#9101-D20C/#9102-D20C

Light/Heavy Ranger MUTT®

Mobile Universal Trailer Tester

OPERATOR'S MANUAL

MADE IN USA

#9101-D20C
Includes Adapter

#9102-D20C

Uses DeWalt® Compatible 20V Battery (Battery Not Included)

#9101-D20C Light Ranger MUTT® Tests 7-Way Flat (SAE J2863), 6-Way Round and 4/5-Pin Connections

#9102-D20C Heavy Ranger® MUTT® Tests 7-Way Round (SAE J560) Pin Connections

Innovative Products of America® Incorporated
888-786-7899 • 234 Tinker Street, Woodstock, NY 12498 • www.ipatools.com

LETTER FROM THE PRESIDENT OF IPA®

My name is Ian Vinci and I am the president of IPA®. I would like to thank you for your interest in IPA®'s product line and share my commitment to you, our products and our policies. In today's world, we have all experienced the lack of service and consideration demonstrated by many companies after you buy their products. They say whatever they can to make the sale, and then it's like pulling teeth to get any service response out of them. I know this myself firsthand and because of this, I want to be sure that your experience with IPA® meets your expectations and that IPA® never disappoints you with our service or customer response.

To prove my commitment to you, if for any reason, you are not happy with one of our products – or more importantly, with the response from our customer service department, or any member of the IPA® team – I invite you to contact me directly via my email president@ipatools.com or call me at 888-786-7899. Your satisfaction is more important to me than the sale itself. We will not be in business for long if we don't make you completely happy with our products and service. I want IPA® to be different and be known for its quality and service.

With that said, please take a look at our product line. You will see innovative first time products that were created to help you do your job faster and better than before. I would also like to invite you to critique our products. If you can think of a better way to make them or changes that will make them work better, please contact me directly and I will be sure to look into it. If you have an innovation and would like some feedback, give me a call.

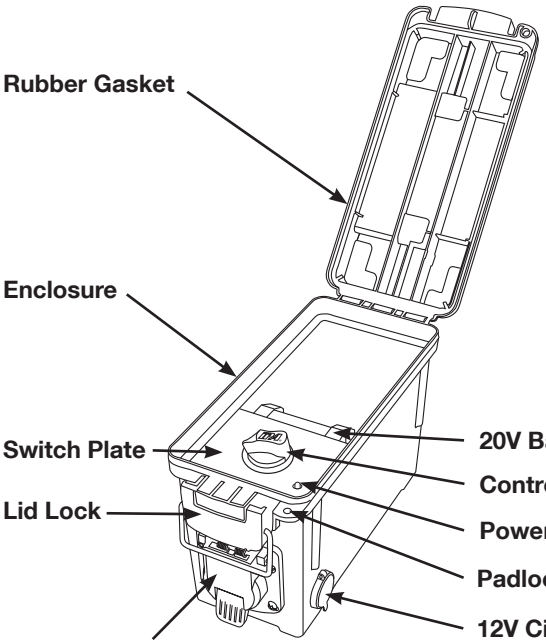
From all of us at IPA®, we thank you for taking the time to review our product line and wish you and your family the very best of everything.

Ian Vinci
President
IPA®

www.ipatools.com
Toll Free: 888-786-7899
Phone: 845-679-4500
Fax: 845-679-4600

#9101-D20C and #9102-D20C Ranger MUTT® PARTS

Fig. 1 - Parts Diagram



ACCESSORIES

3-Way Trailer Adapter #8000
(Included with #9101-D20C only)

(Line art for both #9101-D20C and #9102-D20C units. See 7-Way Socket descriptions for variations between units.)

Use the reference numbers provided when ordering products and parts above.
Toll Free: 888-786-7899

IMPORTANT SAFETY INSTRUCTIONS

IT IS IMPORTANT TO READ, UNDERSTAND AND FOLLOW ALL SAFETY MESSAGES AND INSTRUCTIONS PRINTED IN THIS MANUAL AND ON THE EQUIPMENT BEFORE OPERATING. IF SAFETY INFORMATION IS NOT HEEDED, SERIOUS INJURY OR DEATH TO THE OPERATOR OR BYSTANDERS MAY OCCUR.

DANGER: Indicates a hazardous situation, if not avoided, will result in death or serious injury. The possible hazards are shown in the adjoining symbols or explained in the text.

WARNING: Indicates a hazardous situation, if not avoided, could result in death or serious injury. The possible hazards are shown in the adjoining symbols or explained in the text.

CAUTION: Indicates a hazardous situation, if not avoided, may result in minor or major injury. The possible hazards are shown in the adjoining symbols or explained in the text.

USING THE 20V POWER TOOL BATTERY ADAPTER

This tool is equipped with a power-tool battery adapter and voltage-regulating technology, which allows the use of 20V DeWalt® compatible batteries. This tester regulates the voltage down to a steady 12V output. Under excessive loads greater than 10 amps, the voltage may decrease. Once power loads exceed 12 amps, the internal breaker trips and disconnects power to the trailer. The onboard voltage regulator is protected, and in some cases of extreme power draw, the tool reduces output voltage down to 1V to avoid damaging internal components.

If a steady output voltage of 1V is detected, which has a symptom of very dimly lit trailer lights, disconnect the tester from the trailer and check the voltage output at the connector. With no load connected, the voltage output should return to 12V. If so, this indicates the trailer has a short circuit that is pulling power faster than the thermal breaker can react. Reconnect the tester and select one circuit at a time until the voltage reduces again. This circuit is the cause of the overdraw. You may leave the circuit powered indefinitely while you look for the cause of the short. Try shake-testing wires or removing loads one at a time. If the voltage returns to normal, or the light becomes fully illuminated, you have found the source.

This unit is for use with most all DeWalt® compatible 20V batteries. Most all batteries 5-amp hours or smaller fit in the enclosure with the lid closed. Batteries larger than 5-amp hour may not fully fit inside of the enclosure with the lid down. Some batteries feature a built-in battery management system (BMS). Batteries with BMS systems may interfere with the Ranger MUTT® onboard circuit protection system but are still safe to use. This results in the battery cutting power faster than the Ranger MUTT® breaker can trip. This is expected with batteries that have built in BMS system. For specific compatibility concerns please contact IPA® Tech Support at 888-786-7899.

SPECIFICATIONS

- Input: 20V (Any Amp Hour)
- Output: 12V DC
- Current Rating: 10A Continuous / 12A 15-Second Surge
- Overload Protection: 10A Auto-Resetting Thermal Circuit Breaker
- Connection Type: #9101-D20C - 7-Way Flat (SAE J2863) Pin (6-Way Round and 4/5 Pin w/ Adapter)
  #9102-D20C - 7-Way Round (SAE J560) Pin
- Control Type: Manual Rotary Switch
- Weight: 2 lbs. (empty)

AUTO-RESETTING THERMAL CIRCUIT BREAKER

- The thermally activated, internal auto-resetting thermal circuit breaker requires a 30-second cooldown cycle. After this cycle, the illuminated power LED signifies that the unit is ready to test.

QUICK START-UP GUIDE

SELECT A BATTERY

- The best battery to use is a 20V DeWalt® compatible power-tool battery.
- The battery must be 20-volts DC.
- Maximum battery dimensions: L: 5.25" x W: 4" x H: 6".
- Be sure to install the battery into the adapter correctly, listening for a click to signify proper connection.
- Once the battery is installed, testing can begin.
- Always follow power tool battery care instructions.

WARNING: NEVER OPERATE TESTER WITH BATTERY VOLTAGE LESS THAN BATTERY MANUFACTURERS RECOMMENDED OPERATING RANGE. ELECTRONIC DEVICES ON LOW VOLTAGE MAY SHORTEN LIFE OF AND CAUSE DAMAGE TO INTERNAL COMPONENTS. IDEAL BATTERY VOLTAGE IS 20V.

SET-UP

- Place the tester on a flat, level surface.
- Chock trailer wheels to avoid rolling.

The Ranger MUTT® allows for the testing of trailer electrical systems without the need of the tow vehicle. When used properly, the Ranger MUTT® can save hours spent troubleshooting electrical issues.

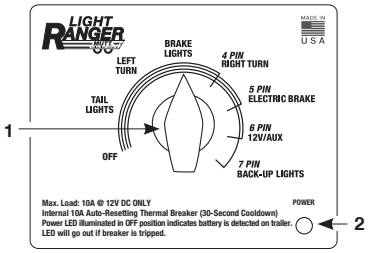
CHECK 7-WAY PIN CONNECTORS: Before operating the Ranger MUTT®, be sure the 7-way socket on the front of the Ranger MUTT® and cable coming from the trailer are in good condition and the pins are spread to the proper width to ensure good connections.

MAINTAIN 7-WAY PIN CONNECTORS: Dielectric grease should be used on all connections to avoid corrosion. If a bad connection exists at the terminal junction, you may get an erroneous reading and the MUTT® will not work properly. Make sure that you have a solid connection in the 7-way socket.

FUNCTIONAL DESCRIPTIONS

The Ranger MUTT® is a diagnostic tool for trailers wired to North American style configurations including 7-way flat (SAE J2863), 6-way round pin and 4/5-pin harness connectors (#9101-D20C fig. 2) and 7-way round (SAE J560) pin configurations (#9102-D20C. fig. 3).

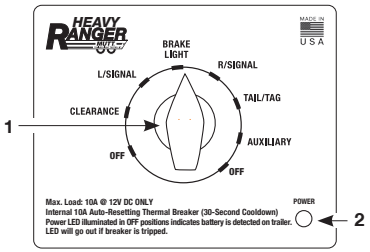
Fig. 2 - #9101-D20C Control and Information Panel



1. **Control Knob: Activates one selected circuit at a time. Selecting the “OFF” position will turn the unit off.**

2. **Power LED: Illuminates when a circuit is selected to indicate the unit is on.**

Fig. 3 - #9102-D20C Control and Information Panel



1. **Control Knob: Activates one selected circuit at a time. Selecting either “OFF” position will turn the unit off.**

2. **Power LED: Illuminates when a circuit is selected to indicate the unit is on.**

OPERATING INSTRUCTIONS

7-WAY PIN TESTING PROCEDURE (Both #9101-D20C and #9102-D20C)

1. Install a fully charged 20V DC battery into your Ranger MUTT®.
2. Plug the trailer's 7-way pin cable into the front of the Ranger MUTT®. Be sure to push firmly until the key is down far enough for the flap to lock in behind it.
3. To begin testing your trailer, turn the Control Knob to the desired circuit.
4. The Ranger MUTT® will send up to 10A continuous @ 12V DC to the selected circuit, e.g., turn signals, brake lights, etc. Perform a visual inspection by walking around the trailer to verify the proper lights are illuminated.
5. Step 4 should be repeated for all lighting circuits.

WARNING: LEFT TURN AND RIGHT TURN SIGNALS FLASHING TOO QUICKLY OR TOO SLOWLY ARE AN INDICATION OF LOW BATTERY VOLTAGE. STOP AND CHARGE OR REPLACE BATTERY IMMEDIATELY TO PREVENT DAMAGE TO TURN SIGNAL FLASHERS.

ELECTRIC BRAKE TESTING (#9101-D20C Only)

1. To inspect electric brakes, first set the trailer on a flat, level surface. Place chocks in front and behind the wheels on one side of the trailer. Proceed to jack up the un-chocked side of the trailer until the tires are off the ground. Follow standard safety protocols such as using jack stands and not placing yourself in harm's way.
2. Ensure that the break-away cable is not disconnected. Try to turn the trailer tires that are off the ground by hand. They should turn with little effort.
3. Turn the Ranger MUTT® Control Knob to the circuit labeled "Electric Brake." Then return to the same tires and try to turn them by hand again. You should not be able to move them. If you are able to move the tires while the electric brake is selected, this indicates that something is wrong or your trailer brakes are out of adjustment. Disconnect the Ranger MUTT® and inspect the braking system further to identify the source of failure.
4. To test the brakes on the other side of the trailer, let the trailer down from the jack stands and repeat set-up procedure described in Step 1.

NOTE: The trailer electric brakes are applied when they receive 12-volts from the towing vehicle. During this test, the Ranger MUTT® will simulate the tow vehicle by providing the full amount of power the trailer brakes can draw. As a general rule, each wheel or electric brake will draw approximately 1.5 - 3 amps. A trailer with four wheels equipped with electric brakes should draw a total load of 6 or more amps on the electric brake circuit. While testing, the use of an amp meter may be helpful when troubleshooting exact causes of electric brake failure.

WARNING: BE SURE TO CHOCK ALL TRAILER WHEELS BEFORE USING THIS TOOL AND ESPECIALLY BEFORE JACKING UP ONE SIDE OF THE TRAILER. FOLLOW ALL STANDARD PROTOCOLS AND COMMON SENSE PRACTICES INVOLVED INCLUDING WORKING WITH A TRAILER ON A FLAT, SOLID SURFACE AND USING PROPERLY RATED JACK STANDS. KEEP HANDS AND FEET FREE FROM TRAILER AT ALL TIMES.

SHORT CIRCUIT AND OVERLOAD TESTING

Summary: The Ranger MUTT® is capable of providing up to 10A of current to a selected circuit. It is equipped with an internal, auto-resetting thermal circuit breaker, which is designed to remove power to the selected circuit when the load exceeds 10A in overload condition. Once power is removed, the circuit breaker requires a 30-second cooldown cycle until power can be reapplied. If the source of the excessive current draw, i.e., the overload condition is still present, the circuit breaker will immediately remove power once again. This process will be repeated until the source of the excessive current draw is removed. Most small trailers should not exceed 10A per circuit when wired properly. You should check the specified current draw for each light bulb or LED on the trailer circuit to determine whether it's an overload condition, short circuit condition or faulty equipment, e.g., electric brakes, lights, harnesses, etc.

Short Circuit: When a positive power source (12V +) is directly connected to or touching the ground (-), wire insulation can wear through due to vibration; exposed copper wire can make contact with the metal trailer frame resulting in a short circuit and a blown fuse in the vehicle.

Overload: When the load (lights and/or electric brakes) attempts to draw more current (amps) than the circuit was designed to handle, this often results in blown fuses.

NOTE: The auto-resetting thermal circuit breaker used in the Ranger MUTT® is thermally activated and requires a short cooldown time between uses. The more often it is tripped, the longer the required cooldown time before it will become active again.

TEST 6-WAY ROUND AND 4/5-PIN TRAILERS WITH 3-WAY ADAPTER

TESTING PROCEDURE

The #9101-D20C Light Ranger MUTT® is designed to test trailers with 6-way round and 4/5-pin connections with the use of the 3-way adapter. The faceplate on the Ranger MUTT® shows which functions are supplied for each pin layout. For example: a 5-pin trailer is wired for tail lights, left turn, brake lights, right turn and electric brakes, but not 12V aux. or backup lights. Consequently, when those circuits are selected on the Ranger MUTT®, they do not power anything on a 5-pin trailer. See fig. 2 for the #9101-D20C faceplate layout. The supplied adapter provides an easy way to plug 4, 5 or 6-pin trailers into the Light Ranger MUTT®. A brief explanation of how to get started is provided below.

1. Plug the 3-way adapter into the 7-way socket on the Ranger MUTT®.
2. Be sure to push firmly until the key is down far enough for the flap to lock in behind it.
3. Plug the trailer into the proper terminal on the 3-way adapter. NOTE: The 5-pin connector also works for 4-pin trailer sockets.
4. To begin testing the trailer, turn the control knob to the desired circuit (as indicated on the faceplate).
5. Once the knob is turned to the selected circuit, power is being sent to the corresponding wire on the trailer.
6. Follow the 7-way pin testing procedure (pg. 7) section for further information.

TROUBLESHOOTING

The Ranger MUTT® is an analog trailer tester designed to help confirm trailer wiring configuration, proper amperage draw, functioning lights, electric brake operation and proper ground connections. Keep in mind that many electrical problems are the direct result of a bad ground connection. By maintaining tight, clean and sealed ground connections, you can eliminate guesswork and improper diagnosis.

We also provide industry-standard wiring diagrams to help you with trailer repairs. The Ranger MUTT® is wired to meet the accepted standard wiring configurations for the industry. Trailers which are improperly wired or wired to "personal" specifications may render the Ranger MUTT® less effective.

Symptom	Possible Cause(s)	Solution
Ranger MUTT® does not turn on.	• Low battery voltage • Poor battery connection	Check battery connections and charge the battery if needed.
Ranger MUTT® is on, but trailer lights do not light up.	• Low battery voltage • Poor cable connection • Poor pin tension • Defective wiring • Defective light/bulb • Inadequate ground	First, verify that the Ranger MUTT® power stays on when power is applied to the trailer. A low battery will power the Ranger MUTT®, but when power is sent to the trailer, the load may cause the Ranger MUTT® to shut down due to low voltage conditions under load. Check for faulty operating trailer lights, wiring, ground, battery polarity, etc. Trailer light bulb or light assembly defective. If problem is still present, call Tech Support at 888-786-7899.
Wrong circuit is powered on trailer.	• Trailer wired incorrectly • Cross circuit condition • Wires jumped • Light bulb filament shorted together	The trailer is not wired to standard specifications. Correctly wire trailer to manufacturers standards or refer to Ranger MUTT® wiring diagrams. Confirm trailer wiring is correct at 7 way plug/socket and the corresponding light assembly/brake magnets. If problem is still present, call Tech Support at 888-786-7899.
Electric brakes are not working.	• Tester battery voltage too low • Poor ground • Short/open circuit on trailer wiring • Defective brake magnets	Verify the battery is fully charged. Verify trailer power and ground at brake circuit connection. (Typically located near the wheel end.) If power and ground are verified, you must safely jack up the trailer and spin the wheel while applying the brake to verify proper operation. Another method is to check amperage load. Most electric brakes draw approximately 2-3 amps per wheel. Check manufacturer specifications for additional information. If brakes still do not work, suspect faulty brake magnets or mechanical failure with brake components/adjustment. If problem is still present, call Tech Support at 888-786-7899.

TROUBLESHOOTING

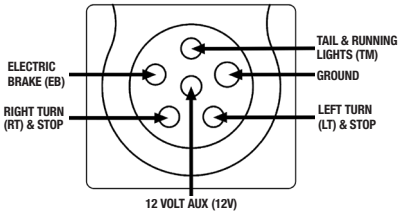
Symptom	Possible Cause(s)	Solution
One circuit powers two sets of lights.	• Cross circuit likely in trailer wiring • Light bulb filament shorted internally • Light bulb socket contacts shorted together	The trailer has crossed wires or one terminal has two wires connected at the pin. Light bulb partially blown causing cross circuit inside the light bulb. Clean the light bulb socket and install a new light bulb. If problem is still present, call Tech Support at 888-786-7899.
The Power LED keeps turning off and on again.	• Battery voltage too low on tester • Overloaded circuit or short circuit	Check battery connection and voltage. If the battery voltage is low, recharge the battery and repeat the test. If the problem persists with a fully charged battery, suspect circuit overload. Repair short or overloaded circuits. The Ranger MUTT® is designed for a maximum output of 10A DC @ 12 volts. If a trailer circuit exceeds this draw or there is a short circuit, the Ranger MUTT®'s auto-resetting thermal circuit breaker will continue to disconnect and reconnect power. During this process, the LED will turn on and off until the issue resolves. If the battery is fully charged and the LED is blinking when disconnected from a trailer, call Tech Support at 888-786-7899.

TYPICAL TRAILER WIRING

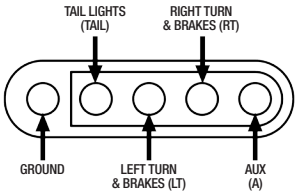
NOTE: The standard wiring pictured in fig. 4 is viewed from the front of the connector. Not all trailers/vehicles are wired to this standard. The use of an electrical circuit tester is necessary to ensure proper match of a vehicle's wiring to a trailer's wiring. On the 6-way plugs, the 12V wire and electric brake wire may be reversed on some trailers (particularly horse trailers).

Fig. 4 - Trailer Wiring

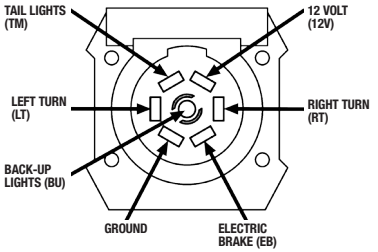
6-WAY ROUND PIN VEHICLE FEMALE SOCKET (FRONT VIEW)



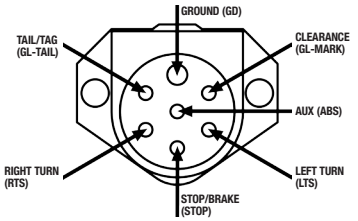
4/5-PIN VEHICLE CONNECTION (FRONT VIEW)



7-WAY FLAT (SAE J2863) PIN VEHICLE FEMALE SOCKET (FRONT VIEW)



7-WAY ROUND (SAE J560) FEMALE SOCKET (FRONT VIEW)



TECHNICAL TIPS

- Always verify your battery is operating within manufacturers recommended voltage range.
- Most electric problems occur at the plug. Always make sure the pins are clean before assuming something is wrong with the trailer.
- The Power LED will illuminate (even in the OFF position) when the tester is connected to a trailer that has its own on-board battery supply. This indicates that the tester recognizes voltage coming back from the trailer.
- As a best practice, limit the time engaging trailer electric brakes with this tool. Electric brake magnets get very hot and are not intended to be left on for extended periods of time.

Limited One-Year Warranty

#9101-D20C LIGHT RANGER MUTT®
#9102-D20C HEAVY RANGER® MUTT®
Mobile **U**niversal **T**railer **T**ester

Innovative Products of America® Incorporated has established a Limited One-Year Warranty Policy for the **Ranger MUTT®**, not including any wearable parts, i.e., clips, etc.

One-Year Limited Warranty/Return or Replace Policy: The product is covered for one year from the date of the original user's purchase under the stipulations of the Standard Warranty.

The product is warranted to be free from defects in workmanship or material. If there is a problem due to workmanship or material defect, Innovative Products of America® will repair or replace the product within 24-working hours after it is received by the IPA® Repair Service Center. If it is determined that the product has been tampered with or altered in any way, the warranty is void and all claims against the product will not be honored. The Warranty Repair/Return procedures require that the proof of purchase must be established (either by warranty card from the seller or by point of purchase receipt/invoice) and the manufacturer makes every attempt to return ship the product, prepaid freight, within three business days from the receipt of the returned product.

If it has been determined that the tool has been damaged due to misuse, Innovative Products of America® Incorporated will repair the tool at a cost we deem reasonable and these charges will be the responsibility of the user. We truly want you to be happy with our products, so if you have any questions, call us toll free at 888-786-7899.

IPA® FUTURE NOW®

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