EXXOTEST® EDUCATION

Vehicle training equipment

User's guide for DTM7030
LIGHTING & SIGNALLING TRAINING MODULES

CONTENU

1. INTRODUCTION

1.1. Reminder of the Basics of Electricity

Voltage. The Volt is used to measure Voltage (also known as 'potential difference' or 'pd), which is defined as the work done per unit charge in order to move that charge from one point to another. The symbol used for voltage is V, and its unit is the Volt.

Current. The Amp (or Ampere) is used to measure an electrical current, which is defined as the rate of flow of electrical charges through a point per second. The symbol used for current is I, and its unit is the Ampere.

Resistance. The Ohm is used to measure electrical resistance, which is defined as the opposing force applied, by a component, to the electrical charges in a circulating current. The symbol used for resistance is R and its unit is the Ohm (Ω).

1.1.1. Physical laws

In an electrical circuit, the flow of current is controlled by the following two rules:

- The lower the resistance, the greater the current flowing through the circuit.
- The higher the voltage, the higher the current flowing through a fixed resistance.

These two rules allow us to form fundamental Ohms laws:

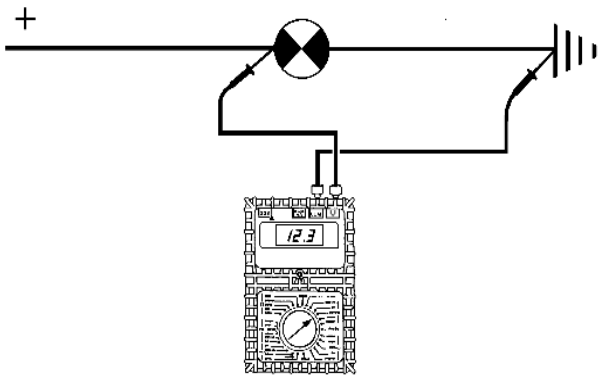
U=I*R where U is expressed in Volts, R in Ohms & I is in Amperes.

Power is defined by a mathematical formula:

P=I*U where P is expressed in Watts, U in Volts & I in Amperes.

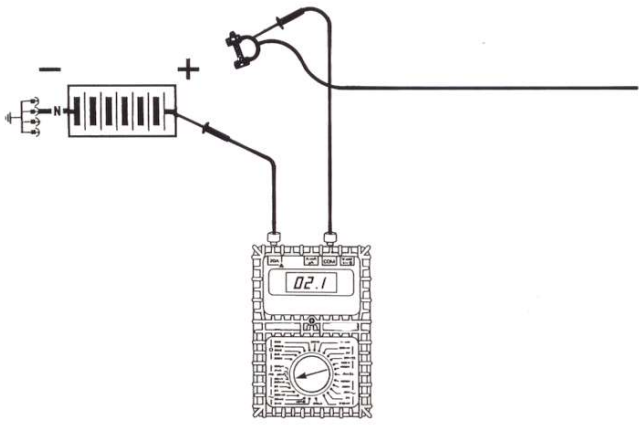
1.1.2. Equipment to be used

The Voltmeter used to measure a voltage or potential difference across the terminals of a component in an electrical circuit. The following precautions must be taken during use:
The voltmeter must be connected in parallel with the terminals of the component to be tested.

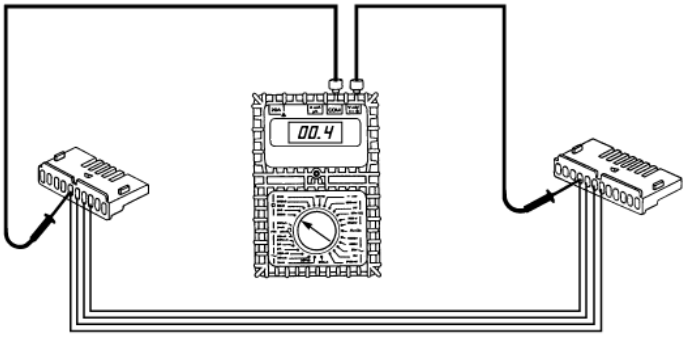


The Ammeter used to measure the current flowing through a circuit. The following precautions must be taken during use:

- Always connect to the circuit to be tested in series.
- Must be associated with a load.
- Pay careful attention to the maximum authorised current for the ammeter in use.

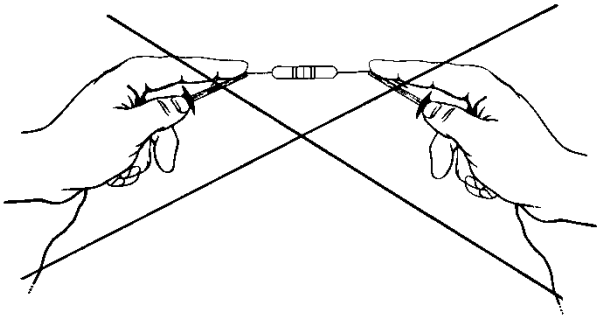


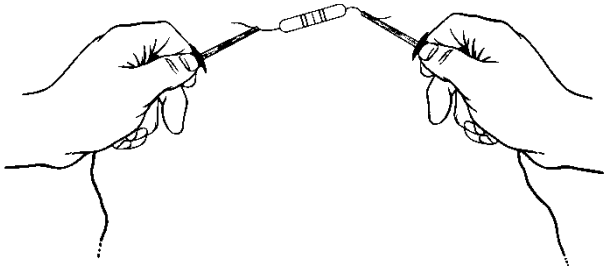
The Ohmmeter used to measure the resistance of a conductor. Connects to the terminals of the component to be tested.

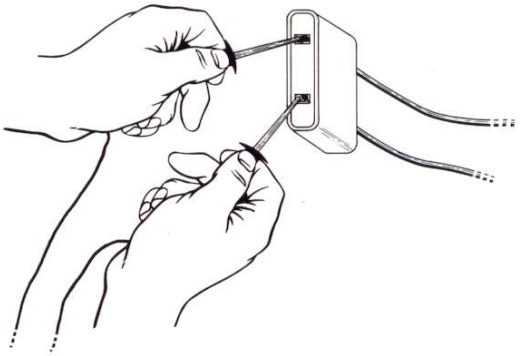


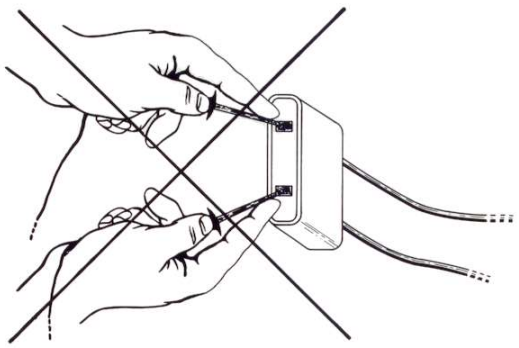
The following precautions must be taken during use:

- The device should never be connected to an external power supply.
- Components to be measured must be disconnected from the circuit and powered-down.
- Avoid disrupting readings by touching the circuit with any part of your body (which is a conductor).









1.2. Vehicle power supply

Vehicles are fitted with batteries, which work as chemical storage devices for the electrical energy produced by the vehicle's generator (alternator). The batteries must be capable of providing rapid high current supplies (above all, at low temperatures) when starting the vehicle cold and providing partial or total supply to the other major loads throughout the vehicle's electrical system for a limited period, above all when the vehicle's engine is running at idle or has been stopped. This requirement is generally met by a lead-acid battery (sulphuric acid).

The normal voltage for a battery fitted to a private vehicle is 12V.

The requirements imposed by each of the vehicle's circuits, in terms of starting power, capacity and charging current, apply for a temperature range of between -30 and +70 °C.

The various characteristics of vehicle batteries:

- Voltage - generally 12.5 V for private vehicles.
- Capacity, in Ah (Ampere-Hours), i.e. the number of amps which can be consumed for a period of one hour before the battery is fully discharged (Caution: with a half-charged battery, it may prove difficult to start the vehicle).
- The number of amps supplied at start-up - depending on vehicle type and engine.
- The size and height - different for each vehicle.
- Location of +ve and 0 V terminals.

0V + + 0V

1.3. Standardised terminal IDs (taken from DIN 72 552)

A few examples of markings:

1 Ignition - low voltage
15 Positive when ignition is turned on

Battery
30 + Battery
31 Ground 0v

Starter
50 Starter motor control

Relays

85 & 86	Relay control	87	Working
87b	At rest	30	Common

1.4. Connections

Definition :

Connections are used to link two or more components, with the option of disconnecting the link, maintaining a good electrical contact and even waterproofing the connection.

Several different types of shapes exist, all of which are easy to remove.

The best connections are those with the lowest possible electrical resistance.

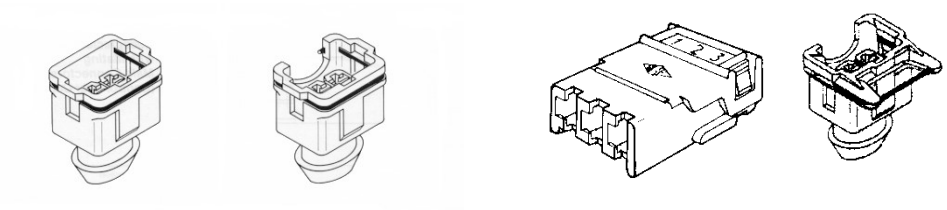
Be aware of current restrictions!

Examples of types of connector:

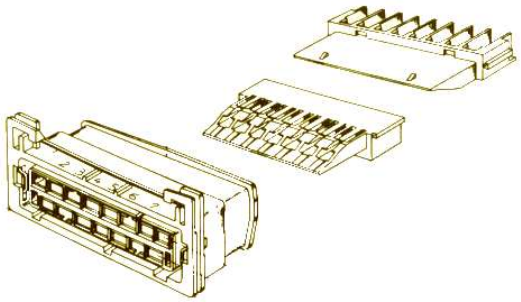
Female flat-lugged connector.

3-way female flat-lugged connector.

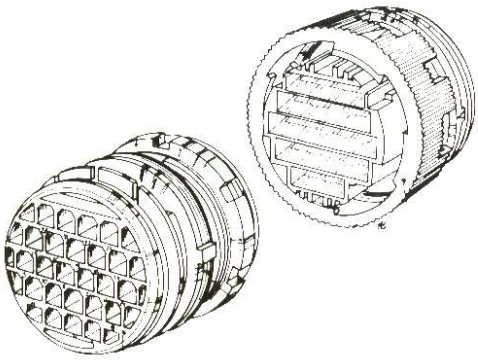
Female, 1-7-way connector with or without clip, leak tight (water temperature probe, HV coil, etc. used by PSA and Renault):



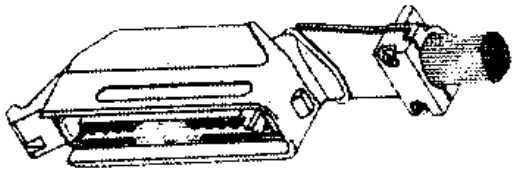
Female connector, 9, 15... way, leak tight (powered ventilation control unit, etc., used by PSA).



Bulkhead connector, 10, 14, 23, way, leak tight (used by PSA):



15, 25, 35, 55, way connector, for all types of ECU: injection, ABS, air conditioning, suspension control, etc. on a number of vehicles.

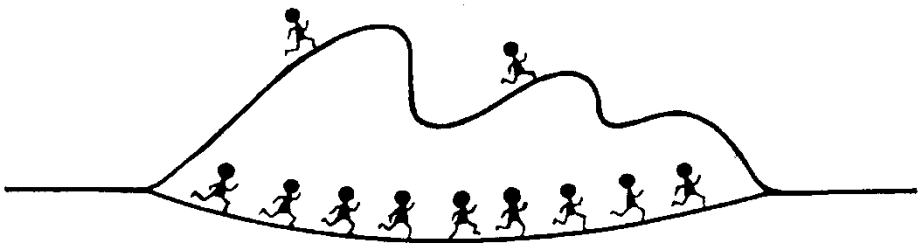


1.5. Electrical circuit components

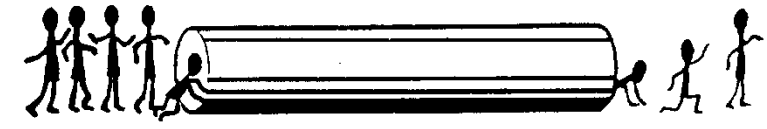
Connecting multi-strand copper wires of various cross-sections, depending on current.

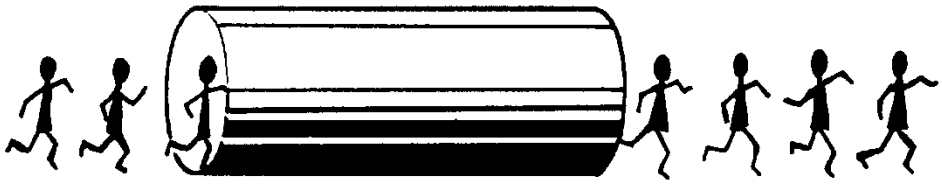
The resistance within the circuit depends on:

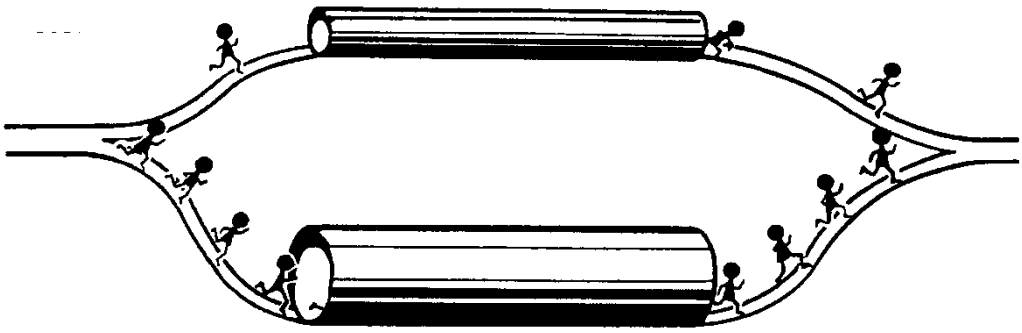
- Length:



- Cross section (flow):







- Type of cable:

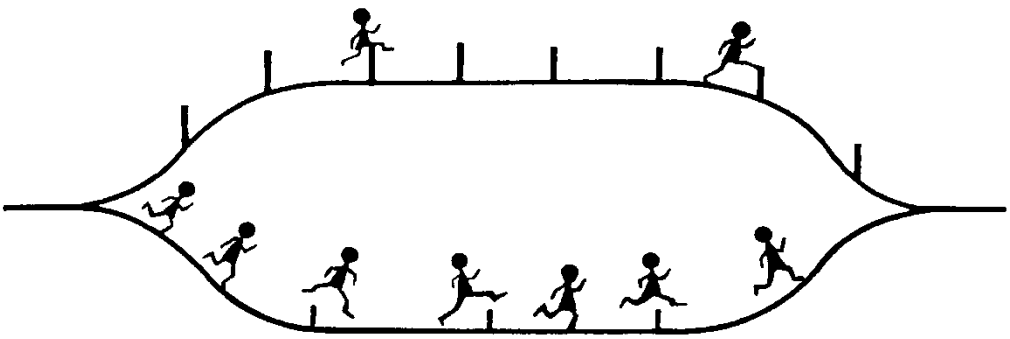


Table of standard values for electrical conductors:

Conductor	Resistivity in Ω.m
Silver	$1,64 .10^{-8}$
Copper	$1,72 .10^{-8}$
Aluminium	$2,69 .10^{-8}$
Nickel	$7,8 .10^{-8}$
Iron	$9,8 .10^{-8}$
Chrome-plated nickel	$108,5 .10^{-8}$

Table showing resistance and weight of copper wiring:

Diameter mm	Cross section mm^2	Weight kg/km	Weight kg/km
1,00	0,7854	7	22,28
1,50	1,7671	15,750	9,903
2	3,142	28,00	5,570
2,5	4,909	43,75	3,565
3	7,069	63	2,476

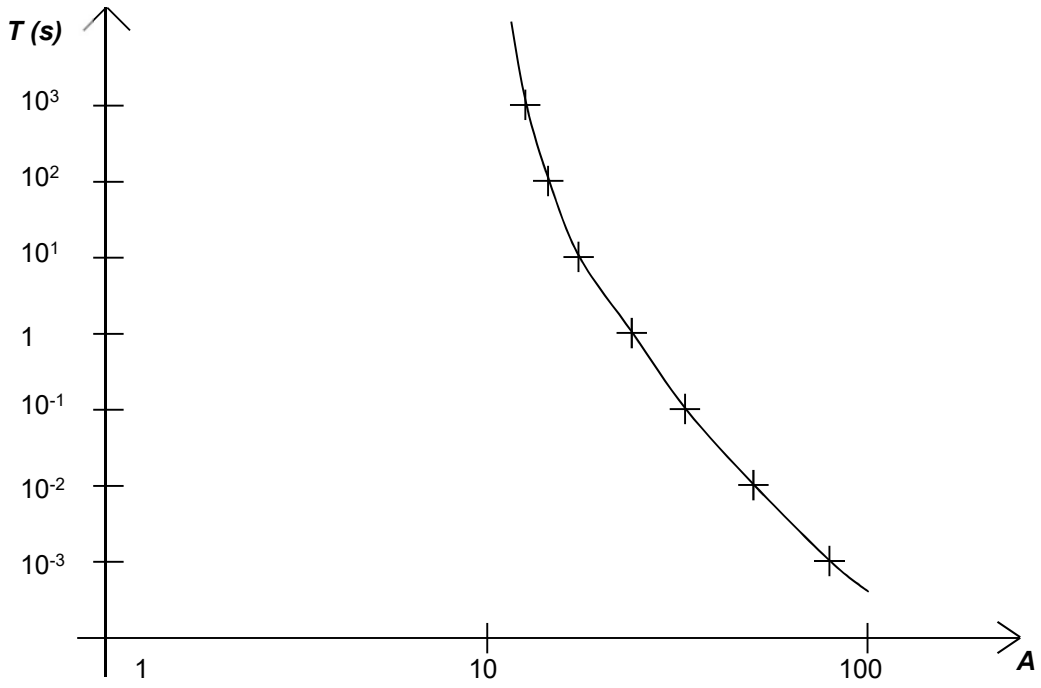
1.6. Fuse

A fuse is a safety device, used to protect an electrical circuit from excess current. Generally, fuses comprise a metal strip which melts at a given temperature. If the current flowing through the circuit exceeds a pre-determined value, the fuse metal melts, thus opening the circuit.

A 10A fuse is designed to withstand 10 Amperes at 20°C, however, it will withstand 20A for a period of 10 seconds, 30A for 5 seconds and even 80A for 0.01 seconds.

Here is an example of the time/current curve for a fast blow 10A fuse (time-delayed fuses are also available).

Example of a graph:

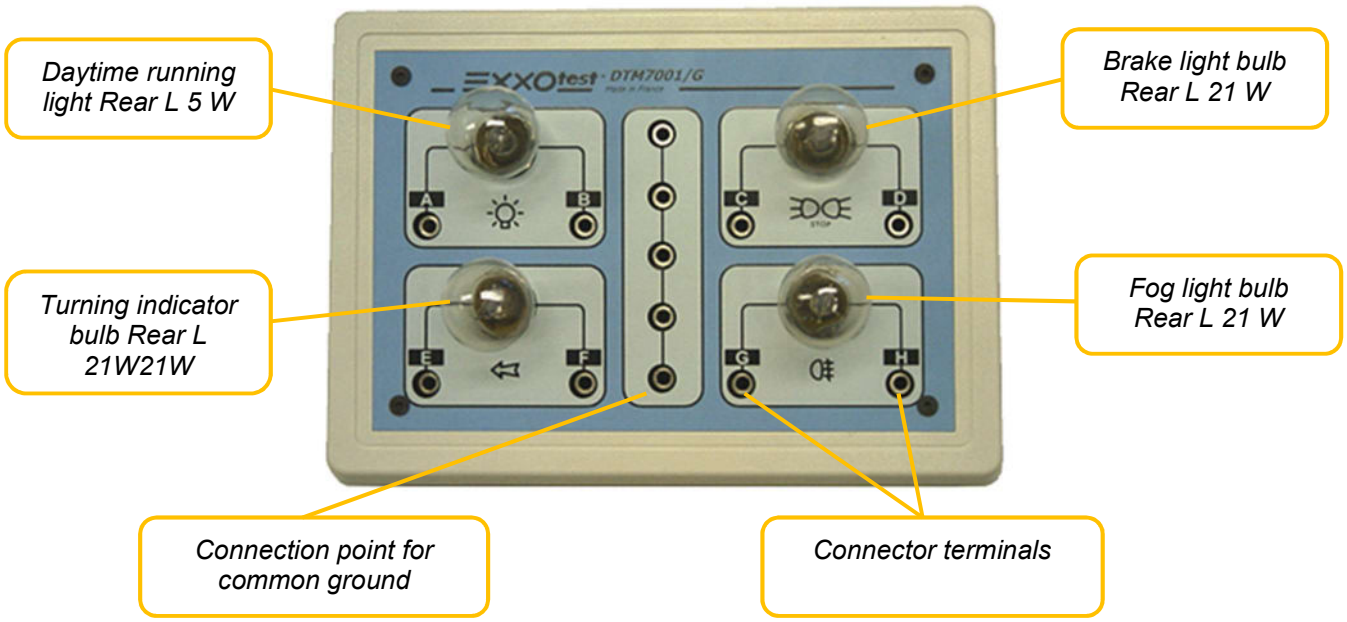


2. FUNCTIONING

2.1. Details of the DTM7030 series of modules

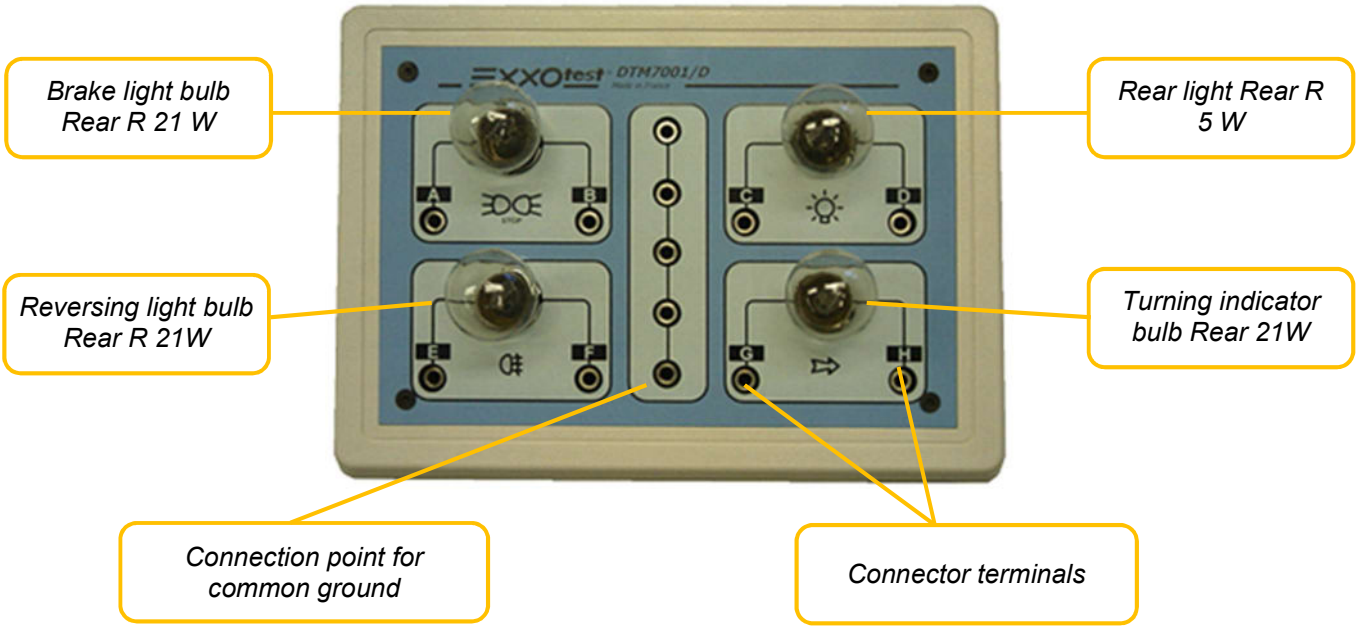
2.1.1. Module DTM7001/G

This module represents the left rear lighting cluster and includes the turning indicator, daytime running light, reversing light and brake light.



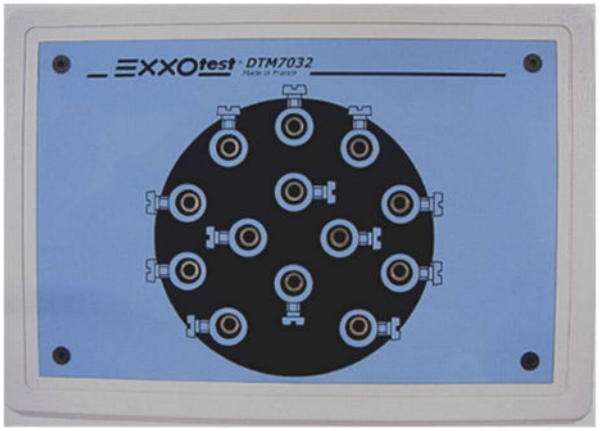
2.1.2. Module DTM7001/D Le module DTM7001/D

This module represents the right rear lighting cluster and includes the turning indicator, daytime running light, fog light and brake light.



2.1.3. Module DTM7032

This module is used for coupling purposes, trailer side.



2.1.4. Module DTM7031

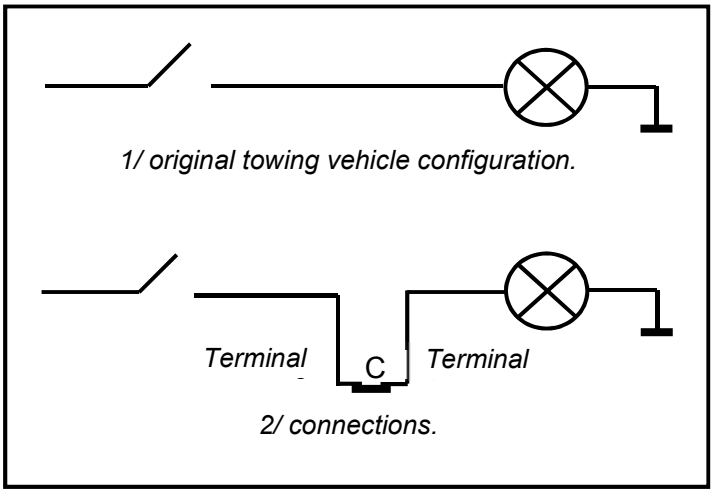
This module is used for coupling purposes, vehicle side.

ID	Description
1	Indicator - LHS
2	Rear fog light
2a	Ignition
3	Terminal 1 - 8 ground
4	Indicator - RHS
5	Headlights - RHS
6	Brake lights
7	Headlights - LHS
8	Reversing lights
9	Permanent +
10	+ battery charge
11	Unused
12	Unused
13	Terminal 9 - 12 ground

Note: Terminals 1 to 8 for module DTM7031 are used to connect to the left and right rear lights on the vehicle.

Particularity of the 13-way connector (DIN):

This connector is fitted with a breaker (C), which will cut off the supply to the rear fog lights of the towing vehicle at connection. This precaution is to avoid blinding the driver due to reflection on the trailer or caravan.



2.2. Bundle controller BM250

This device is designed to assist with the wiring of systems, checking proper operation and diagnostics.

It can be used to identify the wires in a bundle and ensure correct wiring.

This controller consists of a unit and an appropriate bundle, which is connected to the system.

Bundle controller unit BM250.

Description of the bundle controller unit BM250:

BM 250 can be used to test:

- The 2 standard types of connectors
- With 7 or 13 electrical contacts.

The BM 250 has built-in electrical protection devices against:

- Short circuits and reversed polarities for the battery;
- Will flash if polarities are reversed.

BM 250 will carry out an initial test to check the general integrity of wiring, by detecting if an electrical contact is exposed:

- If OK, a series of green indicators will light up

BM 250 will switch each green indicator to red after executing the following commands:

- LHS turning indicator, then RHS,
- Left headlamp, then right,
- Brake lights,
- Reversing lights,
- Fog light
- Spare

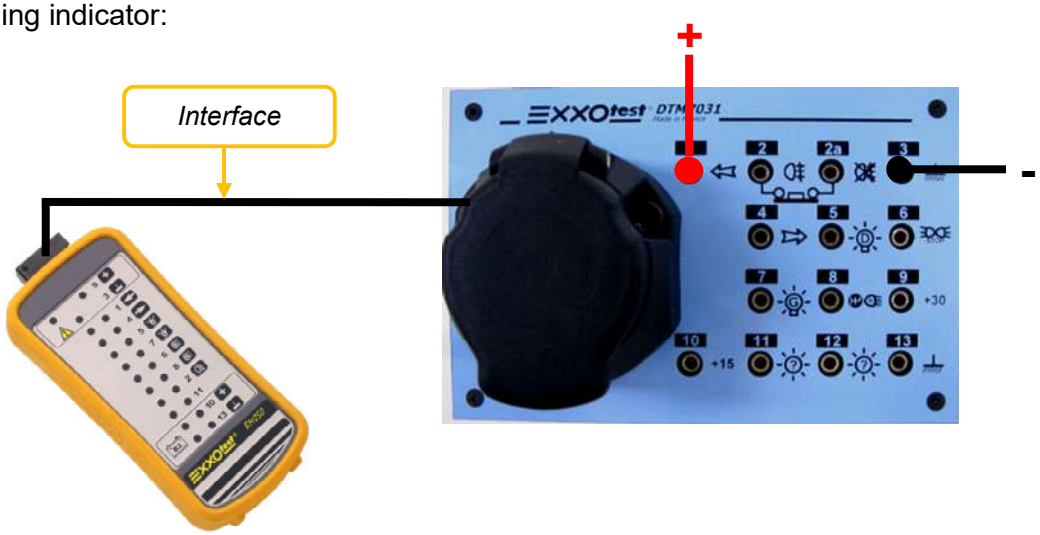
BM 250 can also be used to confirm:

- The direction of wiring from a 2nd battery in the trailer (for contacts 10 and 13).

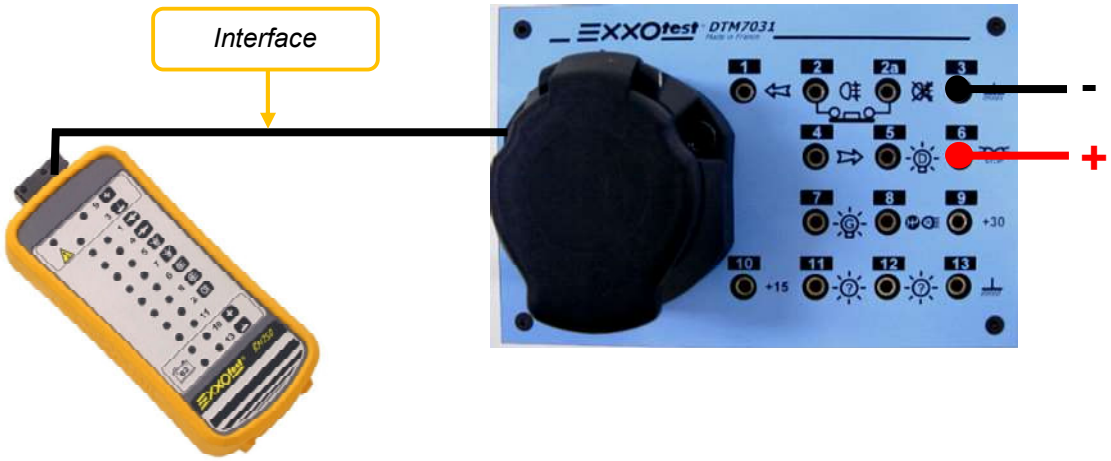
2.3. Wiring and exercises

Testing of connections between the vehicle socket or module DTM7031 and the BM250 device:

Test the LHS turning indicator:



Test the brake lights:

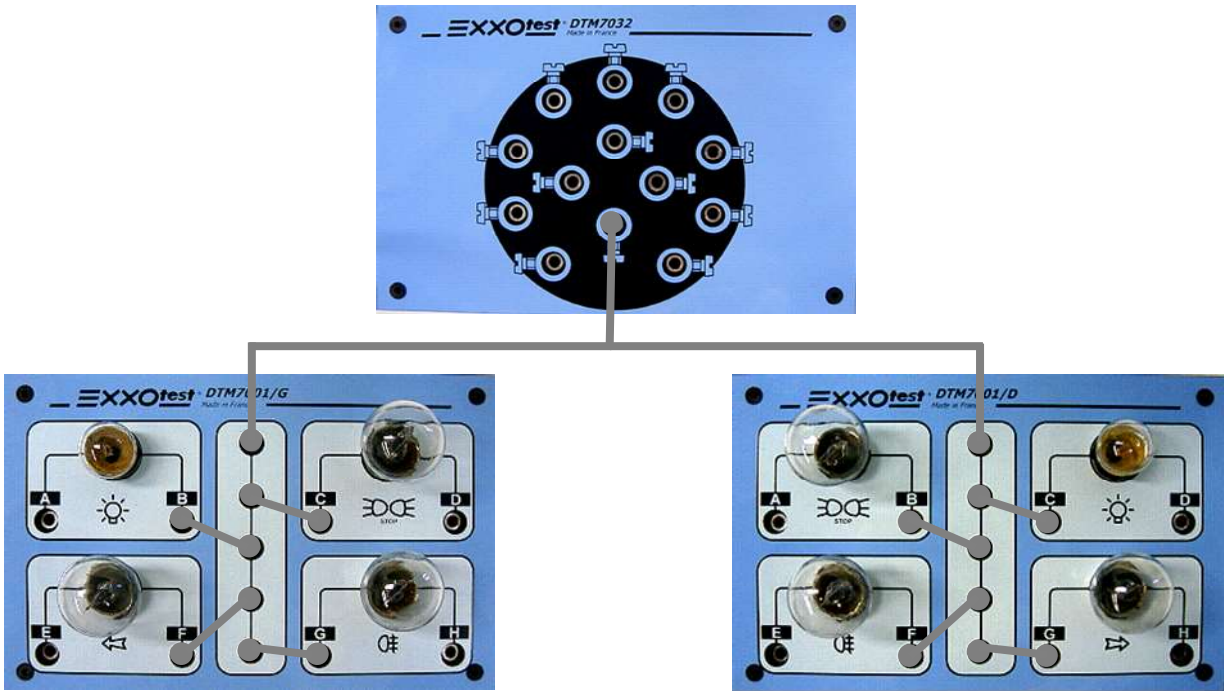


Test the rear left daytime running light:

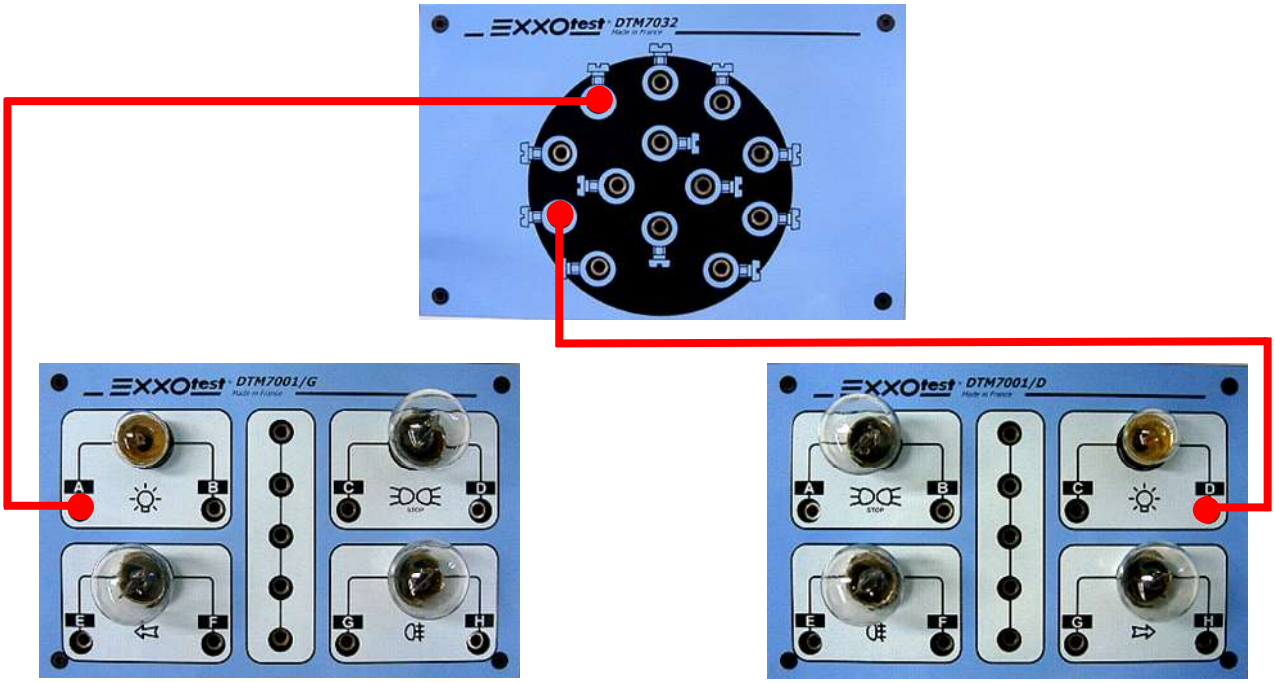
Test the reversing light:

2.4. Wiring for the DTM7032, DTM7001/G and DTM7001/D modules

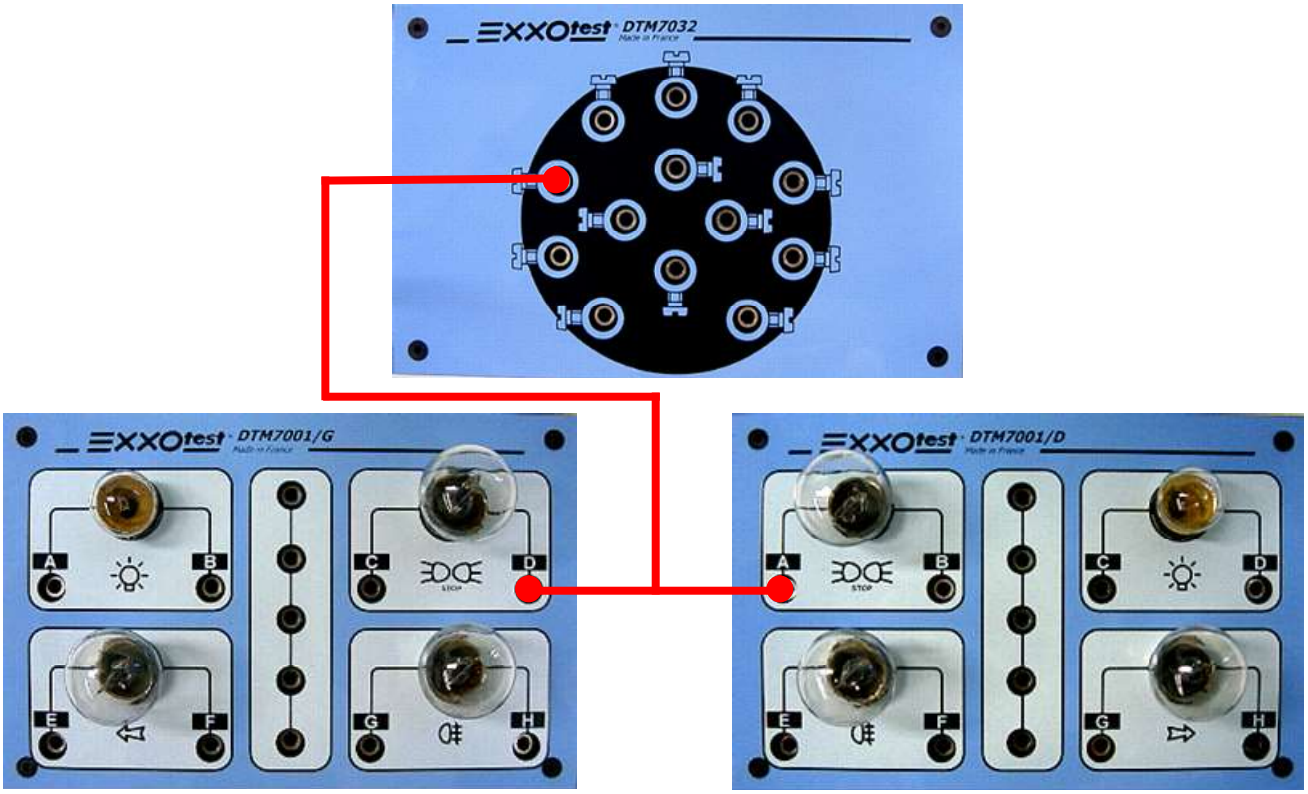
Ground wiring:



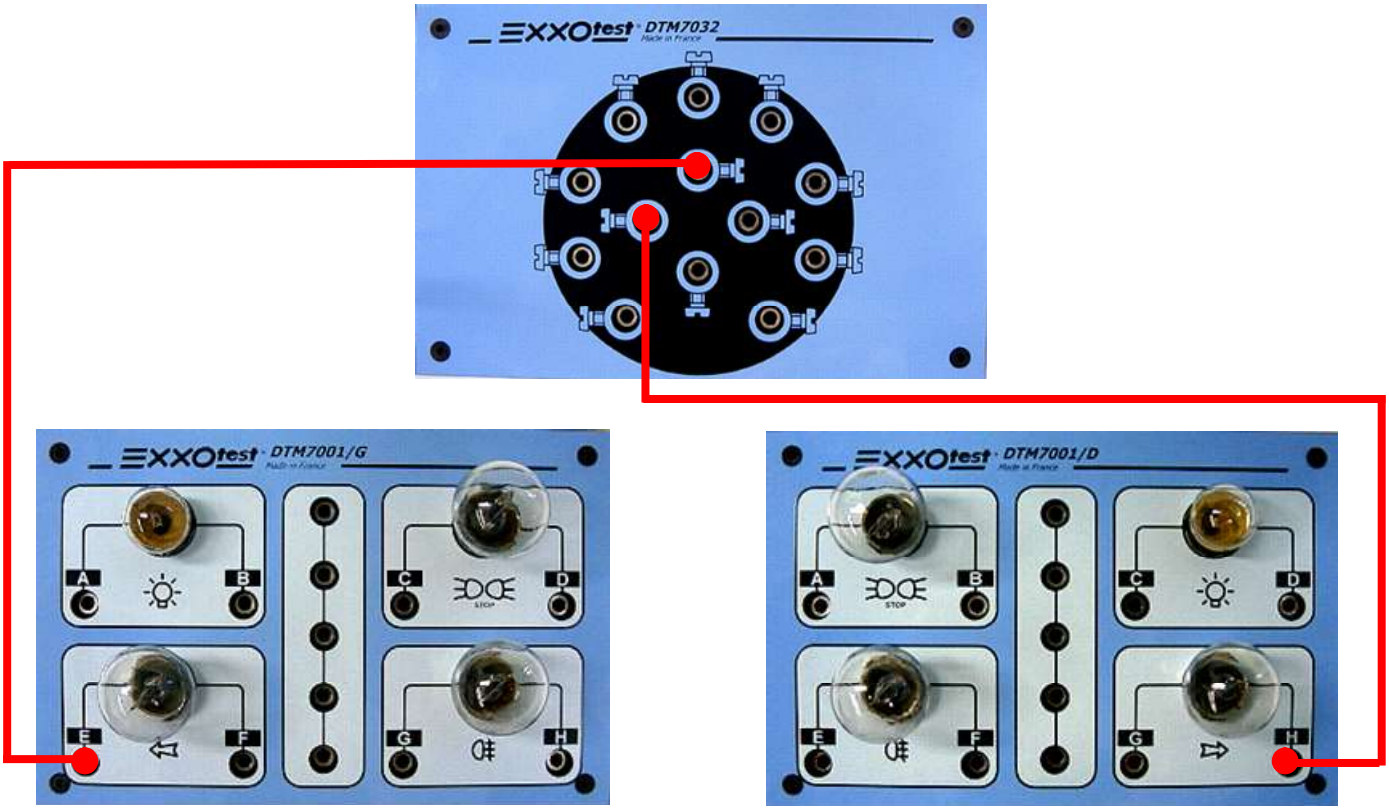
Left and right daytime running light wiring:



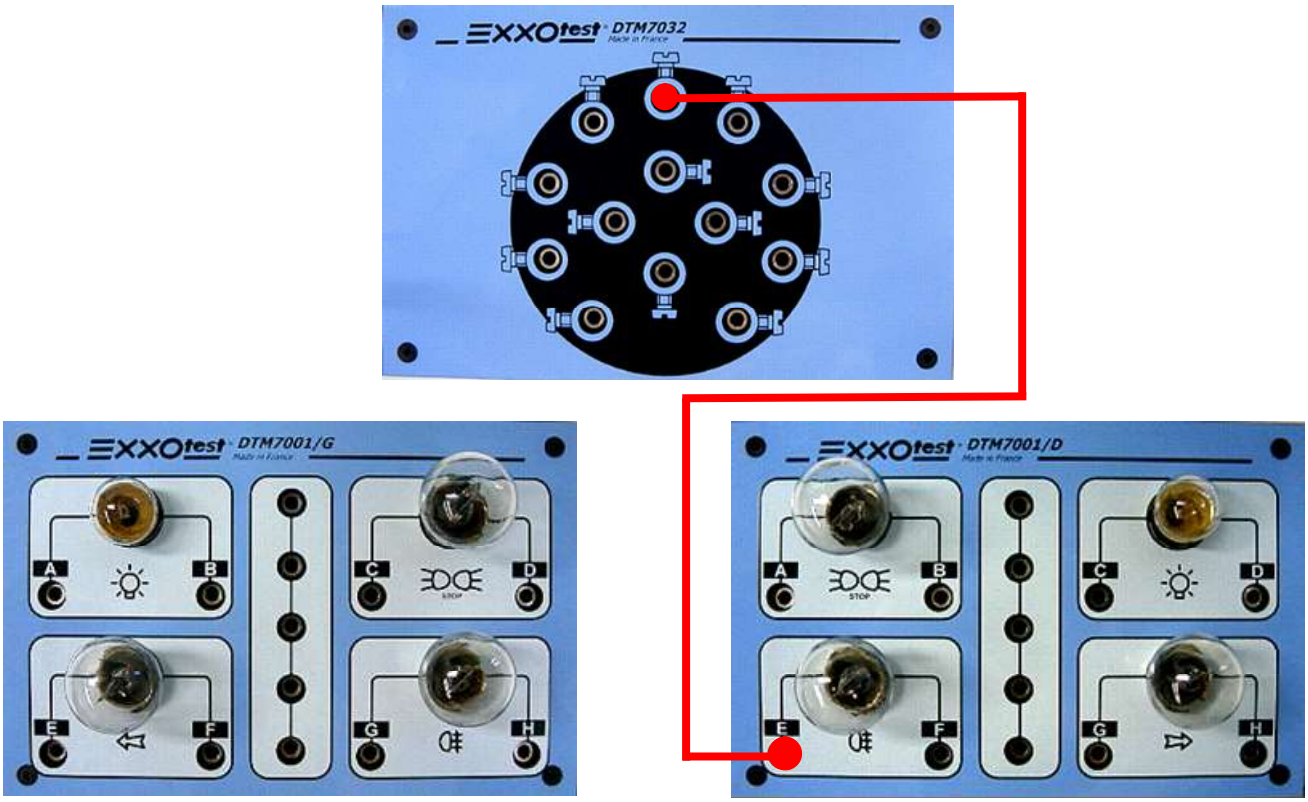
Brake light wiring:



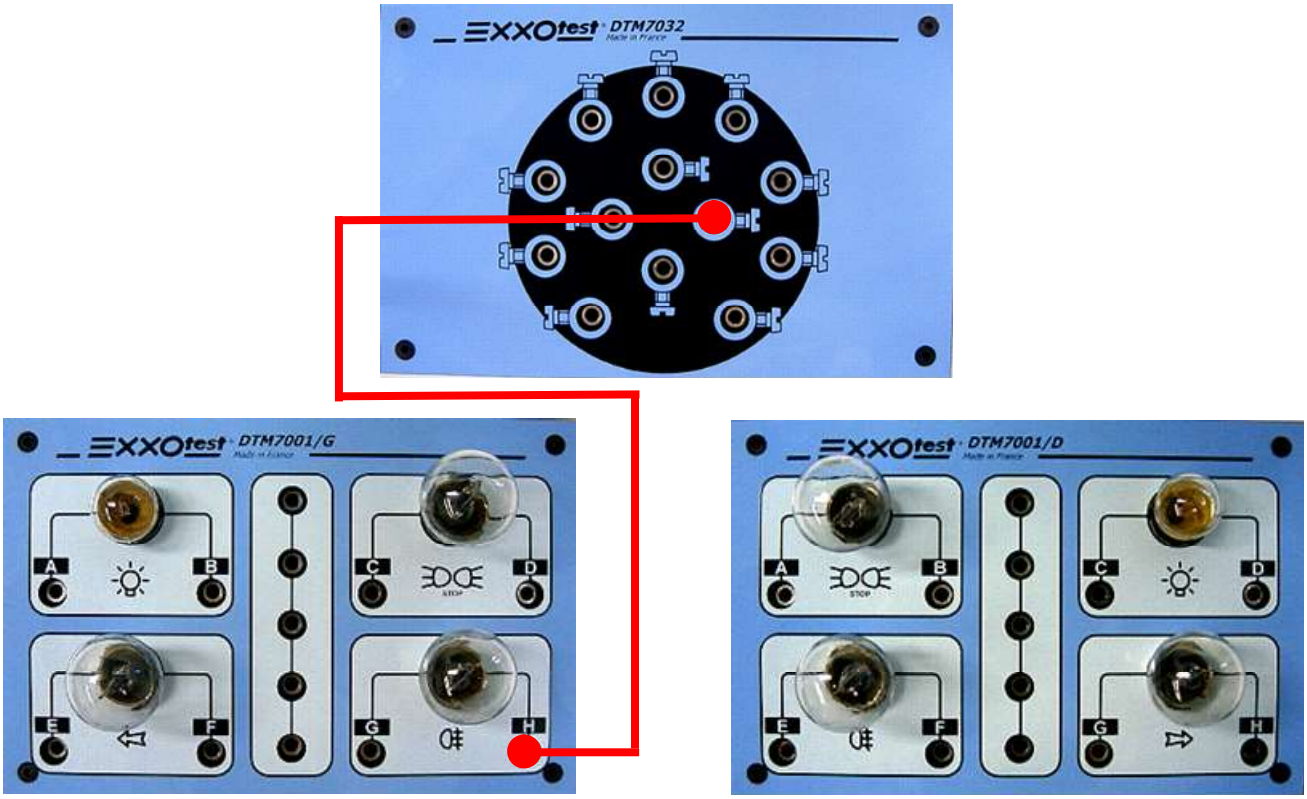
Turning indicator wiring:



Reversing light wiring:

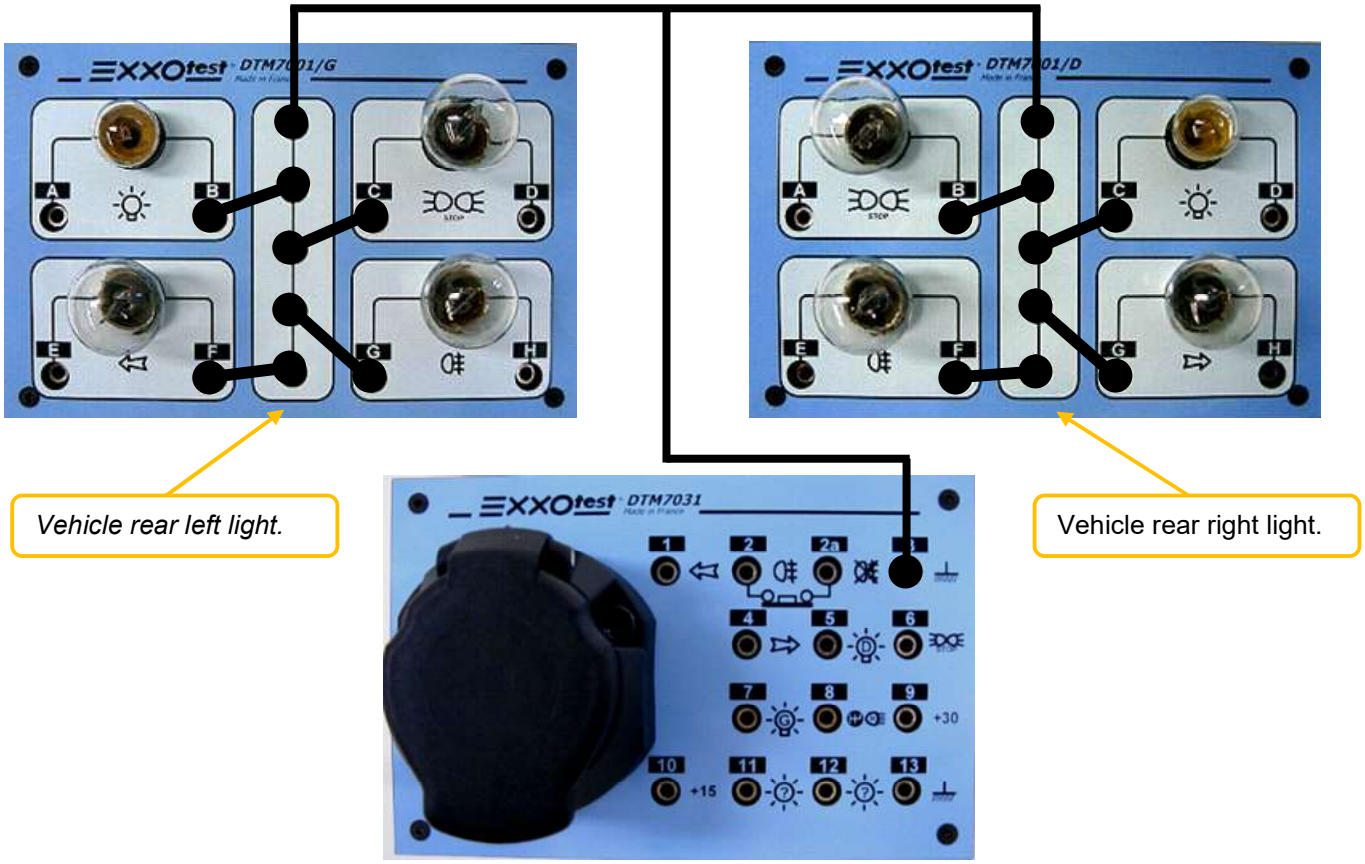


Fog light wiring:

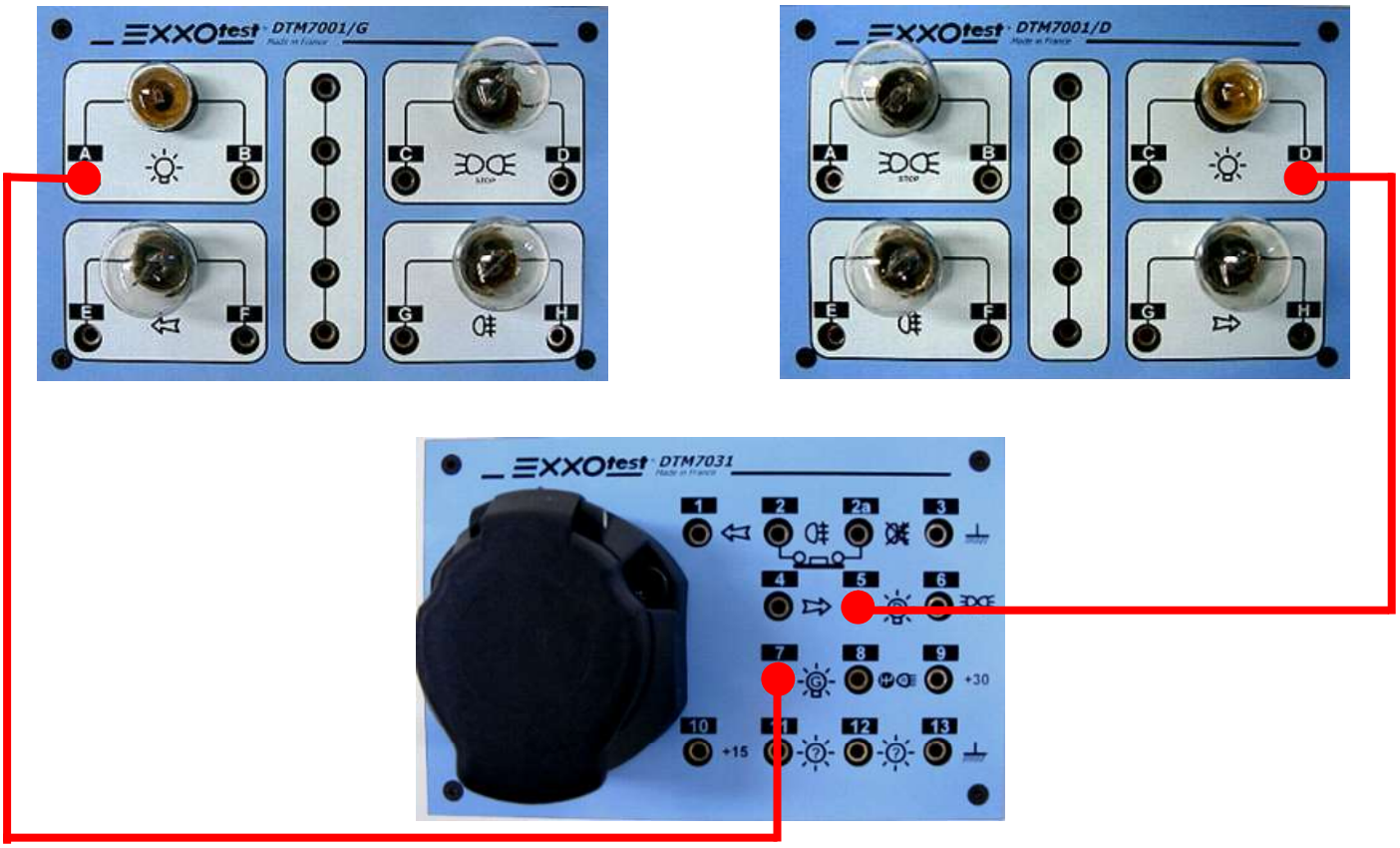


2.5. Wiring between the vehicle and the trailer socket

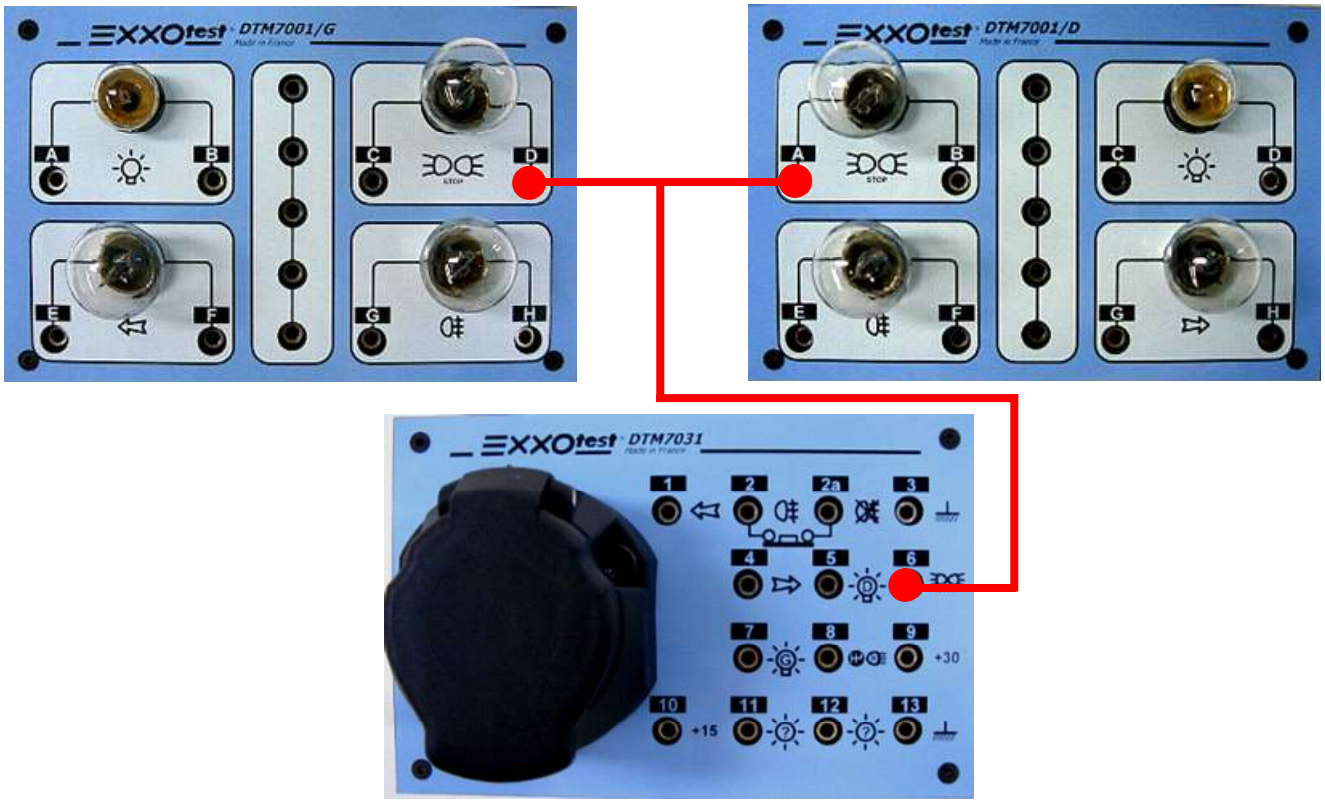
Ground wiring:



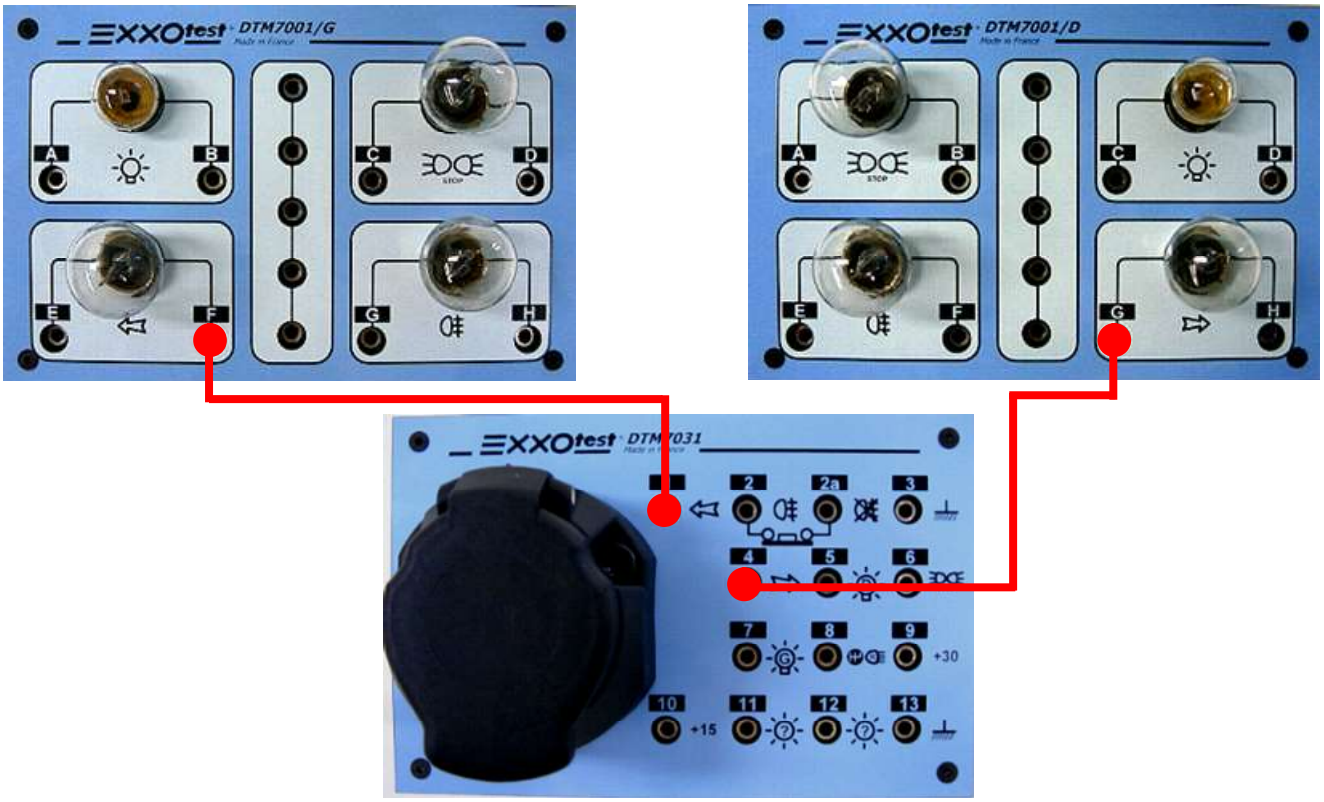
Left and right daytime running light wiring:



Brake light wiring:

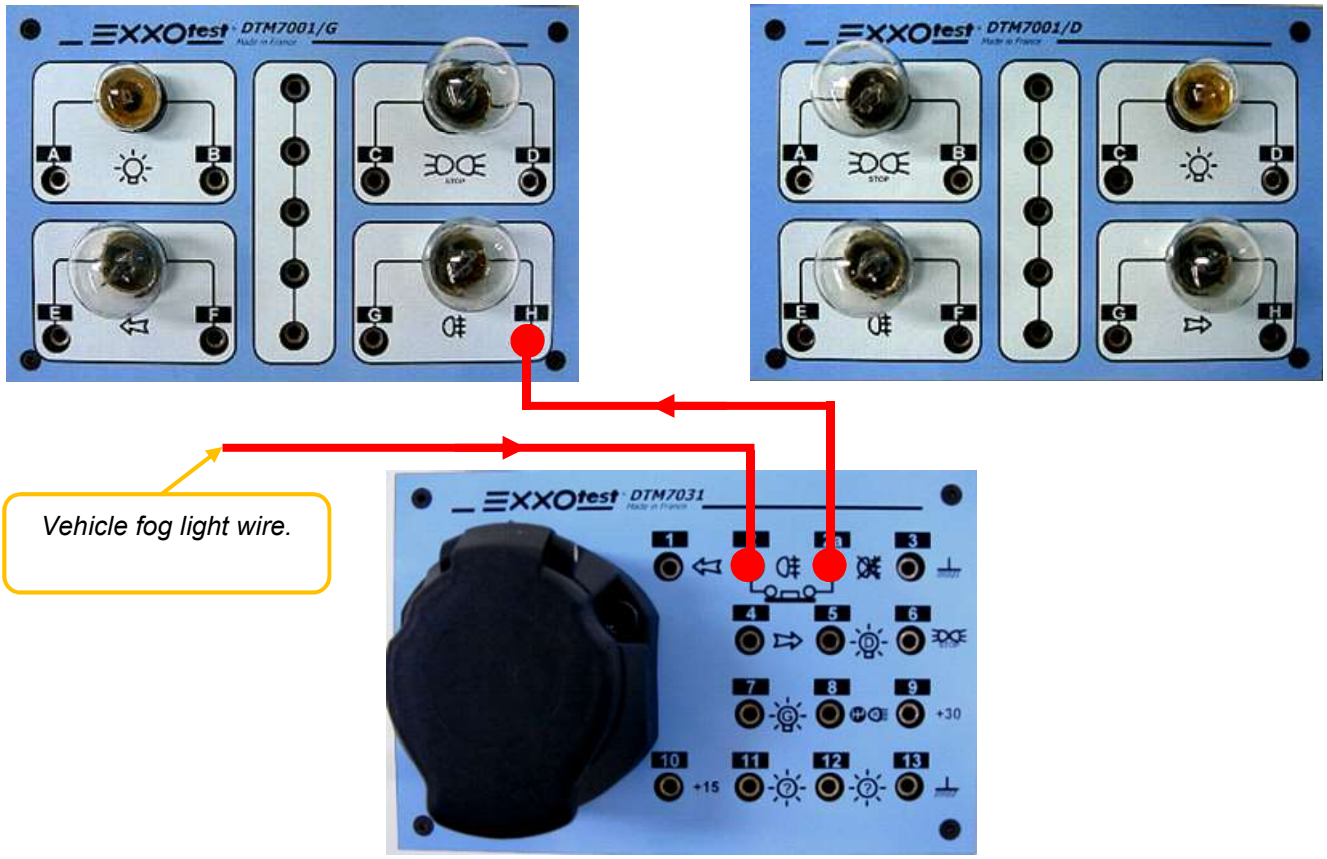


Turning indicator wiring:



Reversing light wiring:

Fog light wiring:



2.6. Installation Guide & Instructions

Installing and setting-up all DTM7030 modules

Connect to a 12 to 14 V power supply (not provided), paying careful attention to polarities.
Then interconnect the various modules in accordance with the operating manual supplied with all DTM7030 modules.
When energised, moving parts remain in their current position.

Operational environment

All DTM7030 modules should be installed in a clean, dry location, free of dust, water vapour and combustion fumes.
The equipment requires a lighting level of approx. 400 to 500 Lux.
The equipment can be installed in a Practical Workshop Classroom, the noise generated will not exceed 70 dBA.
Modules are protected from potential user errors.

Calibration & maintenance of all DTM7030 modules

Calibration: Factory Settings.

Servicing interval: N/A

Cleaning: Use a soft, clean cloth with a window cleaning product.

Number of stations, user position

All DTM7030 modules can be taken as one single workstation.
The various modules are placed on a worktop, and users will remain seated throughout their practical lesson.

Method for removal from service

Turn off power supply, unplug all connecting wires. Check for current by pressing the buttons on each module, if nothing happens, no current is present.
Then store the DTM7030 modules in a contained room with a panel marked "Equipment Removed from Service".

Residual hazards

N/A.

DECLARATION OF CE CONFORMITY

By means of this declaration of conformity, as defined by the European Directive on Electromagnetic Conformity 2004/108/EC, the company:

ANNECY ELECTRONIQUE S.A.S
Parc Altaïs – 1, rue Callisto
74650 CHAVANOD – FRANCE

Declares that the following product:

Brand	*Model*	*Description*
EXXOTEST	**DTM7030**	**TEACHING MODULES Lighting and Signalling - coupling**

I - Has been manufactured in accordance with the requirements of the following European Directives:

- LV Directive 2006/95/EC - 12 December 2006
- EMC Directive 2004/108/EC - 15 December 2004

and satisfies the requirements of the following standard:

- NF EN 61326-1 dated 07/1997 +A1 of 10/1998 +A2 of 09/2001 Electrical measurement, control and laboratory equipment, EMC-related requirements.

II - Has been manufactured in accordance with the requirements of the European Directives relating to EEE design and WEEE management for the EU. :

- Directive 2002/96/EC dated 27 January 2003 on Waste Electronic and Electrical Equipment (WEEE).
- Directive 2002/95/EC dated 27 January 2003 on the limitations for the use of certain hazardous substances in the construction of Electronic and Electrical Equipment (EEE).

Drawn up in Saint-Jorioz on 24 July 2007.

CEO - Stéphane SORLIN