INSTRUCTIONS

IMPULSE COMMUTATED INVERTERS

INTRODUCTION

The following explanation is intended as an aid in trouble-shooting and maintenance. It does not purport to cover all details or variations in the equipment nor to provide for every possible contingency which might be met in connection with its installation, operation or maintenance.

POWER CIRCUIT

Inverter power circuits are either six or twelve phase depending upon the inverter size and permissible harmonic content in the output voltage. Twelve phase inverters consist of two semi-independent six-phase inverters whose output voltages are added in series.

Each six-phase inverter consists of six pairs of controlled rectifiers which connect the output transformers to the input d-c bus as shown in Fig. 1.

If controlled rectifiers 1 and 1' are gated or fired so as to be in a permissible conducting state at the same time, the d-c bus voltage will be impressed across the associated output transformer primary winding a-a'. Likewise, when rectifiers 4' and 4 are gated simultaneously, the d-c bus voltage will be impressed in the reverse direction across the same winding. When associated pairs of controlled rectifiers are gated in turn for 180-degree periods, the voltage impressed on the output transformer primary will be a series of square waves as shown in Fig. 2.

A voltage is impressed on the primary of the output transformer when pairs of rectifiers (1 and

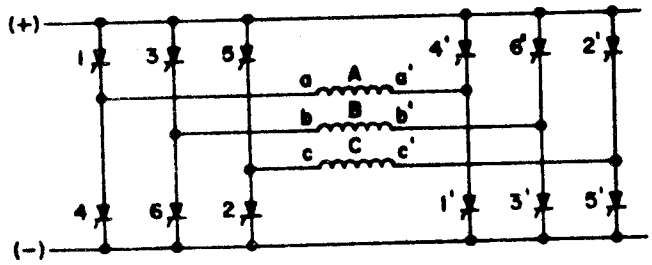

Fig. 1. Six-phase inverter showing controlled rectifiers and transformers primary connections

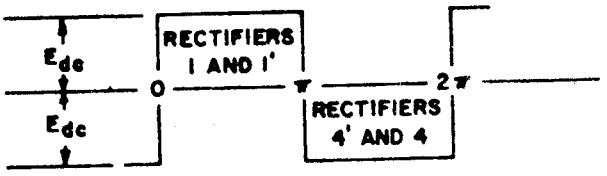

Fig. 2. Square waves on primary of output transformers

1' or 4' and 4) are gated simultaneously. When the rectifier pairs are gated for 180-degree periods which do not coincide, the voltage impressed on the output transformer primary will consist of alternating square-wave pulses of less than 180 degrees in width as shown in Fig. 3.

As the angle α (the gating delay of the second pair of rectifiers 1' and 4') is increased, the width of the resulting voltage square waves impressed on the output transformer primary is reduced. The resulting output voltage is therefore reduced. Thus, voltage control is accomplished by retarding the gating or conduction period of one pair of rectifiers with respect to the other pair.

The operation described above has covered only the waveshape impressed on the primary of output transformer A (Fig. 1). The primaries of output transformers B and C are energized by gating their associated rectifiers in a similar manner. When the rectifiers are gated in the proper sequence, and

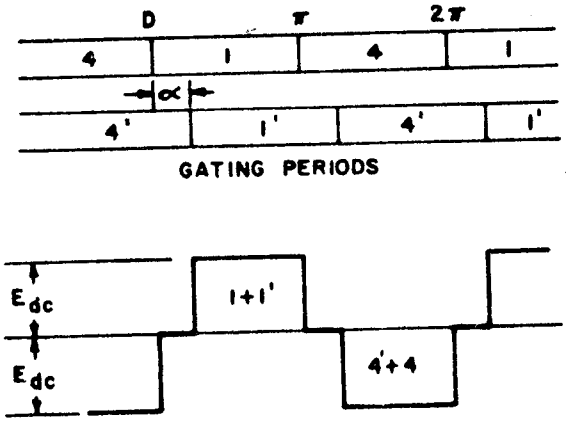

Fig. 3. Square waves when associated rectifiers are delayed by angle α

Waveshapes of 12-phase Inverter Voltage With Various Retard and Pulse Width

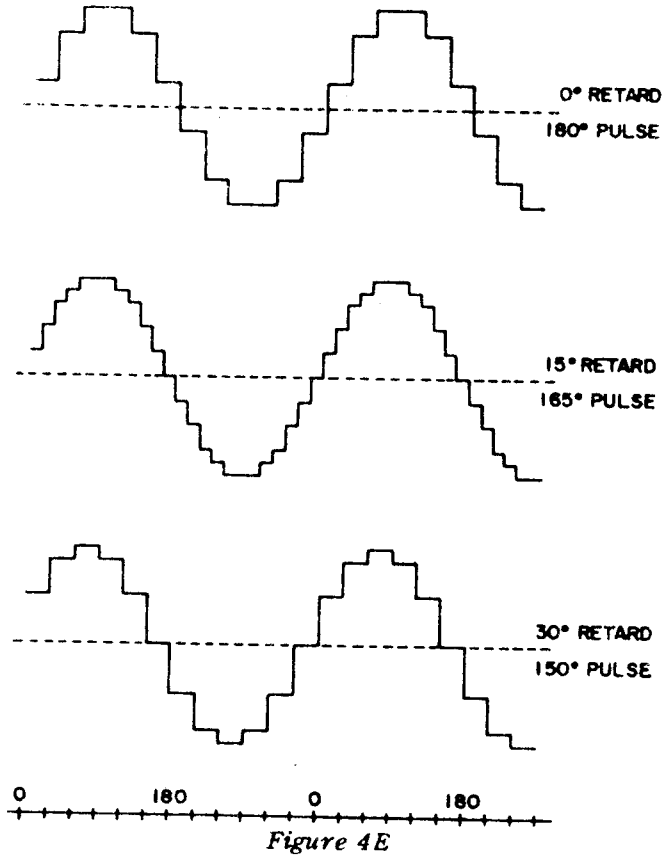

Figure 4E

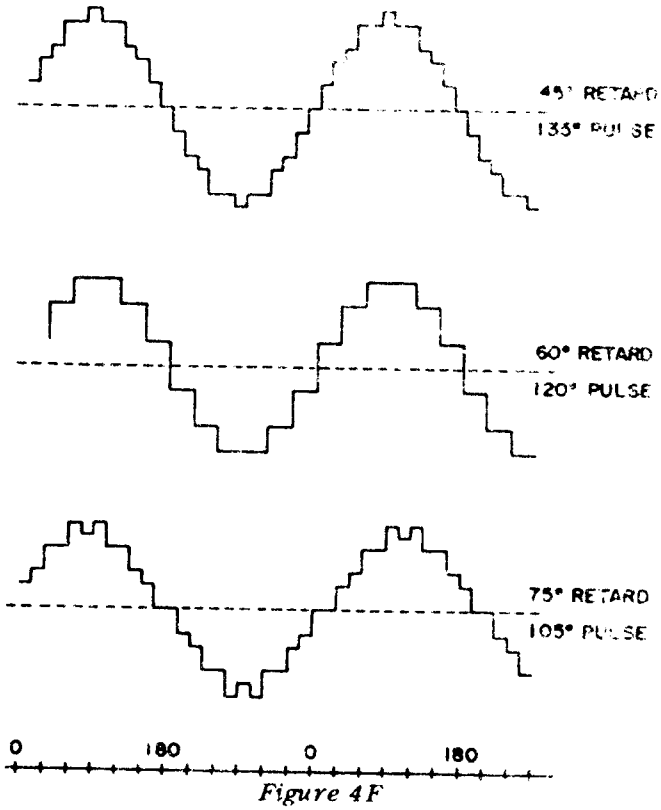

Figure 4F

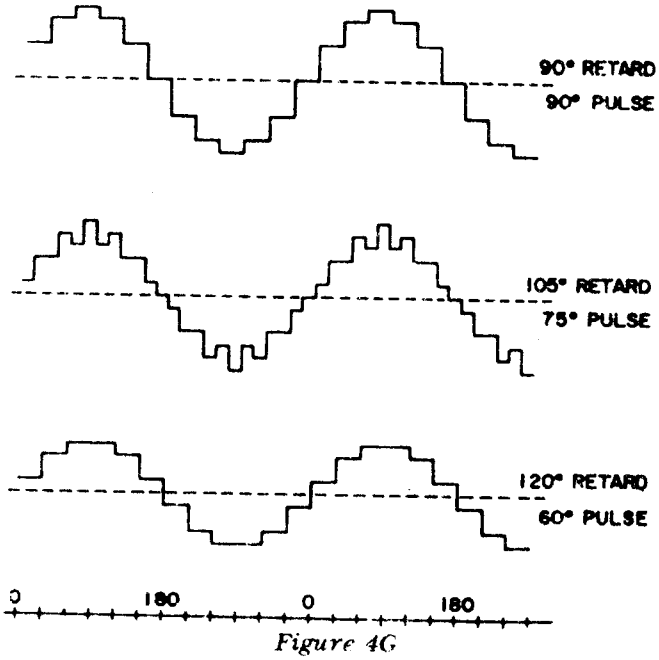

Figure 4G

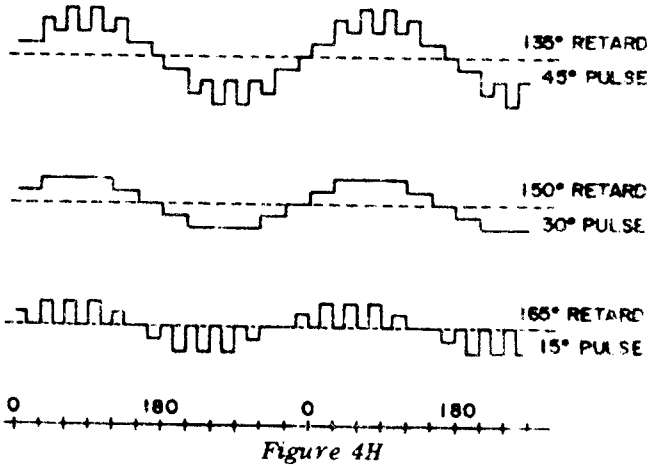

Figure 4H

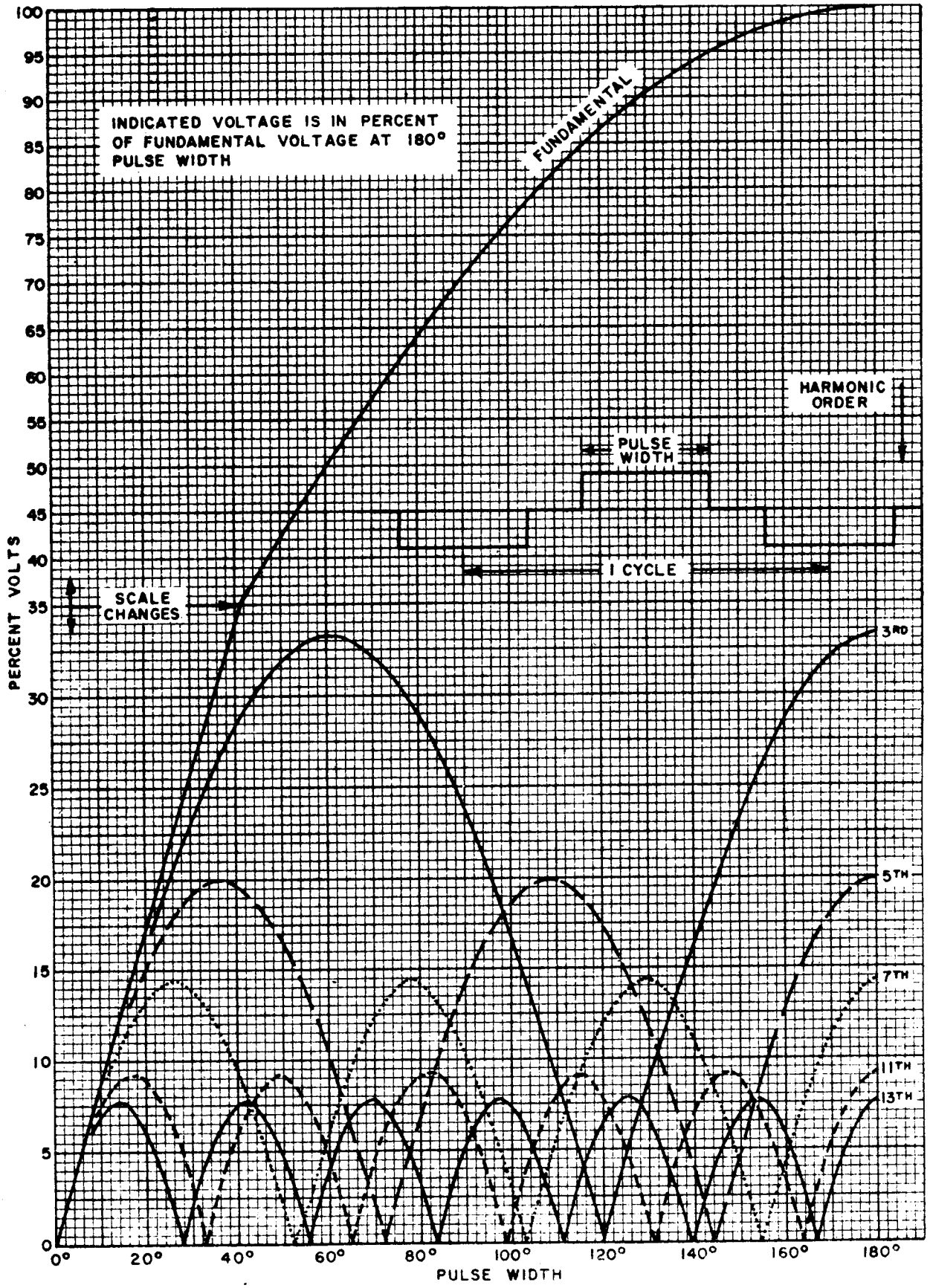

Fig. 5. Harmonic content of inverter output voltage (at 180-deg pulse width)

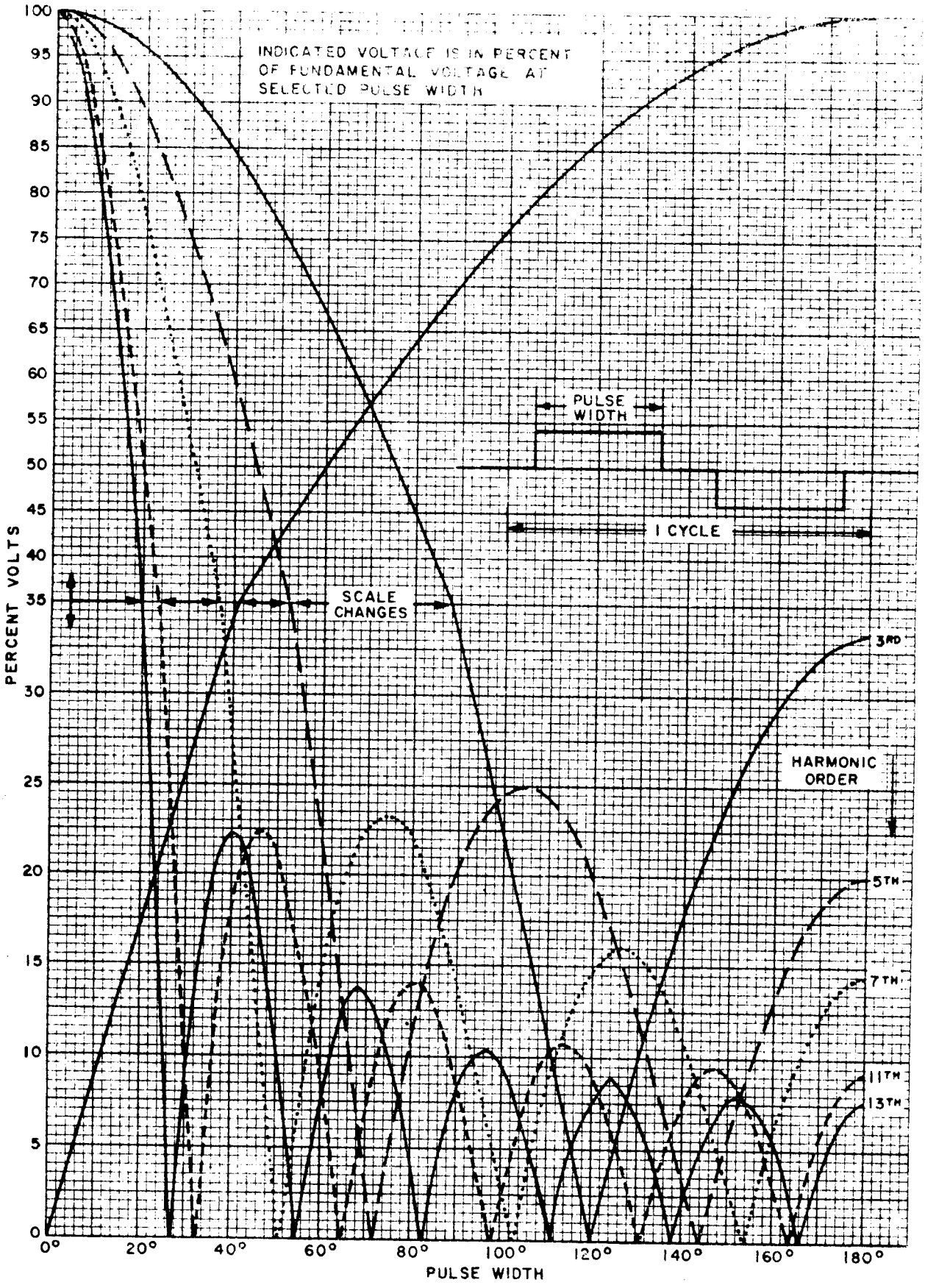

Fig. 6. Harmonic content of inverter output voltage (at selected pulse width)

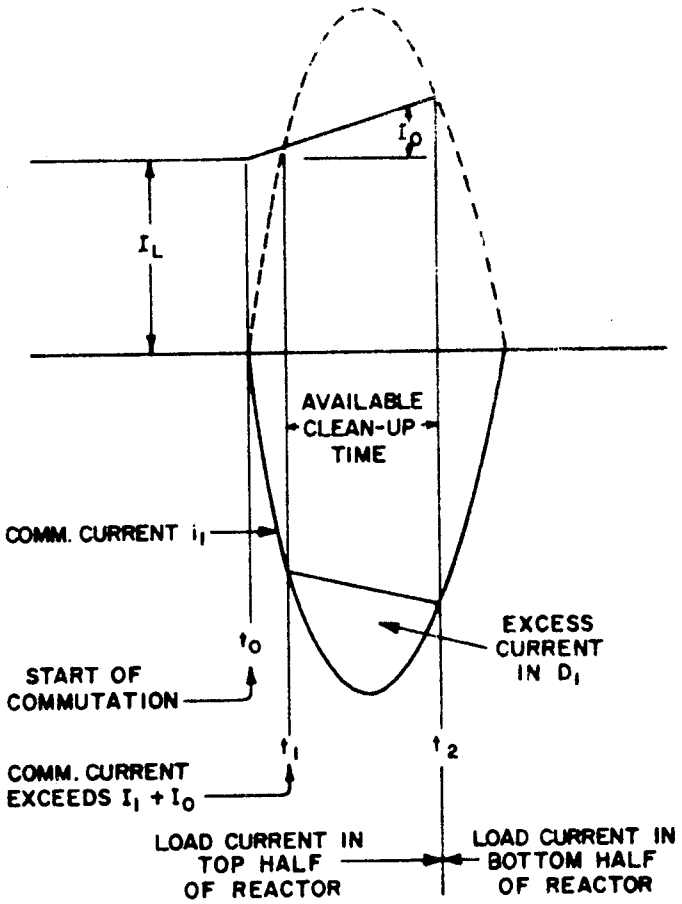

Fig. 9. Relationship between current commutated and clean-up time

SWITCHGEAR DEPARTMENT

GENERAL ELECTRIC

PHILADELPHIA, PA.