

15-5010 Testing alternator with regulator in vehicle

Operation no. of operation texts and work units or standard texts and flat rates:

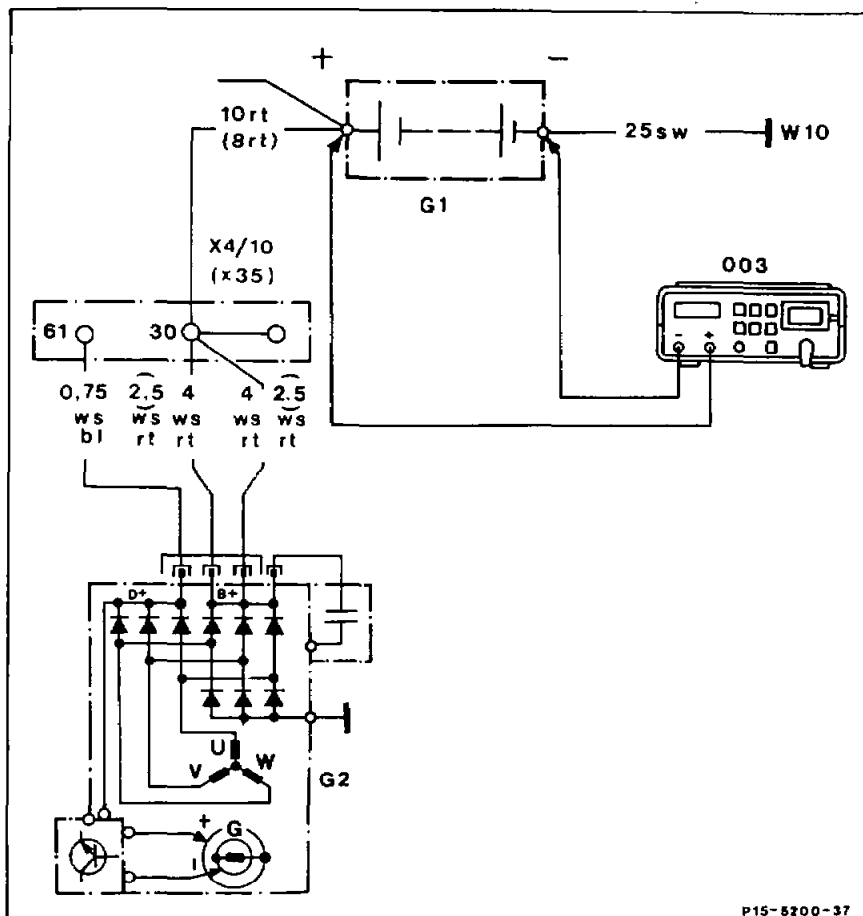
A. Preconditions for test

Electric cables at battery and alternator and also ground cable between engine and body check whether tight and in proper condition.
Poly V-belt tension check (13-342).
Battery electrolyte density measure, specification $\geq 1.24 \text{ kg/dm}^3$.
Charge indicator lamp check operation (see table).

| Ignition/glow start switch in position | Charge indicator |
|--|------------------|
| 0 | OFF |
| 1 | OFF |
| 2 | ON |

B. Testing regulating voltage, engines 102, 103, 104, 111, 601, 602, 603, 605, 606

Preceding work:
Section A. Preconditions for test



Connection diagram

G1 Battery
G2 Alternator
W10 Battery ground

X4/10 Terminal block terminal 30/terminal 61 battery (3-pin)
003 Multimeter

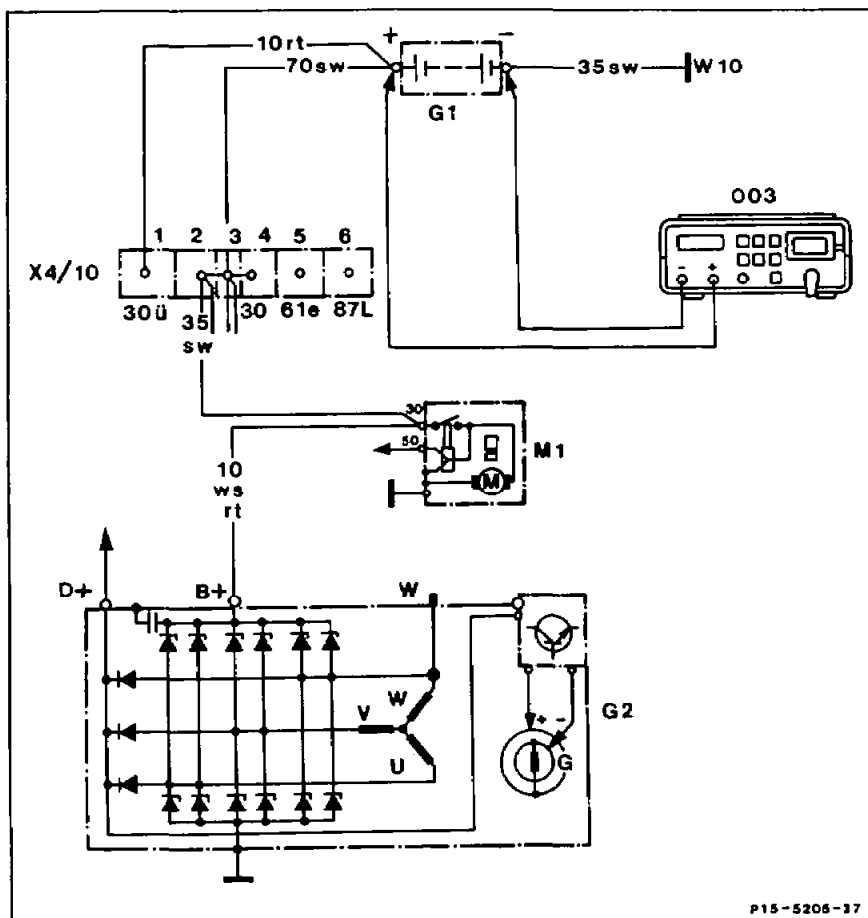
| | |
|--|---|
| Multimeter (003) | connect, disconnect. |
| Engine | start, stop. |
| Operation of charge indicator lamp when idling and at increasing engine speed (up to 3000/min) | check. Indicator lamp must go out. |
| Regulating voltage | check. Run engine at 3000/min. Drain on battery only from positive-operation electrical components (e. g. ignition). Read off regulating voltage after running engine for 2 minutes. Specification 13.0 – 14.5 volts. |

- Regulating voltage > 14.5 volts 1. Replace regulator.
2. Replace alternator if regulator in order.
- Regulating voltage < 13.0 volts 1. Rectify contact resistance at electrical connections of charging system.
2. Perform diode test as per section F.

C. Testing regulating voltage engine 119.974

Preceding work:

Section A. Preconditions for test



Connection diagram

G1 Battery
G2 Alternator
M1 Starter
W10 Battery ground

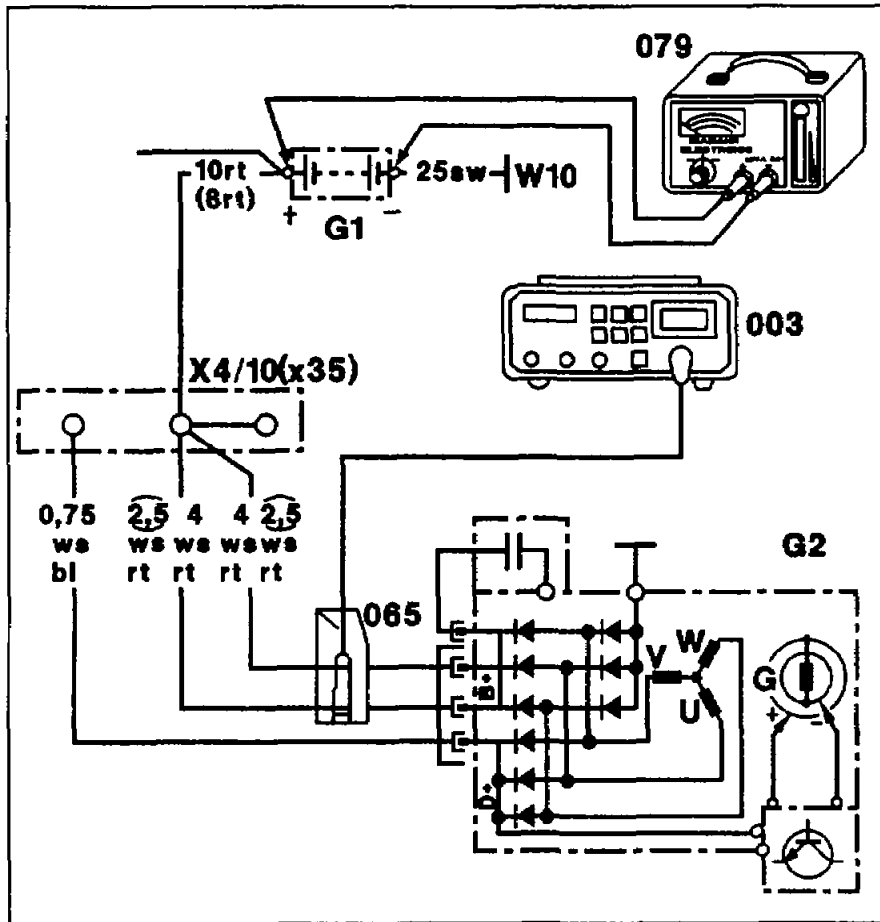
X4/10 Terminal block terminal 30/30Ü, 61e/87L (6-pin)
003 Multimeter

| | |
|--|--|
| Multimeter (003) | connect, disconnect. |
| Engine | start, stop. |
| Function of charge indicator lamp at idle and increasing engine speed (up to 3000 rpm) | check. Charge indicator lamp should go out. |
| Regulating voltage | check. Run engine at 3000/min. Drain on battery only from positive-operation electrical components (e. g. ignition). Read off regulating voltage after running engine for 2 minutes. |
| | Specification 13.0 – 14.5 volts. |

- Regulating voltage > 14.5 volts 1. Replace regulator.
2. Replace alternator if regulator in order.
- Regulating voltage < 13.0 volts 1. Rectify contact resistance at electrical connections of charging system.
2. Perform diode test as per section F.

D. Testing charging current, engines 102, 103, 104, 111, 601, 602, 603, 605, 606

Preceding work:
 Section A. Preconditions for test
 Section B. Testing regulating voltage



P15-5256-37

Connection diagram

| | | | |
|-------|--|-----|---------------|
| G1 | Battery | 003 | Multimeter |
| G2 | Alternator | 065 | DC clamp |
| W10 | Battery ground | 079 | Load resistor |
| X4/10 | Terminal block terminal 30/terminal B1 battery (3-pin) | | |

| | |
|---------------------------|--|
| Multimeter (003) | connect, disconnect. |
| Load resistor (079) | connect, disconnect. |
| Engine | start, stop. |
| Charging current | test. Run engine up to appropriate speed (see table). Apply drain on battery with load resistor until max. charging current is reached. The regulating voltage must not drop below 12.7 volts when this is done. Specification not reached. Perform diode test as per section F. |

Charging current of alternator

| Engine | Charging current at 14 volts Amperes | Engine speed (corresponds to alternator speed of 6300/min) | Transmission ratio engine to alternator |
|---------------------------------|---|--|---|
| 102 | 55 | 2500 | 2.54 |
| 102 ¹⁾ | 70 | 2500 | 2.54 |
| 102 ³⁾ | 80 | 2500 | 2.53 |
| 102.96/102.98 ²⁾ | 70 | 2500 | 2.54 |
| 103 | 70 | 2250 | 2.82 |
| 103 ³⁾ ⁴⁾ | 80 | 2250 | 2.82 |
| 104.98 | 80 | 2500 | 2.53 |
| 104.94/99 | 90 | 2200 | 2.93 |
| 104.94/99 ³⁾ | 120 | 2200 | 2.93 |
| 111 | 70 | 2200 | 2.93 |
| 111 ¹⁾ | 90 | 2200 | 2.93 |
| 111 ³⁾ | 120 | 2400 | 2.63 |
| 601, 602 | 55 | 2500 | 2.54 |
| 601, 602 ¹⁾ | 70 | 2500 | 2.54 |
| 603.91 | 55 | 2200 | 2.89 |
| 603.91 ¹⁾ | 70 | 2200 | 2.89 |
| 603.96 | 70 | 2200 | 2.89 |
| 603.96 ³⁾ | 80 | 2200 | 2.89 |
| 605, 606 | 70 | 2200 | 2.89 |
| 605, 606 ³⁾ | 90 | 2200 | 2.89 |

1) With air conditioner/automatic temperature and automatic climate control.

2) Version with catalytic converter as of 08/89.

3) With optional alternator with larger capacity.

4) (AUS), (USA), (J).

Commercially available testers

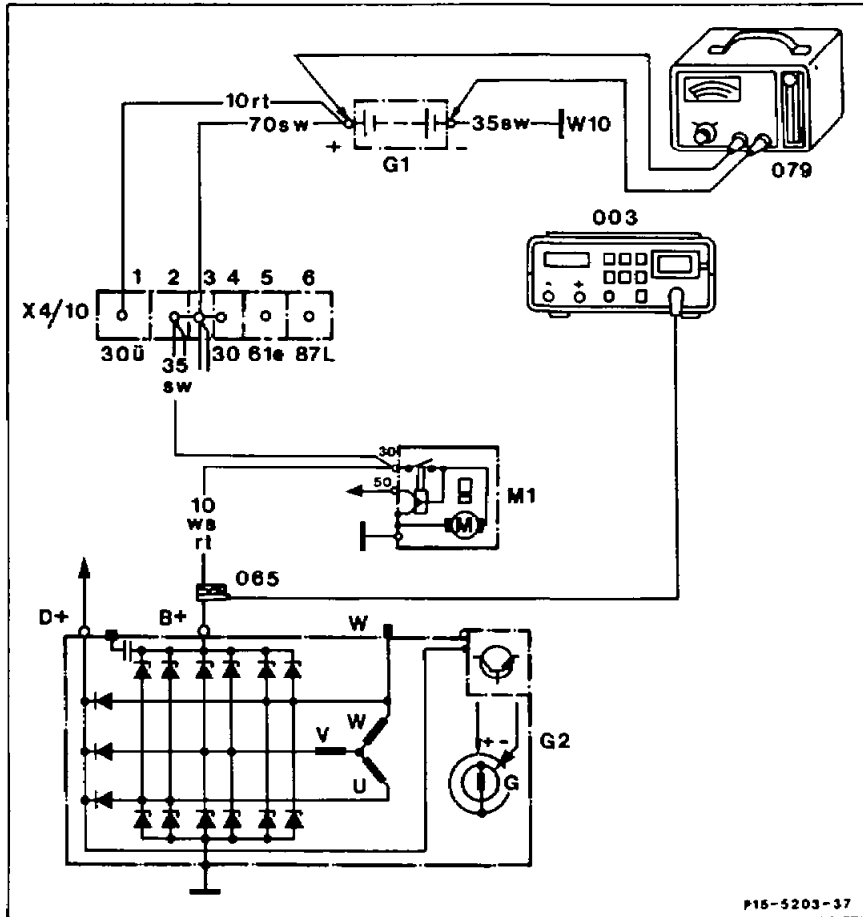
| | |
|---------------|------------------------------|
| Multimeter | e. g. Sun DMM-5 or Fluke, 23 |
| Load resistor | e. g. Hermann, Elektronik |

E. Testing charging current, engines 119.974/975

Preceding work:

Section A. Preconditions for test

Section C. Testing regulating voltage



Connection diagram

| | | | |
|-------|--|-----|---------------|
| G1 | Battery | 003 | Multimeter |
| G2 | Alternator | 065 | DC clamp |
| W10 | Battery ground | 079 | Load resistor |
| X4/10 | Terminal block, terminal 30/30Ü, 61e/87L (6-pin) | | |

| | |
|---------------------------|--|
| Multimeter (003) | connect, disconnect. |
| Load resistor (079) | connect, disconnect. |
| Engine | start, stop. |
| Charging current | test. Run engine up to appropriate speed (see table). Apply drain on battery with load resistor until the maximum charging current is reached. The regulating voltage must not drop below 12.7 volts when this is done. Specification not achieved. Perform diode test as per section G. |

Charging current of alternator

| Engine | Charging current at 14 volts Amperes | Engine speed (corresponds to alternator speed of 6300/min) | Transmission ratio engine to alternator |
|-------------------|---|--|---|
| 119 ¹⁾ | 110 | 2200 | 2.91 |
| 119 ²⁾ | 110 | 2000 | 3.2 |

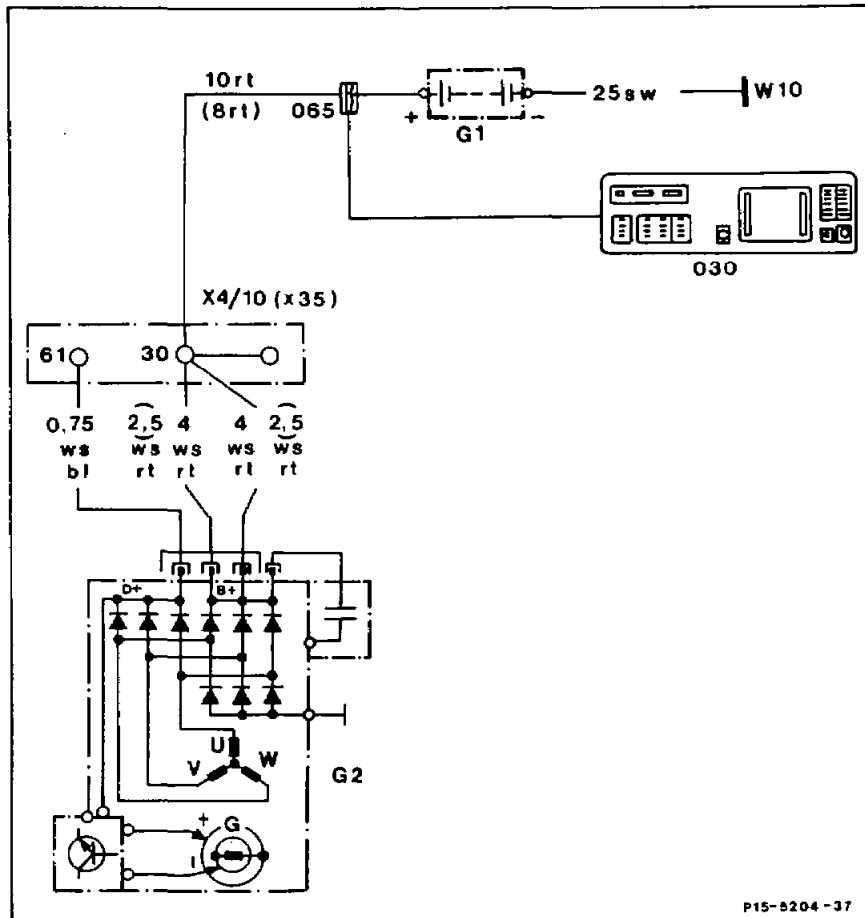
¹⁾ With 8-groove belt drive

²⁾ With 6-groove belt drive

Commercially available testers

| | |
|---------------|------------------------------|
| Multimeter | e. g. Sun DMM-5 or Fluke, 23 |
| Load resistor | e. g. Hermann, Elektronik |

F. Testing diodes, engines 102, 103, 104, 111, 601, 602, 603, 605, 606



Connection diagram

G1 Battery
 G2 Alternator
 W10 Battery ground

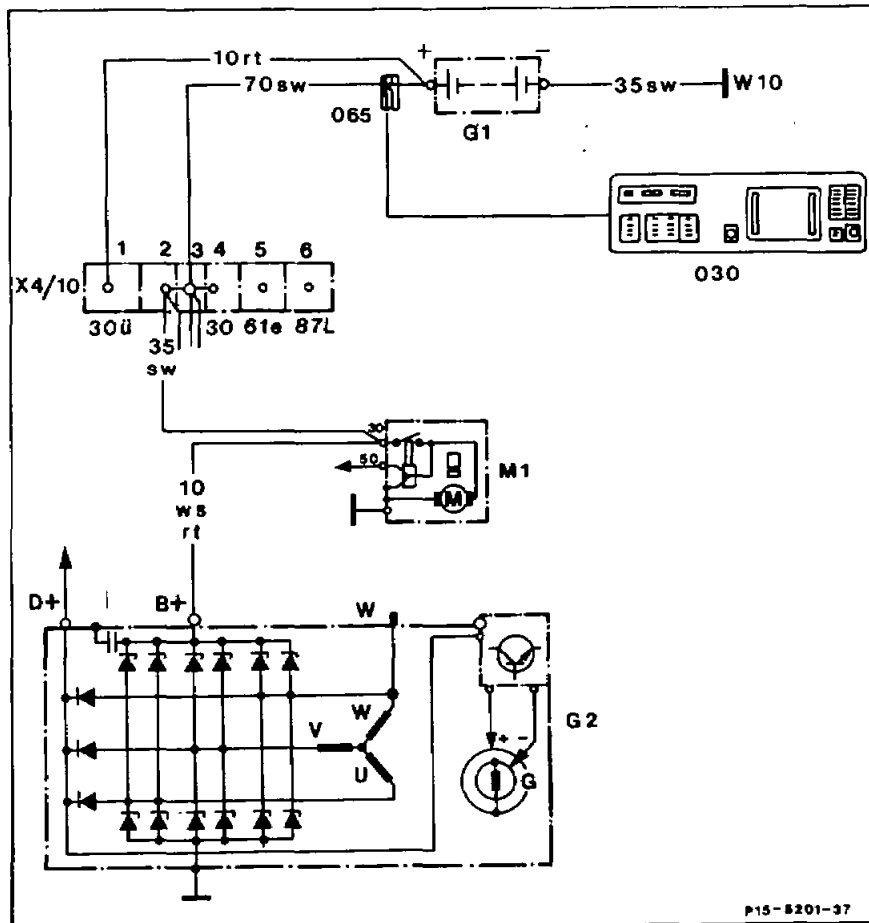
X4/10 Terminal block terminal 30/terminal 61 battery (3-pin)
 030 Engine tester with oscilloscope
 065 DC clamp

Note

It is not possible to assess the exciter diode when performing this test.

| | |
|---|---|
| Engine tester with oscilloscope (030) | connect, disconnect. |
| Engine | start, stop. |
| Low beam | switch on, switch off. |
| Diode harmonics | assess at 3000/min (engine speed) (see section G for diode images). |
| Diode harmonics in order | replace regulator. |
| Diode harmonics not in order | replace alternator. |

G. Testing diodes, engines 119.974/975



Connection diagram

| | |
|-----|----------------|
| G1 | Battery |
| G2 | Alternator |
| M1 | Starter |
| W10 | Battery ground |

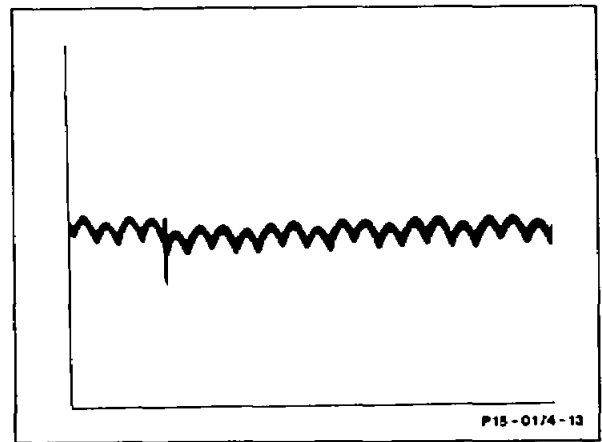
| | |
|-------|--|
| X4/10 | Terminal block, terminal 30/30Ü/ 61e/87L (6-pin) |
| 030 | Engine tester with oscilloscope |
| 065 | DC clamp |

Note

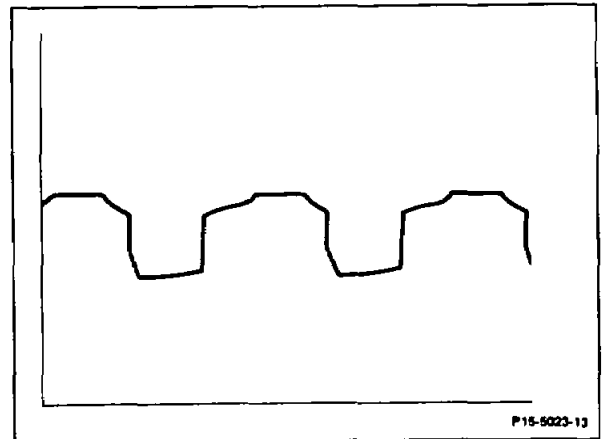
It is not possible to assess the exciter diode when performing this test.

| | |
|---------------------------------------|------------------------------------|
| Engine tester with oscilloscope (030) | connect, disconnect. |
| Engine | start, stop. |
| Low beam | switch on, switch off. |
| Diode harmonics | assess at 3000/min (engine speed). |
| Diode harmonics in order | replace regulator. |
| Diode harmonics not in order | replace alternator. |

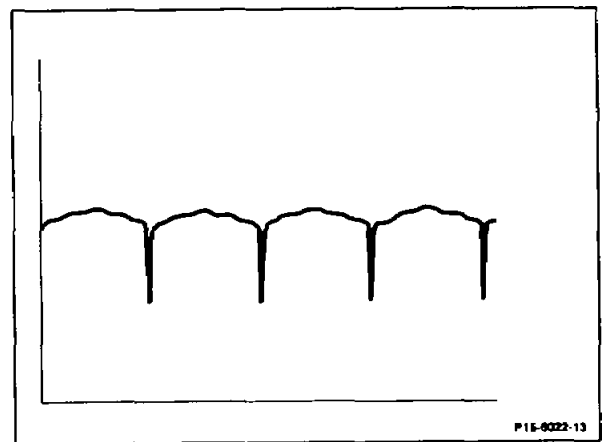
Diode harmonics in order (voltage peaks possible but of no significance) (example)



Harmonics if one positive diode is faulty (example)



Harmonics if one negative diode is faulty (example)



Commercially available tester

Engine tester with oscilloscope

e. g. Hermann, Datascope 980
Bosch, MOT 301/400
Sun, 2110
BEAR, DACE