

# Replacing a SmartWORKS PT or SmartWORKS AT with a SmartWORKS LD Board

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The SmartWORKS LD series is a replacement for the SmartWORKS PT and SmartWORKS AT boards. Most hardware specifications and software capabilities are the same, except for a few design changes. This application note will highlight those changes for the purpose of aiding customers who are replacing older boards with the new LD series.

## Hardware Modifications

Basic channel structure and capability are consistent throughout the SmartWORKS family of products. Variations in structure occur to provide different capabilities. All hardware specifications are the same, except those outlined in the following table:

Table 1: Hardware Differences

	PT	AT	LD 409	LD 809
Network Connectors	RJ21X Amp	RJ21X Amp	RJ14	RJ14
H.100 Bus	yes	yes	no	yes
MVIP Bus	yes	yes	no	no
PCI board size	full	full	half	full
Audio jack connector	3 pin header	3 pin header	phone jack	phone jack
Passive mode impedance	12K	n/a	18K	18K
Termination mode	no	yes	yes	yes
Termination standards	n/a	us only	us, eu, aus, ch	us, eu, aus, ch
DC Voltage Measurement	no	no	yes	yes
Headset/Speaker Jumper	no	no	yes	yes

## Installation Requirements

Due to the high impedance of the LD product, lines running from the board must be terminated or wired to another line. If not, crosstalk occurs and events are generated on vacant adjacent channels.

## Software Modifications

The software design of the LD board supports the features and functionality of both the PT and AT cards, as well as new features such as voltage and loop reversal detection. As a result, new APIs and events have been added to the SDK and minor functional differences exist among the three boards. This section lists these variations.

### De-Bouncing

	SmartWORKS AT	SmartWORKS PT	SmartWORKS LD
To specify de-bouncing times use API <b>MTSetPSTNParams()</b> . Data field MT_PSTN.ring_deglitch specifies the ring de-bouncing time, and field MT_PSTN.loop_deglitch specifies the loop current de-bouncing time.	✓	✓	✓
To specify loop voltage debouncing use <b>MTSetLVParams()</b> and set the <i>msDeglitchTime</i> parameter.			✓

### Line Status

	SmartWORKS AT	SmartWORKS PT	SmartWORKS LD
Use API <b>MTGetChannelStatus()</b> to retrieve status bits LINE_ON_HOOK and LINE_NO_LOOP.	✓		
Use API <b>MTGetChannelStatus()</b> to retrieve status bits LINE_ON_HOOK and LINE_NO_LVOLTAGE_OFFHOOK.		✓	
Use API <b>MTGetChannelStatus()</b> to retrieve status bits LINE_ON_HOOK, LINE_POLARITY(0 for normal; 1 for reversed), LINE_NO_LOOP, and LINE_NO_LVOLTAGE_MIDDLE.			✓

## Event Filtering

	SmartWORKS AT	SmartWORKS PT	SmartWORKS LD
<p>Use <b>MTSetEventFilters()</b> to enable bit SE_LCURRENT_CHANGE. This yields events of EVT_LOOP_ON, EVT_LOOP_DROP.</p> <p>Event filtering of SE_LREV is obsolete.</p>	✓		
<p>Use <b>MTSetEventFilters()</b> to enable bit SE_LVOLTAGE_CHANGE. This yields events EVT_LVOLTAGE_OFFHOOK and EVT_LVOLTAGE_NOTOFFHOOK.</p> <p>Event filtering of SE_LREV is obsolete.</p>		✓	
<p>Use <b>MTSetEventFilters()</b> to enable bit SE_LVOLTAGE_CHANGE or SE_LCURRENT_CHANGE.</p> <p>SE_LVOLTAGE_CHANGE yields events of EVT_LVOLTAGE_ABOVE, EVT_LVOLTAGE_BELOW, or EVT_LVOLTAGE_MIDDLE (i.e. EVT_LVOLTAGE_OFFHOOK).</p> <p>SE_LCURRENT_CHANGE yields events of EVT_LOOP_ON, EVT_LOOP_DROP, and EVT_LOOP_REVERSE.</p> <p>Event filtering of SE_LREV is obsolete.</p>			✓

## Line Polarity

	SmartWORKS AT	SmartWORKS PT	SmartWORKS LD
Not monitored	✓	✓	
<p>Use API <b>MTSetMoni()</b> and enable MONI_REVERSAL. This yields event EVT_MON_REVERSAL when line states EVT_LOOP_REVERSE or EVT_LVOLTAGE_BELOW are detected.</p> <p>Another method, is to rely on information passed into the MT_EVENT structure with these events: EVT_ABOVE or EVT_BELOW.</p>			✓

## Loop Voltage Detection

	SmartWORKS AT	SmartWORKS PT	SmartWORKS LD
No voltage detection	✓		
Voltage detection is available within a pre-fixed threshold high of 16V and a pre-fixed threshold low of 3V. The loop voltage state is defined into two states: EVT_OFFHOOK and EVT_NOTOFFHOOK.		✓	
<p><b>MTSetLVParams()</b> is used to set the thresholds of voltage high and voltage low (60V to -60V). This allows custom definition of the three loop voltage states of ABOVE, BELOW, and MIDDLE (e.g. ONHOOK, REVERSE (line unplugged), and OFFHOOK states). With LD's capability of detecting the three states of loop voltage change, the LD can detect the presence of a wink, a state PT channel cannot detect. LD can also provide current voltage reading, a capability PT channels do not have.</p>			✓

## Start Media Control

	SmartWORKS AT	SmartWORKS PT	SmartWORKS LD
Start a media task based on START_LOOPON bit used by IO_Control structure. (SE_LCURRENT_CHANGE must be enabled with <b>MTSetEventFilters()</b> )	✓		✓
Start a media task based on START_LVOLTAGE_OFFHOOK bit used by IO_Control structure. (SE_LVOLTAGE_CHANGE must be enabled with <b>MTSetEventFilters()</b> )		✓	✓

## Terminate Media Control

	SmartWORKS AT	SmartWORKS PT	SmartWORKS LD
Terminate all media tasks based on EVT_LOOP_DROP. TERM_LOOP_DROP must be enabled with <b>MTSetTerm()</b> .  - OR - To terminate a specific media task set the TERM_LOOP_DROP bit of the MT_IO_CONTROL.TermEnable field.	✓		✓
Terminate all media tasks based on EVT_LVOLTAGE_NOTOFFHOOK. TERM_LVOLTAGE_NOTOFFHOOK must be enabled with <b>MTSetTerm()</b> .  - OR - To terminate a specific media task set the TERM_LOOP_DROP bit of the MT_IO_CONTROL.TermEnable field.		✓	✓

## New APIs

The SmartWORKS LD delivers a new feature set that includes programmable voltage detection, line voltage reporting, and polarity reversal detection. The LD constantly samples current line voltage and has the ability to measure and report voltage within the following range: +60V to -60V. New APIs have been added to the SmartWORKS SDK to implement these capabilities.

### **MTGetLVDetectValue()**

Obtains the current loop voltage reading. (+ / -2V).

### **MTSet/GetLVParams()**

Provides the user the capability to set the thresholds of voltage high and voltage low. This allows custom definition of the three loop voltage states of ABOVE, BELOW, and MIDDLE (e.g. ONHOOK, REVERSE (line unplugged), and OFFHOOK states are the common terms for ABOVE, BELOW, and MIDDLE states).

### **MTGetLVDetectState()**

Retrieves the current detection state of loop current. If a value of 0 is returned, the channel is currently not detecting loop voltage

### **MTSet/GetReverseLoopPolarity()**

First, use **MTGetLVDetect()** to obtain the current line voltage reading. If the voltage is negative, then the loop polarity of the line is reversed. Use this API to reverse the loop polarity through a software change rather than a wiring change.

## Voltage Detection

The LD has the ability to measure and report voltage within the following range: +60V to -60V.

Normal ring to tip values on telephone networks in the United States is +48V coming from the CO (Sprint phone lines are typically reversed) and +24V coming from the PBX. Users can control Threshold High and Threshold Low ranges through **MTSetLVParams()** parameters.

When connected to a +48V system, AudioCodes recommends the following settings:  
Threshold High = +35V  
Threshold Low = +2 V

When connected to a +24V system, AudioCodes recommends the following settings:  
Threshold High = +18V  
Threshold Low = +4 V.

Below is a test setup in SmartView to describe LD operation:

1. Under SmartView, select **Settings** then select **MT(Get/Set)LV(Params/Detect)()**.
2. Check current voltage, if positive, go to step 7, if negative continue with step 3.
3. Close the Loop Voltage screen.
4. Choose **Settings** then select **MT(Get/Set)ReverseLoopPolarity()**.
5. Change to Reverse and select the **OK** button. Close the Loop Polarity screen.
6. Choose **Settings** then select **MT(Get/Set)LV(Params/Detect)()**.
7. Set *Threshold low* and *Threshold high*.
8. These settings will give you:
  - a. EVT\_LVOLTAGE\_ABOVE for an Onhook state.
  - b. EVT\_LVOLTAGE\_OFFHOOK for an offhook state.
  - c. EVT\_LVOLTAGE\_BELOW for a line that is not connected.

#### **About Deglitch Time**

When using the **MTSetLVParams()** API, one parameter Deglitch Time is used to control De-bouncing time in unit of 10ms. When the line voltage crosses over one threshold it must remain above or below the threshold level for the time period set with this parameter. To set this parameter with SmartView select **Settings** then select **MT(Get/Set)LV(Params/Detect)()**.