

Recommendation M.495**TRANSMISSION RESTORATION AND TRANSMISSION ROUTE DIVERSITY:
TERMINOLOGY AND GENERAL PRINCIPLES****1 Purpose of transmission restoration and transmission route diversity**

The purpose of transmission restoration and transmission route diversity is to protect the continuity and quality of international telecommunication services by minimizing the effects of potential effects of a transmission failure.

This Recommendation applies to both analogue and digital transmission.

Note — This Recommendation may also apply in the case of hazardous conditions.

2 Causes of transmission failures

The causes of transmission failures can be divided into three major categories:

- equipment failure: this can be reduced by improving equipment reliability;
- outages due to the operating organization. For example, maintenance work or human errors;
- external causes which are very difficult to prevent and for which specific protection might be needed. For example weather conditions or excavation work.

In this Recommendation, failures or faults that are referred to may be either total or partial failures or faults. The relevant terminology concerning failures and faults can be found in Supplement No. 6 [1].

3 Definitions concerning transmission restoration and transmission route diversity

The purpose of this terminology is to define a vocabulary which can be used in connection with transmission restoration and transmission route diversity.

Note — In this terminology, the term "link" is used as a generic term for digital section, digital path, group link or section, supergroup link or section, mastergroup link or section, supermastergroup link or section, line section, section and line link.

3.1 Basic concepts**3.1.1 transmission restoration**

The different actions taken in order to restore the transmission of a signal affected by a transmission fault.

3.1.2 transmission restoration function

The ability to perform under stated conditions and within given time constraints the transmission restoration.

Note 1 — This function is aimed at increasing the transmission availability; it can provide transmission link supervision and control, the sending and receiving of control and check signals, and the changeover from normal to an alternative link, if necessary by assembling links.

Note 2 — This function can allow the restoration of failed transmission systems, links, groups, digital blocks, equipment, etc., as well as the restoration for maintenance purposes such as planned outages, or to remedy conditions that affect transmission such as fading.

Note 3 — The transmission restoration function can be implemented by equipment that is dedicated to it, or by equipment that has other functions, such as, for example, automatic digital distribution frames.

3.1.3 transmission restoration function: direct transmission restoration (protection link switching)

Direct transmission restoration is that category of transmission restoration function in which one transmission link between two stations is substituted for another between those two stations.

Note — This reflects a configuration in which M links protect N links, or in which $N+M$ links give redundancy to a relation requiring N links, with the extremities of all links in the same locations. It is recommended to use the expression $N+M$ direct transmission restoration to designate such a configuration. See Figure 1/M.495.

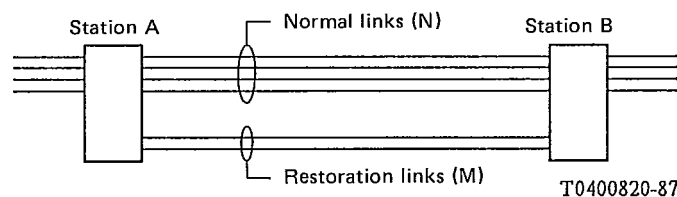


FIGURE 1/M.495

**$N+M$ direct transmission restoration system
(protection link switching)**

3.1.4 transmission restoration function: automatic or semi-automatic transmission rerouting (protection network switching)

Automatic or semi-automatic transmission rerouting is that category of transmission restoration function in which transmission links are assembled together and substituted for another link.

Note — This reflects a configuration in which a certain number of links form a restoration network and protect normal links. Within a given transmission station, or for a given switching equipment, M links protect N links. It is recommended to use the expression $N+M$ automatic transmission rerouting to designate such a configuration.

Figure 2/M.495 shows an example. In Station A, M restoration links can be used for restoration of N normal. A link between A and B can be restored, for example, directly or via C.

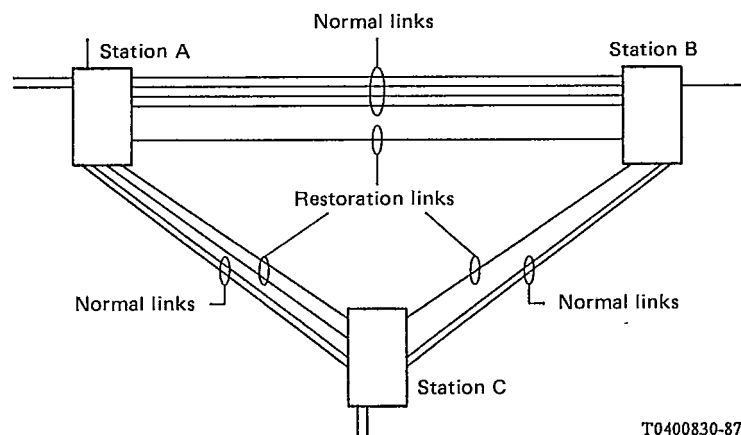


FIGURE 2/M.495

**$N+M$ automatic transmission rerouting system
(protection network switching)**

3.1.5 transmission restoration function: 1+1 restoration

1+1 restoration is that category of transmission restoration function in which one transmission link is substituted for another associated link, generally on another transmission route. See Figure 3/M.495.

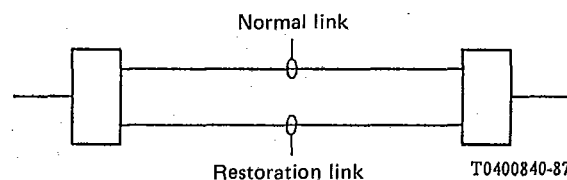


FIGURE 3/M.495

1 + 1 restoration system

3.1.6 transmission restoration function: manual transmission rerouting

Manual transmission rerouting is that category of transmission restoration function in which one transmission link is replaced manually by another when a complete or partial transmission route failure has occurred or when the normal route restoration link is not available due to a previous or simultaneous interruption, or when there is no such restoration link provided.

Note — Such rerouting is normally effected using plugs and cords.

3.1.7 transmission restoration control function

This is the function which decides whether restoration is necessary on the basis of information from the link supervision system or link alarms.

Note — The control function might be included in a specific equipment, or in the transmission restoration equipment itself, or within a restoration control centre. Control decisions can also be taken by people in, for example, a control centre.

3.2 Systems and equipment

3.2.1 transmission restoration system

A system that can be used to implement the transmission restoration function. An example is shown in Figure 4/M.495.

3.2.2 transmission restoration equipment

The part of the transmission restoration system that switches the transmission from the normal link to a restoration link.

3.2.3 normal transmission link/equipment; normal digital block, group, supergroup, etc.

A transmission link/equipment or a digital block, group, supergroup, etc., which is used for transmission under normal operating conditions.

3.2.4 restoration link/equipment

A transmission link/equipment which is used for transmission when the normal link/equipment is not available.

Note 1 — A restoration link or equipment is generally idle under normal operating conditions, but might be used under these conditions by low-priority traffic for which a lower degree of service availability is accepted.

Note 2 — Note 1 may not apply to 1+1 type restoration system where both links are carrying the traffic.