

Sentinel™ TS-EFI-300

EFI TEST SET

USER'S MANUAL



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1. OVERVIEW

1.1 INTRODUCTION

The Sentinel™ TS-EFI-300 is a battery powered primary injection test set used for testing the trip function of earth fault indicators. It is extremely light-weight, self-contained and portable. The device is contained within a robust black ABS enclosure and ships with test leads and an external battery charger.

FIGURE 1: Sentinel™ TS-EFI-300



1.2 FEATURES

- 300A Nominal Injection Current Using Single Turn
- 200ms Injection Timer
- Tests All Known EFI Models Worldwide Under All Typical Settings
- Inherently Overload Proof
- Safe Output Voltage (<1V) Under All Conditions
- Battery Powered Using Internal Rechargeable SLA Battery
- Extremely Lightweight (~1kg)
- Extremely Compact (Single Handed Operation)
- Current Output LED Indication And Current Healthy Buzzer
- Open-Circuit LED Indication
- Low Battery LED Indication
- Wall Charger And Car Charger Included
- Convenient Carry Bag Included
- Rugged And Reliable Solid State Electronics
- ISO9001 Based Quality Assurance
- Electromagnetic Compatibility

2. OPERATION

2.1 CHARGING

Plug the external battery charger cable jack into the charging socket located on the side of the Test Set. Allow up to several hours for the internal battery of the Tester to be charged. The charger will usually have a red LED to indicate charging and a green LED to indicate when unit is fully charged. A fully charged Tester will usually be able to test at least 100 EFI's before requiring to be recharged.

2.2 CURRENT INJECTION

The Tester current output is a nominal 300A. The actual current is at least 20% higher to allow for EFI accuracy tolerances and injection cable clamp resistance tolerances. The output waveform is a modified sine wave with a duration of 10 cycles (200ms at 50Hz).

The Tester output amplifier injection lead consists of a single turn of flexible braided cable. When testing an EFI, the braided cable is passed around the core of the EFI current transformer and then fastened closed. The injection cable clamping mechanism consists of two tinned copper plates which are pressed tightly together by a brass bolt and captive wing nut assembly. The wing nut should be tightened by a pair of human hands until reasonably firm. Do not over tighten using tools.

Initiation of a test current is performed by depressing the "INJECT" pushbutton for at least two seconds. The green LED labeled "CURRENT OUTPUT" illuminates during current injection. The red LED labeled "OPEN CIRCUIT" illuminates during the current injection if the output current lead is not firmly fastened closed or if the contact resistance between the pressure plates is too high. The red LED labeled "LOW BATTERY" illuminates during the current injection if the internal SLA battery needs to be recharged. A buzzer sounds for one second if healthy current was injected without there being a low battery condition or an open circuit condition. If the red LED's do come on they will extinguish after a successful current injection or after about 10s of inactivity.

So, to summarize, the Tester will only sound the buzzer when adequate test current has been injected, with the green LED illuminated during the injection period while the two red LED's remain off.

The Tester output voltage is completely harmless being less than 1 Volt under all conditions. The Tester design inherently prevents any shock potential from developing across its output under any electronic or mechanical failure mode. However the user should be aware that during live conditions on site the equipment under test is connected to the electricity grid and has the potential to have extremely hazardous and lethal high voltages. The user should take the necessary safety precautions as discussed later in this document under the section titled "SAFETY".

2.3 EFI TEST FAILURE CONSIDERATIONS

There is obviously effort and cost involved in replacing a faulty EFI. So if an EFI is found to “fail” under test, it is worth double checking the integrity of the test.

The first thing to do is to check whether the EFI can be tripped via its own test/reset pushbutton or magnetic reed switch. This will at least prove some of the EFI functionality and also show if it has an adequate power supply (there may have been a mains power failure or the EFI may have a flat battery.)

The next thing to do is to repeat the injection of test current ensuring that the test equipment is generating adequate test current. During each test make sure that after depression of the “INJECT” for at least two seconds, the Tester control unit sounds the buzzer for one second, showing a flash of green light on the LED indicator labeled “OUTPUT CURRENT” while both the “LOW BATTERY” and “OPEN CIRCUIT” red LED indicators remain off.

If the EFI still appears not to trip, it is worth doing a few preliminary checks on the EFI installation. Is the EFI current sensor connected to the control unit? It may not have been installed or commissioned properly.

Finally before writing the EFI off, it is worth double checking the Tester on another EFI to prove the integrity of the test equipment and testing procedure.

3. MAINTENANCE

3.1 BATTERY

The Tester is powered by a maintenance-free, rechargeable sealed lead-acid battery. At the end of its lifetime the battery is easily replaced by opening the Tester cover, loosening the battery mounting bracket and pulling off the supply cables from the battery spade terminals. A replacement battery of the exactly the same dimensions and electrical specifications should be used (See section titled "SPECIFICATIONS"). The battery has reached the end of its lifetime when it has to be recharged noticeable more often or is failing altogether to inject sufficient test current.

3.2 INJECTION CABLE CONTACT PLATES

For the Tester to inject its rated current it is critical that the single turn of the injection cable has a very low resistance. This resistance is mainly determined by the contact resistance between the two tinned copper plates of the clamping mechanism. This contact resistance is a function of the force of the clamping mechanism, the area of contacts, and the resistance of the two surfaces. To maintain low resistance between the two surfaces, they should be kept clean and they should be kept flat. Even a single particle of dust or sand can stop the two surfaces from contacting over a large area. A very light sanding with water paper can easily restore the surfaces if there has been any oxidizing or blemishing. It is wise to protect the surfaces by keeping the clamping mechanism tightly closed when not in use.

4. SPECIFICATIONS

Output Current:	300A RMS minimum (typical safety factor of +20%)
Output Frequency:	50Hz \pm 10%
Output Duration:	10 cycles (200ms at 50Hz) \pm 10%
Output Voltage:	<1V Peak
Waveform Type:	Modified Sine wave
Maximum EFI CT core diameter:	30mm
Current Amplifier Lead:	1m
Inject Button:	Press and hold for at least 2s to initiate test current
Battery:	6V, 1.2AH, rechargeable SLA, 97mm x 50mm x 24mm
Recharge Interval:	100 tests (typical minimum)
Control Unit Dimensions:	130 x 70mm x 45mm
Current Amplifier Dimensions:	150 x 80mm x 40mm
Mass:	1kg

5. SAFETY

To avoid electric shock read the following carefully:

- Ensure that the TS-EFI-300 is only used by qualified personnel practicing applicable safety precautions.
- Use caution during the installation and use of this product; high voltages and currents may be present in the circuit.
- Wear protective clothing and gloves as required.
- Always inspect the tester for damage before using the product.
- Do not use the product if damaged.

6. WARRANTY

The Sentinel™ TS-EFI-300 electronic hardware and software is copyrighted to Cybertronix cc 2012.

This product is warranted to be free from defects in material and workmanship for a period of twelve months (12) from the date of shipment. Correction shall be in the form of repair or replacement of the defective items or components, freight paid by the customer both ways. Such correction shall constitute a fulfillment of all Cybertronix cc liabilities in respect to said items and components. In no event shall Cybertronix be liable for consequential damage.

No other warranties:

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