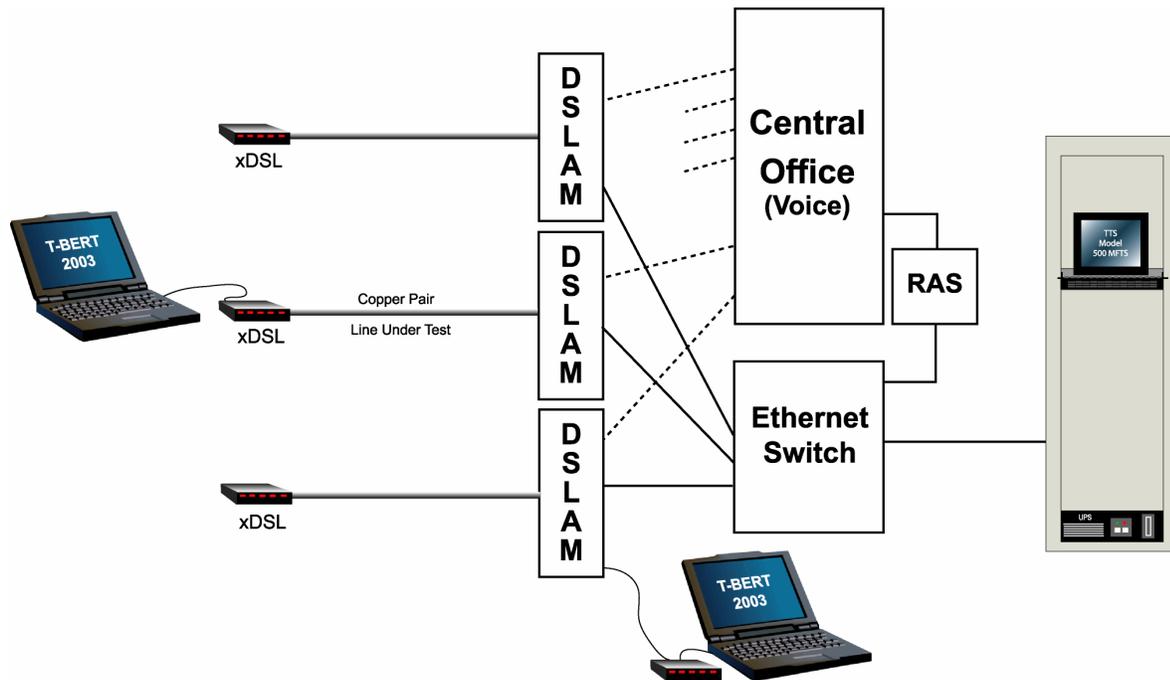


## T-BERT 2003 – xDSL TESTING FROM VOICE TO BROADBAND APPLICATION NOTES, July 2003



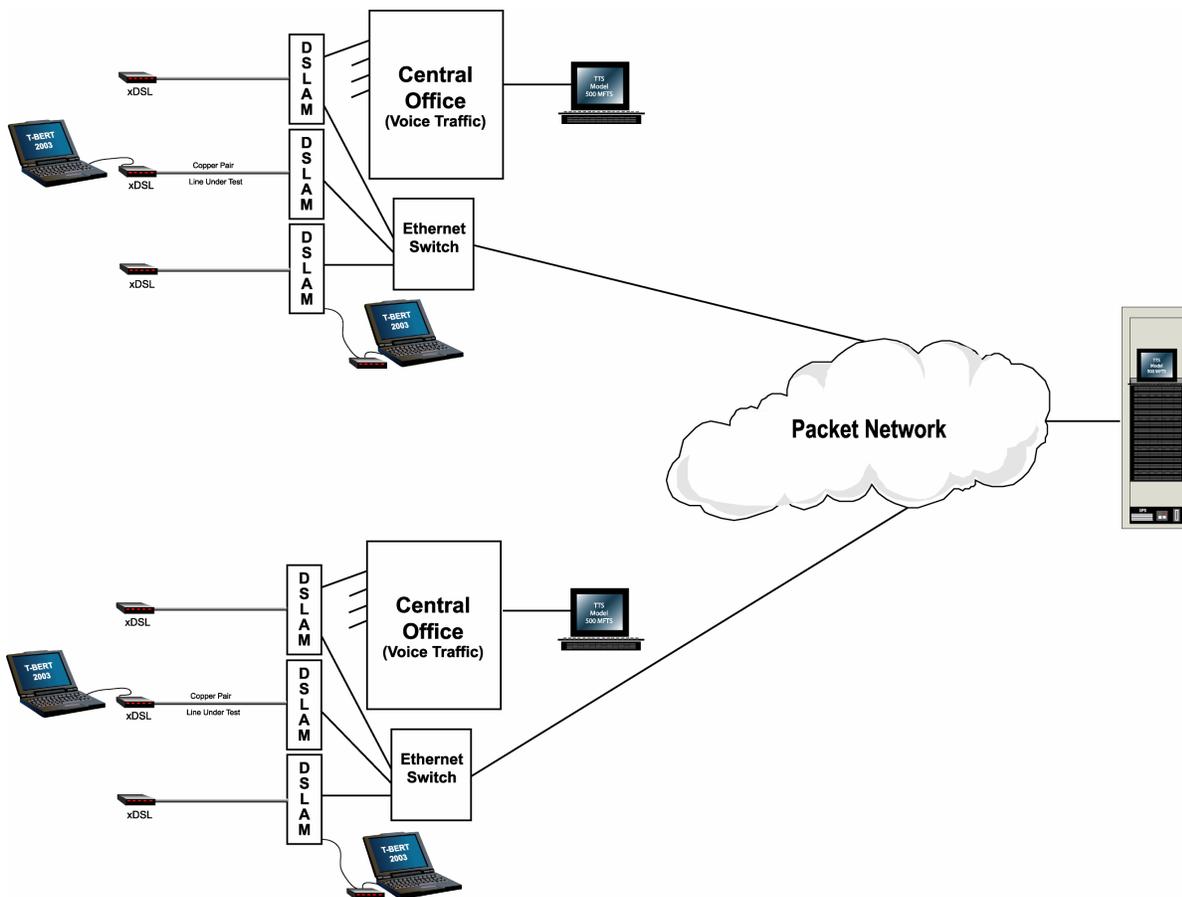
**Figure 1: xDSL – T-BERT 2003 Test Connections - Central Office Configuration**

[1] T-BERT 2003 can be used, not only to test the broadband performance through the Ethernet switch, but if a small Remote Access Server (RAS) is served by a digital span from the CO, the Ethernet output of the RAS can also be connected into the Ethernet Switch. Then the T-BERT unit in the CO can accept Dialup-to-RAS calls and Broadband Ethernet-to-Ethernet sessions, all to the same test address for our T-BERT unit listening behind the Ethernet Switch. This will allow testing over the voice ports of the xDSL service, connecting from the dialup modem of the laptop, through the copper loop, DSLAM splitter, and on through the voice switch. The information that we extract from our recommended V.90/56K modem in the laptop will help identify problems on the copper pair.

[2] Before dispatching to the customer site, a CO technician could attach a T-BERT 2003 unit (laptop in Figure 1) to the copper line input to the DSLAM card and test through the Ethernet Switch to the T-BERT 2003 unit shown in the test bay. This will give assurance that the DSLAM card and connection through the Ethernet Switch is working okay. The Laptop test controller shown here in the CO could also be another rack unit or desktop Test Controller equipped with T-BERT 2003. These units can be remote-controlled so that a CO technician could make the desired physical connection into the DSLAM, and a remote test could then be run by any other personnel who can network into the remote-controlled T-BERT unit. If the DSLAM is working, then a dispatch to the customer site may be in order.

[3] Test results are swapped at the end of each test session, so that the results for both the UpLink and DownLink paths are stored in both the Technician's Laptop Test Controller and also in the unattended Test Controller in the Central Office equipment.

## T-BERT 2003 – Application Notes, xDSL Testing

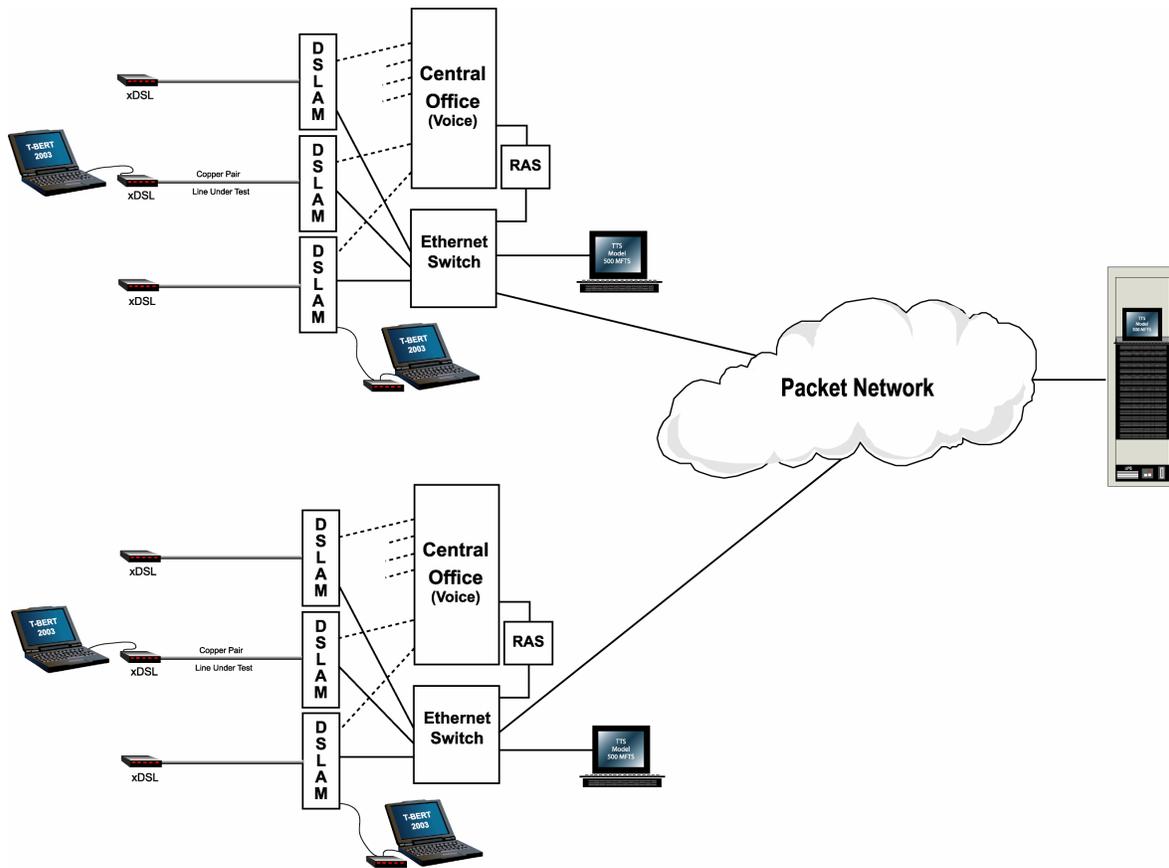


**Figure 2: xDSL – T-BERT 2003 Testing – Centralized Test Configuration**

Figure 2 shows a completely centralized configuration; that is, the unattended base units are all located in one bay at a centrally located site. If a non-blocking sub-network can be provided for testing, then there is no interference by the intervening network traffic, and one can assume that the test results represent the local access performance. If this is not possible, then we can provide a base unit at each CO, behind the local Ethernet Switch. One test strategy might be to first test to the centralized test bay. If that xDSL performance test passes, then the technician at the customer site is done. The technician may move on to the next task. A benchmark is permanently stored in the centralized equipment without requiring any further effort on the part of the technician to then upload the test results to some desired reporting site.

It is also possible to connect the multiple T-BERT 2003 Test Controllers in a Sub-Network unit that will automatically route a test request to the next available unit, very much like a hunt group operation on dial-up calls. This will allow technicians to pre-program a common address for the bank of multiple T-BERT Controllers in the central site, without having to cope with multiple addresses to test to the unattended units.

## T-BERT 2003 – Application Notes, xDSL Testing



**Figure 3: xDSL – T-BERT 2003 Testing – Local & Centralized Configuration**

In Figure 3, T-BERT 2003 tests may be conducted to either a local T-BERT Base Unit Test Controller in each Central Office, served off of the Ethernet Switch and serving multiple DSLAMs in that office, or to the Centralized Test Center bay of multiple T-BERT Base Units. As test traffic increases in any given Central Office, multiple T-BERT Test Controllers can be added. This configuration allows sectionalizing whether data problems are due to the interoffice Packet Network, or due to the Local xDSL Access Line. The ability to sectionalize from an intra-office line through the DSLAM, or from the customer site, is still preserved. If the Installation and Repair Technicians are equipped with a spare xDSL modem, they may by-pass the customer's modem and test with a known, good (or golden) modem, to isolate if the customers modem is operating properly.