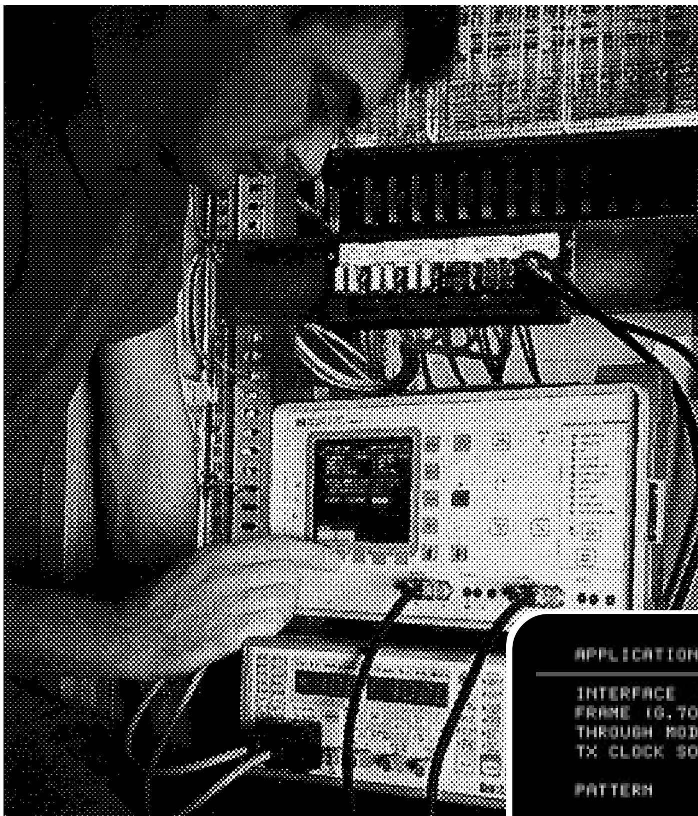
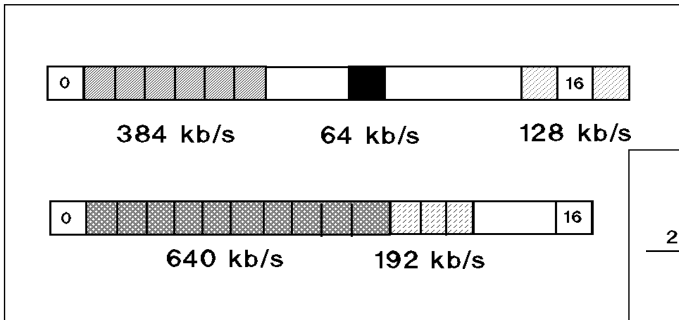
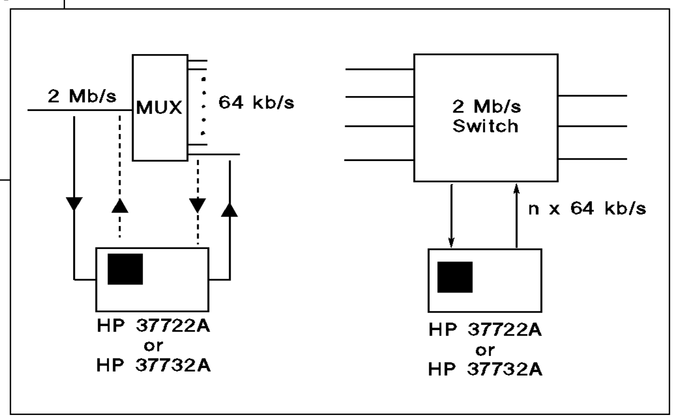
Testing n x 64 kb/s services



Application Note 1211-2

n x 64 kb/s traffic





Wideband services such as videoconference, LAN interconnection, and high-speed computer links usually require a bandwidth greater than 64 kb/s, but maybe less than the full 2 Mb/s, for example, 384 kb/s. These wideband signals can be sent in a 30-channel 2 Mb/s frame by "sharing" the signal between several "aggregated" 64 kb/s channels. According to CCITT recommendation G.704, the n x 64 kb/s signal is accom-modated in "n" contiguous time-slots, omitting TS16, and with each timeslot taking consecutive octets of the traffic signal. If the remaining timeslots are unused for traffic, they should be filled with all 1s. Of course, more than one n x 64 kb/s signal may be carried in the 2 Mb/s frame, depending on the bandwidth.

In practice, it is not necessary to use contiguous timeslots provided they are filled in an agreed sequence and demultiplexed sequentially at the far end. An example of a non-contiguous plan is the recommendation for five 384 kb/s channels (six timeslots each) given in CCITT G.735:
1-2-3 + 17-18-19, 4-5-6 + 20-21-22 and so on.

The most critical factor when using n x 64 kb/s aggregate channels is to ensure all equipment is configured for the same sequence of timeslots. Furthermore, the integrity of this sequence must be maintained, particularly if the signal passes through switching equipment.

You need to know that each timeslot is delayed by the same amount, and that timeslots have not been interchanged by a switch. When problems occur, you need to identify the position of a received timeslot for a known transmit timeslot.

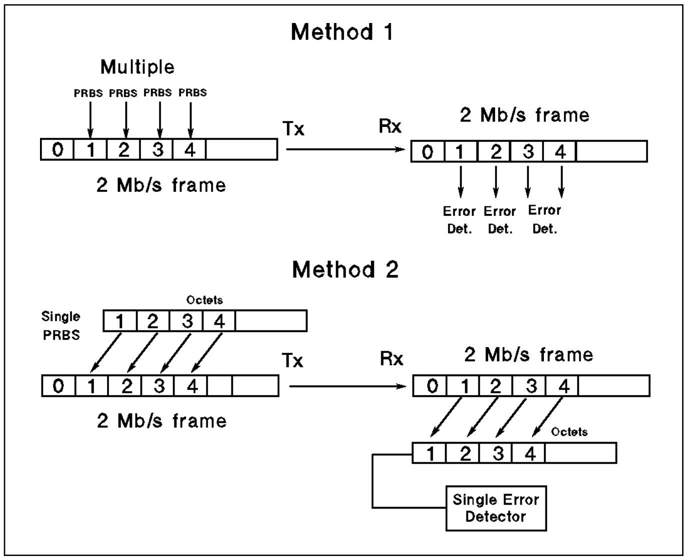
Conventional PRBS tests at leased line rates of 64 kb/s, 704 kb/s and 2 Mb/s are well understood. However, when framing at 2 Mb/s or 704 kb/s is added, the value of the test can be enhanced.

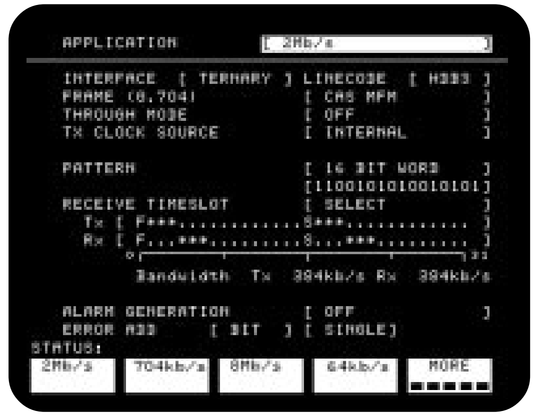
For example using a test set like the Hewlett-Packard 37722A digital telecom analyzer or the HP 37732A telecom/datacom analyzer, a multiplexer can be stimulated with a 64 kb/s signal and a check made in the appropriate timeslot of the outgoing 2 Mb/s stream. Similarly, you can send a PRBS test signal in one or more 64 kb/s timeslots, and check for timeslot integrity at the output of a crossconnect switch.

Tests on n x 64 kb/s circuits

When testing n x 64 kb/s circuits, the foremost requirement is to check the integrity of a wideband signal spread across several timeslots that make up an aggregate channel.

Two ways to test n x 64 kb/s





Some network equipment may treat the individual 64 kb/s channels as independent entities, switching them to different timeslot positions or even rerouting them through different paths. If this happens, the multiple timeslots of the n x 64 kb/s signal will not arrive at the destination in the right sequence, and some could be missing altogether. It will be difficult or impossible to reconstruct the wideband signal.

At present there is little or no switching in digital leased lines, but this might increase in the future with greater use of virtual private networks and ISDN.

To test an n x 64 kb/s channel, you can inject a separate PRBS pattern in each allocated timeslot, and check for continuity and error-free reception at the far-end on a channel-by-channel basis (method 1 above). However, it is more realistic to "spread" a single PRBS across the sequence of timeslots allocated to the wideband channel just as the live signal would (method 2 above). In this approach, the first octet of the PRBS would go to the first timeslot, the second octet to the second timeslot in the plan, and so on. The unused timeslots are usually filled with all 1s, though a PRBS such as 2^6-1 can also be used.

For the wideband signal to be received without error at the far end, not only would the timeslot allocations have to be maintained, but the timeslots would also need to arrive in the right sequence. The integrity of the n x 64 kb/s would thus be proved. The second method is the one used in the HP 37722A and 37732A.

If a timeslot has been misplaced, then you would need to send an identifiable pattern (an 8-bit word, for example) in each timeslot and search for it at the receive end.

When doing a "loop-back" test at n x 64 kb/s, it is possible that the return path may use a different timeslot allocation. In this case, the test set would need to have independent settings of transmitter and receiver timeslots. The HP 37722A and 37732A have this facility. The above shows the setup for transmission of a 384 kb/s channel in timeslots 1, 2, 3 and 17, 18, 19, and reception in timeslots 4, 5, 6 and 20, 21, 22, as in CCITT recommendation G.735.

Drop and insert

One final application of a framed 2 Mb/s test set capable of "through-data" mode is to drop and insert single or multiple 64 kb/s test channels while the remaining channels carry revenue-earning traffic. This requires the test set to be placed in-circuit with the 2 Mb/s line.
A much more detailed analysis is then possible on one or more 64 kb/s channels while still providing a partial service. Again, the HP 37722A and 37732A have this capability.

HEWLETT® PACKARD

For more information on Hewlett-Packard Test & Measurement products, applications or services please call your local Hewlett-Packard sales offices. A current listing is available via Web through AccessHP at http://www.hp.com. If you do not have access to the internet please contact one of the HP centers listed below and they will direct you to your nearest HP representative.

United States:
Hewlett-Packard Company
Test and Measurement Organization
5301 Stevens Creek Blvd.
Bldg. 51L-SC
Santa Clara, CA 95052-8059
1 800 452 4844

Canada:
Hewlett-Packard Canada Ltd.
5150 Spectrum Way
Mississauga, Ontario
L4W 5G1
(905) 206 4725

Europe:
Hewlett-Packard
European Marketing Centre
P. O. Box 999
1180 AZ Amstelveen
The Netherlands

Japan:
Hewlett-Packard Japan Ltd.
Measurement Assistance Center
9-1, Takakura-Cho, Hachioji-Shi
Tokyo 192, Japan
Tel: (81-426) 48-0722
Fax: (81-426) 48-1073

Latin America:
Hewlett-Packard
Latin American Region Headquarters
5200 Blue Lagoon Drive
9th Floor
Miami, Florida 33126
USA
(305) 267 4245/4220

Australia/New Zealand:
Hewlett-Packard Australia Ltd.
31-41 Joseph Street
Blackburn, Victoria 3130
Australia
1 800 629 485

Asia Pacific:
Hewlett-Packard Asia Pacific Ltd.
17-21/F Shell Tower, Times Square
1 Matheson Street, Causeway Bay
Hong Kong
Fax: (852) 2506 9285

Printed in UK
Data subject to change
5091-2069E (8/91)