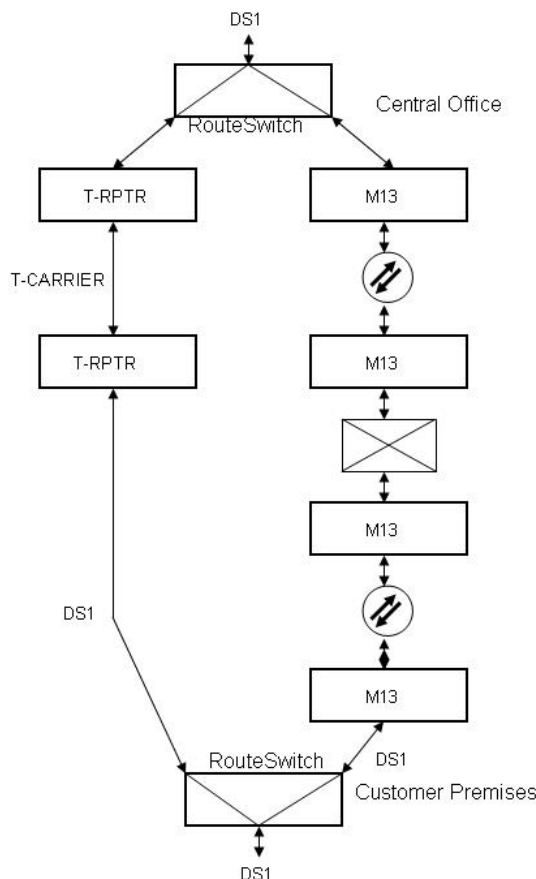




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## APPLICATIONS NOTE 115

### Model 5702 RouteSwitch, List Numbers -1, -1A, and -1B



Model 5702 RouteSwitch is a successful example of a so-called “single-ended Automatic Protection Switch” and has evolved to remain compatible with evolving T1 transmission networks. The original Model 5702 List 1 was compatible with the original “slow E2A” telemetry response specifications. Later, Model 5702 List 1A handled “fast E2A” telemetry which had grown more prevalent in the industry.

Model 5702 List 1A has been the most common APS choice among independent network providers for over one decade. It has the ability to recognize T1 facility faults categorized as “soft failures” relating to a poor received Bit Error Rate (BER) with threshold settable by the user. It also has the ability to recognize T1 facility faults categorized as “hard failures.” The two types of hard failures are Loss of Signal (LOS) and Out of Frame (OOF). In the event that Alarm Indication Signal (AIS) were received from the facility, it was assumed that this was caused by failed terminal equipment in the far end, opposite from where it was detected. This can be seen in the left side of the adjoining figure. Basic T-carrier repeaters would only replicate signals originating at the terminal ends and would not intentionally alter the signal content. Since RouteSwitch was not intended to switch traffic facilities based on terminal equipment failures, it would not switch upon receipt of AIS from either facility.

That is now changing. Many more modern network facilities appear like the right side of the adjoining figure. They include so-called “intelligent network elements” that are able to sense an upstream LOS or OOF and then to forward AIS in the same direction. Examples of these would be M13 multiplexers and SONET multiplexers used on microwave and fiber optic networks. As a result, it is desirable for the RouteSwitch to recognize the same soft failures and hard failures as before, but also to recognize AIS as another hard failure condition on the facility and take appropriate switching actions. Therefore, Model 5702 List 1B was created to accommodate this. All other aspects of operation and alarming are identical between Model 5702 List 1A and List 1B. Model 5702 List 1A cards operate on LOS or OOF as well as failed BER. List 1B cards operate on LOS, OOF, AIS, and also failed BER.

The decision to transfer facilities is made in the following order of priority:

- a. (Hard Failure) List 1, 1A, or 1B. OOF event declared upon the detection of 2 out of 5 consecutive framing bits in error or LOS declared upon detection of  $175 \pm 75$  consecutive zeros (no pulses) on a DS1 channel. A circuit pack declares a failure 10 milliseconds after the declaration of an OOF or LOS event to verify that the event is genuine and not a temporary interruption due to other causes.



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- b. (Hard Failure) List 1B only. A facility AIS which causes the associated circuit pack to transmit AIS (continuous unframed 1s toward the equipment side, also called blue signal) until the facility becomes protected. The switch only occurs from an AIS which originates on either DS1 receive working (RW) or DS1 receive protection (RP). The OOF or LOS or AIS failure condition is declared clear after 20 seconds of continuous in-frame operation.
- c. (Soft Failure) List 1, 1A, or 1B. BER which meets or exceeds the selected BER threshold on the circuit pack if the protection channel has a better calculated BER. A BER failure condition is declared clear when the calculated BER improves beyond (better than) the BER threshold.

It is intended to have user option switches matching on cards side-to-side and end-to-end except for exceptions. The exceptions are (a) the BER threshold may be set differently, (2) the hard-fail and soft-fail time delays may be set differently. Revertive or non-revertive operation must match. Linecode must match.

Each card, is physically identified by Model number and List number in multiple locations of the faceplate, the component side of the printed circuit assembly, and the solder side of the printed circuit assembly.

It is required to have an identical pair of these cards side-by-side at each end, and it is highly recommended to have an identical pair end-to-end on the facilities. It would be smart to fill one entire project with identical cards, primarily for the troubleshooter to be able to easy perform those tasks. The most universal choice would be List 1B cards all around.