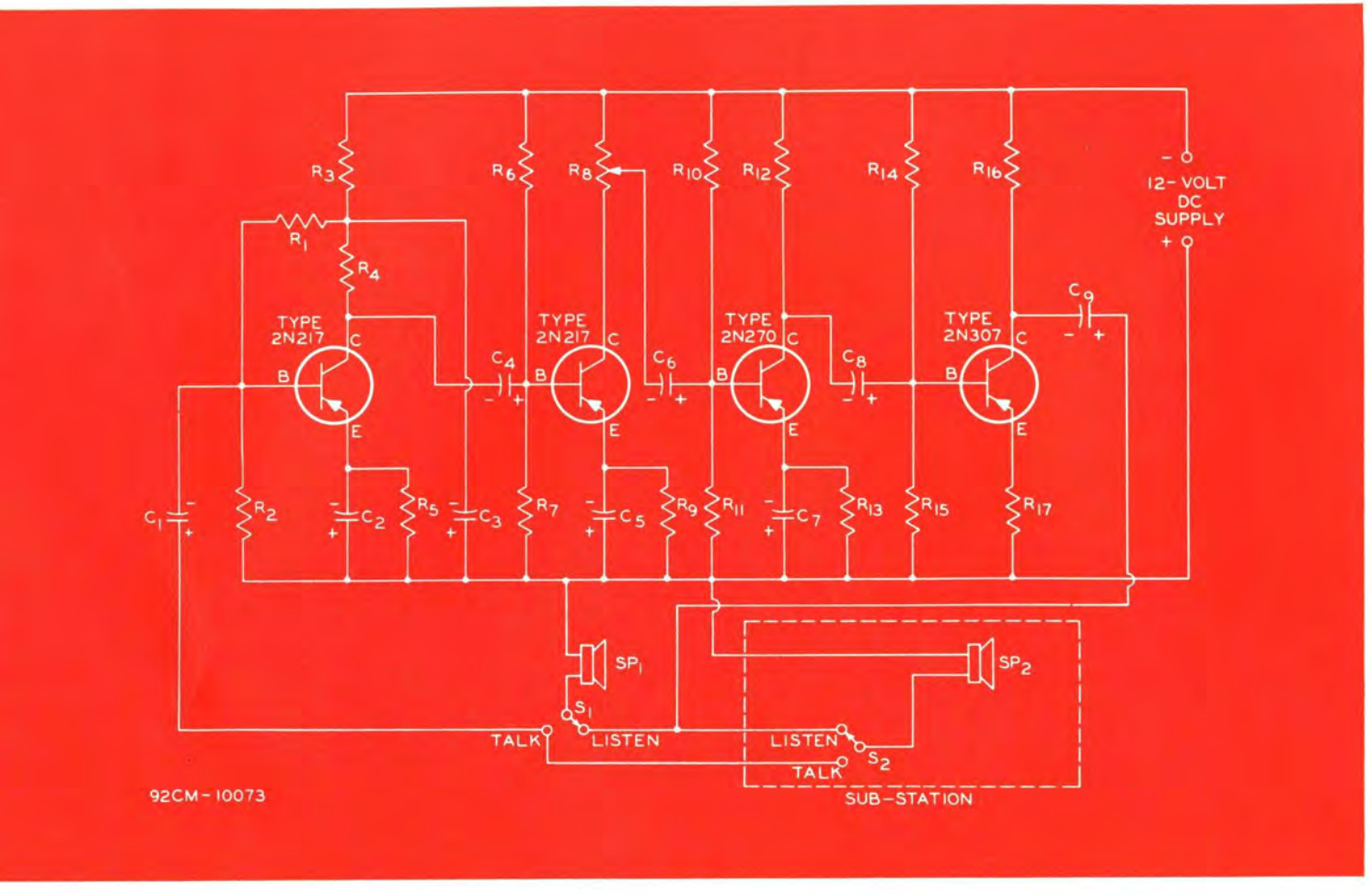
B = 12-volt battery (or 12-volt zener diode)
R1 = Resistor, see Note One
R2 = 250 ohms, 1 watt
R3 = 1,000 ohms, 0.5 watt

NOTE ONE: Sum of R1 and internal resistance of unregulated supply should be 12 ohms.

NOTE TWO: Output current = 0.5 ampere.

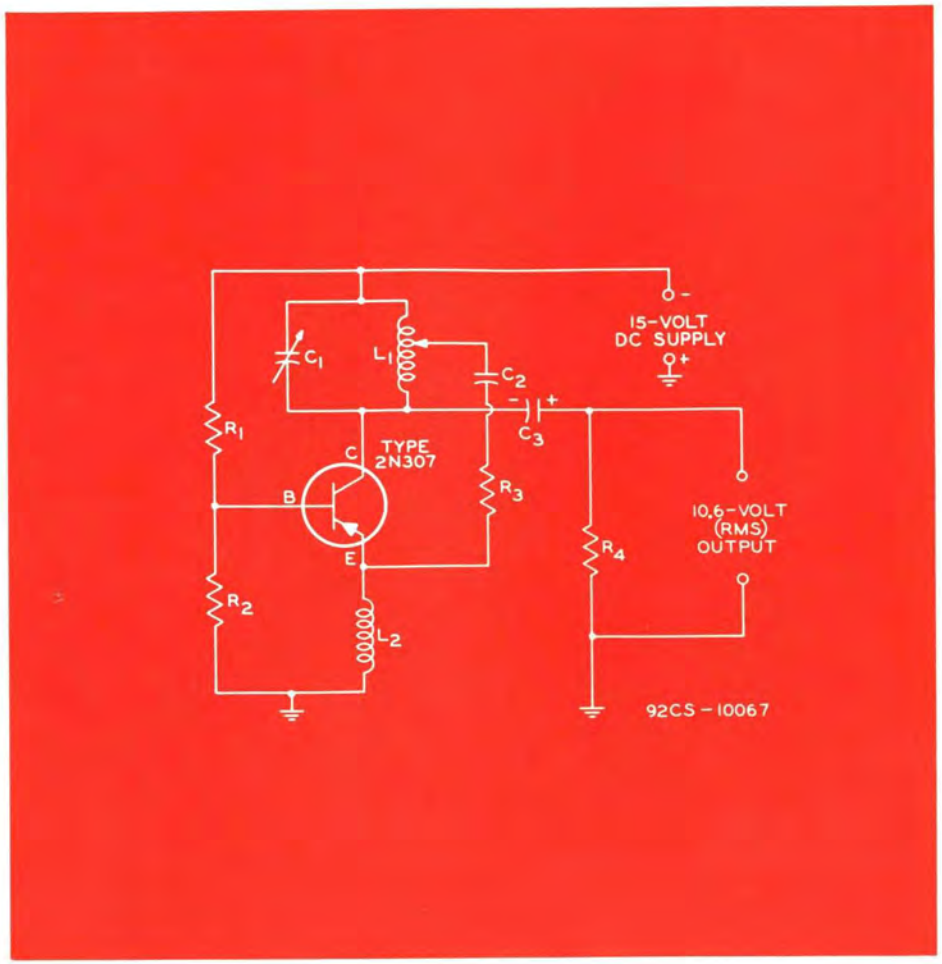
NOTE THREE: To obtain a 6-volt regulated output, change the battery to 6 volts and the unregulated supply to 12 volts.

INTERCOMMUNICATION SYSTEM



C1 = 25μf, electrolytic, 6 v
C2 = 100μf, electrolytic, 6 v
C3 = 25 μf, electrolytic, 12 v
C4 = 25μf, electrolytic, 12 v
C5 = 50 μf, electrolytic, 3 v
C6 = 25 μf, electrolytic, 12 v
C7 = 50 μf, electrolytic, 3 v
C8 = 100 μf, electrolytic, 12 v
C9 = 25 μf, electrolytic, 12 v
R1 = 20,000 ohms, 0.5 watt
R2 = 2,000 ohms, 0.5 watt
R3 = 5,600 ohms, 0.5 watt
R4 = 5,600 ohms, 0.5 watt
R5 = 560 ohms, 0.5 watt
R6 = 22,000 ohms, 0.5 watt
R7 = 5,100 ohms, 0.5 watt
R8 = Volume-control potentiometer, 1,000 ohms, 0.5 watt
R9 = 330 ohms, 0.5 watt
R10 = 750 ohms, 0.5 watt
R11 = 330 ohms, 0.5 watt
R12 = 75 ohms, 0.5 watt
R13 = 39 ohms, 0.5 watt
R14 = 200 ohms, 1 watt
R15 = 47 ohms, 1 watt
R16 = 5 ohms, 10 watt
R17 = 1 ohm, 2 watt
S1 = Switch, master-station
S2 = Switch, sub-station
SP1 = Speaker, master-station, 12 ohms, 1 watt
SP2 = Speaker, sub-station, 12 ohms, 1 watt

SINUSOIDAL POWER OSCILLATOR



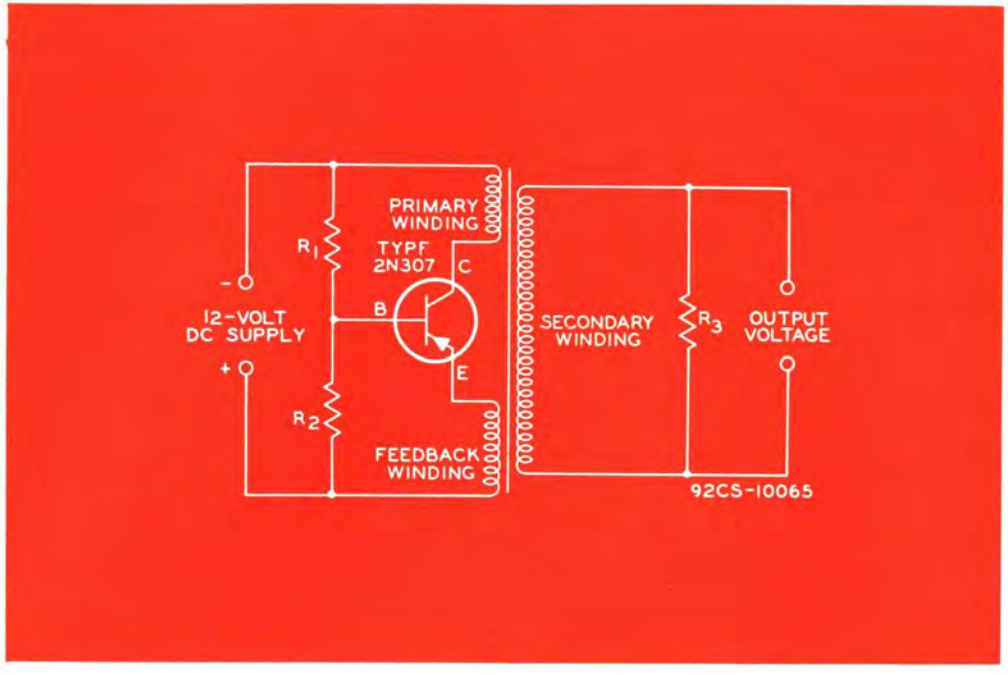
C1 = Variable capacitor, 0.1 μf, 200 v
C2 = 0.2 μf, paper, 200 v
C3 = 1 μf, electrolytic, 50 v
L1 = Tank coil, 100 μh
L2 = RF choke, 2.5 mh., dc resistance = 10 ohms
R1 = 620 ohms, 0.5 watt
R2 = 18 ohms, 0.5 watt
R3 = 10 ohms, 0.5 watt
R4 = Load resistor, 700 ohms (minimum), 0.5 watt

NOTE ONE: Vary C1 for frequency range of 50 Kc to 150 Kc.

NOTE TWO: Power Input = 680 mw, Power Output = 160 mw.

NOTE THREE: For highest efficiency, place L1 tap about 1/10 from top of coil.

DC-TO-AC INVERTER



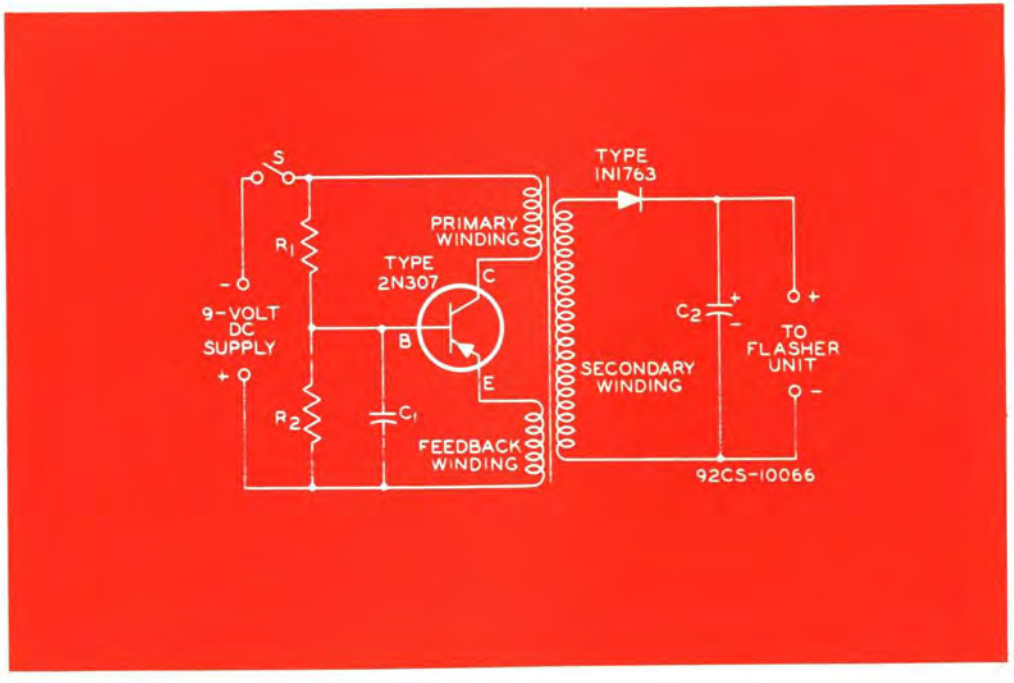
R1 = 10,000 ohms, 0.5 watt
R2 = 10—50 ohms, 0.5 watt
R3 = Load resistor, 1,600 ohms (minimum) 8 watts

NOTE ONE: R2 should be adjusted for optimum performance.

NOTE TWO: This circuit will provide a 110-volt (rms), 60-cps, 8-watt output with an efficiency of 70%.

NOTE THREE: For transformer, United Transformer Corporation type H-97 or equivalent may be used. Secondary-to-primary turns ratio = 20:1. For primary winding use primary end tap and primary center tap. For feedback winding use feedback center tap and feedback end tap (only half of available primary and feedback windings are utilized).

ELECTRONIC PHOTOFLASH POWER SUPPLY



C1 = 0.1 μf, paper, 100 v
C2 = 1,500 μf, electrolytic, 300 v
R1 = 200—500 ohms, 0.5 watt
R2 = 20—100 ohms, 0.5 watt
S = Switch

NOTE ONE: R1 and R2 should be adjusted for optimum performance.

NOTE TWO: For transformer, United Transformer Corporation type H-98 or equivalent may be used. Secondary-to-primary turns ratio = 15:1. For primary winding use primary end tap and primary center tap. For feedback winding use feedback center tap and feedback end tap (only half of available primary and feedback windings are utilized).

RADIO CORPORATION OF AMERICA

SEMICONDUCTOR PRODUCTS

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