PROTECTOR BLOCKS
GENERAL

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1. GENERAL

1.01 This section covers the use and maintenance of the more common types of protector blocks.

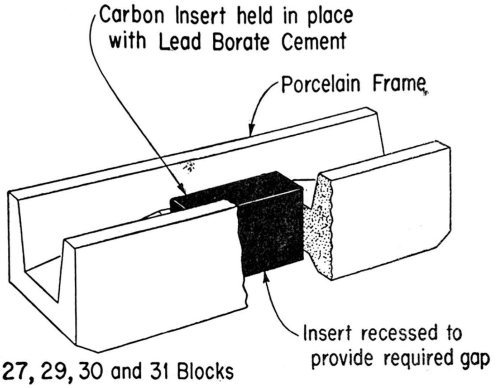
1.02 Protector blocks usually consist of a pair of carbon blocks, which, when installed in a suitable protector mounting, provide a small air gap between a line conductor and ground. This gap provides a low impedance path to ground when abnormally high voltages are applied to the line, such as might result from lightning or from contacts between telephone conductors and power wires.

1.03 Protector mountings for use with the protector blocks discussed in this section are described in other sections pertaining to the individual mountings.

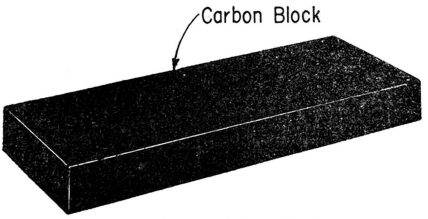
2. TYPES OF PROTECTOR BLOCKS

Rectangular Type

2.01 The rectangular type protector block is illustrated below:



27, 29, 30 and 31 Blocks



26 and 28 Blocks

2.02 Some of the uses of this type of block are in the 83A, 84A and 87A mounting assemblies and in the 104A and 108A mountings.

2.03 One of the blocks is made entirely of carbon and the other of porcelain with a small carbon insert. When installed in a protector mounting, the carbon block is in contact with the ground electrode; and the carbon insert of the porcelain block is in contact with the line terminal through a protector spring which holds the assembly in place.

2.04 Characteristics of the blocks are listed in Table 1.

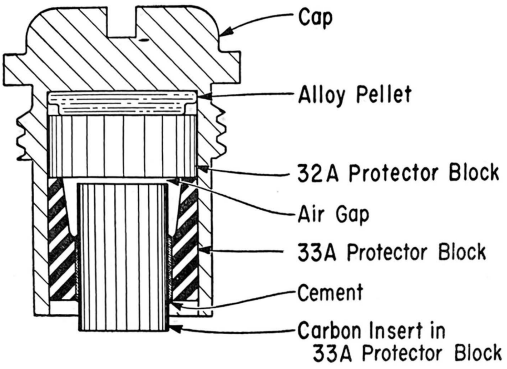
TABLE 1

Code Designation	Gap	60-Cycle R.M.S. Breakdown Voltage	Color Code on Porcelain	Common Use
26*-27	.003 in.	350	White	C.O. and Station Prot.
28*-29	.003 in.	350	White	C.O. Protection
26*-30	.006 in.	700	Blue	Cable Protection
26*-31A	.010 in.	1000	Yellow	Special Applications

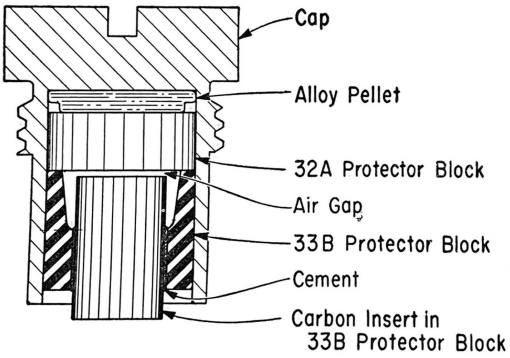
* The 26 and 28 blocks are carbon.

Cylindrical Type

2.05 There has recently been developed a cylindrical type of protector block assembly of the general appearance shown in the illustrations below. The principle of operation is similar to that of the rectangular blocks just described. A cylindrical carbon insert is held in position in a porcelain block by means of lead borate cement and forms the line electrode of the protector. The ground electrode is a circular carbon disc which rests on a lip of the surface of the porcelain block at the required separation from the cylindrical carbon insert. This circular carbon disc is in contact with the cap which is grounded. Continued excessive current through the gap causes the cement to melt, allowing the cylindrical carbon insert to be pushed into solid contact with the carbon disc under the action of a spring provided in the mounting.



107 B Protector



107 C Protector

2.06 Characteristics of the blocks are listed in Table 2:

TABLE 2

Part	Code Designation	Gap	60-Cycle R.M.S. Breakdown Voltage	Color Code on Porcelain	Proposed Use
Carbon Disc	32A				
Porcelain Assembly	33B	.003in.	350	White	Station Protection
Porcelain Assembly	33A	.006in.	700	Blue	Cable Protection
Assembly of 32A & 33B in Capsule	107C	.003in.	350		Station Protection
Assembly of 32A & 33A in Capsule	107B	.006in.	700		Cable Protection

2.07 This type of protector block is currently used in the NC (protected) cable terminal and in the 111 type protectors.

Note: Since the cylindrical type of protector block is replaced when operated, the remainder of this section (covering inspection, maintenance, etc.) pertains to the rectangular type of block only.

3. PRECAUTIONS

3.01 If there is any reason to believe that a power contact has occurred, make a check from the ground to be certain that safe working conditions exist before performing any work at a protected terminal or protector mounting location.

4. PLACING PROTECTOR BLOCKS

4.01 Place rectangular porcelain and carbon blocks by holding the assembly firmly by hand and pressing into place in the protector mounting so that the protector spring rests squarely against the carbon insert of the porcelain block. Avoid sliding motion between the blocks as any loosened carbon particles are a potential service hazard.

5. INSPECTION AND MAINTENANCE

5.01 Both the porcelain and carbon blocks shall be handled carefully and shall not be placed indiscriminately into containers. They shall be kept either in the original shipping cartons or in approved holders, such as the 3A Holder.

5.02 When porcelain and carbon blocks are removed from the protector mounting to clear trouble or for any other reason, they shall be inspected and cleaned as covered in 5.03 to 5.05.

5.03 Inspect porcelain and carbon blocks for indications of chips and cracks. One side of the carbon block may show sufficient pitting to cause rejection of the use of that side, but if the reverse side appears satisfactory, the latter side of the block should be utilized. Reject porcelain blocks if subject to any of the following defects:

(a) Porcelain blocks which have both walls of the spring groove chipped at the same end.

(b) Porcelain blocks which have any chip or crack in the porcelain that extends to the carbon insert.

(c) Porcelain blocks which show evidence that the carbon insert has moved.

5.04 Clean porcelain and carbon blocks which pass inspection outlined in 5.03 by brushing with a No. 351 tool.

5.05 After the porcelain and carbon blocks have been cleaned, they shall be inspected for further evidence of defects, as follows:

(a) Do not reuse any blocks which cannot be cleaned free of dirt or other foreign matter.

(b) Do not reuse any blocks in which the carbon sparking areas are glazed, scratched or cracked, or show signs of soft or unduly roughened spots on those areas.

6. OPERATED PROTECTOR BLOCKS

6.01 Study of protector blocks indicates that the degree of pitting or blackening depends upon the number and intensity of lightning discharges and on the duration and intensity of power arcing.

6.02 **Lightning,** although of very high voltage, is generally applied for a very short period of time, and causes slight pitting and blackening of the protector blocks. The damage is usually not sufficient to render the blocks unfit for further service.

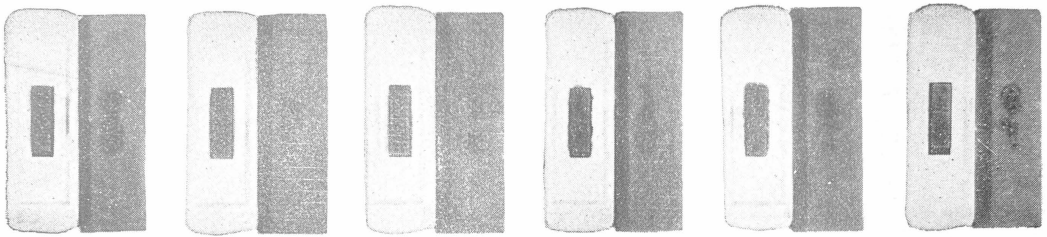
6.03 Protector blocks operated by lightning to the extent of very heavy pitting or blackening indicate that the plant has been exposed to frequent or severe lightning discharges. Such information may be useful in the investigation of cable troubles resulting from lightning.

6.04 **Power** may be of low voltage and generally is applied for a much longer period of time than lightning, the effect being to make deep pits with whitish deposits or to ground the blocks permanently. Blocks thus damaged by power are usually unfit for further service.

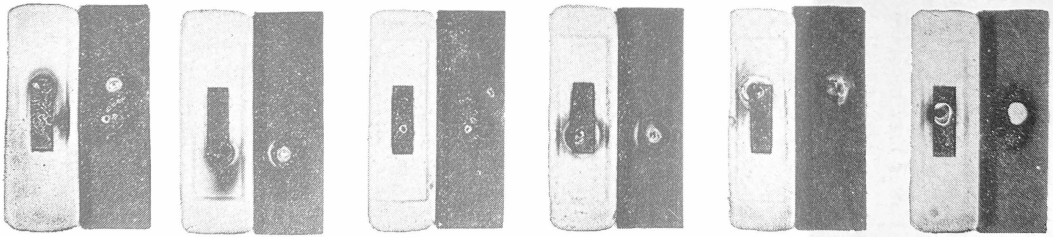
6.05 Protector blocks operated by power are indicative of an irregular plant condition. It is important, therefore, in order to take the necessary action to preclude further trouble, to make a careful inspection for direct or swinging contacts or inadequate separations between telephone and electric plant. Any cases where protector blocks are operated by power for which the cause has not been determined should be reported to your supervisor for further investigation.

6.06 **Moisture** may also cause deterioration of carbon protector blocks. At damp locations, moisture may accumulate between the protector blocks and establish a high resistance path for current. Electrolytic action will cause the carbon to soften and crumble and small particles of carbon will eventually bridge the gap between the two blocks, placing a permanent ground on the line. A cavity results, rendering the carbon blocks unfit for further service. The associated porcelain block with the carbon insert is not affected and remains serviceable.

6.07 The following illustrations show blocks that have been operated by lightning or power:

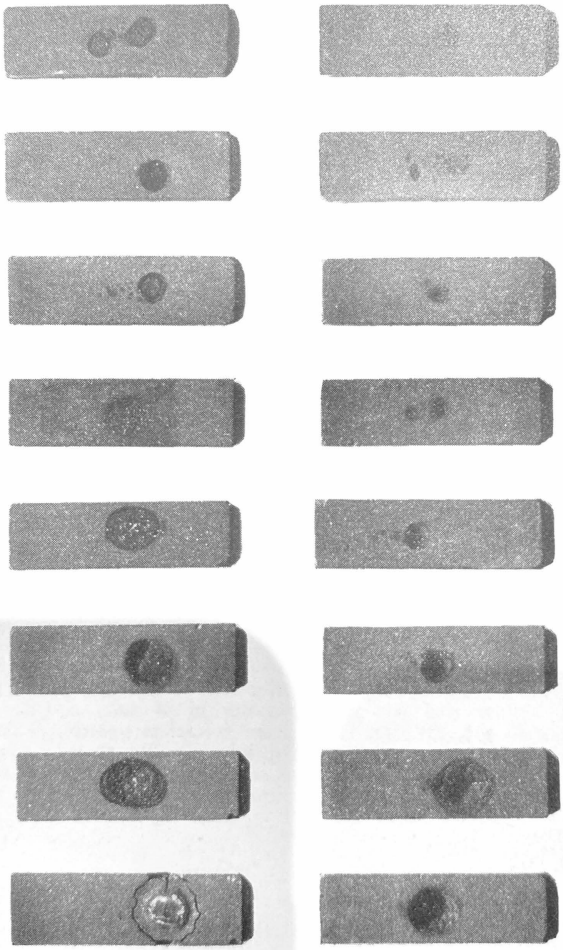


PROTECTOR BLOCKS OPERATED BY LIGHTNING



PROTECTOR BLOCKS OPERATED BY POWER

6.08 The following illustrations show blocks that have been deteriorated by moisture:



PROTECTOR BLOCKS DETERIORATED BY MOISTURE