BOSCH

Renault (1963-67)
Volkswagen (1963-73)

DESCRIPTION

Bosch manufactures both a two-unit and a three-unit regulator for six and 12 volt systems. In 1973 only the two-unit regulator was made. Two-unit regulators consist of a voltage regulator and a cutout relay. Three-unit regulators incorporate a current regulator in addition to the voltage regulator and cutout relay. The voltage regulator on all Bosch regulators is a two stage unit operating on a double set of contacts. A regulating element of semi-conductive material called "variode" is incorporated in some models. This variode senses temperature variations in the cable due to amount of charging current and ambient temperature.

CAUTION — Before putting generator and regulator into operation, they must be polarized. To polarize generator, momentarily contact lead from positive post of battery to "D+" terminal on regulator (with belt removed). Never polarize by connecting terminal "B+" (on regulator) to terminal "D+" on regulator. Damage may result to regulator, and generator.

APPLICATION

Model	Part No.
Alfa Romeo	
Giulia 1600 (1963-68)	
TI, Sprint, Spider	③RS/VA 200/12 A2
All Others	③VA/14V 25A
BMW	
1500, 1600, 1800 (1963-65)	0 190 350 018
1800 ti (1963-66)	0 190 350 044
1600, 1602 (Before 8/67)	0 190 350 057
Mercedes Benz	
190C, 190DC (1963-65)	①0 190 309 002
220B, 220SB, 220SEB (1963-65)	0 190 309 002
300SE (1963-65)	0 190 309 010
300SEB (1965-67)	0 190 309 010
300SEL (1966-67)	0 190 309 010
Opel	
All Models	
1100 Eng (1966-67)	0 190 350 033
1100, 1500 Engine (1968-70)	0 190 350 049
Porsche	
356 (1963-65)	0 190 309 017
912 (1966-69)	②0 190 350 038
Renault	
R-1094 (1963-66)	190 309 109
R-1095 (1963-67)	190 309 109
R-1130 (1963-67)	190 309 019
R-1131 (1963-65)	190 309 019
R-1132 (1965-66)	190 309 019
R-1133 (1965-67)	190 309 019
Saab	
All Models (1965-66)	③12/A2
Volkswagen	
Type 1	
1963-64	④190 213 015
1964-65	190 213 032
1966	⑤190 213 036
1967-68	190 238 038
1969-72	190 213 069
1973	190 350 068

APPLICATION (Cont.)

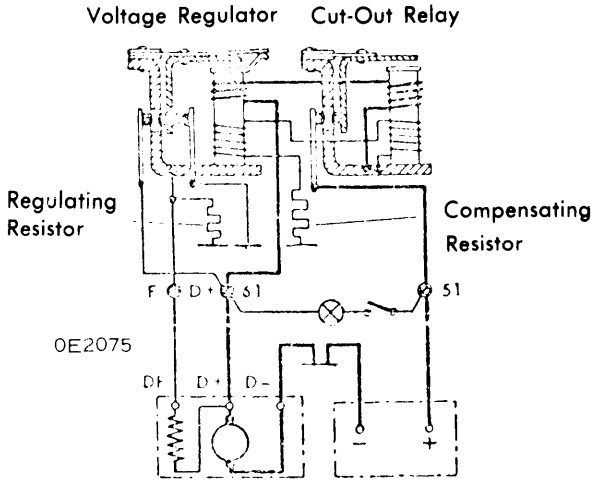
Model	Part No.
Type 2	
1962-64	190 213 031
1965	190 350 030
1966	190 215 025
1967-68	190 350 038
1969-71	190 350 064
Type 3	
1966-68	190 350 038
1969-72	190 350 069
1973	190 350 068
Volvo	
544 (1963-66)	0 190 350 005
122S (1967-68)	0 190 350 005

① — Optional regulator part number is 0 190 300 079.
② — Optional regulator part number is 0 190 350 038.
③ — Type number.
④ — Karmann Ghia uses part number 190 213 013.
⑤ — Karmann Ghia uses part number 190 213 025.

TESTING

CUTOUT RELAY

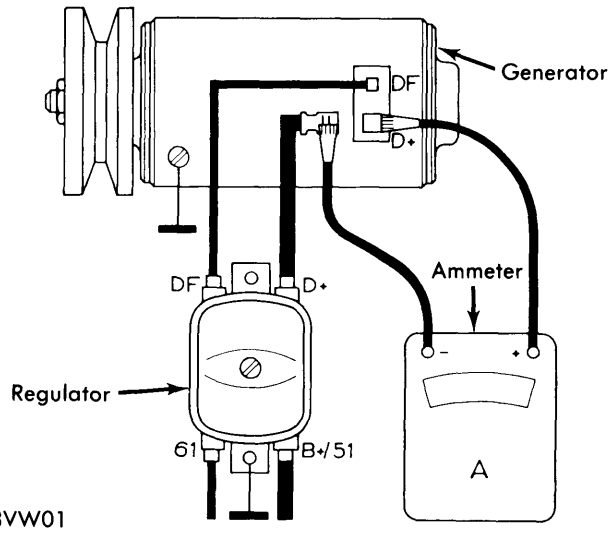
All Regulators (Except 1973) — Check with battery disconnected. Connect a voltmeter to terminal 61/D+ (generator terminal) of regulator and D+ of generator. Connect a variable resistor, adjusted to rated output, to terminal 51/B+ of regulator (battery terminal). Slowly increase generator RPM, voltage should also increase. Relay cuts in when voltage drops abruptly. Reading at this point is cut in voltage (see specifications chart). Check reverse current (see specifications chart) by connecting generator to a half charged battery. Increase generator speed to maximum rated RPM, then decrease slowly. The current indicator will travel into discharge area until relay cuts out. Indicator should then return to zero. Check amperage just as relay cuts out.



TWO-UNIT REGULATOR (TYPICAL)

BOSCH (Cont.)

1973 Regulator – *CAUTION – "D+" terminals on regulator must not be disconnected with engine running as field windings on generator will burn out.* Disconnect "D+" lead from generator. Connect a 15-0-15 amp. ammeter between lead and "D+" terminal. Connect ammeter positive terminal to generator and negative terminal to disconnected lead. Start engine and allow to run at fast idle. Reduce idle until ammeter moves to negative range (see specifications). Turn engine off. Ammeter must jump back to zero before engine comes to a complete stop. If ammeter does not return to zero, cutout relay is defective and regulator must be replaced or adjusted.



CUTOUT RELAY TEST HOOKUP

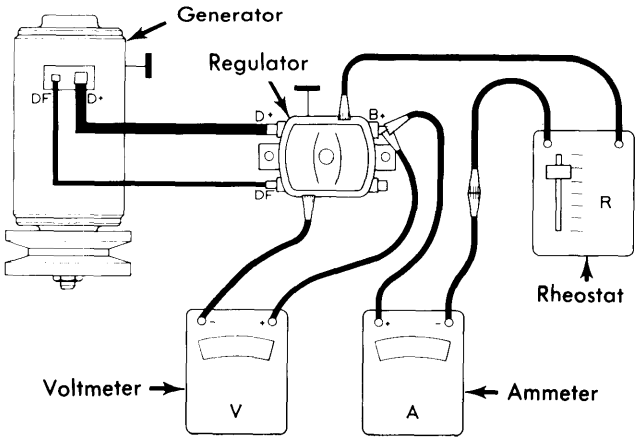
VOLTAGE REGULATOR

All Regulators (Except 1973) – Check regulating voltage with battery and resistance disconnected, at idle and with a cold generator. Connect a voltmeter to terminal 51 of the regulator. Increase speed of generator and read voltage before it increases (see specifications chart).

1) On two-unit regulators, check regulator at load with cold generator. Run generator at approximately twice the rated RPM. Adjust the variable resistor to obtain the load shown on specifications chart. The voltage should be as shown in chart.

2) Three-unit regulators use two stage cutout relays. Low stage is for low RPM and upper stage is for high RPM. When cutout relays go from upper stage to lower stage voltage difference between low and upper stage must not exceed ±.2 volts for six volt units or ±.3 volts for 12 volt units.

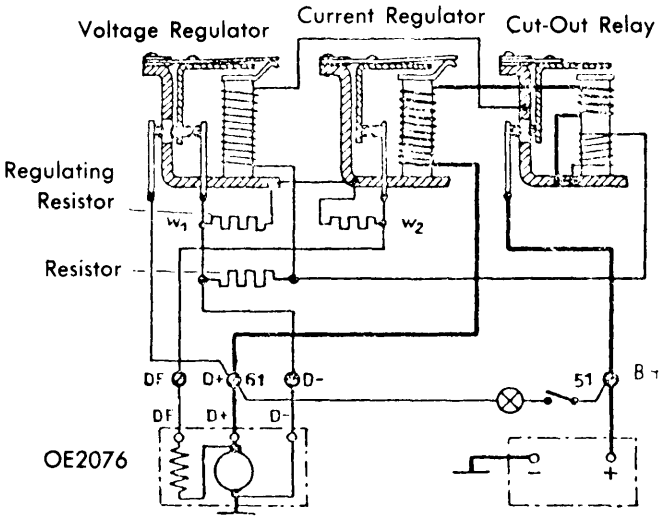
1973 Regulators – This test requires the use of a 0-30 volt voltmeter, a 10-0-50 amp. ammeter and a rheostat that can be loaded to 50 amps. Use a mimimum of nine AWG wire for test connections. Connect leads to regulator terminal "B+/51" and connect voltmeter, ammeter and rheostat as shown in illustration. Start engine and increase speed to about 3000 RPM. Adjust rheostat to proper load setting (see specifications chart). Read regulating voltage and compare to specifications. Adjust or replace regulator if voltage is not to specifications.



VOLTAGE REGULATOR TEST HOOKUP

CURRENT REGULATOR

Three-Unit Regulators Only – Run generator at approximately twice the rated RPM. Connect a second battery parallel to a variable resistor. Increase the resistance until the voltage breaks away. Reading must cover the maximum current listed (see specifications).



THREE-UNIT REGULATOR (TYPICAL)

ADJUSTMENTS ON TWO-UNIT REGULATORS

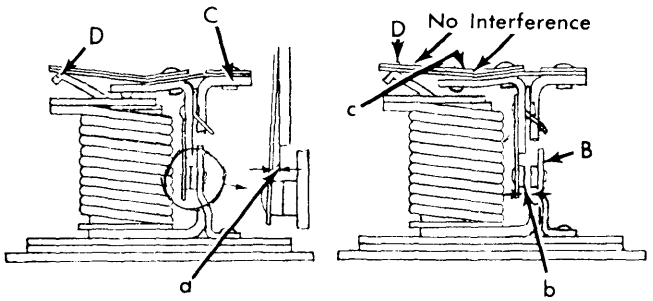
CUTOUT RELAYS

Relay With Temperature Compensation – With armature in cutin position, adjust bending of spring to "a", .008-.020" (.2-.51 mm), by bending bracket "C" (see illustration).

2) With armature in cutout position, adjust gap "b" to .015-.047" (.38-1.19 mm) by bending "B" (stationary relay point). The necessary pressure "c" for closing the points has to be 4.22 ozs. (see illustration).

BOSCH (Cont.)

3) Adjust cutin voltage by bending bracket "C". If further adjustment is needed, bend stop "D". To increase reverse current, decrease clearance "a" by bending "B" and vice versa.



Cut-In Position Cut-Out Position

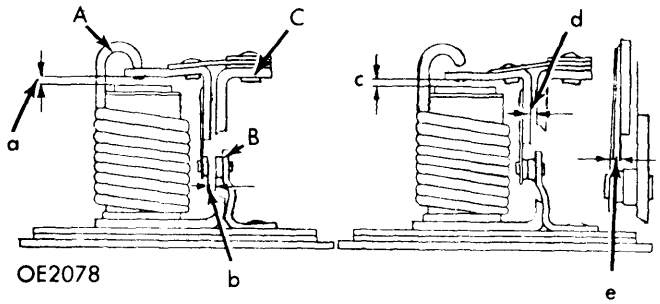
OE2077

CUT-OUT RELAY WITH TEMPERATURE COMPENSATION

Relay Without Temperature Compensation With Flexible Contacts – 1) With armature in cutout position, bend stop "A" for proper clearance "a", .031-.051" (.79-1.3 mm). Bend stationary contact "B" for gap "b", .015-.047" (.38-1.19 mm).

2) With armature in cutin position, check gap "c", .004-.012" (.1-.31 mm). Clearance "d" should be .004-.02" (.1-.51 mm). Spring "e" should bend .008-.02" (.2-.51 mm).

3) Adjust cutin voltage by bending bracket "C". To increase reverse current, decrease clearance "c" by bending "B" and vice versa.



OE2078

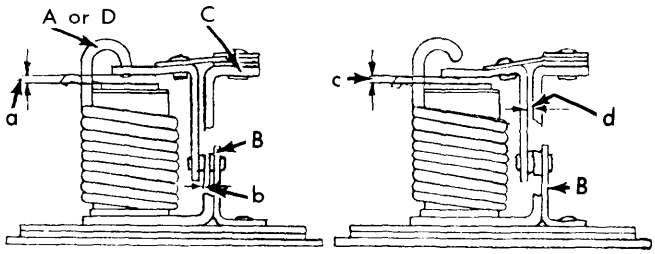
Cut-Out Position Cut-In Position

CUT-OUT RELAY WITHOUT TEMPERATURE COMPENSATION WITH FLEXIBLE CONTACTS

Relay Without Temperature Compensation With (Inflexible Contacts – 1) With armature in cutout position, bend stop "A" for clearance "a" which should be .031-.051" (.79-1.3 mm). Bend "B" (stationary contact) for proper gap of .023-.047" (.58-1.19 mm).

2) With armature in cutin position, check clearance "c" for clearance of .008-.02" (.2-.51 mm). Check clearance "d" which should be the same as "c".

3) Adjust cutin voltage by bending bracket "C". To increase reverse current, decrease clearance "c" by bending "B" and vice versa.



Cut-Out Position Cut-In Position

OE2079

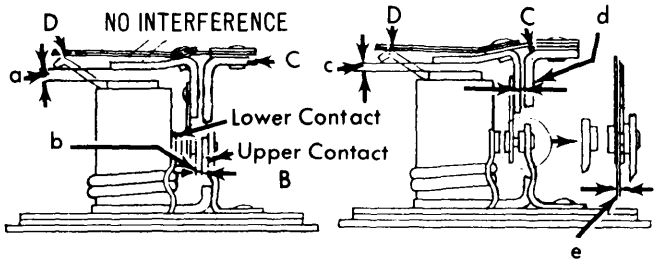
CUT-OUT RELAY WITHOUT TEMPERATURE COMPENSATION (INFLEXIBLE CONTACTS)

VOLTAGE REGULATOR

Regulator With Flexible Contacts & 1973 Regulators – 1) With armature in cutout position, bend "C" for clearance "a", .031-.051" (.79-1.3 mm). Bend "B" (upper stationary contact) for "b" of .01-.015" (.25-.38 mm).

2) With armature in cutin position, check clearance "c". It should be .012" (.31 mm) minimum. Clearance "d" is .008" (.2 mm) minimum. Spring "e" should bend .008-.023" (.2-.58 mm).

3) Adjust the regulating voltage at idle by bending up stop "D" to achieve a higher reading and down to achieve a lower reading.

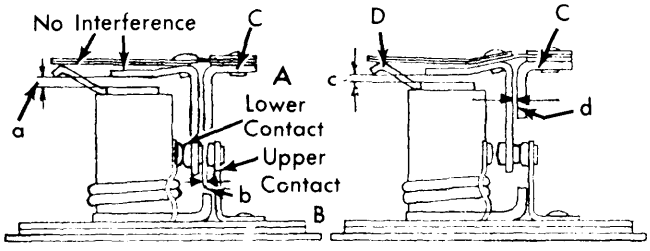


CUT OUT POSITION CUT-IN POSITION

OE2080

VOLTAGE REGULATOR ADJUSTMENT

Regulator With Flexible Contacts – Adjust the same as with flexible contacts except with armature in cutin position. Clearance "c" and "d" should be .003" (.2 mm).



Cut-Out Position Cut-In Position

OE2081

VOLTAGE REGULATOR (INFLEXIBLE CONTACTS)

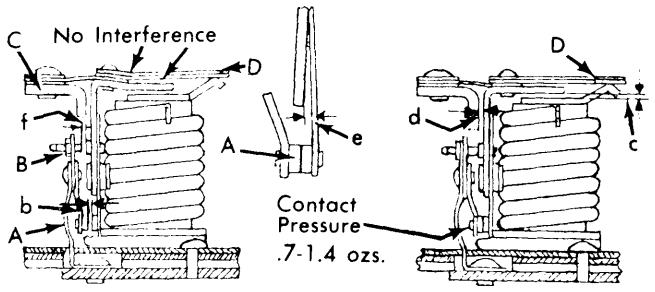
BOSCH (Cont.)

ADJUSTMENTS ON THREE-UNIT REGULATORS

CUTOUT RELAYS

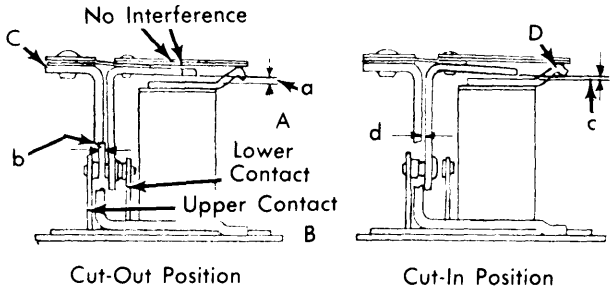
Single Stage Relay – Adjust the same as relay "Without Temperature Compensation With Inflexible Contacts".

Two Stage Relay – 1) With armature in cutin position, adjust "c" to .012-.02" (.31-.51 mm) by bending "C". Clearance "d" must be .008-.02" (.2-.51 mm). Adjust contact pressure to .7-1.4 ozs. by bending the stationary contact.



TWO-STAGE REGULATOR

2) With armature in cutout position, check "e". It should be .012-.015" (.31-.38 mm); "b", .015" (.38 mm) minimum; "f", .02-.047" (.51-1.19 mm).



VOLTAGE REGULATOR

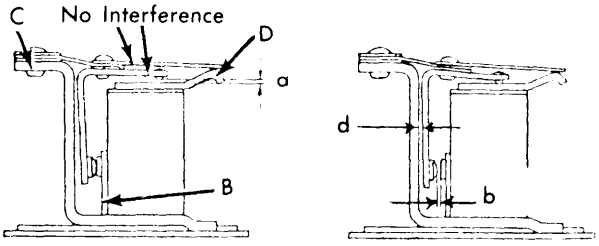
3) Adjust cutin voltage by bending "C". If necessary readjust "b" by bending "B". To increase the reverse current, decrease "c" (cutin position) by bending "B" and vice versa.

VOLTAGE REGULATOR

1) With armature in cutout position, "a" should have a clearance of .031-.051" (.79-1.3 mm). Bend "C" if necessary. Bend "B" (upper stationary contact) for correct gap of "b", .01-.015" (.25-.38 mm).

2) With armature in cutin position, clearance "c" should be a minimum of .008" (.2 mm). Clearance "d" should also be the same.

3) Adjust regulating voltage at idle by bending stop "D". For closer voltage difference between cutout and cutin position, decrease "a" by bending stop "D". Readjust gap "b".



CURRENT REGULATOR

CURRENT REGULATOR

1) With armature in cutout position, adjust "a" to .04-.056" (1.02-1.42 mm) by bending "C".

2) With armature in cutin position, make sure "d" is .012-.031" (.31-.79 mm). Check, and if necessary, adjust gap "b" to .012" (.31 mm) minimum by bending "B" (stationary contact).

3) To make the electrical adjustment, bend stop "C" to achieve correct cutin values (see specifications).

LATE BOSCH GENERATOR REGULATOR CHART

Part Number	Cutout Relay		Regulating Voltage	Current Regulator Setting	
	Cut-In Voltage	Reverse Current Amps.	At Idle Volts	Cold Amps.	Hot Amps.
0190300070	9.6-10.5	11.5	14.6-15.2	.....	.....
0190350063	12.4-13.1	2.5-6.5	12.8-13.8	.....	55
0190350068	12.4-13.1	① 2.5-6.5	12.8-13.8	.....	45
0190350069	12.4-13.1	2.5-6.5	12.8-13.8	.....	45

① – In 1973, reverse current amps. should be 2.0-7.5.

EARLY BOSCH GENERATOR REGULATOR CHART

TWO UNIT REGULATORS

Part Number	Cutout Relay		Regulating Volts		Load Setting	
	Cut-In Voltage	Reverse Current Amps	At Idle Volts	Load Volts	Setting Watts	Current Amps
0 190 213 001	6.2-6.8	2-5.5	7.3-8.0	6.4-7.3	160	31
0 190 213 013	6.2-6.8	2-5.5	7.4-8.1	6.4-7.3	180	34
0 190 213 015	6.2-6.8	2-5.5	7.4-8.1	6.4-7.3	180	34
0 190 213 031	6.2-6.8	2-5.5	7.4-8.1	6.4-7.3	180	34
0 190 213 032	6.2-6.8	2-5.5	7.5-8.1	6.4-7.3	180	34
0 190 214 010	5.5-6.5	2-7.5	7.1-7.8	6.1-7.0	160	29
0 190 214 011	12.3-13.2	.....	.....	13.5-14.5 ①	.....	.....
0 190 215 011	6.2-6.8	2-7.5	7.3-8.0	6.3-7.2	180	34
0 190 215 025	6.2-6.8	3-7.0	7.4-8.1	6.4-7.3	.....	34
0 190 302 069	12.5-13.1	2-7.5	13.5-14.5	12.8-13.8	.....	45
0 190 350 007	12.3-13.2	5-11.5	13.5-14.5	.....	.....	.....
0 190 350 010	12.3-13.2	.....	.....	13.4-14.5	.....	.....
0 190 350 018	5.9-6.3	2-7.5	6.9-7.5	6.2-7	.....	65
0 190 350 023	12.3-13.2	5-11.5	13.5-14.5	.....	.....	.....
0 190 350 030	5.9-6.5	2-7.5	6.9-7.5	.....	.....	.....
0 190 350 050	12.4-13.1	2-7.5	.....	13.4-14.3	.....	.....
0 190 350 057	5.9-6.3	2-7.5	6.9-7.5	6.2-7	.....	65

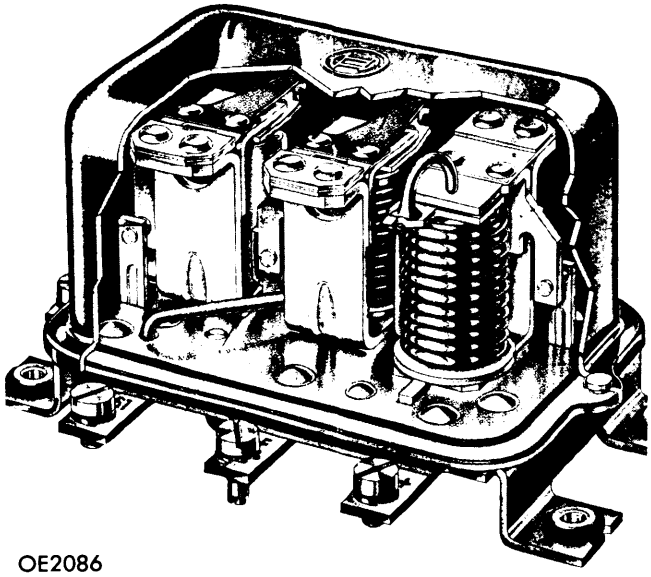
① – Check with light load at 2500 RPM (Engine Speed).

THREE UNIT REGULATORS

Part Number	Cutout Relay		Regulating Voltage	Current Regulator Setting	
	Cut-In Voltage	Reverse Current Amps	At Idle Volts	Cold Amps	Hot Amps
0 190 300 044	6.2-6.8	4-9	6.9-7.6	40-44	37-41
0 190 300 045	12.6-13.5	2-7	13.7-14.7	19-23	17-21
0 190 300 070	9.6-10.5	11.5	14.6-15.2 ①	.....	.....
0 190 300 078	12.6-13.5	4.5-9.5	13.7-14.7	30-34	27-31
0 190 300 079	12.5-13.2	5-11.5	13.5-14.5	37-41	35.5-40
0 190 302 004	12.5-13.2	5-11.5	13.5-14.5	.....	27.5-32
0 190 302 020	12.5-13.2	5-11.5	13.5-14.5	.....	27.5-32
0 190 309 001	6.3-6.7	4-9	7-7.5	50-54	47-51
0 190 309 002	12.5-13.2	5-11.5	13.5-14.5	29-33	27.5-32
0 190 309 009	12.5-13.2	5-11.5	13.5-14.5	29-33	27.5-32
0 190 309 010	12.5-13.2	5-11.5	13.5-14.5	37-41	35.5-40
0 190 309 017	6.3-6.7	4-9	7.0-7.5	50-54	47-51
0 190 309 019	12.6-13.5	4-9	13.5-14.5	.....	.....
0 190 309 039	12.5-13.2	5-11.5	13.5-14.5	49-53	47-52
0 190 309 109	12.5-13.2	5-11.5	13.9-14.9	.....	28-32
0 190 312 006	12.5-13.2	5-11.5	13.5-14.5	22-26	20-25
0 190 350 014	12.5-13.2	5-11.5	13.5-14.5	37-41	35-40
0 190 350 033	12.3-13.2	5-11.5	13.5-14.5	.....	.....
0 190 350 038	12.5-13.2	5-11.5	13.5-14.5	37-41	35-40
0 190 350 044	5.9-6.6	2-8.5	6.8-7.5	.....	.....
0 190 350 064	12.5-13.2	5-11.5	13.5-14.5	37-41	35-40
0 190 350 068	12.5-13.2	5-11.5	13.5-14.5	37-41	35-40
0 190 350 069	12.5-13.2	5-11.5	13.5-14.5	37-41	35-40

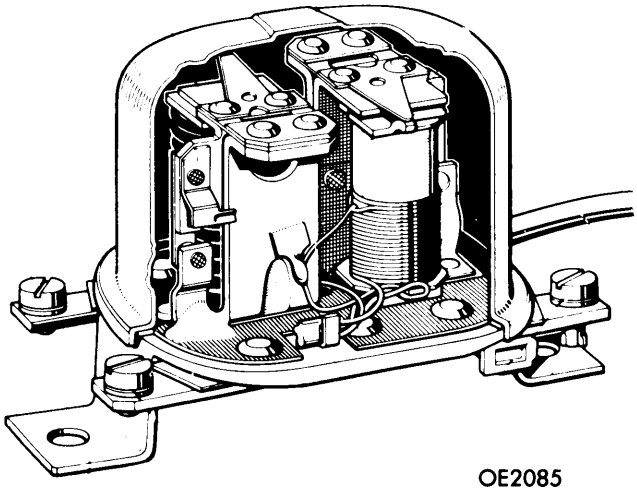
① – No load voltage at 3,000-4,000 RPM (Engine Speed).

BOSCH (Cont.)



OE2086

BOSCH THREE-UNIT REGULATOR (TYPICAL)



OE2085

BOSCH TWO-UNIT REGULATOR (TYPICAL)