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SCANNER

Trailer Lighting System Tester 01009

User's Guide

Equipment Record

Purchased from:
Date of purchase:
Serial Number:



Thank You...

for buying a Scanner. You've purchased a well-made piece of test equipment that will serve you for years to come.

Please take a few moments now to look over this User's Guide. Once you know how to use your **Scanner**, you will be able to perform an accurate lighting system test on any trailer in one minute or less.

Since the battery or power supply you install will have a big impact on the unit's overall performance, pay special attention to the sections titled "Selecting the Power Source" (pages 5&6) and "Selecting the Battery" (page 6).



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SCANNER SPECIFICATIONS

Length	14.82 in. (376 mm)
Width	10.70 in. (272 mm)
Height	13.62 in. (346 mm)
Weight (less battery)	10.03 lbs. (4.47 kg)
Operating voltage	12Vdc (nominal)
Switched circuits	Aux, Mark, Tail
Scanned circuits	Left, Stop, Right
Circuit breakers	Aux, Mark, Tail- 20 amps total, SAE type 1 auto reset Left, Stop, Right- 14.6 amps each, SAE type I auto reset
Short circuit warning	Two red LED's; one for each circuit breaker
Low battery warning	One LED. Blinks at 11 volts. Full on at 10 volts and scanning is halted.
Total current capacity	35 amps
Trailer connection	SAE 7-pole plug with cable protector spring
Trailer cable	8'5 ft (2.59 m) usable length, 14 gage, 7 conductor
Auxiliary ground lead	6.5 ft (1.98 m) 12 gage with 50 amp clip
Carrier	Grey low-density polyethylene (LLDPE) molded in one piece
Battery (not included)	BCI size Group U1, or 22NF, or 24, (except group 24 marine), and others

USING YOUR Scanner

Instructions for basic light testing

Basic Testing

☒ **Insert your Scanner 7-way plug** into the trailer's lighting socket.

☒ **Turn ON** the Auxiliary, Marker, and Tail light circuit switches as needed. Flip the Mode Select Switch to AUTO to activate the Scan Feature. Your **Scanner** then operates the turn signals and stop lights in the following sequence:

Left 1.5 Sec→ Stop 3.0 Sec→ Right 1.5 Sec→
(The sequence repeats indefinitely.)



☒ **Walk around the trailer** to visually determine that all lighting functions are working and that the turn signals and stop lights operate in this exact sequence.

☒ **If the lights operate in some other order** or the long dwell is not on the stop lights, the trailer has either wiring defects or is improperly wired.

☒ **Four-wire systems do not have a stoplight circuit.** The stoplight function is created when the towing vehicle powers both turn signals simultaneously and steadily. Your **Scanner** won't know the difference; it always powers its 7-pole plug in exactly the same sequence. The three-second dead spot that occurs as your **SCANNER** attempts to power the trailer's non-existent stoplight circuit makes the sequence at the back of the trailer **appear** as follows:

Right 1.5 Sec→ Left 1.5 Sec→ Dead 3.0 Sec→

Testing for Bad Grounds



☒ **The red CSIs (Circuit Status Indicators)** do double duty. When the circuits are turned ON the CSIs function as tell-tale lights; but when the circuits are turned OFF, the CSIs monitor their assigned circuits for small current feedbacks. The CSIs glow brightly even on small currents. By monitoring each circuit for small wayward currents, bad grounds and other problems are revealed.

Note how in this picture the left and the Marker CSIs are both on, even though the Marker switch is off. This indicates a bad ground at the left side turn signal/marker light installation.

☒ **To test for bad grounds**, start with all of the circuit switches OFF. Flip the Mode Select Switch to the AUTO position. The unit will run the turn signal and stop light circuits in turn.

☒ **Watch the CSIs on your Scanner panel.** As your **Scanner** scans through the circuits, **there should never be more than one CSI lit up at a time.** If any two CSIs light up while the unit is scanning, it usually indicates a bad ground at a bulb that is performing those two functions. For example, if the TAIL CSI lights up when the LEFT CSI does, suspect a bad ground at the left-hand tail/turn light assembly. This test is only valid for circuits that use incandescent dual-filament bulbs.

☒ **Other problems can cause the CSIs** to respond similarly. These include circuits that are bleeding into each other due to wiring problems, or touching bulb filaments. The most likely culprit- by a wide margin- will be a grounding problem, so check your grounds first.

☒ **If all CSIs light** when only one circuit is turned ON, the main ground circuit is open. Grounding the trailer with the auxiliary ground lead provided with your **Scanner** should temporarily clear the problem so you can continue your lighting system test.

Using the Freeze Feature

➡ **The scanning action can be stopped at any point.** Observe the CSIs until the circuit you want to pause on is powered, then move the Mode Select switch quickly through OFF to the FREEZE position. The scanning action is halted at that point and steady power is applied to the circuit.

➡ **Scanning action resumes** where it left off when the Mode Select Switch is pushed back to AUTO.

Using the Short Circuit Indicators (SCIs)



➔ **If your Scanner confronts a short circuit**, one of its circuit breakers will trip open, and the appropriate SCI will light up. Turn all circuits OFF while you're waiting for the circuit breaker to reset (it will reset automatically with an audible click in about 15 seconds). Once the circuit breaker resets, turn the circuits ON again, one at a time. The circuit breaker will trip open again, and its SCI will light up again when the offending circuit is turned on.

Using the Low Power Indicator (LPI)

✘ **The LPI blinks** when the battery voltage falls to 11 volts. When the battery falls to 10 volts, the LPI lights up steady and the scanning action is halted. This feature protects your test battery from deep discharges that can ruin it.



✘ **It's always a good idea to check the LPI** before traveling to distant trailer yards. Once an automotive battery starts to die, it dies rather quickly. If the LPI is blinking, charging is needed. Expect only limited testing time before your **SCANNER** shuts down due to low voltage.

MAKING OTHER TESTS

Testing light cords, etc...

Testing Rear-Mounted 7-Pole Lighting Sockets

❑ **Never conduct your primary lighting system check** from the rear-mounted plug! You are not testing the floor cable or the nose plug this way, and these are two common trouble spots. And **never** power the trailer from both ends at once, such as powering the rear plug with your **Scanner** while a tractor is plugged into the trailer at the front (even if everything is turned off in the tractor). Not only will any test results obtained **this** way be invalid, but you could damage your **Scanner or the tractor electrical systems!**

❑ **If the trailer has a rear-mounted lighting socket**, you'll want to check its operation. Use an adapter or a good light cord to connect a Tractor Plug Output Tester (TPO Tester such as our #01950) to the rear socket. Then, with your **Scanner** powering the trailer from the **front**, read the test results from the TPO Tester.



❑ **If you don't have a TPO Tester**, make your usual lighting system test from the trailer's front socket. Check the rear socket by repeating the lighting system test, but this time use your **Scanner** to power the trailer from the rear socket. Don't forget, **your main lighting system test must always be done from the front socket!**

Testing Light Cords

❑ **To test light cords** you'll need an adapter (such as our # 01030 or equivalent) to connect your **Scanner** 7-way plug to the light cord in question. Insert a TPO Tester into the other end of the light cord. Observe the lights on the TPO Tester as you operate your **Scanner** circuit switches.

❑ **If all of the TPO Tester's LED's light** when only one circuit switch is turned on, the light cord's ground circuit is open.



Testing Electric Brakes

☑ **Your SCANNER can be used to test the operation of electric brakes**, but only on an on/off basis. You can use an adapter wired so that the electric brakes apply each time your tester scans to the STOP circuit (the red wire). Or, if you'd rather not have the brakes apply automatically as part of the scan sequence, wire your adapter so your **Scanner** applies the brakes when any other unused circuit is manually turned ON (such as the AUX or TAIL circuits). If your brakes draw more than 14 amps, you'll have to use the AUX, MARK, or TAIL circuit

TESTING ABS SYSTEMS

Instructions for basic ABS testing

Testing ABS Systems

Modern trailer ABS systems contain an on-board computer with self-testing and diagnostic capabilities. Some systems test each time the auxiliary pin of the 7-pole plug is powered, while others perform a little self test each time the Stoplight circuit is powered. An amber "ABS fault" marker light is located on the left frame rail, usually near the rear of the trailer where it can be seen by the driver through his mirror. It is used to signal the results of this test. **Using your Scanner to test these systems** is simply a matter of powering up the ABS so that the system can **test itself**, and observing the result of that test.



Before beginning your ABS test, it is **essential** that you have a battery or a power supply capable of providing smooth, conditioned power to your **Scanner** (such as our No.01963 30-Amp power Supply). Do not attempt to power this test by using a typical shop battery charger all by itself. The current from shop chargers often has a ragged wave form that might not be recognized by the ABS computer, and may cause erroneous fault indications. You may, however, test a trailer's ABS while a charger is charging your **Scanner**'s battery; the battery will act to smooth and condition the charger's output, much like a capacitor does.

1. To test the system, position your **Scanner** off to the left front corner of the trailer so you can operate the unit and still have a clear view of the trailer's ABS fault light.

2. Turn your Scanner Auxiliary circuit switch ON. Depending on the system, the ABS might test at this time. If it does, the ABS marker light should light up and remain lit for 3 to 5 seconds, then go out, and you may hear the trailer's modulating valves "chuffing".

3. Flip the Mode Select switch to AUTO to scan over to the Stoplight circuit, then flip it to FREEZE to pause the scanning action there. Flip the Mode Select switch OFF and, while observing the trailer's ABS marker light, turn the stoplight circuit ON again by flipping the Mode Select switch back to FREEZE. Each time your **Scanner** powers the trailer's stop lights, the trailer's ABS fault light should light up for 3 to 5 seconds, then go out. If the ABS fault light fails to light up, or if it blinks, or if it stays lit all the time, a problem exists in the trailer's ABS.

Obviously, the trailer is stationary for this test. Note how this differs from real-world operation; that is, when the trailer is *actually moving*. In that condition, each time the brakes are applied, the ABS fault light should light for about one second and then go out.

If an ABS fault is found, the ABS has an extensive self-diagnostic feature that can guide you straight to the problem. Since there are different systems in use, using this feature is beyond the scope of this user's guide; consult the factory documentation for model-specific information.

ABS technology is evolving rapidly. New systems and procedures are arriving almost daily, so we can't guarantee that the above information will be correct in the future or in every case. Even though testing and diagnosing ABS systems is a remarkably "user friendly" operation, the complexities of today's vehicles make it essential that you **know the correct testing protocol for the type of ABS system you are servicing.**

SELECTING ADAPTERS

Information about available adapters

The following adapters and accessories are available from Square Wheel. If you already have adapters on hand, you can use them successfully as long as they are in good, service-able condition and have ground circuits. If an adapter does not have a ground circuit you will have to deploy the auxiliary ground lead every time you use it.

Adapter application chart

To test ↓	You'll need ↓ (P/N)
Output of a tractor's SAE 7-pole lighting plug	01950
SAE 7-pole light cords- test continuity	01030 & 01950
Semi-Trailers equipped with the old-style SAE 6-way SOCKET	01018
Utility and construction trailers etc. equipped with a CABLE and SAE 6-pole PLUG	01019
Rear-mounted SAE 7-pole sockets (such as those found on the back of pup trailers)	01027 & 01950
Recreational vehicles equipped with a CABLE and a round, 7-blade PLUG	01023
Light-duty recreational vehicles equipped with ribbon cable and a 4-pole flat plug	01023 & 01022 (or 01017)
All applications. Plugs into your <i>SCANNER</i> 7-pole plug, you supply and install whatever kind of plug is needed on the other end. Most cost-effective adapter solution.	01017



**01018
01019**



01027



01030



01017

SELECTING THE POWER SOURCE

Some options for powering your *Scanner*

How do you intend to use your Scanner? Do you need complete portability so you can use your tester anywhere? If so, you don't want to be tethered to a line cord. Maybe you're going to use your tester in one place, as at the end of an assembly line. In that case you won't want to be bothered with battery charging. The chart below shows three testing situations and suggests ways to power your *Scanner*.

Example	Powering Suggestions
Service Truck (exclusively)	Battery alone. Tester has no charger inside to add to carry weight, and is completely portable. Can be used in any weather. Your <i>Scanner</i> battery can be charged from your service truck's electrical system while you drive. Important: Read "Connecting Your Charger" on page 11 before you do this.
Multi-use-Service Truck & Shop Floor	Battery plus a 6-amp charger. Unit can be fully portable or run on 120 volts when it's available. When running on 120 volts, the tester's duty cycle is about 50%, which is plenty for most applications. Because the charger is installed, the unit is not weatherproof, but the charger can be easily removed if you must work in wet environments.
Trailer Assembly Operation	30 Amp Power Supply mounted in remote location and connected to tester via 12 volt power cable. Since the tethering cable carries only 12 volts, this system offers safety advantages should the cable become cut or damaged. The tester can be used in any weather so long as the charger is mounted in a dry location. Or 30-Amp Power Supply mounted inside tester. Can be used anywhere a 120 volt source is available. 100% duty cycle, no battery requirement. Not weatherproof.

POWER SUPPLIES AND BATTERY CHARGERS

Some ideas about powering your *Scanner*

For your convenience, Square Wheel offers the 6 Amp *Deltran Battery Tender* and the 30 amp *IOTA DLS-30* power supply. There are other chargers and power supplies on the market that are similar and provide equally satisfactory service.

☒ **The Deltran unit is small and light** and can be installed right inside your tester's carrier **along with** a battery for a versatile plug-in or stand-alone tester.

☒ **The IOTA power supply is larger** and more expensive, but does not require a battery. It requires access to 120 volts, and is capable of a 100% duty cycle.

☒ **Either of these units can be mounted** right inside your *Scanner* carrier, but **neither is weatherproof**.

Power Source	Advantages	Disadvantages
OPTION 1 Battery Alone	<ol style="list-style-type: none"> 1. Complete portability- can be used anywhere 2. Least expensive power option initially 3. Can be used in any weather 	<ol style="list-style-type: none"> 1. Battery must be charged regularly 2. Might prove to be most expensive in the long run 3. Can be cumbersome if you're using a big battery
OPTION 2 Deltran 6-Amp Battery Tender installed along with a BCI size (group) U1 battery.	<ol style="list-style-type: none"> 1. Complete portability when needed. You're not tethered to a line cord. 2. Convenient plug-in-and-forget-it charging. Can be plugged in on a 24-7 basis without over charging. 	<ol style="list-style-type: none"> 1. When plugged in, duty cycle for tester is typically about 50% (ample for most applications) 2. Not weatherproof unless you remove the Battery Tender
OPTION 3 IOTA 30 Amp Power Supply alone	<ol style="list-style-type: none"> 1. No battery to buy or maintain 2. Always ready to work 3. Duty cycle is 100% 4. Lightest carry weight 5. Least expensive in the long run. 	<ol style="list-style-type: none"> 1. Must have 120 volt supply available 2. Not weatherproof 3. Most expensive initially

SELECTING THE BATTERY

Picking the best battery for your application

Your Scanner is not fussy about the battery you install. You have the ability to select the battery with those specific attributes that are most important to **your** intended usage.

Type— Unless you have special battery needs, we suggest you install an ***inexpensive*** 12 volt automotive battery. Don't bother with a long warranty or a high CCA rating; they are meaningless in this application. Deep-cycle and gel-cell batteries are best when your battery must go for long periods without charging, but they're heavy and expensive. Avoid these unless you really need the capacity they offer.

Physical Size— The maximum recommended battery size is the BCI group 24 (except group 24 Marine; the terminals are too high). Group 24 batteries are 10"long x 7"wide x 9"High (over terminals). If you're installing the optional ***BATTERY TENDER*** charger/maintainer, the group "U1" size battery is recommended. It is small and leaves ample room for the charger inside the carrier.

Reserve Capacity— Reserve capacity is a measure of your battery's ability to release power over a period of time, and is the only value you need to consider.

This "rule of thumb" is useful when specifying reserve capacity:

When testing typical van trailers with standard incandescent lighting equipment, **the number of minutes of useful life per charge is roughly equal to twice the battery's reserve capacity.** For example, a battery with a reserve capacity of 45 will yield approximately 90 minutes of test time before charging is required. The new LED lighting now being installed on trailers draws far less current. If you are checking a high percentage of LED equipment, expect considerably longer usage between charges.

Weight—for easy hand carrying, a maximum battery weight of about 30 lbs is suggested.

Terminals—post, lug, or stud terminals are acceptable. Avoid side terminals; they might make battery installation difficult.

INSTALLING THE BATTERY

Instructions for installing your battery

WARNING!

- 1. Never store the auxiliary ground lead, 7-way plug, or anything else on top of the battery. This could cause a short circuit resulting in damage to your battery, your tester, and/or cause serious bodily injury.**
- 2. Never use your tester's battery to jump-start a vehicle. If, in an emergency, you must use your *Scanner* battery for some other purpose, remove the battery from the carrier and disconnect both battery leads.**
- 3. Never use your tester's 7-way plug to power anything other than a trailer's electrical system.**

● **Install a battery that is clean**, charged, and in good condition. Position the battery lengthwise at the rear of the carrier so that the positive(+) terminal will enter the carrier first.

● **If needed, use the battery terminals provided** to connect the leads. No part of the connection should extend out over the edge of the battery, and the battery leads should head toward each other. Observe correct polarity- red is positive (+), black is negative (-).



● **Cover the terminals** with the insulating covers provided on the battery leads.

● **Slide the battery into the carrier** and push it forward as far as it will go.

● **Some small batteries** (group U1 for example) fit sideways inside the carrier, although very snugly. Often these batteries have a lug on each end of the battery case. To install or remove this type of battery from the carrier, you must first lift the battery

slightly to allow these lugs to clear the ribs in the carrier's side. Other small batteries (group 22NF for example), are too big to fit sideways, so use spacers to center the battery and keep it from moving side-to-side.

❑ **Styrofoam blocks make the best spacers**, but nail-free wooden blocks will also work satisfactorily.

❑ **We do not recommend using grease** or sprays to control corrosion on the terminals because these usually become too messy.

CONNECTING YOUR CHARGER

Some tips and ideas about connecting your charger

WARNING! It is the user's responsibility to know and follow proper battery handling safety rules! Always follow the battery manufacturer's recommended handling and servicing procedures. Failure to do so can result in property damage, serious bodily injury or death.

If you have installed the Deltran **BATTERY TENDER**, charging the battery is simply a matter of plugging the charger in. You can leave the **BATTERY TENDER** plugged in on a 24-7 basis, it won't overcharge your battery, but it is **not weather proof**. If you must use your **Scanner** outdoors during inclement weather, remove the charger before going outside.

You can also charge your **Scanner** battery through the 7-way cable. "Hard wire" a charger's output leads directly to a SAE 7-pole socket mounted at a convenient location. Wire the charger's positive lead to the auxiliary circuit pin (the center pin) of the socket and the negative lead to the ground pin (the fat pin). To charge the battery, simply plug your Tester's trailer plug into this socket and turn ON the AUX circuit switch. Charging current will flow thru the unit and charge your battery through your **Scanner** circuitry.

This simple charging station provides the plug-in convenience of a built-in charger, but without a 120-volt charger on board, your **Scanner** will still be weatherproof.

If you're charging your **Scanner** battery from your service truck's electrical system, charge it through the 7-way cable. You may find your **Scanner** 20 Amp circuit breaker trips each time you start the truck's engine, because your **Scanner** battery is trying to start the truck when the key is turned. This is considered normal and not a problem.

For safety, run a separate 10 gage wire from your truck's positive battery terminal and install a 30 amp SAE Type 1 automatic resetting circuit breaker in that line. Hook the breaker up so its ACC terminal connects to your truck battery's positive (+) terminal, and its BAT terminal connects to the positive (+) terminal of your **Scanner** battery.

If you're using a large battery you can, of course, simply slide the battery out of the carrier to connect your charger.

Regardless of which charging method you use, make sure the battery is well ventilated at all times. Always keep your tester's open end away from walls or other obstructions that would prevent air from circulating into the carrier and around the battery.

CHARGING THE BATTERY

General information about charging your battery

WARNING!

It is the user's responsibility to know and follow proper battery handling safety rules! Always follow the battery manufacturer's recommended handling and servicing procedures. Failure to do so can result in property damage and/or serious bodily injury.

↓ **Nothing will destroy a good battery** faster than overcharging. As a rule when charging most batteries, voltage should be limited to about 14 volts at no more than 12 amps for maximum battery life. Check your charger output to make sure it can limit itself to these levels.

↓ **On the other hand**, storing a partially discharged battery will shorten its life. Charge the battery as soon as practical after use.

↓ **We suggest a 6 to 10 amp charger**, preferably with a "storage" or "float" mode be dedicated to charging your tester's battery.

↓ **Deltran's 6 Amp BATTERY TENDER charger/maintainer** is just such a charger and is our primary recommendation. The **BATTERY TENDER** is rated at 6 amps, and its microprocessor controlled float mode will never allow your battery to be overcharged, even if left plugged in on a 24-7 basis. The microprocessor protects the charger from damage due to overload, short circuits, or reversed polarity. The **BATTERY TENDER** is small enough and light enough (only 21 ounces) to be mounted in your **Scanner** carrier along with your battery. We suggest you use the BCI size (group) U1 battery with this charger, but it is possible to use a bigger battery if your application requires it.



01060 Deltran Battery Tender

Square Wheel Industries, Inc.'s Five-Year Warranty

What could *Possibly* go wrong?...

Warranty Policy: Each Scanner Trailer Lighting System Tester is warranted by Square Wheel Industries, Inc. to be free from defects in materials and workmanship for a period of five years from the date of purchase by the original customer. The warranty will not apply where the unit has been abused, misused, subject to accident, or if the defect is caused by alterations made to the unit without approval from the manufacturer.

This warranty covers 100% of parts and labor. Square Wheel Industries will, at its option, repair or replace any unit or part thereof which, in its opinion, has failed under the terms of this warranty. Replacement units may be a different model than the unit being returned for service providing the replacement unit is functionally equal to or better than the unit that was returned. Replacement units may be either new or reconditioned. Replacement of parts or the complete unit does not extend the original warranty period. The customer shall return the unit to Square Wheel Industries "freight prepaid". Square Wheel Industries, Inc. will pay for shipping the repaired unit back to the customer.

When you unpack your Scanner, you may notice some scuffing or minor scratches on the carrier. Your **Scanner** carrier is molded from low-density polyethylene. This material is very tough and able to withstand extreme conditions, but prone to acquiring small surface imperfections. In fact, scuffing often occurs as the carrier is withdrawn from the manufacturing mold, and during the trimming, shipping, and assembly process. These cosmetic imperfections in no way affect the strength or integrity of the carrier.

There is no finer material for your Scanner carrier. Its use ensures a virtual lifetime of rough-and-tumble service.

Service and spare parts

If you must return your **Scanner** for service...

It is very important that you include a note explaining what's wrong, and please include the name and phone number of someone with firsthand knowledge of the problem.

For service or further information call or fax:

