



MAINTENANCE INSTRUCTION

PNEUMATIC CONTROL (PC) SWITCH

DESCRIPTION

Generally, all locomotives with the exception of switchers (optional equipment), are equipped with an important protective device called a pneumatic control or PC switch, Fig. 1. It is used in connection with the air brake system to provide one or a combination of protective functions depending on application or customer requirements.

The main components of the PC switch are:

1. Diaphragm
2. Actuating linkages
3. Electrical contacts

The oil resisting diaphragm, Fig. 2, is acted upon by air pressure from piping connected at the 3/8" coupling at the bottom of the switch. The diaphragm in turn transmits this force to a system of spring loaded arms and levers.

The main pressure spring, Fig. 2, may be adjusted by means of the nut at the top to close (or open) the electrical switch contacts at the desired air pressure.

A differential spring and cam lever assembly, mounted inside the switch on the left side, is designed to hold the electrical contacts in the "picked up" position until air pressure on the diaphragm has dropped to the desired "drop out" value. The differential spring may also be adjusted

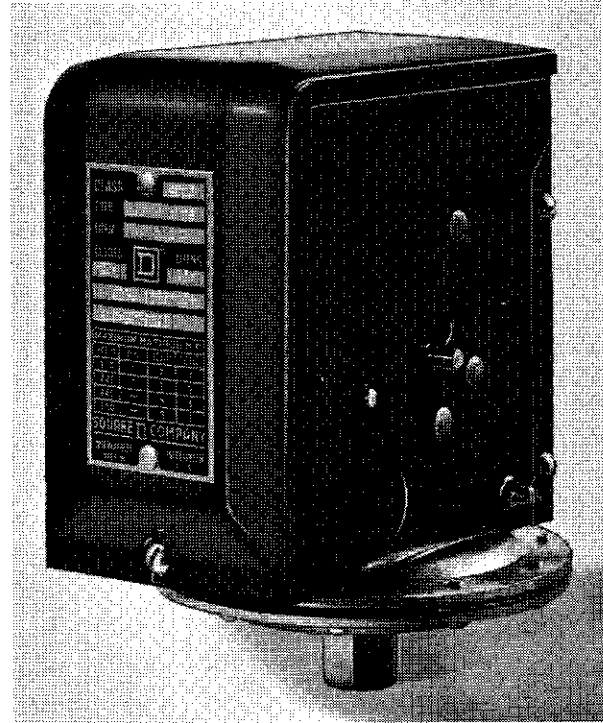


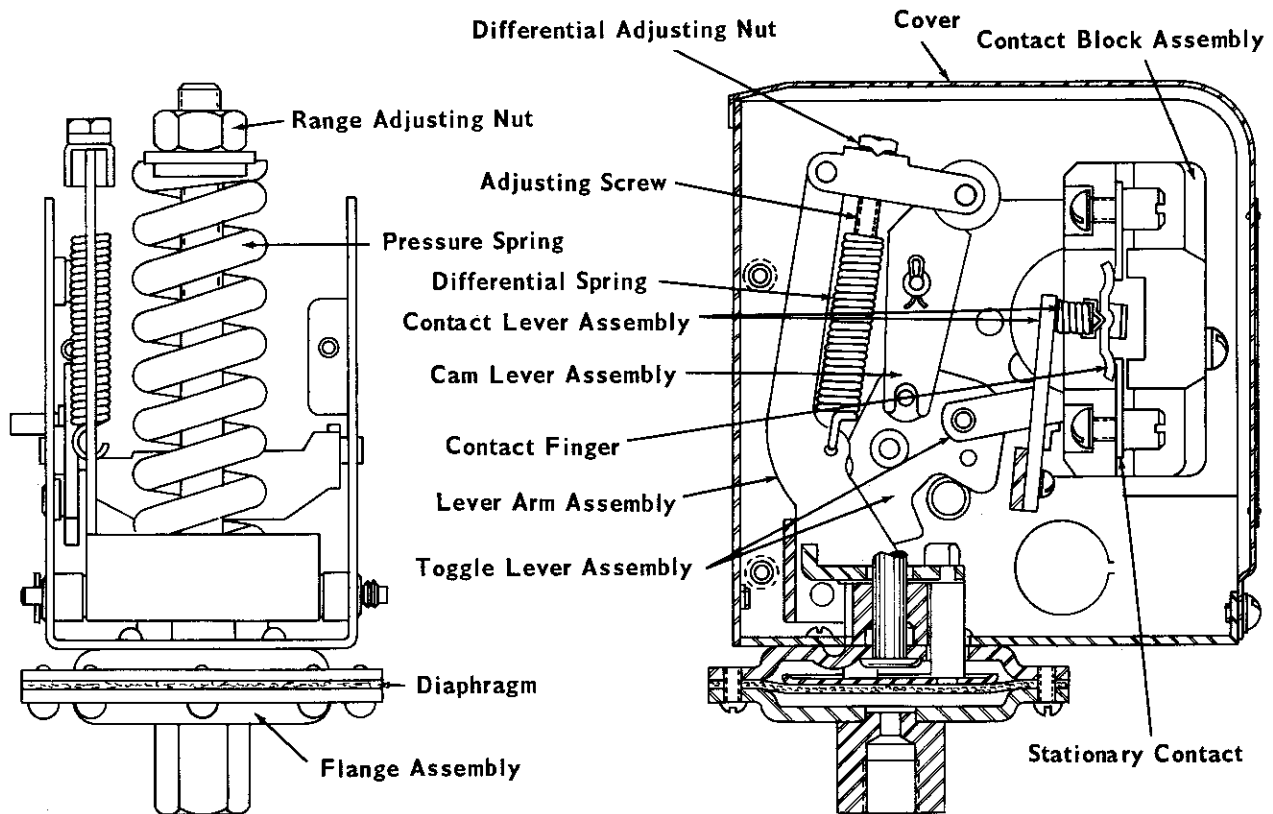
Fig. 9 — Pneumatic Control Switch 8442

by means of the nut provided at the top, rear of the switch.

The various switches and their respective operating pressures are tabulated in the Maintenance Data section of this instruction.

Depending on switch type and application, the electrical contacts may be either normally open or normally closed. These contacts are of silver alloy material which will ensure long life with a minimum of attention. The contacts change position (open or close) through action of a spring

*NOTE: Information contained herein is applicable to equipment being produced as of the date of publication.



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Fig. 2 — PC Switch - Cross-Section

loaded contact finger assembly which the toggle linkage of the switch assembly acts upon in response to air pressure on the diaphragm.

OPERATION

The PC switch is employed in a locomotive air brake system to initiate protective action, such as reducing diesel engine speed to IDLE, when one or more of the following air brake applications are made.

SERVICE SAFETY APPLICATION

1. Locomotive Overspeed
2. Foot Pedal
3. Train Control

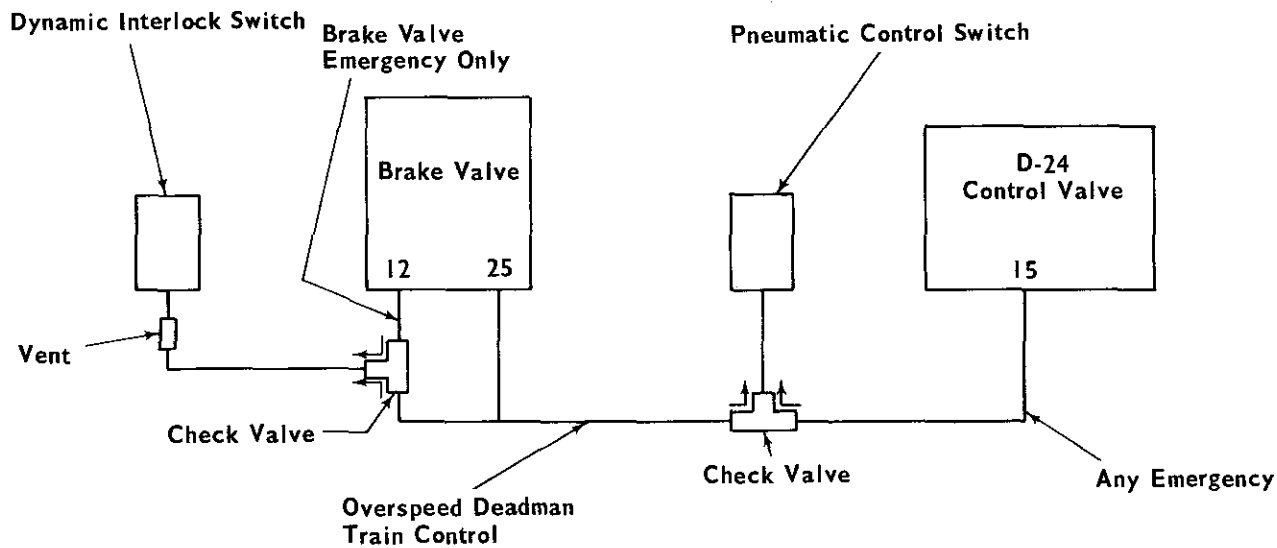
EMERGENCY APPLICATION

1. Brake Valve
2. Conductor's Valve
3. Break-In-Two

Customer preference and the type of air brakes employed dictate the air pressure settings, contact arrangement, the air brake applications that will actuate the switch, and the protective action to be initiated. This, of course, means many possible arrangements which cannot all be covered in this instruction. The following paragraphs outline one commonly used arrangement and is offered here for purposes of clarity of description and should not be taken as fact for every Electro-Motive locomotive unit. For specific operating details, refer to the wiring diagram and air piping diagram for the locomotive unit in question.

PC SWITCH PICK-UP

The typical air piping schematic, Fig. 3, illustrates the air brake piping connections to the PC switch. Any emergency air brake application will introduce pressure



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Fig. 3 - Air Schematic

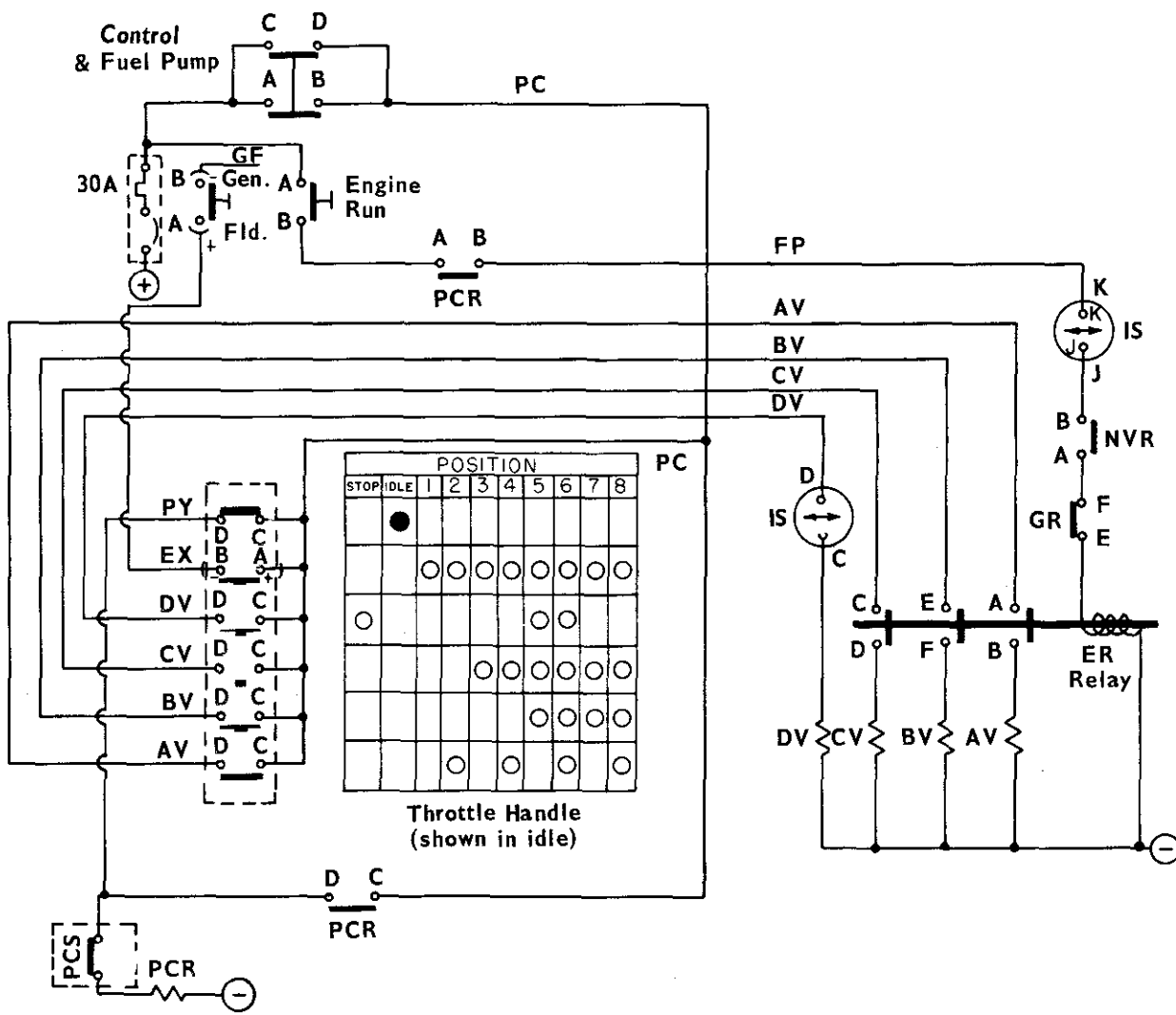


Fig. 4 - Pneumatic Control Circuit

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on the PC switch diaphragm through the No. 15 pipe and any safety control application will do the same through No. 25 pipe.

Assuming that the electrical contacts are normally closed, Fig. 4, pressure on the PC switch diaphragm in excess of established setting will open these contacts. This in turn opens the circuit to the Pneumatic Control Relay (PCR), the AB interlocks of which now will open to break the FP circuit. As a result, the Engine Run Relay (ER) is de-energized and its interlocks open to break the throttle to governor circuits thus de-energizing the AV, BV, and CV governor solenoids. The engine speed will now be reduced to IDLE.

NOTE: Since the DV governor solenoid is not affected by the ER relay, tripping of the PC switch will cause the engine to shut down in instances when the throttle is in the 5 or 6 position.

PC SWITCH RESETTING

In order to regain normal locomotive operation and throttle control, it is necessary that the PC switch be reset and the PCR and ER relays again be energized.

The following steps are necessary to reset the PC switch:

1. Eliminate the cause of air brake application and then recover the air brakes. The brake valve should be placed in the "lap" position and the PC switch will reset itself when application pipe pressure raises to a sufficient level. This is true when the original tripping was caused by a safety control application.

Under instances where tripping of the PC switch was caused by an emergency air brake application an

additional step is necessary. This consists of placing the brake valve in "lap" position and leaving it there until application pipe pressure builds up where a pronounced air exhaust will be heard. At this time, the brake lever should be placed in running position after which the PC switch will automatically reset.

2. To regain the necessary electrical functions, the PCR and ER must be energized. This is accomplished by placing the throttle in IDLE which will establish a circuit from the PC wire to the PY wire through the controller idle switch. The PCR is now energized and will establish its own holding circuit through closing of the PCR-CD interlock. The ER relay is also energized and the engine governor will again respond to throttle control.

MAINTENANCE

The PC switch has been carefully designed and manufactured to provide long life and trouble free operation. Inspection of switch operation should be made, however, at intervals specified in the Scheduled Maintenance Program. Such attention will ensure continued satisfactory operation.

ELECTRICAL CONTACTS

The electrical contacts are made of a silver alloy material which do not require cleaning or dressing even though they appear blackened. When the contacts are worn to base metal they may be replaced either individually or as a complete stationary or movable assembly.

Upon removal of the switch cover all contacts can be easily inspected or replaced by first removing the ceramic insulating block to expose them. This is

done by removing the two machine screws that hold the block to the switch housing.

The stationary contacts are in the block and are individually held in place by a machine screw and nut which also serves as a terminal for external circuit connections.

The bridge type movable contacts are spring loaded and may be easily removed from their guides by depressing the spring and turning the contact sideways.

DIA PHRAGM

During periodic inspections, the diaphragm should be inspected for wear, cracks or other indications of deterioration. Replacement is readily accomplished by removing the 8 machine screws which hold the lower half of the connecting flange and diaphragm in place.

PICKUP PRESSURE ADJUSTMENT

Should it be necessary to adjust the pressure at which the switch picks up or functions, this can be done by means of the adjusting nut provided, Fig. 2. Turning this nut clockwise will increase the spring pressure on the diaphragm which will in turn then require a greater air pressure to actuate the switch. Turning

the adjusting nut in the opposite direction will serve to lower the pressure requirements for switch operation.

DROPOUT PRESSURE ADJUSTMENT

The pounds pressure between "pickup" and "dropout" is referred to as the differential. The dropout pressure or differential can be adjusted when necessary by means of the nut provided, Fig. 2. Turning this nut downward will increase spring pressure and differential. To reduce the differential, the nut can be backed off.

NOTE: Extreme changes in differential may not be possible on a given switch due to the springs used. When such changes are required, new springs may have to be applied to accommodate operation in the range desired.

LUBRICATION

During periodic inspections, one drop of light engine oil should be applied to each of the moving parts in the actuating linkage.

The PC switch cover should be kept in place at all times to protect the switch components from dust and dirt.

MAINTENANCE DATA

<u>Part Number</u>	<u>Contact Arrangement</u>	<u>Opening Pressure</u>	<u>Closing Pressure</u>
8117872	2 N.O.	20 lbs.	35 lbs.
8340775	2 N.C.	40 lbs.	20 lbs.
8350391	2 N.O.	20 lbs.	35 lbs.
8369622	1 N.O. - 1 N.C.	42 lbs.	30 lbs.

Litho in U.S.A.