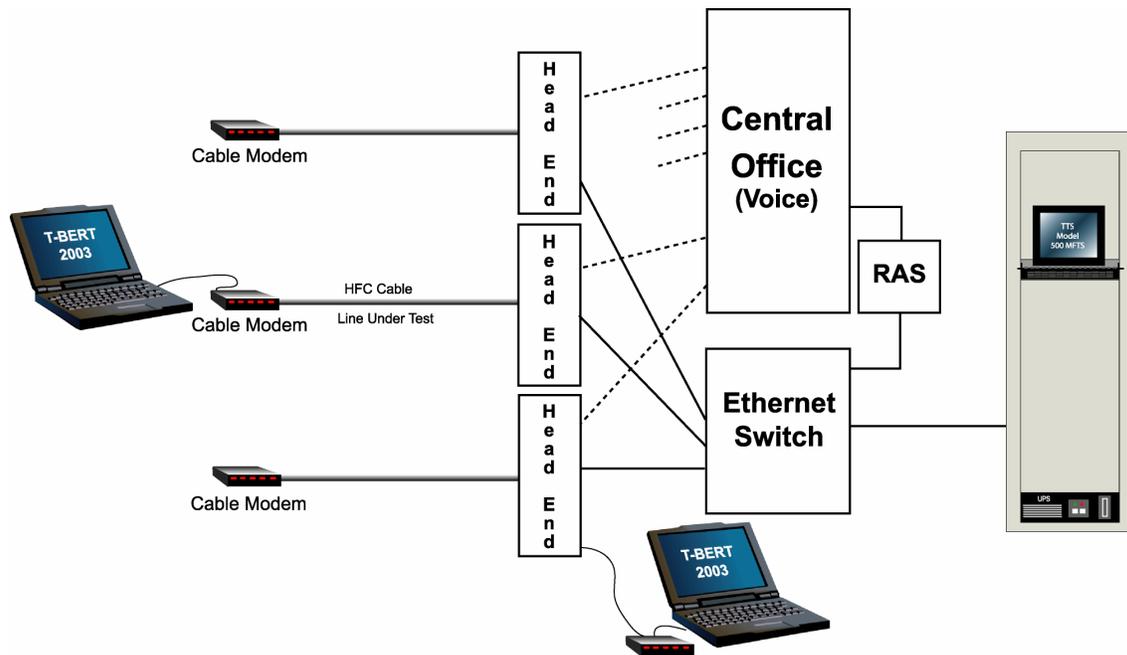


## T-BERT 2003 – HFC TESTING FROM VOICE TO BROADBAND APPLICATION NOTES, July 2003



**Figure 1: T-BERT 2003 Test Connections – HFC Configuration**

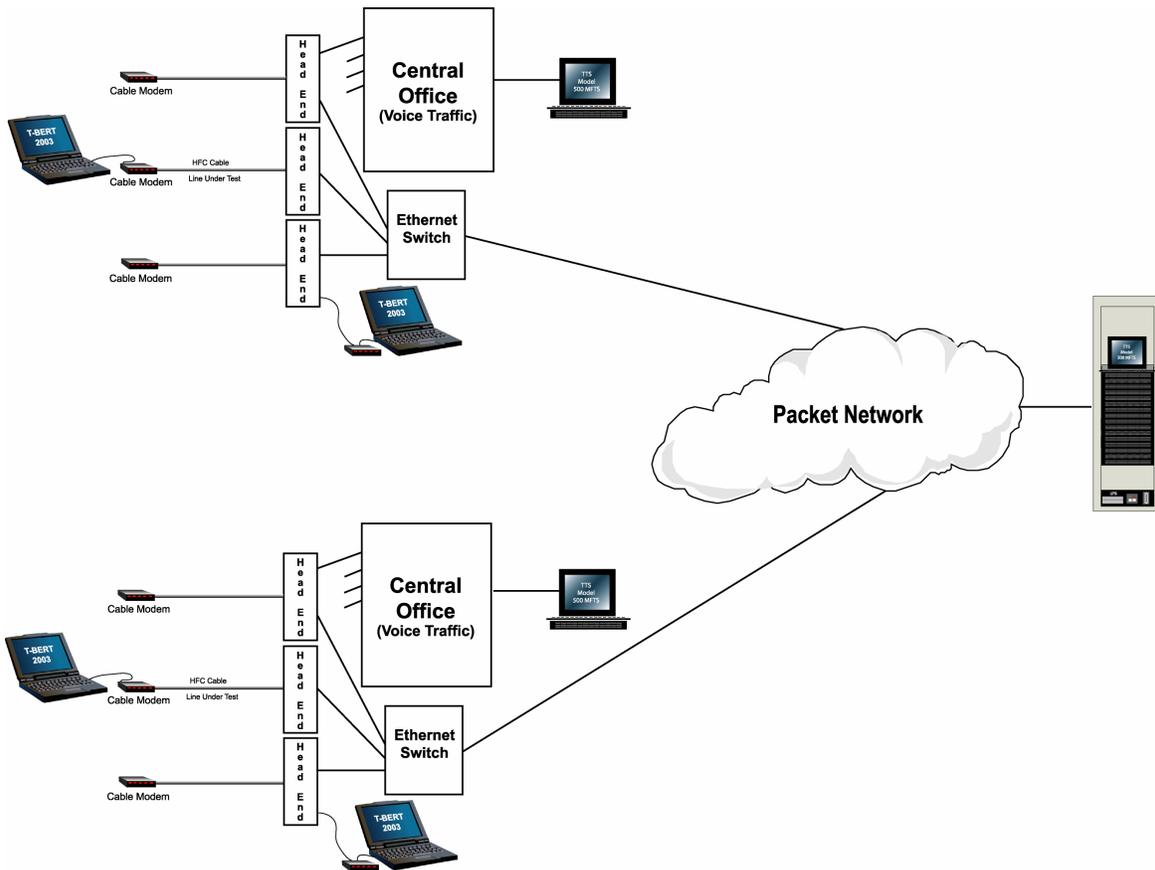
[1] T-BERT 2003 can be used, not only to test the broadband performance through the Ethernet switch, but if a small Remote Access Server (RAS) is served by a digital span from the CO, the Ethernet output of the RAS can also be connected into the Ethernet Switch. Then the T-BERT 2003 unit in the CO can 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 HFC Cable Modem, connecting from the dialup modem of the laptop, through the HFC cable, Head End multiplex, 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 local access line.

[2] Before dispatching to the customer site, a CO technician could attach a T-BERT 2003 unit (laptop in Figure 1) to the line input to the Head End and test through the Ethernet Switch to the T-BERT 2003 unit shown in the test bay. This will give assurance that the Head End equipment 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 Head End NIU or Voiceport, and a remote test could then be run by any other personnel who can network into the remote-controlled T-BERT unit. If the Head End 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, HFC Testing

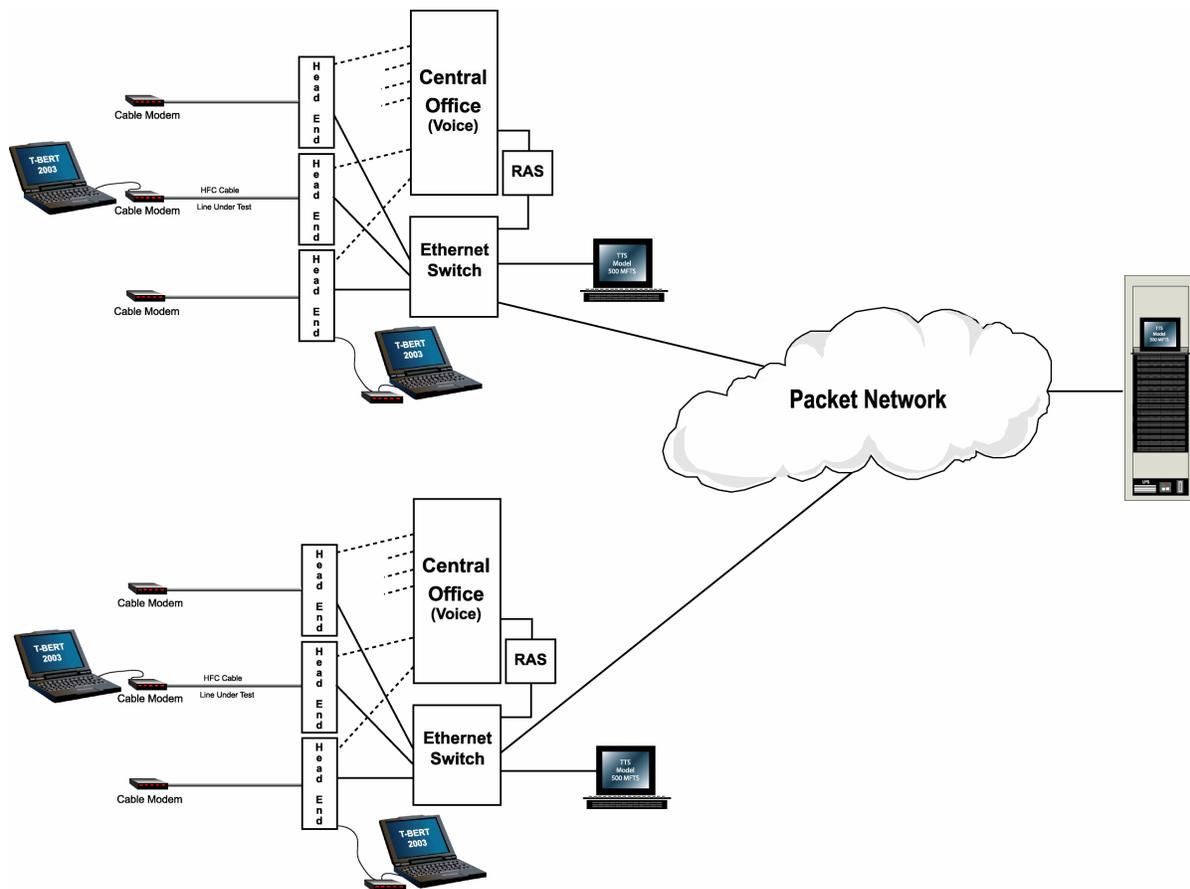


**Figure 2: HFC – T-BERT 2003 Testing – Centralized Test Configuration**

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 HFC connection 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, HFC Testing



**Figure 3: HFC – 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 Head Ends out of that CO, 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 HFC Access Line. The ability to sectionalize from an intra-office line through the Head End, or from the customer site, is still preserved. If the Installation and Repair Technicians are equipped with a spare Cable 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.

It may not be convenient to locate the Ethernet Switch in a Central Office run by another vendor. In this case, it may be more appropriate to locate the T-BERT Base Units at each Head End.