Durst

TB-E1200/4

ALTERNATOR & STARTER MOTOR TEST BENCH

Operating Instructions

Model TB-E1200/4 | Industrial Test Bench | INS:17 refreshed



Made in Australia by Durst Industries (Aust.) Pty Ltd

1/11 Packard Ave, Castle Hill NSW 2154, Australia | durst.com.au | sales@durst.com.au | +61 2 9660 1755

Contents

Section	Page
Introduction	3
Key features and specifications	4
Important safety information	5
Installing the test bench	6
Installing the batteries	6
Drive motor, transverse slide and mounting	8
Reading electrical meters	9
Panel meters, controls and terminals	10
Generator tests	12
Testing generator maximum output	14
Setting the generator regulator	15
Alternator tests	18
Alternators with external regulators	20
Other alternator tests: maximum output	22
Starter tests	24
Using the diode tester	26
Using the regulator tester	28
Other tests with the TB-E1200	30
Optional extras	30
General maintenance	31
Extreme environment maintenance	32
Maintenance checklist and log	33
Troubleshooting	34
Disclaimer, warranty and support	34

Introduction

Read this manual before installing or operating the TB-E1200/4. Keep it with the bench.

Welcome to Durst automotive test, charging and diagnostic equipment. The TB-E1200/4 is a heavy-duty industrial test bench for alternators, generators and starter motors. It is designed for professional automotive, transport, marine, mining, defence, council and TAFE workshops.

All Durst equipment is manufactured to high standards, checked before leaving the factory, and covered by the Durst warranty. For inquiries or problems, contact Durst Sales and Technical Services. Include a full description of the problem, the equipment type and the serial numbers.

IMPORTANT: Vehicle manufacturers' service and overhaul manuals should be consulted at all times to confirm fault diagnosis, remove-refit and overhaul instructions, as well as test procedures and specifications.

Intended use

- Test 6V, 12V and 24V DC charging and starting systems.
- Run generator motor tests, maximum output tests and regulator settings.
- Test alternators with internal or external regulators, plus maximum output.
- Test starter motors for pinion clearance, no-load performance and locked-armature torque.
- Test alternator diodes and electronic voltage regulators on the built-in diode and regulator testers.

Key features and specifications

Figures below come from the TB-E1200-4 specifications sheet and the original operating instructions.

Key features

- Fully reversible rotation, clockwise and anti-clockwise.
- Fingertip speed dial with forward and reverse control from the panel and remote.
- Precision double-sprung jewel moving-coil panel meters with anti-static lenses and mechanical zero screws.
- Tachometer with calibrated forward and reverse display via tacho impulse pick-up.
- Heavy-duty shunt and selectable ammeter scales.
- Switchable A-circuit and B-circuit field warning lights.
- Combination poly-Vee and V-section belt drive for a wide range of alternators and generators.
- Acme-thread feed screw with crank handle for fast belt tensioning on the side platform.
- Quick clamp for alternators (Durst TBA-669 style pegs and ratchet levers) plus a robust universal V-clamp for generators and starters.
- Mains isolation switch and circuit breaker, plus an emergency stop that shuts the bench down.
- Battery isolation key switch and sliding bus-bar voltage selector.
- Free-standing powder-coated zinc steel frame with accessory shelf and battery compartment.
- Conforms to ASI360 Part 11 (1980) as stated on the specifications sheet.

Performance

Specification	Value
DC capacity	Tests 6V, 12V and 24V systems as standard
Supply voltage	415 V, 50 Hz, three phase (as stated on the specifications sheet)
Drive motor	Australian-made 4.0 kW heavy-duty fan-cooled
Starter testing	Tests starters to 1500 A
Drive speed	Variable speed 5000 to 0 to 5000 rpm
Alternator / generator load	To 2.64 kW (220 A at 12V and 110 A at 24V)
Voltmeter ranges	0 to 10 V, 0 to 20 V, 0 to 50 V (switched)
Ammeter scales (INS)	50 A, 100 A and 500 A (500 A auto when using starter terminals)
Diode meter	Centre scale 3 to 0 to 3 A DC
Regulator meter	0 to 20 V DC and 0 to 40 V DC

Physical and included accessories

Specification	Value
Weight	Approx. 150 kg (in crate approx. 165 kg)
Width	850 mm (in crate 920 mm)
Depth	780 mm (in crate 1000 mm)
Height	1450 mm (in crate 1600 mm)
Carbon pile rheostat	TB-667, attached with the bench
Battery leads	x 3
Test leads / clips	LS-150 x 1, LS-151 x 3, LS-152 x 3, LS-153 x 1
Leads	LS-611B x 1, LS-611R

Important safety information

EARTHING

Earthing-type plugs are fitted to equipment that needs alternating current power.

If the plug will not fit the outlet, contact a licensed electrician.

Do not under any circumstances disconnect the earthing wire.

STARTER MOUNTING

Do not attempt starter tests with the starter secured in a vice. The starter may free itself and injure personnel.

Mount starters in the bench clamp as described in this manual.

General precautions

- Install the bench on a level site with convenient power and access to both sides for battery servicing.
- For added stability, secure the bench to the floor.
- Know where the emergency stop is (left-hand side of the main panel). It shuts the motor down. Turn it clockwise to reset before restarting from the remote control.
- Reduce drive speed before stopping the motor. Switch the bench off at the main switch next to the circuit breaker when finished.
- Use test leads of adequate size for the full-load current of the unit under test.
- Keep hands, clothing and tools clear of belts, pulleys and rotating parts.
- Do not continue a generator or alternator test if the unit temperature becomes excessive.
- If maximum current is not known during a generator maximum-output test, do not exceed 25 A.

Batteries

- Batteries can emit explosive gases. Keep sparks, flames and smoking away from the battery compartment.
- Check polarity carefully before connecting. Reverse polarity can damage meters and the unit under test.
- Isolate the batteries with the key switch when the bench is not in use.

Installing the test bench

Set the bench up once, check power and controls, then fit the batteries.

1. Position and power

1. **Choose the site.** Level floor, convenient power outlet, and access to the left and right sides for battery servicing. Secure the bench to the floor if needed.
2. **Connect power.** Plug the test bench into the correct supply as fitted for your unit. Turn power on at the switch.
3. **Locate the main switch.** The main switch and circuit breaker are on the right-hand side of the control box and panel.
4. **Turn the bench on.** Switch the test bench on at the main switch.

2. Remote control and first run

1. **Take the remote.** Locate the remote control on the right-hand side of the control box and panel. Lift it off the hanging pin.
2. **Select direction.** Use the remote to select motor direction (clockwise or anti-clockwise) of the drive pulley.
3. **Set speed.** Dial in the speed required to test the alternator. The LCD also shows motor shaft speed.
4. **Stop cleanly.** After the test, reduce speed and select motor stop. Switch the bench off at the main switch next to the circuit breaker.

EMERGENCY STOP: The emergency stop is on the left-hand side of the main panel and shuts the motor down. Turn it clockwise to reset before starting the motor again from the remote control.

Installing the batteries

Locate the batteries conveniently behind the unit and connect the cables according to their markings as illustrated in Figure 1. Note that 4 x 6 V, or 2 x 6 V and 1 x 12 V batteries, may be used.

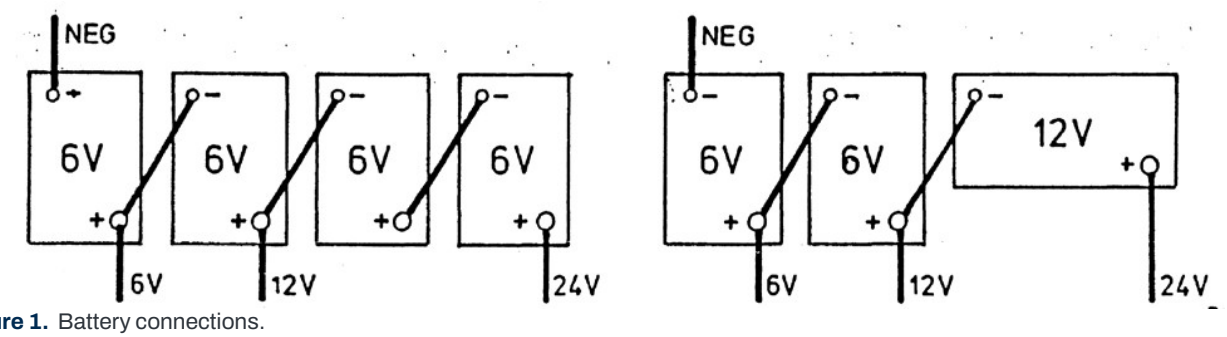


Figure 1. Battery connections.

Check battery voltage on the bench voltmeter

1. **Select the range.** Set the voltmeter range switch to 50 volts and identify the 0 to 50 scale on the voltmeter face.

2. **Check each tap.** Connect the black terminal to the NEGATIVE terminal and touch the red lead in turn to the 6V, 12V and 24V terminals. If the connections are correct, the voltmeter will show 6V, 12V and 24V as the red lead is touched to each terminal.

Drive motor, transverse slide and mounting

Test bench drive motor

TB-E1200 series benches are driven by a high-torque variable-speed motor designed for Durst test benches. A control knob sets speed. Push buttons set direction. Robust construction and sealed armature bearings mean the Durst motor needs very little maintenance.

Transverse slide

The transverse compound slide secures units during testing. A universal V-clamp is provided with the bench, as is the Durst TBA-669 quick-acting alternator clamping bracket.

Mounting generators and alternators

- Mount generators and alternators on the slide with their drive pulley facing the control panel case. If a voltage regulator is being tested, secure it with bolts and nuts to the regulator mounting plate provided.
- Install the drive belt between the drive motor and the generator or alternator pulley. Use the correct belt type for multi-ribbed pulleys. Align the belt in a straight line between the pulleys.
- Tension the drive belt. Use hand pressure on the feed-screw crank only when adjusting the slide and tightening the lock clamps.
- Switch the drive motor ON. Operate the speed and direction controls to obtain the correct direction of rotation. Check that the unit turns freely.
- Switch the motor OFF, reducing speed first.
- Use test leads with suitable terminals. Leads from the panel terminals to the unit output must be sized for the specified full-load current.

Mounting starter motors

- Mount starter motors on the slide with their drive assembly facing away from the control panel case. This allows a hand-held or electronic tachometer to measure rpm, and the optional Durst TBA-671 starter torque arm to measure starter torque.
- Use test leads with suitable terminals. Leads from the panel terminals to the starter must be sized for the specified full-load current.

Reading electrical meters

The analogue meters across the top of the panel are your main readouts during every test.

These are moving-coil analogue meters. The value is shown by a pointer moving across a graduated scale.

Before every measurement: Select the range on the meter selector switch. Identify the scale on the meter face. Determine the value of the smallest scale increment.

Example

If the AMPS selector is set to 100, the centre scale on the instrument face is in use. That scale has four graduations between 0 and 20. Each small space equals 4 A (0, 4, 8, 12, 16, 20 A).

Acceptable reading accuracy is half of the smallest scale division. On the 100 A range that means about 2 A.

MECHANICAL ZERO: At the lower centre of each meter is a small screw used to set the pointer to zero with no power on the meter. Turning the screw rotates a cam that moves the pointer a small amount.

Panel meters, controls and terminals

Meters sit at eye level. Range selectors and meter terminals sit just below them. The voltage selector bridge is at the centre of the lower panel, with alternator and generator terminals to the right and starter terminals to the left.

VOLTS DC meter

Indicates the voltage in the circuit connected to the GENERATOR VOLTS terminals. Scales: 0 to 10, 0 to 20 and 0 to 50 V, selected by the VOLTS switch below the meter. Check polarity when using the voltmeter.

- Momentarily touch the voltmeter leads to the circuit while watching the meter. Upscale (left to right) means polarity is correct. Downscale (right to left) means reverse the leads.
- Reverse polarity can stick the pointer below zero. A light tap on the panel below the meter usually restores it.

RPM x 100 meter

Shows drive-motor speed, clockwise or anti-clockwise, in revolutions per minute. Actual speed of the unit under test depends on direct coupling or the pulley ratio when belt-driven. Speed and direction are controlled from the motor speed control.

AMPERES DC meter

Connected between the generator test terminals and the voltage selector bridge, the ammeter registers current to or from the alternator or generator under test. Scales: 50, 100 and 500 A, each with a displaced zero. The 50 and 100 A scales are selected by the AMPS selector for generator and alternator testing. The 500 A scale activates automatically when current is taken from the starter test terminals.

- On generator or alternator tests, the ammeter shows current flowing to or from the bench batteries.
- On starter tests, the ammeter shows current flowing from the bench batteries to the starter.

Voltage selector bridge

Selects the operating voltage for the test. Three battery supply terminals (6V, 12V, 24V) and a centre terminal. Loosen the centre and battery terminals, rotate the bridge so the slotted end engages the required supply terminal, then tighten with finger pressure only.

Ground terminal and selector bridge

Connects the frame ground of the bench to positive (for positive-earthed components) or negative (for negative-earthed components). Loosen GROUND and the POSITIVE GEN ONLY / NEGATIVE terminals, rotate the bridge to the required polarity, then tighten with finger pressure only.

Main power terminals

POSITIVE GEN ONLY. Positive output from the bench batteries for generators, alternators and any test that needs bench battery power.

NEGATIVE. Negative polarity for the POSITIVE GEN ONLY terminal.

Starter test terminals

- STARTER SOLENOID: powers the shift solenoid on pre-engaged starters when PRESS TO OPERATE is pressed.
- STARTER 500 AMPS: powers the starter under test when PRESS TO OPERATE is pressed.
- Current from either terminal is shown on the AMPERES DC meter 500 A scale.

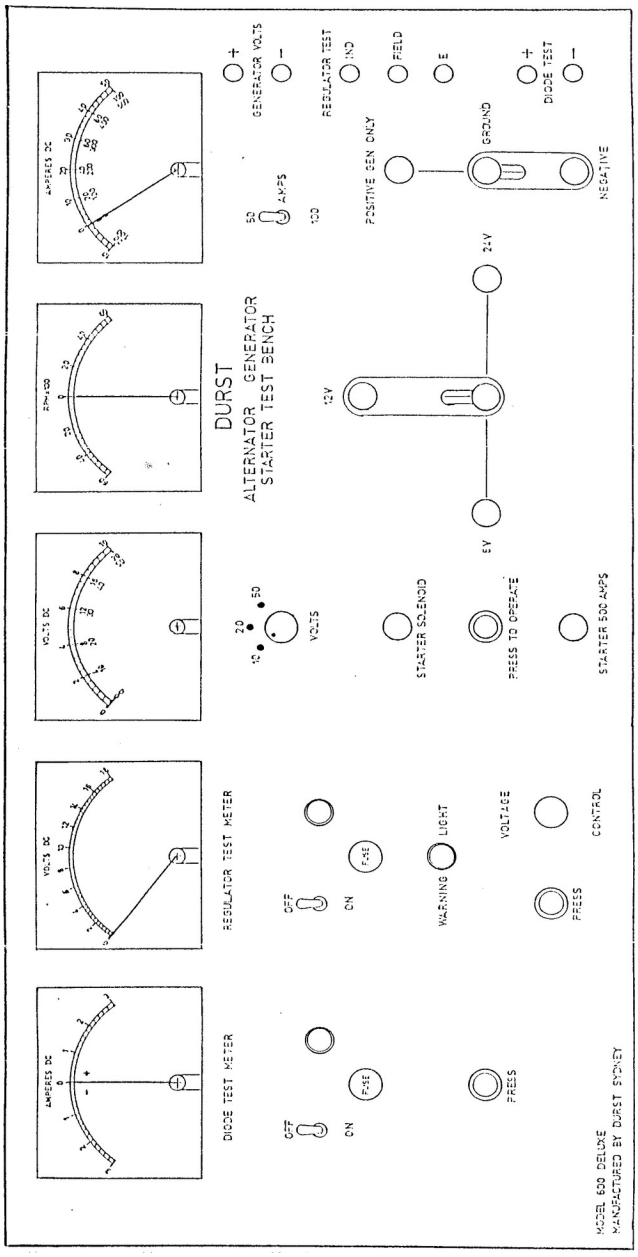


Figure 11. Control panel.

Generator tests

Start with the motor test. It checks condition and polarises the generator.

Generator as motor

A simple, quick test for a DC generator is to see if it will run as a motor. Besides indicating condition, the motor test polarises the generator. The field is connected to the armature and current is applied to the armature and ground so the unit runs as a shunt motor. Output rpm is low. The lower the speed, the better the unit will perform as a generator, because motor speed relates to the speed at which charging will commence.

Before this test, the field connections must be known. There are two types. Refer to Figure 2.

Type A. Field internally connected to armature positive. An earth is applied through the voltage regulator contacts. Bosch generators are generally Type A.

Type B. Field internally connected to armature negative. A positive is applied through the voltage regulator contacts. Lucas, Delco Remy and other American generators are generally Type B.

Look for identification letters on the generator. The armature terminal is usually A, B+ or D+. The field is usually F or DF. If a voltage regulator or cut-out is fitted, disconnect it for the motor test.

- Type A: link DF and D- / D+ as required. Apply negative to the D- terminal and the generator frame before applying positive to D+.
- Type B: link D+ and F. Apply positive to D+ and negative to the generator frame.

During the motor test the ammeter indicates to the left of zero (current taken from the bench batteries). See Figure 3 for the motor-test connection diagram.

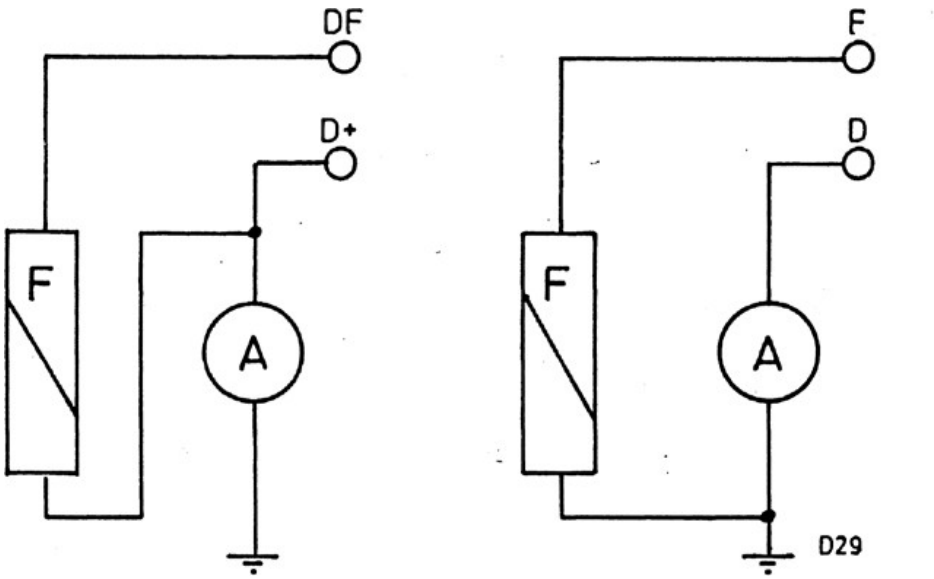


Figure 2. Generator Type A and Type B connections.

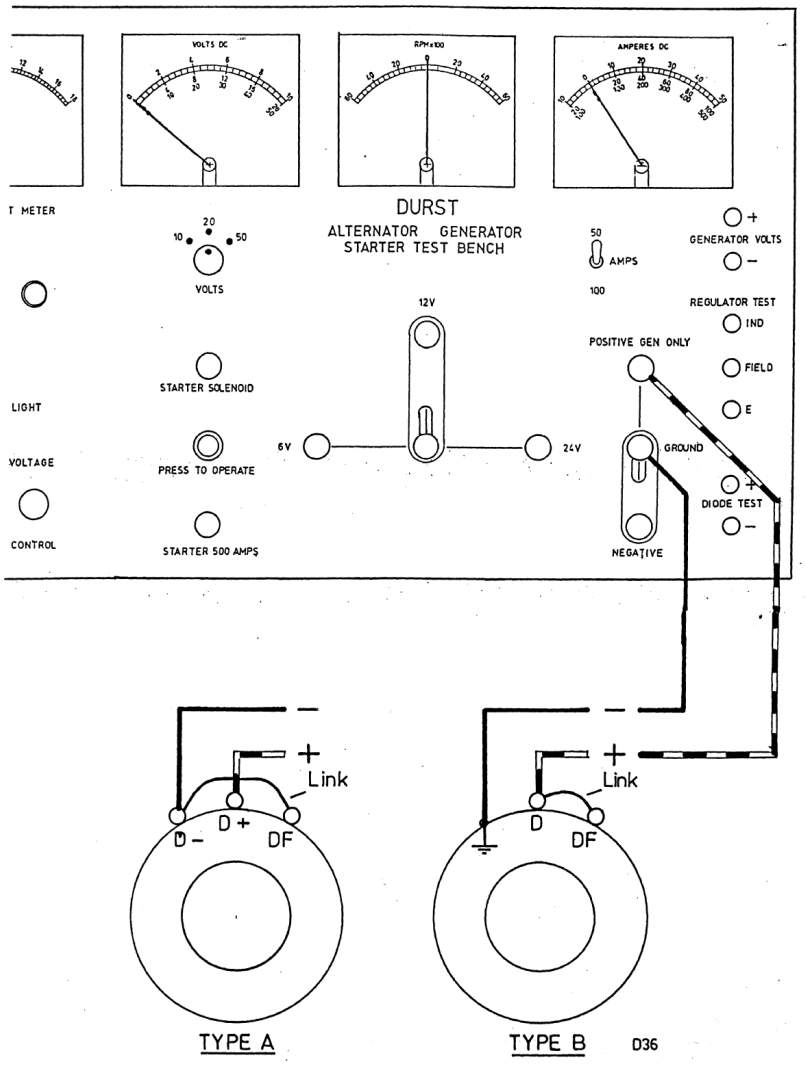


Figure 3. Generator test connections. Motor test.

Testing generator maximum output

When testing maximum output, the field must be excited directly from a battery of the same voltage as the generator. The connection is the same as the motor test in Figure 3. The procedure below is for 12 V Type B generators and must be modified where necessary for Type A.

NOTE: Terminal codes. Armature: B+, D+ or A. Field: DF or F.

1. **Mount the generator.** Mount as described earlier.
2. **Set polarity and ranges.** Select GROUND to NEGATIVE on the polarity bridge. Set AMPS to 50 A. Set VOLTS to 50 V.
3. **Connect power leads.** POSITIVE GEN ONLY to the generator armature. NEGATIVE to the generator frame. Link armature to field at the generator with a short conductor and suitable terminals or clips.
4. **Connect the voltmeter.** VOLTS + (red) to the armature. VOLTS - (black) to the generator frame.
5. **Start the drive.** Switch the motor ON and drive the generator at low speed in the direction marked on the generator frame.
6. **Select 12V.** Connect the voltage selector bridge to 12V. The ammeter may show a slight discharge.
7. **Raise speed.** Increase speed while watching the voltmeter and ammeter. The ammeter shows output current into the bench batteries. Current depends on battery state of charge and drive speed. Raise speed until maximum output is reached.

CAUTION

If maximum current is not known, do not exceed 25 A.

Discontinue the test if generator temperature becomes excessive.

1. **Shut down.** Reduce drive speed until the ammeter is approximately zero. Open the voltage selector bridge. Turn the motor OFF. Disconnect leads and remove the generator.

Setting the generator regulator

The generator electro-mechanical regulator combines three functions: cut-out, current regulator and voltage regulator.

- Cut-out: closes the circuit to the electrical system and battery when the generator is running, and opens it when generator voltage is less than battery voltage (idle or stopped).
- Current regulator: limits generator output current to protect the armature.
- Voltage regulator: regulates output voltage to protect the electrical system and battery.

Check the manufacturer's specifications for air and contact gap clearances and for voltage, current and cut-out settings. Make electrical settings in this order: voltage regulator, cut-out, then current regulator.

TYPICAL SETTINGS (example only)

Voltage regulator open-circuit voltage: 14.9 to 15.5 V.

Cut-out closes: 12.7 to 13.3 V; opens when reverse current is 2 to 5 A.

Current regulator: 25 A.

The procedure below is typical for Lucas or Delco Remy Type B 12 V negative-ground generators with a three-unit voltage regulator. See Figure 4.

Preliminary set-up

1. **Mount units.** Mount the generator. Remove the regulator cover and mount the regulator on the plate on the transverse slide.

2. **Set polarity and ranges.** GROUND to NEGATIVE. AMPS to 50 A. VOLTS to 20 V.

3. **Connect the circuit.** POSITIVE GEN ONLY to regulator BAT.
   NEGATIVE to generator frame.
   Generator armature to regulator GEN.
   Generator field to regulator F.
   Generator frame to regulator base.
   VOLTS + (red) to regulator GEN.
   VOLTS - (black) to the NEGATIVE terminal on the selector bridge.
   Voltage selector bridge to 12V.

Setting the voltage regulator

1. **Isolate the cut-out.** Place an insulator between the cut-out contacts.

2. **Run and adjust.** Switch the motor ON and drive at approximately 2000 rpm. Adjust regulator armature spring tension for 14.9 to 15.5 V. Increase to approximately 3500 rpm. Voltage should remain steady.

3. **Stop.** Reduce speed, switch the motor OFF, and remove the insulator.

Setting the cut-out

1. **Find cut-in.** Switch the motor ON and raise rpm while watching the voltmeter. Voltage rises then falls slightly when the cut-out closes. This should occur between 12.7 and 13.3 V at approximately 1450 rpm.

2 **Check charge.** Increase speed and check the ammeter. Current depends on battery state of charge and drive speed. A positive current should be indicated.

3 **Check cut-out drop.** Reduce speed while watching the ammeter. It drops below zero then returns to zero as the cut-out opens. Operation should be between -2.0 and -5.0 A. Switch the motor OFF.

Setting the current regulator

1 **Short the voltage contacts.** Short-circuit the voltage regulator contacts.

2 **Run and adjust.** Switch the motor ON and drive at approximately 4000 rpm. The ammeter should show 25 +/- 1 A. Adjust armature spring tension if needed (more tension increases current).

NOTE: You may need a load across the battery (Durst 667 carbon pile rheostat or Durst battery load tester 2003 or 3006) to reach rated current.

1 **Shut down.** Reduce speed until the ammeter is approximately zero. Open the voltage selector bridge. Turn the motor OFF.

Final check

1 **Refit the cover.** Replace the regulator cover. Connect the voltage selector bridge to 12V.

2 **Warm run.** Drive at approximately 3000 rpm until the generator is warm to the touch. Watch VOLTS DC so voltage does not exceed the earlier setting.

3 **Finish.** Reduce speed to approximately zero amps. Open the voltage selector bridge. Turn the motor OFF. Disconnect and remove the generator and regulator.

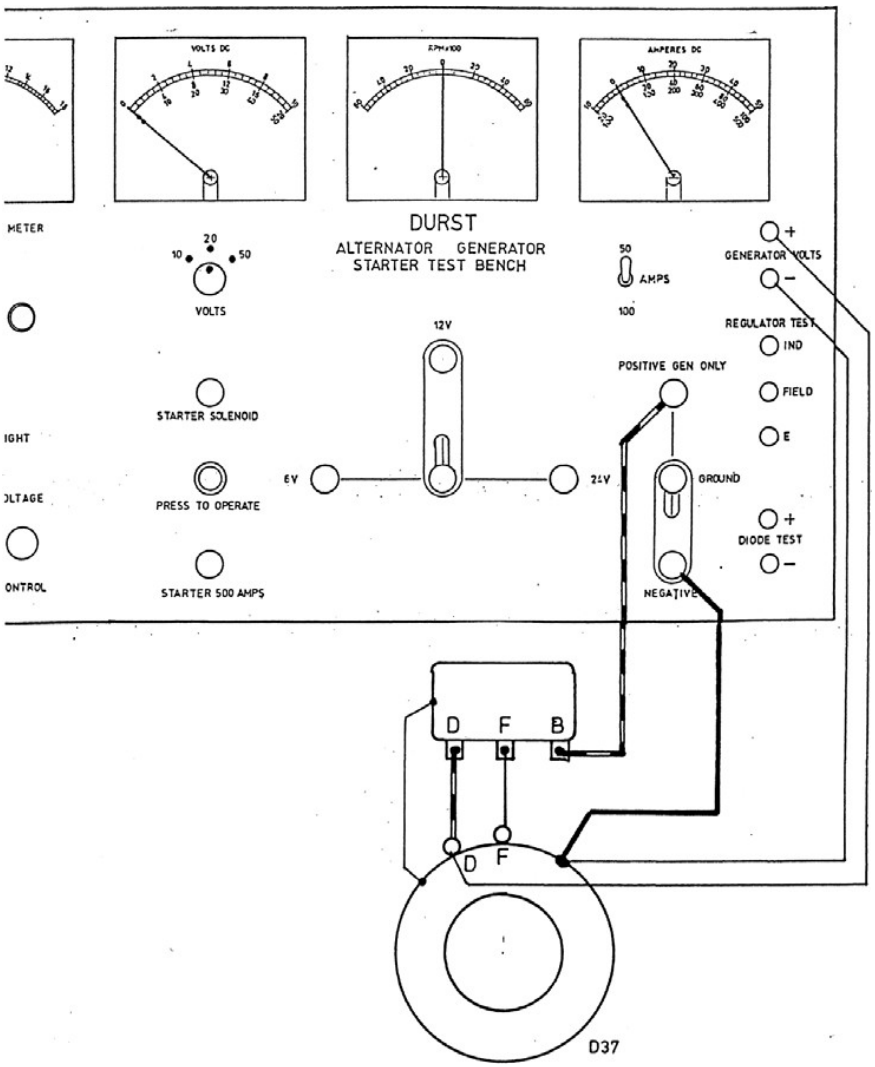


Figure 4. Generator and regulator test connections.

Alternator tests

Have a 12 V 2 W globe (24 V 2 W for 24 V systems) with leads and clips ready so you can check the charge-warning light.

NOTE: Terminal codes. Output: BAT or B (larger diameter). Warning light / regulator feed: D+ or L. Rotor / field control: DF, F or Field.

Alternators with internal regulators

Typical procedure for Bosch 14 V 35 A negative-ground alternators with an internal electronic voltage regulator. See Figure 5.

1. **Mount and set ranges.** Mount the alternator. GROUND to NEGATIVE. AMPS to 50 A. VOLTS to 20 V.
2. **Connect power and lamp.** POSITIVE GEN ONLY to alternator output. NEGATIVE to alternator frame. 2 W test lamp between output and warning-light terminal.
3. **Connect the voltmeter.** VOLTS + (red) to output. VOLTS - (black) to frame.
4. **Select 12V.** Connect the voltage selector bridge to 12V. The 2 W lamp should glow.
5. **Run up.** Switch the motor ON and drive at approximately 1000 rpm. VOLTS should be more than 12 V. Current depends on battery state of charge (often 5 to 15 A if nearly full).
6. **Step the speed.** Increase in steps to approximately 2500, 3500 and 4500 rpm. At each step, VOLTS should be 13.7 to 14.3 V. Note ammeter current.
7. **Check max with load.** At 4500 rpm, load the bench batteries with a carbon pile rheostat (Durst 667 is suitable). VOLTS should stay 13.7 to 14.3 V. Keep checking voltage while the alternator warms.
8. **Shut down.** Reduce speed and switch power OFF. Open the voltage selector bridge. Disconnect and remove the alternator.

If the internal regulator does not regulate within the manufacturer's limits, replace it.

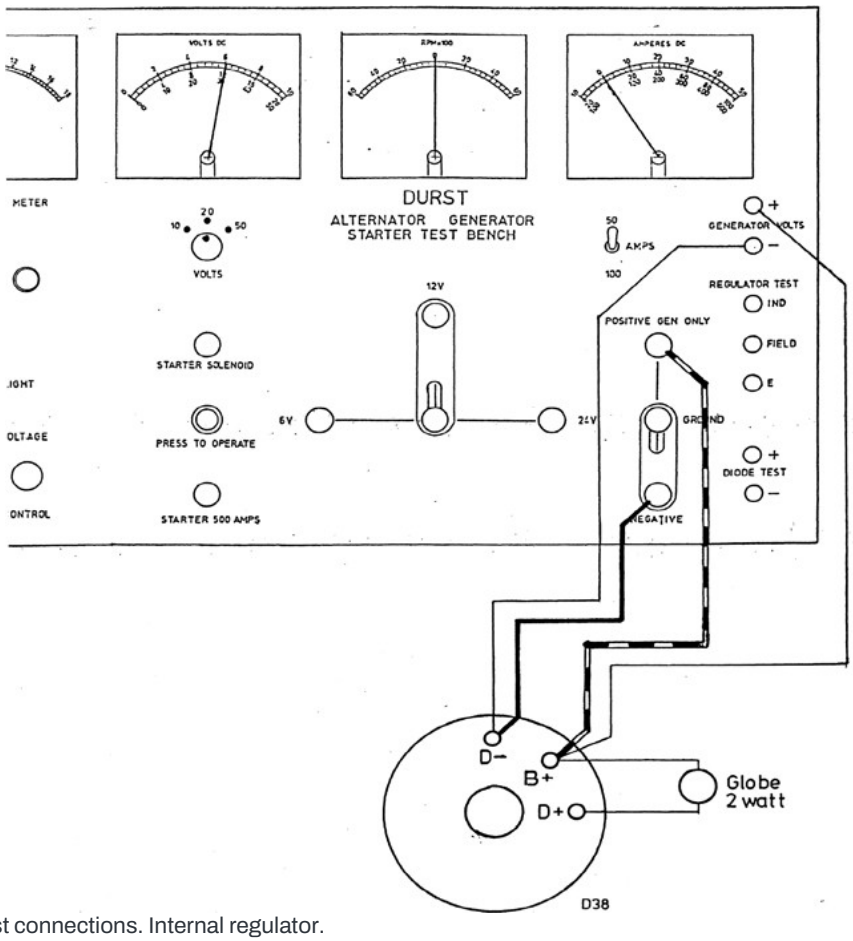


Figure 5. Alternator test connections. Internal regulator.

Alternators with external regulators

Typical procedure for Bosch 14 V 35 A negative-ground alternators with an electro-mechanical or electronic external voltage regulator. See Figure 6.

1. **Mount units.** Mount the alternator. Secure the regulator with a small clamp or bolt and nut on the transverse slide.

2. **Set ranges.** GROUND to NEGATIVE. AMPS to 50 A. VOLTS to 20 V.

3. **Connect the circuit.** POSITIVE GEN ONLY to alternator output.
   NEGATIVE to alternator frame.
   Regulator D+ to alternator D+.
   Regulator DF to alternator DF.
   2 W test lamp between alternator output and regulator D+.
   Regulator mounting bracket to alternator frame.
   VOLTS + (red) to output. VOLTS - (black) to frame.

4. **Select 12V and run.** Connect the voltage selector bridge to 12V. The lamp should glow. Switch the motor ON and drive at approximately 1000 rpm (the original text also notes a low-speed check near 100 rpm). VOLTS more than 12 V. Current often 5 to 15 A if batteries are nearly full.

5. **Step the speed.** Increase to approximately 2500, 3500 and 4500 rpm. At each step, VOLTS 13.7 to 14.3 V. Note current.

6. **Load check.** At 4500 rpm, load with a carbon pile rheostat. VOLTS should stay 13.7 to 14.3 V while the alternator warms.

7. **Shut down.** Reduce speed and switch power OFF. Open the voltage selector bridge. Disconnect and remove the alternator.

If the regulator does not regulate within the manufacturer's limits, replace it. Adjusting electro-mechanical alternator regulators is difficult and not recommended.

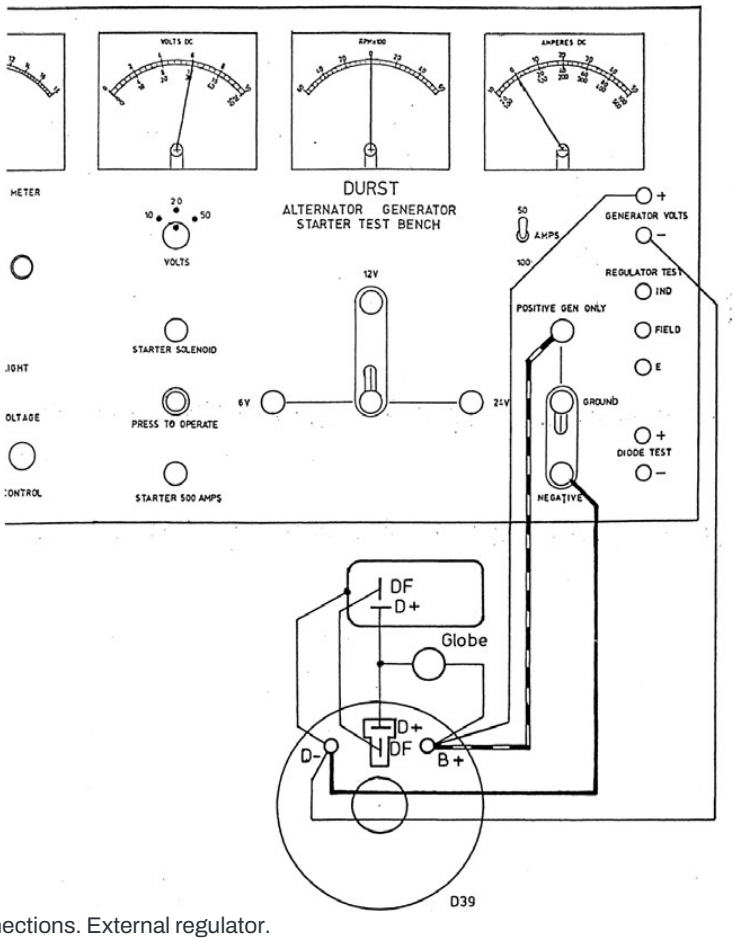


Figure 6. Alternator test connections. External regulator.

Other alternator tests: maximum output

This test connects the rotor to a battery supply, or to the stator output, so the machine runs unregulated. The rotor is linked directly to the alternator output. Output current is limited by stator impedance.

Typical procedure for Nippondenso 12 V negative-ground alternators with an external electro-mechanical voltage regulator. See Figure 7.

1. **Mount and set ranges.** Mount the alternator. GROUND to NEGATIVE. AMPS to 50 A. VOLTS to 20 V.
2. **Connect power.** POSITIVE GEN ONLY to alternator output. NEGATIVE to the alternator frame.
3. **Link field for full output.** Link E on the plug socket to the frame connection. Link F on the plug socket to the alternator output terminal.
4. **Connect the voltmeter.** VOLTS + (red) to output. VOLTS - (black) to frame.
5. **Run up.** Switch the motor ON and drive at approximately 1000 rpm. Increase until output current on the ammeter stabilises. This often exceeds rated current. Check the manufacturer's specifications. Voltmeter typically about 14.0 to 15.0 V.
6. **Shut down.** Reduce speed and switch power OFF. Open the voltage selector bridge. Disconnect and remove the alternator.

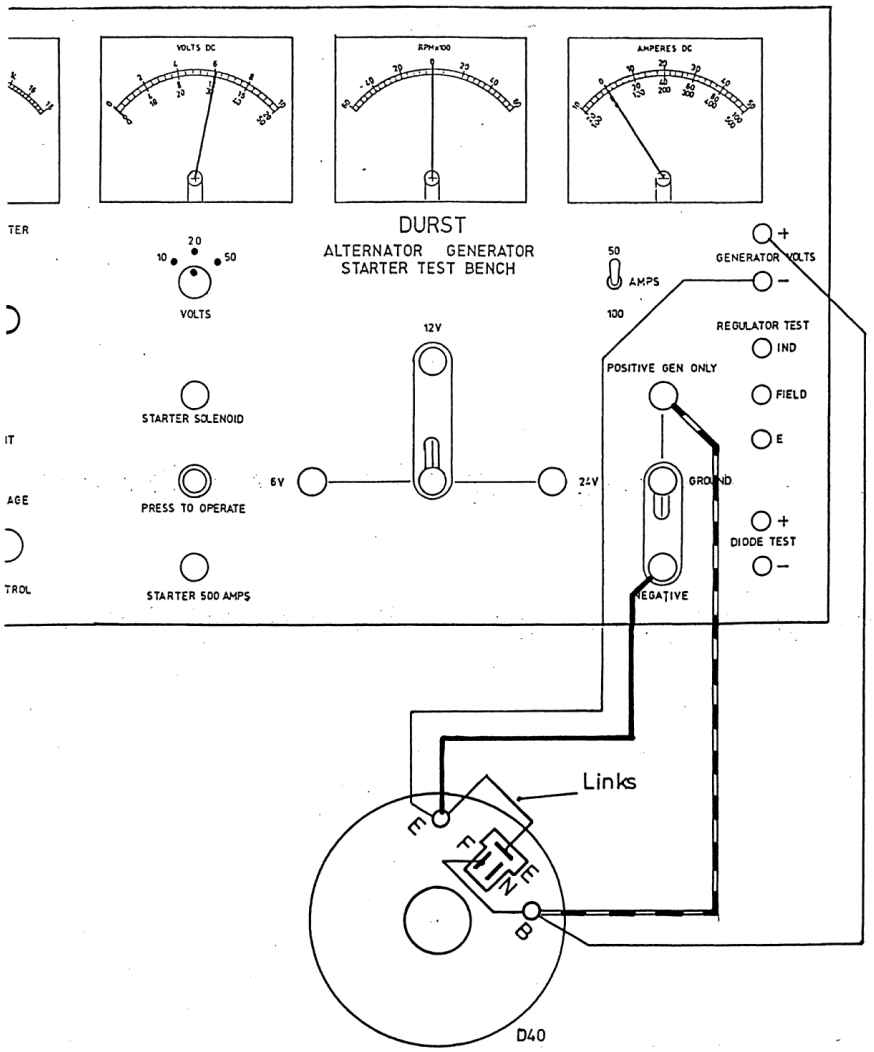


Figure 7. Alternator test connections. Maximum output test.

Starter tests

These checks cover pinion-to-thrust-collar clearance with the shift solenoid energised, no-load voltage/current/speed, and locked-armature (stalled) voltage, current and torque.

CAUTION

Do not attempt starter tests with the starter secured in a vice. The starter may free itself and injure personnel.

These instructions refer to a light-vehicle 12 V pre-engaged solenoid-shift starter. Other starters use a similar procedure. See Figure 8.

1. **Mount the starter.** Mount in the clamp with the drive end facing away from the control panel.
2. **Set polarity and range.** GROUND to NEGATIVE. VOLTS to 20 V.
3. **Connect the solenoid.** Light-gauge conductor from STARTER SOLENOID to the SW connection on the starter solenoid. Voltage selector bridge to 12V.
4. **Check pinion travel.** Press PRESS TO OPERATE. The solenoid should move the pinion to the engage position. The armature may rotate at low speed. Check clearance between pinion gear and thrust collar. Release the button.
5. **Connect main power.** Heavy-gauge conductor from STARTER 500 AMPS to the battery connection on the starter solenoid.
6. **No-load run.** Press PRESS TO OPERATE. The starter should accelerate to no-load speed. Record voltage, current and armature speed (mechanical or optical tachometer). Release the button.
7. **Locked armature.** Use the Durst TBA-671 torque arm (or a steel wedge) to lock the armature. Press PRESS TO OPERATE and record locked-armature voltage, current and torque. Release the button.
8. **Finish.** Disconnect the torque arm and leads. Remove the starter from the clamp.

Compare results with the manufacturer's specifications. Results should not vary greatly from those figures.

Locked-armature torque

T = F x D, where T is torque in newton metres, F is force in newtons (from the spring balance), and D is distance in metres from the centre line of the starter pinion (where the tester clamp secures it) to the centre line of the spring balance.

Starter resistance may be found by dividing locked-armature voltage by locked-armature current.

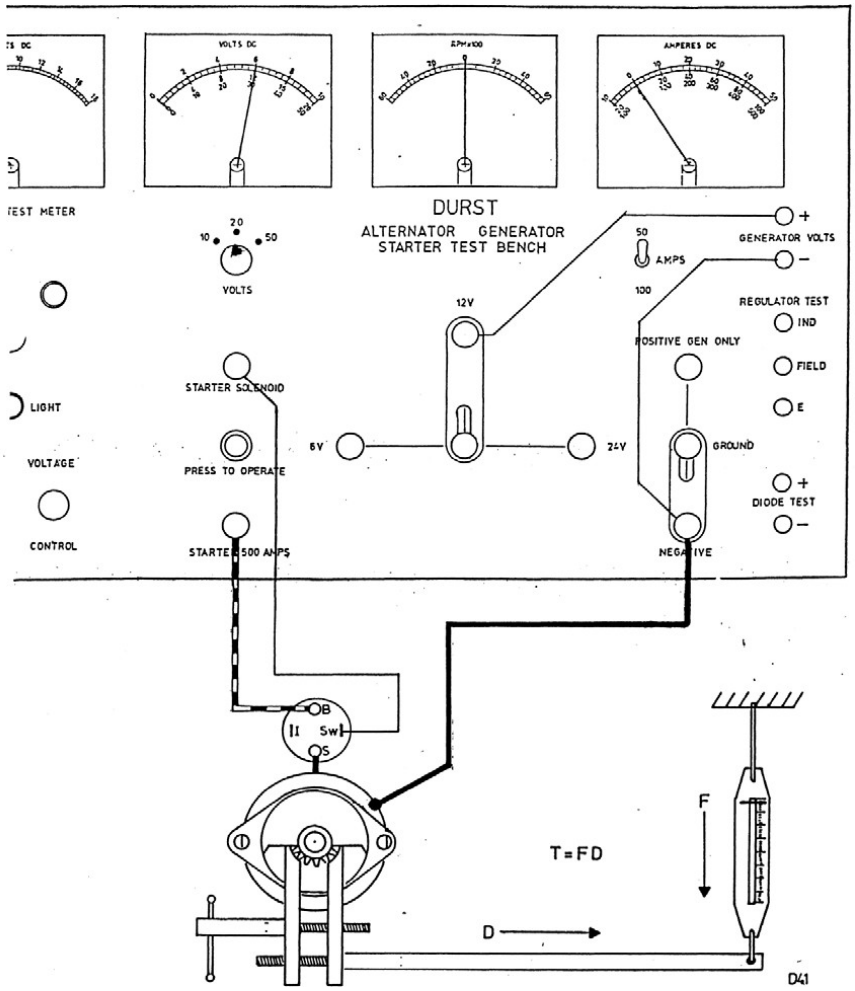


Figure 8. Starter testing.

Using the diode tester

Diode testing is essential in alternator overhaul. The diode section tests power diodes and field exciter diodes under simulated operating conditions while they remain connected to the stator windings. Figure 9 shows typical connections for a six-diode alternator.

Testing negative (power) diodes

1. **Power on.** Switch power ON. Check the POWER ON light illuminates.
2. **Lead set-up.** Connect the red and black test leads to the red and black diode test terminals. Red clip to the negative diode plate (the plate that connects directly to the rear end shield). Black clip on one stator winding connection.
3. **Press to test.** Press PRESS TO TEST and observe the diode meter. Open or shorted diodes leave the pointer at zero. A serviceable diode deflects. Note direction and magnitude.
4. **Repeat.** Repeat for the other two stator connections. Deflection should be approximately the same.
5. **Finish.** Disconnect the leads and turn power off.

Testing positive diodes

1. **Power on.** Switch power ON. Check the POWER ON light.
2. **Lead set-up.** Connect red and black leads to the diode terminals. Red clip to the alternator output terminal (insulated from the rear end shield). Black clip on one stator connection.
3. **Press to test.** Press PRESS TO TEST. Note deflection. Zero means open or shorted. Repeat on the other stator connections.
4. **Finish.** Disconnect the leads and turn power off.

NOTE: Meter deflection for exciter diodes is less than for power diodes.

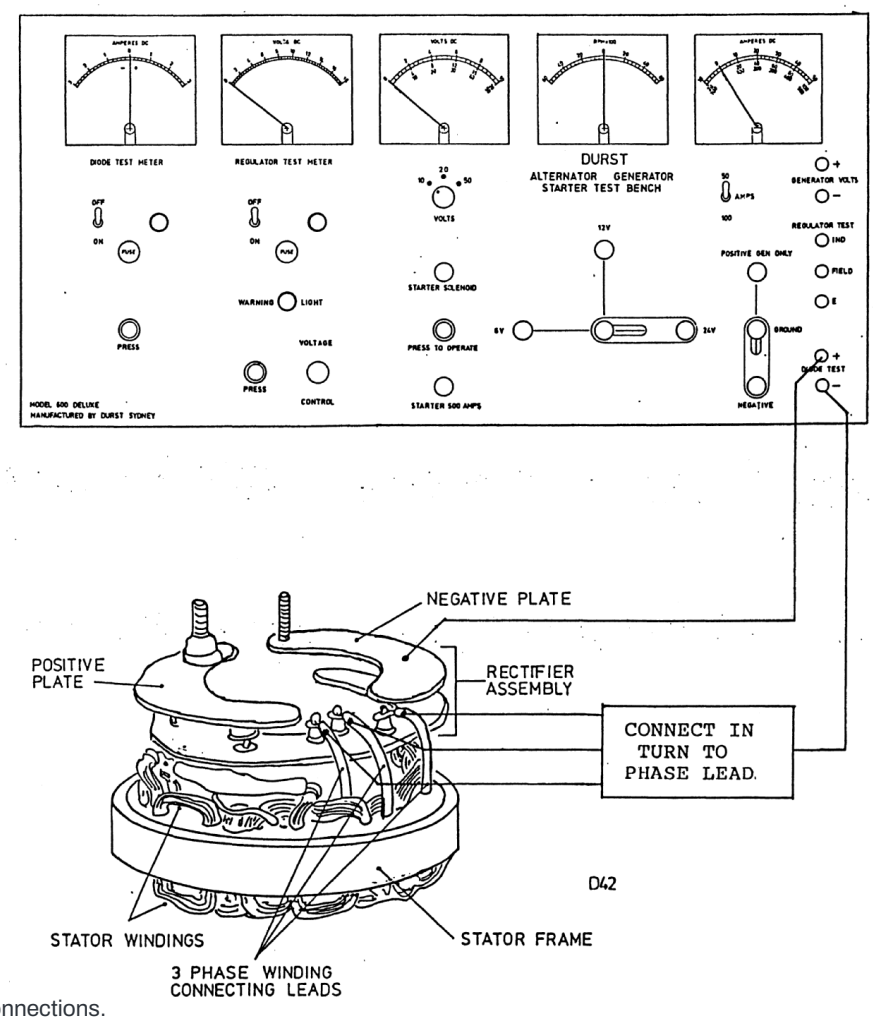


Figure 9. Diode test connections.

Using the regulator tester

The voltage regulator tester on the 1200 Deluxe bench checks internal and external electronic voltage regulators. Positive and negative switching regulators can be tested; results differ slightly for each type.

A negative regulator switches positive current from the exciter diodes to the regulator. The negative side of the rotor winding is directly connected to ground.

IMPORTANT

Do not use the regulator tester with electro-mechanical voltage regulators. Terminal identification varies between manufacturers.

Testing negative regulators

1. **Power on.** Switch power ON. The indicator light to the right of the switch shows power is on. The bench batteries must be able to provide 24 V to use the regulator tester.
2. **Zero the control.** Turn VOLTAGE CONTROL fully anti-clockwise.
3. **Connect the regulator.** Connect the test leads to the regulator. Test-lead terminals are at the centre right-hand side of the panel.
4. **Press and check the warning light.** Press the regulator PRESS button. The WARNING LIGHT should illuminate. If it does not, the regulator is faulty.
5. **Find the switch point.** Hold PRESS and slowly turn VOLTAGE CONTROL clockwise while watching the REGULATOR TEST METER. Note the voltage at which the WARNING LIGHT goes out. Compare with the manufacturer's specification. As a rule of thumb, 13.7 to 14.3 V indicates a serviceable regulator.

NOTE: The warning light may glow slightly at the switching voltage. Increasing the voltage a little more extinguishes it completely.

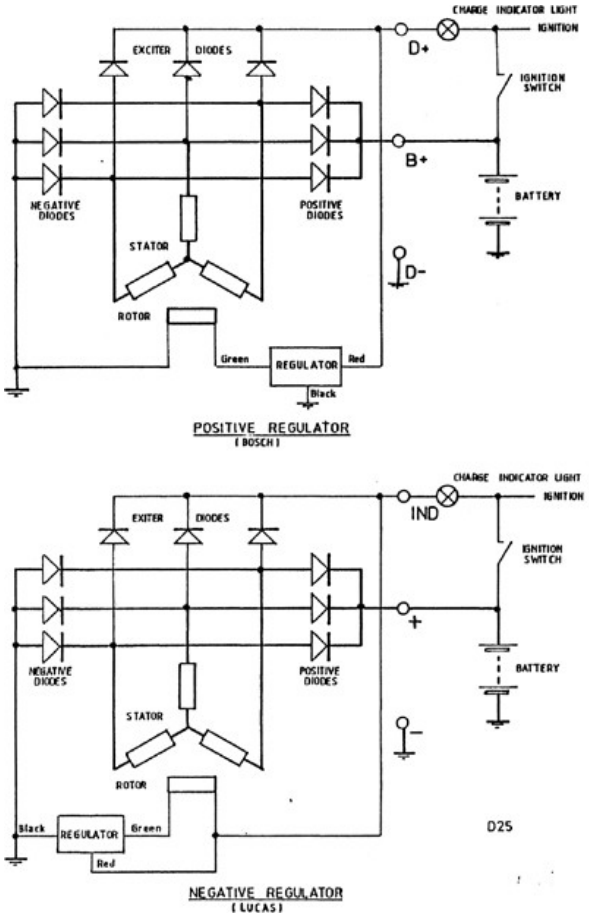


Figure 10. Regulator configurations.

Other tests with the TB-E1200

The bench is also a convenient power source for general automotive electrical component checks.

Power for component testing

1. **Connect leads.** Connect test leads to POSITIVE GEN ONLY and NEGATIVE. Leave the GROUND bridge on NEGATIVE.
2. **Select range.** Set AMPERES DC to 50 A.
3. **Operate the component.** Touch the leads to the component and read the ammeter as it operates.

Insulation / short-to-ground test

To test insulation, connect a lamp in series with the 12 V or 24 V supply. Leave the voltage selector bridge open and connect the lamp between the centre terminal and the 12 V or 24 V terminal. Connect test leads to POSITIVE GEN ONLY and NEGATIVE. Leave GROUND on NEGATIVE. Touching the leads together should light the lamp.

Touch the leads to ground and the terminal of the component. If the lamp lights, there is a short to ground. Use a 24 V lamp and supply when testing starter fields, armatures, and alternator stators and rotors for shorts to ground.

Example: alternator rotor

1. **Short-to-ground.** NEGATIVE lead to the rotor shaft. Touch POSITIVE GEN ONLY to the slip rings. If the lamp lights, there is a short to ground.
2. **Continuity / current draw.** Provide power as for component testing. Touch the leads to each slip ring and read current on the ammeter. A serviceable rotor typically draws 2 to 5 A. Check the manufacturer's specifications.

Optional extras

Model	Description
TBA-668	Self-contained field ammeter, range 10 to 0 to 10 A, complete with test leads
TBA-671	Torque arm. Spring-type tester clamps on the starter gear for load readings
LB70	Portable load bank, 70 A at 12 V. Six switchable loads (20, 20, 10, 10, 5, 5 A). Large ammeter. Powder-coated fan-ventilated steel case with carry handle. Heavy-duty leads and insulated colour-coded battery terminals
TBA-667	Carbon pile rheostat for discharging batteries. Heavy-duty leads and insulated colour-coded clips. Powder-coated ventilated steel case with carry handle

General maintenance

Regular care keeps the TB-E1200/4 accurate and ready for workshop use. Carry out these checks as part of normal operation.

Keep it clean and dry

- Wipe the enclosure, panel and meters with a soft cloth. Avoid high-pressure water jets and harsh chemical cleaners.
- Keep the battery compartment dry and free of corrosion.
- Do not store the bench where water can pool, drip or spray onto it.
- If water enters the control box or meters, switch off and isolate. Have a qualified person inspect it before use.

Batteries and leads

- Keep the bench batteries charged. Low battery voltage reduces test accuracy and can mislead diagnosis.
- Inspect battery cables for frayed insulation, loose lugs and corrosion. Clean and tighten as needed with the bench isolated.
- Before each use, check test leads for damaged insulation, burnt terminals and loose clips.
- Replace damaged leads with correctly sized Durst leads.

Drive system

- Check the drive belt for wear, cracks and glazing. Align pulleys and set tension with the feed-screw crank and lock clamps.
- Keep the transverse slide ways clean and lightly lubricated as suited to your workshop practice. Check lock clamps and the quick clamp pegs and ratchet levers.
- Listen for unusual motor noise or vibration. The sealed armature bearings need little maintenance; contact Durst if noise increases.

Meters, switches and terminals

- Confirm mechanical zero on each meter with no power applied.
- Check that range selectors, the voltage and ground bridges, the key isolation switch, the main switch, the circuit breaker and the emergency stop all operate firmly and correctly.
- Keep terminal posts clean and free of oxidation so high-current connections stay reliable.

Who should service the bench

- Operators can carry out the external checks in this section.
- Only a qualified person should work inside the control box, on the drive motor, or on high-current battery cabling.
- Do not modify the bench. Durst is not liable for damage from unauthorised modifications.

Extreme environment maintenance

For dusty, wet, hot or corrosive workshops (mining, quarries, wash bays, coastal sites). Follow this section in addition to General maintenance.

WHY DUST AND MOISTURE MATTER

Fine conductive dust and moisture get into meters, switches, relays and terminal bridges.

Build-up causes intermittent readings, stuck meters and high-resistance joints on high-current paths.

Site practice

- Where possible, keep the bench in a covered, low-dust area when not in use.
- Keep it out of rain, washdown bays and standing water.
- Never hose down or pressure-wash the bench. Wipe with a soft cloth.
- If water, mud or chemicals enter the unit, remove it from service, isolate it and have a qualified person inspect it before use.

Keeping it clean in dusty conditions

- Clean regularly using a method that suits your site (for example vacuuming or low-pressure air), following your site rules.
- Before cleaning inside the control box, switch off and isolate. Only a qualified person should open it.
- Set an inspection and cleaning schedule that matches your dust, heat and moisture levels.
- Contamination from dust, water or chemicals is not normal use under warranty.

Hot and high-load use

- After long high-load alternator or starter tests, allow the drive motor and the unit under test to cool.
- Watch generator and alternator temperature during tests. Stop if temperature becomes excessive.
- Heat and vibration wear belts and leads faster. Inspect them more often.

WARRANTY

Damage caused by contamination (such as dust, water or chemicals), or by a lack of maintenance in harsh environments, is not normal use. It is not covered by warranty.

Maintenance checklist and log

Use this checklist as a starting point and adjust it to suit your workshop. Copy the log page as needed.

Maintenance checklist

Check	Who	When
Batteries charged; key isolation and voltage bridge working	Operator	Before each use
Test leads, clamps and terminals free of damage and corrosion	Operator	Before each use
Drive belt aligned and tensioned; slide locks secure	Operator	Before each use
Meters zeroed; emergency stop and main switch working	Operator	Before each use
Enclosure wiped clean; battery compartment dry	Operator	After each use / daily
Inside of control box inspected and cleaned (isolated)	Qualified person	As per your site schedule
Repairs, motor work, or faults you cannot clear	Durst or authorised Durst service centre	As needed

Maintenance log

Date	Check or service done	Findings and action taken	Name and signature

Troubleshooting

Issue	Possible cause	Suggested action
No motor response	Main switch off, breaker tripped, emergency stop latched, or remote not selected	Check power, reset breaker and emergency stop (turn clockwise), then restart from the remote
Voltmeter reads downscale or sticks below zero	Reverse polarity on the voltmeter leads	Reverse the leads. Tap the panel lightly below the meter if the pointer is stuck
Low or no charge current on alternator / generator test	Batteries fully charged, poor connections, wrong polarity bridge, or unit fault	Confirm bridge and lead connections. Load batteries with a carbon pile if needed. Compare with manufacturer specs
Regulator warning light does not illuminate on tester	Faulty electronic regulator, or batteries cannot supply 24 V	Confirm battery voltage. Replace the regulator if the light still does not illuminate
Diode meter stays at zero	Open or shorted diode, or poor clip contact	Recheck clip placement on the diode plate / stator joint. Retest each phase
Starter does not crank under PRESS TO OPERATE	Solenoid lead not on SW, main 500 A lead not connected, or flat batteries	Confirm solenoid and 500 A leads, voltage bridge and battery state
Intermittent meters or switches in dusty / wet sites	Contamination inside the panel	Isolate. Have a qualified person clean and inspect (see Extreme environment maintenance)

Disclaimer, warranty and support

Intended use. The TB-E1200/4 is engineered for professional workshop testing of automotive electrical charging and starting components. Always follow the vehicle and component manufacturer's test specifications.

Liability. While every care has been taken in producing this manual, Durst Industries (Aust.) Pty Ltd, its employees and agents expressly disclaim all liability arising from improper installation or application of the equipment described.

Warranty. Damage caused by contamination (such as dust, water or chemicals), or by a lack of maintenance in harsh environments, is not normal use and is not covered by warranty. Keep your maintenance log as a record of care.

Contact Durst

Contact	Details
Company	Durst Industries (Aust.) Pty Ltd
Address	1/11 Packard Ave, Castle Hill NSW 2154, Australia
Website	durst.com.au
Email	sales@durst.com.au
Phone	+61 2 9660 1755

Your TB-E1200/4 record

Fill this in and keep it with your proof of purchase.

Item	Details
Model	TB-E1200/4
Serial number	
Date of purchase	
Purchased from	

Documentation references (from original INS)

Item	Reference
Barcode	9346080000181
Product Specification Manual	PS 82
Work Instruction Manual	WI 82
Product Costing Manual	PC 82