



New Features
TSA3300 vrs 1.51
Telephone Signal Analyzer Software

1) Call Waiting Deluxe (CWD) Support

The Call Waiting Deluxe (CWD) features of a telephone can now be tested with the TSA3300 software. CWD services offered by telephone companies, allow a user to hold, transfer, conference, or drop callers following a Caller ID with Call Waiting (CIDCW, or Type 2) message. The term "Type 2.5" can also refer to Call Waiting Deluxe feature.

A telephone requests a CWD service by sending flash and DTMF digit after a successful CIDCW transmission. Each CWD option is represented by a unique DTMF code. The TSA3300 program will display a message representing the CWD service if a DTMF code is received within a specified time window following a hook switch flash. In the following example, "CWD: Forward" is displayed on receiving a DTMF 9 after a valid flash.



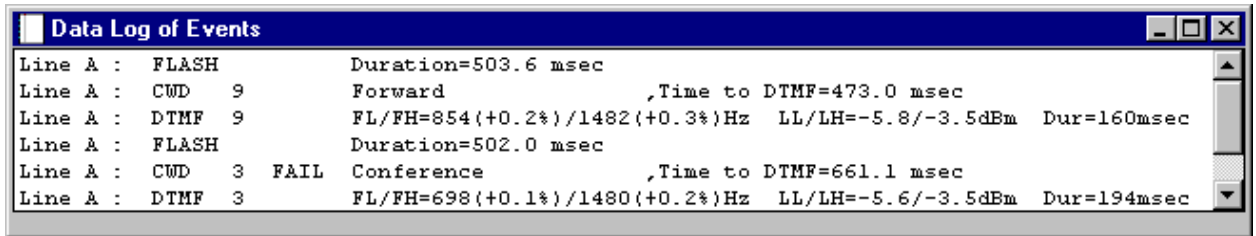
The time period between the end of the flash and DTMF digit must fall within a specific window to be considered a valid CWD service request. If the DTMF is generated too late, the central office switch may ignore it, while if it arrives too early, the switch may not be ready to accept it. The minimum and maximum delays from the flash to the DTMF digit are specified in the Pulse Dialing & Flash Setup window. If the timing falls outside the valid range, it will be displayed in red, as shown below.



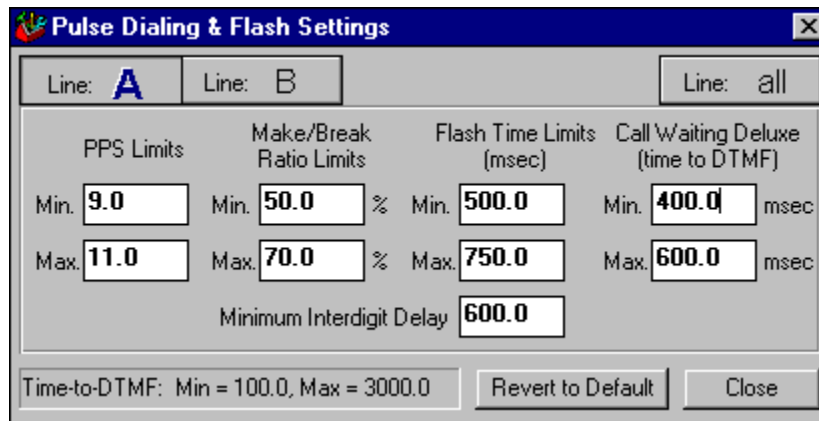
All of the flash timing, CWD interval timing, and DTMF digit characteristics can be recorded in the event log. Depending on the filter settings, the data recorded in the event log can be specified to meet various requirements. The following figure shows two



CWD service requests captured in the data log window. The first was successful, while the second failed, due to an invalid delay between the hook switch flash and the DTMF digit. As seen below, the entire CWD event is broken down into 3 entries. The first records the flash time, the second records the interval time (from end of the flash to the start of the DTMF digit) and the CWD service being requested, and finally, the third entry records the DTMF digit information.



In order to detect the CWD service request, both the flash timing and DTMF digit must meet the defined limits. As such, the hook switch flash time must fall between specified minimum and maximum limits. Also the DTMF digit must fall within limits for level and frequency. If either the flash timing or DTMF digit is invalid, no CWD service request will be displayed.



Two TSA3300 program events have been added to support the CWD detect features. An event may be programmed to trigger various actions on the successful reception of a CWD service request, or an action can be triggered on an invalid CWD service request. These new events and actions are programmed within the Automatic Actions setup window.

The Call Waiting Deluxe feature, described in the Bellcore GR-416-CORE document, defines the linkage between the received DTMF code and the CWD function as shown below.

Digit	Function
3	Conference
4	Drop Last
5	Drop First
6	Hold
7	Drop



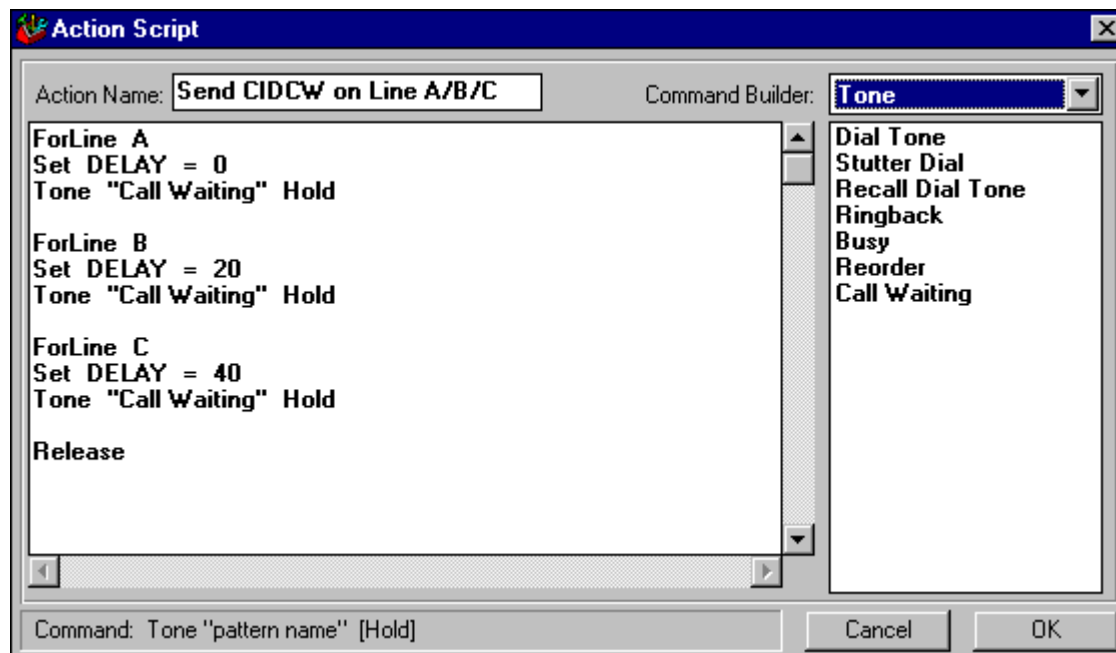
- 8 Announce
- 9 Forward

If any DTMF digits, other than those defined above, are detected following a hook switch flash, the program will display "(undefined)".

2) Synchronizing Multiple Telephone Lines

In testing multiple line telephones, it becomes important to simulate worst case conditions for any real time processing required by the telephone. An example of this is multiple Type II Caller ID transmissions, where a telephone must detect simultaneous CAS tones along with decoding the FSK on multiple lines. Other situations include detecting ringing occurring at the same time on multiple lines.

To better control the timing between actions issued to multiple telephone lines, the action script commands have been modified. A new parameter called DELAY controls the amount of time delay inserted before starting any action. The DELAY parameter is unique for each line, as such, each line can have a different delay value. Also, the TONE and RING script commands support synchronization between multiple lines by using an altered command line. If the HOLD modifier is added at the end of the command, the action will be prepared, but not started. In this manner, the actions on multiple lines can be set up in advance and at the end of the action script, they are started simultaneously by using the RELEASE command.



In the example above, lines A, B, and C are sent a Type II (CIDCW) Caller ID transmission. However, by using the DELAY parameter value, the SAS/CAS tone on line B will be delayed by 20 msec, relative to line A. Likewise, the SAS/CAS tone for line



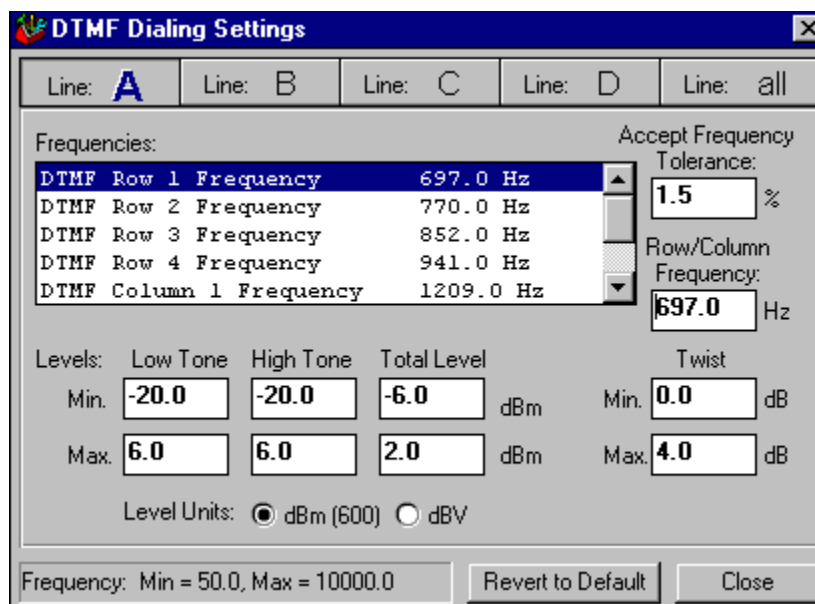
C is delayed by 40 msec, relative to line A. If the DELAY value were set to zero, then the SAS/CAS tones for all the telephone lines would commence at the same time.

Using the HOLD modifier on each of the three TONE commands, holds back the start of the tone until the RELEASE command is processed. If the HOLD modifier is not present, that line would start the CIDCW sequence immediately, without waiting for the rest of the script to execute. This can result in significant delays between the signals on the telephone lines. The HOLD modifier can be used with the TONE, RING, and new OSI commands. The range of the DELAY parameter is from 0 to 10000 msec (10 seconds). If the specified value is outside this range, it will be clamped to the closest minimum or maximum value.

It is important to note that the PC's processor speed has an influence on the timing accuracy in starting multiple actions simultaneously. This residual timing error is in the range of +/- 2 msec for a Pentium class processor. Since the sequence of starting actions is from line A to line D, line A will always be the first to start and line D the last. As such, if more accurate timing is needed, it is possible to delay line A by a few milliseconds using the DELAY parameter. The accuracy of the DELAY parameter is within +/- 1 msec.

3) DTMF Total & Twist Level Limits

For received DTMF digits, limits can be placed on the total signal level and the twist level, in addition to the limits for the low and high group tones. The twist level is defined as the level ratio between the low group tone and the high group tone. Positive twist occurs when the level of the high group tone is greater than the low group tone. Likewise, negative twist exists if the high group tone level is less than the low group tone. The total level and twist limits are specified in the DTMF Dialing Settings window, as shown below.





The Last Digit Results window now includes the total signal level and twist level in addition to the previous measurements displayed. If any of the specified limits are violated, the measured value will be highlighted in yellow. For the measurement of signal level, the displayed units will match the section for that line's level meter. This can be either dBm (600 ohms), dBV, or Vrms.

[A] Digit = 5	
Low Group Level	-4.2 dBm
High Group Level	-1.9 dBm
Total DTMF Level	0.1 dBm
Twist Level	2.3 dB
Low Group Freq	772 Hz (0.2%)
High Group Freq	1336 Hz (0.0%)
Tone Duration	83 msec
Interdigit Delay	127 msec

4) Events & Action Script Enhancements

New Events:

With the addition of Call Waiting Deluxe (CWD) support, two new events termed "CWD" and "Invalid CWD" can be defined. The "CWD" event is associated with a specific CWD feature, such as:

Conference, Drop Last, Drop First, Hold,
Drop, Announce, Forward, and (undefined)

The event is triggered whenever a CWD service request, of the specified type, is detected. If this event is linked to an action script, the contents of that script will then be executed.

The Invalid CWD event is not associated with a specific CWD feature, and is triggered anytime a CWD service request has been detected, but the timing interval between the hook switch flash and DTMF digit is outside the specified limits.

New/Modified Action Script Commands:

- a) **TONE "network tone name" [Hold]**
The TONE command allows the modifier HOLD to be added after the network tone name. With the HOLD modifier, the network tone is prepared for execution, but not started. It is held until the RELEASE command is processed. The RELEASE command will start all network tones, ringing, or OSI's at the same time, assuming the DELAY parameter is set to zero. A non-zero DELAY parameter value will hold back that line until the delay time expires.
- b) **RING "ringing pattern name" [Hold]**



Similar to the TONE command, the RING command allows the optional use of the HOLD modifier. It functions in the same manner, by holding the start of the ringing until the RELEASE command is processed.

c) **OSI (duration) [Hold]**

A new command, OSI, will generate an open switching interval (OSI) with the specified duration. During an OSI, the DC feeding voltage is removed from the telephone line. The duration of the OSI must range between 1 and 10,000 msec. As with the TONE and RING commands, the OSI can be held back with the HOLD modifier. Once a RELEASE command is processed, the OSI will start. Note that the DELAY parameter affects the start of the OSI as well as the start of any network tones and ringing.

Note: TSPC hardware versions 2.2b and earlier do not support the generation of an OSI. If the TSA3300 program detects the older hardware versions, then a warning will be generated.

d) **RELEASE**

This command starts the execution of any held network tones, ringing, or OSI. Before starting the programmed actions, if the DELAY parameter for any line is greater than zero, then a delay is inserted.

e) **MESSAGE "text" [parameter name [, line]]**

The MESSAGE command has been changed to allow multiple text strings to be displayed, along with displaying the value of any parameter value. Parameter values are specified enclosing the parameter name and telephone line in [] brackets.

For example, the command:

Message "The Caller ID name on line B is: " [CID_NAME,B]

Will display:

The Caller ID name on line B is: John Smith

f) **WAIT (delay)**

The WAIT command will suspend the script program execution by the time value specified. The duration value must be in the range of 1 to 1000 milliseconds. While the delay is in effect, no other commands, actions, or event will be processed.

Note that the resolution of the WAIT command is approximately 50 msec.

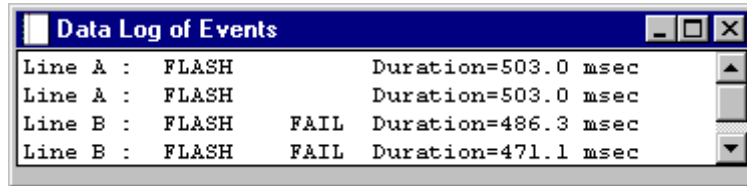
4) Miscellaneous Changes

- a) Increased Number of Ringing Patterns and Network Tone Definitions



The maximum number of ringing patterns that can be defined has been increased from 16 to 128. Also, the maximum number of network tones that can be defined is increased from 16 to 64.

- b) Recording Flash Duration's
The data log will now record the duration of any hook switch flashes detected, as well as reporting if the detected flash is within the specified minimum and maximum duration limits.



- c) Changing the Data Log Filter Settings
In addition to changing the filter settings by right clicking the mouse in the Data Log of Events window, selecting the "Filter Settings..." command button in the Event Log Options window opens a new window where all the filter settings can be adjusted. Using this method to change the filter settings is more effective when changing a large number of the options at the same time.
- d) Comment Field for Data Log Printout
When printing the Data Log, an optional comment field can be filled out. The comments can include information such as test conditions and unit under test details. These comments will appear on the printout and are saved with the program configuration.