

# HOW TO OPERATE LIONEL TYPE KW "MULTI-CONTROL" TRAINmaster TRANSFORMER

**115 Volts      60 Cycles      190 Watts**  
**Alternating Current Only**

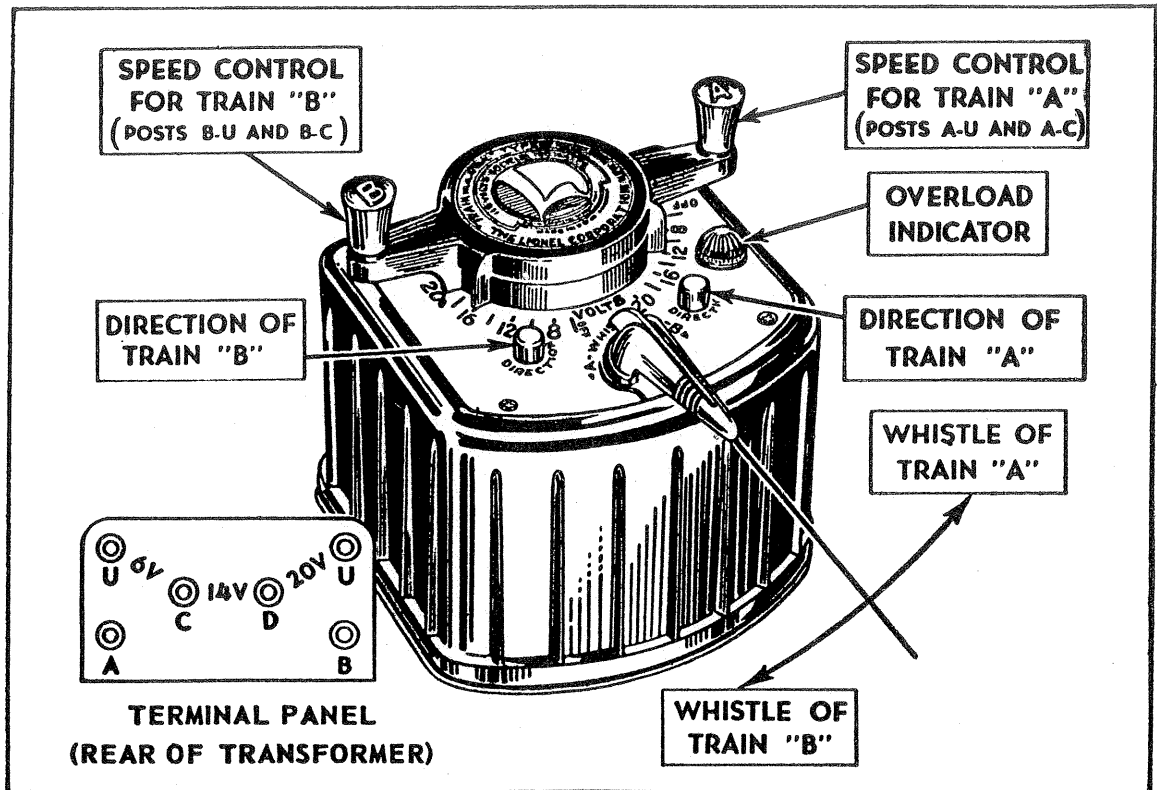


Figure 1—Type "KW" Multi-Control Transformer

Lionel electric trains operate on low voltage, ranging from 8 to 18 volts, depending on the size and type of the locomotive and the number of cars and accessories used. Lionel transformers reduce, or transform, the available house voltage to the low voltage required. The plug at the end of the transformer cord is plugged into any convenient wall outlet and the low voltage is then obtained from the output terminals at the rear of the transformer.

Type "KW" Multi-Control transformers are made to operate on 115-volt 60-cycle alternating current, which is the normal house power supply used in the United States. The wattage rating of the "KW" transformer is 190 watts, and it is powerful enough to operate a railroad system with two trains and several switches and accessories. The wattage of a transformer is a measure of its capacity, or ability to furnish power. While your house current determines the rated *voltage* and *frequency*, in cycles, of the transformer, the *wattage* of the transformer you need is governed by the kind and number of trains and the number of lights and operating accessories in your model railroad system. The larger the train and the greater the number of accessories, the more power you need and the higher should be the wattage rating of your transformer. To assist you in planning your railroad system, the Instruction Booklet lists the power in watts required by each Lionel locomotive and railroad accessory.

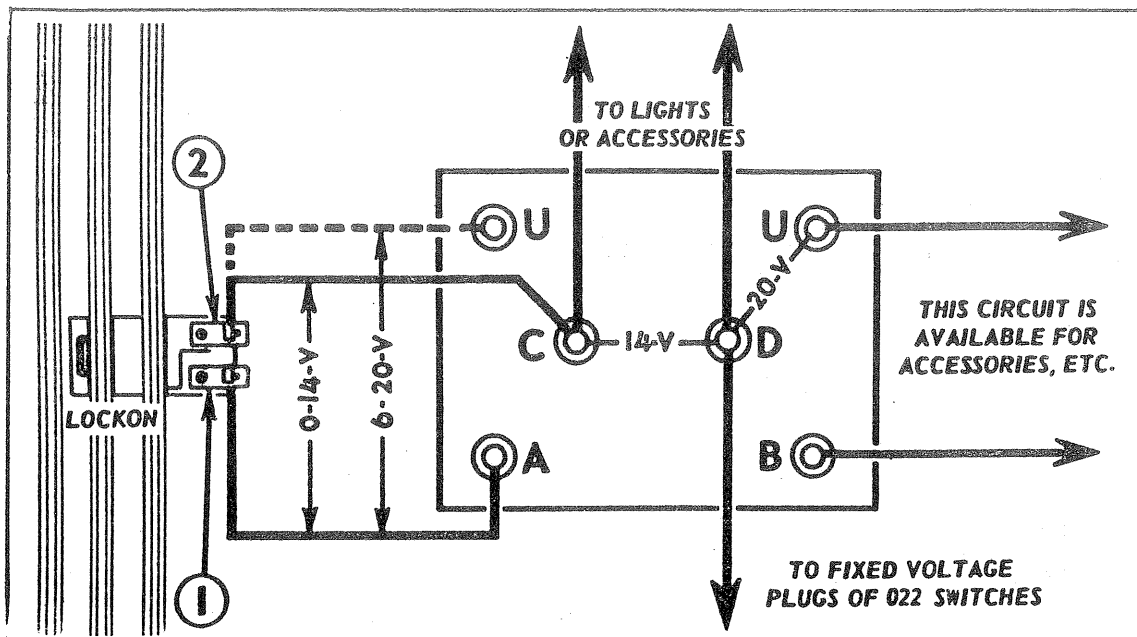


Figure 2—Connections for One-Train Layouts. If 0-14 Volt Range Is Too Low, Connect No. 2 Lockon Clip to Post U Instead of Post C, as Shown by Dotted Line.

## HOW TO CONNECT TRANSFORMER TO TRACK

In order to get the electric current from the transformer to the track a pair of transformer posts supplying variable voltage must be connected to the track. The connection to the track is generally made by means of a track lockon. The lockon is clipped onto a convenient section of straight track and its terminals are connected to the transformer posts by means of two lengths of insulated wire.

1. Strip the insulation from the ends of the two pieces of wire.
2. Wrap the end of one wire around one of the "U" posts and tighten the thumb nut. If you wrap the wire around the post in clockwise direction it will not slip out as you tighten the nut.
3. Connect the other end of this wire to No. 2 clip of the Lockon. This clip makes a connection to the outside or "ground" rails of the track. Push down the upper half of the clip until the metal loop projects through the slot on top. Insert bare end of the wire in the loop and release. Spring tension will hold the wire tight.
4. In the same manner connect either the "A" or the "B" transformer post to No. 1 clip of the lockon. No. 1 clip makes connection to center or "power" rail of the track.

## CONTROLLING LOCOMOTIVE SPEED

"KW" transformers are designed to operate and control two separate train layouts. Train speed is regulated by varying the voltage delivered to the track. This voltage control is accomplished by the two throttles on top of the transformer. Each throttle controls two different voltage ranges.

Throttle "A" controls the voltage of either the A-U (6-20 volts) or the A-C (0-14 volts) circuit.

Throttle "B" controls the voltage of either the B-U (6-20 volts) or the B-C (0-14 volts) circuit.

In most cases, the 6-20 volt range is the best to use.

## BLOWING THE TRAIN WHISTLE

The lever located between the two "Direction" buttons is the whistle control. Moving this handle so that the indicator points to "Whistle A" will sound the whistle on the train running on circuit "A"; moving the handle in the opposite direction will sound the whistle on the train running on circuit "B".

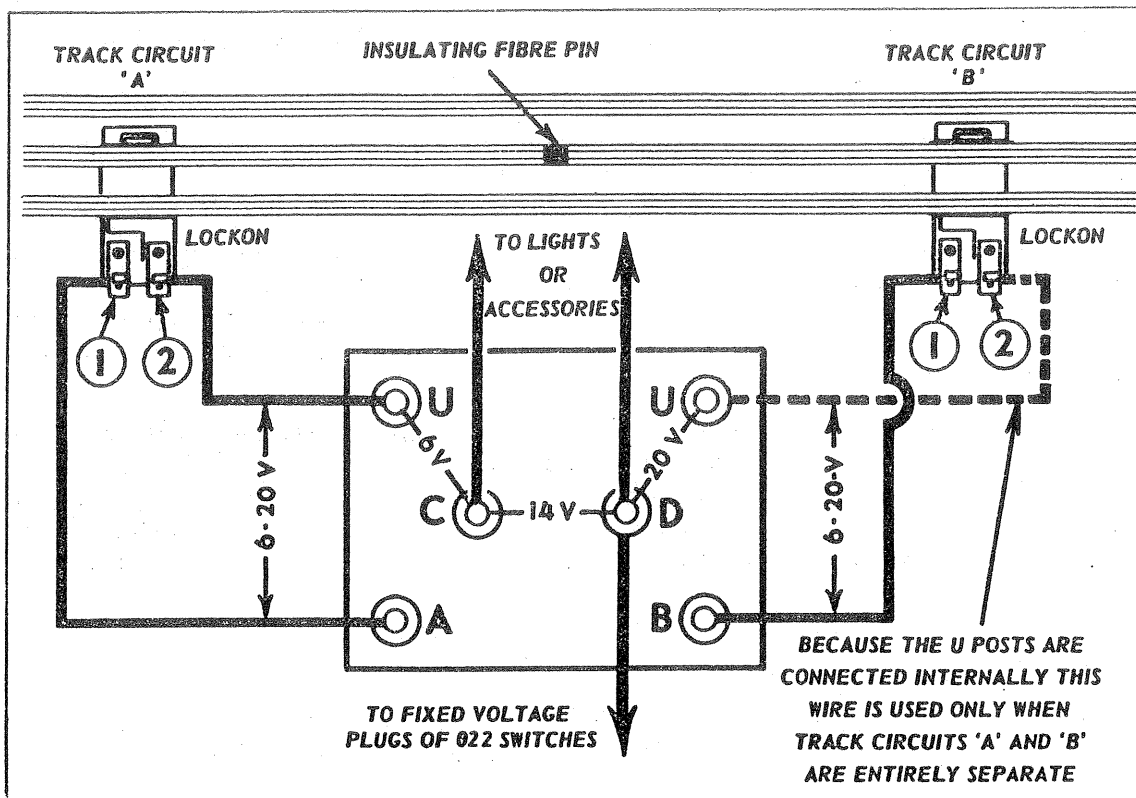


Figure 3—Transformer Connections for Layouts with Two Trains.

## REVERSING LOCOMOTIVES

The two "Direction" buttons located below the throttle handles operate the locomotive reversing "E-Units". The right hand button controls the locomotive running on the "A" circuit. The left hand button controls the locomotive on "B" circuit. The locomotive "E-Units" work in sequence: Forward, Stop, Reverse, Stop. Press the "Direction" button *once to stop* a moving locomotive and *twice to reverse* its direction.

## HOW TO CONNECT ACCESSORIES

While variable voltage supplied by transformer binding posts "A-U" and "B-U" is used for train operation, lights and accessory equipment work best on fixed voltage of approximately 14 volts. This voltage is supplied by binding posts "C-D". Of course, if you have but one train you can operate your accessories on the free variable voltage circuit, setting the throttle control at approximately 14 volts. Be careful, particularly in the case of illuminated accessories, not to set the voltage too high, or you will burn out the lamps. If you operate with the lowest voltage possible you will greatly extend the life of your lamps and other equipment.

If your layout contains No. 022 Switches, No. 456 Coal Ramp, or other track components which require fixed voltage having the same "ground" as the track, connect them to post "D" as shown in Figures 3 and 4.

In the event that you have several lights or other accessories all requiring the same voltage, it is possible to use the same transformer binding posts for all of them. A simple method for wiring a number of lights or accessories in "parallel" is shown in Figure 4. Two main "feeders" to the transformer and individual leads from the feeders to each accessory eliminate unnecessary wiring. If your railroad is operated on a table or platform, the feeders may be concealed by attaching them underneath the platform and boring small holes for the wires to

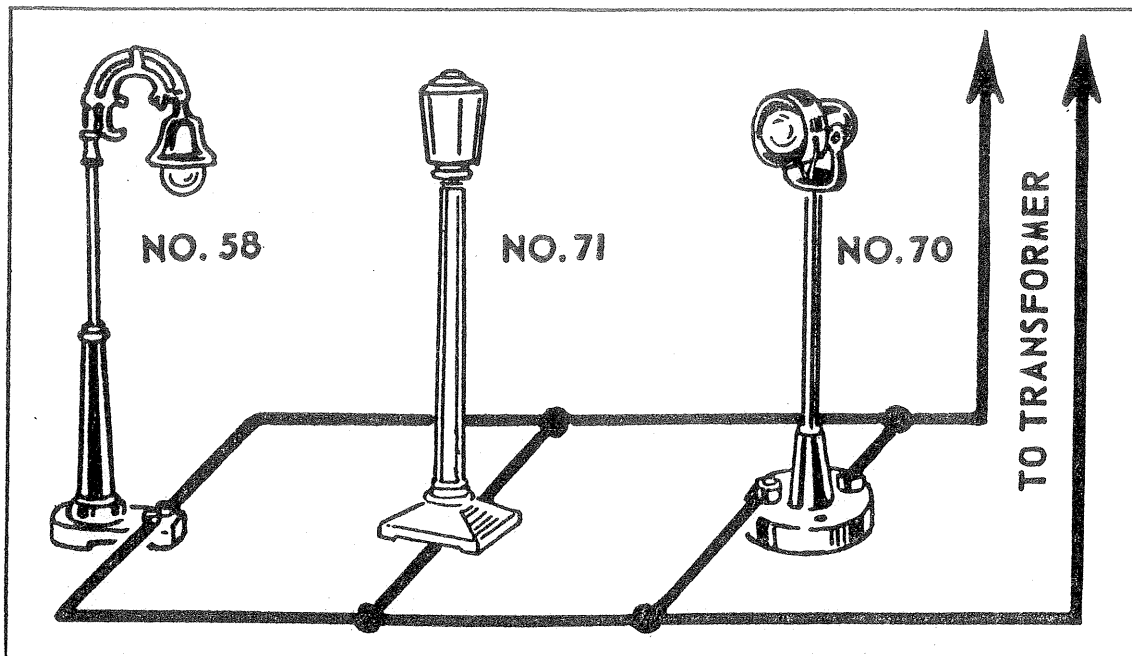


Figure 4—How to Connect Accessories in "Parallel".

each accessory. Remember that if two or more 14-volt accessories are wired together in "parallel", the voltage source required is still 14 volts, regardless of whether two, three or more accessories are so connected.

## HOW THE CIRCUIT BREAKER OPERATES

To protect the transformer from overheating and damage due to short circuits "KW" transformers are equipped with built-in automatic circuit breakers. Whenever the current drawn from the transformer exceeds a certain limit the red warning light flashes on and the circuit breaker opens, cutting off power to the track. In a few seconds the circuit breaker automatically closes and the red light goes off. If, however, the short circuit which caused the overload still exists, the red light will go on again and the circuit breaker will reopen. This sequence will continue without damage to the transformer until the cause of the short circuit has been removed.

A short circuit is caused by a direct connection between the center rail and one of the outside rails. A derailed car or locomotive is the most frequent cause of short circuits so make sure that all the wheels of locomotive and cars are properly set on the rails. If your layout shows a short circuit even after all the rolling stock has been removed from the rails it is probably due either to incorrect wire connections or to broken insulation on the power rail.

It is important to understand that the purpose of the circuit breaker is to protect the transformer itself. It operates only if the transformer is overloaded. It is possible, therefore, particularly in very large layouts, for the track to be "shorted" without causing the circuit breaker to operate or the red light to flash. In this case, although the transformer voltage may drop below the operating point of the trains, the transformer will not be injured because it is not being overloaded beyond its safe limit.

**NOTE:** After your transformer has been operating for a while you will find it warm to the touch. It is the nature of all electrical power equipment to become warm when in use.

**WARNING:** Do not attempt to blow the whistle while there is a short circuit or you may damage the whistle controller.

## HOW TO OPERATE A TWO-TRAIN LAYOUT

Figure 5 shows an "O" gauge layout for running two trains independently. In order to operate two trains in this manner, the layout must be "sectionalized", that is, one loop insulated from the other loop by fibre pins at each of the points indicated by dots. Each loop is controlled by a separate throttle lever, while the accessory binding posts are used for switches and other accessories which may be in the railroad system. Although this layout shows seven

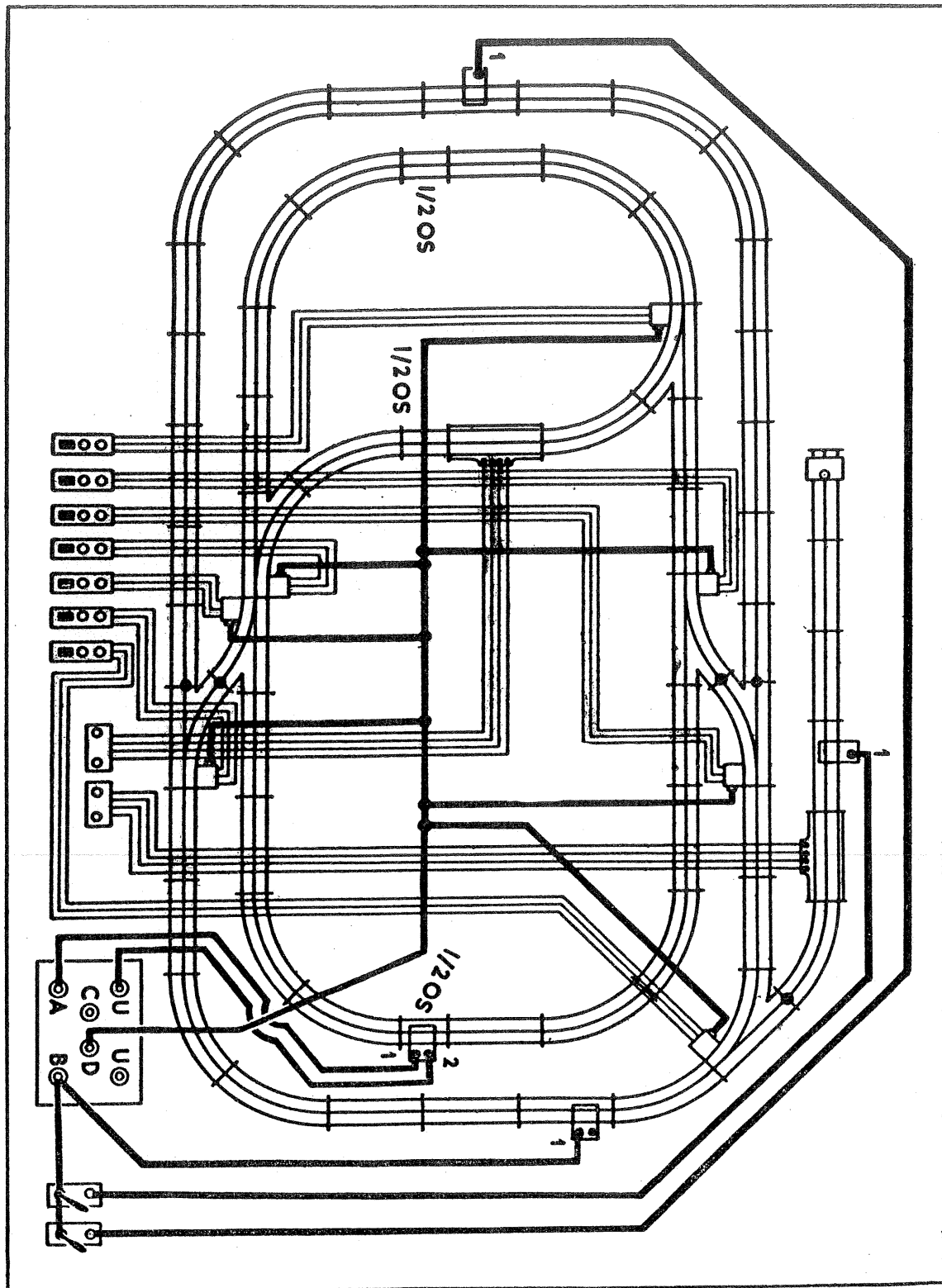


Figure 5—A Typical "O" Gauge Layout for Operating Two Trains. Track needed: 33 sections straight track, 3 half-sections straight track, 18 sections curved track, 4 right hand switches, 3 left hand switches, 2 remote control sections, 1 bumper.

switches, three of these may be eliminated by leaving off the siding in the upper right of the diagram, and the connecting track in the center of the inside loop. Each switch has its own controller. For convenience all controllers should be mounted on a centrally located panel board. Two sections of remote control track used for uncoupling and for unloading are also shown on the layout.

When crossing from one loop to another it is important that the voltages supplied to the inner and the outer loops are approximately equal. This is done by setting both throttles at the same voltage. Unless this is done, the contact rollers of the locomotive crossing the insulating pins which separate the two circuits will bridge two dissimilar voltages causing a short circuit and stopping the train.

In the lower right hand corner of the diagram are shown two switches. The purpose of the left hand switch is to cut the current in or out of the siding, as desired. The other switch sectionalizes the left half of the outside loop. It will be convenient when you desire to stop a train on the left half of the outside loop while a second train crosses over from the inside loop to the right half of the outside loop.

## **SERVICE INFORMATION**

This transformer was inspected at the Factory and is in perfect operating condition. Like all Lionel products it is guaranteed against defects in material and workmanship to the extent that if any such transformer is returned to the Lionel Corporation or to any of its Authorized Service Stations within one year of the date of purchase it will be repaired or replaced.

If in the future it should ever require servicing, you may either send it to the Factory Service Department or to the nearest Lionel Approved Service Station listed in the back of the Instruction Book.

If you decide to mail the transformer to the Factory, be sure to pack carefully to avoid damage in transit. Use the original box, if possible, and enclose in another corrugated box or strong container. A letter in a stamped envelope stating fully the service desired must be pasted to the outside of the wrapper. Postal regulations do not permit any written instructions to be placed inside of the package.

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