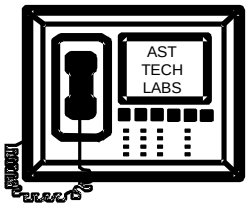

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CLASS / ADSI Signaling Summary

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1. Introduction

This document contains a summary of the signaling characteristics of CLASS and the ADSI (Analog Display Services Interface). This information is intended to be informative and provide a basis for discussions regarding CLASS / ADSI testing, and CPE / Server / Switch signaling implementations

2. Background Documentation

It is assumed that the reader is familiar with the following Bellcore documents. These documents contain the requirements, recommendations, and specifications pertinent to the CLASS and ADSI protocols.

GR-30-CORE (Issue 1, 1994)	*LSSGR: Voiceband Data Transmission Interface Section 6.6*
SR-TSV-002476 (Issue 1, 1992)	*Customer Premises Equipment Compatibility Considerations for the Voiceband Data Transmission Interface*
TR-NWT-001273 (Issue 1, 1992)	*Generic Requirements for an SPCS to Customer Premises Equipment Data Interface for Analog Display Services*
SR-INS-002461 (Issue 1, 1992)	*Customer Premises Equipment Compatibility Considerations for the Analog Display Services Interface*
TR-NWT-000031 (Issue 4, 1992)	*CLASS Feature: Calling Number Delivery*
TR-NWT-001188 (Issue 1, 1991)	*CLASS Feature: Calling Name Delivery Generic Requirements*
TR-NWT-001401 (Issue 1, 1993)	*Visual Message Waiting Indicator Generic Requirements*
SR-3004 (Issue 2, 1995)	*Testing Guidelines for Analog Type 1,2, and 3 CPE as Described in SR-INS-002726*

3. CLASS and ADSI Protocols

This section is included to provide a brief summary of the CLASS and ADSI protocols. The emphasis here is on signaling rather than discussing the information flow or software details. Bellcore has defined three CPE types: Type 1 is for interfacing to on-hook CLASS services such as Caller-ID (CID), which may include the Calling Name information (CNAM), and the Visual Message Waiting Indicator (VMWI) feature. Type 2 is CID and/or CNAM but the feature works while off-hook in conjunction with the Call Waiting feature. This is called Caller-ID on Call Waiting (CIDCW). Type 3 is for interfacing to features using the Analog Display Services

Interface (ADSI) protocols. A Type 2 CPE must be capable of interfacing to Type 1 and Type 2 features. A Type 3 CPE must be capable of interfacing to Type 1, Type 2, and Type 3 features.

3.1 Type 1 Features (CID, VMWI)

On-hook CID (number and/or name) is transmitted on the telephone line between the first and second power ringing signal. The data is transmitted via Frequency Shift Keying (FSK) modulation. Figure 3-1 shows the typical signaling arrangement. Figure 3-2 shows the timings associated with Type 1 signaling. Note that when distinctive ringing patterns are used, there may be more than one silent interval. The longest silent interval (between cycles) is when FSK data is transmitted. The CPE is required to receive the FSK, decode it and display the information as appropriate.

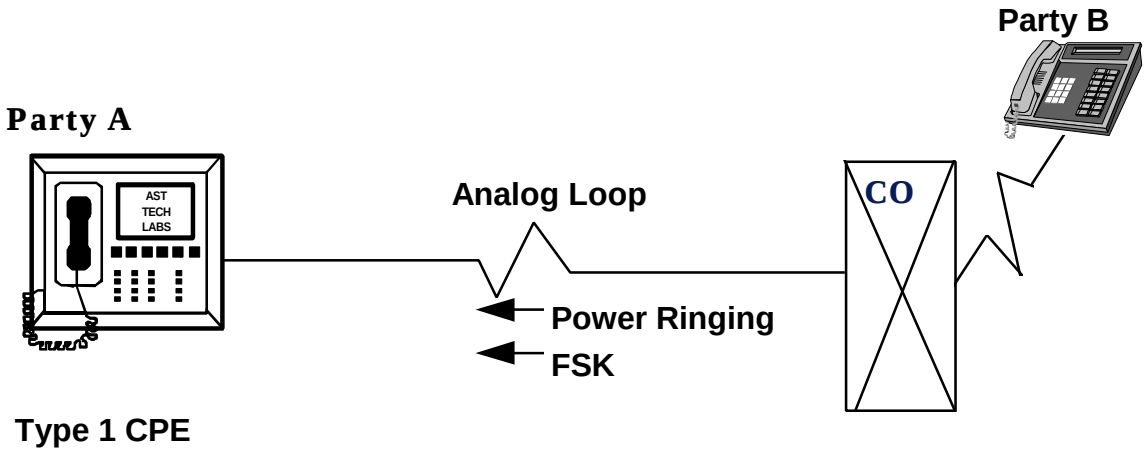
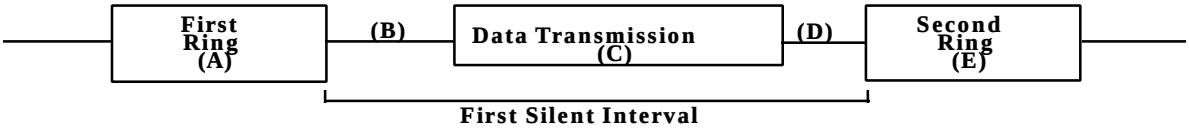


Figure 3-1 Type 1 Signaling



A	2.0 Sec.	First power ringing on interval (**0.2** - 2.2 Sec.)
B	250 ms	Channel Seizure Delay.
C	2.9 - 3.7 Sec.	Time available for data transmission
D	200 ms	Data transmission will stop at least 200 ms before the second ring
E	2.0 Sec.	Second power ringing on interval (1.8 - 2.2 Sec.)

Figure 3-2 Type 1 Signaling Timing

3.2 Type 2 Features (CIDCW)

The CIDCW feature is used to transmit the same information as the on-hook CID feature except in this case the customer's current call is interrupted while the data is transmitted to the CPE. This interruption is started by the Stored Program Controlled Switching System (SPCS) by transmitting a Call Waiting signal (440 Hz, about 300 ms) followed by a CPE Alerting Signal (CAS). The CAS is what is detected by the CPE. Upon detecting the CAS the CPE is to mute the CPE handset (transmitter and receiver), or speakerphone microphone and speaker, send a DTMF Acknowledgment signal (ACK) and wait to receive the FSK. If a time-out occurs after sending the ACK, the CPE is to un-mute the transmitter and receiver and continue with normal operation. Figure 3-3 shows the typical signaling arrangement for the Type 2 CIDCW feature. Figure 3-4 shows the timings associated with Type 2 signaling.

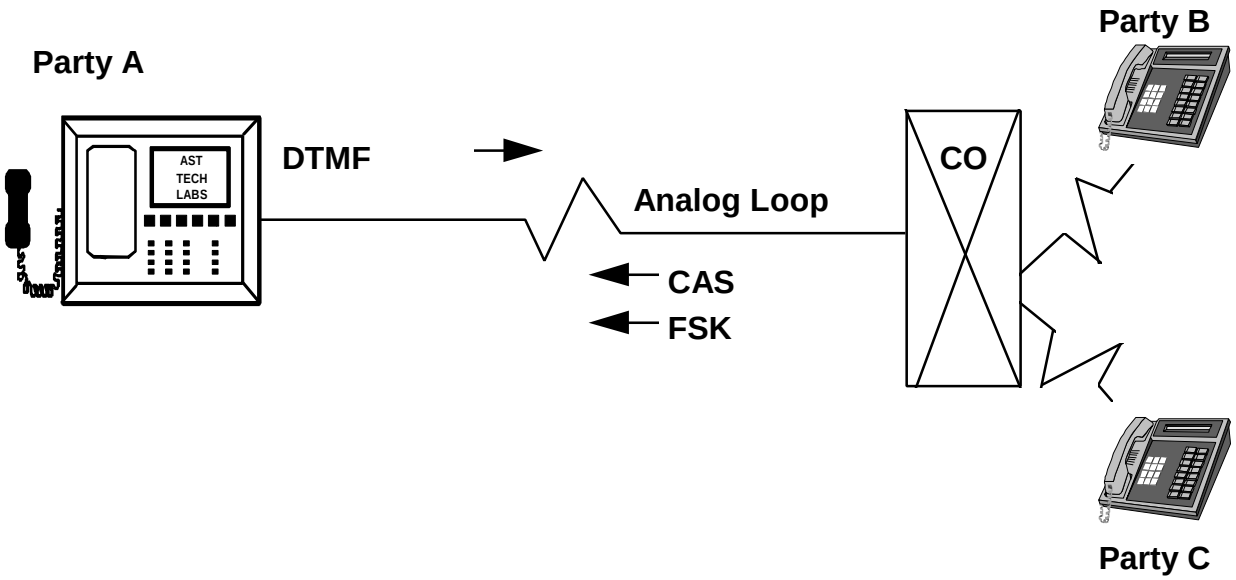
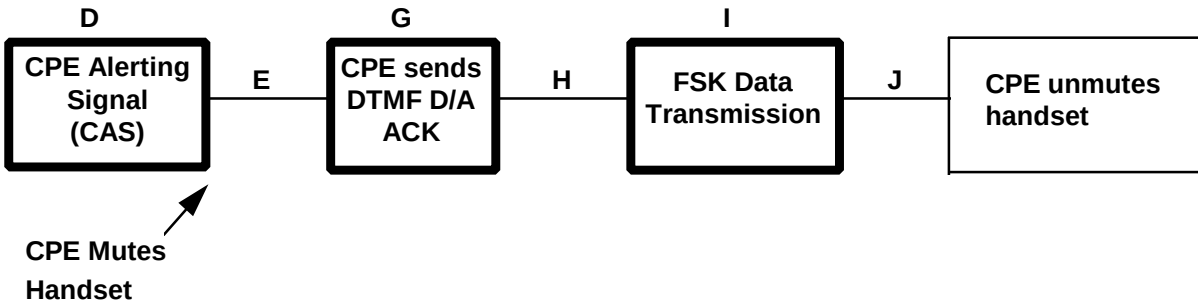


Figure 3-3 Type 2 Signaling



D	**75 - 85 ms**	**CPE detects the CAS**
E	**0 - 100 ms**	**CPE must begin to send ACK with 100 ms of receiving CAS**
G	**55 - 65 ms**	**Length of the (DTMF D for Type 2, DTMF A for Type 3) ACK signal**
H	**0 - 500 ms**	**Maximum time CPE should wait for data: after 500 ms CPE should return to state before CAS received**
I	**?**	**Timing is feature dependent**
J	**0 - 50 ms**	**CPE must unmute the handset within this time**

Figure 3-4 Type 2 Signaling Timing

3.3 Type 3 Features (ADSI)

ADSI provides protocols that define two different types of features. One, Server Display Control (SDC) which is used for real-time connection to a server (via a regular telephone connection) or directly to an SPCS. SDC features are usually for transactions such as banking, visual voice mail, enhanced Interactive Voice Response (IVR), etc. SDC applications will display text on the CPE screen and alternately send voice to provide more instructions. The user interacts with the application by pressing softkeys which the server has programmed to perform various signaling when selected. The second type of feature is called Feature Download (FD) or Script Interpretation. FD is used to download a semi-permanent script into the telephone. The script contains information which allows the phone to track various states of calls and provide context sensitive information to the user. This will enable the user to make better use of CLASS and Custom Calling services which without FD, would require the user to remember procedures, sequences, and signaling codes. The FD script relieves the user of this burden by presenting text and softkeys that show the user which services are available and the ability to activate the service with one touch of a softkey button.

Figure 3-5 shows the typical signaling arrangement for SDC, and Figure 3-6 shows the signaling scenario for the use of a FD script. Figure 3-7 shows the timings associated with Type 3 SDC signaling. FD signaling timing depends on the actual services to which the script is designed to interface with.

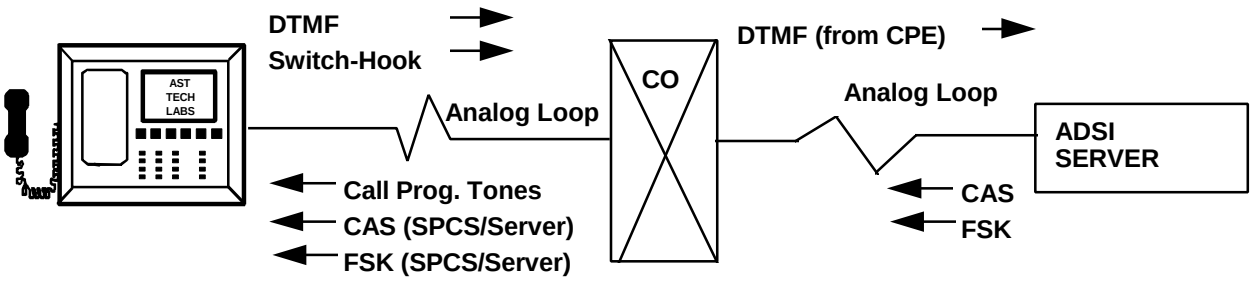


Figure 3-5 Type 3 ADSI Server Display Control Signaling

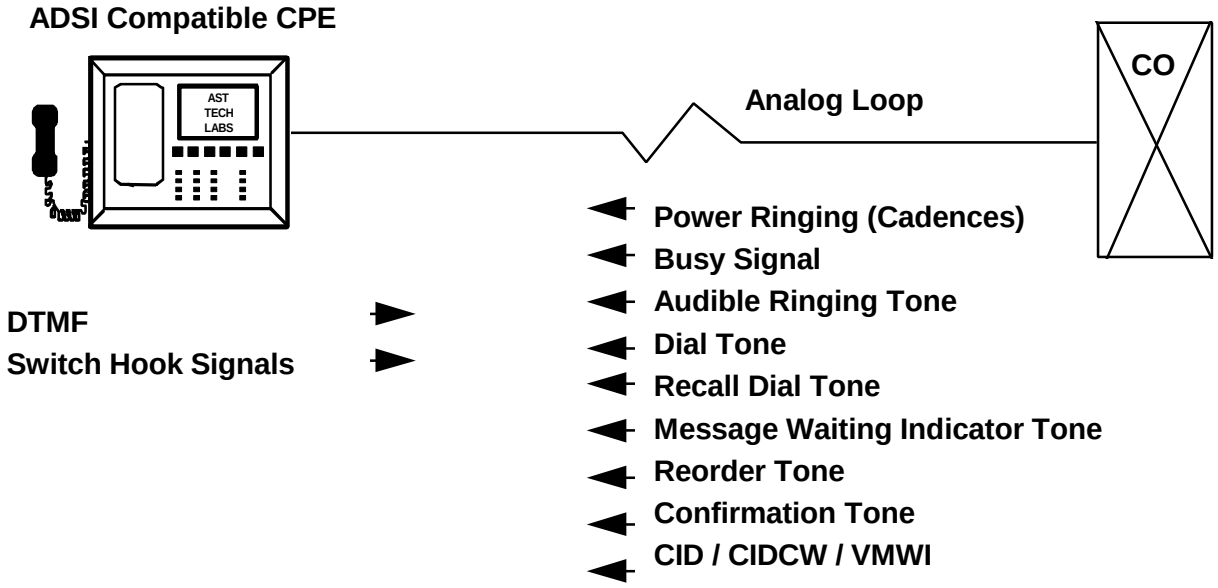
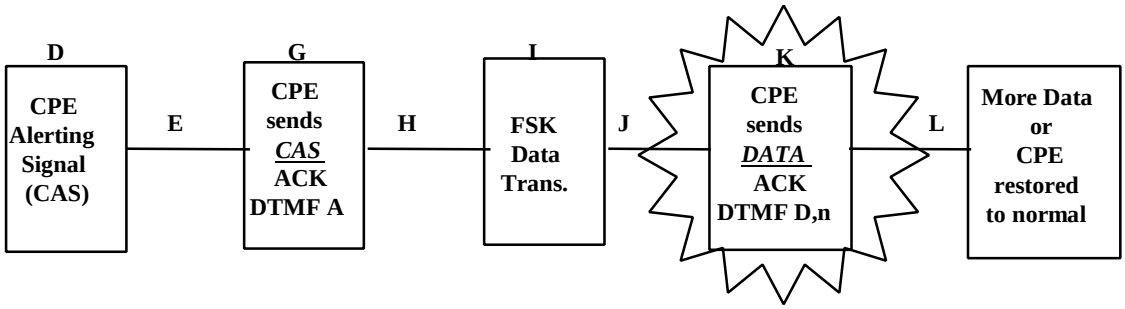


Figure 3-6 Type 3 Feature Download (Script Interpretation) Signaling



D	**75 - 85 ms**	**CPE detects the CAS (CPE mutes handset/keypad)**
E	**0 - 100 ms**	**CPE must begin to send ACK within 100 ms of receiving CAS**
G	**55 - 65 ms**	**Length of the (DTMF A) ACK signal**
H	**0 - 500 ms**	**Maximum time CPE should wait for data: after 500 ms CPE should return to state before CAS received**
I		**Timing is feature dependent**
J	**100 - 600 ms**	**CPE sends the appropriate message ACK signal a minimum of 100 ms after FSK carrier ceases (this allows for multiple data frames to be included in one data burst)**
K	**155 - 185 ms**	**DTMF D0, D1, D2, D3, D4, or D5 to ACK ADSI messages**
L	**0 - 50 ms**	**CPE restores previous state of handset / keypad (unless CPE has been instructed to go into Data Mode)**

Figure 3-7 Type 3 SDC Signaling Timing

4. Conclusion

AST Technology Labs Inc. has provided this information to provide it's clients, and potential clients, with information that may aid in the understanding of CLASS and ADSI features and signaling

AST Technology Labs Inc. provides the following services:

- **Conformance testing of Client's CPE.**
  Tested to established Bellcore recommendations. Accurate, timely, confidential testing, professional reports, and custom response to our Client's needs.

- **Consulting.**
  AST Technology Labs Inc. provides consulting via custom designed seminars for large or small groups, or more informal one-on-one meetings. The topics for the seminars are specified by our customers. The range of topics includes CLASS / ADSI CPE signaling and testing, telephony switch signaling and testing, ADSI protocol interpretation, and ADSI servers and feature development.

- **Custom Test Equipment.**
  AST Technology Labs Inc. has built custom test equipment for in-house use to perform conformance tests. Many of our clients wish to perform some of these tests on their own manufacturing or development sites. We can provide custom test equipment, built to our client's specifications, that is used to perform CPE testing. AST Technology Labs Inc. can also provide training and consulting for testing lab set up and operations.