

## Instruction Manual

# RF Signal Tester

311002 rev.B

**Part No. 249269, Series A, North America (N.A.)**

**Part No. 249880, Series A, Australia**

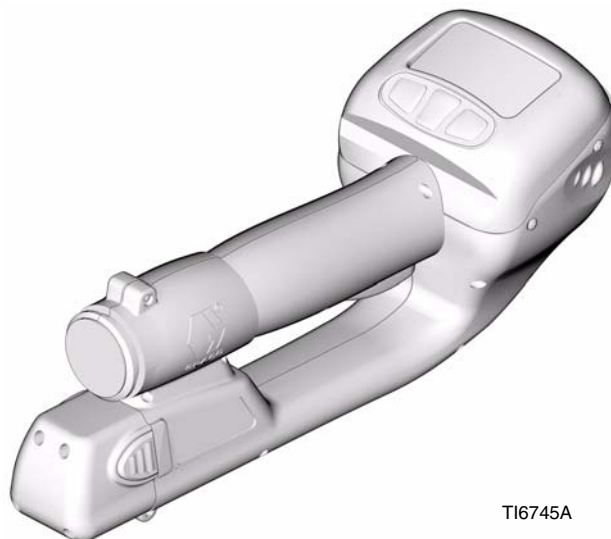
Used to evaluate the Matrix RF signal quality in a new or existing Matrix facility.

U.S. Patents Pending



### Important Safety Instructions

Read all warnings and instructions in this manual. Save these instructions.



TI6745A



FCC ID: JHIGNET  
IC: 4840AGNET



Australian Vendor Code: N3845

### Industry Canada Statement

The term "IC" before the certification/registration number only signifies that the Industry Canada technical specifications were met.

PROVEN QUALITY. LEADING TECHNOLOGY.



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## Manual Conventions


### Warning

|   |
|---|
|  <b>WARNING</b>  |
|  <p><b>WARNING</b> indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.</p> |

### Caution




|   |
|---|
| <b>CAUTION</b>  |
| <p><b>CAUTION</b> indicates a potentially hazardous situation which, if not avoided, may result in property damage or destruction of equipment.</p> |

### Note

 A note indicates additional helpful information.

# Warnings

The following general warnings are related to the safe setup, use, grounding, maintenance and repair of this equipment. Additional more specific warnings may be found throughout the text of this manual where applicable.

|  <b>WARNING</b> |   |
|--|---|
|                 | <p><b>FIRE AND EXPLOSION HAZARD</b></p> <p>When flammable fluids are present in the work area, such as gasoline and windshield wiper fluid, be aware that flammable fumes can ignite or explode. To help prevent fire and explosion:</p> <ul style="list-style-type: none"> <li>• Use equipment only in well ventilated area.</li> <li>• Eliminate all ignition sources, such as cigarettes and portable electric lamps.</li> <li>• Keep work area free of debris, including rags and spilled or open containers of solvent and gasoline.</li> <li>• Do not plug or unplug power cords or turn lights on or off when flammable fumes are present.</li> <li>• Ground equipment.</li> <li>• Use only grounded hoses.</li> <li>• If there is static sparking or you feel a shock, <b>stop operation immediately</b>. Do not use equipment until you identify and correct the problem.</li> <li>• Keep a fire extinguisher in the work area.</li> </ul> |
|                 | <p><b>BATTERY SAFETY</b></p> <p>The battery may leak, explode, cause burns, or cause an explosion if mishandled:</p> <ul style="list-style-type: none"> <li>• You must use the battery type specified for use with the equipment.</li> <li>• Sparking can occur when changing batteries. Only replace the battery in a non-hazardous location, away from flammable fluids or fumes.</li> <li>• Handle and dispose of battery properly - do not short circuit, charge, force over discharge, disassemble, crush, penetrate, incinerate, or heat the battery to a temperature exceeding 185° F (85° C).</li> </ul>  |

## Overview

The Matrix RF Signal Tester is used to evaluate the Matrix RF signal quality for locating the Transceiver(s) in a new or existing Matrix facility.

The quality of Matrix RF signals can be affected by building characteristics such as building size and type of construction. Other RF devices located in the building or close by can also interfere with Matrix RF signals. The RF Signal Tester will assist you in positioning the Matrix Transceiver(s) in the best possible location.

The RF Signal Tester is battery powered and contains RF hardware identical to that used in Matrix Meters and Tank Level Monitors (TLMs).

**The RF Signal Tester requires a Matrix Transceiver to function properly.** The Transceiver must be positioned in the building as close as possible to the position of intended installation. The Transceiver must be powered up, but does not need to be connected to a PC.

If the facility already has a functioning Matrix system, the RF Signal Tester can utilize the existing Transceiver without interrupting or interfering with the Matrix system. A second “test” Transceiver can still be used, if desired, as long as its dip switch settings are not already in use by another Transceiver in the facility.

## Removing and Replacing the Battery



### WARNING



Read warnings on page 3.

1. Remove the battery by pressing in on both battery lock buttons (E) and pulling the battery (F) out and away from the Signal Tester. See FIG. 1.
2. Place the battery in the Graco Matrix battery charger. See *Instruction Manual 309502* for details.
3. Replace the battery by pressing in on both battery lock buttons (E) and pushing the battery (F) into the Signal Tester.

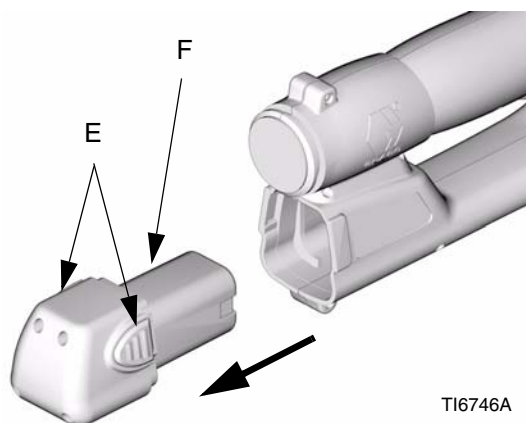


FIG. 1

## Display Functions

### Asleep / Awake Mode

*Asleep* is a battery-saving mode in which the display goes blank after a five-minute period of no button or trigger switch activity. An RF test lasting longer than five minutes will stop and the LCD display backlight will go out as the Signal Tester enters the sleep mode.

The display comes *Awake* from sleep mode when any display button is pressed. RF testing will not automatically restart. To resume testing press the trigger switch.

### Battery Life Indicator

On the right side of the display is a series of four bars located under the word BATT. See FIG. 2. The presence of all four bars indicates a fully charged battery. The bars decline in number as the Signal Tester is used and the battery discharges. All Matrix signal tester batteries should be re-charged using a Graco Matrix battery charger at the end of the working day to assure good performance the next day.

- Batteries can be recharged at anytime without battery damage.
- At one bar on the display you will have about 20-40% of the charge remaining.

- If an RF Signal Tester is removed from service for an extended time the battery should be removed and recharged.
- If you see the message “Remove Low Battery - Wait 30 Seconds Then Replace”, follow the instructions and replace the low battery with a fully charged battery. **Do not do this procedure during RF signal testing.**
- Even when a Signal Tester is idle (asleep), the Signal Tester is still functioning and the battery will be used.

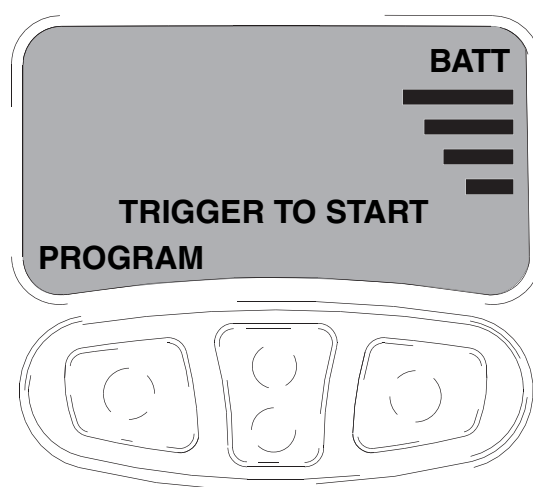


FIG. 2

## Operation

### Preliminary Settings

#### Power

1. To turn on the power to the RF Signal Tester insert a fully charged battery. See FIG. 1. The RF Signal Tester powers on to the main screen. See FIG. 3.

2. To turn off the power to the RF Signal Tester remove the battery.

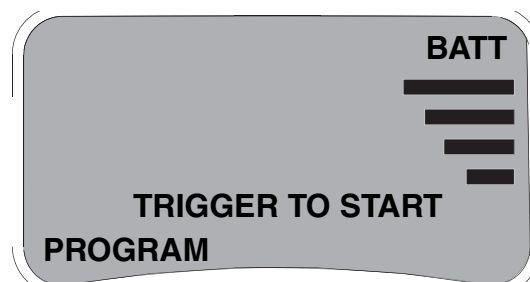


FIG. 3

## Select Network and Transceiver ID

If necessary to determine the Transceiver dipswitch settings see **Determining Transceiver Dipswitch Settings** on page 8 for a guide. **It does not matter if an RS232 connection or an RS422 connection is used or will be used in the installation.** To perform the test all that's needed is a powered on Transceiver and the correct network ID and Transceiver ID entered into the RF signal tester.

1. Press the left button (B) under PROGRAM to display the current Transceiver's network and address (NET WK ID A, TRANS ID A). See FIG. 4.
2. If necessary, enter a new letter for the network ID and address ID for the target Transceiver. These new settings are based on the target Transceiver dip switch settings. (See manual 309498 for detailed dip switch instructions).

Press the SELECT button (A) to toggle between the Network and Transceiver ID. Use the center up/down buttons (C) to change letter designations. See FIG. 4.

3. Press the PROGRAM button (B) to save settings and return to the Main screen.

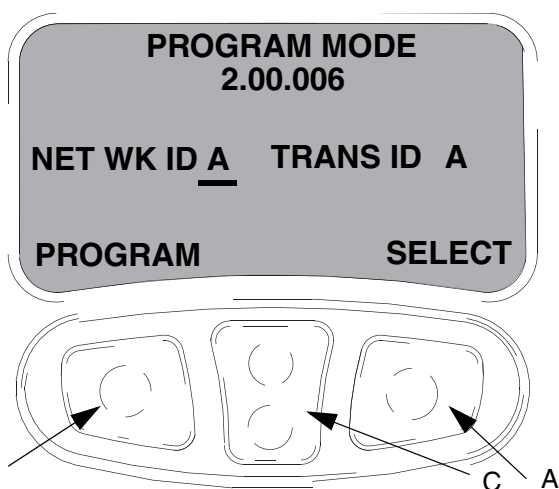


FIG. 4

The Network ID and Transceiver ID screen also displays the software revision level for the tester. See FIG. 4.

If the PROGRAM screen is selected during an RF signal test, the test will stop. The testing then must be manually restarted.

## Performing the RF Signal Test

1. Press the trigger switch to begin testing the signal quality between the tester and the Transceiver. See FIG. 5.

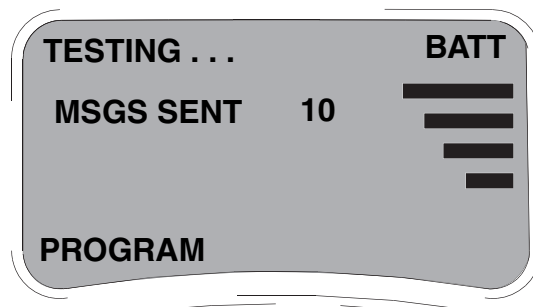


FIG. 5

Once the RF test begins, the Signal Tester transmits ten test messages to the Transceiver and “listens” for the Transceiver to send a signal back to the Signal Tester acknowledging that the message was received. This series of ten test messages is called a test interval and takes approximately ten seconds. However, the ten second interval can vary depending on the RF environment and signal quality.

**IMPORTANT:** Do not move the Signal Tester while testing a specific location.

2. Once the series of ten signals is complete the Signal Tester screen will display the results as either a GOOD SIGNAL or BAD SIGNAL. See FIG. 6.

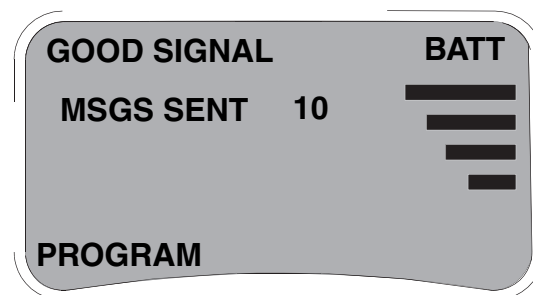



FIG. 6

**GOOD SIGNAL:** If over several test intervals the result is consistently a GOOD SIGNAL, the location is within the range of the Transceiver for reliable communication.


**BAD SIGNAL:** If the results are consistently a BAD SIGNAL, (despite an occasional GOOD SIGNAL reading), the location is **not** within the range of reliable Transceiver communication.

3. Pressing the RF Tester trigger again resets the tester to zero and restarts the testing.

 Pressing the trigger anytime during the test stops the testing at the last message sent. Pressing the RF tester trigger again resets the tester to zero and restarts the testing.

### LOCATING THE TRANSCEIVER(S)

Perform RF signal testing at all Meter and TLM locations to determine an appropriate mounting location for the Transceiver(s).

 If a Transceiver needs to be repositioned or another Transceiver needs to be added to the system, be sure to repeat RF signal testing at all Meter and TLM locations in the facility to assure reliable RF communication from the new Transceiver location(s).

## Optional Display Information

The number of retries for each test interval is used to calculate if the return signal is a GOOD SIGNAL or a BAD SIGNAL. This optional/additional information can be displayed if desired for signal troubleshooting/analysis. *It is not necessary to display this information for general RF Signal testing.*

### On/Off

Optional information is displayed by pressing the up center button (C) **during** the RF signal testing process. Pressing the down center button (C) **during** the RF signal testing process hides this information. See FIG. 7.

## Optional Display Information Explanation

Each test interval sends 10 messages to the Transceiver. Each of these 10 messages is resent up to 10 times or until the RF tester receives a response from the Transceiver. If no response is received after resending the individual message 10 times the RF tester moves on to the next text message and resends it up to 10 times or until a response is received from the Transceiver.

Once all 10 test interval messages have been sent and RF testing is complete, the number of retries for each of the 10 messages is totaled (anywhere from 1-100) and then divided by 10 to get the AVG. RETRIES number. This number is displayed on the RF tester screen.

For example, FIG. 7 illustrates an RF interval test where a total of 50 resend messages were bad out of a possible 100 (10 test interval messages x 10 retries = 100)  
 $100 \div 50 = 5$ .

A test interval that has an AVG. RETRIES of 4 or more is considered a BAD SIGNAL. An average of less than 4 is considered a GOOD SIGNAL.

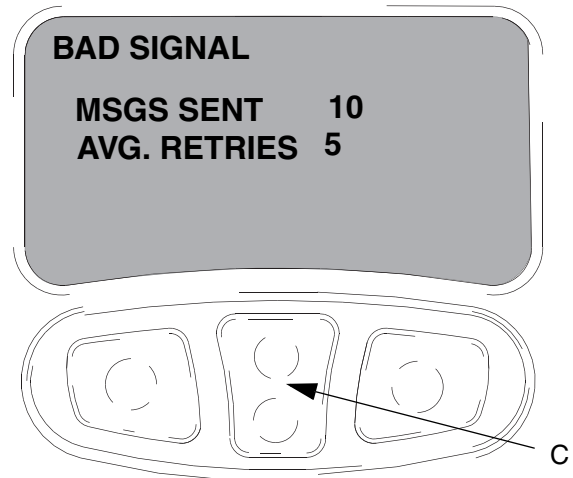


FIG. 7



# Determining Transceiver Dipswitch Settings

Each Transceiver is equipped with two, 4 - position dipswitches labeled S1 and S2 representing the network ID (S1) setting and the Transceiver ID (S2) setting. See FIG. 8. There is a possibility of (8) Network ID's and (8) Transceiver ID's. The eight positions for each Network ID and Transceiver ID are identified as A, B, C, D, E, F, G, and H. See FIG. 9 and FIG. 10.

- **Network ID (S1):** This is the RF identification setting assigned to a Matrix installation. All components in the system use this same Network ID. For example, if one dealership is using Network ID (A), the dealership across the street would require Network ID (B) to avoid RF interference between the two systems.
- **Transceiver ID (S2):** This is the RF identification setting assigned to a Matrix Transceiver(s). Matrix system components are then assigned to the Transceiver(s) ID's as desired for RF communication. For example, If a system required two Transceivers, some components would be assigned to one Transceiver and other components would be assigned to the second Transceiver using the Transceiver ID dipswitch.

**Existing Matrix Facility** - If the Transceiver is already installed, two large letters should be visible on the outside of the box. The first letter represents the Network ID and the second letter represents the Transceiver ID.

If no letters are present on the installed Transceiver, it may be necessary to look inside the Transceiver box to determine the dipswitch settings. First determine if an RS232 or an RS422 connection is used and then refer to FIG. 9 and FIG. 10 to determine the Network ID and Transceiver ID.

Testing can be completed while the Matrix system is in use. The test messages sent by the RF Signal Tester will be ignored by the PC that is connected to the system.

**New Matrix Facility** - the factory default setting for all Transceivers is (AA). The first A refers to the Network ID and the second A refers to the Transceiver ID. It does not matter in a new installation if an RS232 or an RS 422 connection will be used at the time of installation.

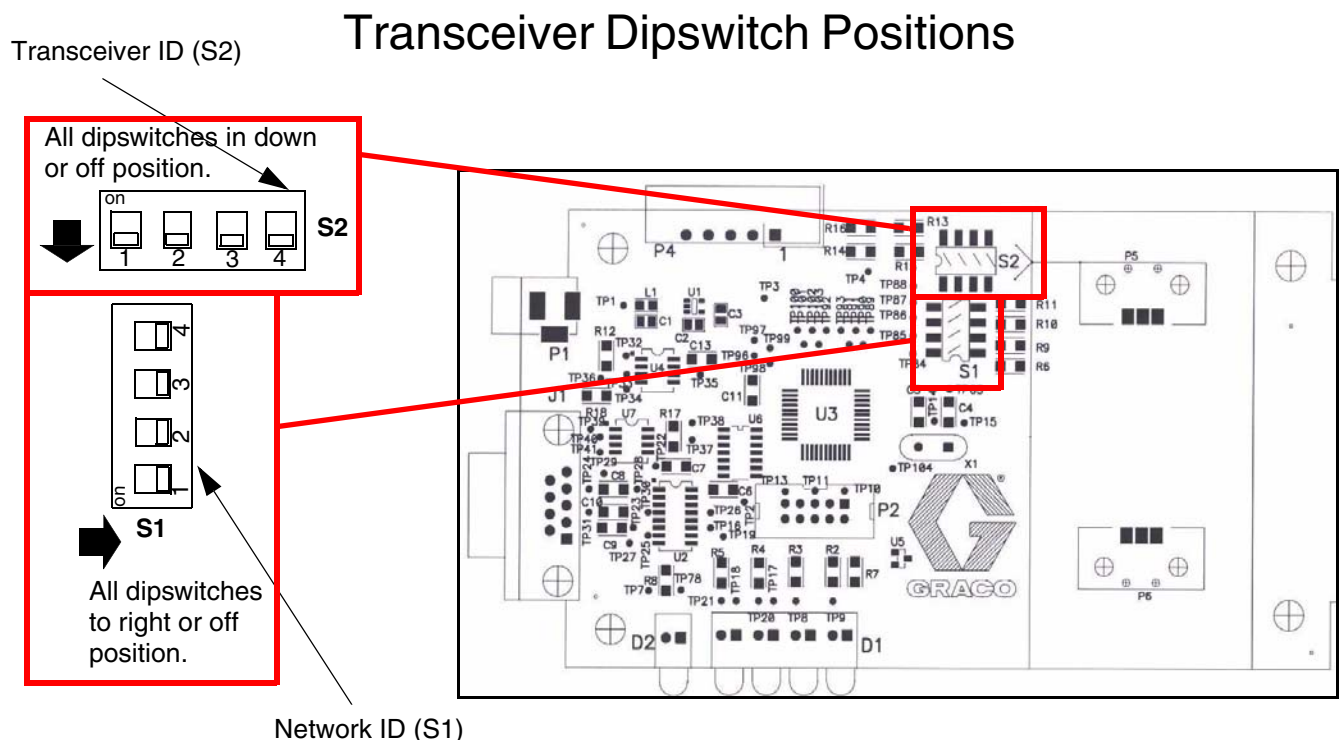


FIG. 8



## Dipswitch Settings using RA232 Connection.

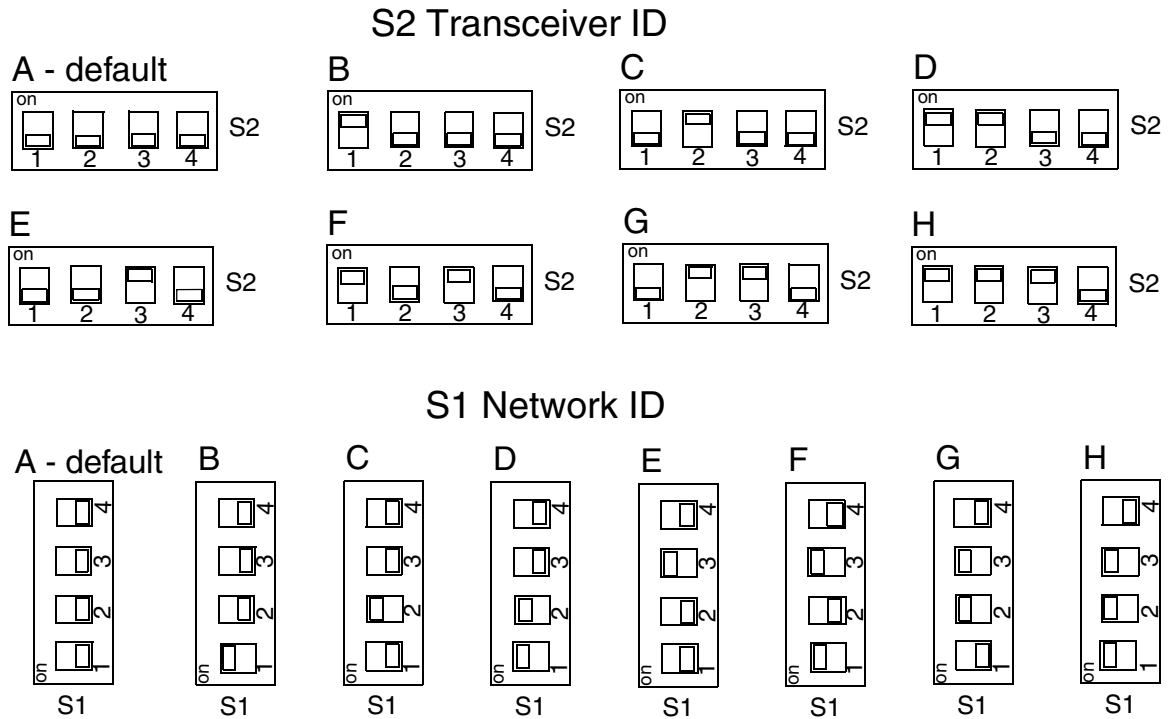


FIG. 9

## Dipswitch Setting using RS422 Connection

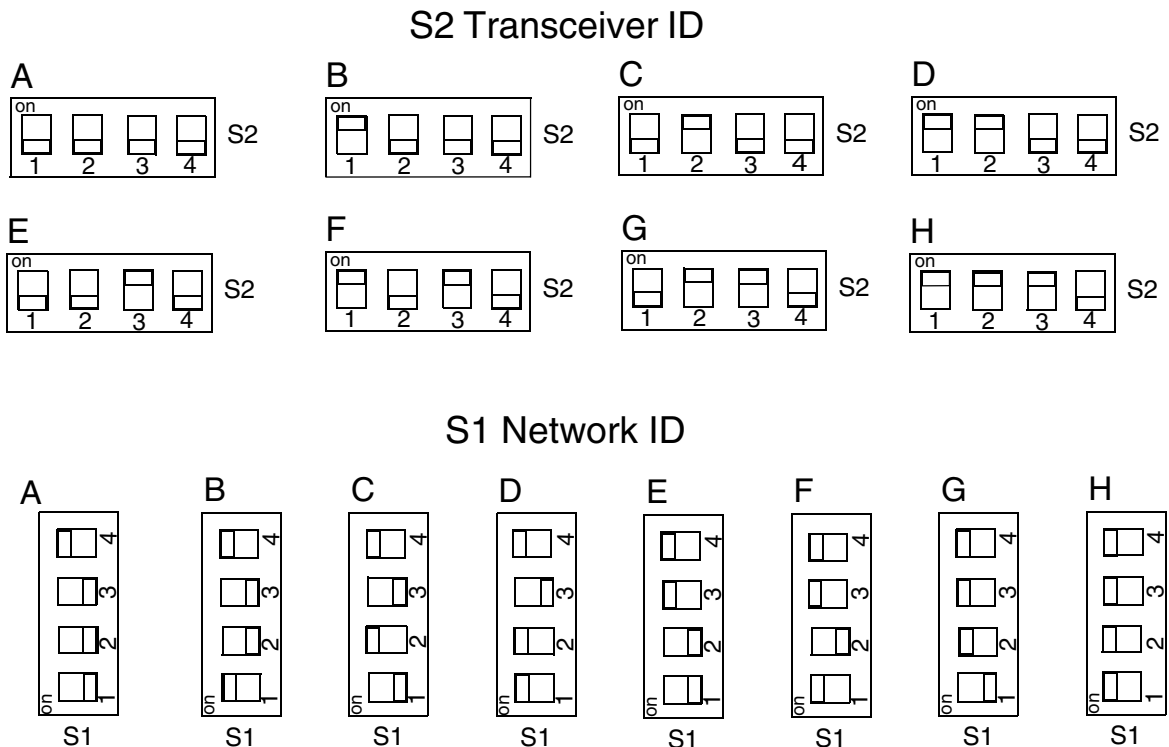
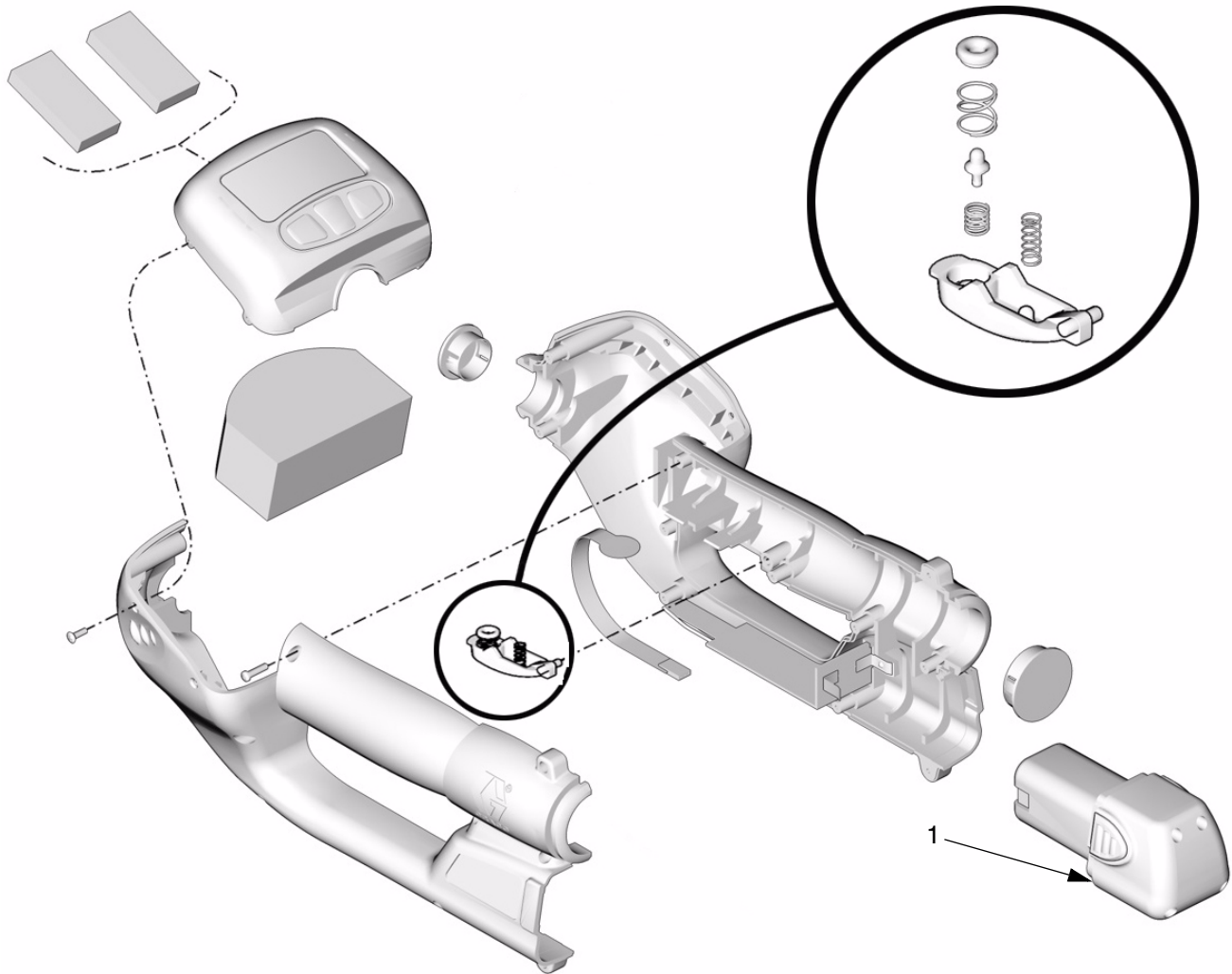


FIG. 10

# Parts for 249269 and 249880 Matrix RF Signal Tester



TI6747

Battery is rechargeable and requires a Graco Matrix Battery Charger for recharging. See Instruction Manual 309502.

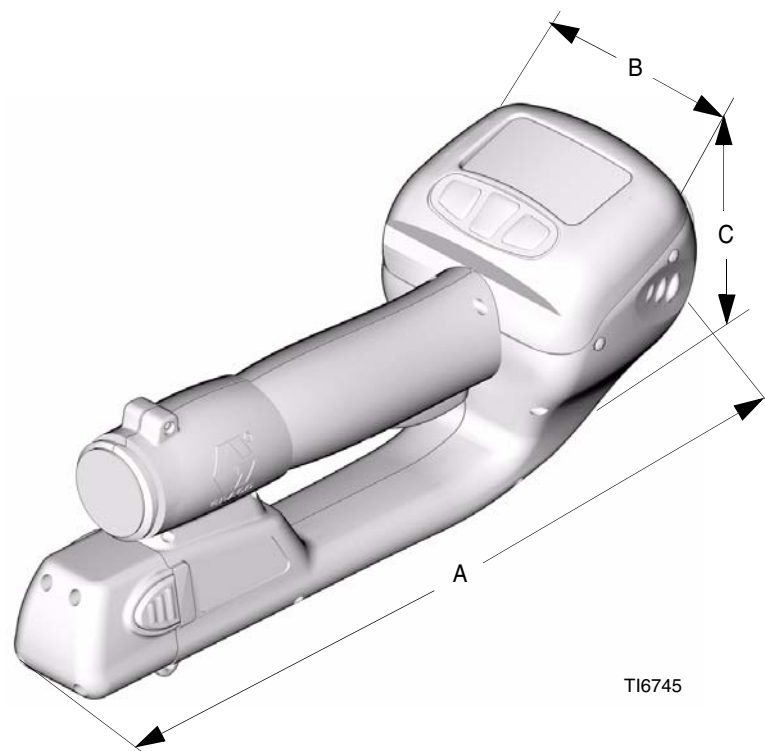
| Ref. | No. | Part No. | Description                                    | Qty. |
|------|-----|----------|--|------|
|      | 1   | 117310   | BATTERY, 9.6V NMH rechargeable                 | 1    |
|      | 2   | 117427   | CHARGER, single bay (not shown)<br>(N.A.)      | 1    |
|      |     | 120106   | CHARGER, single bay (not shown)<br>(Australia) | 1    |
|      | 3   | 117429   | CHARGER, four bay (not shown)<br>(N.A.)        | 1    |
|      |     | 120107   | CHARGER, four bay (not shown)<br>(Australia)   | 1    |

# Technical Specifications

|   |   |
|---|---|
| Operating temperature range . . . . .   | .32° F to 120° F (0° C to 49° C)  |
| Storage temperature range. . . . .  | -30° F to 120° F (-34° C to 49° C)  |
| Battery . . . . .   | rechargeable nickel-metal hydride 9.6 VDC   |
| Battery storage temperature range. . . . .  | .50° F to 86° F (10° C to 30° C)  |
| RF Communication . . . . .  | 902-928 MHz frequency hopping, spread-spectrum (N.A.)<br>. . . . . 915-928 MHz frequency hopping, spread-spectrum (Australia) |
| Unobstructed RF Communication Range (based on building construction and RF environment) . . . . . | .300-500 ft (91.0-152.0 m)  |
| Obstructed RF Communication Range (based on building construction and RF environment) . . . . .   | .250-300 ft (76.2-91.0 m)   |
| Conformity (for 249880) . . . . .   | ACMA (Australia)  |
| Approvals (for 249269) . . . . .  | FCC, Industry Canada (IC)   |

## Dimensions

- A** 12.0 in. (304.8 mm) overall length
- B** 4.75 in. (120.6 mm) overall width
- C** 5.25 in. (133.3 mm) overall height



# Graco Standard Warranty

Graco warrants all equipment manufactured by Graco and bearing its name to be free from defects in material and workmanship on the date of sale to the original purchaser for use. With the exception of any special, extended, or limited warranty published by Graco, Graco will, for a period of twenty-four months from the date of sale, repair or replace any part of the equipment determined by Graco to be defective. This warranty applies only when the equipment is installed, operated and maintained in accordance with Graco's written recommendations.

This warranty does not cover, and Graco shall not be liable for general wear and tear, or any malfunction, damage or wear caused by faulty installation, misapplication, abrasion, corrosion, inadequate or improper maintenance, negligence, accident, tampering, or substitution of non-Graco component parts. Nor shall Graco be liable for malfunction, damage or wear caused by the incompatibility of Graco equipment with structures, accessories, equipment or materials not supplied by Graco, or the improper design, manufacture, installation, operation or maintenance of structures, accessories, equipment or materials not supplied by Graco.

This warranty is conditioned upon the prepaid return of the equipment claimed to be defective to an authorized Graco distributor for verification of the claimed defect. If the claimed defect is verified, Graco will repair or replace free of charge any defective parts. The equipment will be returned to the original purchaser transportation prepaid. If inspection of the equipment does not disclose any defect in material or workmanship, repairs will be made at a reasonable charge, which charges may include the costs of parts, labor, and transportation.

**THIS WARRANTY IS EXCLUSIVE, AND IS IN LIEU OF ANY OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO WARRANTY OF MERCHANTABILITY OR WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE.**

Graco's sole obligation and buyer's sole remedy for any breach of warranty shall be as set forth above. The buyer agrees that no other remedy (including, but not limited to, incidental or consequential damages for lost profits, lost sales, injury to person or property, or any other incidental or consequential loss) shall be available. Any action for breach of warranty must be brought within two (2) years of the date of sale. Graco makes no warranty, and disclaims all implied warranties of merchantability and fitness for a particular purpose in connection with accessories, equipment, materials or components sold but not manufactured by Graco. These items sold, but not manufactured by Graco (such as electric motors, switches, hose, etc.), are subject to the warranty, if any, of their manufacturer. Graco will provide purchaser with reasonable assistance in making any claim for breach of these warranties.

In no event will Graco be liable for indirect, incidental, special or consequential damages resulting from Graco supplying equipment hereunder, or the furnishing, performance, or use of any products or other goods sold hereto, whether due to a breach of contract, breach of warranty, the negligence of Graco, or otherwise.

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# Graco Phone Numbers

**TO PLACE AN ORDER**, contact your Graco distributor or call to identify the nearest distributor.

**Phone:** 612-623-6928 **or Toll Free:** 1-800-533-9655, **Fax:** 612-378-3590

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MM 311002

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311002B 6/2006