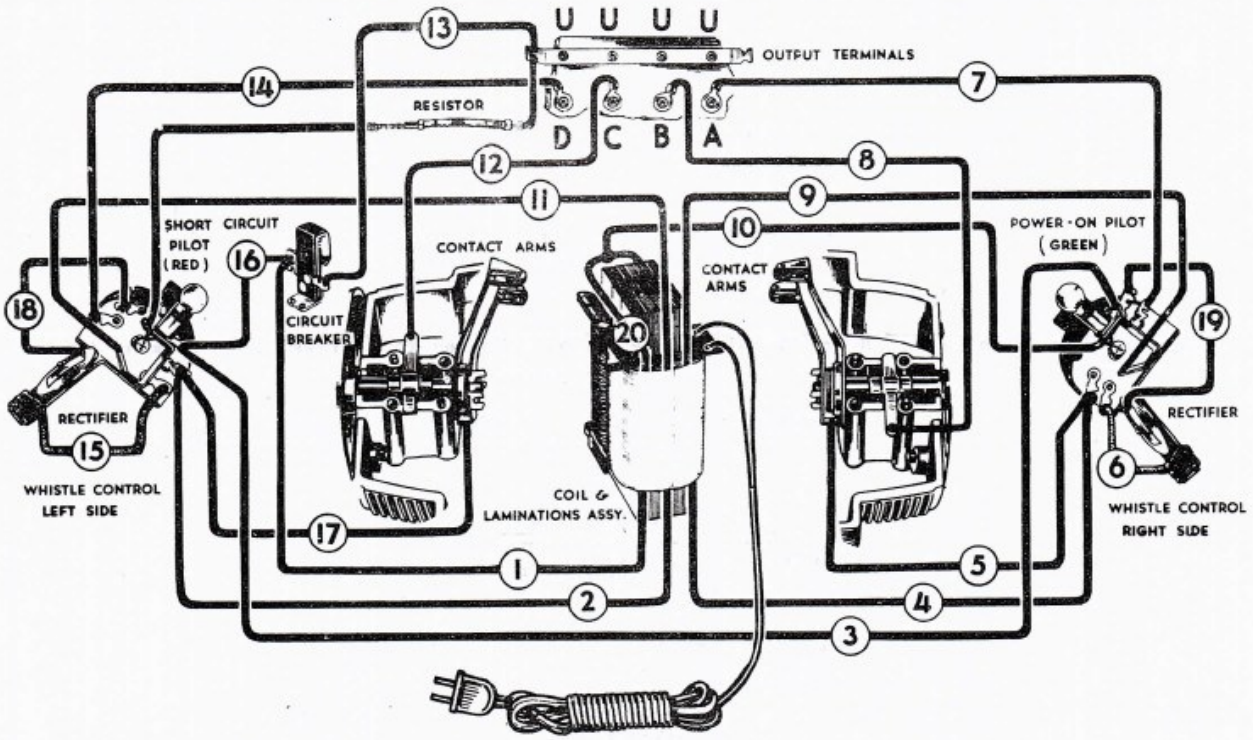
LIONEL SERVICE MANUAL

PICTORIAL WIRING DIAGRAM OF TRANSFORMERS "VW" and "ZW"

The 'ZW' Multi-Control transformer differs from the illustrated 'VW' in having a heavier Coil and Lamination Assembly and a different Circuit Breaker. The wiring and arrangement of parts are identical. In the 1948 'VW' transformers Lead No. 13 is a 12' length of special resistance wire which is wound around the circuit breaker and which acts as a heater to decrease the breaking time of the circuit breaker in case of short circuits. The numbers of the leads correspond with the Schematic Wiring Diagram on previous page.

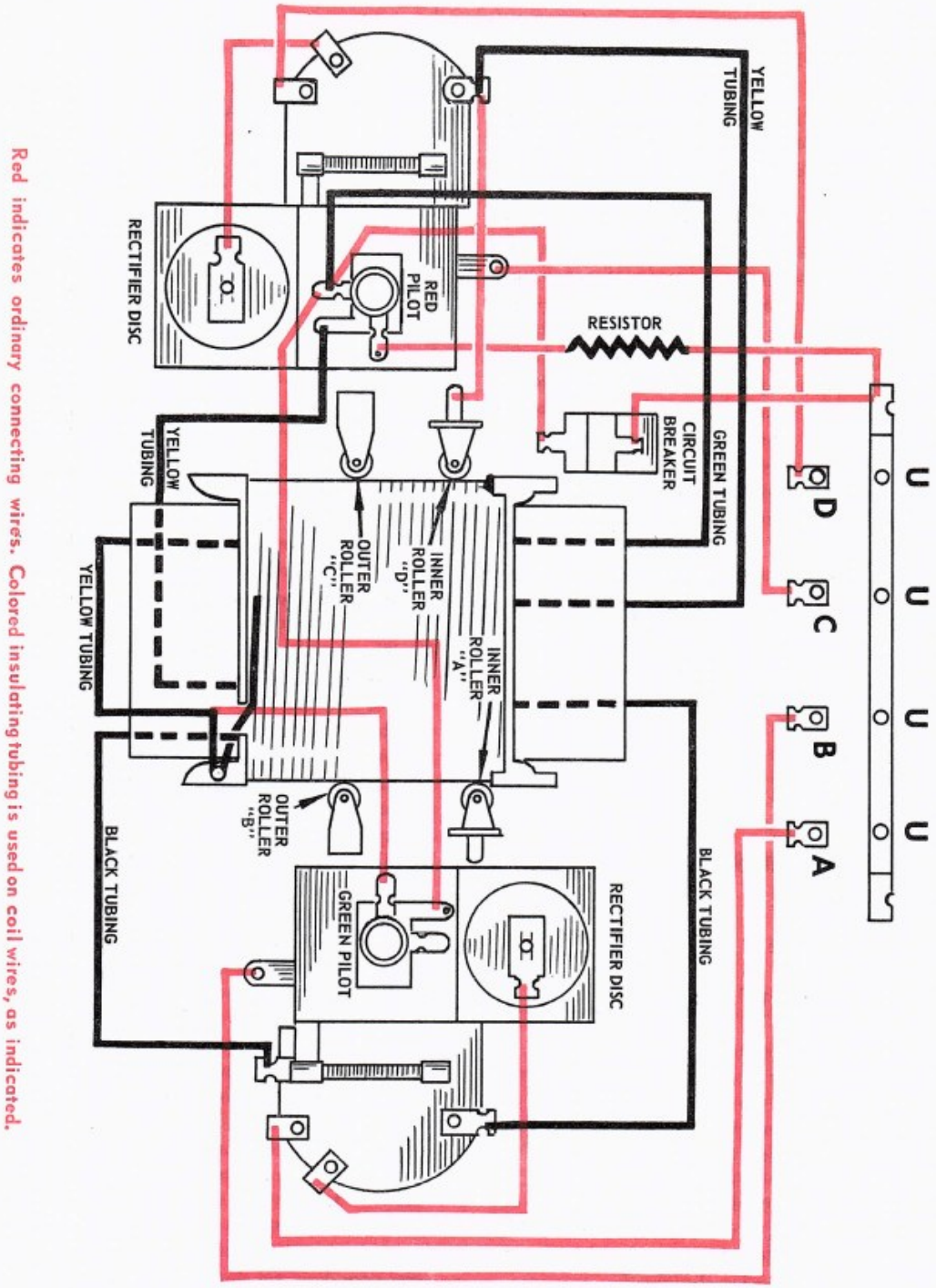


LEAD NO.	DESCRIPTION
1	NO TUBING
2	BLACK TUBING
4	YELLOW TUBING
6	RESISTANCE WIRE
9	YELLOW TUBING

LEAD NO.	DESCRIPTION
11	BLACK TUBING
13	HEATER WIRE (See note)
15	RESISTANCE WIRE
20	YELLOW TUBING

PRINTED IN U. S. OF AMERICA

PICTORIAL WIRING DIAGRAM OF ZW TRANSFORMER MODEL R



Red indicates ordinary connecting wires. Colored insulating tubing is used on coil wires, as indicated.

PRINTED IN U. S. OF AMERICA

LIONEL SERVICE MANUAL

"ZW" MULTI-CONTROL TRANSFORMER
Model R

Since its original issue the ZW transformer has undergone many design changes so that most of the part numbers listed in the previous section are no longer valid.

One of the principal design changes has been the substitution of a one-piece riveted lamination stack which required changes in the coil support brackets.

Other changes include new whistle control assemblies with intergral resistors and a slightly different method of mounting them in place; a new upper case assembly with a riveted escutcheon plate; and new circuit breakers. These changes were introduced without any changes in the transformer designation. Model R refers specifically to transformer in which the 6-volt pilot lamps used in previous models were replaced with 18-volt lamps, eliminating the use of a series lamp resistor.

The basic wiring has remained the same, but a new pictorial diagram redrawn for improved clarity appears on page 2.

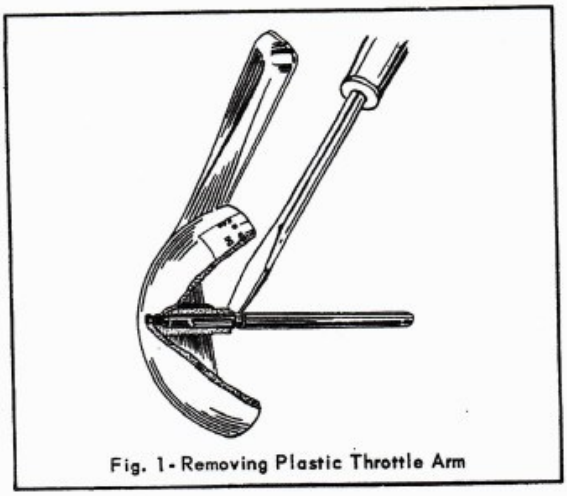


Fig. 1 - Removing Plastic Throttle Arm

Disassembling the Transformer

1. Remove transformer cover by taking out the 4 recessed screws on top of transformer case.
2. To remove the entire throttle arm assembly illustrated in Figure 1 pull out pin "A" in Figure 2 with a pair of pliers.
3. To remove the plastic throttle pull it straight out off the metal shaft. It can usually be started by inserting a screwdriver between the throttle arm and the metal disc and prying it off.

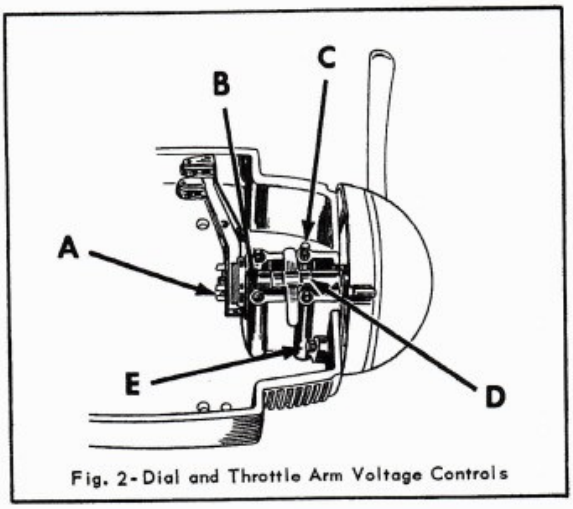


Fig. 2 - Dial and Throttle Arm Voltage Controls

4. The whistle control assemblies are held to the transformer case by a machine screw at point B and a lock ring at point C. After the screw and lock ring are removed the right hand control can be lifted off and folded back. To lift off the left-hand control, however, some of the wires may have to be unsoldered.

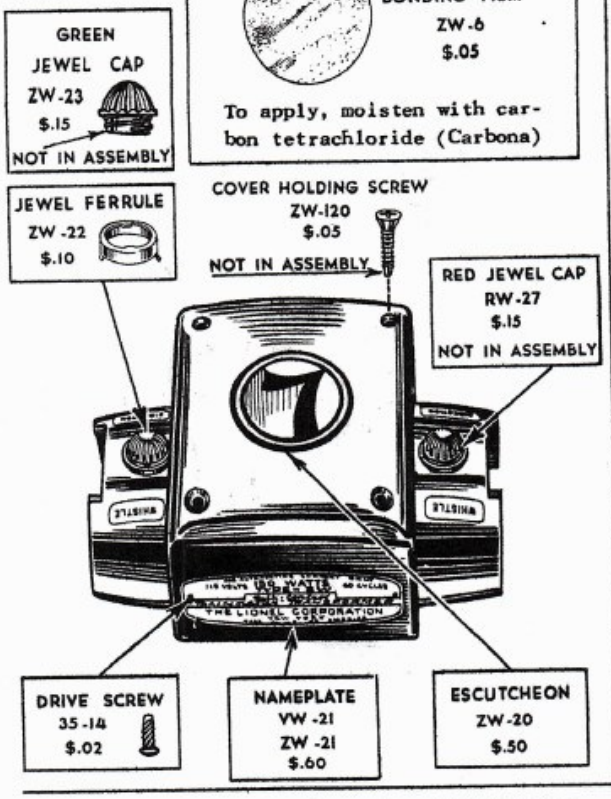
   When replacing controls observe their correct position. The semi-circular notches cut in the edge of the fibre pieces should face the rear of the transformer. Don't forget to replace both pieces of insulating paper between the bracket and the fixed voltage dial shaft. Both are necessary to maintain proper pressure on the contact spring "D".
5. To remove fixed voltage dial assembly stopping "E" must be tapped out from within the case. If you don't have enough room to work take out the coil assembly by loosening the 4 hex head screws holding the coil brackets to the bottom of the transformer case.
6. To replace worn carbon rollers simply crush the old carbon roller and then cut through the rivet with a pair of cutting pliers. Do not attempt to straighten the tabs holding the roller bracket or they will crack off.

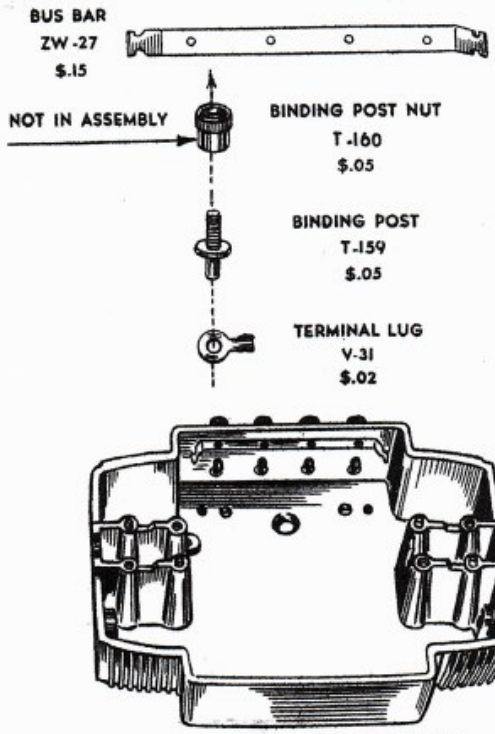
   When replacing coil assembly make sure that all the connecting wires are bent well away from the path of the moving contact arms. The sharp edges of the arms may cut through the insulation causing an internal short circuit against which the circuit breakers does not provide protection.

PRINTED IN U. S. OF AMERICA

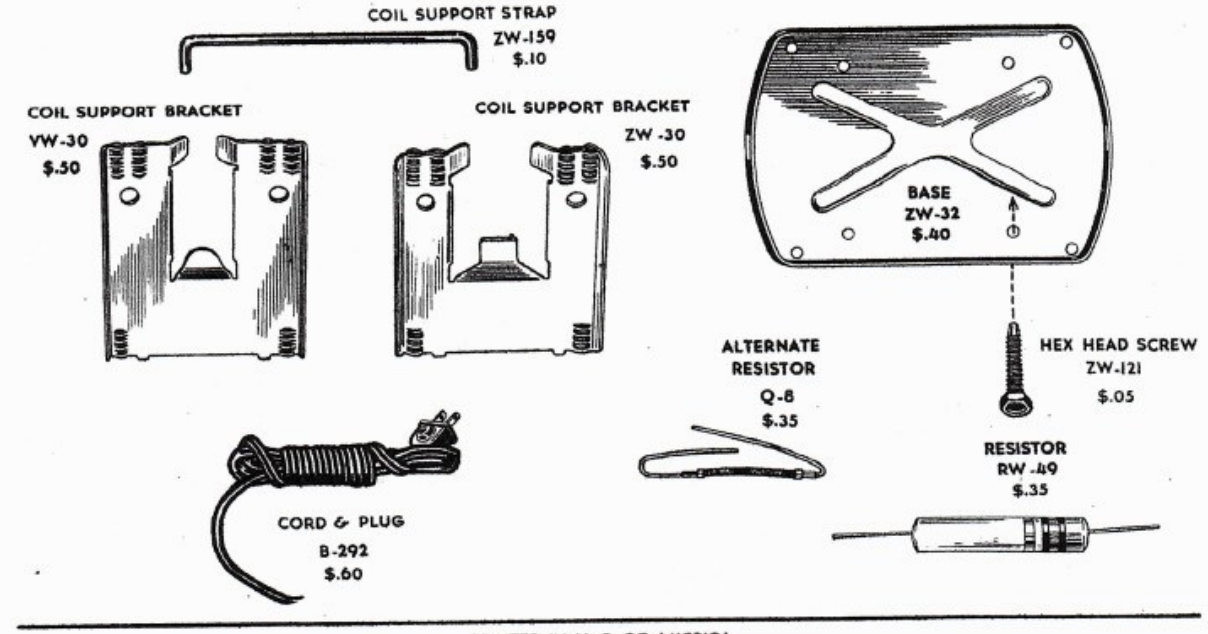
LIONEL SERVICE MANUAL

UPPER CASE ASSEMBLY
VW-3
ZW-3
$4.00





LOWER CASE ASSEMBLY
ZW-25
$4.00

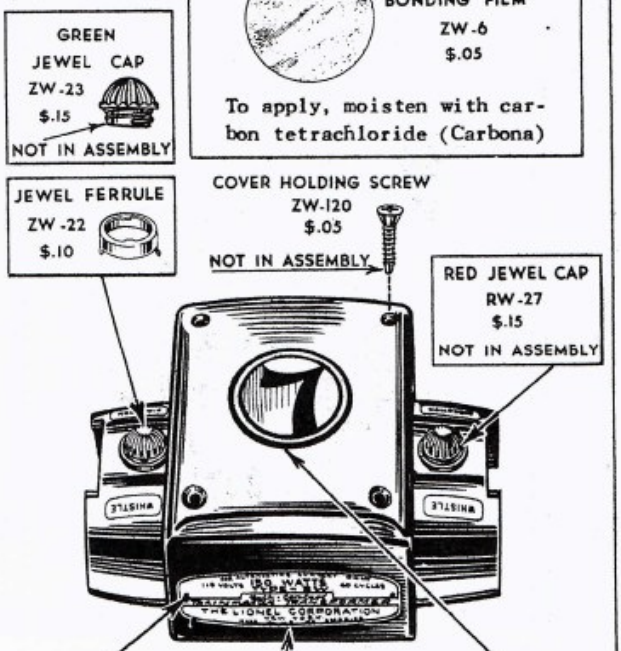


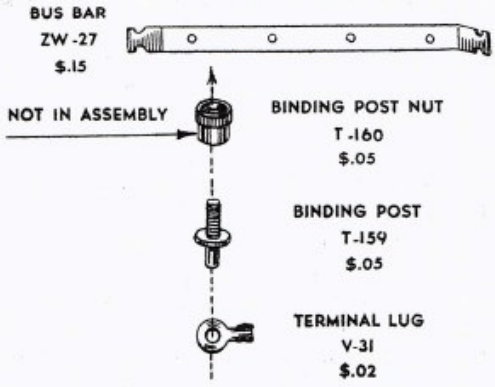
PRINTED IN U. S. OF AMERICA

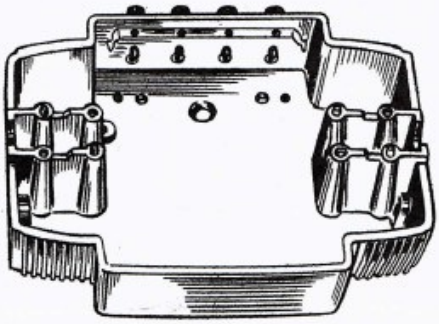
LIONEL SERVICE MANUAL

UPPER CASE ASSEMBLY

VW-3
ZW-3
$4.00

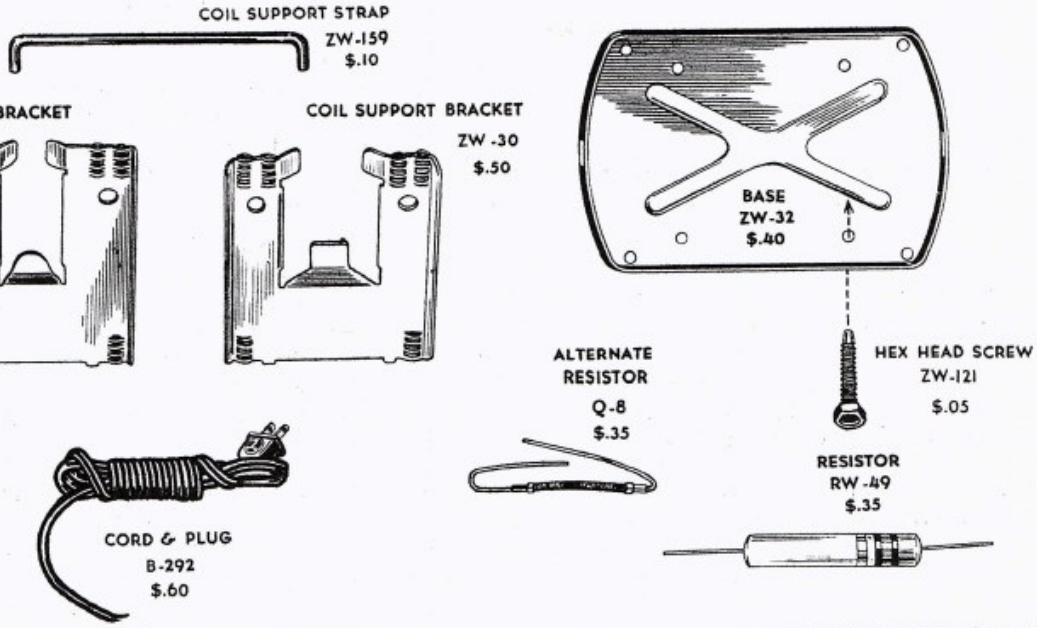






LOWER CASE ASSEMBLY

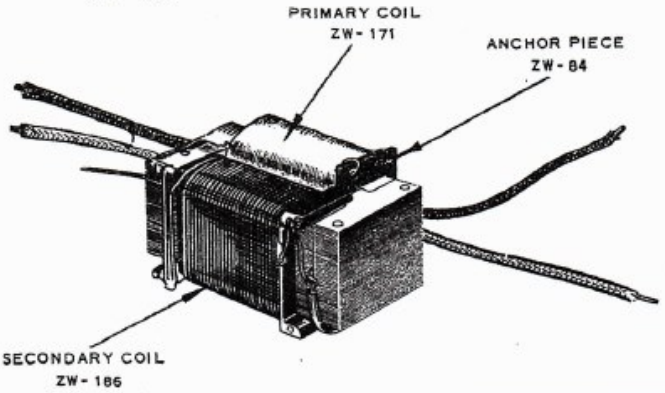
ZW-25
$4.00



PRINTED IN U. S. OF AMERICA

LIONEL SERVICE MANUAL

COIL & LAMINATIONS ASSY.
ZW-201

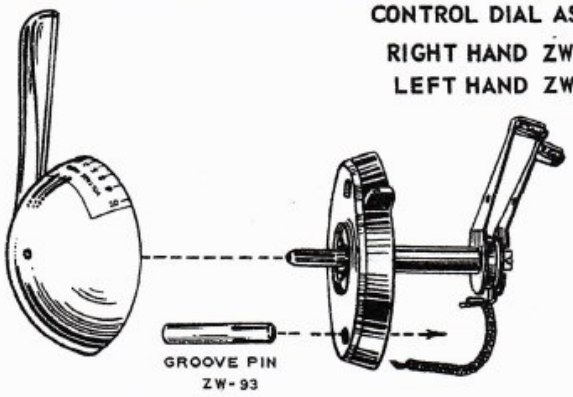


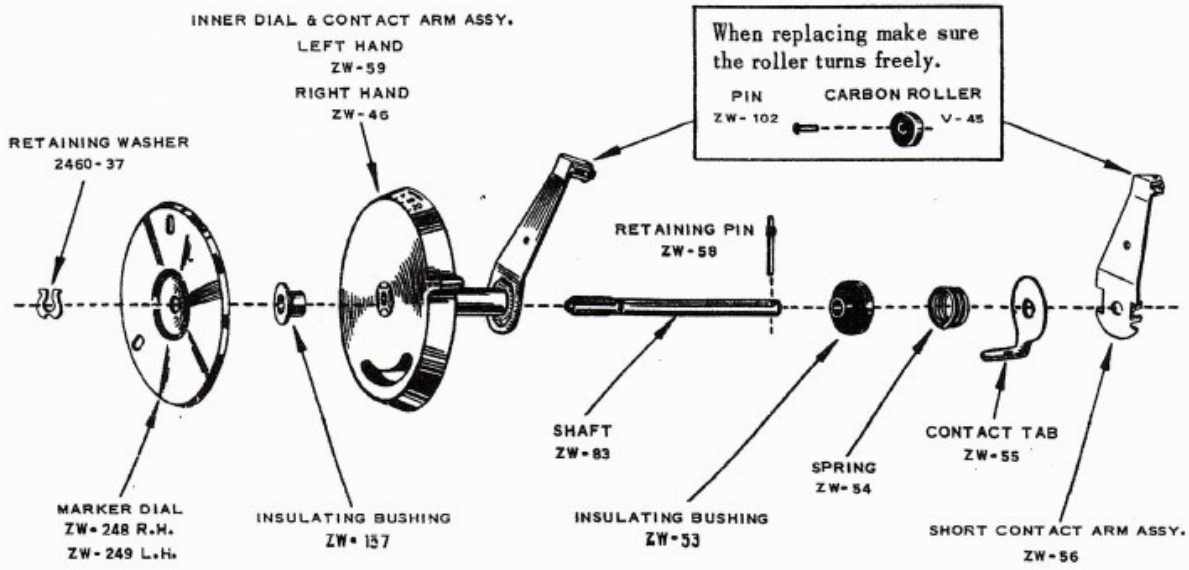
To remove the transformer coils for replacement the two parts of the lamination assembly should be disassembled by prying them apart with a wide chisel-edged tool, which can be made by grinding down an old flat file. The two sections can be reassembled by squeezing them together in a large vise.

CONTROL DIAL ASSY.
RIGHT HAND ZW-49
LEFT HAND ZW-60

OUTER CONTROL DIAL ASSY.
L.H. ZW-99
R.H. ZW-96

Outer Control Dial Assembly and the large Groove Pin, ZW-93, are not included in Control Dial Assembly.

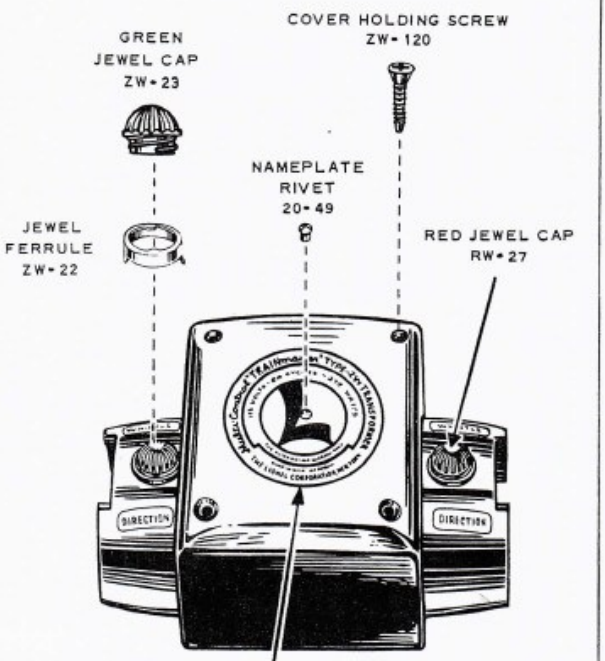




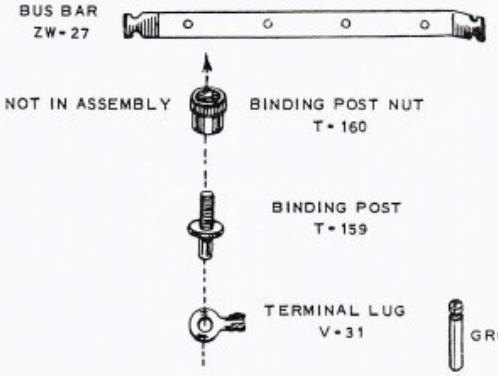
PRINTED IN U. S. OF AMERICA

LIONEL SERVICE MANUAL

UPPER CASE ASSEMBLY
ZW-182

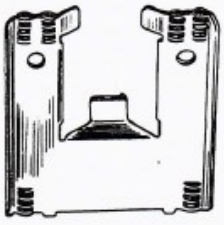


NAMEPLATE
ZW-181

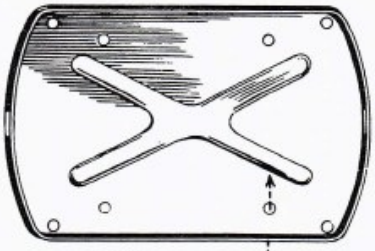


LOWER CASE ASSEMBLY
ZW-244

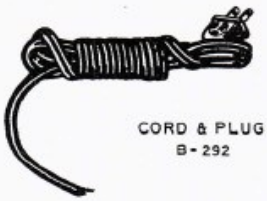
COIL SUPPORT STRAP
ZW-159



COIL SUPPORT BRACKET
ZW-191



BASE
ZW-32



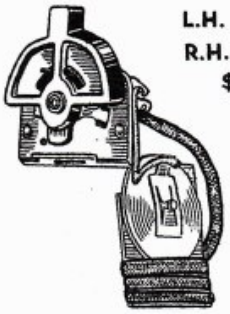
CORD & PLUG
B-292

HEX HEAD SCREW
ZW-121

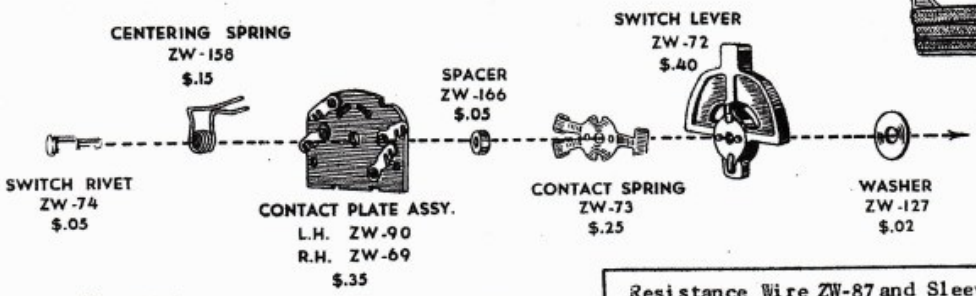
PRINTED IN U. S. OF AMERICA

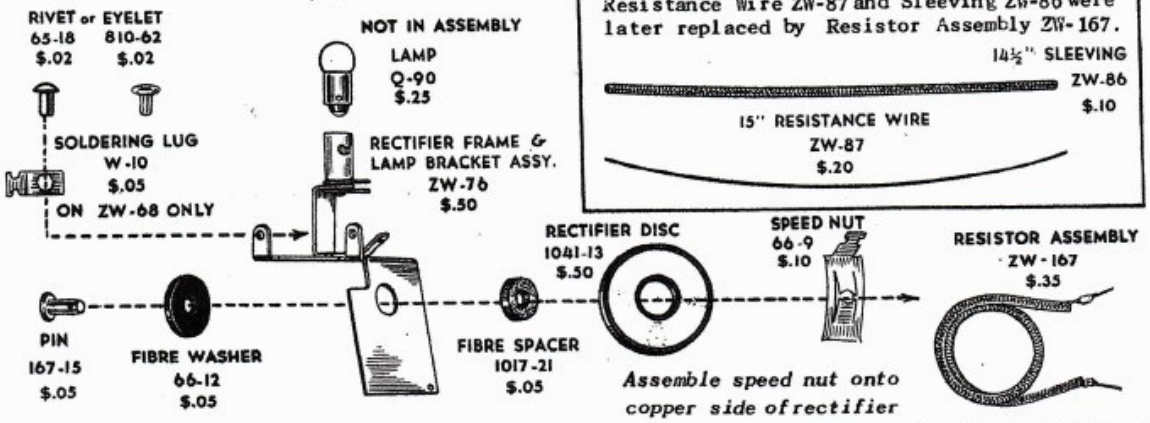
LIONEL SERVICE MANUAL

Right and left hand Reversing Unit Assemblies differ from each other in the location of contacts on the Contact Plate Assembly. For easier identification the edges of right hand contact plates are blackened while the edges of the left hand contact plates remain 'natural.'

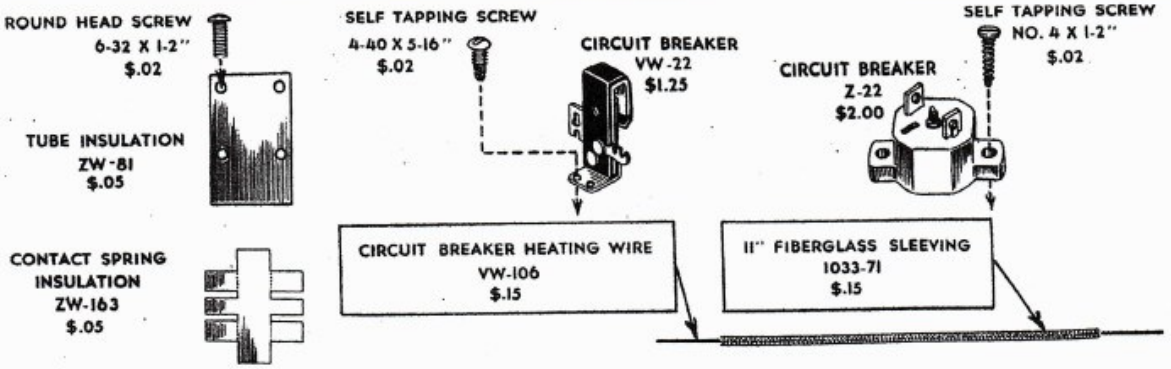


REVERSING UNIT ASSY.
L.H. ZW-89
R.H. ZW-68
$2.50





Resistance Wire ZW-87 and Sleeving ZW-86 were later replaced by Resistor Assembly ZW-167.



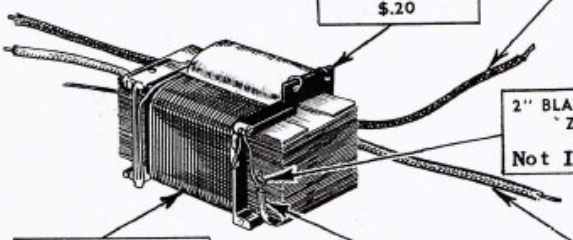
As explained on Page 1 of this section, the Heating Wire W-106 in its Sleeving 1033-71 is wrapped around the VW-22 Circuit Breaker to decrease its breaking time.

PRINTED IN U. S. OF AMERICA

LIONEL SERVICE MANUAL

COIL & LAMINATIONS ASSY.

ZW-172
$7.50



ANCHOR PIECE
ZW-84
$.20

6" BLACK SLEEVING
ZW-104
$.10

2" BLACK SLEEVING
ZW-108
$.05
Not Illustrated

SECONDARY COIL
ZW-161
$2.50

6" YELLOW VARGLAS SLEEVING
ZW-160
$.15

6" YELLOW SLEEVING
ZW-142
$.10

COIL & LAMINATIONS ASSY.

VW-110
$6.00

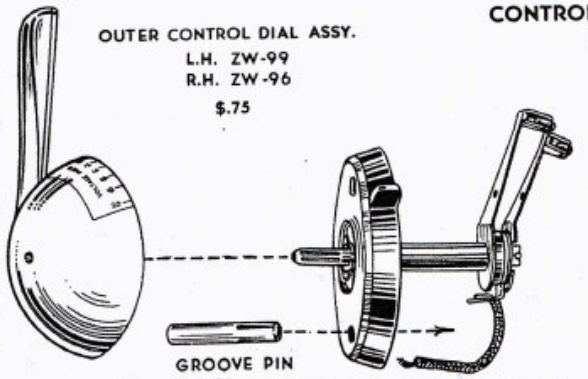
SECONDARY COIL
VW-107
$2.50

Outer Control Dial Assembly and the large Groove Pin, ZW-93, are not included in Control Dial Assembly. VW and ZW assemblies differ from each other in the length and shape of the contact springs. A few of the earliest transformers used a paper tube insulation instead of Insulating Bushing, ZW-157.

CONTROL DIAL ASSY.

RIGHT HAND
VW-49
ZW-49
LEFT HAND
VW-60
ZW-60
$2.50

OUTER CONTROL DIAL ASSY.
L.H. ZW-99
R.H. ZW-96
$.75



GROOVE PIN
ZW-93
$.10

When replacing make sure the roller turns freely.

PIN
ZW-102
$.02

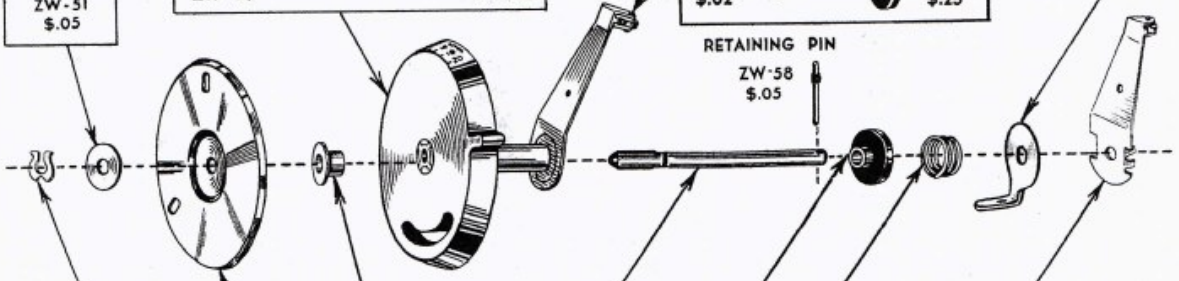
CARBON ROLLER
V-45
$.25

INNER DIAL & CONTACT ARM ASSY.
LEFT HAND VW-59 ZW-59 $1.25 RIGHT HAND VW-46 ZW-46

WASHER
ZW-51
$.05

CONTACT TAB
ZW-55
$.10

RETAINING PIN
ZW-58
$.05



RETAINING WASHER
2460-37
$.05

INSULATING BUSHING
ZW-157
$.10

SHAFT
ZW-83
$.30

SPRING
ZW-54
$.10

SHORT CONTACT ARM ASSY.
VW-56
ZW-56
$.40

MARKER DIAL
ZW-122
$.25

INSULATING BUSHING
ZW-53
$.15

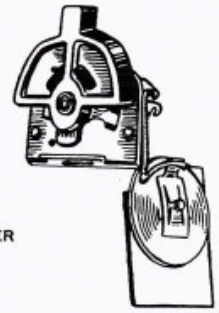
PRINTED IN U. S. OF AMERICA

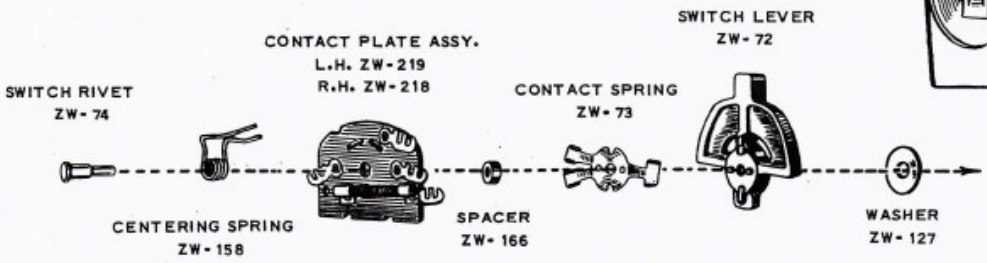
LIONEL SERVICE MANUAL

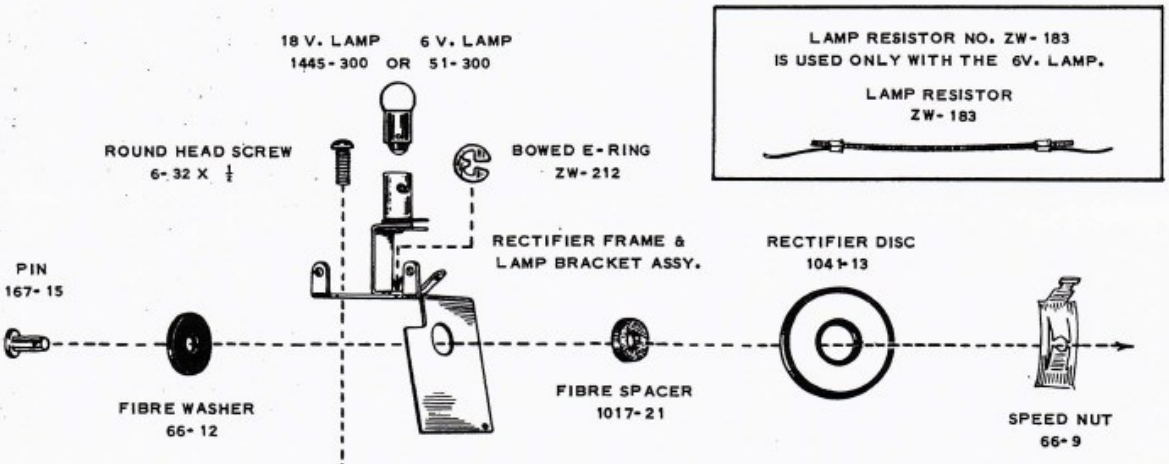
Right and left hand Reversing Unit Assemblies differ from each other in the location of contacts on the Contact Plate Assembly. For easier identification the edges of right hand contact plates are blackened while the edges of the left hand contact plates remain "natural".

REVERSING UNIT ASSY.

L.H. ZW-214
R.H. ZW-213







PRINTED IN U. S. OF AMERICA

LIONEL SERVICE MANUAL

TRANSFORMERS TYPES "VW" and "ZW"

Types 'VW' and 'ZW' Multi-Control Transformers, built in 1948, are similar to other Multi-Control transformers in the principle of operation but differ from them in their general appearance and in having a double set of whistle and reversing controls so that two separate layouts can be operated independently by the same transformer.

Type 'VW' transformer, rated at 150 watts, can supply continuously 110 watts, or approximately 8 amperes at the working track voltage. This transformer can be used with power lines of 110-125 volts, 50-60 cycles.

Type 'ZW' transformer, rated at 250 watts, can supply continuously 180 watts at 14 amperes. The 'ZW' transformer can be used with power lines of 110-125 volts 60 cycles only.

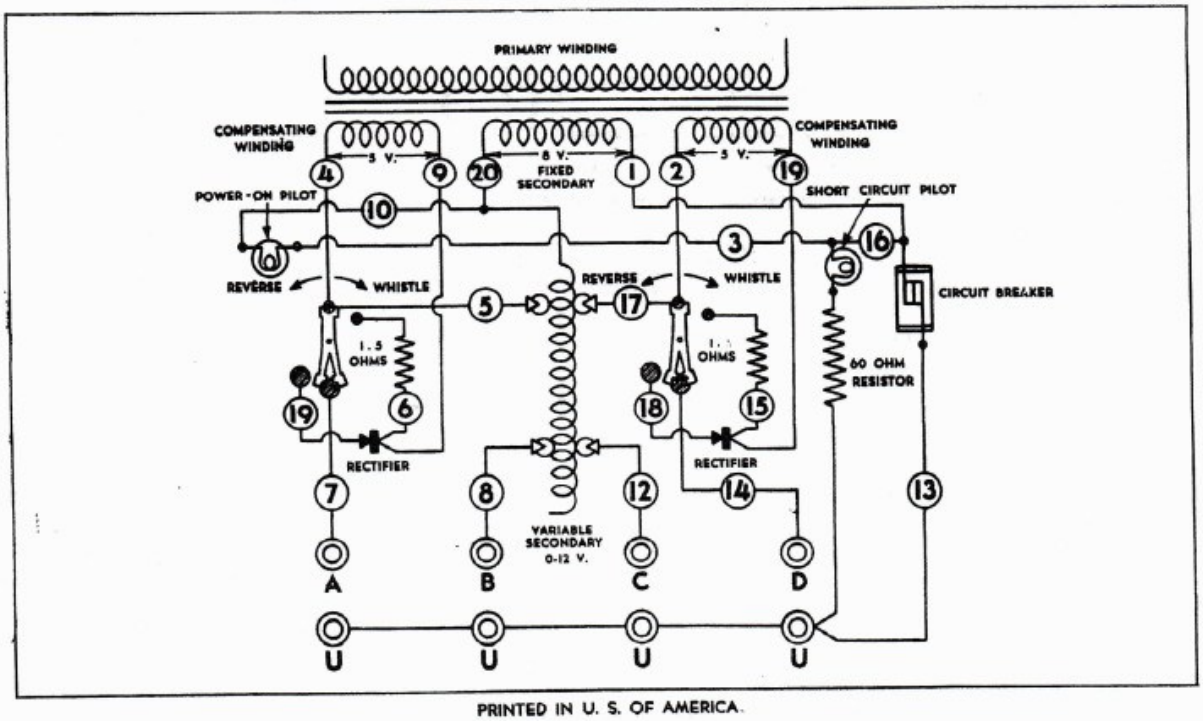
As illustrated in the schematic diagram below, these transformers have a fixed secondary winding of 8 volts in series with a variable secondary winding of 12 volts. This makes it possible for each of the four rolling contacts to supply from 8 to 20 volts. The two 5-volt compensating windings are normally out of the circuit but are switched in series with the circuit whenever the whistle controller is operated to compensate for the voltage drop in the rectifier and the additional load of the whistle motor.

The three fixed secondary windings are wound directly on the primary, while the variable secondary winding is wound separately on a bakelite form and assembled on the opposite leg of the iron core.

The transformers are equipped with a pilot 'power on' light placed across the fixed 8 volts winding, and a 'short circuit' pilot placed across the circuit breaker. The 60-ohm resistor in series with the short circuit pilot limits the voltage placed across that lamp when the circuit breaker opens.

Note: Because circuit breakers of correct value could not be obtained for the 'VW' transformers built in 1948, a length of resistance wire in insulating sleeving was wound around the circuit breaker and served as a heater to decrease its breaking time in case of short circuits.

SCHEMATIC WIRING DIAGRAM OF TRANSFORMERS "VW" and "ZW"



PRINTED IN U. S. OF AMERICA