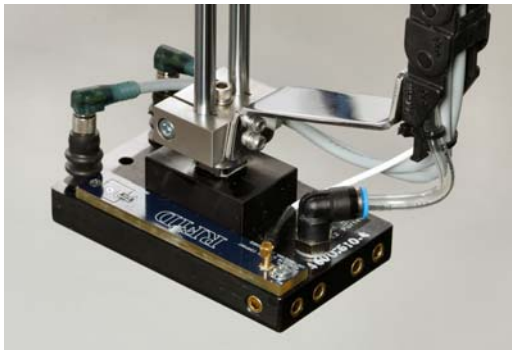
Diagraph®
An ITW Company



TAMPTENNA

PLATINUM SERIES

6000-970
Revision A

Diagraph, an ITW company, continually improves its products, and reserves the right to change or discontinue specifications and designs shown in this manual without notice and without incurring obligation. Diagraph has made every effort to verify the information contained in this manual, but reserves the right to correct any error at the time of the manual's next revision.

Printed in the United States of America

1.0 Introduction

1.1 Introduction to the Platinum Series TampTenna™

The patented TampTenna™ design allows the encoding of class 1 generation 2 RFID tags after printing, without need for an OEM RFID equipped printer. It has been designed to encode tags at high rates of speed, optionally reject bad tags, and verify the tag once on the product. This is all done through the same antenna, which is located on the tamp pad. In this manner, the functions of print, encode, reject, apply, and verify can be done quickly, without added expense of a separate verification system. All of the RFID data is contained in the standard format language of the selected printer, thereby eliminating a separate data stream for RFID content. By parsing out the RFID encode data, the system emulates the OEM RFID printer, which allows the use of available printer drivers. This system will also send a signal to indicate a non-verified tag on product to a downstream reject system.

1.2 Features

- **Encodes 96 bit C1G2 Tags in 80 mS**
- **1/8th inch tag gap separation to ensure maximum tags per roll**
- **Supports nearly all tag antenna topologies, shapes, and configurations**
- **Rejects “Bad” tags in as little as 120 mS**
- **Tested encode rates of 99.9% success**
- **Reject tag count to alert operator when reject plate is reaching maximum capacity**
- **On-the-fly and Sequential encode schemes to match application performance requirements**

1.3 Product Safety

Safety awareness is critical when working with equipment that contains moving parts and extending pneumatic cylinders. Please read all warnings and cautions thoroughly before operating this device.

WARNINGS

- **WARNING - Moving parts of this machine can present hazards. Components that cannot be guarded because of loss of functionality are marked with a warning symbol.**
- **Be aware of the tamp cylinder extension distance, and avoid accidental triggering of the photosensor.**
- **When servicing the unit’s electronic assemblies, always remove the power cord from the unit to prevent accidental shock.**

- **When running for extended periods of time, use caution when accessing the drive module circuitry. The motor drive power transistors, motor case, and motor heatsink can become hot under constant use.**
- **Always close the air inlet valve shutoff when removing or servicing pneumatic module or tamp cylinder.**
- **Wear personal protective equipment, as instructed by your supervisor, when operating or working near this device.**
- **See additional safety precautions in the product's main manual.**

1.4 Document Conventions

Formatting conventions are used throughout this manual as a method of providing consistency for notes and warnings.

Notes:

Note *This symbol appears throughout the manual to provide additional information on a topic, including technical details, exceptions to the instructions and other pertinent information. Notes are identified with a note pad and pen symbol and italics text.*

1.5 Warranty Information

The TampTenna™ system, including all components unless otherwise specified, carries a limited warranty.

For all warranty terms and conditions, contact Diagraph, an ITW Company, for a complete copy of the Limited Warranty Statement.

1.6 Specifications

General Specifications

Category	Parameter
RFID Protocols Accepted	Class 1, Generation 2
Tag Capacity Supported	96 bit
Tag Pitch Offset Distance	Dependent on TampTenna pad placement
Tag Pitch Offset Variance	+/- 0.25 inches
Tag Spacing	0.125 inch gap between adjacent tags minimum
Tag Chip Orientation	Chip Trailing Preferred (Chip Leading by Request)
Maximum Reject Tag Stack Height (Other heights available)	0.86 inches (roughly 50 tags)
Tag Antenna Polarization	Linear, lateral to label length
Tag Chip Orientation	Leading or Trailing
Typical Erase, Encode, Verify time	C1G2 96 bit = 80 mS
Typical Lock Tag time	100 mS
Typical On-Product Verify time	20 mS
Maximum Verify Distance	4 inches
RFID Module power maximum	0.5 Watt

Performance Specifications
(All tests performed at 4 inch distance to product at maximum throughput speed with Reject enabled)

Category	PA/4600 TAMP	PA/6000 TAMP	LA/4700 TAMP
4 x 0.5 in.	**56 PPM**	**No Data**	**No Data**
4 x 2 in.	**No Data**	**No Data**	**No Data**
4 x 6 in.	**No Data**	**No Data**	**No Data**

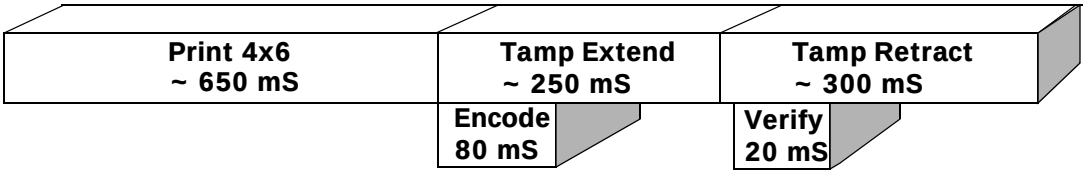
1.7 Known Limitations

- **Maximum Serial Communications Rate is 57,600 baud. For Ethernet, the internal communication rate should be set to 57,600.**
- **Maximum stacking of 2 jobs in the printer's print queue.**

There are two different methods of operation, one for maximum throughput, thus eliminating bad tag rejecting, and a one which performs tag verification prior to application.

1.8 Method 1 - Maximum Throughput

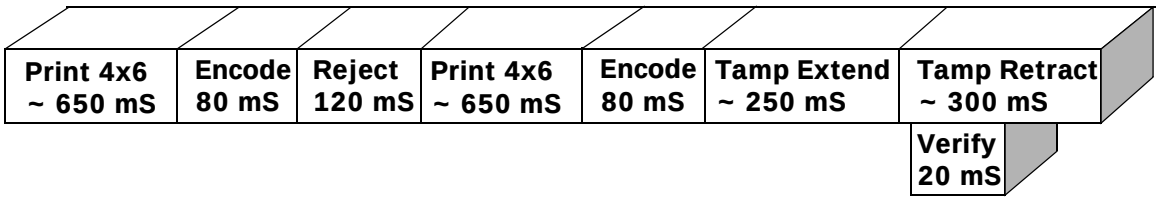
In this scenario, the reject option is disabled by leaving discrete output 1 as None. Each cycle is then performed at maximum speed by completing operations in parallel, as seen below:



Given the case of a 4 inch wide by 6 inch long label, the average cycle takes 1200 milliseconds to complete, which equals a 50 Products Per Minute rate. If the extension distance is 4 inches or greater, then the tag can be programmed while in transit to the product. Upon retraction of the cylinder, the tag is then re-read to verify the tag is on the product, and has not been damaged during application. If the tag cannot be programmed or verified, the unit can be configured to output a discrete output of “not verified”. This can be in-turn, handled by a downstream reject system.

1.9 Method 2 - Bad Tag Rejecting

In this scenario, the reject option is enabled by setting the reject time for a value greater than zero (0). Each cycle is then performed sequentially, allowing bad tags to be removed before application. This reduces throughput, but eliminates bad tags on the roll prior to application. The cycle is performed as seen below (rejecting one bad tag):



Given the case of a 4 inch wide by 6 inch long label, and one bag tag followed by a good one takes about 2130 milliseconds to complete, which equals a product rate of 28 per minute. If there are multiple bag tags in a row, the system will miss passing products while the system is rejecting bad tags. It is critical to use high quality RFID tags to sustain product rates, and build in extra time for rejecting.

Upon the start of cylinder retraction, the tag is then re-read to verify the tag is on the product, and has not been damaged during application. If the tag cannot be verified, the unit can be optionally configured to output a discrete signal of “not verified”. This can be in-turn, handled by a downstream reject system, or plant PLC.

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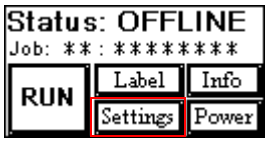
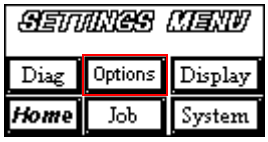
Note *Rejecting time is dependent on label length and print speed (for second label to be printed), reject cycle time, and tamp cylinder cycling to the reject plate. Rejecting is a slow process, repeating many of the initial steps in the application cycle. Successful implementations of rejecting depend on minimizing label length and frequency of bad tags on the roll.*

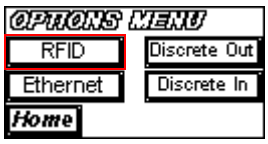
2.0 Setup

Step 1 - Set the Power Level

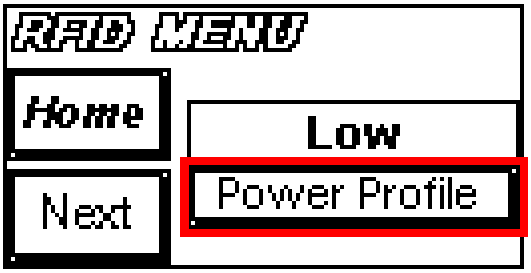
The RFID encoding module emits an RF signal to power the passive tag for reading and writing. RFID tags have circuitry inside to take the RF energy from the module's signal and create power to process the command and return data. This circuitry can be overloaded like any electric circuit, so too much power can damage the chip. It is important to set the power level high enough to maintain high encoding rates for the widest range of tag characteristics, without overloading them. There are five (5) power profiles to choose from, with the "Medium-Low" setting working well for most 4 inch by 0.5 inch inlays. With larger antenna patterns or higher gain tags, use the "Low" setting. For tag inlays further from the TampTenna antenna, use a higher setting.







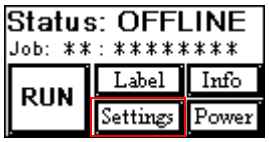
[1] Press the Settings button from the Home screen
[2] Press the Options button
[3] Press the RFID button (only enabled if the RFID Module was detected at power-up)
[4] Press the Power Profile button to toggle to the desired RF Power Level

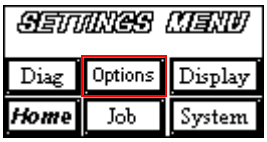


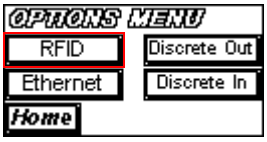
Step 2 - Select the Reject Mode

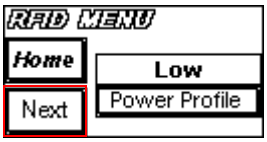
While RFID tag technology has improved over the last several years, there are still occurrences of tags that cannot be encoded. For most applications, the reject mechanism provides a simple and effective way to remove these “bad” tags so that they will not be applied. The reject plate offers high speed operation, so be aware of the plate movement area when setting up the application or working around the unit.

The reject operation is enabled if the Reject time value is greater than zero (0) milliseconds. To disable the reject, set the value to zero (0). The reject time sets the amount of time the system waits for the reject plate to extend before tamping or tamp/blowing the label onto the plate. Typical values range between 80 to 120 mS, based on the incoming air pressure setting.

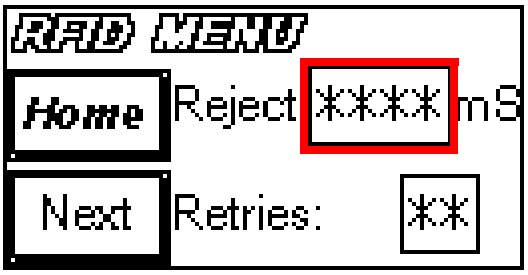






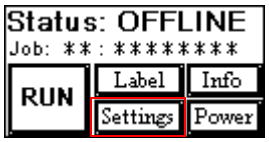


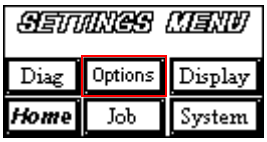
[1] Press the Settings button from the Home screen
[2] Press the Options button
[3] Press the RFID button (only enabled if the RFID Module was detected at power-up)
[4] Press “Next” on the Power Profile menu to enter the Reject/Retries menu
[5] Press the Reject value box to make a time delay selection

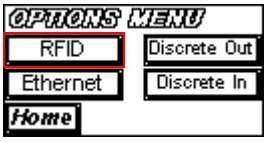


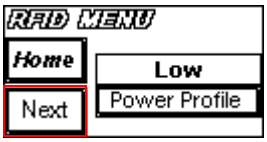
Step 3 - Select the Retry Count

Each time an encode function is performed on an RFID tag, a write and read operation is performed. This is to ensure that the tag was encoded successfully. Some tags respond better on subsequent write attempts, once they have been power-up. The retry count setting determines the maximum number of write cycles that should be performed on tag. The system will always try to encode the tag in the least number of attempts, ideally once. The higher the number of retries, the longer the encode process will take for the worst case tag. It is therefore a trade-off between the retries and encoding time. On pallet applications, where there is more time between products, this number can be increased. While the retry count allows values as high as 99, it is questionable that a tag requiring this many attempts is really a “good” tag. A typical value range is 3 to 20 retries.

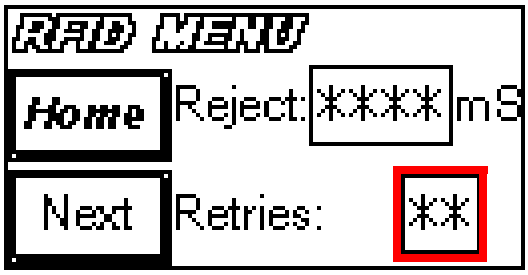








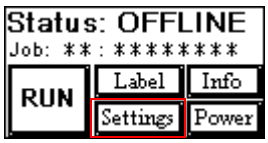
[1] Press the Settings button from the Home screen
[2] Press the Options button
[3] Press the RFID button (only enabled if the RFID Module was detected at power-up)
[4] Press “Next” on the Power Profile menu to enter the Reject/Retries menu
[5] Press the Retries value box to change the number of retries attempted to encode a tag

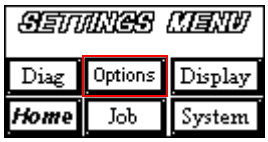


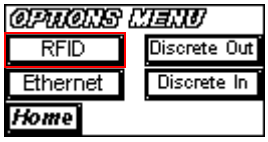
** Step 4 - Set Discrete Output Signals (Optional)

To allow this system to share signals about status to other equipment, such as PLC's, there is the option of the Discrete I/O card (6145-405). Specifically to the RFID functions, 5 output events can be selected for RFID status. These include:

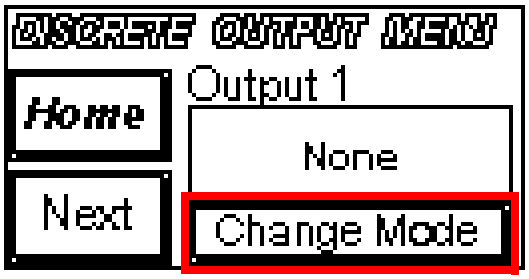
- **RFID / Scan Good - Indicates a good tag was encoded**
- **RFID / Scan Bad - Indicates a tag could not be encoded**
- **RFID Verify - Indicates the tag was verified on the product**
- **RFID No Verify - Indicates the tag was NOT verified on the product**
- **Reject Plate Full - Indicates the reject plate needs to be emptied**



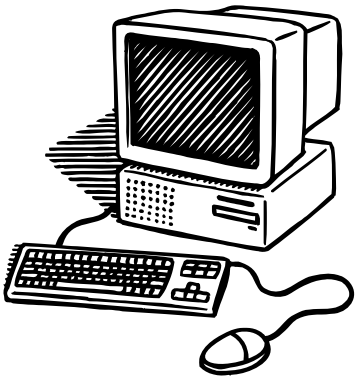




[1] Press the Settings button from the Home screen
[2] Press the Options button
[3] Press the Discrete Out button
[4] Determine which output signal line to configure by pressing "Next" to toggle through selections
[5] Press "Change Mode" to toggle through available output events



Step 5 - Create the Format



[1] To activate the RFID encoding, send a label format with RFID content using the SATO or Zebra commands for RFID, such as IP0 (SATO) or ^WT (ZEBRA). If a format is received without the RFID commands, the format will be treated as non-RFID, and the system will not encode

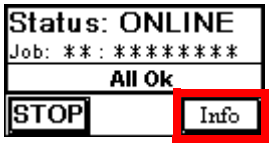
[2] Do not send down more than one format job at a time, without cancelling the prior job. Jobs with a multiple quantity are acceptable

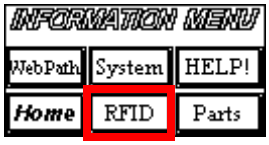
Format Code Fragment Examples (encoded data is 9BF35E847E000000):

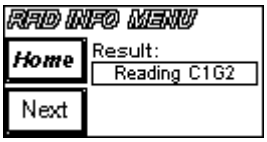
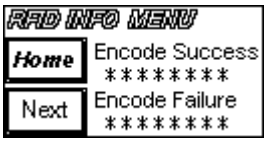
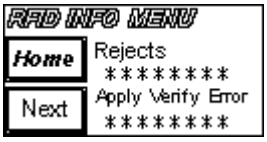
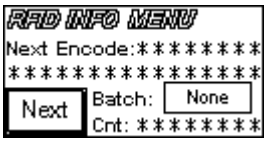
SATO's SPL – "<esc>IP09BF35E847E000000"
ZEBRA's ZPL – "^RS1,,,4^WT1,4,0,0,1,y^FD9BF35E847E000000^FS"
Please see the Printer Manufacturer's Manual on the syntax of the language

3.0 Status During Operation

Map: The Platinum Series systems allow the real-time viewing of RFID status while running through the Information Screens. The encoding status, counts, and other statistics are viewed through these screens.





Screen	Functionality
	Information about the last encoding result, information detected in the label format, and verification information is displayed here. • **Reading C1G2** means the system is current reading a tag in diagnostics • **No Tag** means that the system is currently unable to read a tag in diagnostics • **RFID Content RXD** means that the label format contains an RFID encode field (usually an EPC number) • **Success** means that the last tag encoded successfully • **Failure** means that the last tag was not encoded • **Verified** means that the tag was applied to the product successful and is in a readable location • **Not Verified** means that the tag was encoded successfully and was not readable on the product due to location or other issue • **Batch Cleared** means that the label format contains the command to clear the printer's memory
	Information about the number of successful and failure tag encodes since the last power-up are displayed here.
	Information about the number of verification on product errors are counted here.
	This information screen displays the next value to be encoded (in hexadecimal). Below that data is the Batch status, which displays how many batches in queued up. This is either None, 1 of 1, of 1 of 2. This value will change if the batches are cleared, or the first batch runs out. Below that, the current labels remaining are displayed for the current batch.

4.0 Operational Considerations

4.1 Switching between RFID and non-RFID applications

This is selected by the label format. If there is RFID content in the format, RFID encoding is performed.

4.2 Serial Number Incrementing

Once an RFID format is loaded into the printer and applicator, the first tag will be encoded with the default value in the format. Upon each successive print and encode, the serial number will be incremented. If the tag is rejected, the printer and applicator will each individually increment the printed and encoded serial number on the next tag, to maintain synchronization.

4.3 Printing and Encoding Serialized Tags

Since the unit only buffers two print jobs in the RFID encoding queue, it is important to be able to print an incrementing number and encode the same on the RFID portion of the tag. This is accomplished by using the printer's internal counter for the printed serial number. This will require the constraint of using a printer resident font, but will ultimately speed up the downloading process. Both SATO and Zebra printers contain internal counters to automatically populate serial number fields, but some label creation software packages do not support this function natively. Packages such as NiceLabel directly support this functionality, and are recommended for this type of application. Other packages can be made compliant by using pass through commands, which interject the correct data manually (outside of the WYSIWYG environment).

4.4 Switching Job Batches

In normal print and apply operation, the machine will generate another label immediately after return of the tamp cylinder to the home position for the fastest recycle rate. This is not a good option for automated switch over of product types or batch changes, because there will be a label/tag from the last batch awaiting the first new batch item. To overcome this, the Platinum Series Printer Applicators can employ a method of label on demand, where the photosensor is used to signal the unit to generate the label/tag. This means that a label is presented only when needed, and a change in the data or batch information does not disrupt the flow of changeover. Please see the Platinum Series User Manual for more information on setting the machine for Label on Demand Mode.

5.0 Diagnostics

5.1 Reading RFID Status Counters Serially

By sending a serial string of “<esc>WKGetCounts<CR>”, the unit will respond with the four RFID status counters, padded with leading zeroes to a maximum length of 8 digits. The format is as follows:

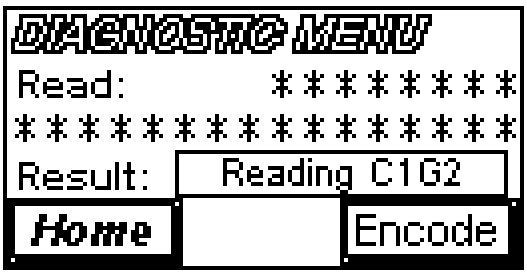
Good: 00000000
Bad: 00000000
Rejects:00000000
NoVerify: 00000000

5.2 Reading RFID Tags Manually

Strictly for diagnostics purposes, the Platinum Series can enter a continuous tag read mode, where the data inside a tag presented within 4 inches of the tamp pad can be read. To enter this diagnostic mode, follow the procedure below:

Screen Location:

Home->Settings->Diag->Options->RFID



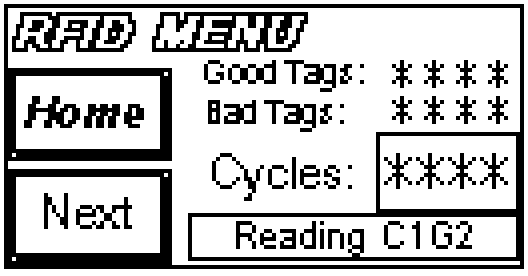
[1] Enter the RFID Diagnostics mode screen
[2] Place a tag under the tamp pad, careful to keep as much of your hand away from covering the tag as possible
[3] Read the tag hexadecimal value on the screen
[4] Test encode the tag by pressing “Encode”. The tag will be encoded with the next value to encode either from the last label format data or a built-in default value. Subsequent encode presses will increment the RFID value.

5.3 Diagnostic Tag Cycle Testing

To determine the most effective settings for antenna positioning, power level, and retry rates, the Tag Cycle test provides a method for tuning the system using a fixed tag on the tamp pad.

Screen Location:

Home->Settings->Options->RFID



[1] Send an RFID-enabled label format and press run to get one RFID onto the tamp pad
[2] Go to the RFID Option menu and press Next until the screen to the left appears
[3] Enter a value into the cycles box to run the cycle test. Note: The value must be different than what is currently entered to start the test
[4] Allow the test to complete. The instantaneous results are displayed
[5] Make adjustments and re-run the test

6.0 Advanced Topics

6.1 Command List

These are the commands currently recognized by the PA/5000LT TampTenna system. Some of these commands are read out of the label format stream, others are optionally sent to change modes and features.

Command List

Command Form	Example	Description
<esc>IP0	<esc>IP011223344556677889 9AABBCC	SATO Command to program 96 bit tags without locking the tag ***Note: subsequent tag prints will automatically increment the serial number if the batch is greater than one.***
^RFW	^RFW,H,0,^FD98765432100000000000000^FS	Zebra Command to program 96 bit tags without locking the tag ***Note: subsequent tag prints will automatically increment the serial number if the batch is greater than one.***
<esc>WKGetCounts	<esc>WKGetCounts<CR>	Diagraph Command to read back the RFID status counters. See section 6.1.
<esc>AFDBKx<esc>Z	<esc>AFDBK1<esc>Z or <esc>AFDBK0<esc>Z	Diagraph Command to set the verbose serial feedback mode. When set to '1', the PA/5000LT unit will sent unsolicited messages out the PC serial port. The message contains the RFID data programmed and the result of programming. An example follows below this table.

Note: <esc> represents the hex value of 0x1b, <CR> is 0x0d

7.0 Replacement Parts

7.1 TampTenna™ Replacement Part List

	Description
6000-970	**Platinum Series TampTenna™ Manual**
6000-451	**Ensyc Technologies® UHF RFID Engine**
6000-411 & 6000-412	**PUR Coaxial Antenna Cable and adapter**
6000-430	**Diagraph Antenna**
6000-420	**Ethernet / RFID PC104 Expansion Board**

Please contact Diagraph at 1-800-526-2531 or visit www.diagraph.com to request replacement parts or schedule service.