

E-1 Digital Trunk and KX-T96188X

1.Introduction

KX-T96188X(E-1 card) is an optional card that provides the system with interface for digital E-1 service.

E-1(or E1) is the European equivalent of the North American 1.544 Mbps T-1(or T1) digital transmission link, except that E-1 carries information at the rate of 2.048 megabits per second.

This is the rate used by European CEPT(Conference of European Postal and Telecommunications Administrations) carriers to transmit 30 (64 Kbps) digital channels for voice or data calls, plus a 64 Kbps channel for signaling, and a 64 Kbps channel for framing (synchronization) and maintenance.

Since robbed-bit signaling is not used (as it is for T-1 in North America), all 8 bits per channel are used to code the waveshape.

The data format of E-1 is the following.

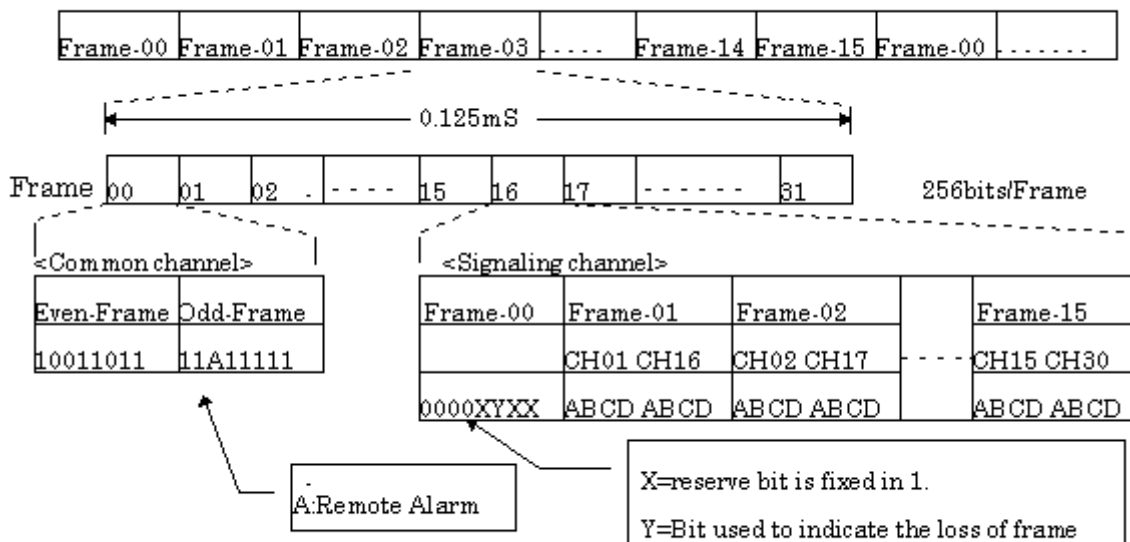
The voice signal data(8bits) which is digitized by PCM(8KHz sampling. Mostly A-law PCM is applied for E-1) is carried by using a channel of the following E-1 data frame. The framing channel(CH00) carries always one of the 2 fixed data which display the head of a data frame.

The signaling channel(CH16) carries signal information of 2 channels at one time by 4 bits(ABCD bits) of binary data.

In the 4 signaling bits, A bit and B bit are used for most of the signaling sequences.

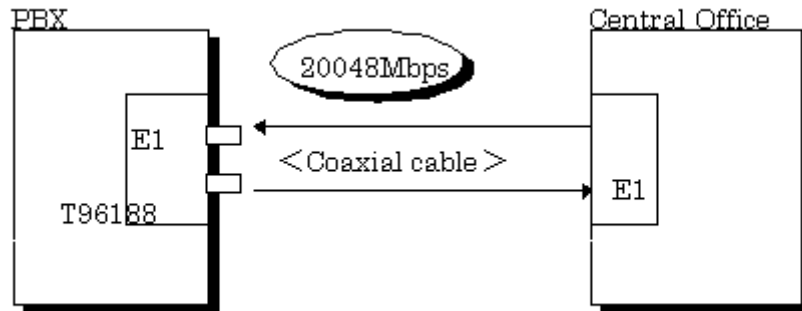
The detail of the signaling sequence which uses these A and B bit is displayed on the section 3 of this document.

This signal sequence is used in almost all the countries commonly.



* The other channels (30 Channels) are Voice Channel.

KX-T96188X(E-1 card) is connected with coaxial cables.



2.Function

The following table is the function of KX-T96188X.

Item	Feature	Note
Interface	64Kbps/CH x 32CH 2.048Mbps	
Connection	Two coaxial cables Two BNC connector (75 ohms)	
Frame Format	PCM30 PCM30-CRC	Selectable
Line Coding	AMI(Alternate Mark Inversion) HDB3(High Density Bipolar of order3)	Selectable
Channel Type (Line signaling)	DR2 (Digital signaling system-R2) E&M-C (Continuous E&M) E&M-P (Pulsed E&M)	Selectable
Register Signaling	DP Signaling sending/receiving DTMF Signaling sending/receiving MFC-R2 Signaling sending/receiving (Digital signaling system-R2 only)	Selectable
Faults & Diagnosis	LED Alarm Display Automatic Fault Release	
Feature	Flexible Channel Assignment Inter system connection (E&M feature)	
Mount Slot No.	No.1,5,9 (Basic/Expansion shelf) Tree slots after E-1 card can not use.(KX-T336) One slots after E-1 card can not use.(KX-TD500)	
Maximum No.	4 Cards (120 ports)	

3.Channel Type(Line Signaling) Detail

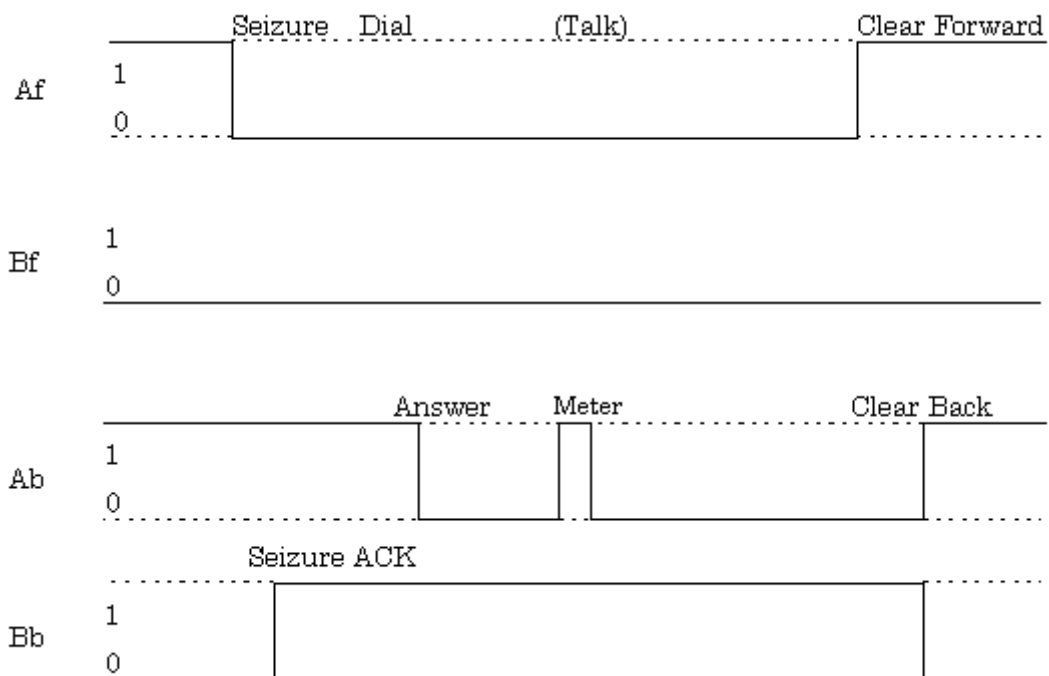
3-1 DR2(Digital signaling system R2)

This signaling is used to connect with Central Office.

KX-T96188X is supporting the following signaling sequence.

Status	Forward		Backward		
	A	B	A	B	
Idle	1	0	1	0	
Seizure	0	0	1	0	
Seizure Ack	0	0	1	1	
Dialing(MFC-R2)	0	0	1	1	
Dialing(DTMF)	0	0	1	1	
Dialing(DP)	X	0	1	1	DP control bit(A-bit or B-bit) selectable.
Answered	0	0	0	1	
Meter Pulse	0	0	X	1	Meter Pulse scan bit(A-bit or B-bit) selectable.
Clear-back	0	0	1	1	
Clear-forward	1	0	0	1	

The DR2 signaling sequence diagram is the following.



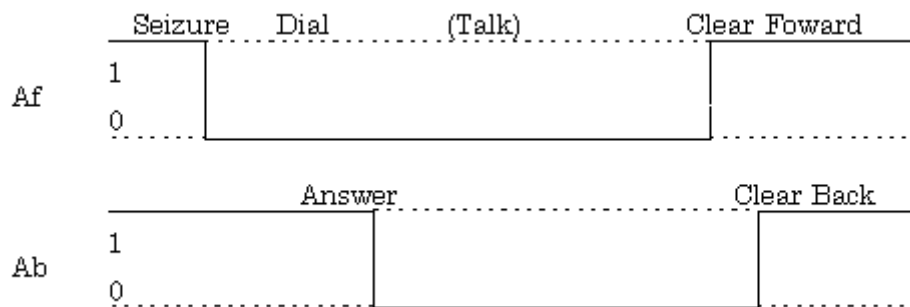
3-2 E&M-C(Continuous E&M)

This signaling is used to connect with our system or Other system. KX-T96188X is supporting the following signalling sequence.

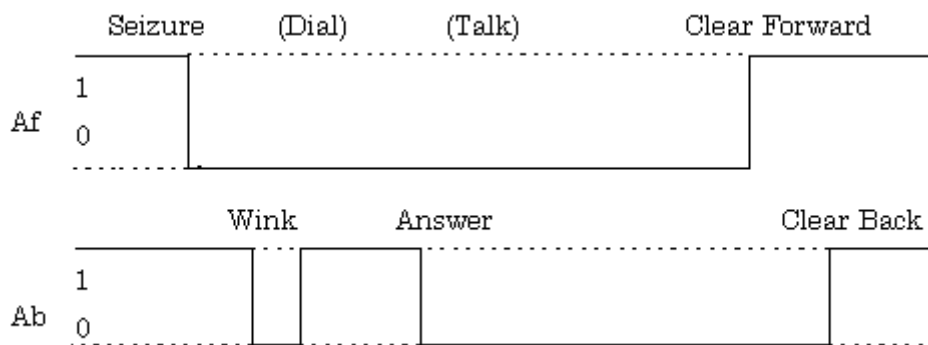
Status	Forward		Backward	
	Af	Bf	Ab	Bb
Idle	1	0	1	0
Seizure	0	0	1	0
(Wink)	0	0	0	0
Dialing(DTMF)	0	0	1	0
Dialing(DP)	X	0	1	0
Answered	0	0	0	0
Clear-back	0	0	1	0
Clear-forward	1	0	0	0

The E&M_C signaling sequence diagram is the following.
It's possible to select Wink or Immediate.

Continuous E&M(Immediate)



Continuous E&M(Wink)



3-3 E&M-P(Pulsed E&M)

This signaling is used to connect with Other system.

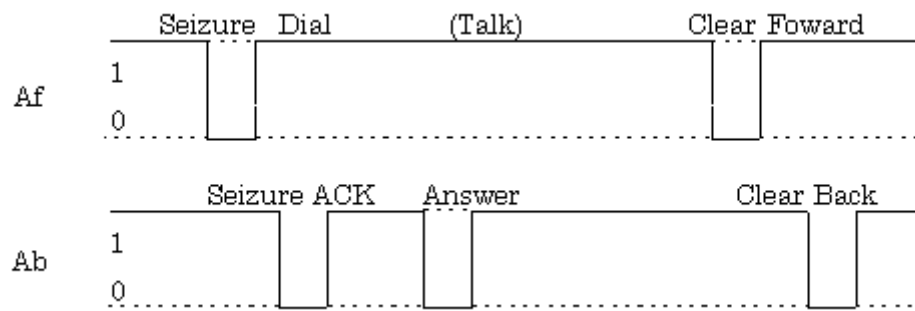
KX-T96188X is supporting the following signaling sequence.

Status	Forward		Backward	
	Af	Bf	Ab	Bb
Idle	1	0	1	0
Seizure	P	0	1	0
Seizure ACK	1	0	P	0
Dialing(DTMF)	X	0	1	0
Dialing(DP)	X	0	1	0
Answered	1	0	P	0
Clear-back	1	0	P	0
Clear-forward	P	0	1	0

(Note) P=Pulse signal.

It's possible to select Short Pulse(150ms) or Long Pulse(600ms) with each pulse signal.

The E&M_P signaling sequence diagram is the following.



4.Registor Signaling(MFC-R2) Detail

The MFC-R2 signal consists of Forward signal and Backward signal. The frequencies of both signals is the following.

Forward signal		Backward signal	
Code No.	Combinations of Frequencies	Code No.	Combinations of Frequencies
01	1380Hz + 1500Hz	01	1140Hz + 1020Hz
02	1380Hz + 1620Hz	02	1140Hz + 900Hz
03	1500Hz + 1620Hz	03	1020Hz + 900Hz
04	1380Hz + 1740Hz	04	1140Hz + 780Hz
05	1500Hz + 1740Hz	05	1020Hz + 780Hz
06	1620Hz + 1740Hz	06	900Hz + 780Hz
07	1380Hz + 1860Hz	07	1140Hz + 660Hz
08	1500Hz + 1860Hz	08	1020Hz + 660Hz
09	1620Hz + 1860Hz	09	900Hz + 660Hz
10	1740Hz + 1860Hz	10	780Hz + 660Hz
11	1380Hz + 1980Hz	11	1140Hz + 540Hz
12	1500Hz + 1980Hz	12	1020Hz + 540Hz
13	1620Hz + 1980Hz	13	900Hz + 540Hz
14	1740Hz + 1980Hz	14	780Hz + 540Hz
15	1860Hz + 1980Hz	15	660Hz + 540Hz

The default data table of the MFC-R2 signal is the following.

Forward Signal			Backward Signal		
Code No.	Group-I	Group-II	Code No.	Group-A	Group-B
01	Digit [1]	Subscriber*	01	Next digit	Idle *
02	Digit [2]		02		Busy *
03	Digit [3]		03	Digit complete	Unallocate *
04	Digit [4]		04	Congestion	Congestion *
05	Digit [5]		05		
06	Digit [6]		06		
07	Digit [7]		07		
08	Digit [8]		08		
09	Digit [9]		09		
10	Digit [0]		10		

11			11		
12			12		
13			13		
14			14		
15			15		

Note:

* = It's possible to change to the other code No(01-15).

It's possible to assign Subscriber or Operator in Group-II.

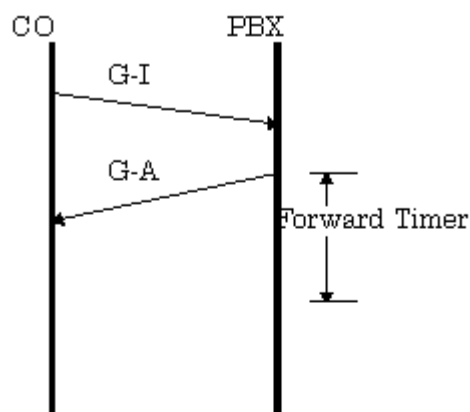
When PBX receive Group-II code which Subscriber is assigned,PBX will send code No. of called party status.

When PBX receive Group-II code which Operator is assigned,PBX will send code No. of Idle and Operator is called.

It's possible to change the forward timer,backward timer and disappearance timer up to 30sec.

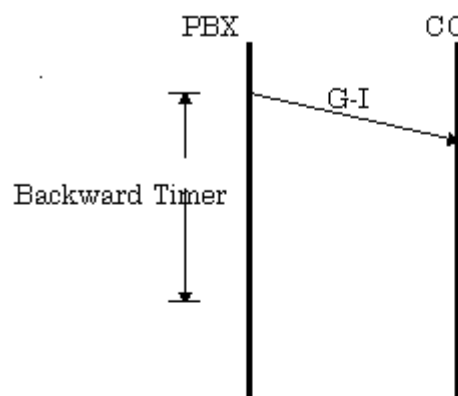
Each Timer is using like the following.

<Forward Timer>



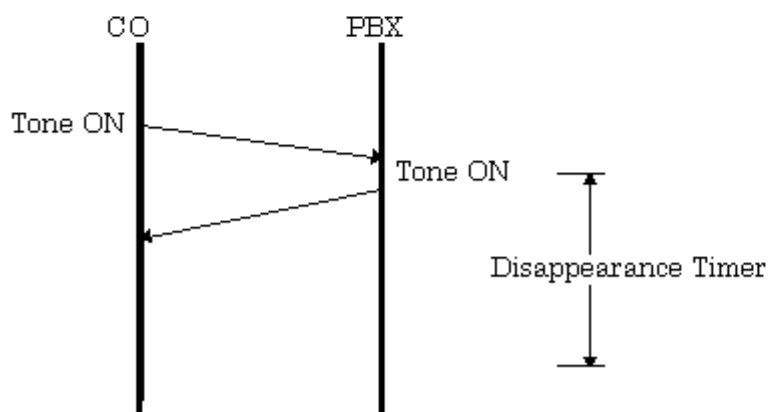
CO did not send next forward signal

<Backwad Timer>



CO did not send backward signal

<Disappearance Timer>



CO did not stop MFC-R2 Tone

