

PROTECTION STANDARDS APPLICABLE TO SWITCHING EQUIPMENT

A. Bremond

1. INTRODUCTION

The purpose of this document is to summarize the main telecommunication standards with regard to the protection requirements against two types of overvoltage :

- lightning surges
- power crossing perturbations

Each country publishes its standard, which can be summarized by the times t_1 and t_2 , the peak voltage of the wave and the surge generator diagram. Table 1 gives on inexhaustive list of the standards .

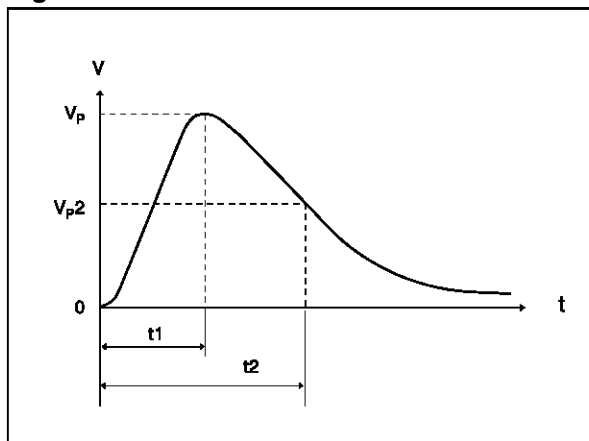
Table 1 : Lightning surge standards

2. LIGHTNING SURGES

The lightning overvoltage is simulated by a biexponential wave, which is defined by the rise time t_1 and the duration t_2 between the start and the time at which the falling edge crosses half the peak value (fig.1)

COUNTRY	AUTHORITY	WAVEFORM (μ s)
ENGLAND	BRITISH TELECOM	10/700
FRANCE	PTT	0.5/700
GERMANY	BUNDESPOST	10/700
ITALY	SIP	10/700 1/1000
SPAIN	COMPANY TELEFONICA DE ESPANA	1/1000
SWEDEN	TELEVERKET	10/700
SWITZERLAND	PTT - BETRIEBE	10/700 1.2/50
USA	BELL	10/1000 10/360 2/10
	FCC	10/560 10/160 2/10

Figure 1 : Standard wave



APPLICATION NOTE

The following figures give the schematics of the surge generators mainly used :

Figure 2 : 10/700 μ s wave generator

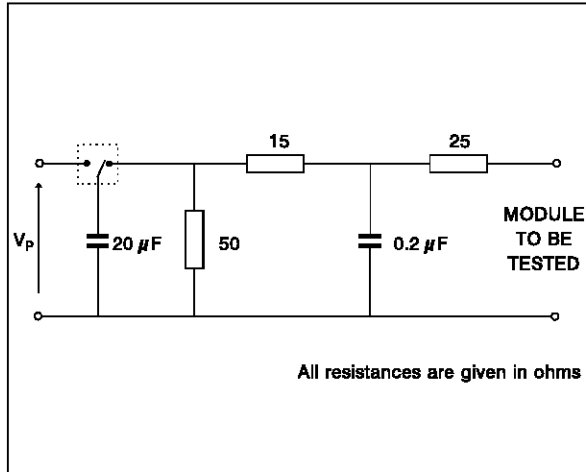


Figure 3 : 1.2/50 μ s wave generator

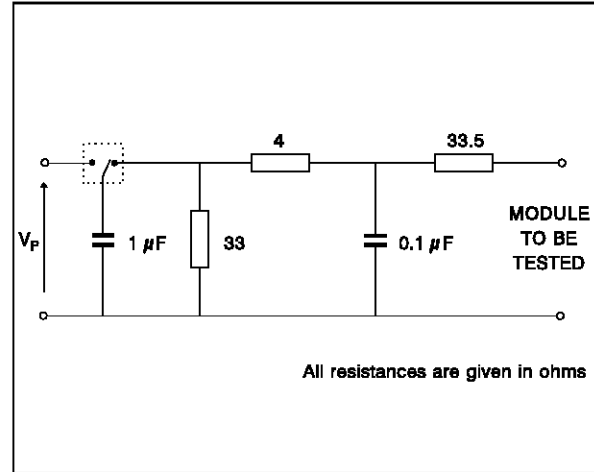


Figure 4 : 0.5/700 μ s wave generator

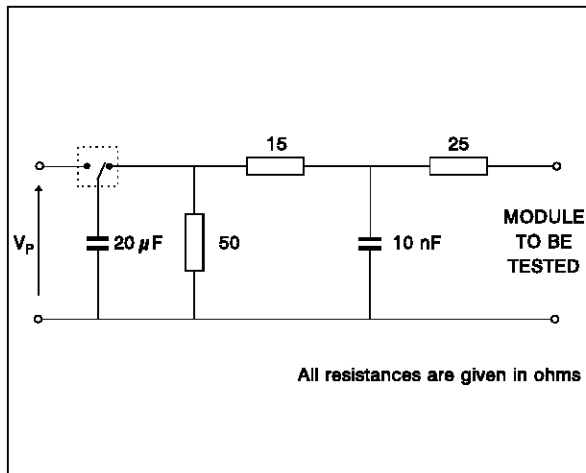


Figure 5 : 10/560 μ s wave generator

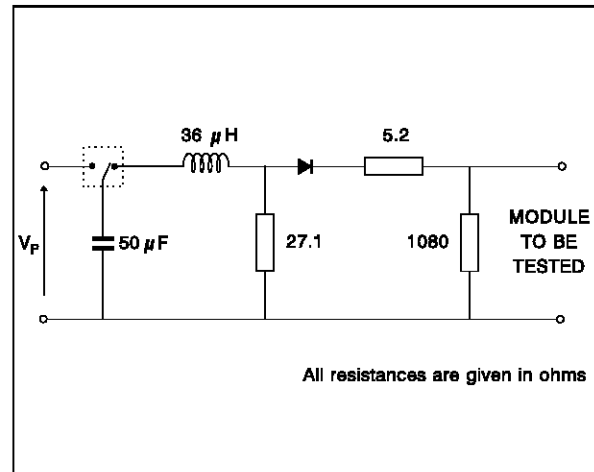


Figure 6 : 1/1000 μ s wave generator

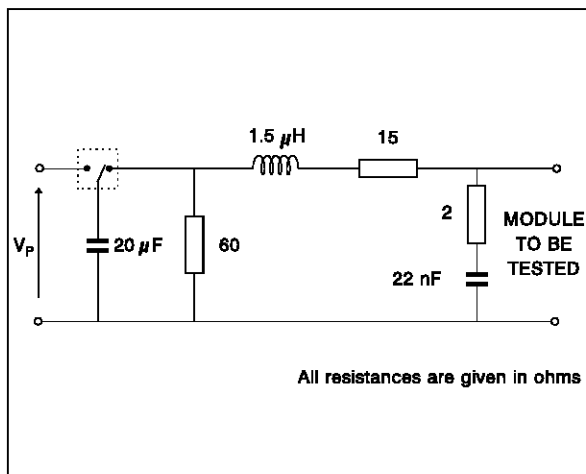


Figure 7 : 10/160 μ s wave generator

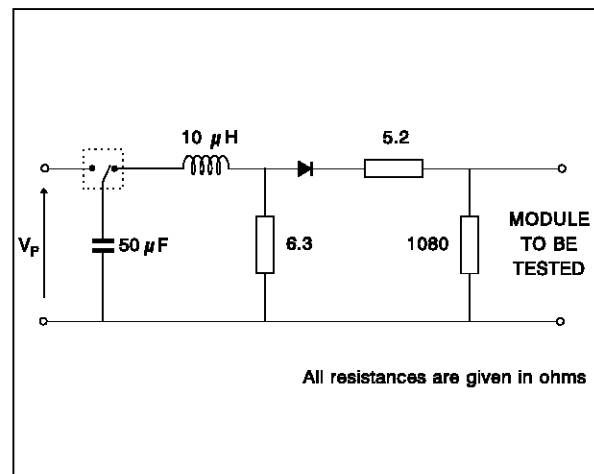
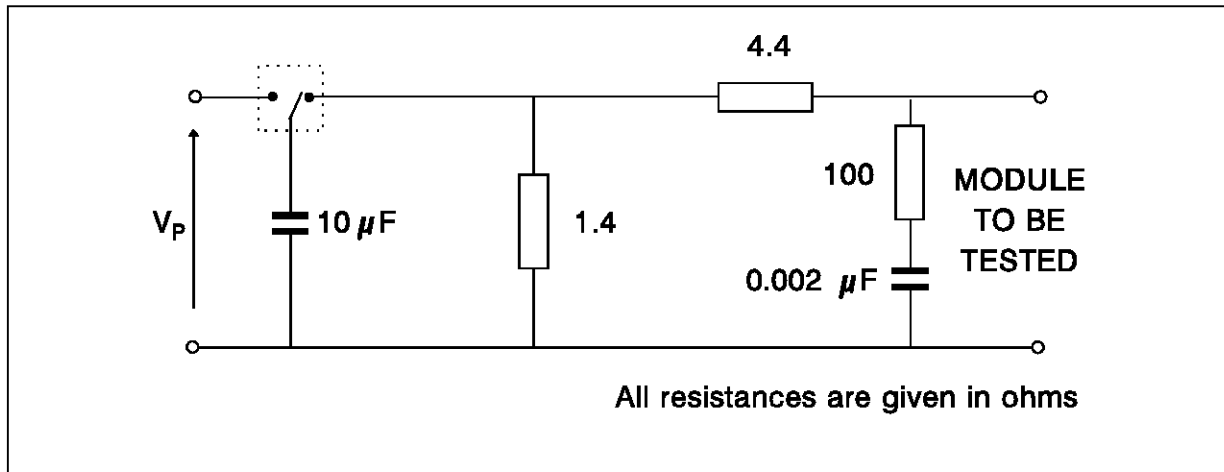


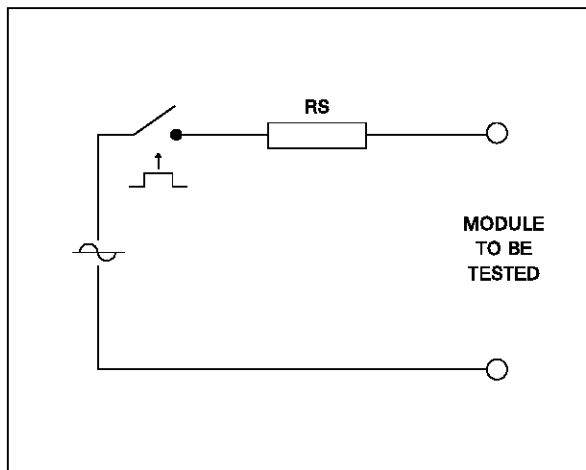
Figure 8 : 2/10 μs wave generator



3. CROSSING OR PROXIMITY WITH MAINS AC LINES :

Crossing or proximity is simulated by a sine wave generator (50 or 60 Hz) connected through a series resistor for a defined time (fig.9).

Figure 9 : Crossing simulation generator



4. CONCLUSION

Telecommunications is a field in which the protection against overvoltages is well defined by standards. The SGS-THOMSON range of protection devices enables all of these to be covered.

Table 2 give some example of crossing simulations.

Table 2 : Power crossing simulations

COUNTRY	VOLTAGE Volts RMS	SERIES RESISTOR (Ohms)	DURATION
ENGLAND	0 TO 250	40 TO 400	15mn
	0 TO 650	150	1s
	0 TO 430 (50 Hz)	150	2s
FRANCE	0 TO 1000	20	Trains of - 1s "on" - 1s "off" - 1s "on"
	> 1000 (50 Hz)	3000	
GERMANY	300 (50 Hz or 16.6Hz)	600	200 ms
ITALY	300	600	500 ms
	650	200	500 ms
	220	10 or 600	15 mn
USA	0 - 50	150	15 mn
	50 - 100	600	15 mn
	100 - 600	600	60 x 1s application

Note : Protection resistors on the line card inputs decrease the peak surge current. These elements have to be taken into account during the line card design to optimize the protection function.

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