INTERNATIONAL TELECOMMUNICATION UNION

CCITT

V.32 *bis*

THE INTERNATIONAL
TELEGRAPH AND TELEPHONE
CONSULTATIVE COMMITTEE

DATA COMMUNICATION OVER THE TELEPHONE NETWORK

A DUPLEX MODEM OPERATING AT DATA SIGNALLING RATES OF UP TO 14 400 bit/s FOR USE ON THE GENERAL SWITCHED TELEPHONE NETWORK AND ON LEASED POINT-TO-POINT 2-WIRE TELEPHONE-TYPE CIRCUITS

Recommendation V.32 *bis*

Geneva, 1991

DOCKET ALARM
Find authenticated court documents without watermarks at docketalarm.com.

FOREWORD

The CCITT (the International Telegraph and Telephone Consultative Committee) is a permanent organ of the International Telecommunication Union (ITU). CCITT is responsible for studying technical, operating and tariff questions and issuing Recommendations on them with a view to standardizing telecommunications on a worldwide basis.

The Plenary Assembly of CCITT which meets every four years, establishes the topics for study and approves Recommendations prepared by its Study Groups. The approval of Recommendations by the members of CCITT between Plenary Assemblies is covered by the procedure laid down in CCITT Resolution No. 2 (Melbourne, 1988).

Recommendation V.32 *bis* was prepared by Study Group XVII and was approved under the Resolution No. 2 procedure on the 22 of February 1991.

CCITT NOTE

In this Recommendation, the expression "Administration" is used for conciseness to indicate both a telecommunication Administration and a recognized private operating agency.

© ITU 1991

All rights reserved. No part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from the ITU.

DOCKET ALARM Find authenticated court documents without watermarks at docketalarm.com.

A DUPLEX MODEM OPERATING AT DATA SIGNALLING RATES OF UP TO 14 400 bit/s FOR USE ON THE GENERAL SWITCHED TELEPHONE NETWORK AND ON LEASED POINT-TO-POINT 2-WIRE TELEPHONE -TYPE CIRCUITS

1 Introduction

This modem is intended for use on connections on general switched telephone networks (GSTNs) and on point-to-point 2-wire leased telephone-type circuits. The principal characteristics of the modem are as follows:

a) duplex mode of operation on GSTN and point-to-point 2-wire leased circuits;

b) channel separation by echo cancellation techniques;

c) quadrature amplitude modulation for each channel with synchronous line transmission at 2400 symbols/s;

d) the following synchronous data signalling rates shall be implemented in the modem:

- 14 400 bit/s trellis coded,
- 12 000 bit/s trellis coded,
- 9600 bit/s trellis coded,
- 7200 bit/s trellis coded,
- 4800 bit/s uncoded;

e) compatibility with Recommendation V.32 modems at 9600 and 4800 bit/s;

f) exchange of rate sequences during start-up to establish the data signalling rate;

g) a procedure to change the data signalling rate without retraining.

Note 1 – On international GSTN connections that utilize circuits that are in accord with Recommendation G.235 (16-channel terminal equipments), it may be necessary to employ a greater degree of equalization within the modem than would be required for use on most national GSTN connections.

Note 2 – The transmit and receive rates in each modem shall be the same. The possibility of asymmetric working remains for further study.

2 Line signals

2.1 *Carrier frequency and modulation rate*

The carrier frequency is to be 1800 ± 1 Hz. The receiver must be able to operate with a maximum received frequency offset of up to ± 7 Hz.

The modulation rate shall be 2400 symbols/s ± 0.01%.

2.2 *Transmitted spectrum*

The transmitted power level must conform to Recommendation V.2. With continuous binary ones applied to the input of the scrambler, the transmitted energy density at 600 Hz and 3000 Hz shall be attenuated 4.5 ± 2.5 dB with respect to the maximum energy density between 600 Hz and 3 000 Hz.

DOCKET ALARM Find authenticated court documents without watermarks at docketalarm.com.

2.3 *Coding*

2.3.1 *Signal element coding for 14 400 bit/s*

At 14 400 bits per second, the scrambled data stream to be transmitted is divided into groups of six consecutive data bits. The first two bits in time $Q1_n$ and $Q2_n$ in each group, where the subscript n designates the sequence number of the group, are first differentially encoded into $Y1_n$ and $Y2_n$ according to Table 1/V.32 *bis*. The two differentially encoded bits $Y1_n$ and $Y2_n$ are used as input to a systematic convolutional encoder which generates a redundant bit $Y0_n$ (see Figure 1/V.32 *bis*). This redundant bit and the six information-carrying bits $Y1_n$, $Y2_n$, $Q3_n$, $Q4_n$, $Q5_n$, $Q6_n$ are then mapped into the coordinates of the signal element to be transmitted according to the signal space diagram shown in Figure 2-1/V.32 *bis*.

TABLE 1/V.32 *bis*

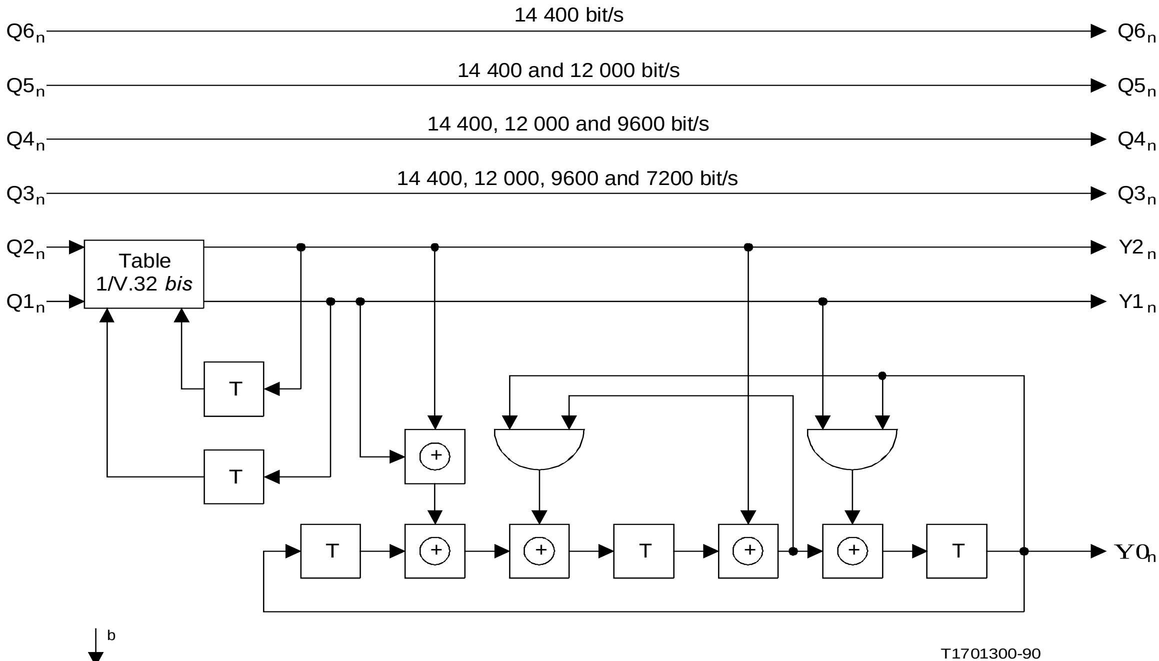
Differential quadrant coding with trellis coding

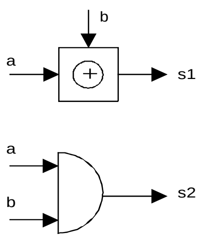
Inputs		Previous outputs		Outputs	
$Q1_n$	$Q2_n$	$Y1_{n-1}$	$Y2_{n-1}$	$Y1_n$	$Y2_n$
0	0	0	0	0	0
0	0	0	1	0	1
0	0	1	0	1	0
0	0	1	1	1	1
0	1	0	0	0	1
0	1	0	1	0	0
0	1	1	0	1	1
0	1	1	1	1	0
1	0	0	0	1	0
1	0	0	1	1	1
1	0	1	0	0	1
1	0	1	1	0	0
1	1	0	0	1	1
1	1	0	1	1	0
1	1	1	0	0	0
1	1	1	1	0	1

2.3.2 *Signal element coding for 12 000 bit/s*

At 12 000 bits per second, the scrambled data stream to be transmitted is divided into groups of five consecutive data bits. The first two bits in time $Q1_n$ and $Q2_n$ in each group, where the subscript n designates the sequence number of the group, are first differentially encoded into $Y1_n$ and $Y2_n$ according to Table 1/V.32 *bis*. The two differentially encoded bits $Y1_n$ and $Y2_n$ are used as input to a systematic convolutional encoder which generates a redundant bit $Y0_n$ (see Figure 1/V.32 *bis*). This redundant bit and the five information-carrying bits $Y1_n$, $Y2_n$, $Q3_n$, $Q4_n$, $Q5_n$, are then mapped into the coordinates of the signal element to be transmitted according to the signal space diagram shown in Figure 2-2/V.32 *bis*.

DOCKET ALARM
Find authenticated court documents without watermarks at docketalarm.com.





a	b	s1	s2
0	0	0	0
0	1	1	0
1	0	1	0
1	1	0	1

Symbol truth table

FIGURE 1/V.32 *bis*

Trellis encoder

DOCKET ALARM
Find authenticated court documents without watermarks at docketalarm.com.

DOCKET ALARM

Explore Litigation Insights

Docket Alarm provides insights to develop a more informed litigation strategy and the peace of mind of knowing you're on top of things.

Real-Time Litigation Alerts

Keep your litigation team up-to-date with **real-time alerts** and advanced team management tools built for the enterprise, all while greatly reducing PACER spend.

Our comprehensive service means we can handle Federal, State, and Administrative courts across the country.

Advanced Docket Research

With over 230 million records, Docket Alarm's cloud-native docket research platform finds what other services can't. Coverage includes Federal, State, plus PTAB, TTAB, ITC and NLRB decisions, all in one place.

Identify arguments that have been successful in the past with full text, pinpoint searching. Link to case law cited within any court document via Fastcase.

Analytics At Your Fingertips

Learn what happened the last time a particular judge, opposing counsel or company faced cases similar to yours.

Advanced out-of-the-box PTAB and TTAB analytics are always at your fingertips.

API

Docket Alarm offers a powerful API (application programming interface) to developers that want to integrate case filings into their apps.

LAW FIRMS

Build custom dashboards for your attorneys and clients with live data direct from the court.

Automate many repetitive legal tasks like conflict checks, document management, and marketing.

FINANCIAL INSTITUTIONS

Litigation and bankruptcy checks for companies and debtors.

E-DISCOVERY AND LEGAL VENDORS

Sync your system to PACER to automate legal marketing.

WHAT WILL YOU BUILD? | sales@docketalarm.com | 1-866-77-FASTCASE

fastcase®
Smarter legal research.