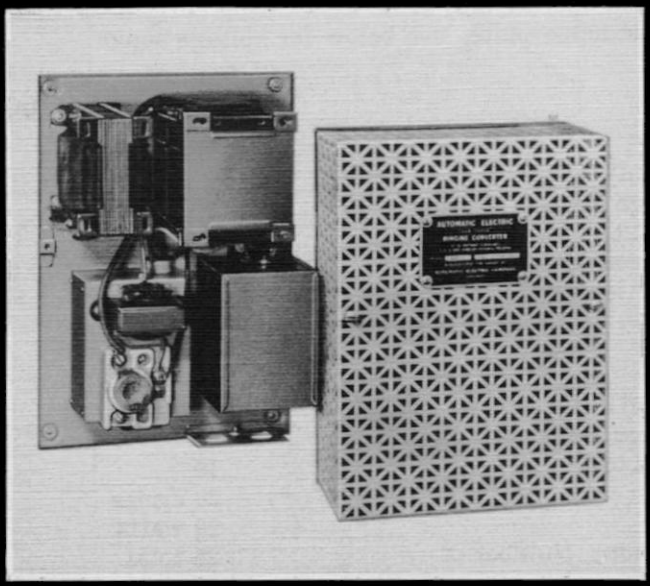
"Sub-Cycle" Ringing Converter

BULLETIN 444



AUTOMATIC ELECTRIC

MAKERS OF TELEPHONE, SIGNALING AND COMMUNICATION APPARATUS
ELECTRICAL ENGINEERS, DESIGNERS AND CONSULTANTS

1033 W. Van Buren St., Chicago, U. S. A.

"SUB-CYCLE"
RINGING CONVERTER

1. GENERAL

The Sub-Cycle Ringing Converter is a static frequency converter which produces telephone ringing current at one-third the frequency of the commercial alternating current supply. It functions without moving parts, but it has one relay required for starting. It inherently produces no high frequencies that would interfere with radio reception.

2. CHARACTERISTICS

The converter will operate only from alternating current of the frequency shown on the Sub-Cycle name plate. See below for voltage range.

Input	**Alternating Current**	
	D-35237-B	D-35237-A
Voltage (nominal)	115 volts	115 volts
Allowable Voltage Range	105-125 volts	105-125 volts
Frequency (Input)	60 cycles	50 cycles
Power Consumption (no load)	26 watts	29 watts
Power Consumption (full load)	50 watts	50 watts
Output		
Voltage (full load)	85 volts	85 volts
Voltage Variation: No Load to Full Load	10%	10%
Frequency	20 cycles	16-2/3 cycles
Power	20 watts	20 watts
Ringers (1400-ohm), Number of	25 total	25 total

A low input voltage will result in lower output and may cause relay chatter. An extremely high input-voltage surge may cause one of the 3-ampere fuses to blow even though there is no excessive ringing current drain. An auxiliary input transformer, having good regulation, must be used in order to operate the converter from a commercial power source of any voltage other than the rated range. One type (transformer D-283104) is supplied for separate mounting with D-35237-C (210-240v, 50 cycle) and D-35237-D (210-240v, 60 cycles.)

The relay may chatter several times when the power is first applied. This is normal but the chattering should not continue.

If ringers of lower impedance than the standard 1400-ohm type are employed, fewer than 25 can be rung. If higher impedance ringers are employed, correspondingly more ringers can be rung. The output circuit is insulated from the power supply and, therefore, may be used for grounded ringing.

3. TONE COIL

The "TONE" coil superimposes, on the ringing current, an easily audible frequency, which serves as "ring-back-tone." The coil is equipped with three taps: "HIGH," "MED" (medium), and "LOW." The medium tap is connected in the factory, and if a louder or softer tone is desired, shift the wire to the "HIGH" or "LOW" tap as the case may be. When the ring-back tone is not required, short circuit the "TONE" coil.

4. INSTALLATION

a. To remove cover, loosen the two screws on the front.

b. Fasten the converter securely to the wall or suitable support with four No. 10 screws. Sub-Cycle units should be mounted vertically with the conduit openings at the bottom. In this position, proper ventilation is assured.

c. The cabinet is grounded through the conduit, the holes being 27/32″ in diameter for ½″ conduit.

d. Connect ringing-current-output binding posts, "OV" and "85V," to the switchboard positions.

e. Connect one 25-watt (110-120 volt) lamp in SERIES with the ringing supply to each switchboard position.

f. Connect a-c power-input wiring to screw terminals on the fuse block. **Connect the grounded side of the power line to the unfused terminal.**

g. See that a **3-ampere fuse** is in place.

h. Replace cover and fasten screws.

i. Switch on the power.

CAUTION

DO NOT SWITCH ON POWER UNTIL ALL CONNECTIONS HAVE BEEN MADE AND THE COVER HAS BEEN REPLACED.

5. OPERATION

The converter consists essentially of two circuits directly coupled together. The resonant circuit, which is tuned to resonate at one-third of the input frequency, consists of a condenser, the primary winding of the output transformer, a relay winding and a tone coil. The second circuit is the commercial current loop. A choke coil acts as a controlling device to allow periodic charging of the condenser, thus supplying the necessary energy to keep the resonant circuit oscillating at its natural frequency.

The relay, which is in series with the resonant circuit, has a single pair of break contacts which short circuits the choke coil before the converter is started. When the converter is connected to the source of commercial power, a rush of current charges the condenser and energizes the relay. The operating time of the relay is approximately equal to the charging time of the condenser. The relay, upon operating, removes the short circuit from the choke coil, thus permitting normal operation of the resonant ringing circuit. The relay, when once energized, will remain energized so long as the commercial current is connected and the converter is not overloaded.

6. RELAY

The relay operates when the converter is put into operation, the relay contacts being held open while the converter is functioning. Should the power supply fail, the relay will release but will operate again to restart the converter when the power is restored.

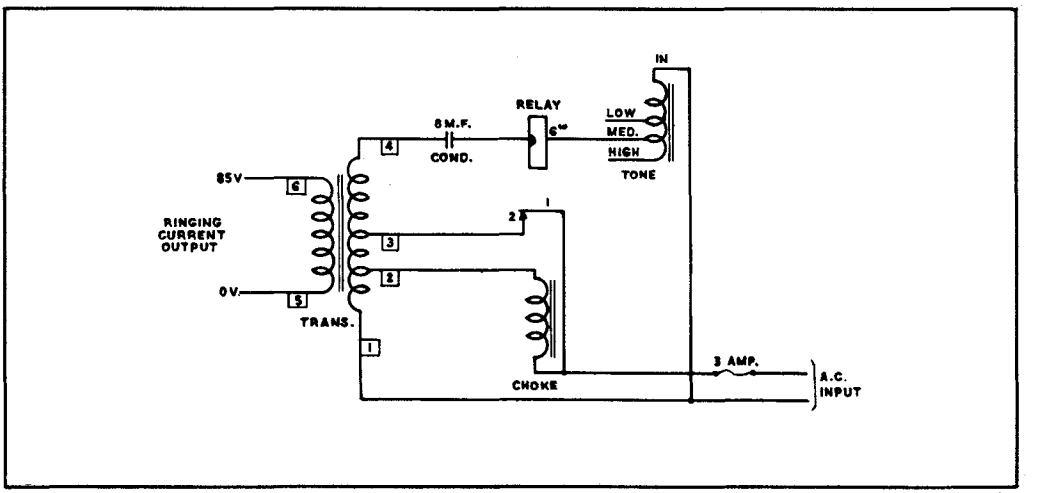


FIG. 1. Schematic Diagram for 60-Cycle A-C Model

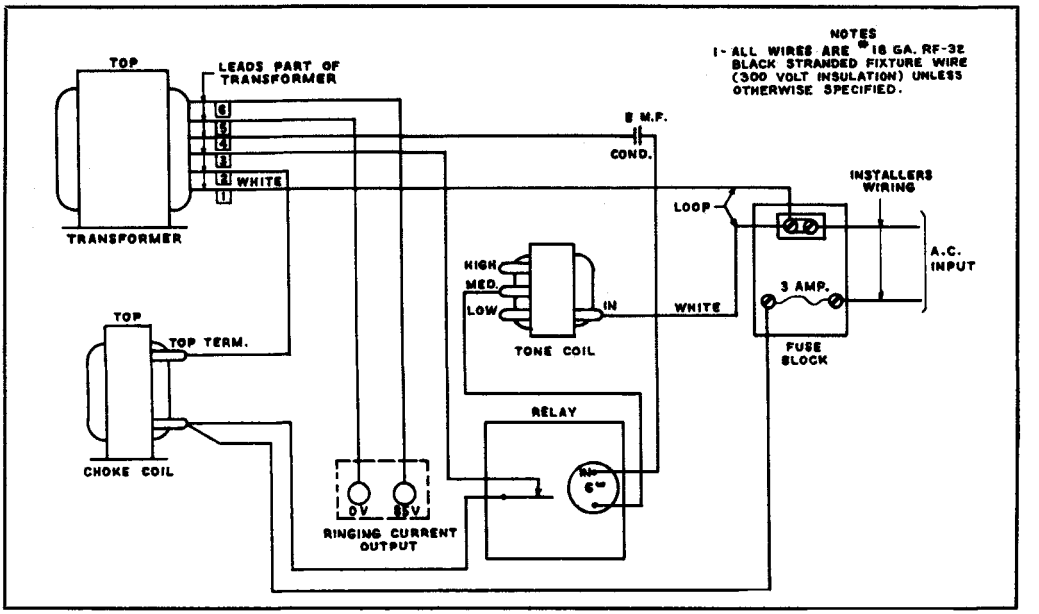


FIG. 2 Wiring Diagram for 60-Cycle A-C Model

The operating time of the relay is a factor which controls the starting of the converter. In case the converter fails to start, check the relay as follows:

(1) See that the armature is not stuck to the coil core and does not bind. If necessary, clean these surfaces by drawing a strip of paper between them while the armature is held operated by hand pressure.

(2) See that the relay contacts are clean and make positive contact when the armature is in the non-operated position.

Relay chatter during operation of the converter usually indicates:

(1) A momentary overload
(2) Incorrect power-supply voltage
(3) Incorrect power-supply frequency
(4) Faulty relay adjustment

If items (1), (2), and (3) are found to be correct, check the relay adjustment as follows:

(a) The armature should operate smoothly.

(b) Check relay gauging with gauges which vary in steps of .001″. Insert the proper gauge between the armature and the core. With a .020″ gauge the contacts should just break. Tolerances above and below this value are ± .003″ on

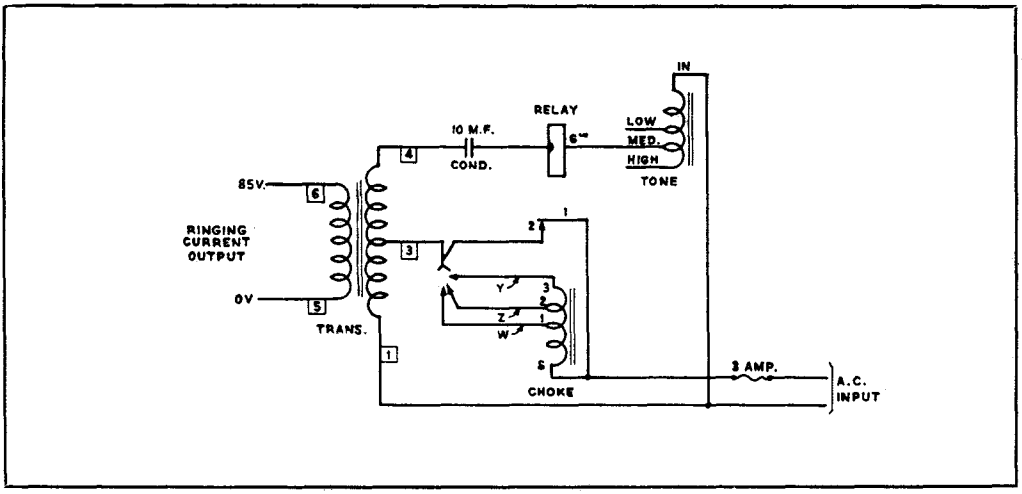


FIG. 3 Schematic Diagram for 50-Cycle A-C Model

inspection or ± .002″ on adjustment. Use the larger tolerance for inspection and if the relay will not pass this inspection, readjust to the smaller "adjustment" tolerance. A pair of duck-bill pliers or a relay-spring bender may be used near the clamping plate to bend the stationary spring as required.

(c) Saturate the core by connecting to 46 volts dc in series with a protective resistance of approximately 50 ohms for a minimum of one second. The saturating current must be in the same direction as other current flow requirements.

(d) Margin; that is, check the electrical (current flow) requirements according to Figure 5. If a current-flow test set is not available use the resistance values given under the heading "RESISTANCE." For testing, use the values under "TEST" column. In the row marked "O" (operate), find the value "260." Put 260 ohms resistance in series with a 46-volt battery, and the relay should operate. In the row marked "NO," non-operate, locate "360" which is a number of ohms with which the relay should not operate in series.

(e) If the relay fails to operate with the "O" (operate) resistance and if the coil is good, bend the armature (movable) spring slightly towards the relay heel piece (base) by placing the duck bill pliers near the clamping plate. This decreases the tension against which the armature must operate.

(f) If the relay operated on the "NO" (non-operate) value of resistance, bend the armature spring slightly toward the "break" (stationary) spring to increase the tension against which the armature must operate. Recheck gauging.

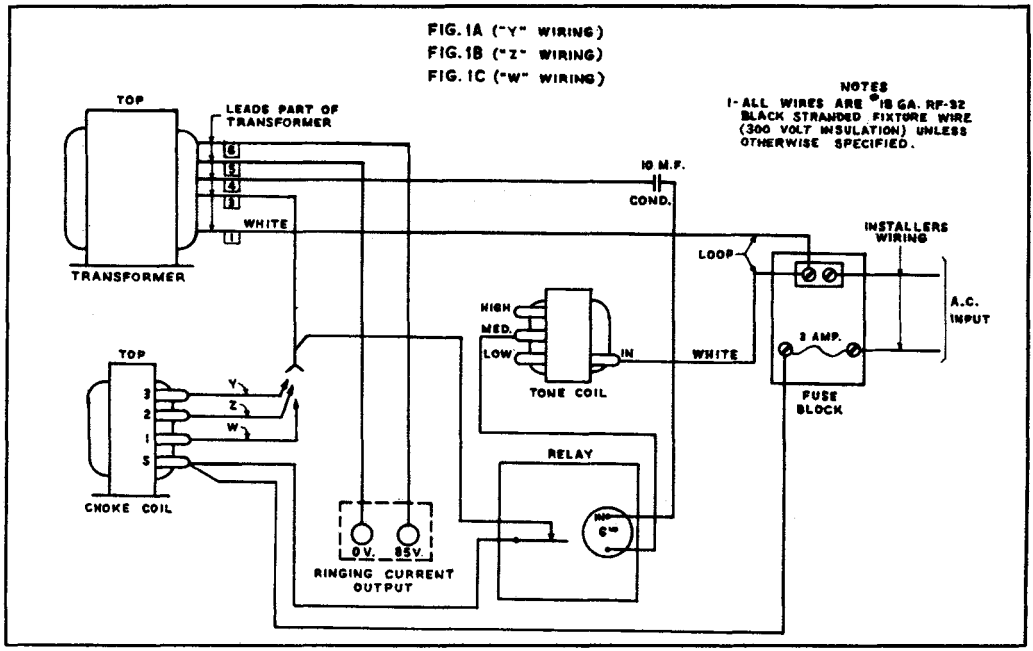
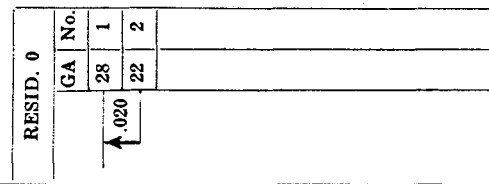


FIG. 4 Wiring Diagram for 50-Cycle A-C Model

CAUTION: In Figures 3 and 4, "Y," "Z," and "W" wiring are factory adjustments and should not be touched in the field.

ADJUSTMENT FOR RELAY D-55583-A



COIL D-283481	TEST FOR	RESISTANCE		CURRENT	
6ω		READJ.	TEST	READJ.	TEST
720 TS #26	0	290	260	.155	.173
	No	330	360	.137	.126

NOTES: TEST WITH 46 VOLTS D.C.
O... Operate
No... Non-operate

FIG. 5 Adjustment Data for Relay D-55583-A

7. REPLACEMENT PARTS

In ordering replacement parts, specify the "PIECE NO." of the converter, voltage and frequency of the commercial supply, the name of the part, and the piece number of the part if possible.

NOTE: In case of difficulty, notify the supplier, stating the nature of the trouble and the "PIECE NO." of the converter.

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