Manual
for Operation

LD 200N

Load Dump generator pulses 5 and 7

Testing of electronic modules in 12V/24V or 42V supply systems.

Load dump and Field decay pulses are generated by sudden disconnection of the battery from the electrical system (load dump). The LD 200N simulates Load Dump pulses as per ISO 7637 / ISO 16750.

The LD 200N can be used as an individual instrument or in combination with all other generators of the series 200.

- ISO 16750-2:2010
- ISO 7637- Ed2
- SAE J1113
- JASO

Hersteller normen gemäss BMW, Chrysler, Ford, MBN, Nissan, Scania

EM TEST (Switzerland) GmbH
Sternenhofstrasse 15
4153 Reinach BL1
Switzerland

Phone : +41 61 717 91 91
Fax : +41 61 717 91 99

URL : http://www.emtest.com

Contents

1. Model Overview

1.1. LD 200N Models

Standard models

Model	Model name till 2008	
LD 200N	LD 200M	Load dump simulator simulates all Load Dump pulses
LD 200N100		Load dump simulator for 100A DUT with internal power supply switch
LD 200N200		Load dump simulator for 200A DUT with internal power supply switch

Options

CLD Module	Optional Module for Clipped Load Dump function

Warning

The internal load capacitor has a capacitance of 112 mF
This capacitor can be charged up to 250 V.

Energy : $W = \frac{1}{2} C U^2$ = **3500J**

Warning

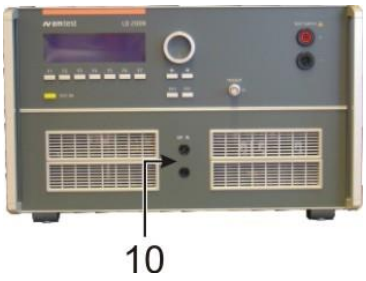
Use of Negative Voltages at the input will result in damage to the instrument!

When performing tests with negative voltage e.g. with a bipolar source, it is important to ensure that the LD 200N100 and LD 200N200 be isolated from battery voltage.

2. Operating Functions

2.1. Front view

1 Display
2 Function keys "F1..F7"
3 Test ON
4 Knob (Inc/Dec)
5 Cursor keys "←" and "→"
6 EXIT
7 ESC
8 CRO Trigger
9 DUT test supply
10 Ext. RL plugs



1 Display
All functions and parameters are displayed (8 lines with max. 40 characters).

2 Function keys "F1.. F7"
Parameters and functions, displayed in the lowest line of the menus, can be selected with the related function key.

3 Test On
By pressing the key "TEST ON" the test procedure is initiated with the preselected parameters. The red LED indicates the trigger of a burst event.

Important

Remark: The battery voltage at the DUT test supply connectors on the front panel is available only after a test menu was selected and TEST ON is pressed.
To have battery voltage at the DUT, it is not necessary to start the test, but TEST ON must be enabled.

4 Knob (Inc / Dec)
The knob increments or decrements a numeric value of the test parameters or selects parameters from a list.

5 Cursor keys
Parameters and functions can be changed on-line. The selection of these parameters is realized by moving the cursor to the left or to the right.

6 EXIT
Pressing the Exit function will exit the menu. Button isn't active while the test is running. during a test run.

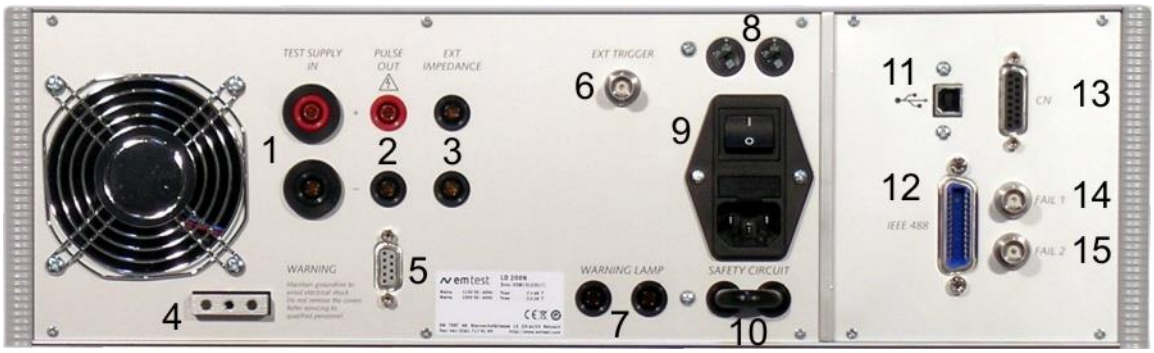
7 ESC
When pressing the ESC button the user moves back one page in the menu. Button is inactive during a test run.

8 BNC - CRO Trigger
At the BNC output the generator trigger can be checked. This output can be generally used to trigger a scope and is synchronous to the impulse events.

9 DUT test supply
The coupling / decoupling network is part of the generator. The DUT is powered via the safety laboratory plugs at the front panel of the simulator. The nominal battery supply is 60V/30A. For higher currents, up to 200A, an UCS200N or the external coupling matrix CNA 200B shall be used. As stand- alone generator the LD 200N100 or LD 200N200 are available.

10 Ext. RL (Ford FMC1278 & Ford EMC CS 2009)
Plugs to connect the external 0.5Ω load resistor for Ford FMC1278 Standard for load dump pulse.

2.2. Rear view



1	DUT supply input	**6**	External trigger	**11**	USB interface
2	Pulse output	**7**	Warning lamp control	**12**	Parallel interface IEEE 488
3	External damping resistor	**8**	Power mains selector	**13**	CN (Not used)
4	Reference earth connection	**9**	Power On switch with fuses	**14**	Fail 1
5	Control output for CNA	**10**	Safety circuit	**15**	Fail 2

1 DUT supply input
The supply voltage for the DUT (max. 60V/30A) has to be connected to the +/- safety laboratory plugs.

2 Pulse output
Additional to the output on the front panel another output is available, mainly used for rack installations in fully automated test set-ups to apply the pulse to external coupling devices.

3 External damping resistor "EXT RD"
Additional to the internal source impedance an external damping resistor can be connected to these safety laboratory plugs. The resultant source impedance is the sum of the internal (10Ω) and the external applied or connected impedance.

4 Ground reference connection
The simulator shall be connected to the ground reference plane of the test set-up.

5 Control output for CNA
Via this interface external coupling networks as UCS200N or the coupling matrix CNA 200B can be controlled. Additional the UCS200N/MPG and LD generators together can generate the so called FIELD DECAY pulse.

Furthermore the interlocking of micro- and load dump pulses is realized by this connection. The interlocking prevents performing micro pulses and load dump pulses at the same time.

To perform LD-pulses with e.g. an UCS 200N, the device has to be released by selecting F5 "external" at the UCS 200N generator.

6 External trigger
At the coaxial connector one single pulse can be released by an external trigger signal of +5V to +15V.

7 Warning lamp control
This relay contact (230V / 6A) can control warning lamps which may be installed in the test set-up (Test On).

8 Power mains selector
The simulator can be set to the local power mains supply (115V/230V).

9 Power on switch with included fuse
The power supply switch includes also two fuses of 1A T for 230V power supply.

10 Safety circuit
The test procedure can only be started when the safety circuit is closed. A running test will be stopped immediately when the circuit is opened.

1	DUT supply input	**6**	External trigger	**11**	USB interface
2	Pulse output	**7**	Warning lamp control	**12**	Parallel interface IEEE 488
3	External damping resistor	**8**	Power mains selector	**13**	CN (Not used)
4	Reference earth connection	**9**	Power On switch with fuses	**14**	Fail 1
5	Control output for CNA	**10**	Safety circuit	**15**	Fail 2

11 USB interface

USB interface “USB B” connector. For data transfer a USB interface is available. The internal RS 232 interface is converted to USB standard. Therefore the user must set the same baud-rate at the device and control software.

Using the USB interface the user can have EMC problems during burst tests. Our experiences say that usually the computer USB port is disturbed by interferences. Therefore a high quality USB cable (USB 2.0 standard) must be used.

12 IEEE 488 interface

13 Fail detection FAIL 1 (TEST STOP)

The BNC input FAIL 1 can be used for failure detection at the DUT. If the input is set to ground (chassis) the generator will be stopped and the current test routine is paused. The test routine can be completely stopped or can be continued at the break point.

A message of FAIL 1 is indicated in the LCD display as well as in the iso.control software.

14 Fail detection FAIL 2 (TEST PAUSE)

The BNC input FAIL 2 can be used for failure detection at the DUT. If the input is set to ground (chassis) the current test routine is paused as long as the low level signal is available at the FAIL 2 input.

Without the low level signal, the test procedure continues automatically. A message of FAIL 2 is indicated in the LCD display as well as in the iso.control software.

15 CN connector

The CN connector is not in use for the LD 200N.

3. Operation

3.1. Description of the menus

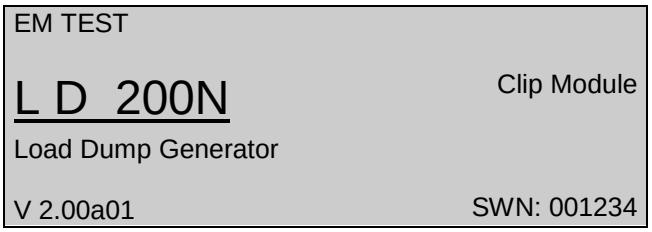
The simulator **LD 200N** is operated by an easy menu control system. Seven function keys are available to select parameters and functions. All functions are indicated on the display; max. 8 lines and 40 characters.

The selected parameter is blinking and can be changed by turning the knob (inc. /dec.). The takeover of the input value occurs after about 500ms encoder downtime. This allows the operator a brief check of the correct input value.

←→ : The digit to be changed can be selected with the cursor (←→).
- Preselected values are directly indicated on the screen.
- The bottom lines shows the desired status after and preselected value pressing the function key.

ESC: ESC will take you back to the previous level in the menu and set the displayed values. The latest settings are stored automatically and will be recalled when the menu is selected again.

EXIT: The firmware will jump back to the main, or next useful upper screen-level.

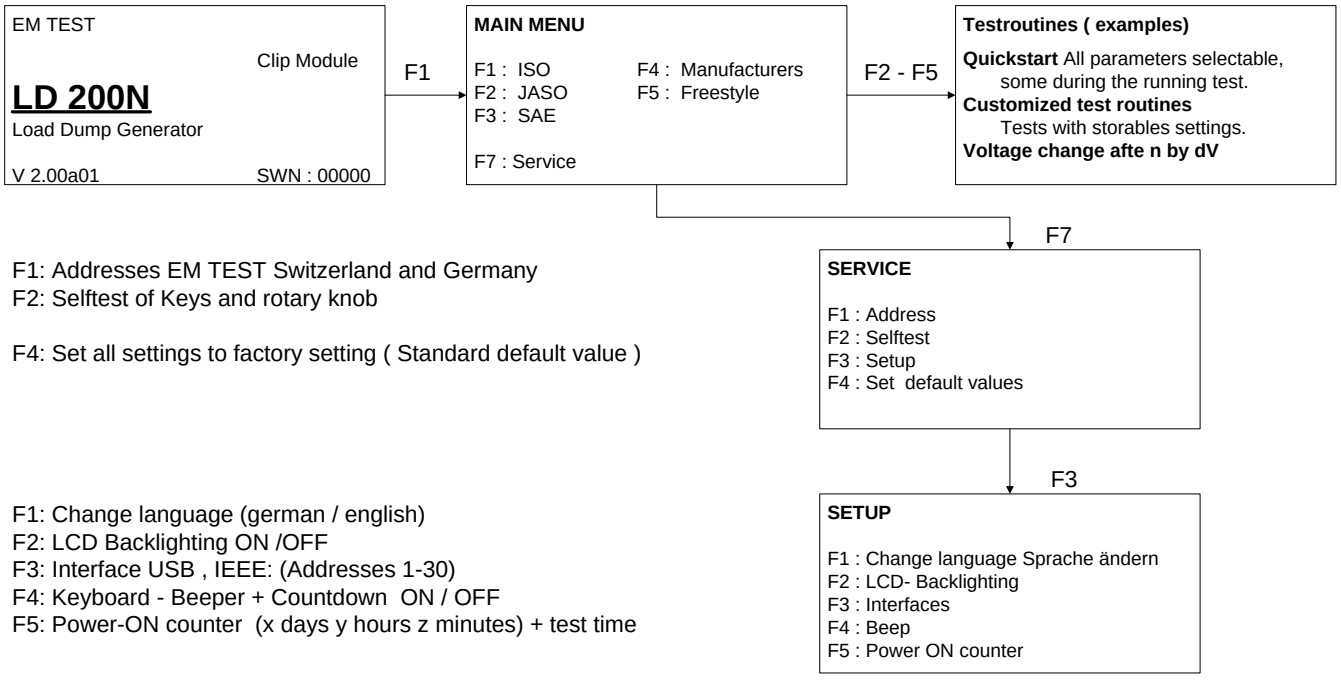


Models: LD 200N

Start-up display example LD 200N

The software number SWN and the version V are used for traceability reasons. These numbers are listed in the test reports generated by the iso.control software and calibration certificates.

3.2. Menu overview



F1: Addresses EM TEST Switzerland and Germany
F2: Selftest of Keys and rotary knob

F4: Set all settings to factory setting (Standard default value)

F1: Change language (german / english)
F2: LCD Backlighting ON /OFF
F3: Interface USB , IEEE: (Addresses 1-30)
F4: Keyboard - Beeper + Countdown ON / OFF
F5: Power-ON counter (x days y hours z minutes) + test time

3.3. Main Menu

The main menu and next menu level.

MAIN MENU

F1 : ISO
F2 : JASO
F3 : SAE
F4 : Manufacturers
F5 : Freestyle
F7 : Service

ISO 16750-2:2010 / 7637-2:2004

F1 : Quickstart
F2 : Customized test routines
F3 : Voltage change after n by ΔV

MANUFACTURERS

F1 : Chrysler / Ford
F2 : Nissan / MBN
F3 : Scania

JASO

F1 : JASO Pulse A1
F2 : JASO Pulse B1
F3 : JASO Pulse D1

Freestyle

Vs	=	100 V	Clp	=	OFF
Pul	=	free	tr	=	100 us
td	=	400 ms	Rs	=	4.0 Ohm
t1	=	34s	tri	=	auto
n	=	00010			

START CHANGE

SAE

F1 : SAE Pulse 5 12V
F2 : SAE Pulse 5 24V

Standard test routines
The user can call up the standard routines as per different standards and start them immediately.

Quickstart
Easy and fast operation of the equipment without special functions. All parameters, except pulse duration time (pul) are adjustable during the test.

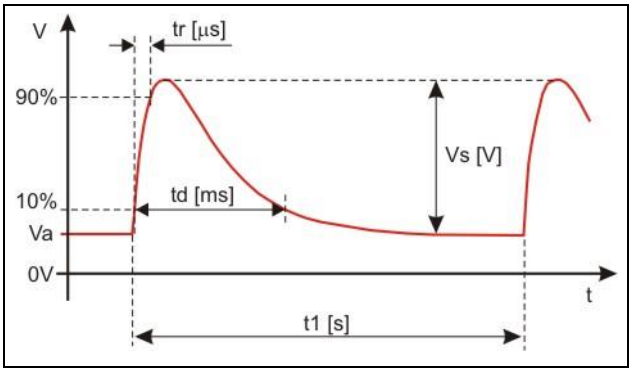
Customized test routines
The user can program, save and recall his own specific test routine. He can select standard routines or special functions such as automatic change of voltage, during a test routine.

Service
Setup menus and routines as a small self test, Addresses of EM Test and a timer is in this menu.

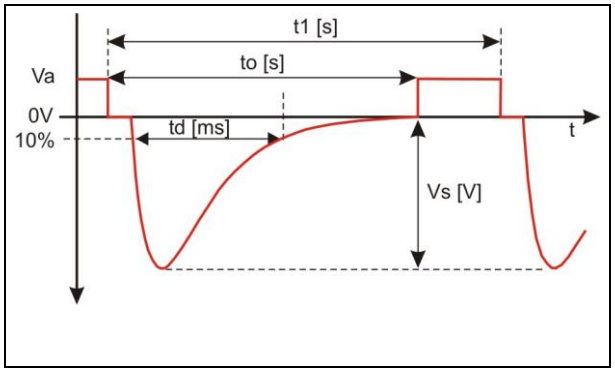
3.3.1. Used short terms

The following short terms will be used within the next pages:

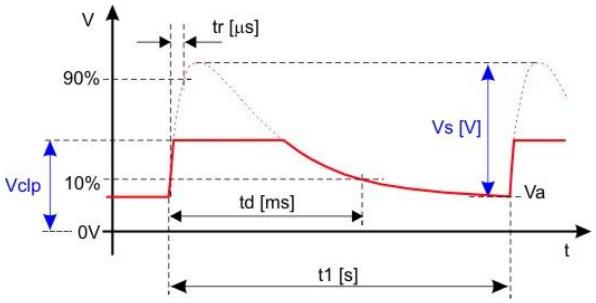
Vs	Test level		**to**	Off time battery supply voltage (neg. pulse)
Pul	Pulse name and/or pulse duration time td		**t1**	Repetition rate of the generated pulses
+/-	Polarity of the generated pulse		**tri**	Trigger mode; AUTO, MAN or EXT
Rs	Internal source resistance		**n**	Number of pulses to be generated
Clp	Clipped voltage OFF, Value [V]			



positive pulse



negative pulse



Clipped pulse

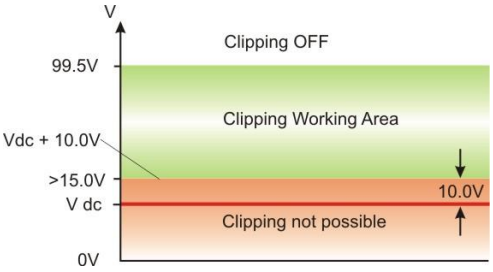
3.4. Clipping (optional module)

The clipping module will clip the load dump pulse to the set voltage by an electronic load.

Clipping voltage range

Min. clipping voltage is the higher value of:
15V or Vdc + 10V

Max clipping voltage: +99.5V higher switching setting (indicated 99.9V in the software) will be marked as **Clipping OFF** in the display.



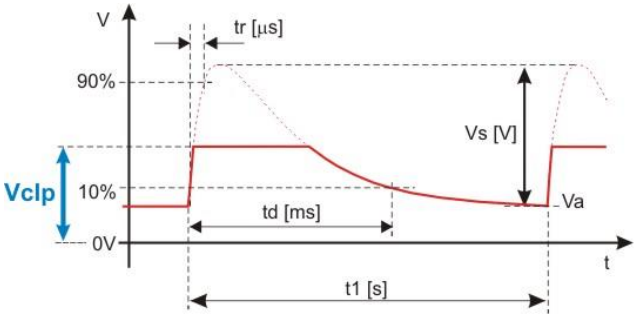
The clipping works only for impulses with positive polarity

Attention

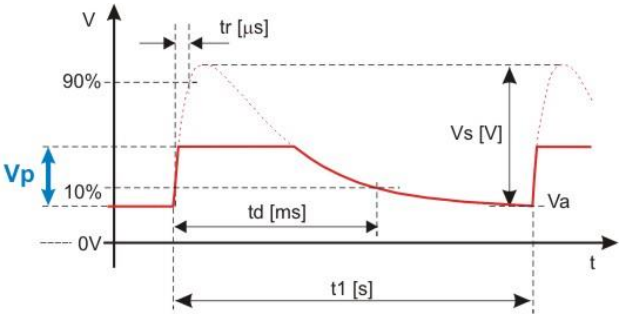
For manual LD 200N application the internal clipping module is only at Freestyle mode available. Please also notice to perform standards like Chrysler or Ford an external clipping device is requested by the manufacturer standard.

Display on LD screen and Iso.control software

The **Clipped voltage** displayed in the LD200 device and iso.control software is **different**.
Cause of the different definitions in the standards of car manufacturers, the iso.control software defines the clipping voltage as difference between alternator voltage Va and peak clipping voltage Vclp.



Clipped pulse display in LD200N



Clipped pulse displayed in iso.control Software

The displayed clipvoltage in the LD200N generator is referenced to the 0V level

Attention

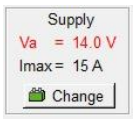
LD 200N: The displayed clipped voltage **Vclp** is referenced to the 0V level
Iso.control: **Vp** = **difference** between Vclp and Va.

Vclp = Va + Vp

Attention

User changes of the supply voltages does not correct and check the clipping value of the LD 200N.

The user is responsible to check the clipping voltage settings



3.5. ISO 16750-2 (2010) / ISO 7637-2 (2004)

The Load Dump pulse as specified in ISO 16750-2 (2010) / ISO 7637-2 (2004) can be tested in this menu.

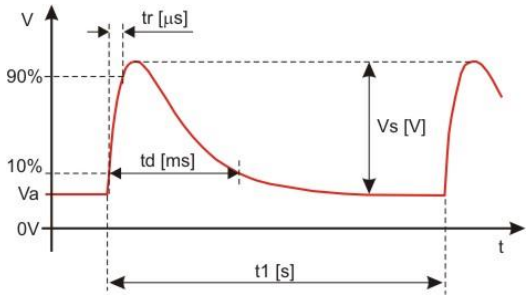
	**ISO 16750-2** Pulsedefinition based from the zero line: Us = $U_{Alternator}$ + $U_{Load\ Dump}$ **ISO 7637-2:2004** Pulsedefinition from the Alternator voltage U_A : Us = $U_{Load\ Dump}$ LD 200Nx **Generator setting: = Impulse amplitude**

ISO 16750-2 (2010) / ISO 7637-2 (2004)

F1 : Quickstart
F2 : Customized test routine
F3 : Voltage change after n by ΔV

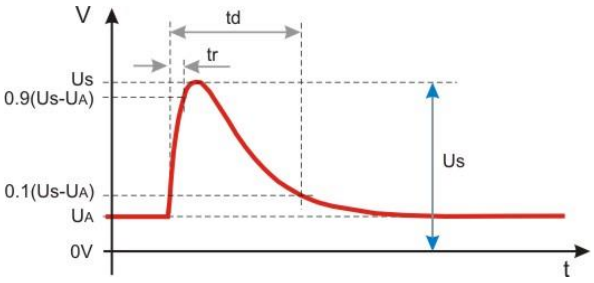
Waveshape of pulse 5 in ISO 16750-2 (2010) / ISO 7637-2 (2004)

	12V system	24V system
Vs Voltage	65V - 87V	123V - 173V
Ri impedance	0,5Ω - 4Ω	1Ω - 8Ω
td duration	40ms - 400ms	100ms - 350ms
tr rise time	≤ 10ms	≤ 10ms



Waveshape of pulse 5 in ISO 16750-2:2010

	12V system	24V system
Vs Voltage	79V - 101V	151V - 202V
Ri impedance	0,5Ω - 4Ω	1Ω - 8Ω
td duration	40ms - 400ms	100ms - 350ms
tr rise time	10 ms (+0/ -5) ms	10 ms (+0/ -5) ms



3.5.1. Quick Start

Quick Start is only in menu ISO 7637-2 available. For other pulses please use Freestyle menu.

Easy and very fast operation of all standard functions of the equipment. The latest simulator settings are stored automatically and will be recalled when Quick Start is selected next.

The pulse is calibrated according the ISO Standard with a 2Ω load.

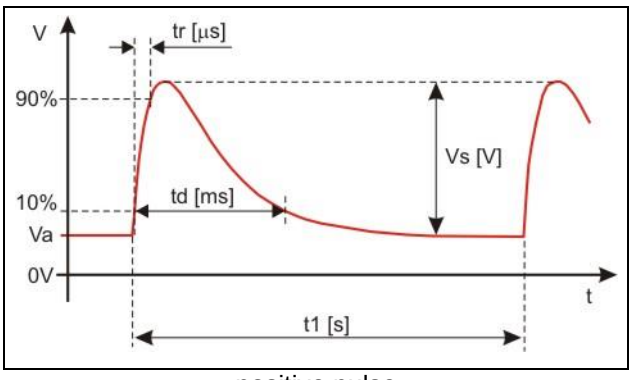
Shown parameters

QUICKSTART						
V	=	100 V	Pul	= 5	400 ms	
+/-	=	+	Rs	=	2.0	Ohm
t1	=45 s		to	=	-	s
tri	=	Auto.	n	=	00010	
START	CHANGE					
F1	**F2**	**F3**	**F4**	**F5**	**F6**	**F7**

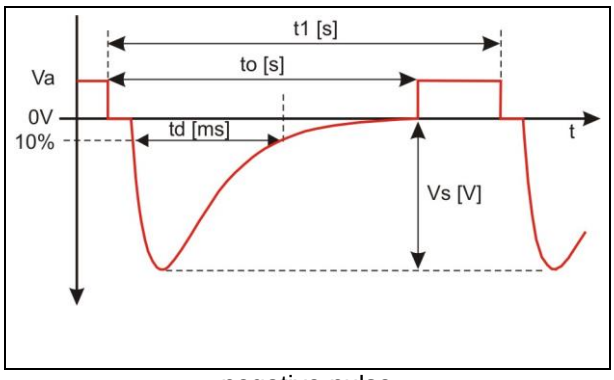
Display during test

QUICKSTART						
U	=	100 V	Pul	=	400 ms	
+/-	=	+	Rs	=	2.0	Ohm
t1=45 s			to	=	-	s
tri	=	Auto.	n	=	00010	
Vsel =	100.0 V		Next Pulse		Counter	
STOP		ZOOM	12s		000001	
F1	**F2**	**F3**	**F4**	**F5**	**F6**	**F7**

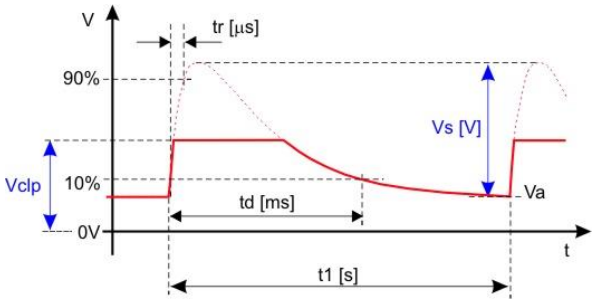
The battery switch off time to block a discharge of the impulse into the battery supply, is only necessary for negative impulses.



positive pulse



negative pulse



Clipped pulse

Press ***CHANGE*** and the test parameters can be changed.

Select the desired parameter with the related function key and change the value by turning the front panel knob. The cursor allows the user to define the digit to be changed (fast or slow change).

Press ***START*** and the test starts immediately with the displayed test parameters.

The operator now can navigate with the ***Cursor*** from parameter to parameter. The blinking parameter can be changed by turning the front panel knob.

Press ***ESC*** will bring the user back to the previous menu level.

All function keys except F2 (if manual trigger is activated) can ***Stop*** the test routine.

3.5.2. Customized Test Routine

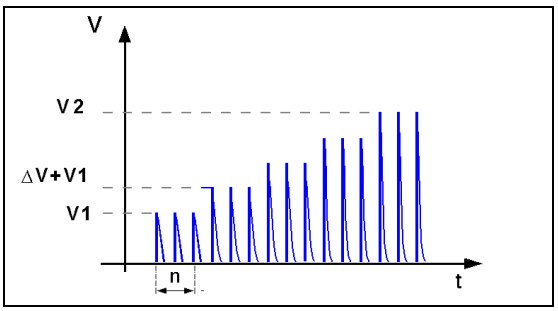
The user can save his own specific test routine, recall and change it. All special functions and routines are stored in this part of the user menu.

Customized test routine						
V	=	100 V	Pul	= 5	400 ms	
+/-	=	+	Rs	=	2	Ohm
t1	=	25 s	to	=	-	s
tri	=	Auto.	n	=	00010	
START CHANGE						
F1	**F2**	**F3**	**F4**	**F5**	**F6**	**F7**

The software controls standard test routines according to the specification of the user. All limitations are the same as defined under Quick Start.

3.5.3. Voltage change after n by dU test routine

The test voltage is variable in the range of V1 to V2. Beginning with V1 the voltage is changed by ΔV after n triggered pulses until the test level V2 is reached.
The same values as in Quick Start can be selected. The maximum repetition rate is limited by V1 or V2 whichever value is higher.



Display

Voltage change						
V1	=	70.0 V	V2	=	200.0 V	
ΔV	=	10.0 V	Pul	= 5	200 ms	
+/-	=	+	Rs	=	2.0	Ohm
t1	=	25 s	t0	=	-	s
Tri	=	Auto	n	=	00001	
START CHANGE						
F1	**F2**	**F3**	**F4**	**F5**	**F6**	**F7**

Test proceeding:

The first voltage (here 70.0V) will be repeated „n“ times. This value will be incremented by ΔV (70.0 + 10 V) and will be repeated „n“ times. The voltage will be incremented until **V2** is reached (here 200.0 V)

The functions START, CHANGE are same as specified under Quick Start.

3.6. JASO D 001-94

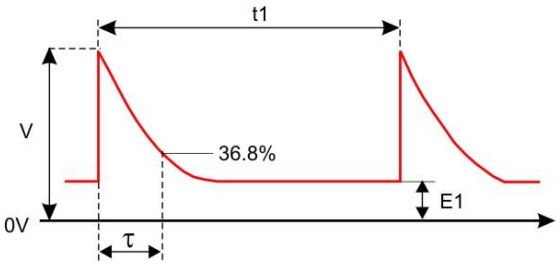
LD 200N offers from JASO standard, the Japanese Automotive Standards Organization the following the following pulses for testing:

JASO

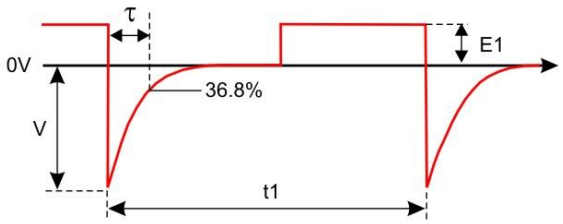
F1 : JASO Pulse A1
F2 : JASO Pulse B1
F3 : JASO Pulse D1

Waveshape of JASO D001-94 pulses

JASO waveform Type A and Type D



JASO waveform Type B



The pulses have a rise time < 1μs and use special output impedances.

V : Maximum value of the transient voltage
τ : Decaying time constant (Time required until the voltage decays to 36.8% of the maximum value).
Rs: Output impedance of the test voltage generator circuit

Standard values for JASO pulses

Type	V [V]	τ [ms]	t1 [s]	Rs [Ω]	n	t0
A1	+ 70	200	not defined	0.8	1	-
B1 *	- 80	60	30s	8	100	4s
D1	+ 110	400	not defined	1.5	1	-

*NOTE: Using a LD 200N generator an external CNA, MPG 200 or UCS 200N is requested to perform this test. A LD 200N100 or LD 200N200 can perform thus test stand alone.

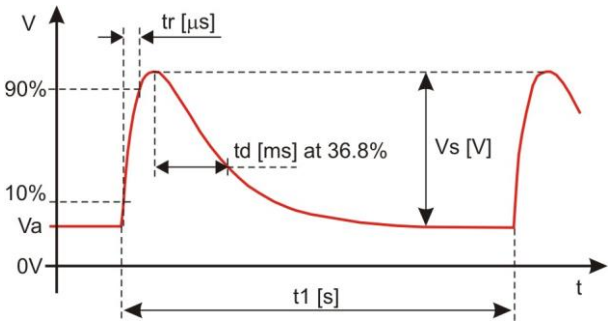
3.7. SAE J1455

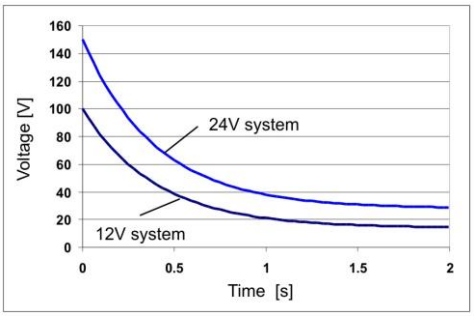
SAE J1455 defines the Load Dump pulse for 12V and 24V power supply system.

SAE

F1 : SAE Pulse 5 12V
F2 : SAE Pulse 5 24V

Waveshape of SAE J1455 pulses





Standard values for SAE pulses

System	Voltage [V]	Source Rs [Ω]	Rise tr	Duration td at 36.8% level	Repetition t1	Events n
12V	+ 86 V	0.4 Ω	100 µs	400ms	10s	5
24V	+ 122 V	0.8 Ω	100 µs	400ms	10s	5

SAE J1455 defines the open circuit waveform as follow:

12V System: $14 + 86\ e^{(-t/0.4)}$
24V System: $28 + 122\ e^{(-t/0.4)}$

Remark: The pulse duration measured at 10%-10% is approx. td=920ms

3.8. Manufacturers Test Routines

LD 200N includes special menus for load dump pulses of the following manufacturer standards

MANUFACTURERS

F1 : Chrysler / Ford
F2 : NISSAN / MBN
F3 : Scania

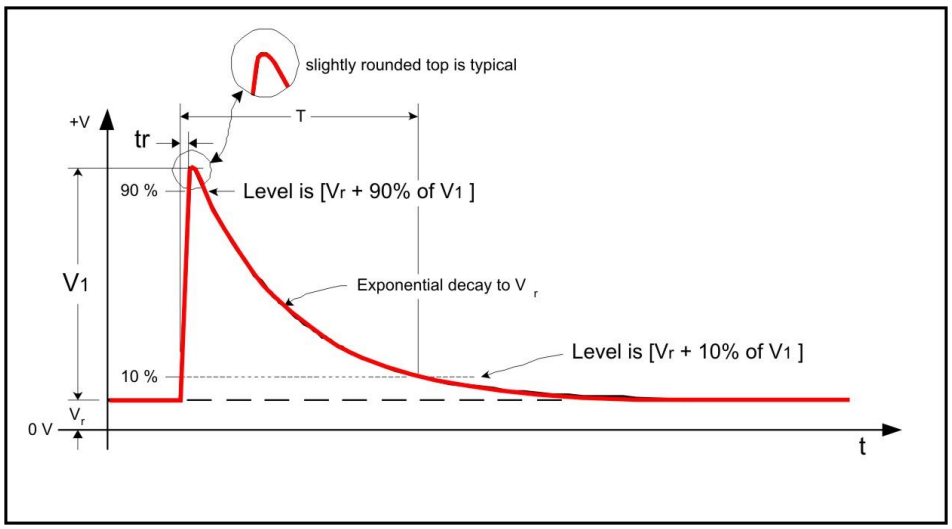
Manufacturers Load Dump pulses reference

Standard	Pulse	Remark
Chrysler PF9326:	Pulse 5	Change D
Ford EMC-CS-2009 :	CI 220 G1 / G2	To perform G2, an external clipping device as per manufacturer specification is requested. The LD 200N performs only the requested unclipped voltage level
Ford FMC1278	CI 222 5a / 5b2	
Ford ES-XW7T AC	CI 220 G	
Ford ES-XW7T AB	CI 240	
Nissan NDS03:	Pulse A1	
Nissan NDS03:	Pulse A2	
Nissan NDS03:	Pulse B1	
MBN 10284:	Pulse 5a 12V	
MBN 10284:	Pulse 5a 24V	
MBN 10284:	Pulse 5a 42V	
Scania TB1400/TB1700	Pulse 5 (125V / 480ms)	
Scania TB1400/TB1700	Pulse 5 (90V / 300ms)	

3.8.1. Standard routine as per Chrysler PF9326 Draft D

Manufacturer	
F1 : Chrysler / Ford F2 : Nissan / MBN F3 : Scania	F1 : Chrysler PF9326 Pulse 5 F2 : Ford ES-XW7T AC F3 : Ford ES-XW7T AB F4 : Ford Load Dump 12V F5 : Ford Load Dump 24V

Waveshape of Chrysler PF9326 pulse 5



	12V Supply
Voltage Vs	91.5V
Impedance Rs	0.5 Ω
Rise time tr	5-10 ms
Duration td	300 ms
Vr Battery voltage	13.5V

Display

Standard Test					Chrysler PF9326
V1	=	51.5 V	V2	=	91.5 V
ΔV	=	10.0 V	Pul	=	Chrys
+/-	=	+	Rs	=	0.5 Ohm
t1	=	120 s	tri	=	Auto
n	=	00001			
START CHANGE					

F1 F2 F3 F4 F5 F6 F7

Test proceeding:

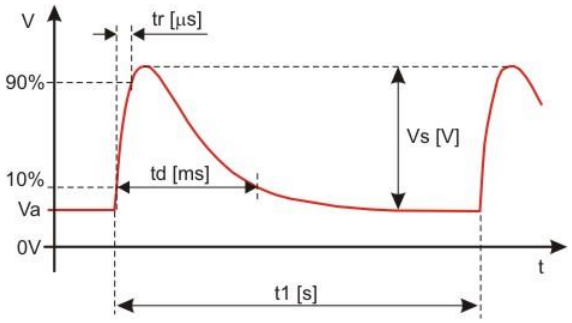
The first voltage (here 51.5V) will be repeated „n“ times. This value will be incremented by ΔV (51.5 + 10 V) and will be repeated „n“ times. The voltage will be incremented until **V2** is reached (here 91.5 V)

The functions START, CHANGE are the same as specified under Quick Start.

3.8.2. Standard routines as per Ford FMC1278, EMC-CS 2009, , ES-XW7T, AB & AC version

Manufacturer	
F1 : Chrysler / **Ford** F2 : NISSAN / MBN F3 : Scania	F1 : Chrysler PF9326 **F2 : Ford ES-XW7T AB** **F3 : Ford ES-XW7T AC** **F4 : Ford 12V** **F5 : Ford 24V**

Waveshape of Ford FMC 1278 pulse 5a, EMC-CS-2009 pulse G1 and Ford ES-XW7T pulse 5



	FMC1278 EMC-CS 2009	**ES-XW7T**	
Vs Voltage Vs	60 V	60 V	
Rs Impedance Rs	0.5 Ω	0.5 Ω	
tr Rise time	5 to10 ms	≤ 10 ms	
td Duration td	300 ms	300 ms	Open circuit
t1 repetition time	30s	30s	
Rl Load resistor	0.5 Ω	0.5 Ω	During pulse (AB: 0.7Ω)

Display

Standard test						Ford 12V
V	=	60 V	Pul	=		FordAC
+/-	=	+	Rs	=		0.5 Ohm
t1	=	30 s	tri	=		Auto
n	=	00003	RL	=		0.5 Ohm
START CHANGE						

F1 F2 F3 F4 F5 F6 F7

Test procedure:
The tests are based on CI240 of the AB version and CI 220G of the AC version of ES-XW7T standard.

The user has to decide if he like to use the internal load RL (setting RL =0.5Ω or 0.7Ω) during the pulse or permanent an external Load (setting ext.).

If the parameter RL is set to 0.5Ω or 0.7Ω , the load dump generator is internally loaded with the following RL resistor during pulse generation by:

0.5Ω resistor for EMC-CS 2009 connected as external **load at the EXT RL plugs**.

0.7Ω resistor for ES-XW7T version AB

0.5Ω resistor for ES-XW7T version AC.

This is only a short term loading function to avoid continuous loading of the dc source and too much power consumption of the load resistor.

➔ **The user must not connect any external load resistors during testing ES-XW7T AB or AC.**

The load resistors are only to verify the current wave shape with a scope

3.8.2.1. Calibration as per Ford ES-XW7T

The Load Dump generator can be verified in manual mode directly at on the device. The verification from ISO.CONTROL software is not possible. This routine is based on the procedure as per Ford ES-XW7T.

The verification procedure needs two measurements:

1. **Open circuit measurement** (RL = ext position)
2. **Loaded measurement** (RL = 0.5Ω respectively 0.7Ω position)

Remark: For the check with the 0.5Ω respectively 0.7Ω load no external load resistor shall be used. The load is switched to the circuit internally. For open circuit measurement with RL = ext. No external load is needed.

Settings for verification

Open circuit

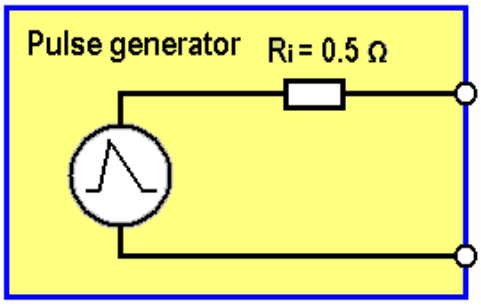
Standard test					Ford ES – XW7T AC
U	=	60 V	Pul	=	FordAC
+/-	=	+	Rs	=	0.5 Ohm
Rep	=	30 s	tri	=	Auto
n	=	00003	RL	=	**ext.**
START CHANGE					
F1	**F2**	**F3**	**F4**	**F5**	**F6** **F7**

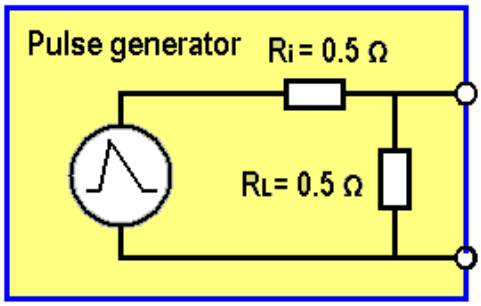
The generator is internally not loaded with the required load impedance and the open circuit voltage can be measured. The voltage is measured directly at the +/- output connectors of the generator.

Current waveform (loaded)

Standard test					Ford ES – XW7T AC
U	=	60 V	Pul	=	FordAC
+/-	=	+	Rs	=	0.5 Ohm
Rep	=	30 s	tri	=	Auto
n	=	00003	RL	=	**0.5 Ohm**
START CHANGE					
F1	**F2**	**F3**	**F4**	**F5**	**F6** **F7**

The generator is internally loaded with the required load resistor of 0.5Ω for the AC version and 0.7Ω for the AB version. The loading occurs only during a short time in which the pulse is generated. This is to protect the battery or the DC supply against overloading. The current waveform can be measured directly at the +/- output connectors of the generator.





The verification shall be realized without any battery supply (e.g. 13.5V) connected.

3.8.2.2. **Calibration as per Ford FMC1278** (previous Ford EMC-CS 2009.1)

The Load Dump generator can be verified in manual mode direct on the device. The verification from ISO.CONTROL software is not possible. This routine is based on the procedure as per Ford FMC1278 for both the 12V and 24V requirements.

The verification procedure needs two measurements:

1. **Open circuit measurement** (RL = ext position)
2. **Loaded measurement** (RL = 0.5Ω)

Remark: For the check with the 0.5Ω load an external load resistor shall be used. The load is connected to the plug RL of the front side of the Load Dump generator. For open circuit measurement the external RL is disconnected.

Open circuit calibration (12 V system)

Standard test					Ford Load Dump 12V
U	=	60 V	Pul	=	Ford12
+/-	=	+	Rs	=	0.5 Ohm
Rep	=	30 s	tri	=	Auto
n	=	00001	RL	=	**0.5 Ohm**
START Change					

F1 F2 F3 F4 F5 F6 F7

loaded verification (12 V system)

Standard test					Ford Load Dump 12V
U	=	60 V	Pul	=	Ford12
+/-	=	+	Rs	=	0.5 Ohm
Rep	=	30 s	tri	=	Auto
n	=	00003	RL	=	**0.5 Ohm /ext.**
START Change					

F1 F2 F3 F4 F5 F6 F7

Open circuit calibration (24V system)

Standard test					Ford Load Dump 24V
U	=	60 V	Pul	=	Ford24
+/-	=	+	Rs	=	0.5 Ohm
Rep	=	30 s	tri	=	Auto
n	=	00001	RL	=	**0.5 Ohm**
START Change					

F1 F2 F3 F4 F5 F6 F7

For 14 V system no verification is defined

Open circuit verification

The generator is internally not loaded with the required load impedance and the open circuit voltage can be measured. The voltage is measured directly at the +/- output connectors of the generator.

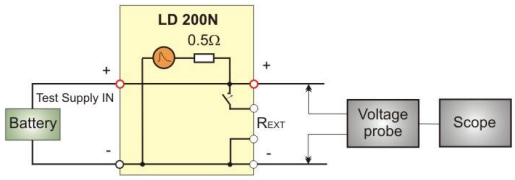
Loaded Verification

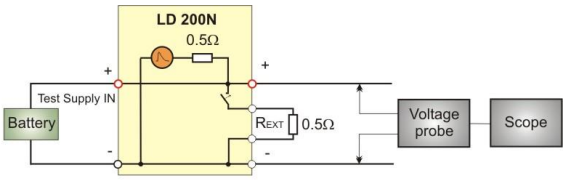
The generator must be verified with a 0.5Ω load. The loading occurs only during a short time in which the pulse is generated. This is to protect the battery or the DC supply against overloading. The current waveform can be measured directly at the +/- output connectors of the generator.

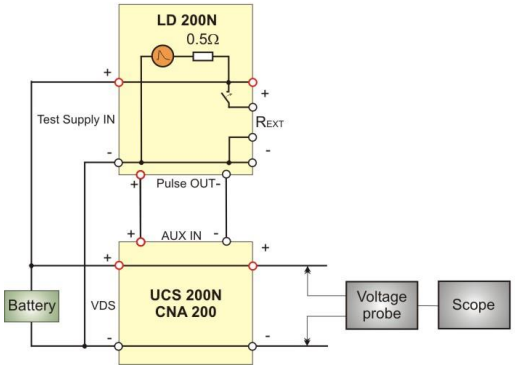
Settings for RL:

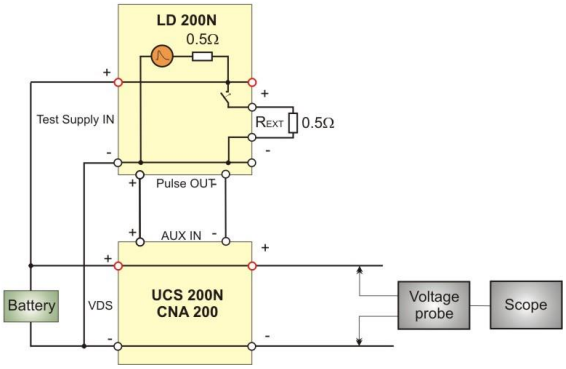
0.5 Ohm: Internal load resistor is used

ext: External load resistor of 0.5Ω is connected at the optional **Ext. RL** plugs on the frontside of the LD generator.









Open circuit measurement Loaded measurement

If an UCS200 is used the voltage measurement is performed at the UCS200 output plugs.

The verification shall be realized with battery supply (e.g. 13.5 V / 27 V) connected.

3.8.2.3. **Testing as per Ford FMC1278** (previous Ford EMC-CS 2009.1)

The Load Dump setting for pulse application of 5a and 5b is the same. The ISO.CONTROL offers a selection for 5a and 5b pulse with identical settings. This routine is based on the procedure as per Ford FMC1278 and previous Ford EMC-CS 2009.

Pulse 5a. Load Dump pulse **full wave** with no clamping (RL = 0.5Ω connected).

Pulse 5b. **Clamped** Load Dump pulse (RL = 0.5Ω connected).
The external clamping device must be installed in parallel to the DUT.

Settings for pulse testing
The generator may be loaded with the ***internal load resistor of 0.5Ω*** during verification. The loading occurs only during a short time in which the pulse is generated. This is to protect the battery or the DC supply against overloading.

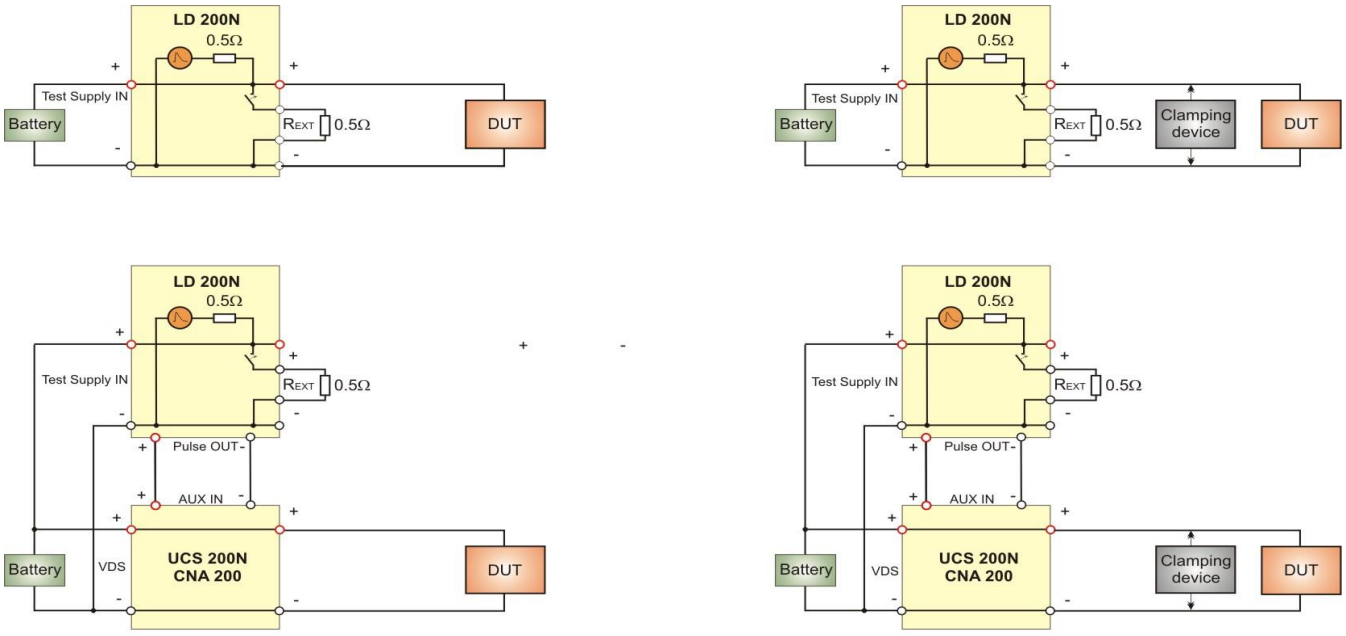
Manual setting

Standard test				Ford Load Dump 12V		
U	=	60 V	Pul	=	Ford24
+/-	=	+	Rs	=	0.5 Ohm
Rep	=	30 s	tri	=	Auto
n	=	00001	RL	=	**0.5 Ohm**
START Change					

F1 **F2** **F3** **F4** **F5** **F6** **F7**

ISO.control setting

Setting for Load Dump pulse 5a and 5b



Remark: For **24V System** REXT= is **not connected**

CI 222 Test setup for Pulse 5a
CI 220 Test Setup for Pulse G1

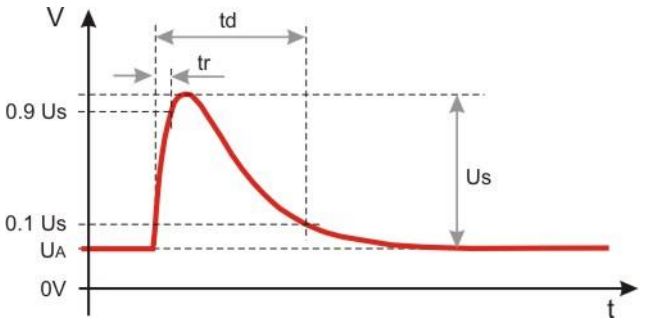
CI 222 Test setup for Pulse 5b
CI 220 Test setup for Pulse G2

Tolerances for Ford FMC ISO pulses 5a und 5b

Pulse 5a parameter

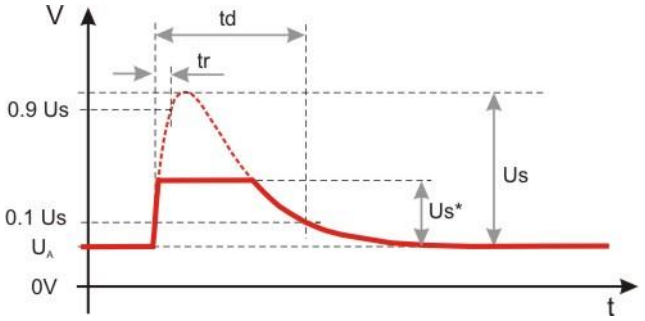
Open Circuit Conditions	
Ua	13.5 V
Us	+60 V
Ri	0.5 Ω
td	300 ms ± 20%
tr	5 bis 10 ms

Loaded Conditions (RL = Ri)	
Ua	13.5 V
Us	30 V = 0.5 * Vs(Open curcuit)
Ri	0.5 Ω
td	150 ms ± 20%
tr	5 bis 10 ms



Pulse 5b parameter

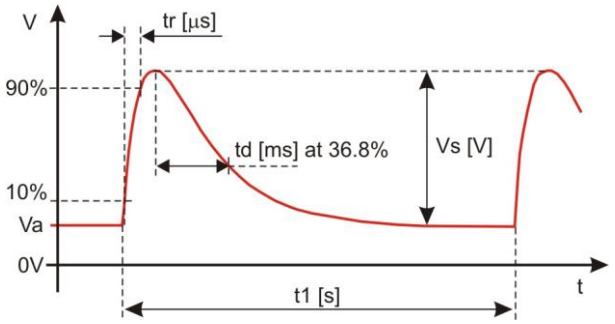
Clipped Conditions	
Ua	13.5 V
Us	+30 V
Us*	+21.5 (-1/+0) V
Ri	0.5 Ω
td	150 ms ± 20%
tr	5 bis 10 ms



3.8.3. Standard test routine Nissan NDS03

Manufacturer	
F1 : Chrysler / Ford F2 : **Nissan** / MBN F3 : Scania	**F1 : NDS03 Pulse A1** **F2 : NDS03 Pulse A2** **F3 : NDS03 Pulse B1** F4 : MBN 10284 Pulse 5a 12V F5 : MBN 10284 Pulse 5a 24V F6 : MBN 10284 Pulse 5a 42V

Waveshape Nissan NDS03 pulse



tr not specified

Standard values Nissan NDS03 pulses

System	Voltage [V]	Impedance Rs [Ω]	Duration td [ms]	Repetition t1	Events n
A1	+ 60	0.66 Ω	270ms	30s	10
A2	+ 60	0.8 Ω	165ms	30s	10
B1	- 80	20.0 Ω	20ms	3	1000

Pulse circuit parameters

System	Voltage [V]	C[µF]	R1 [Ω]	R2 [Ω]
A1	+ 60	15‘000µF	18 Ω	0.66 Ω
A2	+ 60	15‘000µF	11 Ω	0.8 Ω
B1	- 80	1‘000µF	20 Ω	20.0 Ω

Display

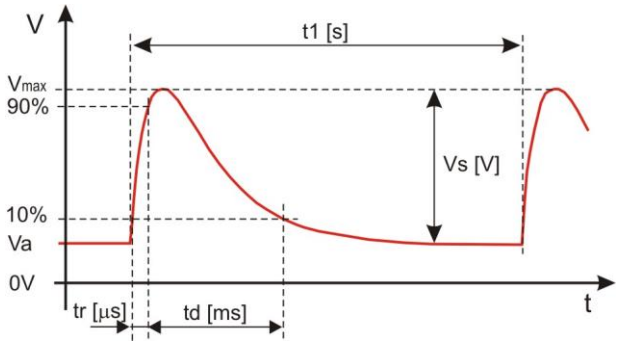
Standard test						Nissan NDS03
V	=	60 V	Pul	=		Nis.A1
+/-	=	+	Rs	=		0.7 Ohm
t1	=	30 s	tri	=		Auto
n	=	000105				
START CHANGE						
F1	**F2**	**F3**	**F4**	**F5**	**F6**	**F7**

The functions START, CHANGE are the same as specified under Quick Start.

3.8.4. Standard routine as per MBN 10 284 part 2

Manufacturer	
F1 : Chrysler / Ford F2 : Nissan / **MBN** F3 : Scania	F1 : NDS03 Pulse A1 F2 : NDS03 Pulse A2 F3 : NDS03 Pulse B1 **F4 : MBN 10284 Pulse 5a 12V** **F5 : MBN 10284 Pulse 5a 24V** **F6 : MBN 10284 Pulse 5a 42V**

Waveshape MBN 10 284 pulse



Standard values MBN 10 284 pulses

	5a (12V)	**5a (24V)**	**5a (42V)**
Vs Voltage	100V	200V	100V
Rs Impedance	2 Ω	2 Ω	2 Ω
tr Rise time	< 0.1 ms	< 0.1 ms	< 0.1 ms
td Duration	400 ms	500 ms	400 ms
t1 Repetition	--	--	--
n Test pulse	5	5	5

Display

Standard test					MBN 10284	
Vs	=	100 V	Pul	=	NBM 12	
+/-	=	+	Rs	=	2 Ohm	
t1	=	15 s	tri	=	Auto	
n	=	00005				
START CHANGE						
F1	**F2**	**F3**	**F4**	**F5**	**F6**	**F7**

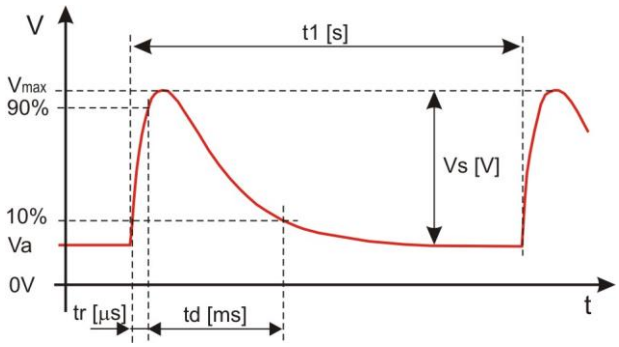
The functions START, CHANGE are the same as specified under Quick Start.

3.8.5. Standard routine as per Scania TB 1700 : 2000 and TB 1400 : 1995

Manufacturers	
F1 : Chrysler / Ford F2 : Nissan / MBN F3 : **Scania**	F1 : Scania Pulse 5 (125V / 480ms) F2 : Scania Pulse 5 (90V / 300ms)

The required test routine is selected with the function keys.

Waveshape Scania TB1400 / TB1700 pulses



Parameters	**TB 1400 Bus**	**TB 1400 Truck**	**TB 1700 ECU's**
Vs Voltage	125V	90V	125V
Rs Impedance	1.5 Ω	1.5 Ω	1.5 Ω
tr Rise time	10 ms	10 ms	10 ms
td Duration	480 ms	300 ms	480 ms
t1 Repetition	--	--	--
n Test pulse	10	10	10

Display

Standard test			Scania TB1400 / TB1700		
Vs	=	125 V	Pul	=	SC.480
+/-	=	+	Rs	=	1.5 Ohm
t1	=	15 s	tri	=	Auto
n	=	00010			
START Change					

F1 F2 F3 F4 F5 F6 F7

The functions START, CHANGE are the same as specified under Quick Start.

3.9. Freestyle

The freestyle menu has a free parameter setting of : Voltage, tr rise time and td duration. With this menu the user is free to create any Load Dump pulse within the generator limits.

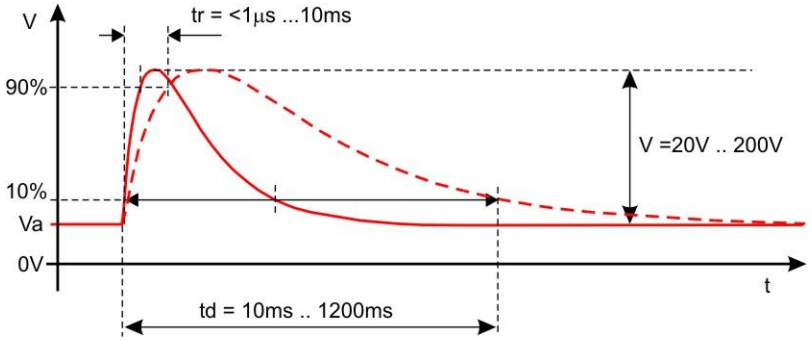
Attention

The pulses in the Freestyle menu don't correspond to a defined standard!

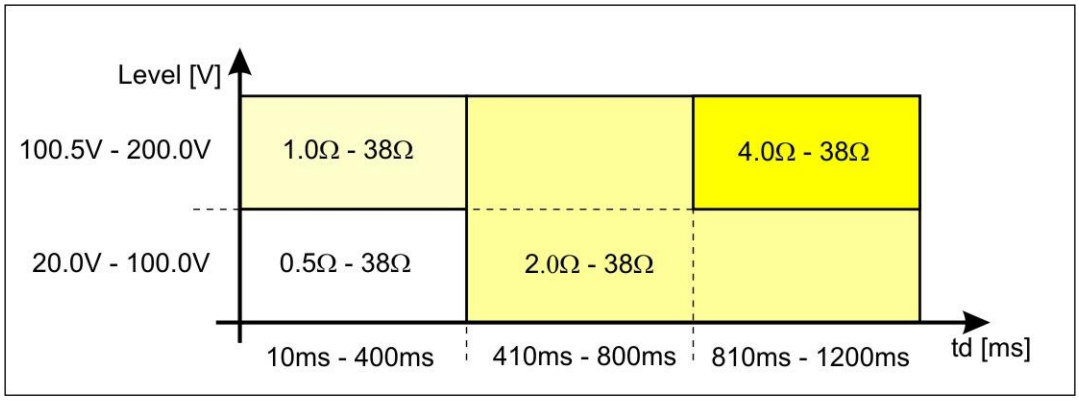
Times as tr and td are typical values.

The accuracy of the voltage, td and tr are depending on the pulse setting and the load.
The exact pulse parameter must be checked by an oscilloscope. If there are differences, the user must modify the setting till the measured pulse is correct.

Waveshape of Freestyle pulses



Freestyle limitations



Rs limitation in function of charging voltage [V] and duration td [ms]

Freestyle Parameter Steps

Parameter	Setting Range	Step
tr Rise time	1µs 10µs - 90µs 100µs - 900µs 1'000µs – 10'000µs	0 10µs 100µs 1000µs
Td Duration	10ms .. 1200ms	10ms

Clipped Load Dump pulse limits:

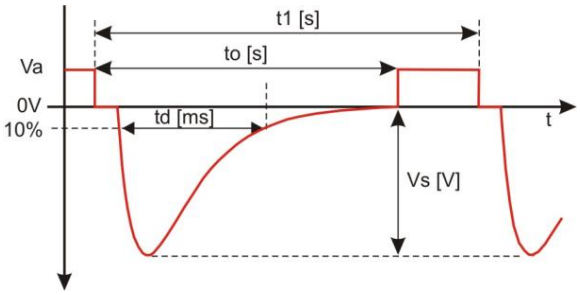
Rise time Tr: 100us – 10'000us
Clipped voltage Clp : 15V - 99.5V in 0.5V Steps
Minimal clip voltage : **10V higher** than the applied dc voltage (protected by hardware)

3.10. Field Decay (Pulse 7)

The test generator type LD 200N includes the possibility to generate in Quickstart menu in ISO 7637-2 the negative Field Decay pulse. This offers to simulate the parameters for „Field Decay“ that is recommended in ISO 7637:1990

Technical data „Field Decay“ as per ISO 7637:1990

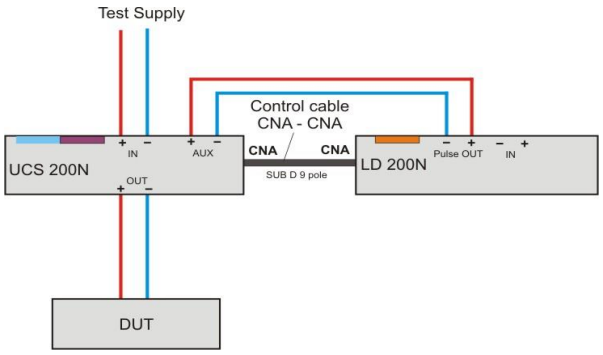
amplitude	max. 80 V
polarity	negative
duration	100 ms
source impedance	10 Ω



Being negative the pulse cannot be superposed directly to the lines of the battery supply. The whole energy content of the pulse would directly be absorbed by the battery itself instead of penetrating the equipment under test. Therefore it is defined (ISO 7637) to switch off the power supply during the pulse is released. The switching off is realized with an electronic switch.

The electronic switch is part of the simulator type UCS 200 and can be used and triggered also by the simulator type LD 200N. The trigger signal is provived at the backpannel of the LD 200N or at the control output for CNA.

Test set-up for field decay:



UCS 200N or MPG200:

- Connect a 9-Pin SUB-D cable as a control line between LD 200N (CNA) ⇔ UCS 200 (CNA).
- Connect the ± pulse out of the LD 200N to the ± Aux of the UCS 200 / MPG200.
- Connect the DUT to the output of the UCS 200.
- Switch on the UCS / MPG and connect the test supply for the DUT at the rear part of the instrument.
- Push the **TEST ON** button to activate the UCS 200 / MPG200.
- Switch on the UCS : F5 EXTERN
- Select the menu Quickstart program in the Field decay parameters.
- Push the button Test On and **start** the test.

Important

- Both instruments, UCS 200N and LD 200N must be powered and the ***Test On*** button must be pressed.
- The control cable between the CNA port of each instrument must be connected.
- The operator takes the risk of internal damage if the test setup is not made according this guideline. For detailed questions please contact your local sales agency for more information.
- In the case that the user only wants to test with pulse 1, 1a, 2 and 6 as part of the UCS 200, it is recommended to disconnect the cable between the + output of the UCS and the + output of the LD 200N.

All other cables can be wired as listed above.

Display

QUICKSTART						
V	=	80 V	td	=	50 ms	
+/-	=	-	Rs	=	10 Ohm	
Rep	=	45 s	to	=	4 s	
tri	=	Auto	n	=	00005	
START Change						
F1	**F2**	**F3**	**F4**	**F5**	**F6**	**F7**

The functions **START**, **CHANGE** are the same as specified under Quick Start.

With **CHANGE** the polarity cannot be changed because it is a recommended parameter of Field Decay pulses.

3.10.1. Cummins 14269-28 Test Pulse 7 (Alternator Field Decay)

This pulse is only available at the iso.control software.
For this Cummins field decay pulse 7, the software uses the JASO Pulse B1. The external impedance at the rear side of the LD200 must be short circuited.

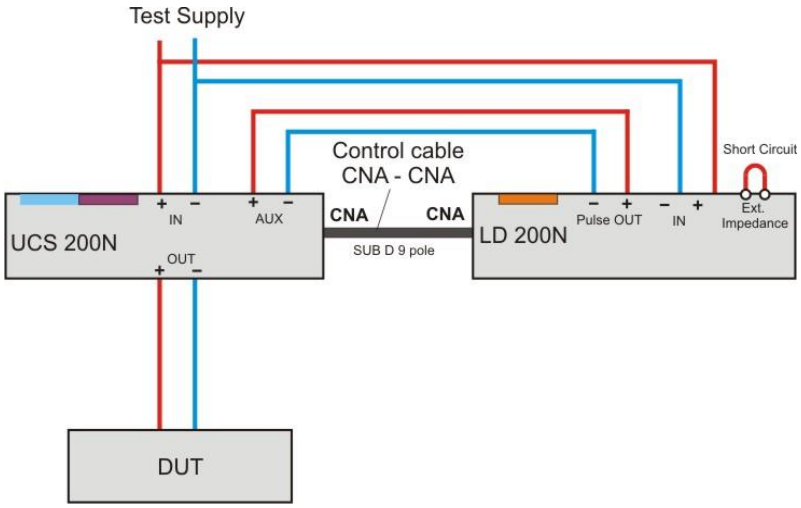
NOTE: The minimum impedance available at the “EXT impedance” connectors at the rear panel of the LD 200N is 10Ω.

Display

R E M O T E						QUICK START
V	=	80 V	Pul	=		JASOB1
+/-	=	-	Rs	=		**ext.**
Rep	=	60 s	to	=		4 s
tri	=	Auto	n	=		00005
START CHANGE						
F1	**F2**	**F3**	**F4**	**F5**	**F6**	**F7**

Setup:

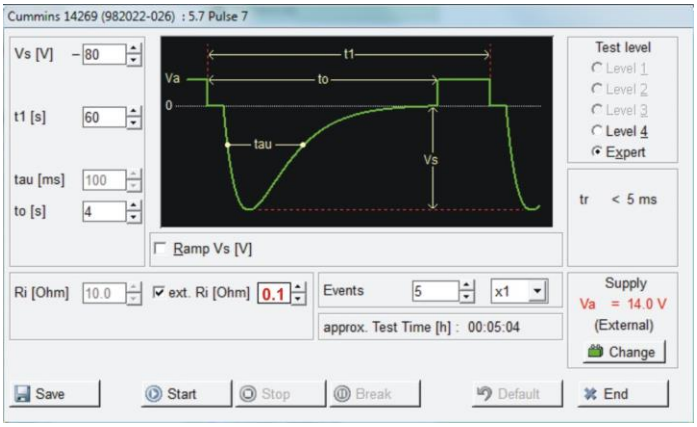
The setup below shows the wiring when testing Field Decay pulse 7 as per Cummins standard. Important is the **short circuit of the Ext. impedance** at the generator rear side. Otherwise the pulse will not be generated. The wiring is the same as in the previous chapter.



SW Setup

To receive a correct Ri value in the report, it is necessary to set the external Ri to 0.1Ω.

Note: The input range of ext. Ri starts at 0.1Ω as minimum value. The total Ri in the report will be noted as 10.1Ω instead of 10.0 Ω. This error of 0.1% should be negligible.



3.11. Service

All service functions are indicated on the display.

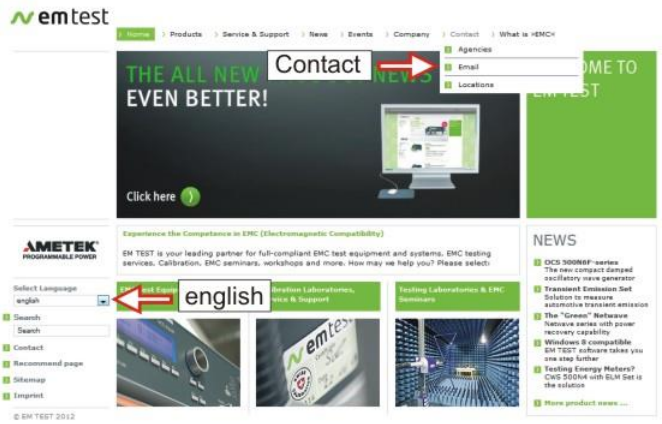
```
SERVICE

F1 :  Addresses
F2 :  Self test
F3 :  Setup
F4 :  Set default values
```

F1 F2 F3 F4 F5 F6 F7

F1 Addresses

The addresses of the EM TEST (Switzerland) GmbH and the EM TEST GmbH are shown. The addresses of all EM TEST sales agencies are listed on the web site of EM Test under :

www.emtest.com



F2 Self test

With the assistance of the user the software can test some parts of the equipment. The software will clearly explain the self-test procedure.

F3 Set-up

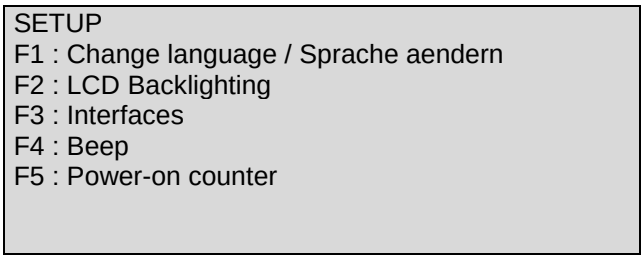
The software will clearly explain the set-up procedure.

F4 Set default values

Pressing of F4 will reset all programmed standard values to the default standard setting (factory setting)

3.12. Setup

This menu helps the user to define the configuration of the LD 200N.



F1 Change language
The user can chose between two languages, German and English.

F2 LCD backlighting
With the use of F2 the backlighting can be switched On or Off. Additionally the Auto Off function can be programmed to switch off the backlighting after a specified time the generator has not been in operation (1 - 30min).

F3 Interfaces
This menu will help the user to define the status of the integrated serial and parallel interfaces, e.g. the baud rate of the RS 232 or the address of the IEEE interface.

F4 Beep
F1 is the selector for the Keyboard beeper ON/OFF mode.
F2 is the selector for the Countdown beeper ON/OFF mode.

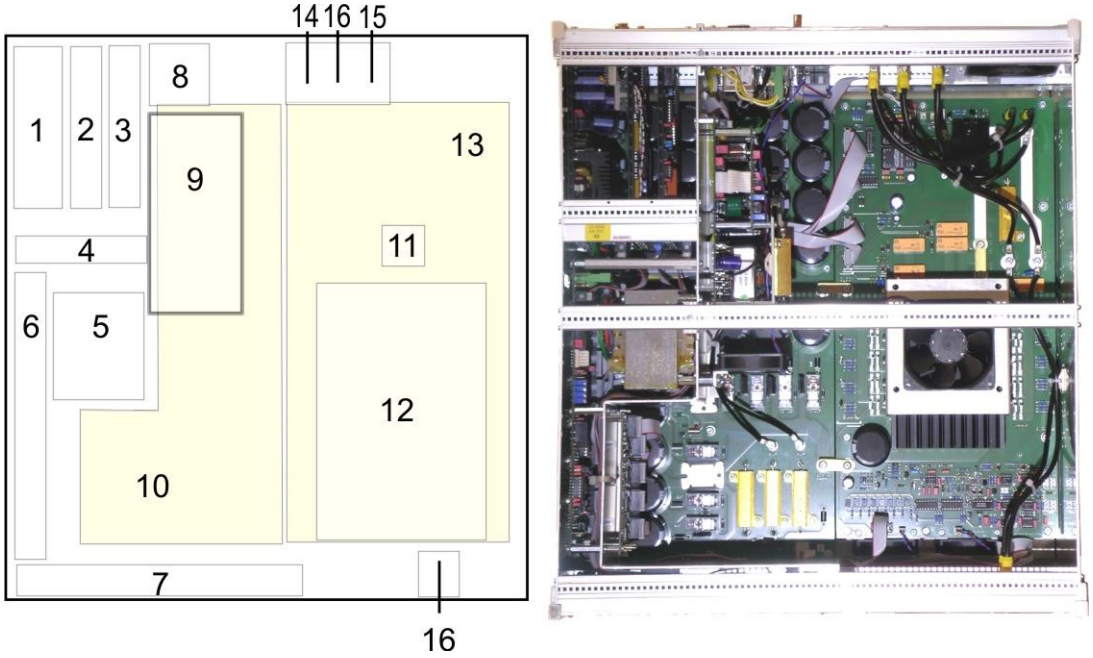
The beeper is always on when a test routine is finished. To indicate that a running test is finished the beeper sounds 3 times.

F5 Power-on counter
Pressing of F5 will show the total power on and test time of the test equipment.

4. Test Equipment LD 200N

4.1. Construction

The Load Dump generator type LD 200N is divided into three main parts. The control unit is shielded and decoupled against the two other units.



I Control unit

1 Power supply board
2 Interface board
3 Processor board
4 Connection board
5 Transformer
6 Filter unit
7 Keyboard/ LCD display
8 Power mains filter

II High voltage part

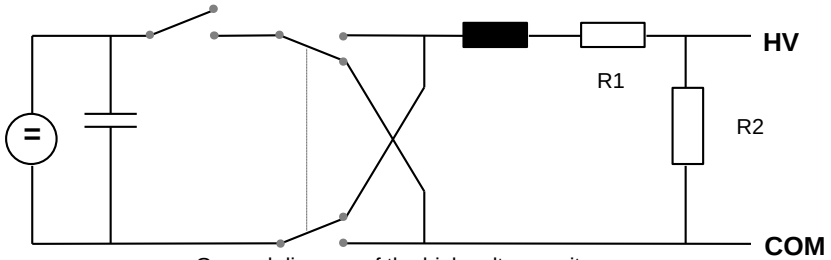
9 High voltage power supply
10 Energy storage
11 Polarity relays
12 Switch
13 Source impedance select (bottom layer)
14 Ext. impedance OUT
15 DUT battery supply IN
16 DUT battery supply OUT

4.2. Control unit

The control unit mainly includes the processing part and the driver components for adapting the high voltage part to the processing unit. Also the galvanic decoupling of low voltage and high voltage is realized within this part.

4.3. High voltage unit

The output pulses are generated, controlled by the processing part. The output is floating.



General diagram of the high voltage unit

5. Technical Data

5.1. Standard test pulses

ISO 7637-2	
Open circuit voltage	V = 87.0V ±10%
Waveshape	No load pulse shape
Rise time tr	5ms - 10ms
Pulse width td	40ms - 400ms± 10% (40, 50, 100, 150, 200, 250, 300, 350, 400ms steps)
Source impedance	selectable 0.5Ω to 38Ω in steps of 0.1Ω and EXT (10Ω + variable EXT Rd)
Energy content	> 940J at max. charging voltage
Polarity	positive / negative (Field Decay)

Ford ES-XW7T AB version	
Open circuit shape CI240	60.0V ±10%
Rise time tr	1ms - 10ms
Pulse width td	300ms ±10%
Source impedance	0.5Ω
Waveform on 0.7Ω	30V ±20%
Pulse width td	150ms ±20%
Polarity	positive

Ford ES-XW7T AC version	
Open circuit shape CI220	60.0V ±10%
Rise time tr	1ms - 10ms
Pulse width td	300ms ±20%
Source impedance	0.5Ω
Waveform on 0.5Ω	30V –0/+10%
Pulse width td	150ms ±20%
Polarity	positive

Ford CS 2009.1	CI 220G
Open circuit waveshape CI220G	60.0V ±10%
Rise time tr	5 - 10ms
Pulse width td	300ms ± 20%
Source impedance	0.5Ω
Waveshape on 0.5Ω load	30.0V ±10%
Rise time tr	5ms - 10ms
Pulse width td	150ms ± 20%
Polarity	Positive
Load	0.5Ω

Ford FMC1278	CI 222
Open circuit waveshape CI222	60.0V ±10%
Rise time tr	5 - 10ms
Pulse width td	300ms ± 20%
Source impedance	0.5Ω
Waveshape on 0.5Ω load	30.0V ±10%
Rise time tr	5ms - 10ms
Pulse width td	150ms ± 20%
Polarity	Positive
Load	0.5Ω

Chrysler PF 9326 Rev E	
Open circuit waveshape	Stepped Voltage ±10% (Start: 31.5V; End: 91.5V; Step 15V)
Rise time tr	5ms - 10ms
Pulse width td	300ms ± 10%
Source impedance	0. or Ext.
Waveshape on 0.5Ω load	45.75V +0% -5%
Rise time tr	1ms - 10ms
Pulse width td	>95ms
Polarity	Positive

SAE J1455	
Open circuit voltage	V = 20 V – 100 V ±10% (86 V; 122 V)
Rise time tr	100 µs
Pulse width td on τ	400 ms± 10%
Source impedance	selectable 0.4 Ω + 0.8 Ω, variable with EXT RD min 10Ω
Polarity	positive

MBN 10 284 part 2	**12V**	**24V**	**42V**
Open circuit voltage	100 V = ±10%	200 V	100 V
waveshape			
Rise time tr	< 0.1 ms	< 0.1 ms	< 0.1 ms
Pulse width td	400 ms ± 10%	500 ms	400 ms
Source impedance	2 Ω	2 Ω	2 Ω / EXT
Polarity	positive		

Nissan 28400 NDS 03 (1997)	
Waveshape for A1	
Open circuit voltage	U = 60 V ± 10%
Capacity C	15 mF
Source impedance R1	18 Ω
Source impedance R2	0.66 Ω, variable with EXT RD
Polarity	positive
Waveshape for A2	
Open circuit voltage	U = 60 V ± 10%
Capacity C	15 mF
Source impedance R1	11 Ω
Source impedance R2	0.8 Ω, variable with EXT RD
Polarity	positive
Waveshape for B1	
Open circuit voltage	U = 80 V ± 10%
Capacity C	1 mF
Source impedance R1	20 Ω
Source impedance R2	20 Ω, variable with EXT RD
Polarity	Positive / negative (NDS 03 (2005) B1 only negative polarity -80 V)

JASO D001	
Waveshape for A1	
Open circuit voltage	U = 70 V ± 10% (56 V + 14 V)
Capacity C	110 mF
Pulse duration τ	200 ms
Source impedance	0.8 Ω, variable with EXT RD
Polarity	positive
Waveshape for B1	
Open circuit voltage	U = - 80 V ± 10%
Capacity C	3 mF
Pulse duration τ	60 ms
Source impedance	8 Ω, variable with EXT RD
Polarity	negative
Waveshape for D1	
Open circuit voltage	U = 110 V ± 10% (82 V + 28 V)
Capacity C	73 mF
Pulse duration τ	400 ms
Source impedance	1.5 Ω, variable with EXT RD
Polarity	positive

SCANIA TB 1400	**for Bus**
Open circuit voltage	U = 125 V ± 10%
Rise time tr	10 ms
Pulse duration td	480 ms
Source impedance	1.5 Ω
Polarity	+ positive

SCANIA TB 1400	**for Truck**
Open circuit voltage	U = 90 V ± 10%
Rise time tr	10 ms
Pulse duration td	300 ms
Source impedance	1.5 Ω
Polarity	+ positive

SCANIA TB 1700	
Open circuit voltage	U = 125 V ± 10%
Rise time tr	10 ms
Pulse duration td	480 ms
Source impedance	1.5 Ω
Polarity	+ positive

5.2. Output limitations

From technical design reason the load dump has the following limitations for the voltage setting.

Limitation	**Parameter who limits**	
Umax. = 180 V	td Pulse duration	td < 100 ms
Umax. = 99.5 V	Ri internal resistance	Ri < 1.0 Ω

5.3. Trigger

Automatic	Auto release with preselected parameters
Manual	Manual release of a single event
Extern	External release by external trigger
Events	Selectable 1 - 30'000 or endless
Counter	1 - 1'000'000

Repetition rate

The LD generator will limit the repetition rate in relation to the maximum energy of the pulses.

Voltage range [V]	Nissan B1	ISO JASO B1 SAE Nissan MBN GM BMW	JASO D1	JASO A1 Freestyle Ford 30s <= 65V
20 - 50	3s	10s	20s	30s
50.5 - 100		15s	30s	45s
100.5-150		20s	40s	60s
150.5 - 200		25s	50s	75s

5.4. Input/output

+/- output	safety laboratory plugs
Coupling	Coupling to + line
Decoupling	by diode
Battery supply input/output	max. 60V/30A

5.5. Test routines

Quick Start	Immediate start, all parameters can be changed on-line
Standard Test Routines	ISO, JASO, SAE, Nissan, MBN, GM, Ford, Chrysler etc.
Freestyle	tr: <1µs..10ms td: 10ms..1200ms
Service	Service, self-test and set-up routines

5.6. Interfaces

Serial Interface	RS 232 ; 1'200 – 19'200 Baud
Parallel Interface	IEEE ; addresses 1 - 30
CN port	Control of CNA 200B, MPG 200 or UCS 200 generator

5.7. General

Dimensions	19" / 6 HU	500 x 450 x 287mm
Weight	28.7 kg	
	30.0 kg	with option clip Module
Power supply	115/230V +10/-15% 50/60Hz (optional 115V)	
Fuses	2 x 2A T	(230 V)
	2 x 4A T	(115 V)

5.8. Environmental conditions

Temperature	10 °C to 35 °C
Humidity	30 % to 70 %; non condensing
atmospheric pressure	86 kPa (860 mbar) to 106 kPa (1 060 mbar)

=> Not relevant data for the standards can be changed by the manufacturer <=

6. Maintenance

6.1. General

The generator is absolutely maintenance-free by using a solid state semiconductor switch to generate the fast transients.

6.2. Test set-up

When setting up the test national and international regulations regarding human safety have to be guaranteed.

It is recommended to connect the simulator to the ground reference plane of the test set-up.

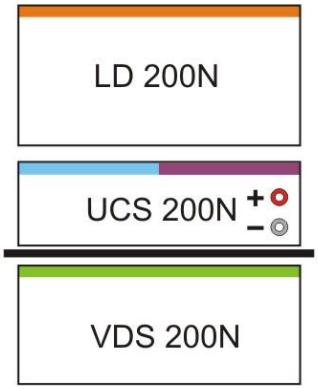
The generators of the series 200, UCS, LD, PFS and VDS can be linked together to a fully automotive test set-up.

The set-up communicates via the IEEE/GPIB bus and is controlled by iso.contril software.

For setting up the system see the following figures:

Each generator can be operated individual as a single equipment.

Devices



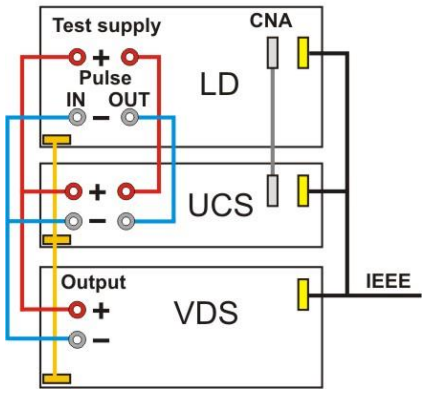
Wiring

Front view

Central +/- output for the DUT is the output of the UCS 200

Ground reference plane. Connect all units and the chassis of the rack to this plane.

Rear view



Connection +/- dc supply
- output VDS to test supply input UCS / LD
- pulse out LD to AUX input UCS

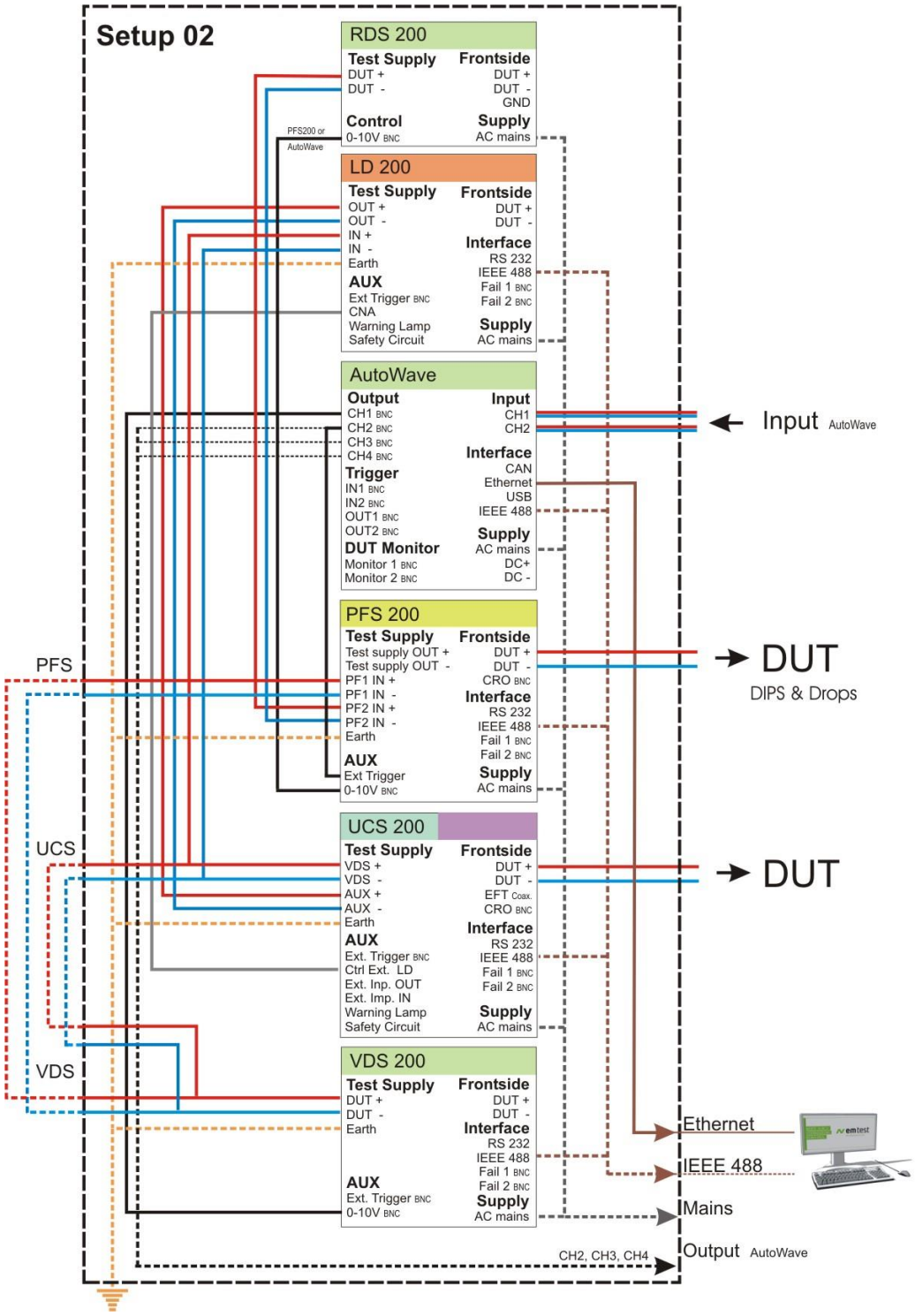
Connect control lines CN
- LD-CN to UCS CN input

Connect the GPIB
- Connect all units

All units must be connected very well to the ground reference system. Especially important is this for the UCS under the aspect of pulse 3a / 3b

Setup example with:

AutoWave
UCS 200
VDS 200N
LD200N
PFS 200N
RDS 200N

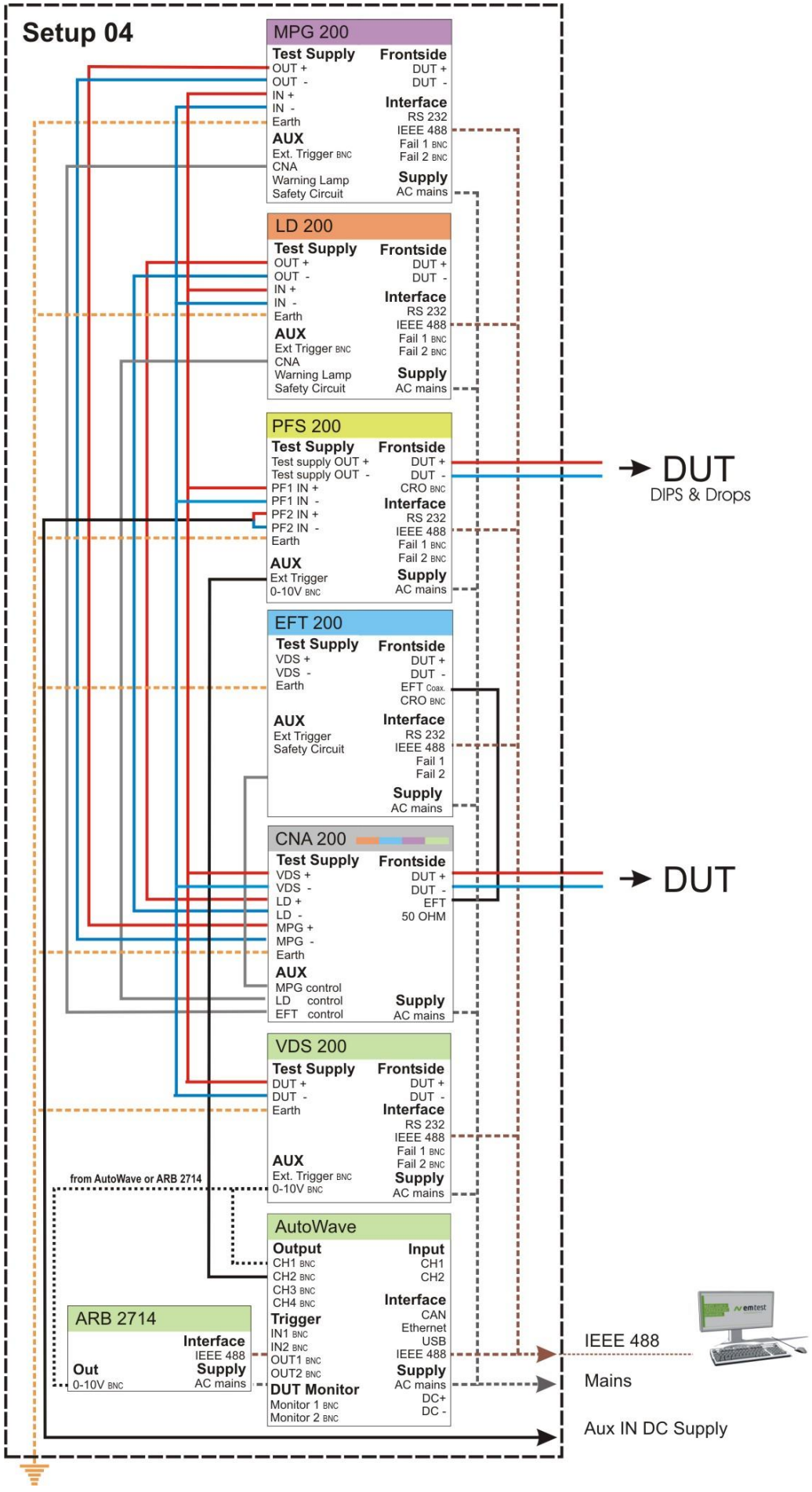


Note : Do never connect the PFS200N output 0-10V in parallel with any Autowave output. In this case the controlled DC source will deliver a wrong output signal. It is not allowed to connect two output sources in parallel.

Setup example with:

ARB 2714 or AutoWave

MPG 200
VDS 200B
LD 200N
EFT 200
CNA 200



6.3. Calibration and Verification

6.3.1. Factory calibration

Every EM TEST generator is entirely checked and calibrated as per international standard regulations before delivery. A calibration certificate is issued and delivered along with a list of the equipment used for the calibration proving the traceability of the measuring equipment. All auxiliary equipment and accessories are checked to our internal manufacturer guidelines.

The calibration certificate and the certificate of compliance (if available) show the date of calibration.

The EM Test equipment are calibrated in the factory and marked with a calibration mark. The used measuring instruments are traceable to the Swiss Federal Office of Metrology.
The calibration date is marked. The validity of the calibration is to the responsibility of the user's quality system. Neither the certificate of calibration nor the corresponding label mark any due date for re-calibration.

Example: Calibration mark

6.3.2. Guideline to determine the calibration period of EM Test instrumentation

Our International Service Departments and our QA Manager are frequently asked about the calibration interval of EM TEST equipment.

EM TEST doesn't know each customer's Quality Assurance Policy nor do we know how often the equipment is used and what kind of tests are performed during the life cycle of a test equipment. Only the customer knows all the details and therefore the customer needs to specify the calibration interval for his test equipment.

In reply to all these questions we like to approach this issue as follow :
EM TEST make use of a solid state semiconductor switch technique to generate high voltage transients. A precious advantage of this technique is the absolute lack of periodical maintenance effort. In consequence thereof a useful calibration period has to be defined based on two criteria:

- The first one is the customer's Quality Assurance Policy. Any existent internal regulation has to be applied at highest priority. In the absence of such internal regulation the utilization rate of the test equipment has to be taken into consideration.

- Based on the experience and observation collected over the years **EM TEST recommend a calibration interval of 1 year** for frequently used equipment. A 2-years calibration interval is considered sufficient for rarely used test generators in order to assure proper performance and compliance to the standard specifications.

6.3.3. Calibration of Accessories made by passive components only:

Passive components do not change their technical specification during storage. Consequently the measured values and the plots stay valid throughout the storage time. The date of shipment shall be considered as the date of calibration.

6.3.4. Periodically In-house verification

Please refer to the corresponding standard before carrying out a calibration or verification. The standard describes the procedure, the tolerances and the necessary auxiliary means. Suitable calibration adapters are needed. To compare the verification results, EM Test suggests to refer to the waveshape and values of the original calibration certificate.

All calibrations and verifications are always done without mains supply voltage connected to the coupling network input.


Danger

Before start the calibration or verification

remove the DUT Mains Supply

from the generator and from the coupling network

6.3.5. Tolerances for Calibration

Pulse 5 ISO 7637-2 ISO 16750	**Vs**	**tr** 10% - 90%	**t_d** 10% - 10%
open circuit	+87V ± 10%	5ms – 10ms	400ms ± 20%
4Ω	+43.5V ± 20% Incl. dc supply	Not specified	200ms ± 20%
Pulse 5 Chrysler	**Vs**	**tr** 10% - 90%	**t_d** 10% - 10%
open circuit	+91.5V ±10%	5ms – 10ms	300ms ±10%
0.5Ω	+45.75V ±20%	not specified	>95ms
Pulse 5 Ford AB	**Vs**	**tr** 10% - 90%	**t_d** 10% - 10%
open circuit DUT Supply 13.5V	+73.5V -0 / +10%	- - -	- - -
open circuit	+60V -0 / +10%	1ms – 10ms	300ms ±20%
0.7Ω Ford-AB	+30V ±20%	not specified	150ms ±20%
Pulse 5 Ford AC	**Vs**	**tr** 10% - 90%	**t_d** 10% - 10%
open circuit with DUT Supply 13.5V	+73.5V -0 / +10%	1ms – 10ms	300ms ±20%
open circuit	+60V -0 / +10%	1ms – 10ms	300ms ±20%
0.5Ω Ford-AC	+30V -0 / +10%	1ms – 10ms	150ms ±20%
Pulse 5a–12V MBN	**Vs**	**tr** 10% - 90%	**t_d** 90% - 10%
open circuit	+100V ±10%	≤ 100µs	400ms ±10%
2Ω	+50V ±20%	Not specified	Not specified
Pulse 5a–24V MBN	**Vs**	**tr** 10% - 90%	**t_d** 90% - 10%
open circuit	+200V ±10%	≤ 100µs	500ms ±10%
2Ω	+50V ±20%	Not specified	Not specified
Pulse 5a–42V MBN	**Vs**	**tr** 10% - 90%	**t_d** 90% - 10%
open circuit	+100V ±10%	≤ 100µs	400ms ±10%
2Ω	+50V ±20%	Not specified	Not specified
Pulse JASO A1	**Vs**	**t_r** 10% - 90%	**τ** at 37% - 37%
open circuit	+70V ± 10%	≤1µs	200ms ± 20%
0.8Ω load	+35V ± 20%	Not specified	Not specified
Pulse JASO B1	**Vs**	**t_r** 10% - 90%	**τ** at 37% - 37%
open circuit	-80V ± 10%	≤1µs	60ms ± 20%
8Ω	-40V ± 20%	Not specified	Not specified
Pulse JASO D1	**Vs**	**t_r** 10% - 90%	**τ** at 37% - 37%
open circuit	+110V ± 10%	≤1µs	400ms ± 20%
1.5Ω	+55V ± 20%	Not specified	Not specified
SAE J1455 – 12V	**Vs** [V]	**t_r** **10% - 90%**	**t_d** **37% - 37%**
open circuit	+86.0 ±10%	100µs ±20%	400ms ±20%
0.4Ω	+43.0 ±10%	Not specified	Not specified
SAE J1455 – 24V	**Vs** [V]	**t_r** **10% - 90%**	**t_d** **37% - 37%**
open circuit	+122.0 ±10%	100µs ±20%	400ms ±20%
0.8Ω	+61.0 ±10%	Not specified	Not specified
Nissan A1	**Vs** [V]	**t_r** **10% - 90%**	**t_d** **37% - 37%**
open circuit	+60 ±10%	<2ms , not specified	270ms ±20%
0.66Ω	+30 ±10%	Not specified	Not specified
Nissan A2	**Vs** [V]	**t_r** **10% - 90%**	**t_d** **37% - 37%**
open circuit	+60 ±10%	<2ms , not specified	165ms ±20%
0.8Ω	+30 ±10%	Not specified	Not specified
Nissan B1	**Vs** [V]	**t_r** **10% - 90%**	**t_d** **37% - 37%**
open circuit	-80 ±10%	<2ms , not specified	20ms ±20%
20Ω	-40 ±10%	Not specified	Not specified
Scania 480	**Vs** [V]	**t_r** **10% - 90%**	**t_d** **10% - 10%**
open circuit	+125 ±10%	10ms ±20%	480ms ±20%
1.5Ω	+62.5 ±10%	Not specified	Not specified
Scania 300	**Vs** [V]	**t_r** **10% - 90%**	**t_d** **10% - 10%**
open circuit	+90 ±10%	10ms ±20%	300ms ±20%
1.5Ω	+45 ±10%	Not specified	Not specified

7. Delivery Groups

7.1. Basic equipment

- Simulator LD 200N
- Power supply cable
- Safety laboratory cables
- Manual on USB memory card
- Control cable LD200N – UCS 200N; SubD 9 pole male-male (optional)
- Safety manual

Identical accessory parts are delivered only once if several devices are orderes. The delivered packing list is in each case valid for the delivery.

7.2. Accessories and options

- **CAISO**
  - Calibration adapter with resistors for pulse verification as per standard ISO 7637-2 and ISO 16750-2

- **User software " iso.control "**
  - Test, analysis and documentation with windows
  - License version for testing according the most automotive standards
  - Report generator with export function to word-processing software

- **User software " AutoWave.control "**
  - Test, analysis and documentation with windows
  - License version for testing according the most industrial standards
  - Report generator with export function to word-processing software

USB Interface

- **K-USB USB interface cable**
  High quality USB 2.0 interface cable for data transfer to the computer.
  Length: 3m connector type USB A – USB B
- **FER-USB**
  Ferrite for suppress burst pulses on the USB cable.
  Application: 8 turns for the best result. max. 10cm above ground.

8. Appendix

8.1. Declaration of CE-Conformity

Manufacturer :	**EM TEST (Switzerland) GmbH**
Address:	Sternenhofstr. 15 CH 4153 Reinach Switzerland

declares, that under is sole responsibility, the product's listed below, including all their options, are conformity with the applicable CE directives listed below using the relevant section of the following EC standards and other normative documents.

Product's name:	Load Dump generator
Model Number(s)	LD200N

Low Voltage Directive 2014/35/EU

Standard to which conformity is declared:

EN 61010-1 : 2011	Safety requirements for electrical equipment for measurement, control, and laboratory use.

EMC Directive 2014/30/EU

Standard(s) to which conformity is declared:

EN 61326-1 : 2012	Electrical equipment for measurement, control and laboratory use Class A
EN 61000-3-2 : 2014	Limits for harmonic current emissions
EN 61000-3-3 : 2013	Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems.

	European representative	Manufacturer
	AMETEK CTS Germany GmbH	EM TEST (Switzerland) GmbH
	Lünenerstr. 211	Sternenhofstr. 15
	D 59174 Kamen	CH 4153 Reinach
	Tel: +49 (0) 2307 / 26070-0	Tel: +41 61-7179191
	Fax: +49 (0)2307 / 17050	Fax: +41 61-7179199
By	N. Holub General manager	A. Burger Design and Research
Place	Kamen, Germany	Reinach BL , Switzerland
Date	25. February 2016	25. February 2016

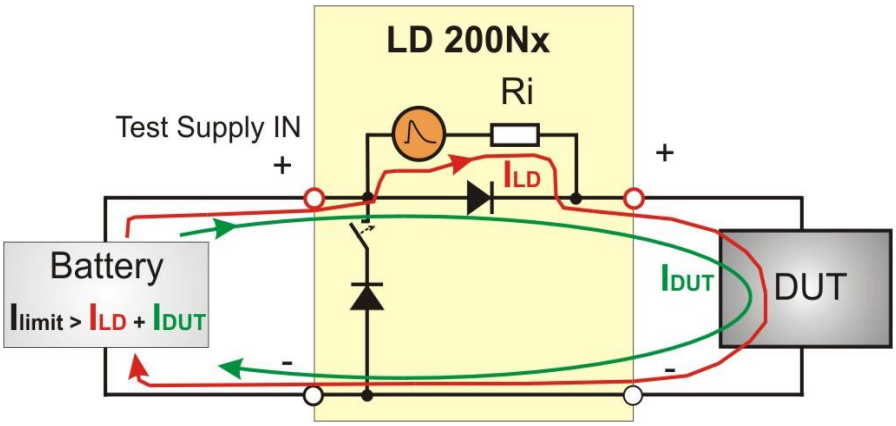
8.2. Current limiter setting for DC supply

Depending on the setup and the Load Dump impulse polarity, the dc source current capacity and current limiter must be able to conduct both, the DUT current I_{DUT} and load dump current I_{LD}.

Positive load dump impulse

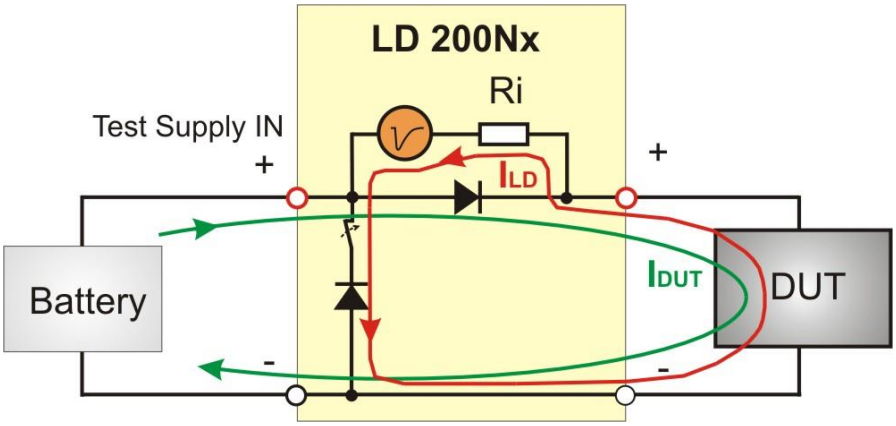
During a positive load dump impulse the current will flow through the dc supply. Therefore the current limiter of this dc source must be set to a higher current rate than the max current in the circuit.

DC source limiter must set to a value **≥ I_{DUT} +I_{LD}**



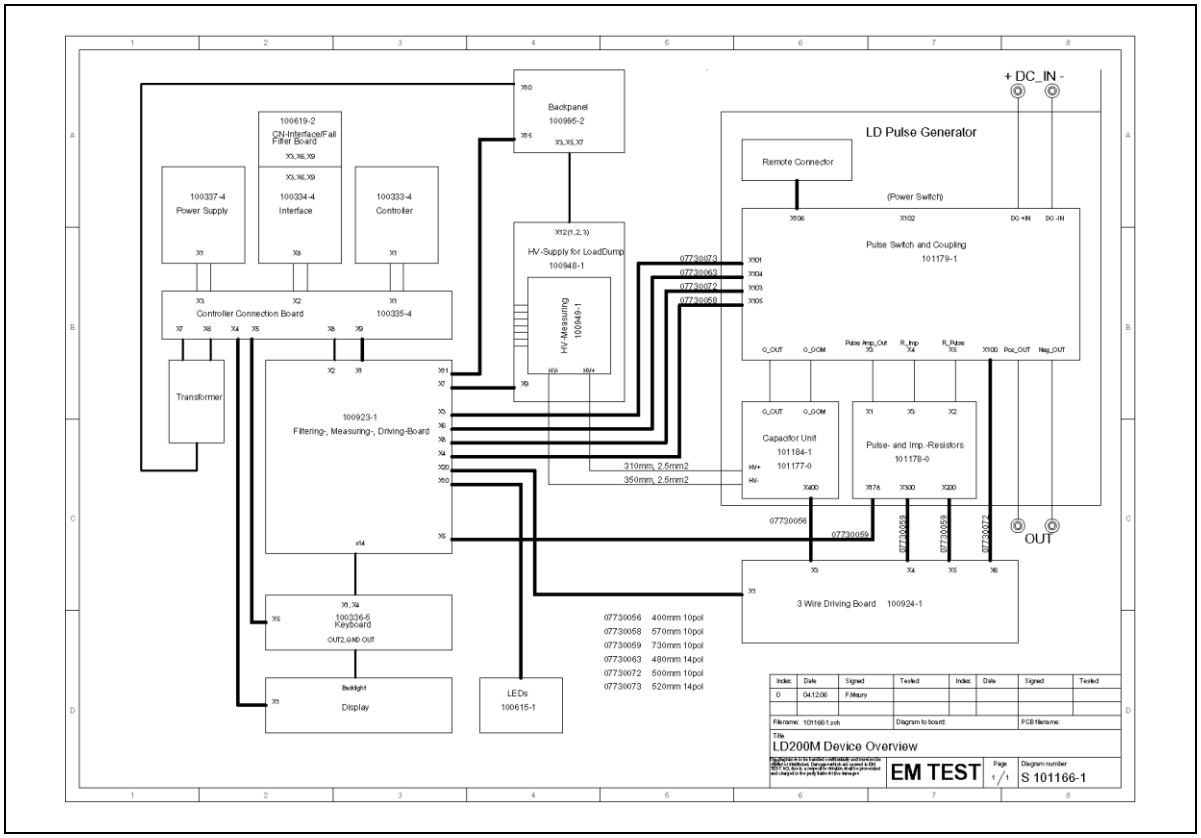
Negative load dump impulse

During a negative load dump impulse the current will flow through the bypass diode. Therefore the current limiter of the dc source can be set to the DUT protection level.

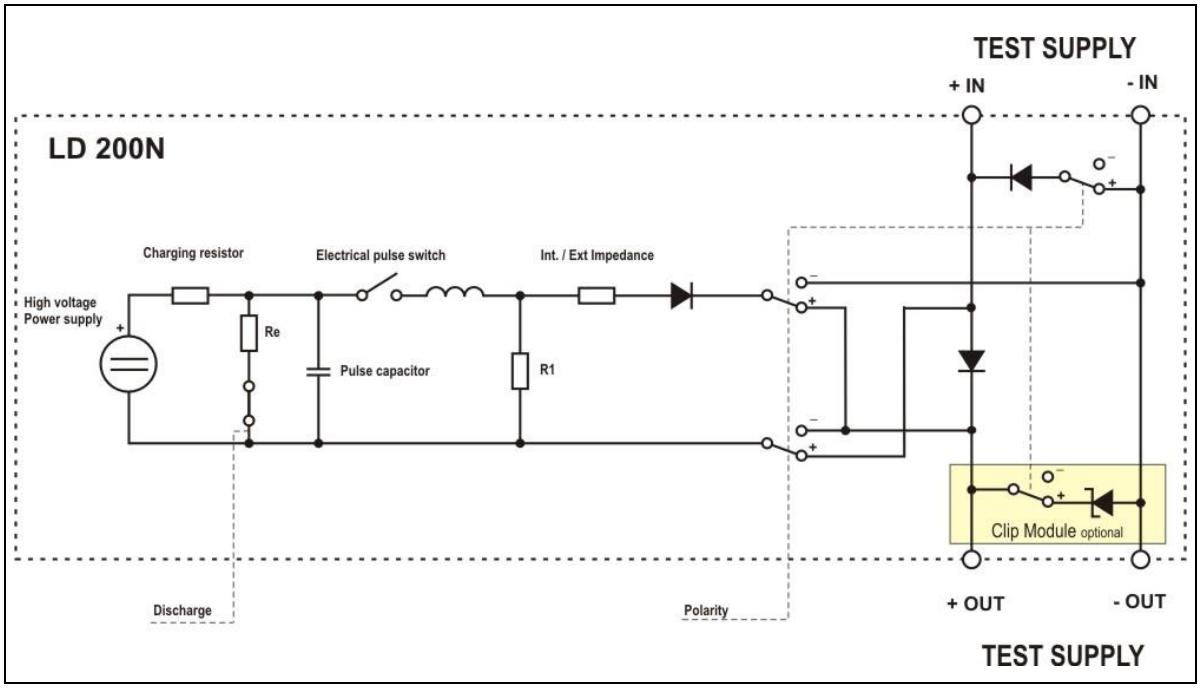


Disable the dc source current limiter or limit to the max current in the circuit

8.3. LD 200N - General diagram



8.4. LD 200N overview coupling



8.5. LD 200N Menu overview

Page 0	Page 1	Page 2	Page 3	Page 4
EM TEST **LD 200N** Load Dump Generator V1.00a01 SWN: 000001	**Main menu** **F1** ISO 7637-2 **F2** JASO **F3** SAE **F4** Manufacturer **F5** Freestyle **F7** Service	**ISO 7637-2** **F1** Quickstart **F2** Customized Program **F3** Voltage change after n by dV	**Quick Start** **F1** Start **F2** Change **F3** Continue	**Start** Starting the test procedure **Change** Select the parameters **Continue**
			Customized test routines Special test routines specified by - the customer setting	**Start** (Start of the test procedure) **Change** (Select new parameters) **Continue**
		Standard Test JASO SAE other Manufacturers	**JASO** **F1** JASO Pulse A1 **F2** JASO Pulse B1 **F3** JASO Pulse D1	**Start** (Start of the test procedure) **Change** (Select new parameters) **Continue**
			SAE **F1** SAE Pulse 5 12V **F2** SAE Pulse 5 24V	
			Manufacturers **F1** Chrysler PF9326 / Ford ES-XW7T **F2** Nissan NDS03 / MBN 10284 **F3** Scania TB1400 / TB1700	
		Freestyle set your own parameters	**Pulse Freestyle.** **F1** Start **F2** Change **F3** Continue	
		Service **F1** Addresses **F2** Selftest **F3** Set-up **F4** Set default values	**Addresses** Addresses of EM TEST In Switzerland and Germany	
			Selftest With the assistance of the user the software can test some parts of the equipment.	
			Set-up **F1** Change language **F2** LCD backlighting **F3** Interfaces **F4** Keyboard beeper **F5** Timer	**Change language** German/English **LCD** backlighting ON/OFF or AUTO **Interfaces** Select parameters **Keyboard-Beeper** (ON/OFF) **Timer**
			Set default values Set factory standard settings	

The menu can differ from model to model without any given notice.