SERVICE MANUAL

OTTP. 95

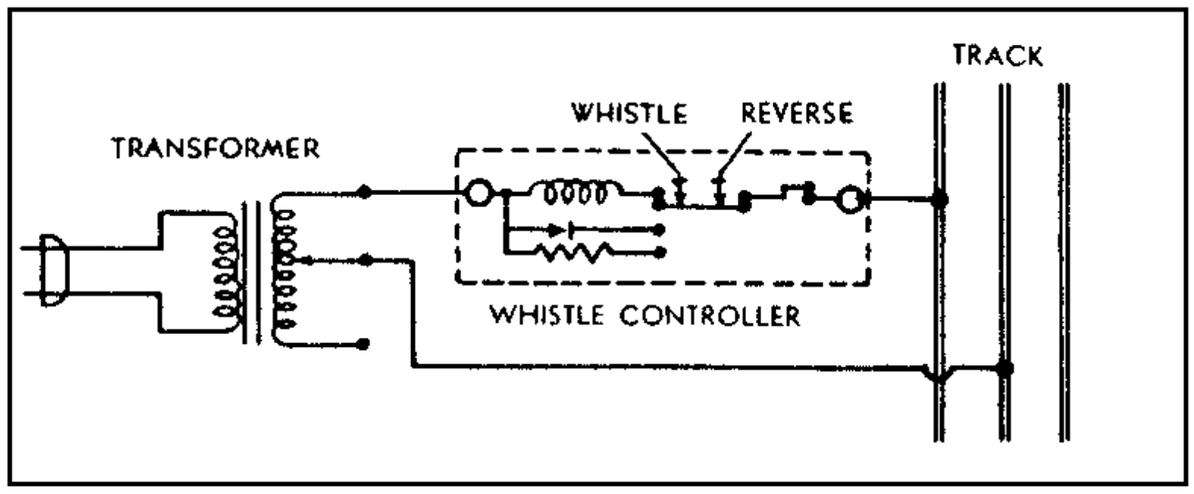
NO. 167C WHISTLE CONTROLLER

The Lionel whistle, described in detail in the section on Whistle Tenders (TEN), is controlled by a d-c relay mounted in the tender together with the whistle mechanism. This relay acts as a switch for the whistle motor which drives a stream of air into the whistle chambers making the characteristic whistling sound. The whistle relay does not respond to alternating current and should remain open even at the highest a-c voltages supplied by Lionel transformers. But it is sensitive to direct current and is adjusted to close whenever a small amount of d-c voltage is fed to the track. This d-c voltage is supplied by the whistle controller whenever you press the whistle button. The whistle controller is connected in 'series' with the transformer and rectifies enough of the transformer output to operate the whistle relay. Actually, as you push the whistle button, two d-c voltages are supplied by the controllers: a momentary 3-4 volt 'pick-up' surge to close the whistle relay, then a steady 'holding' voltage of at least .8 volts to keep the relay closed. These voltages are obtained when a current of one ampere passes through the controller. Higher currents will result in higher d-c voltages, so that the whistle will work more positively with bigger outfits, or with some added track lights or accessories.

Whistle controllers are built either as a separate accessory unit, as Nos. 167 and 167C Whistle Controllers, or are incorporated in the transformer itself, as in the case of 'Multi-Control' transformers Nos. 1041, 1042, 1241 and Types S and S 220.

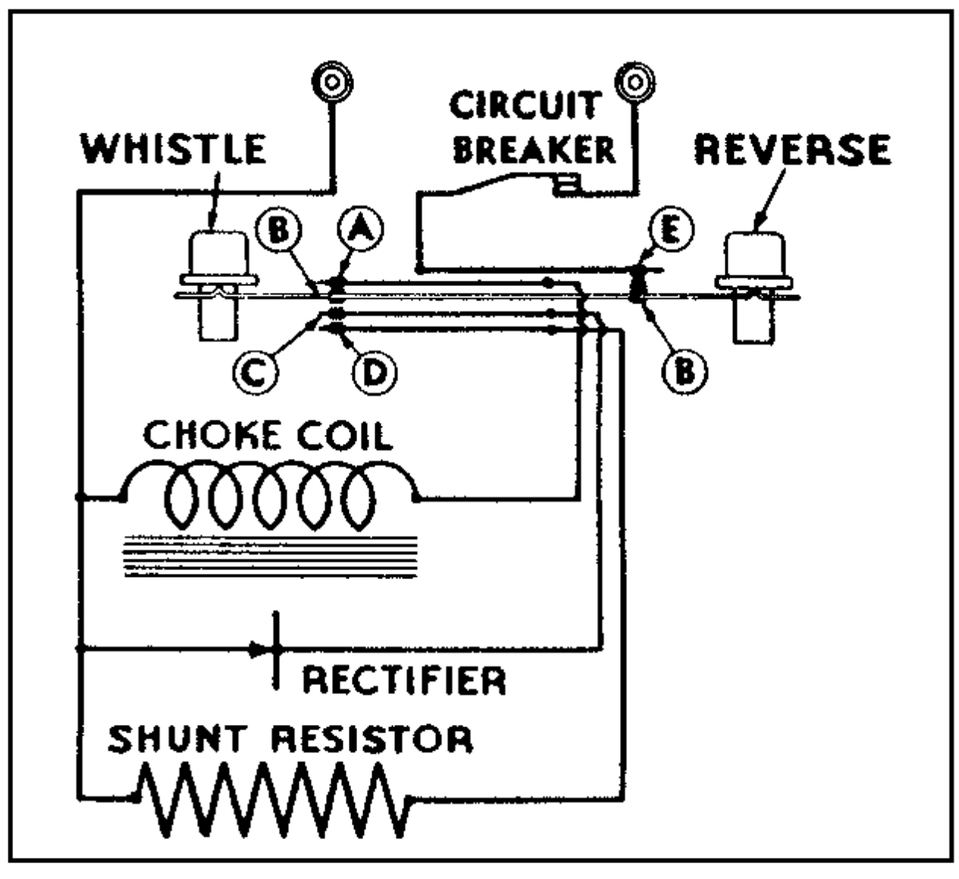
The controllers consist of a copper oxide rectifier disc, a length of resistance wire (approximately 1.6 ohms) which is automatically shunted across the rectifier to obtain the 'holding' voltage, and some means of compensating for the voltage drop across the rectifier which occurs when the whistle is blown and which would cause the train to slow down or stop altogether.

In the Nos. 167 and 167C Whistle Controllers this voltage compensation is accomplished by means of a choke coil with an impedance approximating that of the rectifier and resistor assembly. The choke coil is normally in the circuit. As you blow the whistle you automatically substitute the rectifier for the choke coil, thus keeping the track voltage at approximately the same level.



Since the controller is connected in series with the transformer and track, (See illustration) it is evident that short circuit on the track will cause a heavy current to pass through the choke coil. The coils are made to withstand a current of 6 amperes, but the heavier short circuit current will overheat and eventually burn out the coil. To prevent this damage the latest type of whistle controller, No. 167C, has a thermal circuit breaker which opens the circuit when the current through the controller exceeds the 6 ampere limit.

A schematic diagram of the No. 167C Whistle Controller is shown below.



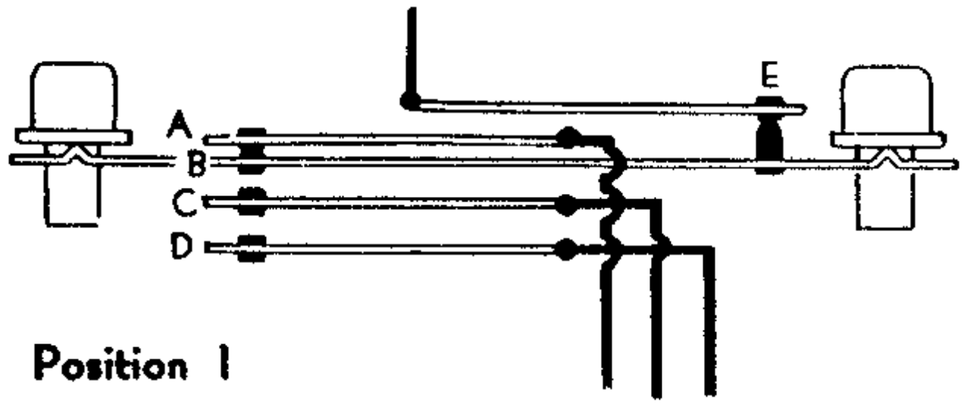
Two push buttons appear on the panel of the 167 and 167C Controllers: one to blow the whistle the other to reverse the locomotive. The 'Whistle' button operates a pile-up sequence switch to make proper electrical connections among the several controller elements. The

SERVICE MANUAL

OTTP.95

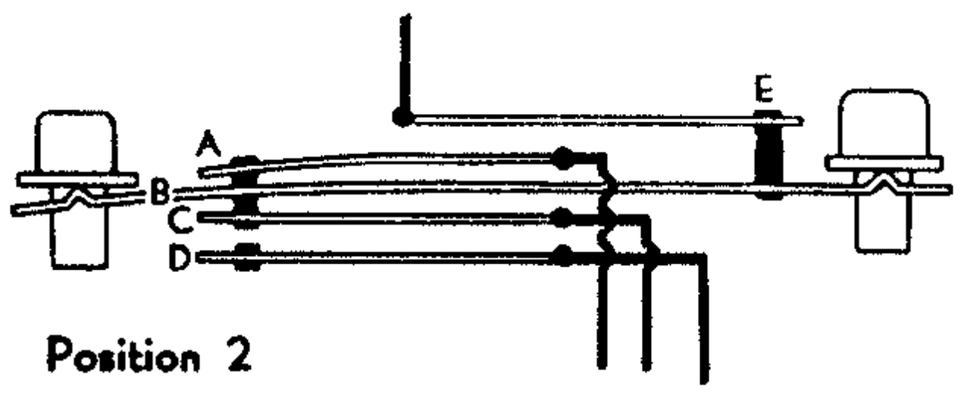
'Reverse' button is a make-and-break switch used to interrupt the track power momentarily in order to operate the locomotive reversing E-unit. (See LOC-671, page 6).

The sketches below illustrate the action of the sequence switch as the Whistle is blown.



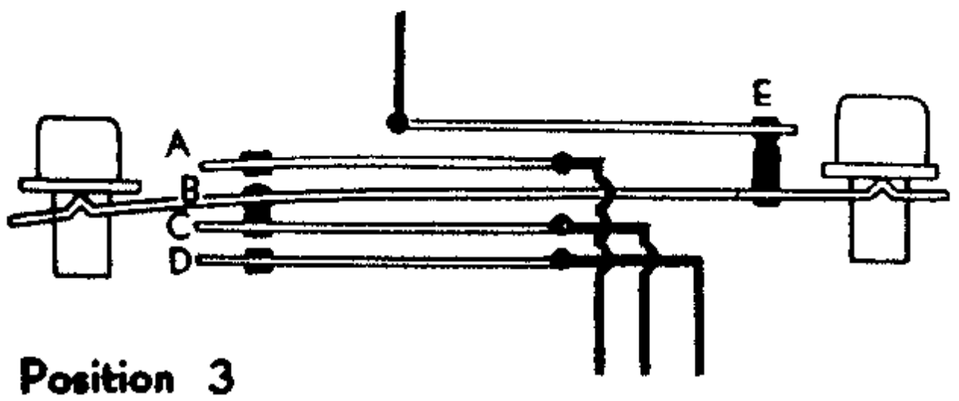
Position 1

Position 1 - Normal operation of train. Contacts B and A must be normally closed so that the current from the transformer passes through the choke coil to the track. If either 'A' or 'E' fail to touch 'B', you will have an open circuit and no power will reach the track.



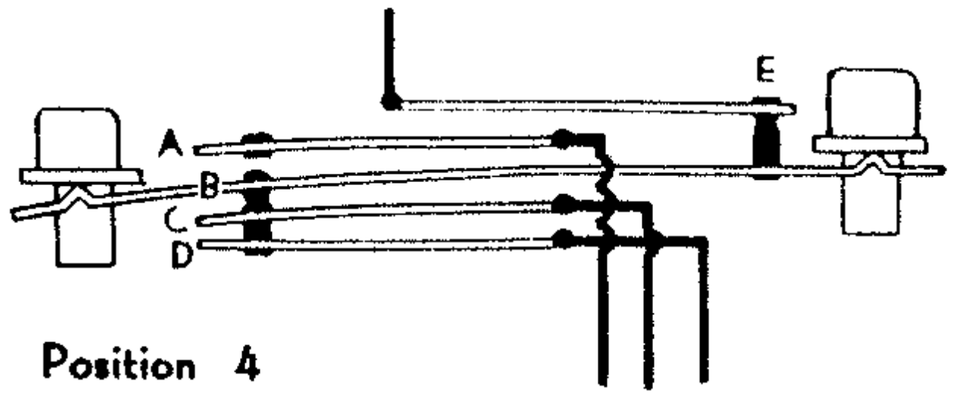
Position 2

Position 2 - As the whistle button is pressed, 'B' moves down to contact 'C.' 'A' follows through maintaining contact with 'B.' If 'B' breaks with 'A' before touching 'C,' the current to the track will be momentarily interrupted and cause the train to reverse.



Position 3

Position 3 - 'B' makes full contact with 'C' and breaks with 'A.' At this moment the full transformer voltage is applied across the rectifier resulting in a high d-c 'pick-up' surge.



Position 4

Position 4 - The whistle button at the bottom of its stroke. 'B' and 'C' contact 'D,' connecting the resistor across the rectifier. This reduces the 'pick-up' voltage to the 'holding' voltage needed to keep the whistle relay closed. Unless this contact is made, continuous application of the relatively higher 'pick-up' voltage will overheat and eventually damage the rectifier disc while the train will slow down or even stop because of insufficient current flow through the controller.

SERVICING WHISTLE CONTROLLER

Lionel whistle equipment is designed to work at line frequencies of 50-60 cycles. It is not suited for direct current power supply since under this condition the whistle relay would remain closed and the whistle would blow continually. At frequencies appreciably higher than 60 cycles the impedance of the choke coil becomes so high that not enough voltage will be supplied to the track to operate the trains.

Trouble is sometimes encountered when the whistle controllers are used in unusually large layouts which draw large currents for their trains and accessories.

When too large a current is drawn through the controller, its choke coil will overheat. The voltage drop across it will increase, slowing up the train and the coil itself will eventually deteriorate and burn out.

The most frequent cause of breakdown of No. 167 Whistle Controllers, which, unlike the the later No. 167C Controllers, are not equipped with protective circuit breakers, is a burned-out choke coil. If the insulation is burned off and the wiring is shorted, the coil will lose its voltage compensating action so that the train will stop whenever you blow the whistle. If the coil is open, the track, naturally will get no power at all.

SERVICE MANUAL

OTTP.95

Another source of trouble common to all whistle controllers is a ruptured rectifier disc, so that the controller loses its ability to furnish d-c voltage. If you try to blow the whistle with a short circuit on the track you will force the rectifier to carry an excessive amount of current. This will overheat the disc and cause it to lose its rectifying ability. Copper oxide rectifiers have shown a remarkable resistance to overloads and will generally regain their rectifying ability after cooling down, but if abused continually they may become permanently damaged.

TROUBLE SHOOTING PROCEDURE

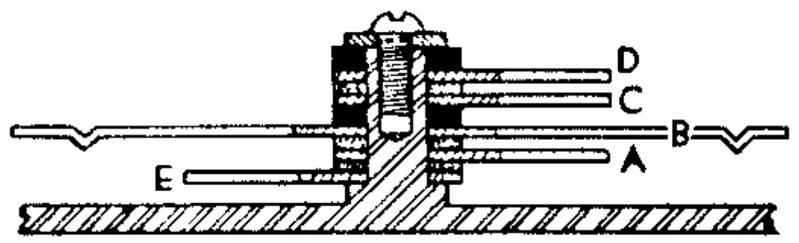
1. Check the Whistle Controller with a whistle which is known to be in good condition to make sure that it is the controller and not the whistle relay which is at fault.

2. Check the operation and the appearance of the contact points to make sure that they are in good condition and make contact in proper sequence. Don't forget to see that 'E' makes contact with 'B' in the normal operating position or no current will be delivered to the track.

3. Make sure that all internal wiring is properly soldered and free of corrosion and rust. See that none of the turns of the resistance wire wound on the rectifier sub-assembly is shorted by touching adjacent turns or the metal plate.

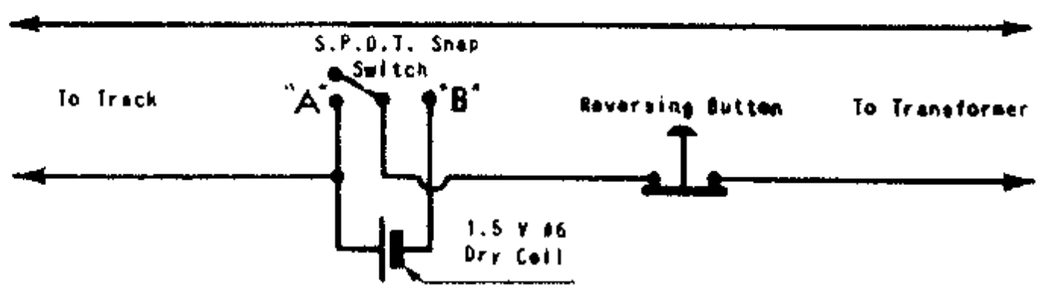
4. Exchange the rectifier disc by prying up 'speed nut' off the bolt holding the disc to the metal plate. Note that the disc is placed with the copper oxide (silvered) side next to the plate. The points of the speed nut should make firm contact with the copper face of the disc. Do not bend or distort the rectifier disc as that may puncture the oxide surface and short out the rectifier.

5. If you have occasion to take apart the pile-up to replace contacts be sure to reassemble the spacers between the contacts in their proper order. They are of two different thicknesses. See illustration below.



BATTERY OPERATION OF WHISTLE

To operate the whistle under extremely heavy load conditions, or in localities where the line frequency is greater than 60 cycles, the whistle controller can be replaced by an ordinary 1.5 volt No. 6 dry cell. The dry cell is connected in the circuit through a fast-acting single pole double-throw snap switch, as shown below. When



switch is in its normal position at 'A', the cell is out of the circuit; when switch is snapped to 'B' the dry cell is thrown into the power circuit and picks up the whistle relay. The switch must be fast enough to keep the locomotive reversing E-Unit from tripping while the switch is being snapped.

In exceptional cases where very large currents are used it may be advisable to use two dry cells in parallel to reduce the a-c voltage drop across them.

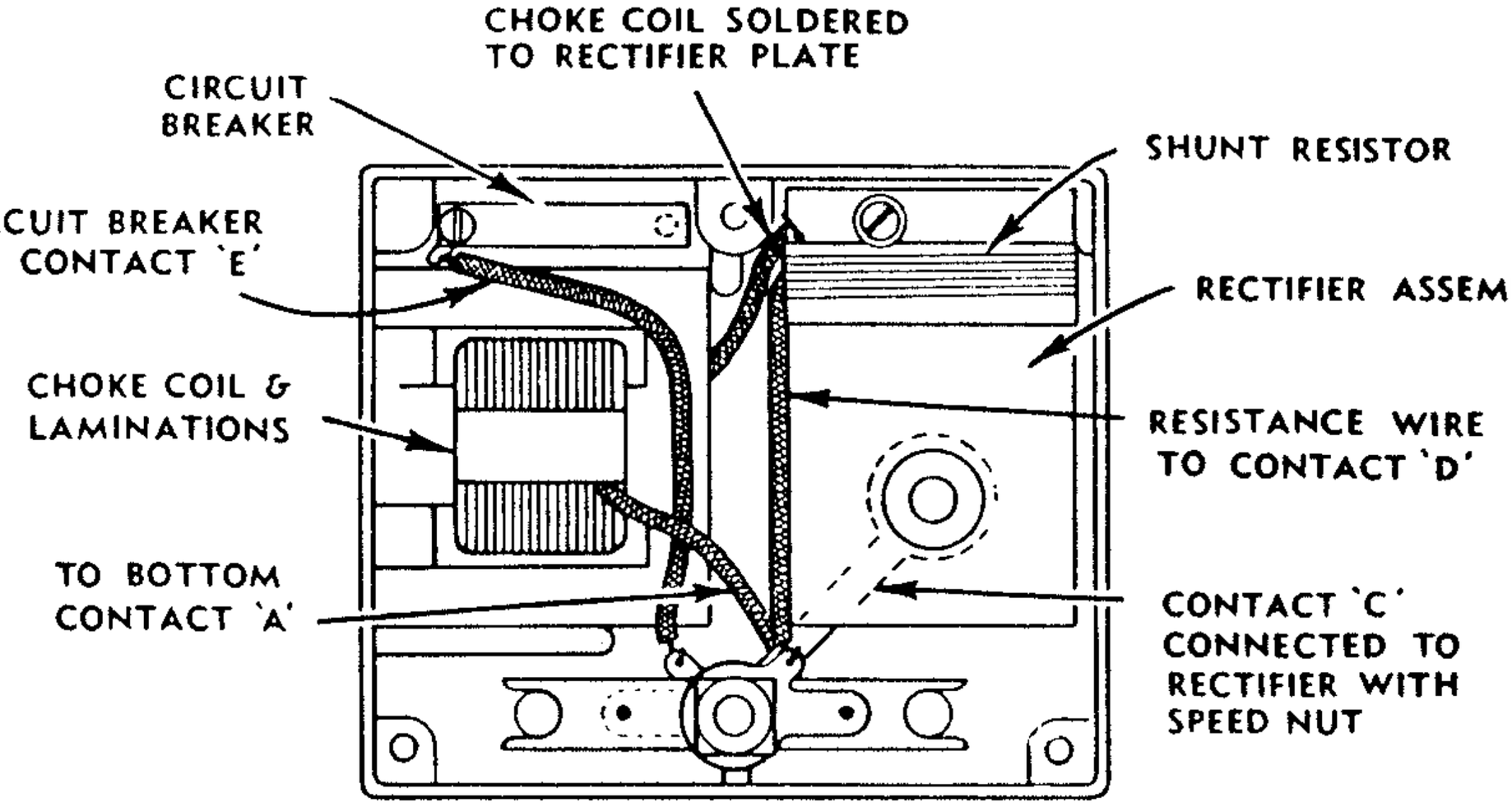
NO. 167 S WHISTLE CONTROLLER

Because lamp-type smoke generators, used in 1946 models of smoke locomotives, drew a relatively large amount of current, these locomotives tended to slow down as the whistle was blown. To eliminate this difficulty, these smoke outfits were provided with No. 167S Whistle Controllers, in which the value of the shunt resistor was decreased from 1.6 ohms to 1. ohm (Approximately one turn of wire less).

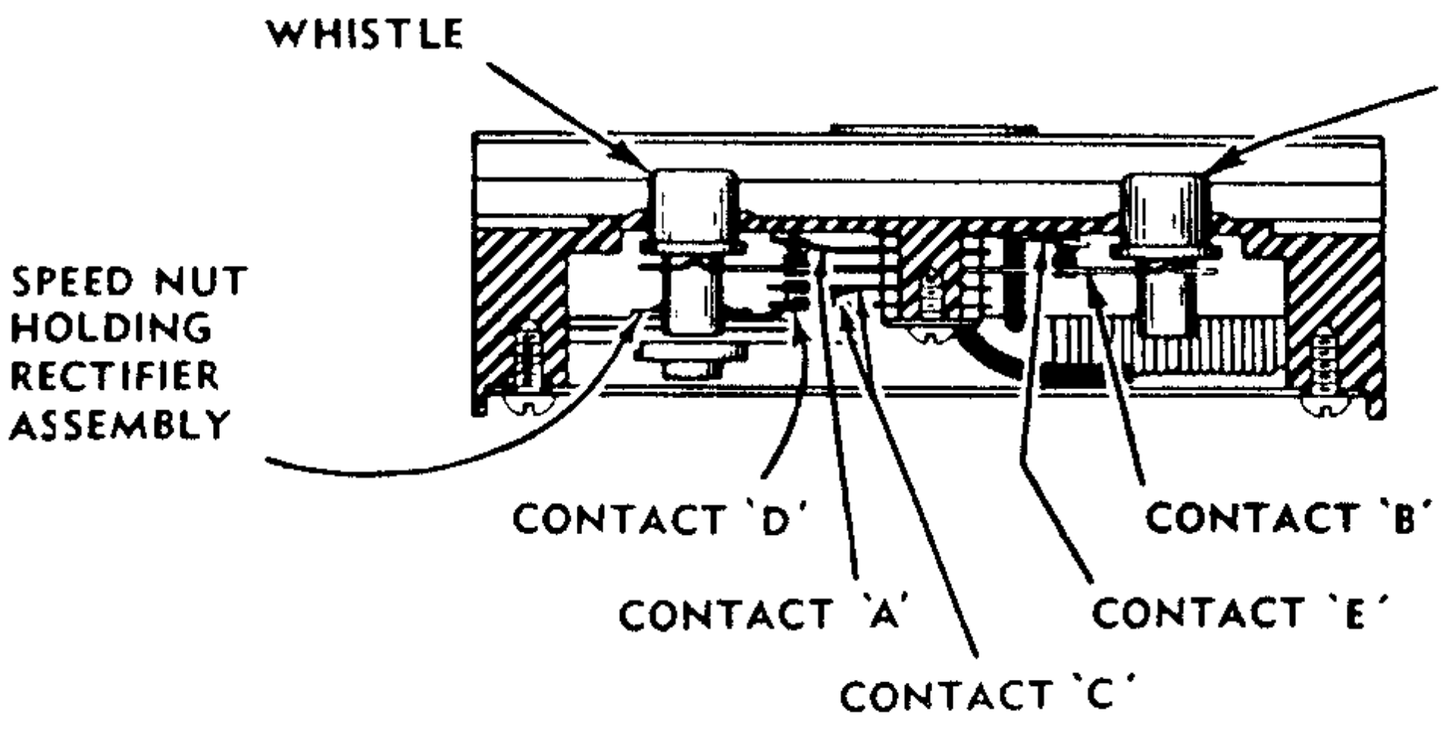
When changing from lamp-type to heater type smoke generator (See LOC-671, Page 5), you may find that the whistle relay gets insufficient d-c 'holding' voltage and drops out, particularly when the locomotive is standing still. To prevent this either add a couple of lights to the outfit to increase the current through the Whistle Controller, or add a turn of resistance wire to the shunt resistor.

SERVICE MANUAL

OTTP.95



Bottom view of No. 167C Whistle Controller with base plate removed to show the wiring and the arrangements of parts.

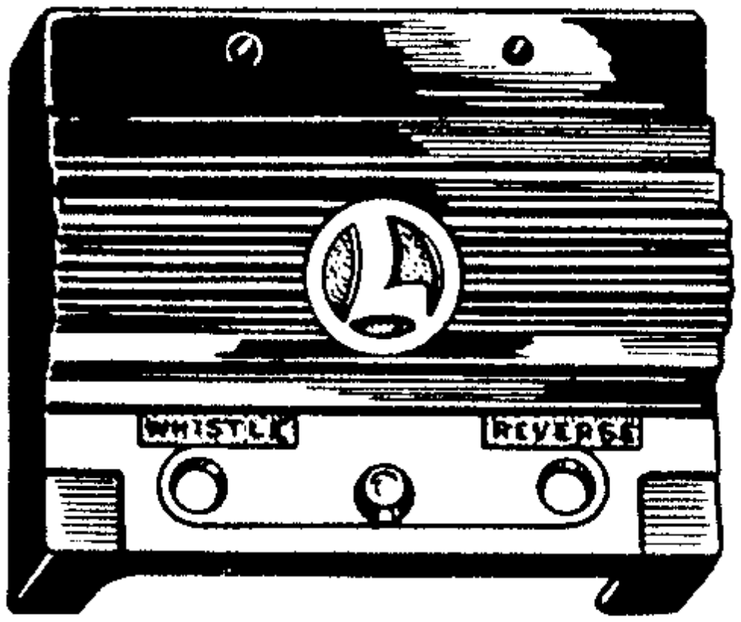


Side view of No. 167C Whistle Controller showing the arrangement of pile-up switches controlling the whistle and the reversing E-Unit.

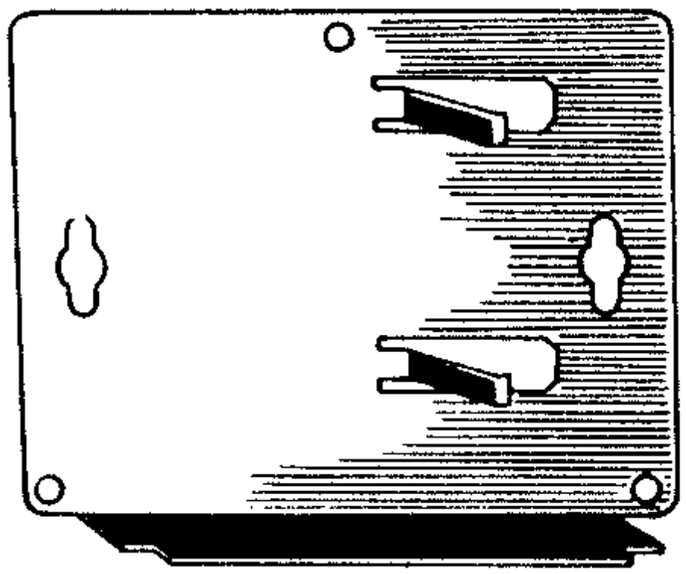
SERVICE MANUAL

OTTP.95

Bakelite Case
167-2N
$1.00



Bottom Plate
167-46N
$.15



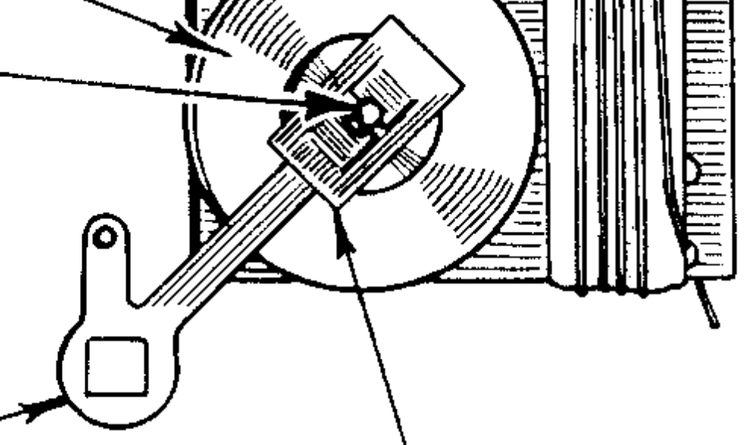
To simplify servicing and adjustment of contacts, the latest whistle controller cases, illustrated above, are open in the front so that the switch pile-up can be exposed by removing the base plate. Older models do not have this opening and require Bakelite Case, 167-2, and Bottom Plate, 167-46, as replacement parts.

Rectifier Disc
1041-13
$.50

Rectifier Assembly
167-11
$1.25

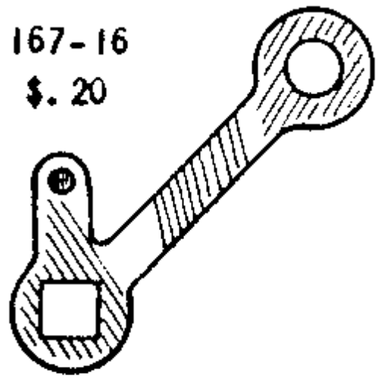
Rectifier Bracket Wound
167-12
$.50

Pin
167-15
$.06

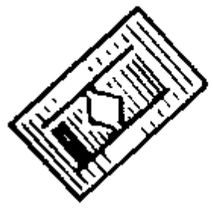


Spacer
66-11
$.05

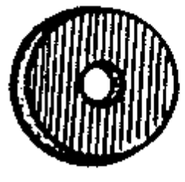
Rectifier Contact Arm
167-16
$.20



Speed Nut
167-20
$.05



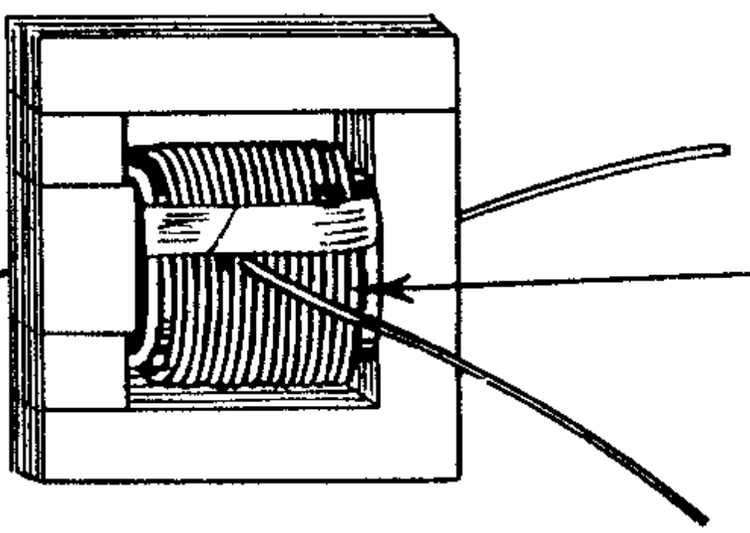
Insulating Washer
66-12
$.05



When replacing rectifier bracket do not shorten the end of the resistance wire wound about the bracket or you will change the required value of the shunt resistance (1.6 ohms) across the rectifier. The same part may be used as replacement in 167S Controllers provided that the resistance is reduced to 1 ohm.

SERVICE MANUAL

OTTP.95

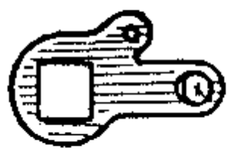


Choke Coil &
Lamination Assembly
67-6
$.75

Choke Coil
167-28
$.35

Contact Arm Assembly
167-33
$.35

Contact Assembly
167-37
$.20



Thin Fibre Spacer
167-21
$.05

Thick Fibre Spacer
RCS-26
$.05

Solder Lug
45-58
$.02

Thermo Assembly
167-50
$.20

Contact Bracket Assembly
167-52
$.15

Push Button
167-3
$.05

Binding Post Nut
88-2
$.03

#4-36 Hex Nut
61-9
$.02

Lockwasher
56-15
$.02

Spring Washer
RU-35
$.05

#4-36 X 13/16"
Round Head Screw
$.02

#4-36 X 7/16"
Round Head Screw
$.02

#6-32 X 1/4"
Groove Screw
$.02

#4-36 X 1/4"
Binding Head Screw
$.02

SERVICE MANUAL

OTTP.95

THE USE OF NO. 167 WHISTLE CONTROLLER WITH TWIN-MOTORED LOCOMOTIVES

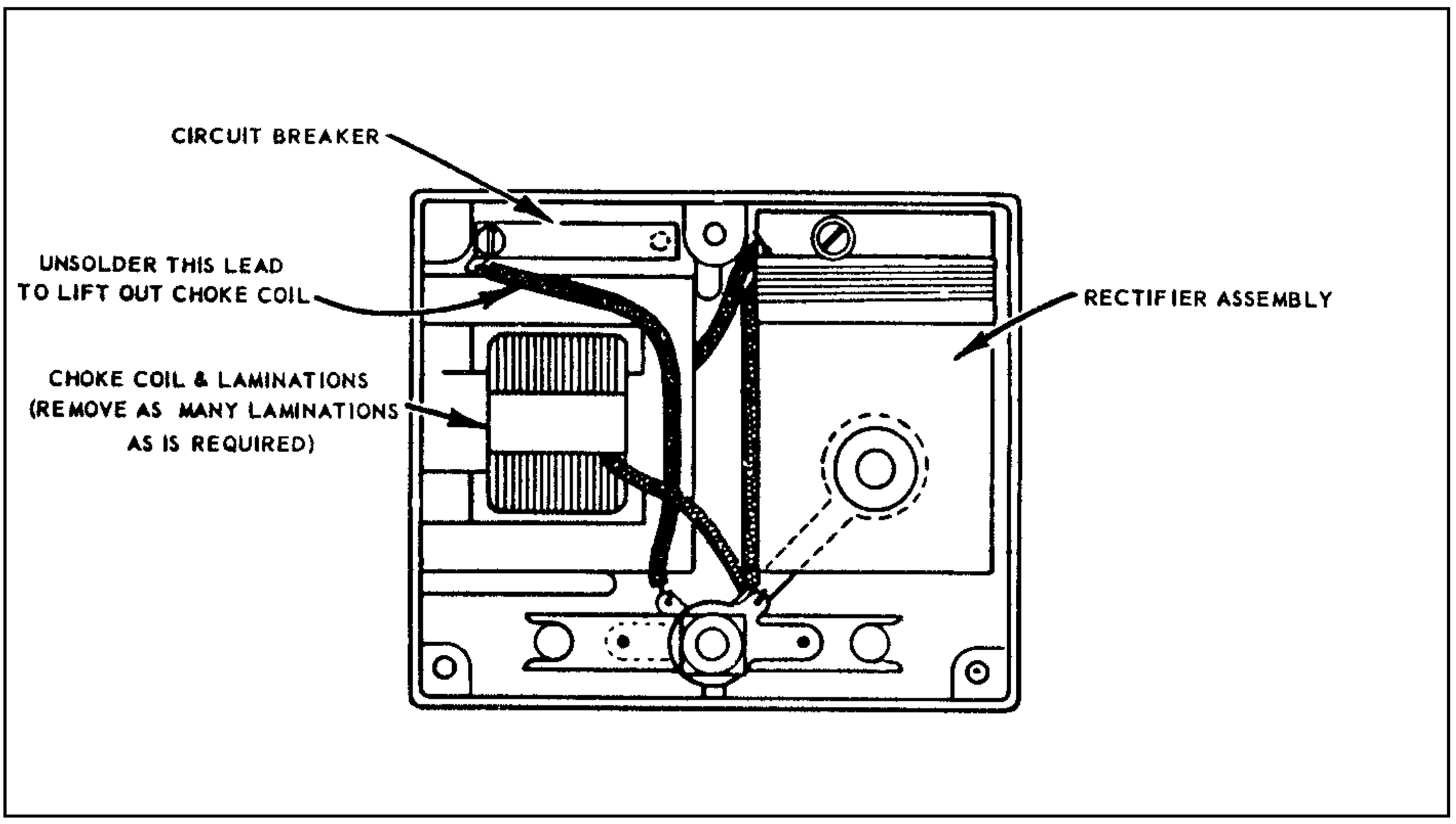
The voltage drop produced by the compensating choke coil in the 167 whistle controller depends directly on the amount of current which passes through it on the way to the track. Since No. 167 Whistle Controller was originally intended to be used with single-motored, steam-type locomotives its choke coil is engineered to produce the correct voltage drop when track current is about 1½ amperes, which is the amount normally taken by a single-motored locomotive.

However, if the whistle controller is used with a twin-motored locomotives the track current passing through the choke coil to the track is 3 to 3½ amperes and the initial voltage drop produced by the choke coil is doubled and the track voltage if frequently depressed down to a point where it is impossible to obtain satisfactory train operation even at full transformer voltage.

Under these conditions it is necessary to lower the impedance of the choke coil in order to eliminate excessive initial voltage drop produced by it. This is done by removing some of the iron luminations from within the coil. For operating a twin-motored diesel the removal of some 10-12 laminations will give satisfactory results but where the situation is complicated by the use of several different types of locomotives some experimentation may be required to determine the best compromise possible for the operation of both whistles and horns.

To reach and lift out the choke coil unscrew the bottom of the whistle control case and unsolder the wire leading from the coil to the solder lug attached to the circuit breaker metal strip. To experiment with the whistle controller while the choke coil is out of the case connect a wire jumper from the end of the coil to the solder lug. To prevent buzzing noise after some of the laminations have been removed the empty space should be filled tightly with cardboard strips.

Bottom View of No. 167 Whistle Controller with Base Plate Removed



PRINTED IN U.S. OF AMERICA

SERVICE MANUAL

NO. 167C - WHISTLE CONTROLLER

Part Number	Location	Unit Price	Min. Quan.	Description
45-58	H-95	.02	12	Solder Lug
56-15	A-61	.02	25	Lockwasher
61-9	H-97	.02	25	4/36 Hex Head Nut
66-11	H-97	.05	12	Spacer
66-12	H-97	.05	12	Insulating Washer
67-6	H-56	1.00		Coil & Laminations Assem.
88-2	G-83	.05	25	Binding Post Nut
167-2	J-22	1.50		Case
167-3		.05		Push Button
167-11	J-11	1.75		Rectifier Assem.
167-15	J-91	.05	10	Rectifier Pin
167-16	J-91	.25	2	Rectifier Contact Assem.
167-20	J-91	.05	10	Speednut
167-21	J-107	.05	10	Thin Fibre Spacer
167-26	J-11	.25	2	Bottom Plate
167-28		.75		Coil
167-33	J-52	.50		Contact Arm Assem.
167-37	J-52	.25		Contact Assem.
167-46N	Sub. 167-26			Bottom Place
167-50	J-52	.25		Thermo Assem.
167-52	J-52	.20		Contact Bracket Assem.
1041-13	N-73	.75	6	Rectifier Disc
RCS-26	H-83	.05	12	Thick Fibre Spacer
RU-35	O-97	.05	12	Spring Washer
4-36 x 13/16"	Q-52	.02	25	RH Screw
4-36 x 7/16"	Q-82	.02	25	RH Screw
6-32 x 1/4"		.02	25	Rec. RH Screw
4-36 x 1/4"		.02	25	BH Screw