HPX-1600
USER GUIDE

Appendix E:
Types of Signalling for Voice Networks

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1. CHANNEL ASSOCIATED SIGNALLING

Point to point voice circuits typically use analogue or MFC tone signalling. When multiple voice circuits are digitised and multiplexed over more economic digital links, the signalling capacity is increased and simplified through digital signalling codes, replacing the MFC tone coding used in earlier telephone systems.

Four bits are used for signalling in each direction of a full duplex link. These are referred to as bits “a”, “b”, “c” and “d”.

In reality only two bits are required which are “a” and “b”. The “c” and “d” bit settings may be configured in each voice interface module. In T1 networks, “c” and “d” are normally set to equal the values of “a” and “b”. In E1 networks, “c” and “d” are normally set to a “01”.

The “a” and “b” bits are transmitted in both directions of a full duplex voice circuit.

Haliplex voice interface modules support three Channel Associated Signalling codes;

- R2 (CAS-E1) – complies to ITU Q.421, used on E1 trunks,
- CAS-T1 – used on T1 trunks,
- PLAR – based on a PUB 43801, 1982 Addendum.

Although R2 (CAS-E1) is commonly used on E1 trunks and CAS-T1 on T1 trunks, the configuration allows the administrator to select the signalling code for each voice interface and the busy code for PCM trunks.

1.1. CAS TO FXO SERVER

The following describes call signalling on the E1 trunk between the HPX-1600 and the FXO Server.

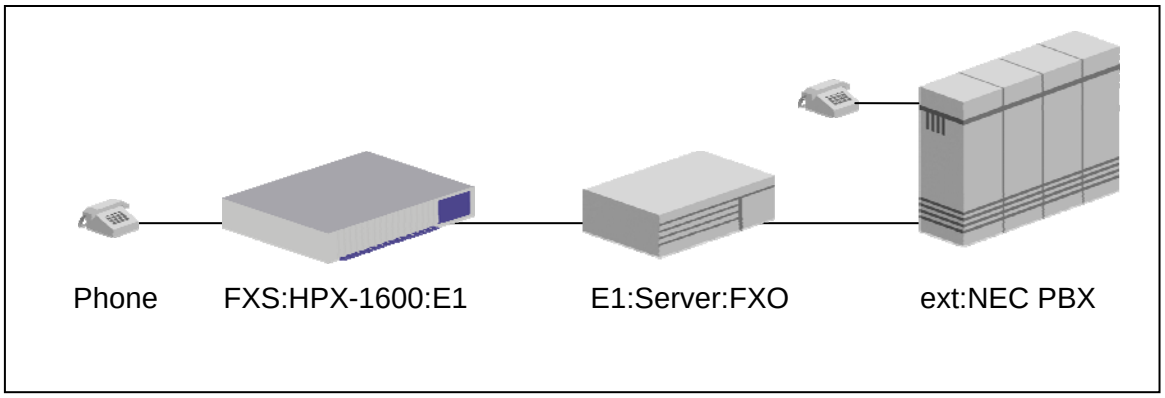

Figure 1: Signalling between HPX-1600 and FXO Server

Table 1 describes the signalling for the Subscriber Initiated Call and Subscriber Terminated. Table 2 describes the signalling for the Subscriber Initiated Call and Exchange Terminated. The HPX signal is sent to the FXO Server and the FXO Server responds to the HPX signal.

HPX abcd	Action	FXO abcd
0101	Idle	0101
1101	Subscriber Off-hook	0101
1101	DTMF dial	0101
1101	Ringing	0101
1101	Answers	0101
1101	Call in progress	0101
0101	Subscriber On-hook	0101

Table 1: Subscriber Initiated Call - Subscriber Terminated

HPX abcd	Action	FXO abcd
0101	Idle	0101
1101	Subscriber Off-hook	0101
1101	DTMF dial	0101
1101	Ringing	0101
1101	Answers	0101
1101	Call in progress	0101
1101	Exchange On-hook	0101
0101	Subscriber On-hook	0101

Table 2: Subscriber Initiated Call - Exchange Terminated

Table 3 describes the signalling for the Exchange Initiated Call and Subscriber Terminated. Table 4 describes the signalling for the Exchange Initiated Call and Exchange Terminated. The FXO signal is sent to the HPX-1600 and the HPX-1600 responds to the FXO signal.

HPX abcd	Action	FXO abcd
0101	Idle	0101
0101	Exchange Off-hook	0101
0101	Exchange generated ring	0(0/1)01
0101	Ringing cadence	0(0/1)01
1101	Subscriber Answers	0101
1101	Call in progress	0101
0101	Subscriber On-hook	0101

Table 3: Exchange Initiated Call - Subscriber Terminated

HPX abcd	Action	FXO abcd
0101	Idle	0101
0101	Exchange Off-hook	0101
0101	Exchange generated ring	0(0/1)01
0101	Ringing cadence	0(0/1)01
1101	Subscriber Answers	0101
1101	Call in progress	0101
1101	Exchange On-hook	0101
0101	Subscriber On-hook	0101

Table 4: Exchange Initiated Call - Exchange Terminated

1.2. R2 TO FXO SERVER

The following describes call signalling on the E1 trunk between the HPX-1600 and the FXO server.

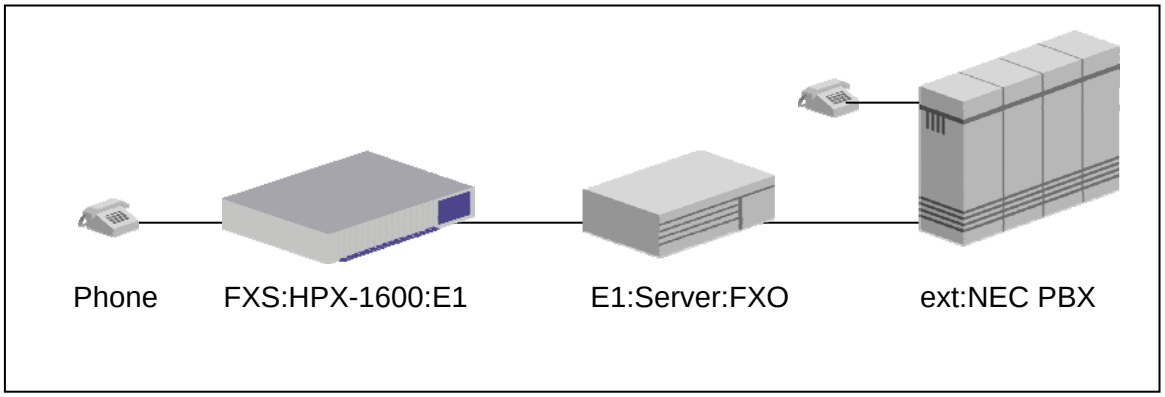

Figure 2: Signalling between HPX-1600 and FXO Server

Table 5 describes the signalling for the Subscriber Initiated Call and Subscriber Terminated. Table 6 describes the signalling for the Subscriber Initiated Call and Exchange Terminated. The HPX signal is sent to the FXO Server and the FXO Server responds to the HPX signal.

HPX abcd	Action	FXO abcd
1001	Idle	1001
0001	Subscriber Off-hook	1001
0001	DTMF dial & Ringing	1001
0001	Answers	1001
0001	Call in progress	1001
1001	Idle	1001

Table 5: Subscriber Initiated Call - Subscriber Terminated

HPX abcd	Action	FXO abcd
1001	Idle	1001
0001	Subscriber Off-hook	1001
0001	DTMF dial & Ringing	1001
0001	Answers	1001
0001	Call in progress	1001
0001	Exchange On-hook	1001
1001	Idle	1001

Table 6: Subscriber Initiated Call - Exchange Terminated

Table 7 describes the signalling for the Exchange Initiated Call and Subscriber Terminated. Table 8 describes the signalling for the Exchange Initiated Call and Exchange Terminated. The FXO signal is sent to the HPX-1600 and the HPX-1600 responds to the FXO signal.

HPX abcd	Action	FXO abcd
1001	Idle	1001
1001	Exchange generated ring	(0/1)001
1001	Ringing cadence	(0/1)001
0001	Subscriber Answers	1001
0001	Call in progress	1001
1001	Subscriber On-hook	1001

Table 7: Exchange Initiated Call - Subscriber Terminated

HPX abcd	Action	FXO abcd
1001	Idle	1001
1001	Exchange generated ring	(0/1)001
1001	Ringing cadence	(0/1)001
0001	Subscriber Answers	1001
0001	Call in progress	1001
0001	Exchange On-hook	1001
1001	Subscriber On-hook	1001

Table 8: Exchange Initiated Call - Exchange Terminated

1.3. R2 TO PBX

The following describes call signaling on the E1 trunk between the HPX-1600 and the NEC PBX.

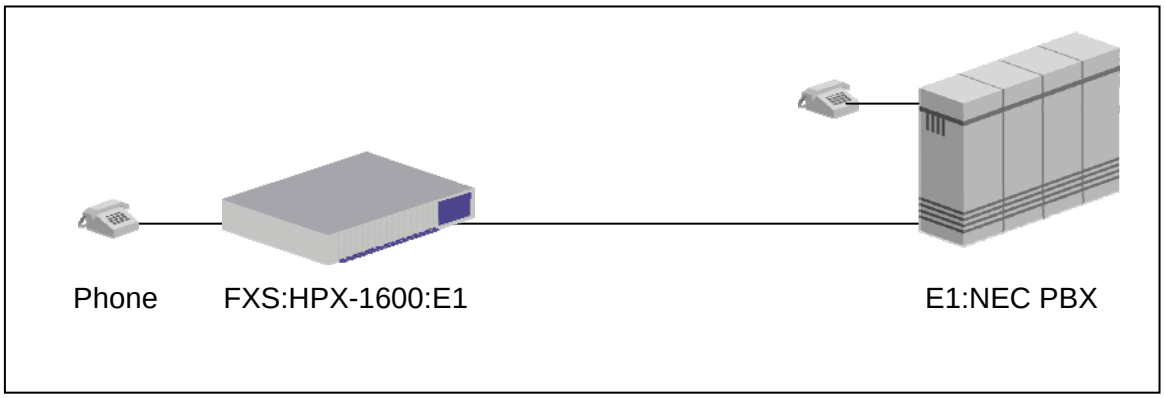

Figure 3: Signalling between HPX-1600 and NEC PBX

Table 9 describes the signalling for the Subscriber Initiated Call and Subscriber Terminated. Table 10 describes the signalling for the Subscriber Initiated Call and Exchange Terminated. The HPX-1600 signal is sent to the NEC PBX and the NEC PBX responds to the HPX-1600 signal.

HPX abcd	Action	PBX abcd
1001	Idle	1001
0001	Subscriber Off-hook	1001
0001	Exchange acknowledges	1101
0001	DTMF dial & Ringing	1101
0001	Answers	0101
0001	Call in progress	0101
1001	Subscriber On-hook	0101
1001	Exchange Idle	1001

Table 9: Subscriber Initiated Call - Subscriber Terminated

HPX abcd	Action	PBX abcd
1001	Idle	1001
0001	Subscriber Off-hook	1001
0001	Exchange acknowledges	1101
0001	DTMF dial & Ringing	1101
0001	Answers	0101
0001	Call in progress	0101
0001	Exchange On-hook	1101
1001	Subscriber Idle	1101
1001	Exchange Idle	1001

Table 10: Subscriber Initiated Call - Exchange Terminated

Table 11 describes the signalling for the Exchange Initiated Call and Subscriber Terminated. Table 12 describes the signalling for the Exchange Initiated Call and Exchange Terminated. The NEC PBX signal is sent to the HPX-1600 and the HPX-1600 responds to the NEC PBX signal.

HPX abcd	Action	PBX abcd
1001	Idle	1001
1001	Exchange Off-hook	0001
1001	Exchange generated ring	0001
0001	Subscriber Answers	0001
0001	Call in progress	0001
1001	Subscriber On-hook	0001
1001	Exchange acknowledges	1001
1001	Idle	1001

Table 11: Exchange Initiated Call - Subscriber Terminated

HPX abcd	Action	PBX abcd
1001	Idle	1001
1001	Exchange Off-hook	0001
1001	Exchange generated ring	0001
0001	Subscriber Answers	0001
0001	Call in progress	0001
0001	Exchange On-hook	1001
1001	Subscriber On-hook	1001
1001	Exchange Idle	1001

Table 12: Exchange Initiated Call - Exchange Terminated

1.4. PLAR HOTLINE

The following describes call signalling on the E1 trunk between the HPX-1600 and the HPX-1600.

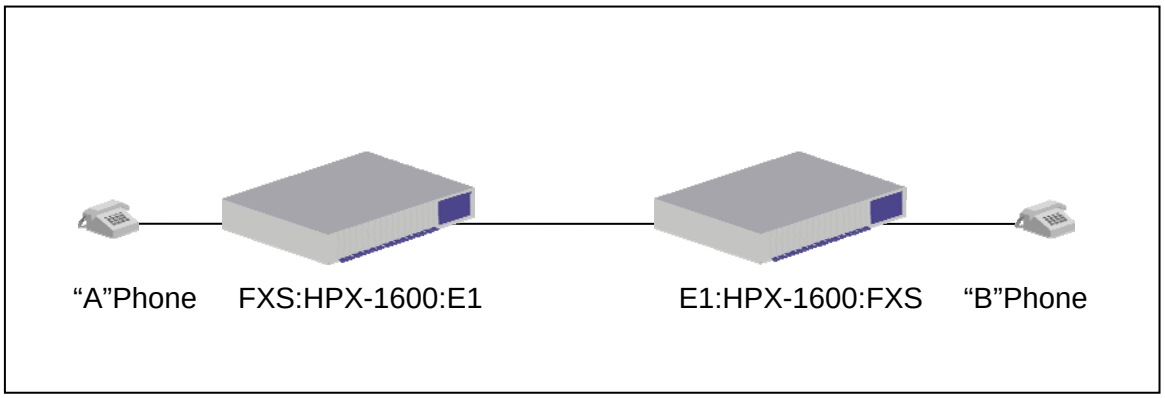

Figure 4: Signalling between HPX-1600 and HPX-1600

Table 14 describes the signalling for the "A" Party Initiated Call and "A" Party Terminated. The "A" Party signal is sent to the "B" Party and the "B" Party responds to the "A" Party signal.

"A" abcd	Action	"B" abcd
1101	Idle	1101
0001	"A" party Off-hook	1101
0001	"B" party Ringing	1101
0001	"B party Off-Hook	0001
0001	Call in progress	0001
1101	"A" **or** "B" party On-hook	1101
1101	Idle	1101

Table 13: "A" Party Initiated Call - "A" Party Terminated

1.5. R2 HOTLINE

The following describes call signalling on the E1 trunk between the HPX-1600 and the HPX-1600.

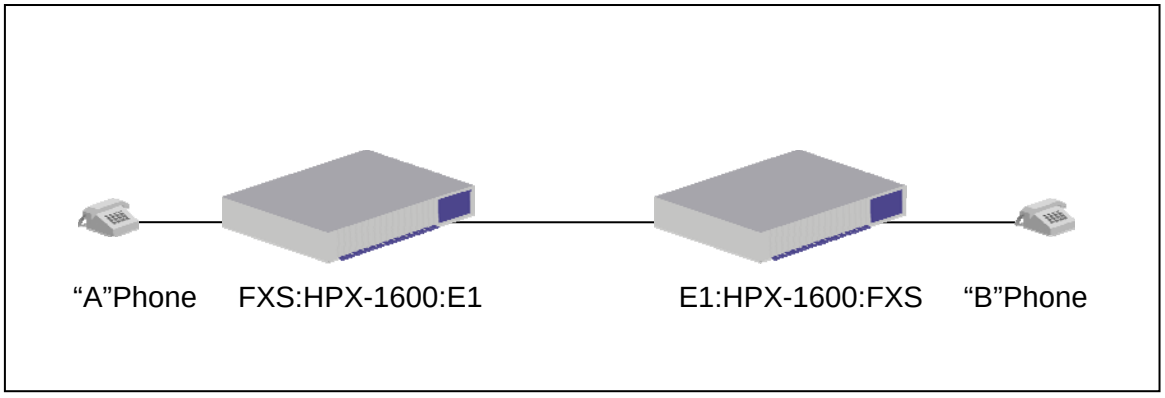

Figure 5: Signalling between HPX-1600 and HPX-1600

Table 14 describes the signalling for the “A” Party Initiated Call and “A” Party Terminated. Table 15 describes the signalling for Variation with “B” Party Terminated. The “A” Party signal is sent to the “B” Party and the “B” Party responds to the “A” Party signal.

“A” abcd	Action	“B” abcd
1001	Idle	1001
0001	“A” party Off-hook	1001
0001	“B” party Ringing	1001
0001	“B” party Off-Hook	0001
0001	Call in progress	0001
1001	“A” party On-hook	0001
1001	Idle	1001

Table 14 : “A” Party Initiated Call - “A” Party Terminated

0001	“B” party On-hook	1001
1001	Idle	1001

Table 15: Variation - “B” party Terminated