INTERNATIONAL TELECOMMUNICATION UNION

ITU-T R.150

TELECOMMUNICATION
STANDARDIZATION SECTOR
OF ITU

TELEGRAPHY

TELEGRAPH TRANSMISSION

AUTOMATIC PROTECTION SWITCHING OF DUAL DIVERSITY BEARERS

ITU-T Recommendation R.150

(Extract from the *Blue Book*)

NOTES

1 ITU-T Recommendation R.150 was published in Fascicle VII.1 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 R.150

AUTOMATIC PROTECTION SWITCHING OF DUAL DIVERSITY BEARERS

(Malaga-Torremolinos, 1984; amended at Melbourne, 1988)

The CCITT,

considering

(a) that Recommendation R.54 lays down a character error rate objective for telegraph communication;

(b) Recommendation M.201 concerning transmission path restoration for service protection;

(c) that the availability and reliability of international telegraph transmission may be improved by providing automatic protection switching of dual, diversely routed bearers to carry TDM aggregates conforming to Recommendation R.101;

(d) that the principle of automatic switching between dual diversity routed bearers may also apply to other telegraph channel multiplexers such as TDM systems conforming to Recommendation R.111 or frequency-modulated voice frequency telegraph (FMVFT) systems conforming to Recommendation R.35, etc.,

unanimously declares the following view

1 It may be desirable to take measures to protect the quality and availability of derived international telegraph channels against bearer breaks or degradation, for example:

i) where the bearer is prone to relatively frequent interruptions (for example, long-haul bearers in intercontinental relations), such that the provisions of Recommendation R.54 may not be met for a significant proportion of the time;

ii) where the number of derived telegraph channels carried on a given telephone-type circuit or other bearer becomes considerable (e.g. in excess of 50).

2 An effective method of counteracting bearer faults is the use of automatic protection switching between dual diversely routed bearers. In this technique, a pair of bearers with geographically diverse paths is selected (e.g. one cable, one satellite), ensuring a low probability of simultaneous outages of both bearers. At the sending end for each direction, the multiplexer aggregate or aggregates are connected to both bearers continuously. At the receiving end for each direction, facilities are provided to select automatically either of the two incoming aggregate signals, using as criteria loss of sync or frame alignment from the TDM or loss of line signal (FMVFT or TDM).

3 Annex A shows methods of implementing protection switching of telegraph bearers.

ANNEX A

(to Recommendation R.150)

Protection switching methods for telegraph aggregates

A.1 *System configurations*

A.1.1 Figures A-1/R.150 and A-2/R.150 illustrate simple applications of automatic protection switching between dual, diversely routed telegraph bearers. The aggregate output at each end is transmitted on both bearers continuously. At each end a Bearer Switchover Unit (BSU) automatically (and independently of action at the distant end) selects one of the incoming aggregates from the two bearers and feeds it to the multiplexer (TDM or FMVFT).

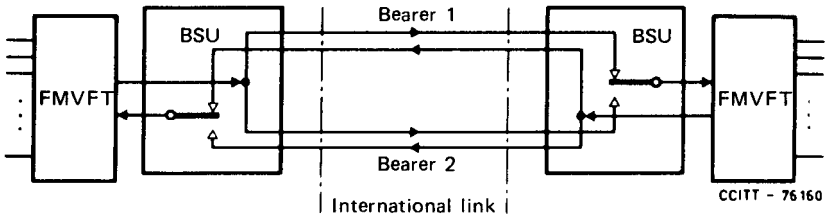

FIGURE A-1/R.150
FMVFT arrangement

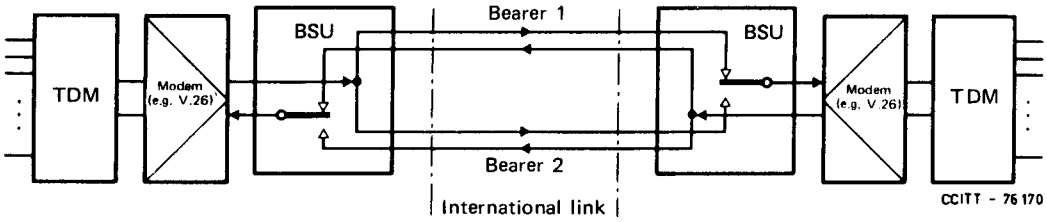

FIGURE A-2/R.150
Single TDM arrangement

A.1.2 Two of the many further possible configurations using higher order digital multiplexers are shown in block form in Figures A-3/R.150 and A-4/R.150.

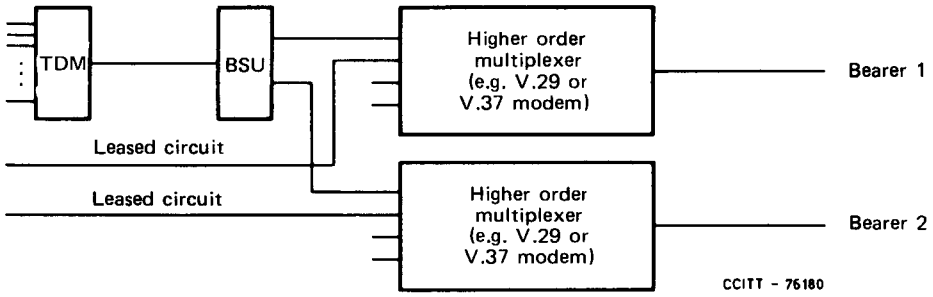

FIGURE A-3/R.150

Arrangement for protected TDM multiplexed with leased data circuits

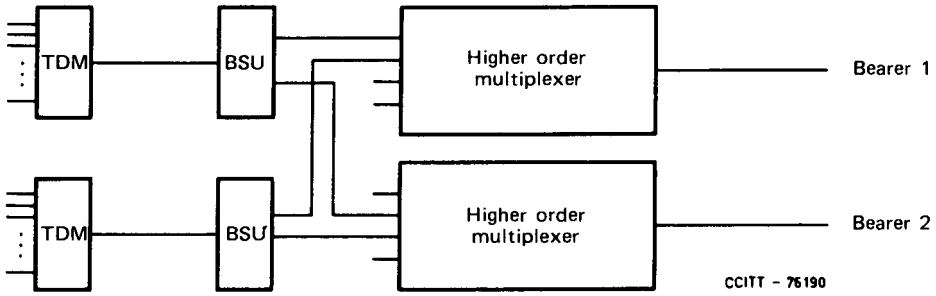

FIGURE A-4/R.150

Arrangement for two protected TDMs

A.2 *Bearer routing*

For protection switching to be effective, every effort should be made to diversify the routing of the two bearers. On the international portion, one bearer might be carried by cable and the other by satellite for example. Common equipment needs to be avoided in both the international transmission systems and any relevant national extensions to them.

A.3 *Bearer switchover unit*

A.3.1 The BSU splits the multiplexer send path for simultaneous transmission on both bearers. In the case of TDM, the split will be made before or after the modems as required, i.e. the aggregate signal is split in either its digital or its analogue form.

A.3.2 The BSU monitors the appropriate circuit and equipment parameters on the receive path of both bearers. It switches the multipexer aggregate input from one bearer to the other as follows:

a) after a continuous period of between one and two seconds[1)] when there is:
   - insufficient signal (where the BSU is in the analogue path) or loss of keying (where the BSU is in the digital path) on the currently selected bearer; and/or
   - loss of local[2)] sync (Recommendation R.101) or frame alignment (Recommendation R.111) within the associated TDM;

   Note – An optional third condition "the other bearer (the bearer not currently in use) has not been detected as faulty within the previous two seconds" is left for further study.

b) once a switchover has occurred, a further switchover due to bearer failure on the newly selected path shall be inhibited for a period of either 8 or 12 seconds[1)] and an alarm signal given.

A.3.3 When TDM systems are used, the BSU switches the received aggregate signal either in its digital or analogue form.

When switching the TDM aggregate in digital form, the following circuits must also be switched:

- received line signal detector (e.g. Recommendation V.24 circuit 109) if required by the TDM;
- receiver signal element timing (e.g. Recommendation V.24 circuit 115).

A.3.4 The logic controlling the above functions shall be designed to be secure, minimizing the risk of a BSU fault that could affect both bearer paths.

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1) The shortening of this delay for Recommendation R.111 TDM aggregates is for further study.

2) Advice from the distant TDM that it has lost sync or frame alignment will not of itself cause the BSU to switch over.