



INTERNATIONAL TELECOMMUNICATION UNION

**ITU-T**

TELECOMMUNICATION  
STANDARDIZATION SECTOR  
OF ITU

**G.352**

**INTERNATIONAL ANALOGUE CARRIER SYSTEMS  
INDIVIDUAL CHARACTERISTICS OF  
INTERNATIONAL CARRIER TELEPHONE SYSTEMS  
ON METALLIC LINES**

---

**INTERCONNECTION OF COAXIAL CARRIER  
SYSTEMS OF DIFFERENT DESIGNS**

**ITU-T Recommendation G.352**

(Extract from the *Blue Book*)

---

## NOTES

1 ITU-T Recommendation G.352 was published in Fascicle III.2 of the *Blue Book*. This file is an extract from the *Blue Book*. While the presentation and layout of the text might be slightly different from the *Blue Book* version, the contents of the file are identical to the *Blue Book* version and copyright conditions remain unchanged (see below).

2 In this Recommendation, the expression “Administration” is used for conciseness to indicate both a telecommunication administration and a recognized operating agency.

## Recommendation G.352

### INTERCONNECTION OF COAXIAL CARRIER SYSTEMS OF DIFFERENT DESIGNS<sup>1)</sup>

(amended at Mar del Plata, 1968 and Geneva, 1980)

In every case of interconnection of coaxial carrier systems of different types at frontiers, some special arrangements are required to enable the systems to interwork satisfactorily.

The following points require special attention:

#### **1 Pilots**

Each line-regulating pilot should be transmitted on the two systems to be interconnected, at the same absolute power level (referred to a point of zero relative level). If the two systems do not use the same frequencies for the pilots, each of the stations situated at the ends of the regulated-line section crossing the frontier should be equipped to send all the pilots needed by both systems.

#### **2 Transmission conditions**

For interconnecting systems using different pre-emphasis values and output levels at national boundaries, Administrations can agree to equalize the level differences by shortening the frontier cable section and adding suitable passive equalizer networks as indicated in Annex A.

There may be cases in which even shortening the cable section to zero is not sufficient to equalize completely the level differences. It is recommended in these cases that the residual small level differences be finally corrected in the next main repeater station.

In some cases it may be feasible to maintain the normal repeater spacing in the frontier cable section and to accept some level differences at some intermediate repeaters near the frontier, ancillary gain and correcting networks being provided in the nearest main station (see Annex B).

#### **3 Power feeding**

In the absence of a special agreement between the Administrations concerned in a power-feeding section crossing a frontier, it is recommended that each Administration power-feed only the repeater stations on its own territory.

#### **4 Supervision and alarms**

In each particular case, these points should be agreed by Administrations concerned.

#### **5 Conditions for the repeater section**

The CCITT has standardized the dimensions of the coaxial pairs to be used in the international European telephone network (see Recommendations G.622 and G.623). Nevertheless, this standardization allows certain variations, so that the coaxial pairs manufactured by different contractors in different countries may not have exactly the same characteristics. To ensure uniformity throughout the frontier repeater section, it is strongly recommended that, by agreement between the two Administrations concerned the manufacture of the whole section should be entrusted to the same firm. If the same contractor does not supply the whole section, the two Administrations concerned must *very carefully* coordinate their detailed specifications and their methods of laying and jointing, to ensure that the conditions recommended by the CCITT for the complete elementary cable section are met.

---

<sup>1)</sup> This Recommendation applies to 1.3 MHz, 4 MHz, 6 MHz, 12 MHz, 18 MHz and 60 MHz systems.

As regards matching of the impedance of this repeater section to the impedances of the two adjacent amplifiers, in the general case of a coaxial cable section between two adjacent repeaters and used for telephony only, the CCITT has defined only the permissible limits for the sum  $N$  of the three terms defined in Recommendation G.332, § 5.

It is recommended that the Administrations concerned with a coaxial cable section crossing a frontier, agree on the values for each of these three terms permissible to meet the above condition - i.e. agree on the use of as good a match as possible. It is also very desirable that, throughout a coaxial system the Administrations concerned should agree always to use the same methods, particularly in impedance matching, so as to simplify system maintenance.

## ANNEX A

(to Recommendation G.352)

The interconnection of systems using different pre-emphasis values and output levels, at additional boundaries, can be achieved by the method shown in Figure A-1/G.352. Repeater locations are designated I to IV, the different systems used in the two countries are indicated by repeater types A and B; the dotted lines w, x, y and z show the possible locations of the actual frontier. The correcting networks shown between repeater points II and III are designed in conjunction with the cable length between II and III to compensate for the differences in level and pre-emphasis of systems A and B. The correcting networks may be mounted in the repeater boxes at II or at III or may be mounted one in each box. Alternatively, they could be mounted in a separate box between II and III. The distance between II and III will normally be less than the repeater spacing of system A or system B and could in the limit be zero, with the repeater boxes II and III adjacent to one another, the frontier would then be at w or z.

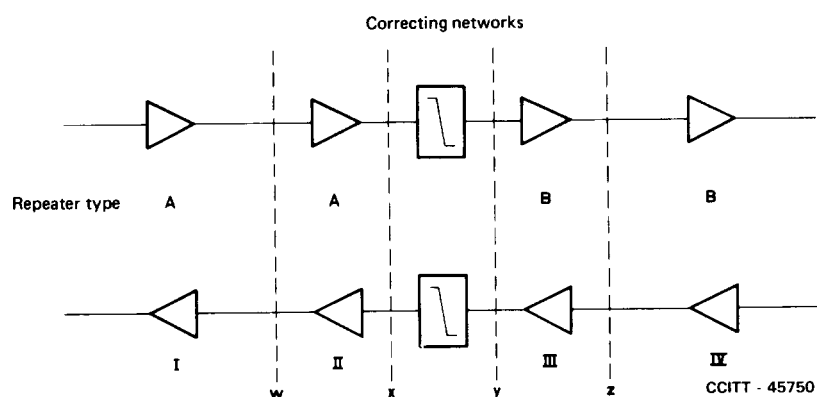


FIGURE A-1/G.352

Interconnection of two systems can be established by this method, using only passive interconnecting networks, if the following condition is met: the repeater input level at any frequency of one system is lower than the output level of the other system at the same frequency, by a small amount (say 1 dB) to allow for the loss of the interconnecting circuit.

The repeaters of type A could be fed with power and supervised from the nearest power-feeding station in country A and similarly for type B repeaters. If the frontier were located at x or y, neither of the power-feeding and supervisory systems need cross the boundary.

With this method all repeaters could be of standard types and the output and pilot levels could be normal. Special correcting networks would be required.

ANNEX B

(to Recommendation G.352)

An alternative method to that given in Annex A is shown in Figure B-1/G.352, in which the ordinary length of repeater spacing with the nominal loss  $a$  is maintained in the frontier cable section. The nominal relative sending level of system I is  $n_I$  and that of system II is  $n_{II}$ . The difference of the relative levels is defined as the differential pre-emphasis:

$$\Delta_{pre} = n_I - n_{II}$$

It shall be assumed that  $\Delta_{pre}$  is positive over the whole transmission band and that at the highest transmitted frequency, the sending levels of the two systems are almost equal. For the adaptation of the relative levels between system I and system II it is necessary to introduce an additional passive correction network  $\Delta_{pre}$  in the direction I  $\rightarrow$  II and an additional active correction network  $-\Delta_{pre}$  in the direction II  $\rightarrow$  I.

For reasons associated with the size of the repeater housing and power supply, it may be desirable to avoid additional amplification in the frontier section, which usually has underground repeaters with a remote power supply. There is no great drawback in using the pre-emphasis of the foreign incoming system up to the following attended repeater station and to accommodate only in this station the requisite gain for transformation of the pre-emphasis. In the attended repeater station, there will be no special difficulty in getting the necessary space and current for the additional equipment. The requisite gain in the direction II  $\rightarrow$  I (for  $-\Delta_{pre}$ ) and in the direction I  $\rightarrow$  II (because of a possible basic loss in the  $\Delta_{pre}$  network) is supplied by additional amplifiers which are usually already provided for in attended stations, to compensate for the basic attenuation of precision equalizers.

As indicated in Figure B-1/G.352 it may be well to use differential pre-emphasis for both directions in the same repeater station, for example on that side of the frontier where there is the system using the smallest pre-emphasis (higher sending relative level). If we assume as is shown in Figure B-1/G.352 that this is system I, the few underground repeaters of system I between the frontier and the attended repeater station will (in lower channels) be operated with the lower level of system II and will affect the overall noise performance of the whole system less critically than if the situation were reversed, such that system II were operated at a higher level.

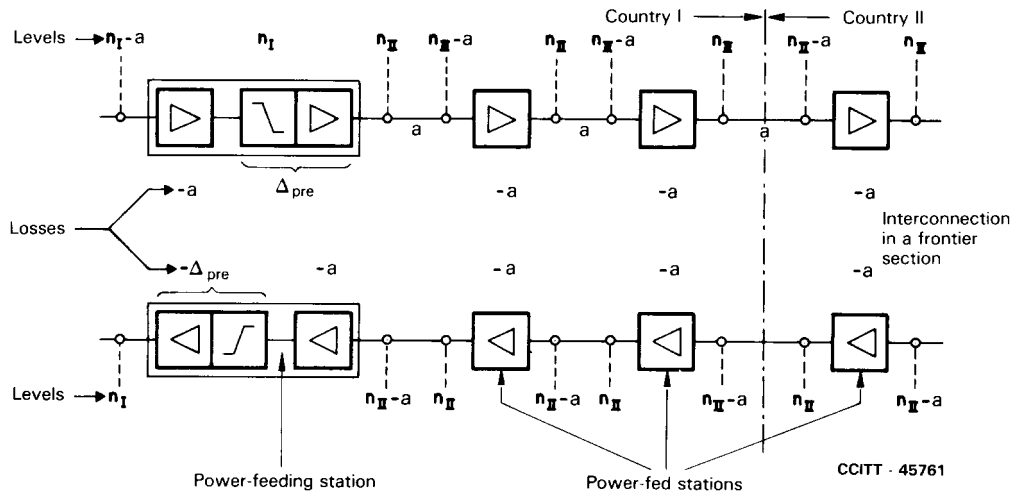


FIGURE B-1/G.352