

## Benefits

Automatic testing saves time  
(weeks reduced to a few hours)

Preconfigured and calibrated  
system

Generates reports in OEM-  
standard formats

Quick turn-around time to  
detect and fix issues prior to  
manufacturing

## Features

Comprehensive physical layer  
test system for CAN (high speed,  
medium speed, fault tolerant,  
single-wire) and LIN (master,  
slave, master/slave)

Tests include normal usage,  
abnormal power perturbations,  
and network stress conditions,  
including invalid bit insertion

Built-in Self-test (BIST) for power  
supply, network bus loads, and  
oscilloscope

Includes measurement  
equipment, electronic impedance  
switching, power supply with  
crank simulation and ground  
offset, and harnesses (with  
pigtailed for your ECU connection)

Mx-PLT transform connectors for  
Mx-Suite software included

## Contact Us

### Danlaw, Inc.

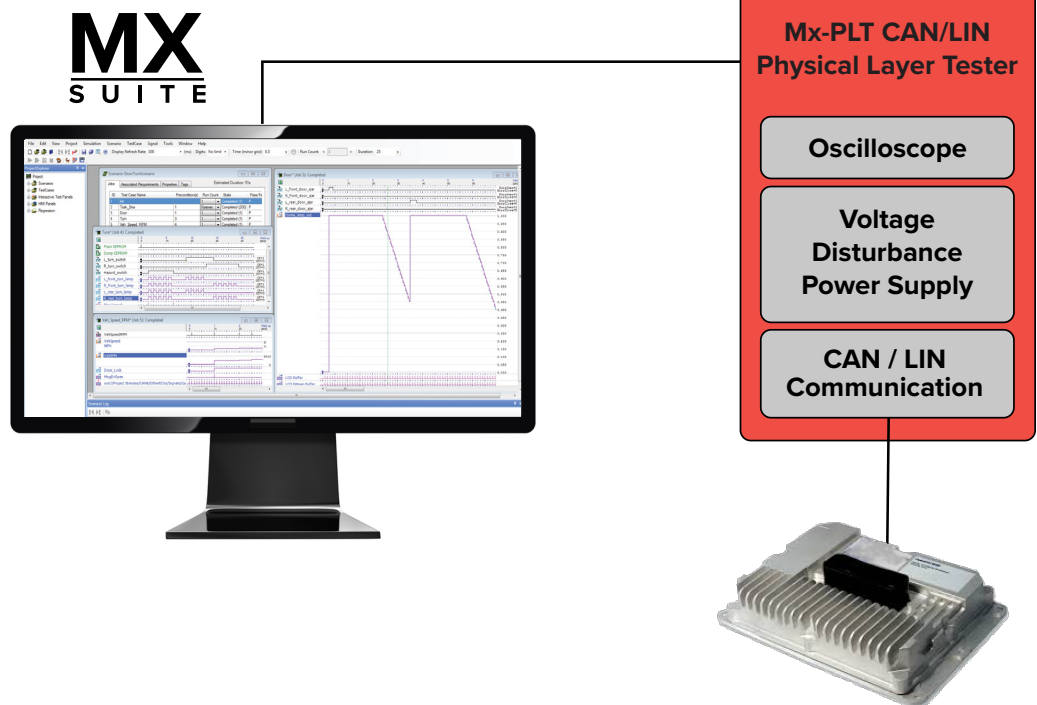
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## Mx-PLT™ CAN/LIN Physical Layer Tester

MX-PLT is a CAN/LIN physical layer test solution that integrates seamlessly with Danlaw's Mx-Suite Embedded Software Test Environment. The cost-effective desktop solution automatically performs tests based on OEM conformance specifications, which reduces test time and operational costs as compared with traditional manual testing. By using a trusted tool that conforms to standard test methods and reporting formats, components are quickly qualified for production release.

The Mx-PLT is a modular system for measuring CAN/LIN devices with three main hardware components: the Danlaw Mx-PLT module, the PicoScope 5243A, and the Danlaw Ground Offset Battery Simulator module. The Mx-Suite software coordinates the operations of the Mx-PLT, providing a library of standardized conformance test cases.



## Communication Bus Specifications

### CAN Physical Layer Compliance Testing

General Motors: GMW14241 sections 1-3  
Fiat Chrysler Automobiles: 7-Z0140, 7-Z0146, 7-Z0166  
Toyota: TSC7222G  
Nissan: 25953NDS36

### LIN Physical Layer Compliance Testing

SAE J2602/2 (Layer 1)  
Ford: 000601.101.AA, 000601.111.AA

# Mx-PLT™ CAN/LIN Physical Layer Tester

## Mx-PLT Conformance Library of Test Cases

### CAN - DWHS / DWMS (Dual Wire High/Medium Speed)

(-) Ground Offset/Line Capacitance Sensitivity  
 (+) Ground Offset/Line Capacitance Sensitivity  
 Behavior during Crank  
 CAN Circuit Shorts  
 CAN Wires Shorted to - Ground, Supply  
 CAN-HI BATTERY SHORT with Power-On RESET  
 CAN-HI GROUND SHORT with Power-On RESET  
 CAN-HI TO CAN-LO SHORT with Power-On RESET  
 CAN-LO BATTERY SHORT with Power-On RESET  
 CAN-LO GROUND SHORT with Power-On RESET  
 Power-Up or Reset for ECU not implement CAN Wake-up  
 Device Capacitance, Input Capacitance  
 Dominant Input Threshold  
 Dominant Output, Output Voltage Levels  
 Ground Loss - on Another ECU, on the ECU Under Test  
 High Voltage Sensitivity  
 Input Threshold  
 Internal Differential Resistor, Resistance  
 Internal Resistance of CANH and CANL  
 Interruption of CAN Wires  
 Local Wake-up  
 Loss of - Ground, Supply  
 Low Voltage Sensitivity  
 Operation at Min Power Supply Voltage  
 Open Circuit on CANL Open Circuit on CANH  
 Operation at Max Power Supply Voltage  
 Min and Max Supply Voltage Level for Bus Communication  
 Output Voltage Levels after Failure Modes Tests - Dom, Rec  
 Current Consumption Test  
 Recessive Input Threshold  
 Recessive Output Voltage Levels  
 Recessive Output Short Between CANH and CANL  
 Short Circuit Between CANH and +Vbat  
 Short Circuit Between CANH and CANL  
 Short Circuit Between CANH and Ground  
 Short Circuit Between CANL and Ground  
 Short Circuit Between CANL and -Vbat  
 Signal Characteristics (Asymmetric Load), (Symmetric Load)  
 Signal Rise/Fall Times  
 Supply +Vbat Loss on the ECU Under Test  
 Test Immunity to Potential Ground Offsets  
 Tolerance of Bit Timing  
 Tolerance to Baud Rate Variation  
 Transceiver Slope Control  
 Transmitted Waveform Measurement  
 Wake Up by CAN

### CAN -DWLSFT (Dual Wire Low Speed Fault Tolerant)

Bit Rising Edge and Falling Edge Times  
 Engine Cranking Power Voltage Curve  
 CANH and CANL Internal Resistance  
 Dominant Signal Voltage Levels  
 Bit Time Precision During Message Transmission  
 Ground Potential Deviation Immunity Test - Anomalies  
 Ground Potential Deviation Immunity Test - No Anomalies  
 Min and Max Power Level for Communication via bus  
 Node Anomaly Tolerance Test - CAN Wire Open Circuit  
 Node Anomaly Tolerance Test - CAN Wire Short Circuit  
 Node Anomaly Tolerance Test - Short Circuit to Power  
 Recessive Signal Voltage Levels  
 Signals Features (Symmetry)

### CAN – Communication Enable

Comm En Line In Input Threshold / Threshold Hysteresis  
 Comm En Line In Successful Wakeup Detection  
 Comm En Line In Wakeup Filter Function  
 Continuous Wake Out Continuous High Level Output  
 Continuous Wake Out High Level Output Voltage  
 Continuous Wake Out Low Level Output Voltage  
 Continuous Wake Out Short Circuit Output Current  
 Comm En In Comm En Shorted - to Gnd, to Battery  
 Comm En In Loss of - Gnd Connection, Power Supply  
 Comm En Out Comm En Shorted - to Battery, to GND  
 Comm En Out Loss of - Gnd Connection, Power Supply  
 Comm En Pulsed Wake In Input Threshold  
 Comm En Pulsed Wake In Successful Wakeup Detection  
 Comm En Pulsed Wake In Wakeup Filter Function  
 Comm En Pulsed Wake Out High Level Output Voltage  
 Comm En Pulsed Wake Out Low Level Output Voltage  
 Comm En Pulsed Wake Out Short Circuit Output Current  
 Comm En Pulsed Wake Out Wake Up Pulse Length

### CAN – SWLS (Single Wire Low Speed)

Behavior during Crank  
 Bus Dominant Output Voltage Level  
 Bus Recessive or Passive State Low Voltage  
 Bus Shorted to Battery/Ground  
 Device Capacitance/Resistance  
 Input Threshold HVWU/Normal Mode  
 Loss of Ground Connection  
 Loss of Power Supply  
 Min and Max Supply Voltage Level for Bus Comm  
 Signal Characteristics  
 Signal Rise/Fall Time  
 Temporary Loss of Power Supply  
 Test Immunity to Battery Offsets  
 Test Immunity to Ground Potential Offsets  
 Tolerance of Bit Timing  
 Tolerance to Baud Rate Variation

### LIN

Battery Offset Voltage  
 Bus Wiring Short to Ground Master / Slave  
 Master Node Termination Resistance  
 ECU Power Loss - Master / Slave  
 Ground Offset Voltage  
 Loss of ECU Ground at Master or Slave Node  
 Master and Slave Node ECU Time Constant and Cap Meas  
 Master Node Bit Time Meas  
 Bus Writing Short to Battery Device with TxD/RxD Not Acc  
 Master Node Tr-d max and Td-r max Measurement  
 Mstr/SI Node Vil Level Meas and Input Thresh Hysteresis (Vih-Vil)  
 Master Node Vin Level Meas  
 Master Node Voh and Vol Levels Meas  
 Op Range Norm Batt Volt-Mstr/SI Device with TxD/RxD Not Acc  
 Op Range Over Volt-Mstr/SI Device with TxD/RxD Not Acc  
 Op Range Under Volt-Mstr/SI Device with TxD/RxD Not Acc  
 Sample Pt Autobaud Max/Min Bit Sample Timing Slave Node  
 Sample Pt Fixed Clock Max/Min Bit Sample Timing Slave Node  
 Slave Node Bit Time Meas - Autobauding  
 Slave Node Bit Time Meas - Fixed Clock Slave Node  
 Slave Node Termination Resistance  
 Slave Node Tr-d max and Td-r max Meas  
 Slave Node Vil Level Meas and Input Thresh Hysteresis (Vih-Vil)  
 Slave Node Vin Level Meas, Slave Node Voh/ Vol Levels Meas

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## Mx-PLT™ CAN/LIN Physical Layer Tester

### Components

**Danlaw Mx-PLT module** - for control, communications, and bus loading

Bus types	CAN (ISO 11898 – dual wire and fault tolerant, J2411 - single wire); LIN
PC interface	USB 2.0 (USB 1.1 compatible)
Operating temp. range	0 °C to 45 °C
Humidity	5 to 80% RH, non–condensing
Power requirements	100-230V @ 1A



**Danlaw Ground Offset Battery Simulator module** - for ECU power and to create stressing voltages, offset voltages and cranking waveforms required by tests



Voltage range	0 - 29V
Current	6A continuous; 20A peak (<1sec)
Offset voltage range	0 - +/-4.5V
Resolution	9mV
Accuracy	1%
Slew rate	<1 ms for the range
PC interface	USB 2.0 (USB 1.1 compatible)

**PicoScope 5243A** - for measurements and capture of waveforms

Bandwidth	100MHz
Vertical resolution	12 bits
DC accuracy	±1%
Maximum sampling rate	13 MS/s streaming; 125 MS/s one shot
PC interface	USB 2.0 (USB 1.1 compatible)



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### Why Danlaw

Danlaw is a global leader in connected car and automotive electronics. Our family of 800 people live, breathe, and create innovative technology for some of the world's largest car makers. Over thirty years ago, we designed software for the first 8-bit Electronic Engine Control module, and today, we continue to develop forward-looking technologies. We focus our efforts on R&D to stay ahead of rapidly changing industry needs in an increasingly connected world. Danlaw is known for ground-breaking technology, efficient development, and adaptive solutions for dynamic environments. Our Engineering Solutions Group provides solutions for embedded systems development and testing for Embedded Control Units (ECUs), vehicle network communications, and embedded software engineering tools.