

**ELECTRICAL
TROUBLESHOOTING
AND REPAIR
928S**

PORSCHE CARS NORTH AMERICA

SERVICE INFORMATION

P90

ELECTRICAL TROUBLESHOOTING AND REPAIR — 928S

P90

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SERVICE

ELECTRICAL TROUBLESHOOTING LOGIC

- Do you understand how the electrical consumer is expected to operate?
- Do you have the correct wiring diagram?
- If the circuit contains a fuse, is the fuse okay and of the correct amperage?
- Is there power provided to the circuit? Is the power source the correct voltage?
- Is the ground(s) for the circuit connected and clean of dirt and corrosion?
- Is the circuit being correctly activated by a switch, relay, sensor, microswitch, etc.?
- Are all electrical plugs connected soundly with no corrosion or loose wires?

Purpose

The method of terminal markings specified in this standard for the entire electrical system of motor vehicles is intended to enable the wiring of components to be carried out accurately, especially in the case of repairs and the installation of replacement parts.

Due to the allocation of specific terminal numbers to individual branch circuits and / or component assemblies and components it is also possible to correctly wire components of different origins using one and the same wiring diagram. This allocation of specific terminal markings makes it easier for those who are frequently involved with motor vehicle electrical components and wiring diagrams to memorize the terminal markings of given components, even if the wiring or the component assemblies and branch circuits as well as the construction of the components themselves vary. This is intended to enable skilled personnel to make most connections even without a circuit diagram.

The system of marking is designed to bring about a standardization of types on both complete components and, in particular, the individual parts of these components. If the components concerned are given standardized terminal markings, it is possible to use the same tools, e.g. for die casting molds or molding compounds as well as for rolling or stamping, even if the parts are used in components that are assembled in a different way or have different ratings.

Principles

The terminal markings do not simultaneously serve as wire markings because the two ends of a wire can be connected to components which themselves have different terminal markings. Consequently, the terminal markings need not be applied to the wires.

Components with 2 or 3 insulated terminals to which the wires may be connected either way round are not given terminal markings because there is no risk of incorrect connection in such a case. For example, it is also possible to do without terminal markings if there are say 2 terminals of different sizes which cannot be confused and differ considerably in cross section.

Primary terminal markings are used in the case of certain components (e. g. motors, relays) which can be used in various circuits since identical components would otherwise have to be given different markings according to their applications. This primary terminal marking system also achieves a considerable standardization of types for stockkeeping.

The old terminal markings are retained even if components which are only listed for individual component assemblies or branch circuits are used in almost identical form for completely different purposes (e. g. wiper motors).

If no switch is interposed, terminals marked **30** are always live, even when the vehicle is switched off. Terminals marked **31** are connected to ground (earth) and thus permanently connected to the battery's negative pole. However, the terminal marking **31** is also retained if a battery switch is fitted before the battery or if an insulated return line is laid directly from the consumer to the battery (not via vehicle ground / earth).

Terminal marking **31 b** is used only if the consumer has to be operated by a switched installed in the ground (earth) return line.

Basic markings are laid down for individual branch circuits or component assemblies and these are given a suffixed index (lower case letter) in the case of supplementary terminals being added which have a different meaning.

If further terminals with different meanings are added in the case of circuits or components for which certain basic markings are specified, the same basic markings should be used along with new indices (l/c letters).

Only the most important components are listed on which the terminal markings are customary in each given case. The terminal markings can be used correspondingly on other components.

In the individual circuit diagrams only those terminals are marked on the components which are used for the branch circuits concerned. However, this does not mean that several functions cannot be combined in each of these components (e. g. light and ignition switches), thus adding further terminals with the terminal markings of other branch circuits.

Component assembly and branch circuit	Terminal marking		Meaning of terminal markings	Former terminal markings
	Basic marking	with index		
Ignition systems	1		Terminal on ignition coil or on trigger unit for high-tension CD ignition (low tension)	1; -
			Terminal on distributor to contact breaker or terminal on contact breaker or timing contact for high-tension CD ignition (low tension)	
		1a	Terminal on distributor with 2 separate circuits to contact breaker I (from ignition coil I, terminal 1, low tension)	1a
		1b	Terminal on distributor with 2 separate circuits to contact breaker II (from ignition coil II, terminal 1, low tension)	1b
	4		Terminal on ignition coil and distributor (high tension)	4
		4a	Terminal on distributor with 2 separate circuits (from ignition coil I, terminal 4, high tension)	4a
		4b	Terminal on distributor with 2 separate circuits (from ignition coil II, terminal 4, high tension)	4b
	7		Terminal of base resistors to or from distributor (timing contact)	
		7a	Terminal on trigger unit for transistor coil ignition or on trigger unit for high-tension CD ignition, terminal for first base resistor	
		7b	Terminal on trigger unit for transistor coil ignition, terminal for second base resistor	
		7f	Terminal on trigger unit for high-tension CD ignition, terminal on charging contact	
	15		Output terminal on ignition switch (driving switch), light / ignition switch (for ignition and day consumers)	15; 16; 15/54
			Input terminal on ignition coil, trigger unit for high-tension CD ignition and trigger unit for transistor coil ignition (low tension)	54/61; +
		15a	Input terminal on trigger unit for high-tension CD ignition (from series resistor for charging transformer)	16
			Terminal on trigger unit for transistor coil ignition	
		Terminal on ignition coil's series resistor		

Component assembly and branch circuit	Terminal marking		Meaning of terminal markings	Former terminal markings
	Basic marking	with index		
General applications	30		Input terminal direct from battery positive pole	30; 30/51
	31		Terminal for return line direct to battery negative pole or ground (earth)	31; -
		31b	Terminal for return line via switch or relay to battery negative pole or ground (earth)	31b
Electric motors (for various applications)	30		Input terminal direct from battery positive pole, only if switch is installed in motor	30
	32		Terminal for return line (change in polarity possible)	31
	33		Terminal for main connection if switch is not installed in motor (change in polarity possible in conjunction with terminal 32)	30
		33a	Terminal for parking switch	
		33b	Terminal for shunt field	54e
		33f	Terminal for 2nd lowest speed step	
		33g	Terminal for 3rd lowest speed step	
		33h	Terminal for 4th lowest speed step	
		33L	Terminal for CCW direction of rotation	30 L
	33R	Terminal for CW direction of rotation	30 R	
Starter systems	30		Input terminal direct from battery positive pole	30; 30/51
		30a	Input terminal on battery changeover switch from battery II positive pole on 12/24 V systems	30a
	31		Output terminal for return line to battery negative pole or ground (earth)	31
		31a	Terminal on battery changeover switch for return line to battery II negative pole on 12/24 V systems	31a
		31c	Terminal on battery changeover switch for return line to battery I negative pole on 12/24 V systems	31; 31a
	45		Output terminal on separate solenoid switch and input terminal on starter (main current connection)	30f; 30h
48		Terminal on starter and starting repeat relay for monitoring starting process	48	

Component assembly and branch circuit	Terminal marking		Meaning of terminal markings	Former terminal markings
	Basic marking	with index		
Starter systems	50		Output terminal on heater-plug and ignition switch, input terminal on starter for controlling starter, also input terminal on battery changeover switch for its operation on 12/24 V systems	50
		50a	Output terminal for controlling starter on battery changeover switch	50a
		50e	Input terminal for control on starting inhibitor relay	50a (for 12 V)
		50f	Output terminal for control on starting inhibitor relay	50
		50g	Input terminal for control on starting repeat relay	50a
		50h	Output terminal for control on starting repeat relay	50
	86		Input terminal on relay (start of winding on battery master switch)	
Generator systems with regulators	51		Terminal for DC voltage on rectifier of alternator	51
	61		Output terminal on regulator or generator for charge indicator lamp (if separate terminal is necessary)	
	64		Terminal on regulator with semiconductor for current limiting and on generator for connection of control line	
	B+		Terminal for battery positive pole on regulator and on alternator with integral rectifiers	B+51; 51; B+30
	B-		Terminal for battery negative pole on regulator and on alternator with integral rectifiers	31B-
	D+		Terminal for dynamo positive pole on generator and regulator and terminal for charge indicator lamp (if no separate terminal 61 is fitted)	D+ D+/61
	D-		Terminal for dynamo negative pole on generator and regulator and terminal for battery negative pole (if no B- terminal is fitted)	D- D-/61
	DF		Terminal for dynamo field on generator and regulator	DF
		DF 1	Terminal for dynamo field 1 on generator and regulator	DF 1
	DF 2	Terminal for dynamo field 2 on generator and regulator	DF 2	

Component assembly and branch circuit	Terminal marking		Meaning of terminal markings	Former terminal markings
	Basic marking	with index		
Generator systems with regulators	Mp		Neutral terminal on alternator in case of separate rectifier	
	U		Phase terminal on alternator	
	V		Phase terminal on alternator	
	W		Phase terminal on alternator	
Lighting and brake light systems	54		Terminal for brake lights on trailer socket and for light clusters, if marking is necessary	15/54; 54
	55		Terminal for fog lights	55; N
	56		Output terminal on light switch and input terminal on dip switch (common feed line for main and dipped beams)	56
		56a	Output terminal on dip switch for main beam and indicator lamp	56a
		56b	Output terminal on dip switch for dipped beam	56b
		56c	Output terminal for partial full beam	—
	57		Terminal for parking light in motorcycle headlight (also for motor cars, trucks etc. in other countries)	57
		57a	Output terminal on light or ignition switch for parking light, input terminal on parking light switch (only if special marking is necessary on combination switches)	P; 57a
		57L	Output terminal for left-hand parking light (only if special marking is necessary on combination switches)	PL; 57L
		57R	Output terminal for right-hand parking light (only if special marking is necessary on combination switches)	PR; 57R
		58	Output terminal on light switch for marker lights, tail lights, number plate lights, panel lighting	58
	58c	Terminal on trailer socket in case of single-core wiring of feed line for tail lights on trailer (with separate fuse in trailer)	58c	
	58d	Terminal for adjustable panel lighting	58b	

Component assembly and branch circuit	Terminal marking		Meaning of terminal markings	Former terminal markings
	Basic marking	with index		
Lighting and brake light systems		58 L	Output terminal on light switch for left-hand marker and tail lights (if separately switched) terminal on trailer socket	58
		58 R	Output terminal on light switch for right-hand marker and tail lights and for panel and number plate lights (if separately switched) terminal on trailer socket	58
Systems for direction indicators	49		Input terminal on flasher unit	15; +, +15; 15+; 15/54
		49a	Output terminal on flasher unit, input terminal on direction indicator switch	S4; S; 54 L
		49b	Output terminal on flasher unit, input terminal on two-circuit direction indicator switch (2nd flasher circuit)	
		49c	Output terminal on flasher unit, input terminal on three-circuit direction indicator switch (3rd flasher circuit)	
	C		Terminal on flasher unit for 1st warning lamp	C; K; K1; P
	L		Output terminal on direction indicator switch for left-hand direction indicator lamps; pole on trailer socket for left-hand direction indicator lamps on trailers	L; VL; HL L 54
		Lb	On two-circuit direction indicator switch for left-hand direction indicator lamps on trailers (in case of 2-trailer operation with separate direction indicator circuits)	L54b
	R	Output terminal on direction indicator switch for right-hand direction indicator lamps; pole on trailer socket for right-hand direction indicator lamps on trailers	R; VR; HR; R 54	
Windscreen wiper and washer systems	53	31b	Terminal on wiper motor for return line via short-circuiting switch to ground (earth) Input terminal on wiper motor (main connection)	31b 54d; S; +; 3; 1
		53a	Terminal on wiper motor (parking switch) and on wiper switch	54; +; +2; 4
		53b	Terminal on wiper motor (shunt field) and on wiper switch	54e; 4; 3
		53c	Terminal on wiper switch for screenwasher pump	53c

Component assembly and branch circuit	Terminal marking		Meaning of terminal markings	Former terminal markings
	Basic marking	with index		
Windscreen wiper and washer systems		53e	Terminal on wiper motor (brake winding) and on wiper switch	53e; 1; 2
		53i	Terminal for higher speed on wiper motor with permanent magnet and 3rd brush	
Horn and fanfare systems, systems with acoustic warning units and indicator lamps	71	31b	Terminal for return line via alarm switch to ground (earth) (for acoustic warning units)	85d
		71a	Input terminal on tone sequence switch unit	H
	72	71a	Output terminal on tone sequence switch unit to 1st and 2nd horn, low	71a
		71b	Output terminal on tone sequence switch unit to 1st and 2nd horn, high	71b
	72	Input and output terminal on alarm switch (for indicator lamp)	72	
		85c	Terminal on tone sequence switch unit, alarm switch (for tone sequence)	
Additional systems	75		Output terminal on ignition switch, e. g. for radio or cigar lighter, when ignition and day consumers are not yet switched on (only if special terminal is necessary)	75, R
Mechanically operated switches (primary terminal markings because these are multi-purpose units)	81		Input terminal on mechanically operated switches, for NCC and changeover contacts (if only 1 feed line)	
		81a	First output terminal on mechanically operated switches, for NCC (NCC-side in case of change-over contacts)	
	81b	Second output terminal on mechanically operated switches, for NCC (NCC-side in case of change-over contacts)		
	82		Input terminal on mechanically operated switches, for NOC	
		82a	First output terminal on mechanically operated switches, for NOC (NOC-side in case of change-over contacts)	
	82b	Second output terminal on mechanically operated switches, for NOC (NOC-side in case of change-over contacts)		
83		Input terminal on step switch (if only 1 feed line, also step switches with neutral position)		
	83a	Output terminal on step switch, switch step I		

Component assembly and branch circuit	Terminal marking		Meaning of terminal markings	Former terminal markings
	Basic marking	with index		
Mechanically operated switches (primary terminal markings because these are multi-purpose units)		83b	Output terminal on step switch, switch step II	
		83 L	Output terminal on step switch, left-hand switch step	
		83 R	Output terminal on step switch, right-hand switch step	
Current relays (primary terminal markings because these are multi-purpose units)	84		Input terminal on current relay for start of winding and contact	
		84a	End of winding on current relay	
		84b	Output terminal on current relay for contact	
Relays, contactors (primary terminal markings because these are multi-purpose units)	85		Output terminal on relay or contactor (end of winding to battery negative pole or ground (earth))	85
	86		Input terminal on relay or contactor (start of winding, if only one feed line)	86
		86a	Input terminal on relay or contactor to start of winding or to 1st winding	
		86b	Input terminal on relay or contactor to winding tap or to 2nd winding in case of several windings	
	87		Input terminal on relay or contactor for NCC and changeover contacts (if only 1 feed line)	30 / 51
		87a	First output terminal on relay or contactor for NCC (NCC-side in case of changeover contacts)	
		87b	Second output terminal on relay or contactor for NCC (NCC-side in case of changeover contacts)	
		87c	Third output terminal on relay or contactor for NCC (NCC-side in case of changeover contacts)	
		87z	First input terminal on relay or contactor for NCC and changeover contacts (if circuits are separate)	
		87y	Second input terminal on relay or contactor for NCC and changeover contacts (if circuits are separate)	
	87x	Third input terminal on relay or contactor for NCC and changeover contacts (if circuits are separate)		

Component assembly and branch circuit	Terminal marking		Meaning of terminal markings	Former terminal markings
	Basic marking	with index		
Relays, contactors (primary terminal markings because these are multi-purpose units)	88		Input terminal on relay or contactor for NOC (if only 1 feed line)	30 / 51
		88a	First output terminal on relay or contactor for NOC (NOC-side in case of changeover contacts)	
		88b	Second output terminal on relay or contactor for NOC (NOC-side in case of changeover contacts)	
		88c	Third output terminal on relay or contactor for NOC (NOC-side in case of changeover contacts)	
		88z	First input terminal on relay or contactor for NOC (if circuits are separate)	
		88y	Second input terminal on relay or contactor for NOC (if circuits are separate)	
		88x	Third input terminal on relay or contactor for NOC (if circuits are separate)	

BASIC CABLE COLOR (DIN 72551)

Basic color and tracer color

red
green
yellow
light blue
grey
brown
white
black

Note: If cables have two colors, the dominant cable color is always mentioned first!


































Color coding of cables

Examples:

green	— ignition coil to distributor
black	— battery to starter
	— ignition switch to coil
red	— starter to generator
brown	— ground (earth)
light blue	— charge light to generator
white	— dipswitch to fuse (main beam)
yellow	— dipswitch to fuse (dipped beam)
grey	— fuse to tail/license plate lamps

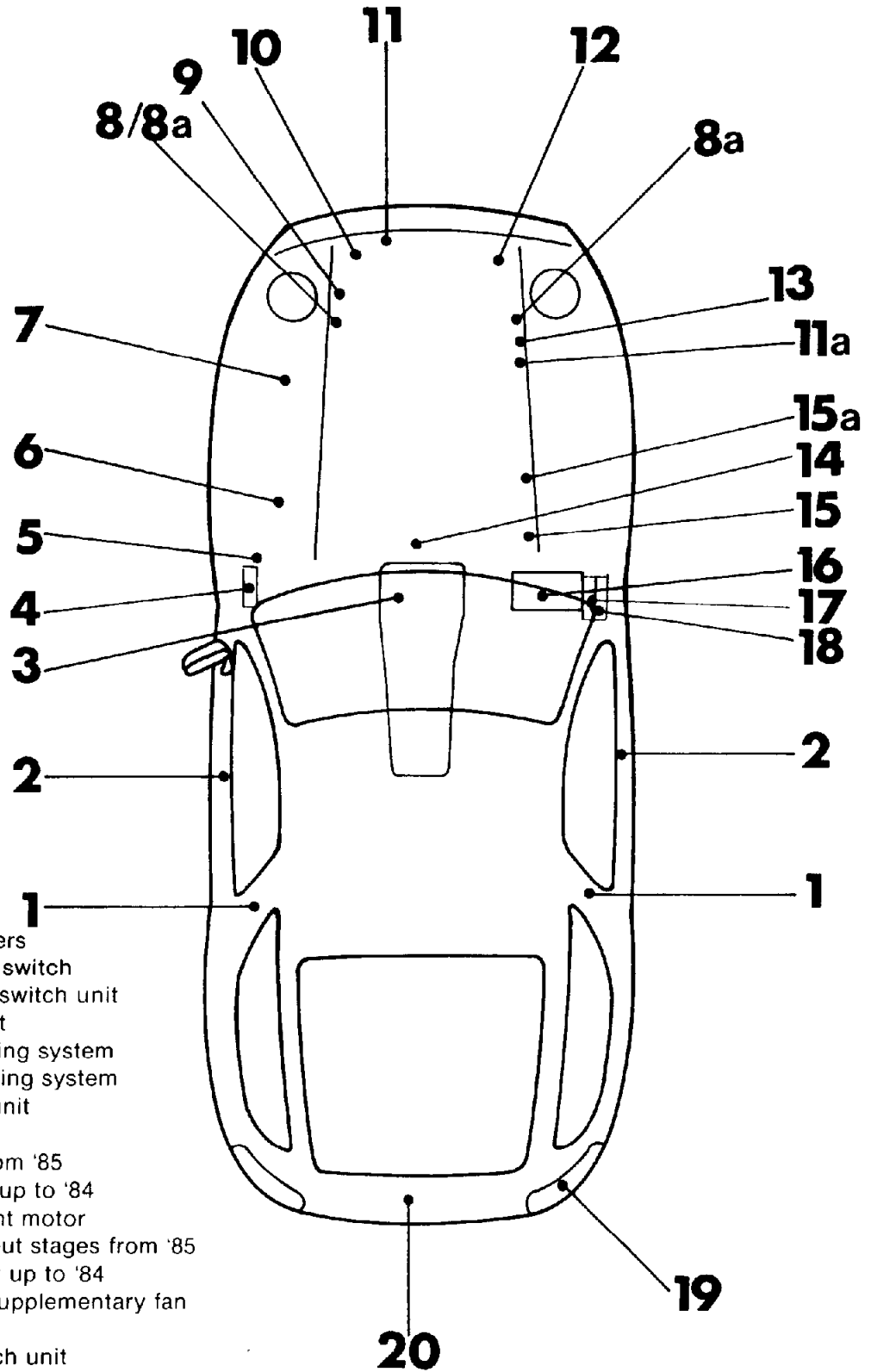
WIRING DIAGRAMS / ELECTRICAL SYMBOLS

Electrical Symbols and Explanations

	Switch, opened		Resistor, heater
	Switch, closed		Fuse
	Step switch		Light bulb
	Push button		Potentiometer
	Switch (push button) with manual operation		Resistance transmitter
	Switch (push button) with mech. operation, e. g. limit switch		Inductive resistor, coil
	Temperature switch		Horn
	Pressure switch		Radio speaker
	Thermic overcurrent circuit breaker (overload protection)		Antenna
	Float switch		Border for equipment
	Motor		Electronic unit, general
	Alternator (generator)		Spark gap
	Gauge, instrument		Diode
	Solenoid coil		Battery cell
	Relay		Wire connection, not unconnectable
	Solenoid valve		Wire connection, unconnectable
			Shielded wire

NOTES

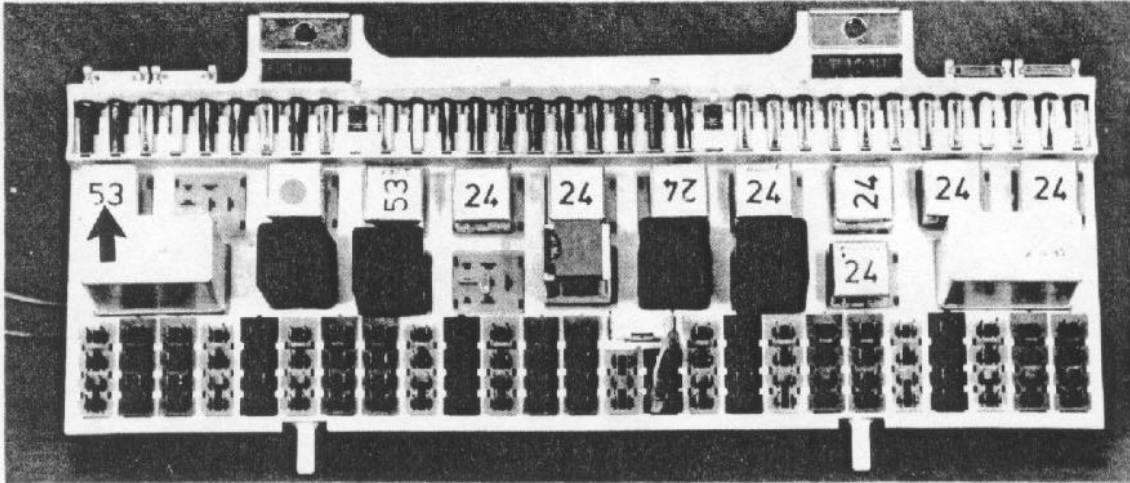
I. WHAT IS LOCATED WHERE ON THE VEHICLE?



- 1 — Rear loudspeakers
- 2 — Rear lid release switch
- 3 — Central locking switch unit
- 4 — ABS control unit
- 5 — Automatic warning system
- 6 — Tempostat warning system
- 7 — ABS hydraulic unit
- 8 — Ignition coil
- 8a — Ignition coils from '85
- 9 — Series resistors up to '84
- 10 — Pop-up headlight motor
- 11 — EZF power output stages from '85
- 11a — TSZ trigger unit up to '84
- 12 — Temp. switch, supplementary fan
- 13 — 14-pole plug
- 14 — Tempostat switch unit
- 15 — Coolant level transmitter
- 15a — Central electrical system — CEB
- 16 — Central electrical system — CEB
- 17 — Ignition control unit from '85
- 18 — L-Jetronic control unit from '85
- 19 — Ground (earth) point behind trim
- 20 — Rear lid release motor

II. 928 CENTRAL ELECTRICAL SYSTEM (CEB)

The central electrical system is located under the foot well cover on the right hand side. It is called the central electrical system because all the vehicle's main cable harnesses lead to this board and all **fuses** (except radio and central locking fuses) and all **relays** (except time, rear wiper relay) are accommodated on the board. This is, therefore, the vehicle's central junction and switching point.



Let us take a closer look at this central electrical system:

1. Front of CEB

The central electrical system consists of a plastic board with fuse holders and relay bases as well as connectors for the cable harness sockets. The relay and connector bases are fitted individually in the CEB board and held by retaining lugs.

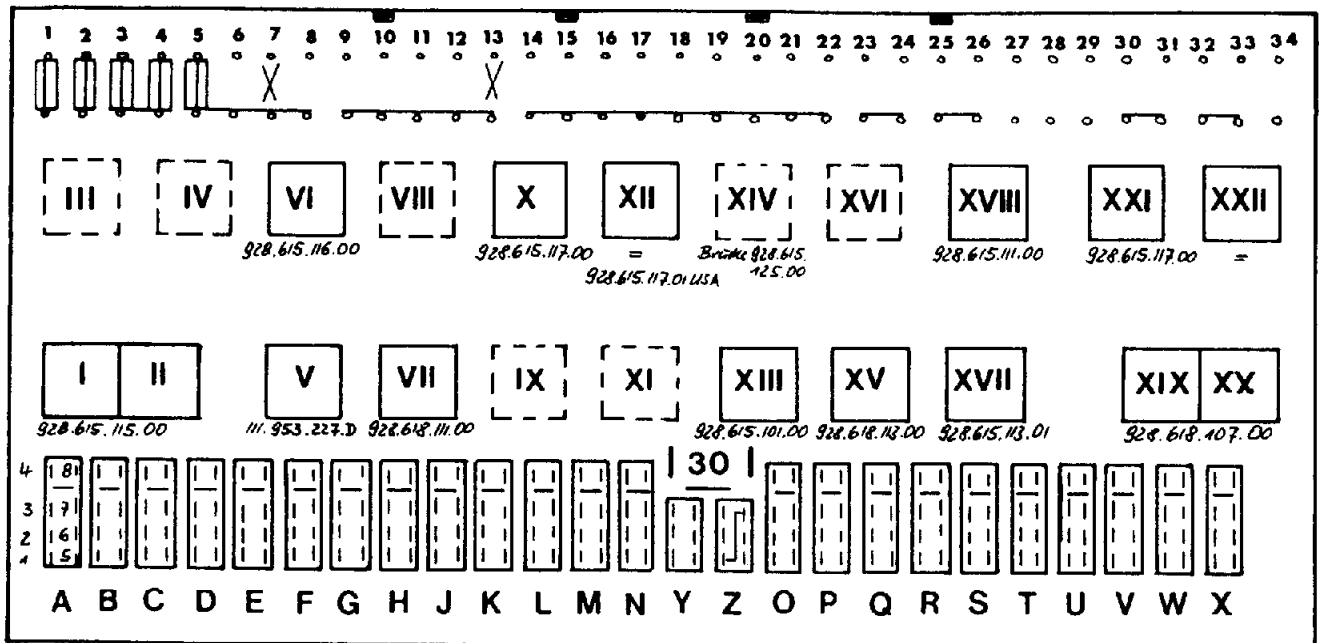
All **fuses** are situated in the upper part of the board. They are numbered from left to right with the numbers **1 – 34**. These identification numbers are visible above the fuses.

The **relays** are arranged in the center of the CEB board and are identified by the "**Roman numerals I – XXII**" which are also applied to the board. (Remember this point — it is important!)

The **connector groups** for the cable harness sockets are arranged in the lower part of the board and marked by the letters **A – Z** on the bottom multi-point connector. The base of each connector group is also numbered **1 – 8** for each connector. This means that each individual plug and socket connection can be found very easily.

For example: **A1** = connector group **A**, connector No. **1**
U5 = connector group **U**, connector No. **5** etc.

The connector bases and the cable connectors are colored.



Fuse allocation

- | | |
|---|--------------------------------------|
| 1 – Fog light | 18 – Rear window heater |
| 2 – Suppl. main beam | 19 – Headlight motor |
| 3 – Engine compartment + number plate light | 20 – Headlight washer |
| 4 – Switch lighting | 21 – Window lifts |
| 5 – Cigar lighter | 22 – Fuel pump |
| 6 – Screenwiper | 23 – Interior lighting, clock |
| 7 – Spare | 24 – L. H. main beam |
| 8 – Sun roof | 25 – R. H. main beam |
| 9 – Reversing light, mirror adjustment | 26 – L. H. dipped beam |
| 10 – Brake light, Tempostat | 27 – R. H. dipped beam |
| 11 – Panel lighting | 28 – L. H. marker light |
| 12 – Instruments and R. H. / L. H. warning lights | 29 – R. H. marker light |
| 13 – Spare | 30 – L. H. front direction indicator |
| 14 – Electr. seat adjustment | 31 – L. H. rear direction indicator |
| 15 – Fanfare, electr. aerial, rear window wiper | 32 – R. H. front direction indicator |
| 16 – Suppl. fan for air conditioning | 33 – R. H. rear direction indicator |
| 17 – Fresh air blower, air conditioning | 34 – Rear fog guard lamp |

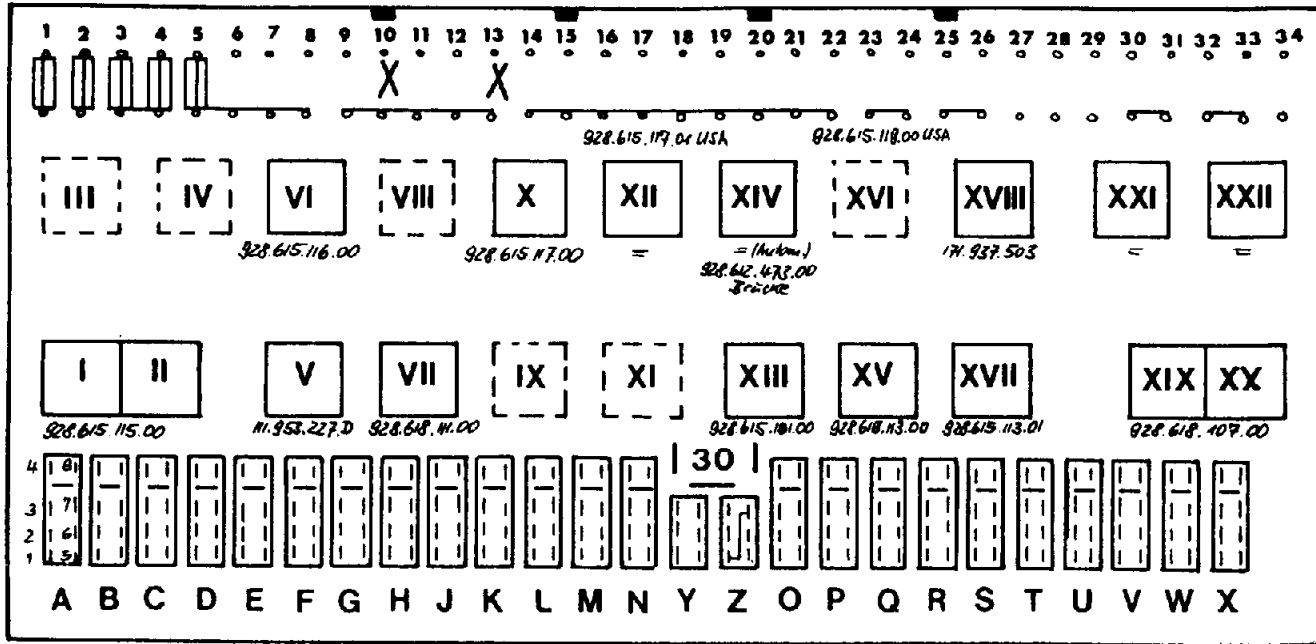
Relay allocation

- | | |
|--------|--|
| I – II | – Rear window heater |
| III | – |
| IV | – |
| V | – Flasher unit |
| VI | – Window lifts |
| VII | – Headlight washer pump |
| VIII | – |
| IX | – |
| X | – Fanfare |
| XI | – |
| XII | – Fog light |
| XIII | – Wiper interval |
| XIV | – Bridge / starter relay, auto. transmission |
| XV | – Suppl. washer pump |
| XVI | – L-Jetronic (USA only) |
| XVII | – Fuel pump |
| XVIII | – Suppl. fan for air conditioning |
| XIX | – Lighting combination relay |
| XX | – |
| XXI | – Fresh air blower |
| XXII | – Defroster |

Note: The time-lag relay is located on the centre console below the radio.
The rear window wiper relay is next to the rear wiper motor.

Fuses 7 and 13 are spare.

CENTRAL ELECTRICAL SYSTEM Mod. 82



Fuse allocation

- | | |
|--|--------------------------------------|
| 1 — Fog light | 17 — Fresh air blower |
| 2 — Suppl. main beam (not USA) | 18 — Rear window heater |
| 3 — Engine compartment + number plate light | 19 — Headlight motor |
| 4 — Instruments, ashtray light | 20 — Headlight washer |
| 5 — Cigar lighter | 21 — Window lifts, central locking |
| 6 — Screenwiper | 22 — Fuel pump |
| 7 — Brake light, Tempostat | 23 — Interior lighting, clock |
| 8 — Sun roof | 24 — L. H. main beam |
| 9 — Air con., mirror adjust., reversing light, rear window wiper | 25 — R. H. main beam |
| 10 — Spare | 26 — L. H. dipped beam |
| 11 — Pushbutton panel, switch lighting | 27 — R. H. dipped beam |
| 12 — Instruments, R. H. / L. H. warning lights | 28 — L. H. marker light |
| 13 — Spare | 29 — R. H. marker light |
| 14 — Electr. seat adjustment | 30 — L. H. front direction indicator |
| 15 — Fanfare, electr. aerial, rear window wiper park | 31 — L. H. rear direction indicator |
| 16 — Cooling blower | 32 — R. H. front direction indicator |
| | 33 — R. H. rear direction indicator |
| | 34 — Rear fog guard lamp |

Relay allocation

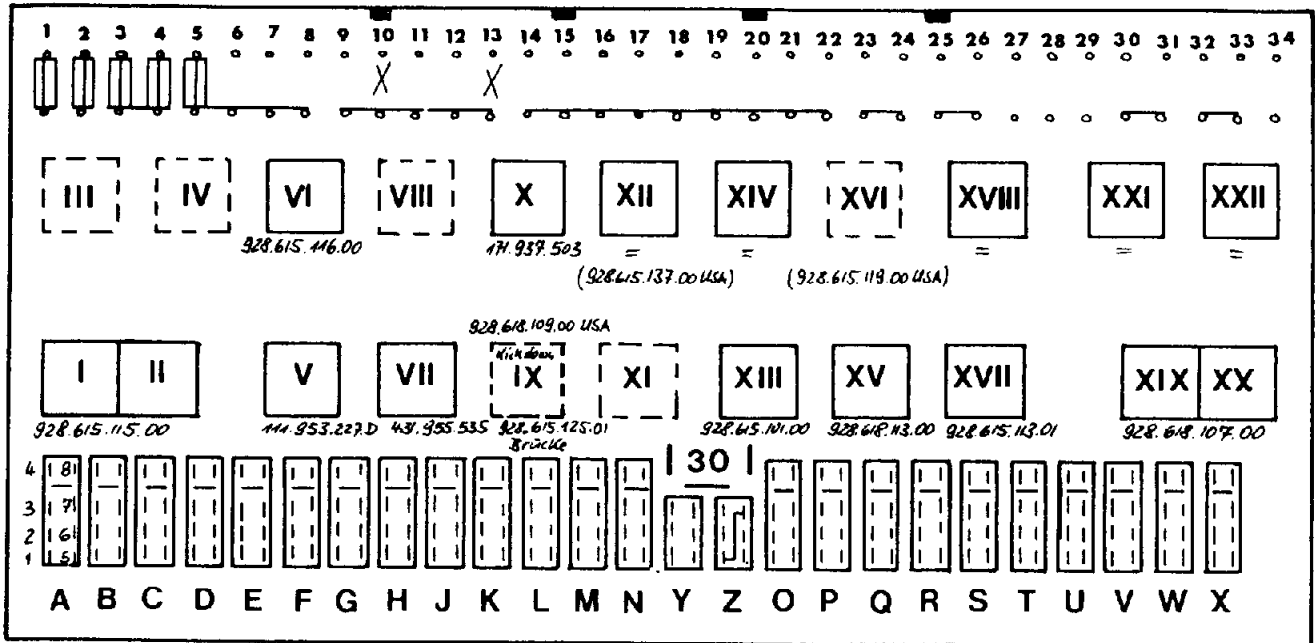
- | | |
|--------|-----------------------------------|
| I — II | — Rear window heater |
| III | — |
| IV | — |
| V | — Flasher unit |
| VI | — Window lifts |
| VII | — Headlight washer pump |
| VIII | — |
| IX | — |
| X | — Fanfare |
| XI | — |
| XII | — Fog light |
| XIII | — Wiper interval |
| XIV | — Starter relay |
| XV | — Suppl. washer pump |
| XVI | — L-Jetronic (USA only) |
| XVII | — Fuel pump |
| XVIII | — Suppl. fan for air conditioning |
| XIX | — |
| XX | — Lighting combination relay |
| XXI | — Fresh air blower |
| XXII | — Defroster |

Note:

The time-lag relay is located on the center console below the radio.

The rear window wiper relay is next to the rear wiper motor.

Fuses 10 and 13 are spare.



Fuse allocation

- | | |
|--|--------------------------------------|
| 1 - Fog light | 17 - Fresh air blower |
| 2 - Suppl. main beam (not USA) | 18 - Rear window heater |
| 3 - Engine compartment + number plate light | 19 - Headlight motor |
| 4 - Instruments, ashtray light | 20 - Headlight washer |
| 5 - Cigar lighter | 21 - Window lifts, central locking |
| 6 - Screenwiper | 22 - Fuel pump, suppl. air valve |
| 7 - Brake light, Tempostat | 23 - Interior lighting, clock |
| 8 - Sun roof | 24 - L. H. main beam |
| 9 - Air con., mirror adjust., reversing light, rear window wiper | 25 - R. H. main beam |
| 10 - Spare | 26 - L. H. dipped beam |
| 11 - Ackn. button, light switch lighting | 27 - R. H. dipped beam |
| 12 - Instrument warning lights | 28 - L. H. parking light |
| 13 - Spare | 29 - R. H. parking light |
| 14 - Electr. seat adjustment | 30 - L. H. front direction indicator |
| 15 - Fanfare, electr. aerial, rear window wiper park | 31 - L. H. rear direction indicator |
| 16 - Suppl. fan | 32 - R. H. front direction indicator |
| | 33 - R. H. rear direction indicator |
| | 34 - Rear fog guard lamp |

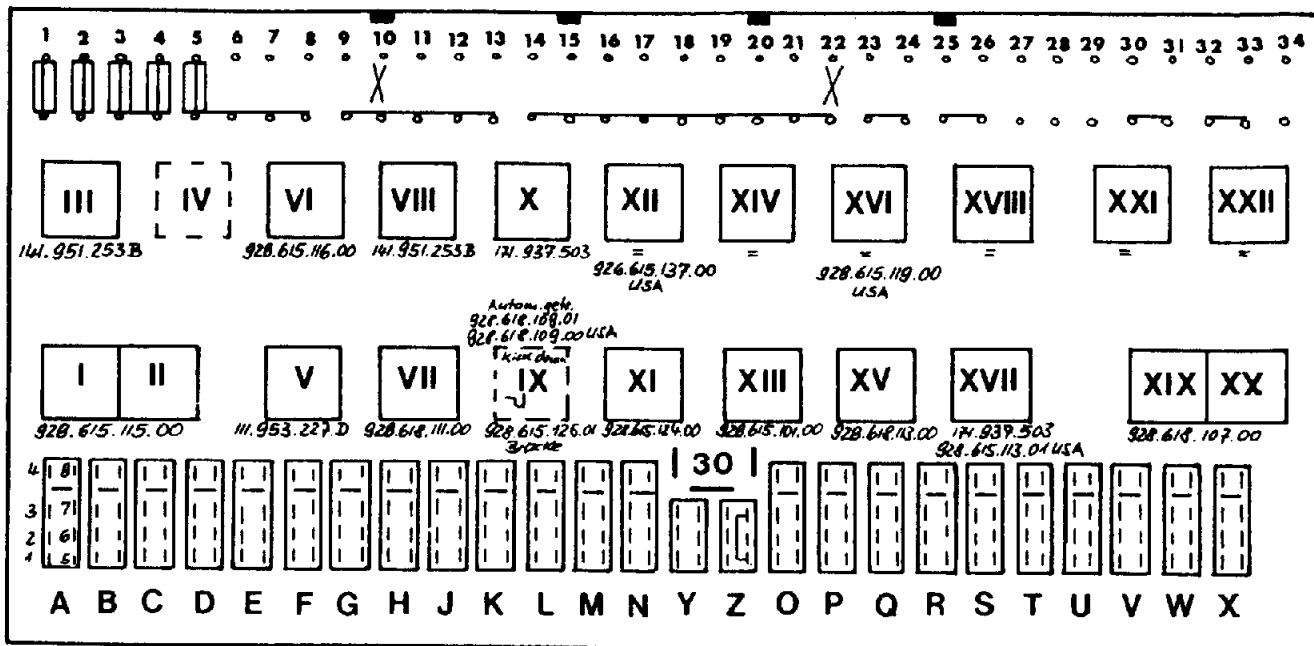
Relay allocation

- I - II - Rear window heater
- III - Spare
- IV - Spare
- V - Flasher unit
- VI - Window lifts, central locking
- VII - Headlight washer
- VIII - Spare
- IX - Kickdown (USA auto. transmission only)
- X - Fanfare
- XI - Spare
- XII - Fog light (USA headlight flasher)
- XIII - Wiper interval
- XIV - Starter relay
- XV - Suppl. washer pump
- XVI - L-Jetronic (USA only)
- XVII - Fuel pump, suppl. air valve
- XVIII - Suppl. fan
- XIX - Lighting combination relay
- XX - Fresh air blower
- XXI - Fresh air blower
- XXII - Defroster

Note:
Time-lag relay is under center console,
rear window wiper relay is next to rear wiper motor.

Fuses 10 and 13 are spare.

CENTRAL ELECTRICAL SYSTEM Mod. 84



Fuse allocation

- | | |
|--|--|
| 1 - Fog light 16 A | 16 - Suppl. fan 25 A |
| 2 - Suppl. main beam 16 A (not USA) | 17 - Fresh air blower 25 A |
| 3 - Number plate light, engine compartment light 8 A | 18 - Rear window heater 25 A |
| 4 - Instruments, ashtray light 8 A | 19 - Headlight motor 16 A |
| 5 - Cigar lighter 16 A | 20 - Headlight washer 16 A |
| 6 - Screenwiper 16 A | 21 - Window lifts, central locking 25 A |
| 7 - Brake light, Tempostat 8 A | 22 - Spare |
| 8 - Sun roof 16 A | 23 - Interior lighting, clock 8 A |
| 9 - Reversing light, mirror adjust., rear window wiper, air con. 8 A | 24 - L. H. main beam 8 A |
| 10 - Spare | 25 - R. H. main beam 8 A |
| 11 - Ackn. button, light switch 8 A | 26 - L. H. dipped beam 8 A |
| 12 - Instrument warning lights 8 A | 27 - R. H. dipped beam 8 A |
| 13 - Fuel pump, suppl. air valve 16 A | 28 - L. H. parking light 8 A |
| 14 - Electr. seat adjustment 25 A | 29 - R. H. parking light 8 A |
| 15 - Fanfare, rear window wiper park, electr. aerial 16 A | 30 - L. H. front direction indicator 8 A |
| | 31 - L. H. rear direction indicator 8 A |
| | 32 - R. H. front direction indicator 8 A |
| | 33 - R. H. rear direction indicator 8 A |
| | 34 - Rear fog guard lamp 8 A |

Relay allocation

- | | |
|--------|--------------------------------------|
| I - II | -- Rear window heater |
| III | -- Window lifts (door open) |
| IV | -- Spare |
| V | -- Flasher unit |
| VI | -- Window lifts, central locking |
| VII | -- Headlight washer |
| VIII | -- EZF ignition system |
| IX | -- Kickdown, bridge |
| X | -- Fanfare |
| XI | -- ABS (anti-skid system) |
| XII | -- Fog light (USA headlight flasher) |
| XIII | -- Wiper interval |
| XIV | -- Starter relay |
| XV | -- Suppl. washer pump |
| XVI | -- LH-Jetronic (USA L-Jetronic) |
| XVII | -- Fuel pump, suppl. air valve |
| XVIII | -- Suppl. fan |
| XIX | -- Lighting combination relay |
| XX | -- Fresh air blower |
| XXI | -- Defroster |

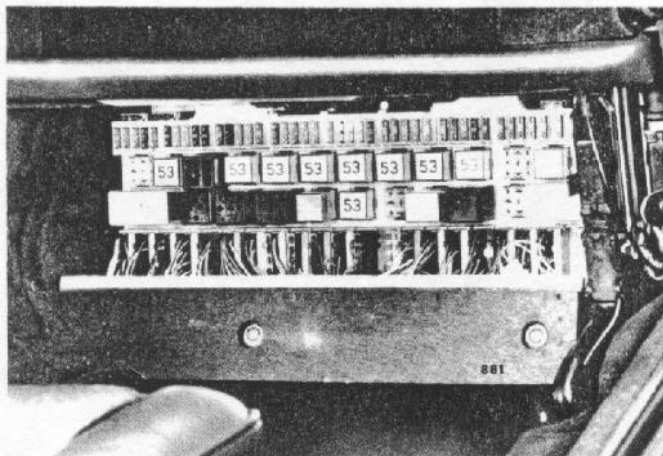
Note:
Time-lag relay under center console, rear window wiper relay is next to battery ground (earth).

SUMMARY / MODIFICATIONS ON CENTRAL ELECTRICAL SYSTEM 928

Model	CEB end digits 928.610.105. . .	can be installed in model
1978	.00	only '78
1979	.01	'78 / 79
1980	.03	only '80
1981	.04	'80 / 81
1982	.05	only '82
1983	.06	only '83 for USA 4-speed automatic '82 / 83 for rest of world
1984	.07 / 08	07 – only 84 for USA / Japan, 08 – only 84 for rest of world
1985		

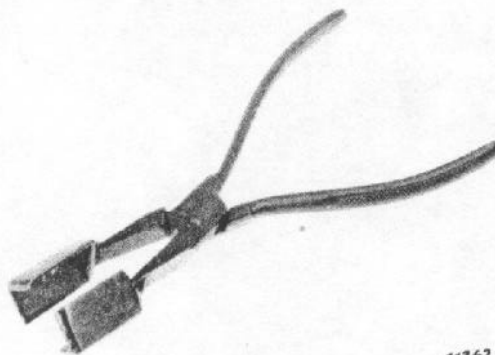
How do the individual CEBs differ?

- CEB Mod. 78** – equipped with set of diodes in relay base XI.
Fuse 13 spare.
- CEB Mod. 79** – set of diodes deleted, tachometric relay (air conditioning) fitted in base XI.
Bridge terminals 30 – 87 if no air conditioning is fitted.
Fuse 13 spare.
- CEB Mod. 80** – tachometric relay XI deleted, new wiring for different main light circuit
(combination relay instead of individual relays).
Fuses 13 and 7 spare.
- CEB Mod. 81** – fuse allocation changed (control of instrument lighting modified).
Fuses 13 and 10 spare.
- CEB Mod. 82** – modified wiring, starter relay XIV for all vehicles. (Bridge on connector in spare
wheel well in case of manual gearbox.)
Fuses 13 and 10 spare.
- CEB Mod. 83** – modified wiring – NEW! Relay IX (kickdown relay) for 4-speed automatic
transmission only, relay XII (fog light for USA vehicles).
CEB 05 can be installed in Mod. 83 vehicles providing they are not equipped with
4-speed automatic transmission or USA versions.
CEB 06 can be installed in place of **CEB 05**.
- CEB Mod. 84** – USA – new wiring for ABS (anti-skid system).
Fuses 10 and 22 spare.
- CEB Mod. 84** – completely new wiring for ABS, LH Jetronic and EZF ignition.
Second ground (earth) lead from **CEB's** ABS relay.
4 connections on connector base Y assigned to ABS.
Fuses 10 and 22 spare.



The fuse plate holds 45 fuses (formerly 35). This was made possible through application of flat-type fuses. Fuses are grouped together in blocks of five and are no longer marked with numbers. To check a certain fuse, they must be counted from left to right.

The number of relays has been increased to 26 (formerly 22). The CEB no longer has the old marking of relays with roman numerals. The markings are shown on a card inserted in the cover. The greater number of relays means less space between relays, so that relay removal is slightly more difficult. We recommend using the relay removing tool 9235 to avoid damaging the relays.



11362

ELECTRICAL SYSTEM — Central Electric '85

The back of the CEB cover has a pocket, in which an equipment card with a picture of CEB as well as fuse and relay connection plans in five different languages are inserted.

Nr	Sicherungung	Fuse	Fusibile	Fusibile	Fusible	A
1	Controltestingsystem	Control testing system	Alarma centralizada	Indicador central	Fusible para sistema de alarma	5
2	Operativelampe	Operative light	Indicador	Indicador para operario	Alarma operario	20
3						
4	Brake light	Brake light	Luci freno	Luci de freno	Fusible para sistema de freno	7,5
5	Wiper motor	Wiper motor	Limpiaparabrisas	Limpiaparabrisas	Limpiaparabrisas	15
6	Turn signal	Turn signal	Indicador de direccion	Indicador de direccion	Fusible para sistema de direccion	5
7	Headlight	Headlight	Faros	Faros	Faros	20
8	Wiper motor	Wiper motor	Limpiaparabrisas	Limpiaparabrisas	Limpiaparabrisas	7,5
9						
10	Wiper motor	Wiper motor	Limpiaparabrisas	Limpiaparabrisas	Limpiaparabrisas	5
11	Wiper motor	Wiper motor	Limpiaparabrisas	Limpiaparabrisas	Limpiaparabrisas	7,5
12	Wiper motor	Wiper motor	Limpiaparabrisas	Limpiaparabrisas	Limpiaparabrisas	7,5
13	Wiper motor	Wiper motor	Limpiaparabrisas	Limpiaparabrisas	Limpiaparabrisas	15
14	Wiper motor	Wiper motor	Limpiaparabrisas	Limpiaparabrisas	Limpiaparabrisas	25
15	Wiper motor	Wiper motor	Limpiaparabrisas	Limpiaparabrisas	Limpiaparabrisas	30
16	Wiper motor	Wiper motor	Limpiaparabrisas	Limpiaparabrisas	Limpiaparabrisas	30
17	Wiper motor	Wiper motor	Limpiaparabrisas	Limpiaparabrisas	Limpiaparabrisas	30
18	Wiper motor	Wiper motor	Limpiaparabrisas	Limpiaparabrisas	Limpiaparabrisas	15
19	Wiper motor	Wiper motor	Limpiaparabrisas	Limpiaparabrisas	Limpiaparabrisas	25
20	Wiper motor	Wiper motor	Limpiaparabrisas	Limpiaparabrisas	Limpiaparabrisas	30
21	Wiper motor	Wiper motor	Limpiaparabrisas	Limpiaparabrisas	Limpiaparabrisas	30
22	Wiper motor	Wiper motor	Limpiaparabrisas	Limpiaparabrisas	Limpiaparabrisas	7,5
23	Wiper motor	Wiper motor	Limpiaparabrisas	Limpiaparabrisas	Limpiaparabrisas	7,5

ELECTRICAL SYSTEM — Central Electric '85

Fuse Survey

Fuse No.	Amps	Terminal	For Equipment	Standard / M-Number
1	5	X	Central locks	*
2	20		Cigar lighter	*
3			—	
4	7.5		Stop lights	* / cruise control M 454
5	15		Wipers	*
6	5	15	Illum. button panel / light switch	*
7	20			/ seat heating M 139/340
8	7.5		Air conditioner	*
9	—			
10	5		Instr. / indicator lamps	*
11	7.5		Rear window wiper	*
12	7.5		Backup lights / mirrors	*
13	15			/ extra air cond. M 570
14	25		X	
15	25	Power windows		*
16	10			/ ABS M 593
17	30	30	Blower	*
18	15		Two-tone horns	*
19	25		Rear window defogger	*
20	30		Power seat left	*
21	30		Power seat right	*
22	—			
23	7.5		Radiator fan afterrun	*
24	5		Inside lights / clock	*
25	20		Headlight cleaners	*
26	1		Rear lid unlocking	*
27	15		Headlight motors	*
28	15			/ booster (radio) M 494
29	25	Engine fan	*	
30	15	55	Fog lamps	*
31	7.5	56 A	High beam left	*
32	7.5		High beam right	*
33	15		Additional high beams	*
34	5	L (49 A)	Turn signal front left	*
35	5		Turn signal rear right	*
36	5	R (49 A)	Turn signal front right	*
37	5		Turn signal rear left	*
38	7.5	56 B	Low beam left	*
39	7.5		Low beam right	*
40	5	58 L	Side marker light left	*
41	5	58 R	Side marker light right	*
42	15	15	Fuel pump, auxiliary air valve	*
43	5		License plate / eng. comp. lights	*
44	5	58	Ashtray / instrument lights	*
45	5		Rear fog light	*

Fuse installation tool: 443.941.802

M 139 Heating for Left Seat
M 340 Heating for Right Seat

M 454 Cruise Control
M 494 Booster

M 570 Additional Air
Conditioning

M 593 ABS
M 650 Electric Sun Roof

ELECTRICAL SYSTEM — Central Electric '85

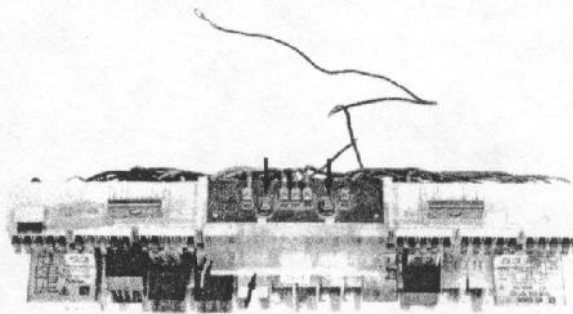
Relay Survey

Relay	For Equipment	Standard	M-Number
I – II	Rear window defogger	928.615.115.00	
III	—		
IV	X-contact	141.951.253.B	
V	Flasher / hazard lights	111.953.227.D	(M 208) 928.615.131.00
VI	Power windows	928.615.128.00	(M 553) 928.615.126.00
VII	Wiper intermittent action	928.615.101.00	
VIII	Defrost (fuse check)	928.615.203.00	
IX	Intensive cleaning	928.618.113.00	
X	Blower	141.951.253.B	
XI	Suppressor	928.618.223.00	
XII	Two-tone horns	141.951.253.B	
XIII	Fog lamps	141.951.253.B	(M 193) 928.615.117.02 (M 553) 928.615.137.01
XIV	Starter	141.951.253.B	
XV	Kickdown		(M 249) 928.618.109.01
XVI	EFZ	141.951.253.B	
XVII	ABS		(M 593) 928.615.124.01
XVIII	Auxiliary fan	141.951.253.B	
XIX	Headlight cleaners	928.618.111.00	
XX	Fuel pump	141.951.253.B	
XXI	—		
XXII	Backup lights	141.951.253.B	(M 249) bridge 928.615.125.00
XXIII	Lights	928.618.107.00	
XXIV	Lights	928.618.107.00	
XXV	LH-Jetronic	141.951.253.B	
XXVI	—		

M 193 Japan Version
 M 208 Trailer Hitch
 M 259 Automatic Transmission
 M 553 USA Version
 M 593 ABS

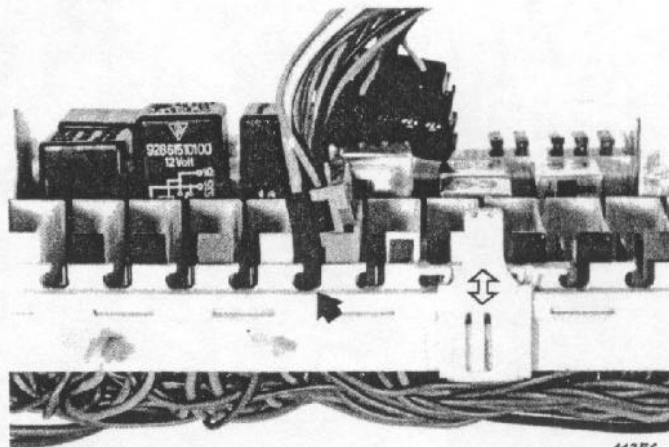
ELECTRICAL SYSTEM — Central Electric '85

Electric power is supplied to CEB (term. 30) through two screwed connections on top of CEB. These connections have a plastic cover.



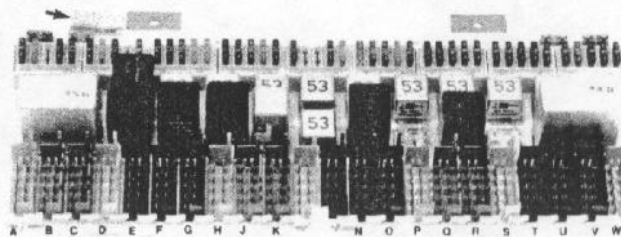
1361

To guarantee firm holding of wire harness plugs on CEB, there is a central locking rail below the group plug plate which can be moved away after pulling a locking grip in the middle. Afterwards the wire plugs can be pulled off if the plug receptacle lock on top of the plug has been pressed off upwards.



11356

The wire harness plugs, which are connected on CEB, are new. In this manner CEB has new plug receptacles each with 10 plug contacts. Plug receptacles have coding grooves and are marked with group codes A through W. A fuse pulling tool is located at the left-hand side above the CEB. There is a fuse testing connection on top of the DEF relay (VIII). If a fuse is inserted in this testing connection, a LED will light up when the fuse is good.



1384

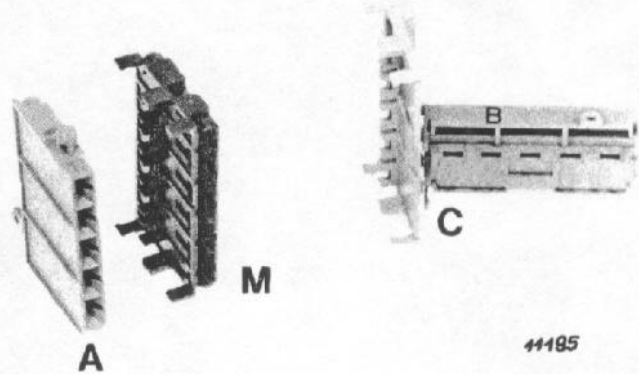
Wire Harness Plugs

The new plug receptacles of wire harnesses connected on CEB consist of different receptacle sections, which are clipped together.

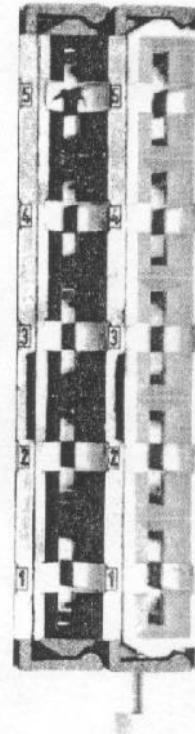
A plug always consists of one "initial element" (A), red or black, one or more "module elements" (M) in black and one "coding element" (C) in seven different colors.

The coding element has the group letters of the plug, in the figure by example: "B".

The initial and each module element can take five each wire plug sockets. Consequently a 10-pin plug consists of an initial element and one module element, as well as the coding element.



The contact recesses of the initial element and module element(s) are marked with numbers 1 through 5.

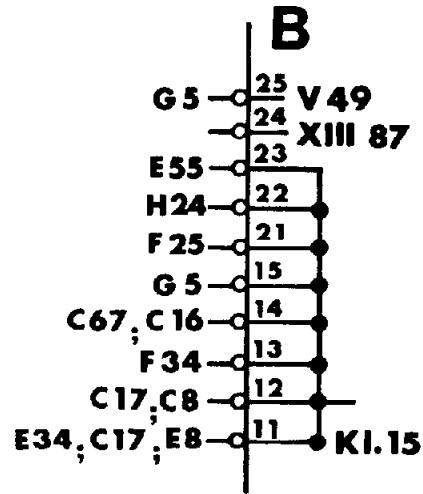


ELECTRICAL SYSTEM — Central Electric '85

To guarantee perfect arrangement of the different contacts the CEB wiring diagram shows plug group letters which are followed by additional numbers, showing whether the single contact can be found in the initial element or a module element.

Number 1 after a letter always means an initial element.

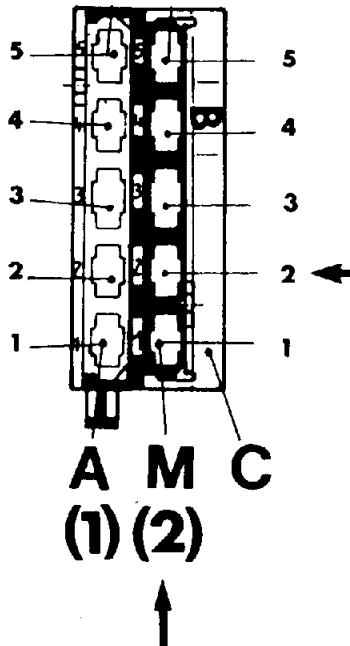
Number 2 means the first module element, and so on.



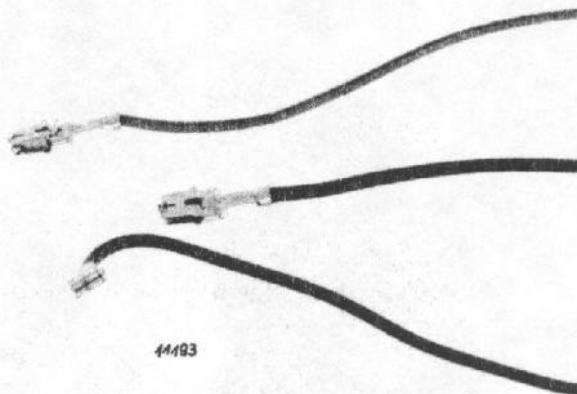
Plug Designations in CEB Wiring Diagram

Example: Designation B22 in CEB wiring diagram means:

single contact is located in "plug B", in the first module element (2) and on plug terminal 2.

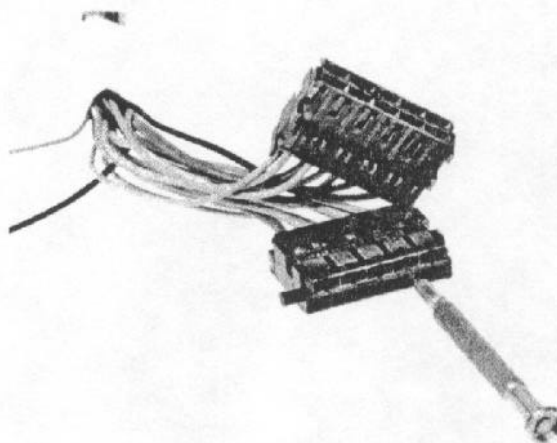


All sleeve-type terminals of wire harness plugs consist of spring contacts, with which safe and almost constant contact force is guaranteed.



44193

To remove a sleeve-type terminal from a plug receptacle the pertinent element must first be removed from the total plug, since sleeve-type terminals are also held in place by plug modules. Only then can the plug locking tabs be unlocked with a special pressing-out tool.



44191

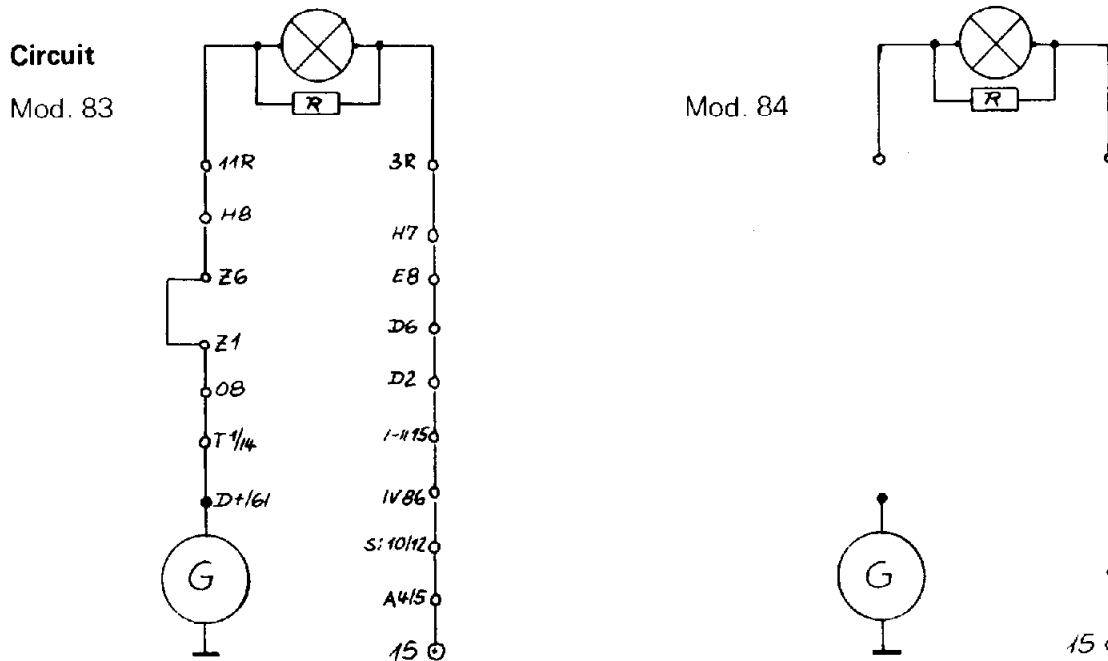
ALTERNATOR

The alternator was completely revised for Mod. 82. It was equipped with updated diodes (wired in parallel), better cooling and a new regulator. The regulator improved again from Mod. 84. It can be identified by the aluminium housing and can be installed in alternator from Mod. 82 onwards.

The field circuit

A field current must flow through the rotor winding in order to excite the alternator, i. e. built up a magnetic field in the rotor.

However, this field current flows only if a load is switched on in the field circuit (between ignition switch and alternator). This load takes the form of the charge indicator lamp.



When the ignition (terminal 15) is switched on, "positive" is applied to the charge indicator lamp. Ground (earth) must be applied to the lamp via the alternator and regulator to make it light up. When the engine is running and if the alternator and regulator are in order, a voltage is supplied via D+/61 (regulating voltage) by the alternator as a result of the magnetic field in the rotor. This means that the charge indicator lamp receives "positive" at both sides and thus goes off. The alternator charges and the regulator is in order. If the regulating voltage were too high or too low in comparison with the voltage at terminal 15, the charge indicator lamp would glow because of the different potentials at the lamp.

A shunt resistor is installed from Mod. 79 because the charge indicator lamp was reduced in size to 1.2 W (formerly 3 W). The internal resistance of the lamp must be reduced in order to allow a sufficiently large field current to flow. A 3-Watt lamp has an internal resistance of approx. 60 Ω and a 1.2-Watt lamp one of approx. 170 Ω.

Example:

$$\text{Current } I \text{ at } 3 \text{ W} = I = \frac{V}{R} = \frac{14 \text{ Volt}}{60 \Omega} = 0.230 \text{ A} = 230 \text{ mA}$$

$$\text{Current } I \text{ at } 1.2 \text{ W} = I = \frac{V}{R} = \frac{14 \text{ Volt}}{170 \Omega} = 0.080 \text{ A} = 80 \text{ mA}$$

In order to reduce the high internal resistance of the 1.2-Watt lamp a resistor is wired in parallel with the lamp (68 Ω). This produces a total resistance of:

$$R_{\text{Tot}} = \frac{R_1 \cdot R_2}{R_1 + R_2} = \frac{68 \Omega \cdot 170 \Omega}{68 \Omega + 170 \Omega} = \frac{11560 \Omega}{238 \Omega} = 48.6 \Omega$$

The current that flows is thus $I = \frac{V}{R} = \frac{140}{48.6} \cong 0.290 \text{ A} = 290 \text{ mA}$

Without the shunt resistor the field current would only be 80 mA — much too little to reliably excite the alternator.

ALTERNATOR

Testing

Note the following points before checking the alternator circuit.

1. Battery fully charged, electrolyte level o. k., battery connections o. k.?
2. Drive belt correctly tensioned, no damage?
3. Does charge indicator lamp light up when ignition is switched on?

You require a voltmeter, ammeter and an oscilloscope for accurate testing.

A) Regulating voltage

Connect voltmeter to D+ / 61 and ground (earth).

Switch on ignition: specified value = 1.4 – 2.0 Volt

Start engine: specified value = 13.2 – 14.2 Volt

Switch on loads (main beam, fresh air blower 4, rear window heater): specified value = 13.2 – 14.2 at approx. 2,000 rpm

B) Charging current

Connect ammeter to battery negative pole (inductive clip).

Switch on loads (as above), measure current.

Start engine, set engine speed to approx. 2,000 rpm.

The ammeter must indicate a definite charge (> load current).

C) Oscilloscope

Connect oscilloscope to D+ / 61 (use special oscilloscope input).

Set engine to 2,000 rpm and switch on loads (as above).

The scope screen must show a uniform current wave trace without any dips or excessive current peaks. The alternator must be warm for this test.

Your exercises

1. Check the field current circuit
 - a) with a test lamp
 - b) with a voltmeterWrite down your testing points and the values!
2. Check the charging current.
Please write down **all** the measured values!
3. Connect up the oscilloscope.
What do you see on the screen?
Disconnect D+ / 61, restart the engine.
What do you see on the screen?

CENTRAL WARNING

The central electronic warning system, i.e. **central warning**, is located on the left of the driver's foot well behind the clutch foot rest. The electronic warning system automatically monitors various functions in the vehicle and signals a fault in the components monitored, depending on priority, by flashing or illuminating the central warning lamp or the appropriate warning indicator in the combination instrument. From Model 79 the acknowledge button in the center console lights up along with the central warning lamp.

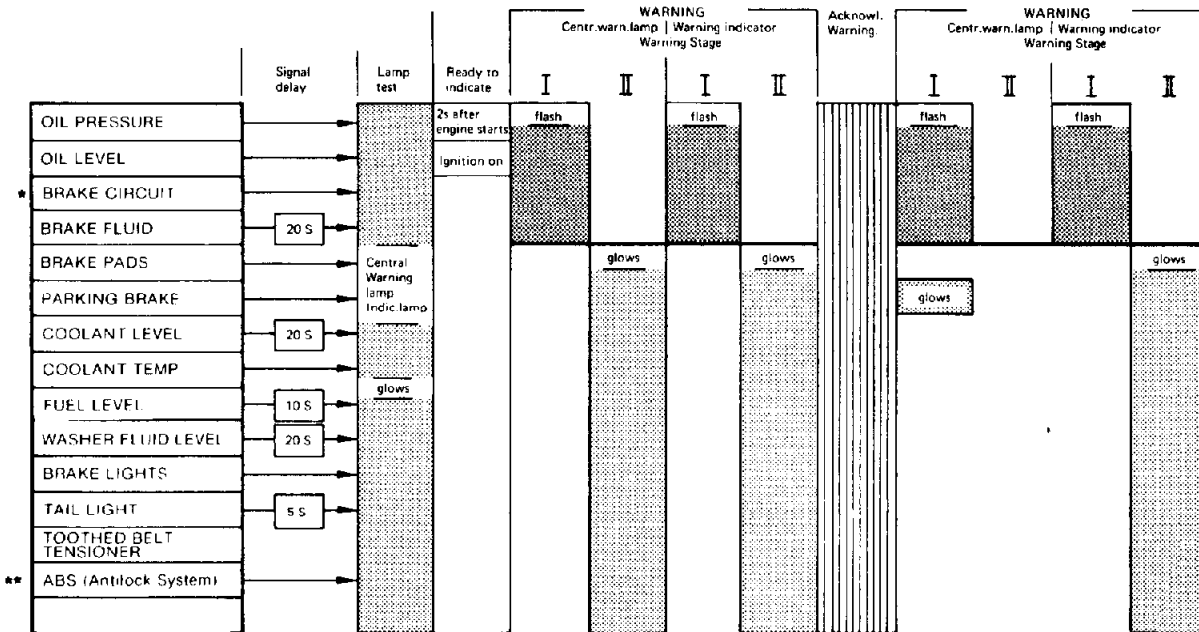
The control function of the central warning light system is divided into two major groups:

- Group "A" – engine oil pressure
 – engine oil level
 – brake circuit (pressure) failure*
 – brake fluid level

Any of these malfunctions reported by the system must be corrected immediately.

- Group "B" – Brake wear (pads) indicator
 – parking brake
 – coolant level
 – fuel reserve level
 – windshield and headlight washer fluid level
 – stop lamps
 – tail lamps
 – toothed belt tensioning
 – ABS (antilock system)

Any group "B" malfunction reported by the system should be corrected as soon as possible.



*discontinued from Mod. 84
 **new from Mod. 86

A) Function

When the ignition is switched on, all warning indicators (indicator lamps and lettering) as well as the central warning lamp and the lamp test acknowledge button light up. The lamp test of items 1 — 10 and 12 — 14 goes off when the engine is started and that of item 11 after the first brake application.

The readiness to indicate in the case of a fault at item 1 begins approx. 2 sec. after the engine starts, at item 2 when the ignition is switched on and the **engine is stationary** and at all other items when the engine is running. If there is a fault at item 1—4, the central warning lamp and the appropriate individual warning indicator flash on and cannot be cancelled by pressing the acknowledge button. Item 3 is stored and automatically flashes again even after a break in the journey. **Item 3 can only be cancelled by briefly disconnecting one pole of the battery.**

The other stores, items 4 and 5, are cancelled when the ignition is switched off. A fault at item 5—16 is indicated by the central warning lamp and the appropriate individual warning indicator glowing all the time. The central warning lamp of items 5 and 7—14 can be cancelled by pressing the acknowledge button in the center console, but the individual warning indicator continues to glow. When the handbrake, item 6, is applied, the warning lamps can be cancelled by releasing the handbrake.

CENTRAL WARNING

Example:

Item 9 tank reserve — fuel reserve level is reached while driving. All lamps light up to test their function when the ignition is switched on. When the engine is started and if the fuel reserve level has not yet been reached, the central warning lamp, acknowledge button and the fuel reserve warning lamp go off. If the fuel reserve level has been reached, i. e. the fuel level float closes the reserve indicator contact, the central warning lamp / acknowledge button and the fuel reserve warning lamp will light up 10 seconds after the contact closes. When the acknowledge button is pressed (driver has noticed reserve warning), only the central warning lamp and the acknowledge button go off; the warning lamp continues to glow until the tank has been topped up as necessary. The time lag of 10 seconds for the indicator in the example (items 4, 7, 10 after 20 sec.) was chosen to ensure that the warning indicator does not respond during cornering, i. e. as a result of the change in fuel level.

Central warning from Model 84

The construction and the functions of the central warning were changed from Model 84. The whole electronic circuit was revised and laid out to accommodate future monitoring functions. It was possible to reduce the size of the central warning by about 50% at the same time. The new central warning may only be installed in vehicles from Model 84 onwards.

The changes:

The connector assignment was changed in some terminal connections.

The warning lamps are extinguished by the alternator charge, terminal 61 — and not by the start pulse, terminal 50.

The "brake circuit" warning lamp is deleted. The brake circuit is monitored by way of the brake fluid level.

Vehicles with the ABS system are equipped with an ABS warning lamp which is tripped directly by the ABS control unit — via the central warning. In the event of a fault the central warning now switches on the central warning lamp as well.

In addition to the transmitter, the coolant level is monitored by a pressure switch installed in the coolant expansion line. (see page 36)

Bulb Monitoring Unit

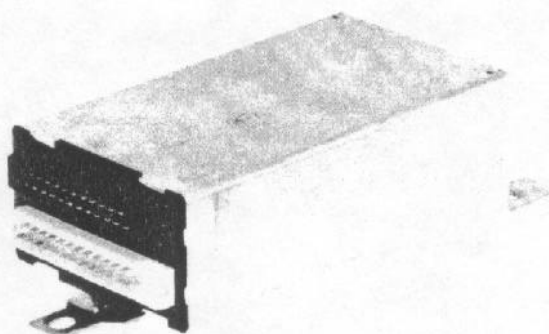
The bulb monitoring unit (behind CEB) has been revised. The monitoring of electric power for the tail lights is now accomplished with electronic components and no longer with mechanical reed switches. The new bulb tester (928.641.603.04) is fully interchangeable with earlier models.

CENTRAL WARNING

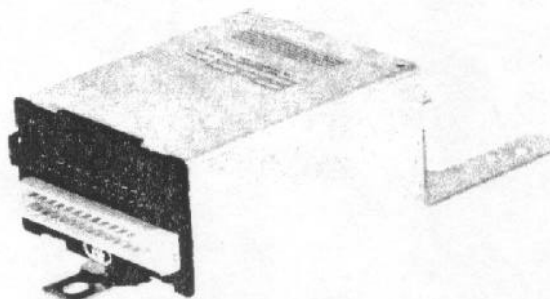
Testing

The central warning has a color-coded **black and yellow**, 25-pole connector strip which is connected to the instrument wiring harness. **The connectors cannot be connected the wrong way round.**

up to Model 83



from Model 84



All the items monitored in the vehicle can be checked in order to test operation of the warning system.

Lamp test

Switch on the ignition to check whether all warning lamps (WL), the central warning lamp (ZW) in the combination instrument and the acknowledge button in the center console light up.

If one of the lamps does not glow, first check the condition of the bulb or its wiring.

Start the engine, release the handbrake and press the brake pedal once – all the warning lamps must go off. (Then switch off the ignition.)

CENTRAL WARNING

Operational test

- I. Up to Model 83, the warning lamps are extinguished by the engine cranking pulse (terminal 50). Accordingly, it is necessary to crank the engine, without letting it run, in order to switch off the warning lamps.
To do this, pull the HT lead, terminal 4, off the distributor and apply it to ground (earth) (screw heads on crossbar mounting).
- II. From Model 84, the warning lamps are no longer extinguished by the cranking pulse, but by the voltage rise of the alternator, terminal D +/61.
The switching threshold is in the region of > 6 V, i.e. when the engine starts and if the alternator charging circuit is in order (voltage rise > 6 V), the warning lamps are extinguished. This means that, even when there is a break at D +/61, the warning lamps go off immediately the ignition is switched on because terminal 15 (+) is applied to the central indicator via the charge indicator lamp.
In order to switch off the warning lamps to test them, it is necessary to separate the multipoint engine connector in the engine compartment after switching on the ignition (lamp test). Connect terminal 1 on connector (front wiring harness) to B+. The warning system, with the exception of oil level and oil pressure, can now be tested.
ZW — central warning lamp
ZW — central warning lamp
WL — warning lamp / warning lettering
Q — acknowledge button (in center console) — functions together with ZW from Mod. 79.

1. Brake light

Operate foot brake.
— **Brake light WL** must go off.

2. Handbrake

Apply handbrake (or connect cable on handbrake contact to ground)
— **Handbrake WL, ZW and Q** must **light up**. The two lamps go off only when the handbrake is released.

3. Coolant temperature

Pull cable connector terminal W (smaller connector lug) off the temperature transmitter on the engine and connect it to ground.
— **Coolant temperature WL, ZW and Q** must **light up**. Press acknowledge button, ZW and Q go off, WL must continue to glow. The WL goes off when the ground connection is removed.

4. Oil level up to Model 83

The transmitter is fitted on the front of the oil sump. Pull cable off transmitter and hold it against ground, or additionally connect multipoint connector part of front wiring harness terminal 6 to ground and attach the connector.
— **Oil level WL, ZW and Q** must **flash**. Press acknowledge button, all lamps must continue flashing. All lamps must go off when the cable is attached to the transmitter, or when the ground connection is removed.

4a. Oil level from Model 84

Connect connector P3 (M23 model 85 and later) on CEB to ground (connector remains plugged in).
— **Oil level WL, ZW and Q** must **flash**. Press acknowledge button, all lamps must continue flashing. All lamps must go off when the cable is attached to the transmitter, or when the ground connection is removed.

CENTRAL WARNING

5. Oil pressure up to Model 83

Separate multipoint engine connector. Use auxiliary cable to apply connector part of front wiring harness, connector socket No. 2, to ground.

— **Oil pressure WL, ZW and Q** must **flash after about 2 seconds**. Press acknowledge button, all lamps must continue flashing. The lamps must go off when the auxiliary cable is removed.

5a. Oil Pressure from Model 84

Connect connector P2 (M22 model '85 and later) on CEB to ground (connector remains plugged in).

— **Oil pressure WL, ZW, and Q** must **flash after about 2 seconds**. Press acknowledge button, all lamps must continue flashing. The lamps must go off when the auxiliary cable is removed.

6. Brake lining wear

Separate one plug connection of a lining contact segment. (Front left-hand side of engine compartment at level of brake master cylinder.)

— **Brake lining WL, ZW and Q** must **light up**. Press acknowledge button — ZW and Q go off, WL continues to glow. Reconnect plug connection, WL continues to glow.

Note: Allow the individual warning lamps (WL) to continue glowing in the following tests until you have checked through all items — otherwise you will have to keep repeating the procedure as per Section I or II.

7. Coolant level

The transmitter (float) is located inside the coolant expansion tank. Pull off cable and join the cable's plug connections together.

— **Coolant level WL, ZW and Q** must **light up after about 20 seconds**. Press acknowledge button, ZW and Q go off and WL must continue glowing. The WL continues to glow after the cable bridge is disconnected.

7a. Coolant level from Model 84

Trip warning as described under 7. Press acknowledge button so that only the WL glows. Fit hand pump VW 1274 on coolant filler neck and pressurize cooling system to at least 0.5 bar gauge. Switch off ignition, wait about 10 seconds and then switch it on again. The "coolant level" warning lamp must light up. Depressurize cooling system. Switch ignition off and on again. No warning lamp should light up.

8. Windshield/headlight washer water level

Remove cover plate from CEB in passenger foot well. Connect auxiliary cable to ground and other end to:

Connector K, terminal 5 (M14 model '85 and later)

or

Connector Q, terminal 6 (none on '85).

(This circuit saves you from having to remove the guard plate in the right-hand wing — in front of the water reservoir.)

— **Washer water WL, ZW and Q** must **light up after about 20 seconds**. Press acknowledge button. ZW and Q go off, WL must continue glowing. The WL continues to glow after the connection is removed.

9. Fuel level

Remove cover plate from CEB in passenger footwell. Connect auxiliary cable to ground and other end to R15.

— **Tank reserve WL, ZW and Q** must **light up after about 20 seconds**. Press acknowledge button, ZW and Q go off, WL must continue glowing. Plug in connector, the WL continues to glow.

CENTRAL WARNING

10. Brake circuit failure (up to Mod. 83) deleted from Model 84

Pull off one connector base from the brake light switch on the master cylinder and use auxiliary cable to join together the opposing connector sockets.

– **Brake circuit WL, ZW and Q must flash.** Press acknowledge button, all lamps must continue flashing. Disconnect connector bridge and reconnect connector base to brake light switch – all lamps, ZW, Q and WL, must continue flashing.

Note: The flashing warning indicator can only be cancelled by briefly disconnecting one battery cable.

– Repeat **Section I or II** for the following tests.

11. Brake fluid level

A pressure switch (extended float) can be seen at the top of the brake fluid reservoir. Press this switch down – or bridge the cable connection.

– **Brake fluid WL, ZW and Q must flash after about 20 seconds.** Press acknowledge button, all lamps continue flashing. Release float pin, or disconnect bridge, all lamps (ZW, Q and WL) continue flashing.

12. Tail light / brake light

The tail and brake light is monitored by a lamp test unit behind the ZEL. The lamp test unit is new from Model 84 and can be retrofitted.

Switch on parking light, depress foot brake (brake light WL must go off). Check rear light function on vehicle. In order to check this item it is necessary to unscrew the rear light lens at one side of the vehicle. – Take out tail light bulb.

– Switch on parking light.

– **Tail light WL, ZW and Q must light up after about 5 seconds.** Press acknowledge button – ZW and Q go off, WL must continue glowing.

The tail light WL goes off when the bulb is refitted. Switch off light! Remove brake light bulb – depress foot brake. **Brake light WL, ZW and Q light up** – press acknowledge button – ZW and Q go off, WL must continue glowing. The WL continues glowing when the bulb is refitted and only goes off after the brake has been depressed once.

Note: Ensure that both rear lights (brake / tail light) are fitted with bulbs of the same make and rating – the central warning will otherwise switch on the warning lamps although the lights are functioning properly.

12. ABS anti-skid (anti-lock) system

Remove relay XVII from CEB, switch on ignition.

– **ABS WL, ZW and Q must light up.** Press acknowledge button, ZW and Q must go off, WL must continue glowing. Refit relay.

13. Tooth belt tension

Disconnect plug connector in front of belt housing.

– **Tooth belt WL, ZW and Q must light up about ~ 3 min.** Press acknowledge button – ZW and Q go off. WL must continue glowing.

CENTRAL WARNING

Note on operation — test points 7 and 7a — coolant level

Coolant level up to Mod. 83

If we assume that the coolant level is so low on a cold engine that the transmitter contact is closed, the central warning will be connected to ground.

When the engine is started, a warning is given after about 20 seconds, i. e. generally during the journey. The coolant expands as it warms up, its volume increases and the coolant level rises.

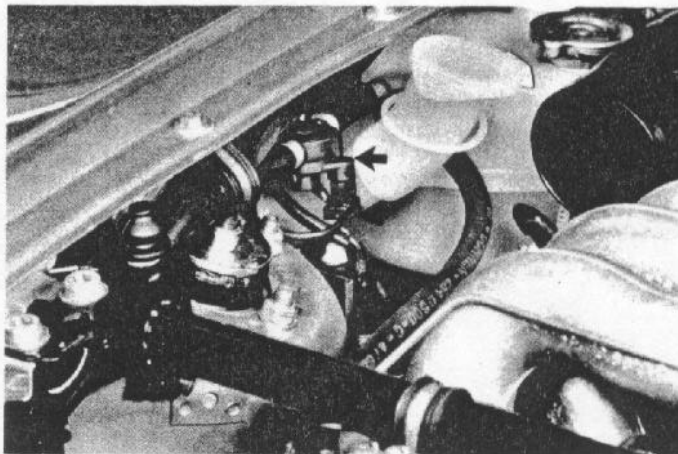
This results in the transmitter contact opening so that no warning is given when the engine is restarted (warm engine).

A visual inspection at the expansion tank may not, therefore, reveal that the coolant level is too low, i. e. when the engine is warm.

This can lead to a faulty diagnosis on the warning system because of it not being possible to reproduce a warning when the engine is warm.

Coolant level from Mod. 84

The central warning system has a pressure switch located in the return line to the expansion tank which now works in conjunction with the coolant level switch. If the coolant level of a cold engine is too low, this will switch on the coolant level warning light after a delay of approximately 20 seconds. Coolant will expand as the engine warms up and the coolant level will rise. If the engine is stopped and started again, the warning will go out. This happens, even though the cold coolant level is too low.



To avoid unnecessary troubleshooting, the pressure switch senses the pressure in the cooling system and sends this information to the central warning unit. Now if there had first been a warning from the coolant level switch and afterwards from the pressure switch, the central warning system will store this signal sequence and maintain the warning, even after the coolant has expanded and the coolant level switch has an opened circuit. In other words, when starting the engine again the warning lamp comes on, even if the coolant level appears correct. If the cap at the expansion tank is removed (to add coolant), pressure escapes and the pressure switch circuit opens. The central warning system, with this indication, assumes coolant has been added and turns the warning lamp out.

CENTRAL WARNING

On the following pages you will find a chart showing the connections of the central indicator. The terminals that are actually connected are marked **O—**.

What is the test procedure?

1. Bring warning system into testing position — Section I or II, page 33.
2. With the aid of the connection chart, use an auxiliary cable to apply the appropriate polarity from the rear, through the plugged in central warning control unit connector.

Caution: Terminals 12, 13, (14), 21 (**black**) are only used to check whether sufficient and correct voltage is applied — check only with voltmeter.

3. If the electrical warning circuit is in order, the warning lamps must light up at all test terminals on which all 3 warning lamps are shown.

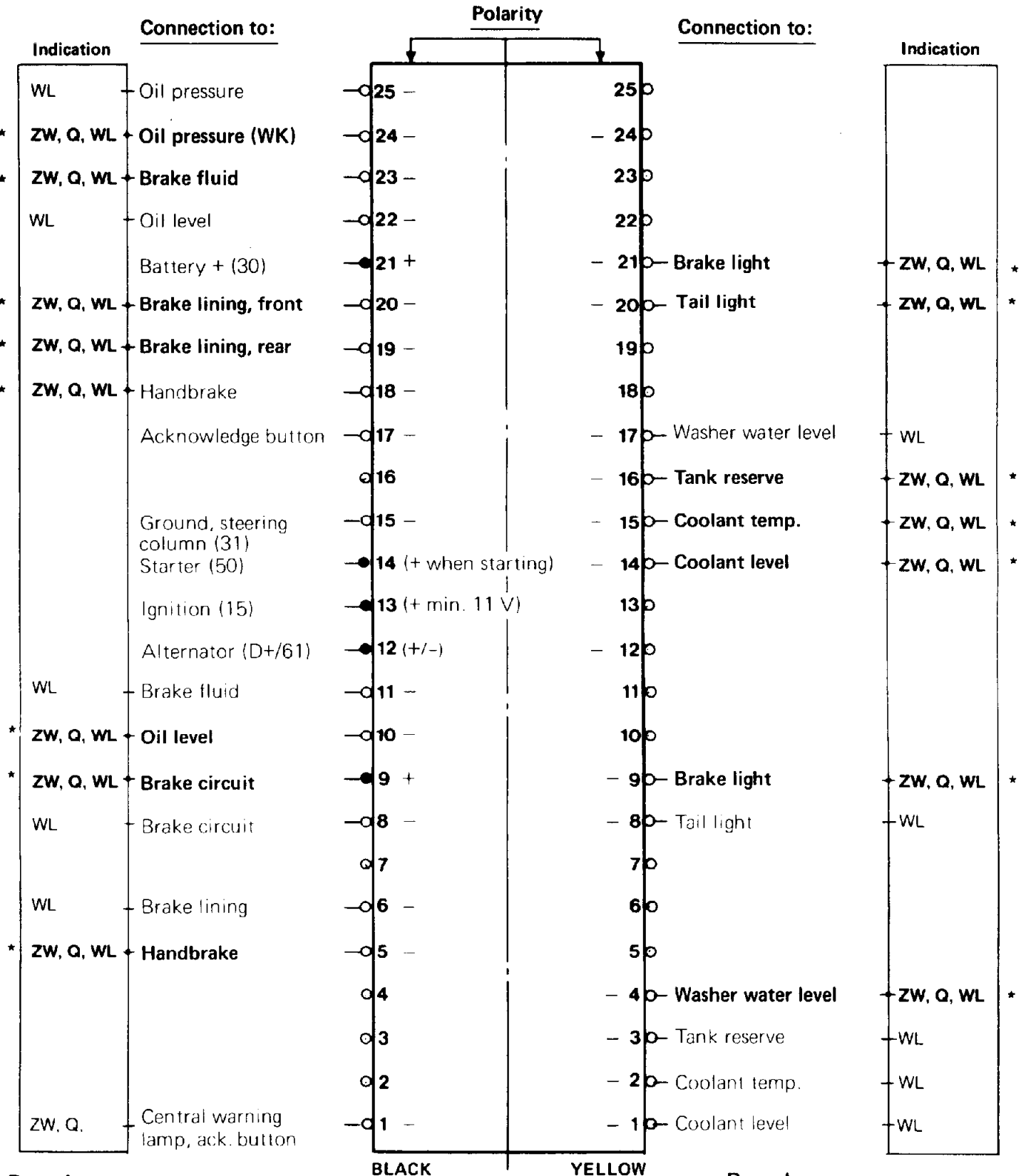
o. g. terminal 15 yellow to ground = ZW, WL, Q must light up (warning system o. k.)
terminal 2 yellow to ground = only WL should light up (connection from connector to WL o. k.)

Caution: Note delayed tripping of warning

4. The central warning is faulty if no warning is tripped at the terminals on which the ZW, Q and WL are shown when you apply the appropriate polarity.
5. The feed line from the transmitter to the central warning is faulty if no warning is tripped after the operational test, but there is a warning when the test as per "item 2" is carried out.
6. If the warning indicator lights when there is no fault, pull of the transmitter cable concerned. The warning indicator must go off and must not come on again (except brake lining wear) — otherwise check wiring (may be connected to wrong ground or one of ground connections on vehicle is loose,), carry out separate test as per items 2 and 5.

CENTRAL WARNING CONNECTIONS UP TO MOD. 83

ZW — central warning lamp WL — warning lamp Q — acknowledge button (reset button in center console)



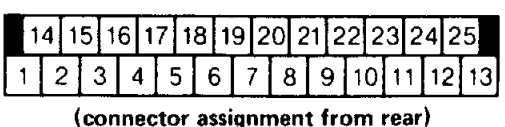
Remarks

Term. 23 delayed!

Term. 9, 10, 23, 24 flash!

Term. 24 only with eng. running!

Term. 17 cancels ZW & Q!



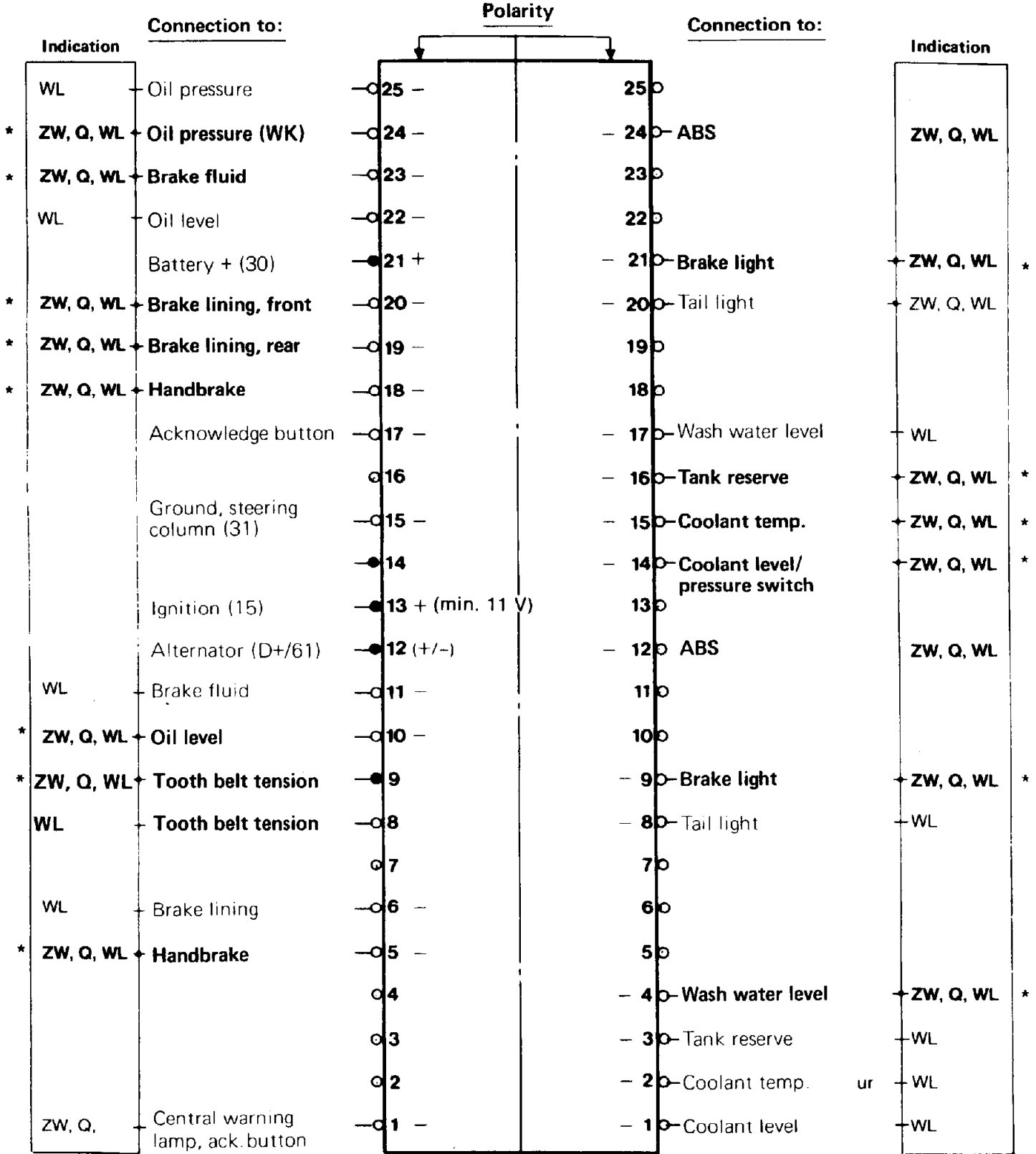
Remarks

Term. 4, 14, 16, (20) delayed!

Term. _____

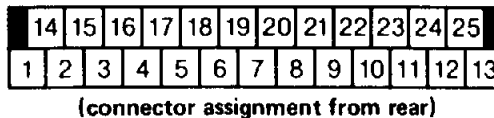
CENTRAL WARNING CONNECTION FROM MOD. 84

ZW — central warning lamp WL — warning lamp Q — acknowledge button (reset button in center console)



Remarks

Term. 23,9 delayed!
 Term. 10, 23, 24 flash!
 Term. 24 only with engine running!
 Term. 17 cancels ZW & Q!



Remarks

Term. 4, 14, 16, (20) delayed!
 Term. _____

ELECTRICAL TROUBLESHOOTING LOGIC

-Do you understand how the electrical consumer is expected to operate?

-Do you have the correct wiring diagram?

-If the circuit contains a fuse, is the fuse okay and of the correct amperage?

-Is there power provided to the circuit? Is the power source the correct voltage?

-Is the ground(s) for the circuit connected and clean of dirt and corrosion?

-Is the circuit being correctly activated by a switch, relay, sensor, microswitch, etc?

-Are all electrical plugs connected soundly with no corrosion or loose wires?



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