INSPECTOR
LINE LOAD SIMULATOR

INSTRUCTION MANUAL INS120P

TASCO, INC.

THIS TESTER IS DESIGNED FOR USE ONLY BY QUALIFIED ELECTRICIANS.

IMPORTANT SAFETY WARNINGS

⚠WARNING

Read and understand this material before operating or servicing this equipment.
Failure to understand how to safely operate this instrument can result in an accident causing serious injury or death.

⚠WARNING

Electric shock hazard:
Contact with live circuits can result in severe injury or death.

- The INSPECTOR line load simulator conforms to IEC61010-1:2010; CAT III 120V, class II and pollution deg.2
- Do not exceed the operating voltage (see specifications).
- Inspect the INSPECTOR line load simulator before every use.
- Never ground yourself when taking measurements. Do not touch exposed circuit elements.
- Do not operate the instrument in an explosive atmosphere.

- To reduce the risk of fire or electric shock, do not expose this product to rain or moisture.
- The line load simulator is intended only for indoor use. To avoid electrical shock hazard, observe the proper safety precautions.
- Before and after hazardous voltage measurements, test the voltage function on a known source such as line voltage to determine proper meter functioning.
- Electric shock hazard. Before opening the case or battery cover, disconnect unit from power. Failure to observe this warning could result in severe injury or death.
- Use only manufacturer approved accessories when performing test functions.

GENERAL SPECIFICATIONS INS120P

Power:	Standard 9 VDC Alkaline battery
Operating Voltage:	95-140 VAC, 60Hz
Current Draw:	2A pulses within ½ second
Fuse:	6.3A, 250V. Not user replaceable
Load:	Constant 10, 15 or 20A simulation
GFCI Trip:	6mA nominal for GFCI, 30mA for RCD
AFCI Trip:	Up to 8, 120A pulses within ½ second
Operating Temperature:	32° F – 120° F (0°C -50°C)
Accuracy:	+/-2%, +/- 2 digits
Size:	3.85" x 1.66" x 7.22" (98mm x 42mm x 183mm)

THANKS FOR CHOOSING THE INSPECTOR

The INSPECTOR line load simulator, INS120P (INSPECTOR) is a rugged tester designed for electricians, plan engineers, safety and electrical inspectors, and building maintenance personnel.

It will find faulty splices and connections, incorrect wiring, undersized wiring, faulty GFCIs, faulty or incorrectly wired AFCIs, incorrect line voltage, and poor ground quality.

With the INSPECTOR you can safely test the wirings ability to handle loads and be sure code recommendations are met.

Because of high technology sampling techniques, the INSPECTOR will not trip circuit breakers or blow fuses.

Using this device is convenient and fast. If any wiring is incorrect, or fails the electrical code recommendations for voltage drop, the display readings will flash.

You will find this high quality unit to be one of your most valuable tools. By using the INSPECTOR you can:

- Show customers faulty wiring in need of repair without removing outlets, cover plates, or panel covers.
- Give your customers assurance and comfort since all wiring is tested for load carrying ability.

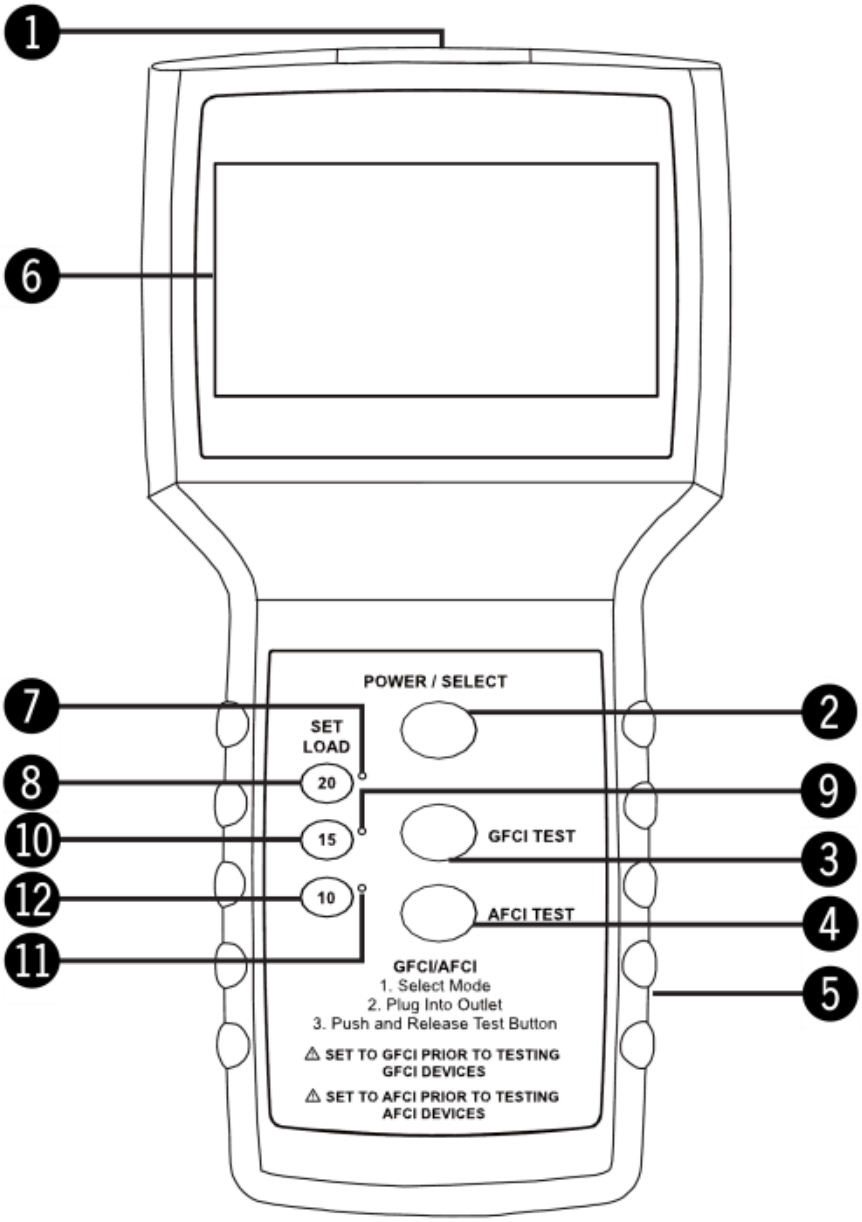
- Verify that wiring meets electrical code recommendations for voltage drop under load.
- Test GFCI and AFCI operations.
- Check ground quality for safety and ability to support sensitive electronic equipment.
- Measure fault currents.
- Avoid embarrassing and expensive call backs.
- Assure yourself and customers that wiring is connected correctly, all splices and connections are proper, and wiring is the proper size for the application.
- Protect your customers from personal injury or damage caused by faulty GFCIs, AFCIs or incorrectly wired circuits.
- Save money and time by eliminating guess work.

Note: The INSPECTOR does not check the condition of wiring insulation.

Typical 2 wire, 15 Amp and 20 Amp outlets

INSPECTOR INTERFACE KEY

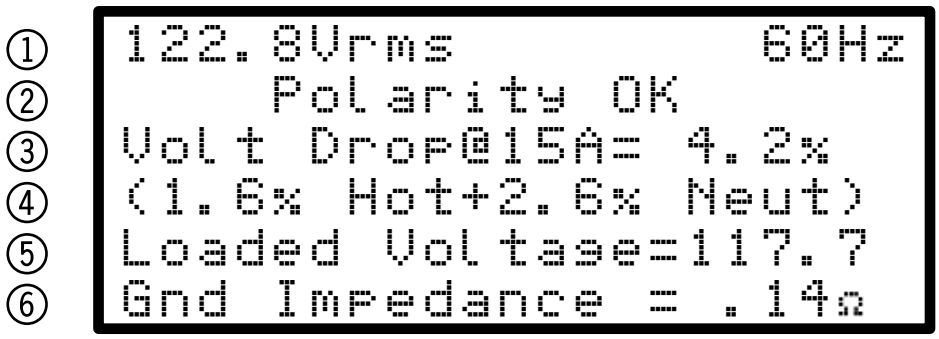
1. Power cord receptacle
2. Power/Select button
3. GFCI Test button
4. AFCI Test button
5. Battery compartment (rear)
6. LCD display
7. 20A load LED
8. 20A load button
9. 15A load LED
10. 15A load button
11. 10A load LED
12. 10A load button



HOW TO USE THE INSPECTOR

A High Quality Adaptor should be used when testing 2 wire outlets. Ground impedance and polarity is not tested on 2 wire outlets.

1. *Before* plugging the INSPECTOR to a GFCI or AFCI circuit outlet to be tested, push the GFCI TEST button or the AFCI TEST button. This prevents the unit from performing tests which may inadvertently trip the protection device prematurely. The INSPECTOR may also be turned on using the POWER/SELECT button, or by plugging it directly into non-protected branch circuits.
2. Plug the INSPECTOR wiring inspection tester into an energized 120V wall outlet using the power cord provided.
3. The unit will perform load testing and display the test results at a factory set default load of 15Amps.
4. Push the desired SET LOAD button (20, 15, 10). Although 10 Amp outlets don't exist, the load may be set to simulate 10, a light load if a small, lower current device will be connected to the line.
5. Read the test results. For GFCI and AFCI test results, refer to the test screen flow charts on pages 10-12.



Main Screen

Line ① shows an unloaded rms voltage of 122.8V / 60Hz at the outlet being tested.

Line ② shows the polarity status.

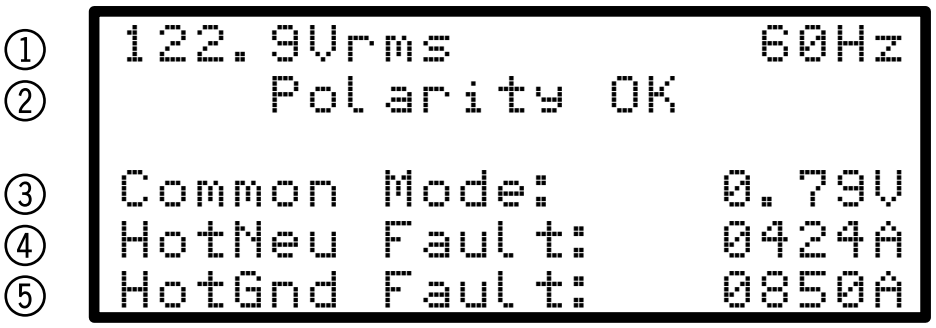
Line ③ show a voltage drop of 4.2% at a setting of 15Amps. The SET LOAD button is set for a test drawing 15 Amps. Since 4.2% is lower than the NEC recommendation of a maximum of 5% drop, the percentage value is not flashing.

Line ④ shows that 1.6% of the voltage drop is on the hot conductor while 2.6% is on the neutral conductor.

Line ⑤ shows that the voltage at the outlet would drop to 117.7 volts with a 15 Amp load applied.

Line ⑥ shows that the impedance (resistance) of the ground conductor from the outlet to the point where it is bonded to the neutral conductor is 0.14 ohms.

NOTE: The SET LOAD button may be changed to show what the drops and voltage would be at 10, 15, or 20 Amps any time after the first reading is indicated.



Second Screen

Line ① shows the outlet to have an rms voltage of 122.9V / 60Hz with no load applied by INSPECTOR.

Line ② shows the polarity status.

Line ③ shows the common mode (the voltage difference between the ground and neutral conductor) to be 0.79V (no load applied by the INSPECTOR).

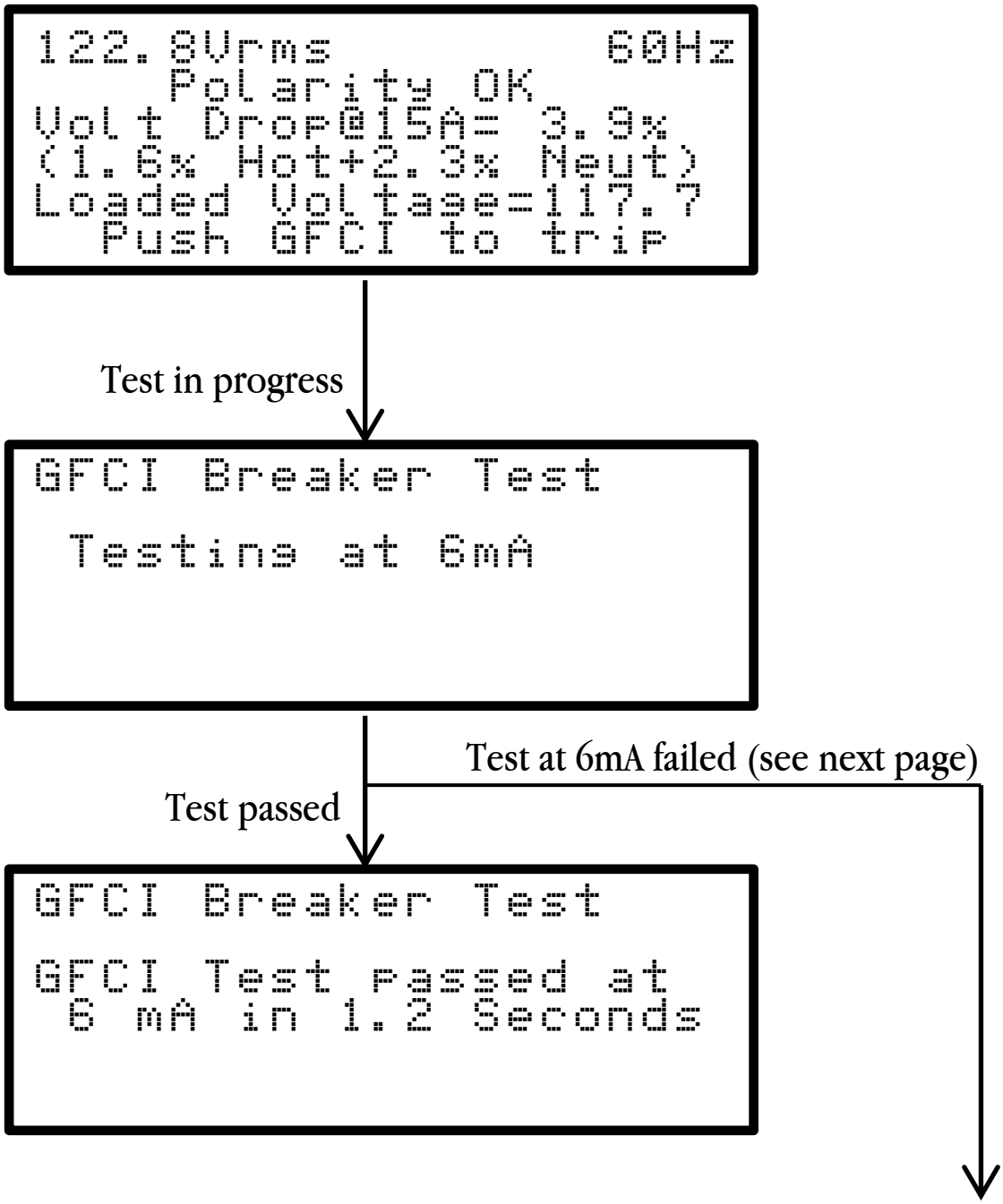
Line ④ shows that if the hot and neutral conductors were to be shorted at the outlet, the wiring resistance would limit the current to approximately 424 Amps.

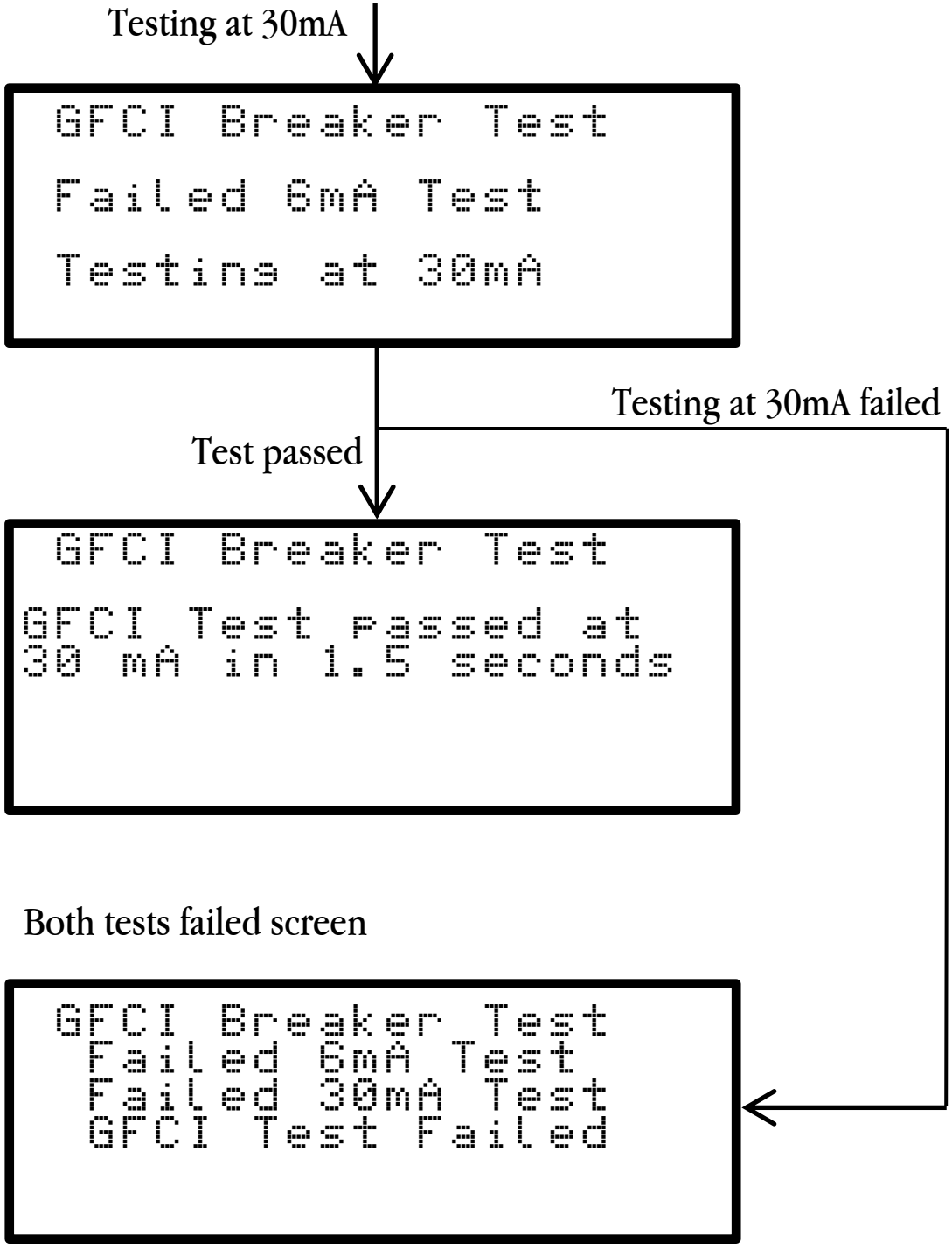
Line ⑤ shows that if the hot and ground conductors were to be shorted at the outlet, the wiring resistance would limit the current to approximately 850 Amps.

Note: The unit turns on automatically when plugged in. Push and release the POWER/SELECT button to toggle between screens.

GFCI TEST SCREENS FLOW CHART

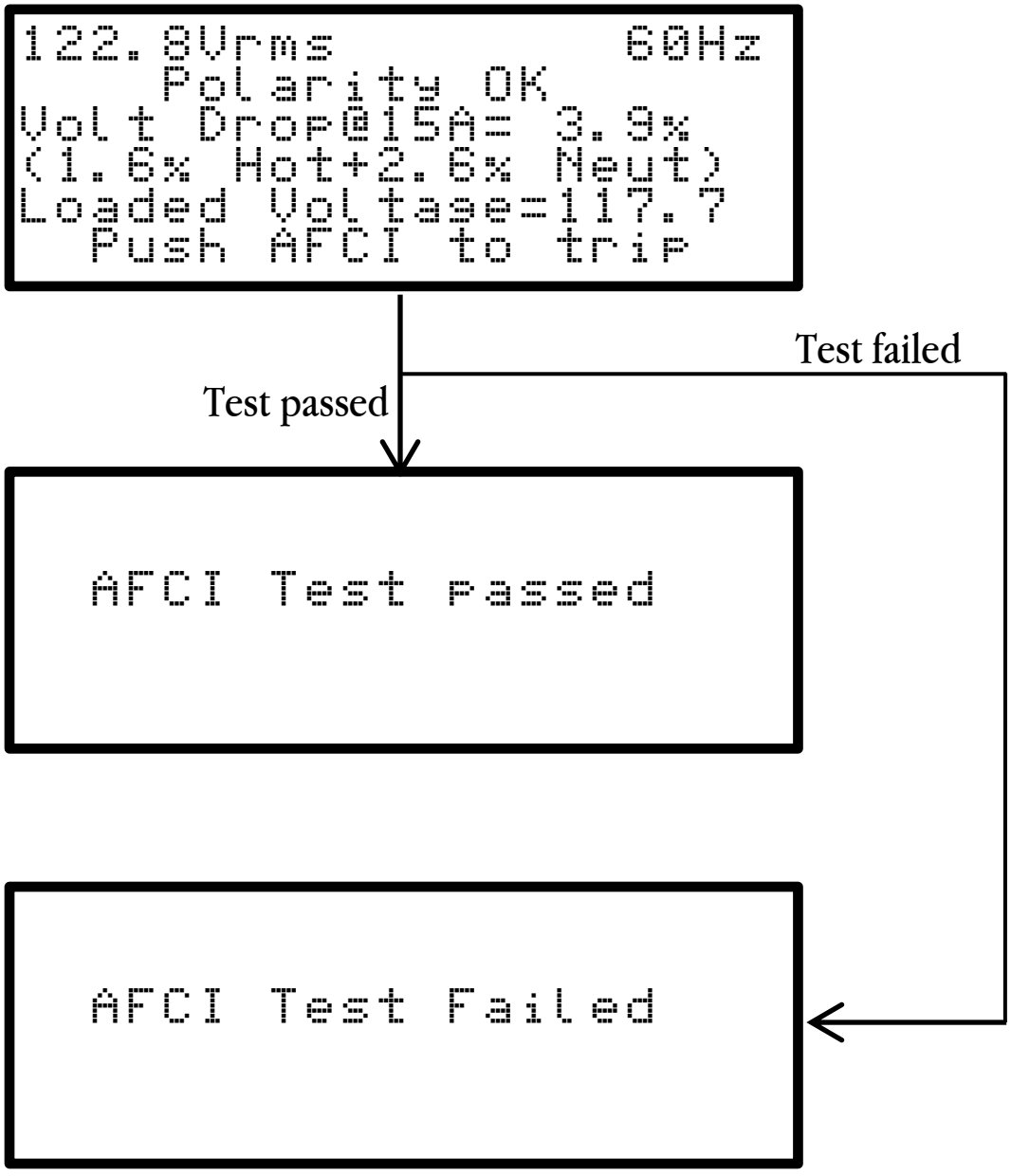
Main screen





AFCI TEST SCREENS FLOW CHART

Main screen



FAULT INDICATIONS

Fault Indicator: Can not test
Fault Indicator: Low Battery
Cause: 9V battery is low.
Remedy: Replace 9V battery. Refer to page 20.

Fault Indicator: Internal Fault
Cause: An internal fault has been detected.
Remedy: Contact factory for return instructions.

Fault Indicator: Voltage Too High
Cause: Line voltage is above 140VAC.
Remedy: Repair circuit (possible open neutral).

Fault Indicator: Voltage Too Low
Cause: Line voltage is below 95VAC.
Remedy: Repair circuit (possible loose connection). Refer to page 17.

Fault Indicator: No Ground
Cause: No ground present on a 3 prong outlet or testing is being done on a 2 prong outlet.
Remedy: None necessary, tests will continue without testing ground related items.

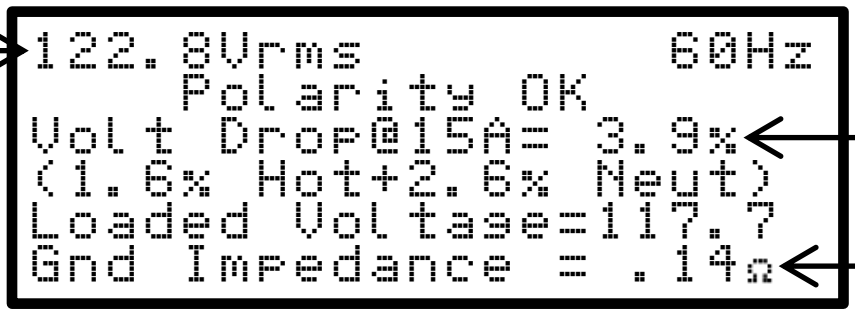
Fault Indicator: Ground or Neutral Hot
Cause: Either the ground wire or the neutral wire is swapped with the hot wire.
Remedy: Turn off circuit power and repair circuit. Retest.

Fault Indicator: Two Hots or
Fault Indicator: Hot-Ground Reversed
Cause: The hot and ground wires are reversed.
Remedy: Turn off circuit power and repair circuit. Retest.

Fault Indicator: Hot-Neutral Reversed
Cause: The hot and neutral wires are reversed.
Remedy: Turn off circuit power and repair circuit. Retest.

Fault Indicator: Open Neutral
Cause: The neutral wire is not connected, broken or loose.
Remedy: Turn off circuit power and repair circuit. Retest.

FLASHING FAULT WARNINGS



Flashes if below 108VAC or if above 132VAC

Flashes if lower than 0.05 ohms or higher than 2.0 ohms.
Note: a very low resistance value *may* be an indication of a "reverse bootstrap" condition in which the neutral contact of a 3 prong outlet has been bootstrapped to the ground contact, but the hot and neutral wires of a 2 wire run (no ground wire) are swapped causing hot to appear on the neutral and ground contact and neutral to appear on the hot contact.
Remedy: Turn off circuit power and visually inspect circuit. Retest.

Flashes if higher than 6%

WHAT THE READINGS MEAN

A) Voltage under load: This is the actual voltage available if a steady load of 10, 15 or 20 Amps is applied to the line. Most North American devices will operate correctly between approximately 110 and 125 volts. Voltage of less than 108 *may* cause computers and other sensitive equipment to malfunction. High or low voltage can often be corrected by the utility company servicing your area.

B) Voltage Drop: Indicates amount voltage would be reduced with the set load applied to the line. The national electrical code recommends no more than a 5% voltage drop. Excessive voltage drop can be caused by poor splices, connections or too small of wiring for the length of the run. Excessive voltage drop can lead to fire, low operating voltages, and marginal operations of equipment. Individual conductor quality is tested by comparing the percentage of voltage drop on the hot and neutral conductors, indicating if either the hot or the neutral has a loose connection or if the wiring run is too long or has too small a gauge wire for the length of the run.

The electrical code (NEC § 210-19) states that "... where the maximum voltage drop on both feeders and branch circuits

to the farthest outlet does not exceed 5 percent, will provide reasonably efficiency of operation".

Possible problems creating excessive voltage drop:

a. Bad splice
b. Loose screw termination
c. Stripped thread on wire nuts or terminal screws
d. Faulty outlet
e. Undersize wiring (too long of run for wire size)
f. Loose connection at circuit breaker or fuse
g. Corroded connections
h. Overheating due to loose contacts
i. Faulty or poor quality push in connections on receptacles
j. Cold forming on aluminum wiring, causing loose connections
k. Worn switch or circuit breaker contacts

NOTE: 15 Amp systems should not be expected to perform to 20 Amp specifications.

C) Ground Impedance Test – This test is not related to the SET LOAD switch and is not affected by voltage drop on the line. This test simply tells you the quality of the outlet

ground. Most computers and high technology electronics are reliant on a good quality equipment ground for proper operation. A typical rule of thumb is ground impedance in most cases should be less than 2 ohms. Loose connection, splices or too small of a ground conductor can cause high impedance. If less than 0.05 ohms is indicated on a medium or long wire run, check the test outlet for a short between neutral and ground.

D) Polarity Test – This test checks for typical wiring errors involving three wire outlets. Any wiring errors should be corrected immediately before further test of the outlet.

NOTE: Open hot is indicated by:

NO VOLTAGE DETECTED

Important notes for testing GFCI / AFCI circuit path:

A) Consult the manufacturer's installation instructions to determine that the device is installed in accordance with the manufacturer's specifications.

B) Check for correct wiring of the receptacle and all remotely connected receptacles on the branch circuit.

C) Operate the test button on the installed device. The device must trip. If it does not trip, do not use the circuit until the GFCI or AFCI has been replaced and retested.

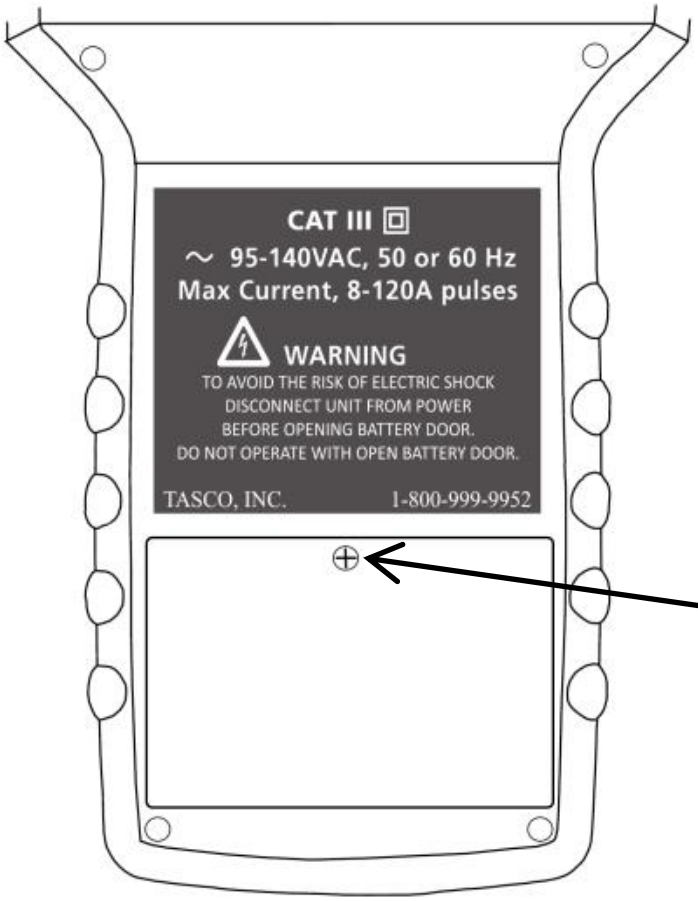
D) Some combination AFCI breakers will not trip using the AFCI TEST mode. To verify wiring path of these circuits, plug in the INSP-3 without setting to AFCI TEST mode.
NOTE: A good quality 3 to 2 wire adapter may be used to test ungrounded systems with minimal loss in accuracy.

Lighting or motor circuits may be tested by using a good quality plug to clip lead adapter having not smaller than 14 gauge wire and not longer than 4 feet.
Large power disturbances or spikes may cause erratic readings.

Battery Replacement and Maintenance

A standard 9V alkaline battery is used. Always unplug unit before replacing battery.

Periodically wipe the case with a damp cloth and mild detergent; do not use abrasives or solvents.



To open battery door, remove screw

Accessory Parts list:

Accessory	qty.
Product specific IEC320 cord	1
Carry Case	1

NOTICE TO PURCHASER:

All statements, technical information and recommendations contained herein are based on tests we believe to be reliable, but the accuracy or completeness thereof is not guaranteed, and the following is made in lieu of all warranties, express or implied. Manufacturer's only obligation shall be to replace such quantity of the product proved to be defective.

Manufacturer shall not be liable for any injury, loss or damage direct or consequential, arising from the use or misuse of this product. User shall determine the suitability of the product for his intended use, and user assumes all risk and liability in connection therewith. No statements or recommendations not contained herein shall have any force or effect unless in an agreement signed by officers of the manufacturer.

WARRANTY:

Tasco, Inc. warrants that the INSPECTOR will be free from defects in workmanship and materials for a period of two (2) years from the date of purchase.

Tasco, Inc. will, without charge, replace or repair, at its option any warranted product returned to the Tasco factory service department.

Tasco, Inc. shall not be liable for any consequential damages, including without limitation, damages resulting from loss of use or damages resulting from use or misuse of this product. Some states do not allow limitations of incidental or consequential damages, so the above limitation or exclusion may not apply to you.

This warranty gives you specific rights and you may also have rights which vary from state to state.

EXCLUSIONS:

This warranty does not apply in the event of misuse or abuse of the product, as a result of unauthorized repairs or alterations, nor if the enclosure has been opened. No user serviceable parts inside.

Manual Rev. A