

# **OWNERS MANUAL LAZER RUNNER RF-LASER TAG SYSTEM**

by

Ascension Productions Inc.

7927A Coronet Road

Edmonton, Alberta, Canada

T6E - 4N7

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# SECTION 1

## INTRODUCTION & QUICK SETUP

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## **1. INTRODUCTION TO THE LAZER RUNNER LASER TAG SYSTEM**

The Lazer Runner RF-Laser Tag system is a state of the art player interactive amusement game. Players of the game are suited up with a Battle Vest. The players Battle Vest is comprised of a Phaser gun and a jacket type vest which has target areas that opposing players will shoot. Once a player has been outfitted with a Battle Vest, the game operator executes a game loading function with a Remote Control and the player enters the playing arena for an exciting interactive laser game experience.

The players use their Phaser to aim and shoot at opposing players in attempts to successfully hit the glowing targets of the opposing players. As the game progresses the game system computer is gathering information from each vest and interactive target that is involved in the game. The computer system can display the real time scores of the players while a game is in play.

The game system computer gathers and stores all who hit who player information. At the end of the game the final scores are downloaded to a printer which supplies each player with one copy of their game results. Each scorecard contains all the information the player needs to see who his major interacting opponents were. Many people have so much fun playing LAZER RUNNER that they keep coming back for more!

### **1.1 MAJOR COMPONENTS**

There are 7 major components to your RF-Lazer Runner System. Let us take a look at each of them and give you a brief description of their operation.

- Battle Station Arena
- Lazer Runner Computer System
- RF-Base Station
- RF-Battle Vest
- RF-Interactive Target
- Remote Loader
- Battery Charger - NiMH

#### **1.1.1 BATTLE STATION ARENA**

The Battle Station is a futuristic maze.....

#### **1.1.2 LAZER RUNNER COMPUTER SYSTEM (PART # 950/PCS001)**

The Lazer Runner Computer System is the heart of game management for the entire laser tag system. The Lazer Runner Computer System is responsible for the authorization of game requests from active vests and the subsequent scoring calculations for the active game. The Lazer Runner Computer system is outfitted with a touch screen monitor creating a user friendly interface for operators of the system.

The Lazer Runner Computer System utilizes a wired serial communications port to send and retrieve data from the RF-Base Station. The Lazer Runner Computer System is also connected via a parallel port to a high speed paper printer for the printing of player scorecards.

#### **1.1.3 RF-BASE STATION (PART # 905/BASESTAT001)**

The RF-Base Station is a transceiver that provides an RF interface for the Lazer Runner Computer System. The RF-Base Station enables the Lazer Runner Computer to transmit and receive messages from various RF devices of the laser tag system.

There is a wired serial communications port connection from the RF-Base Station to the Lazer Runner Computer System. The RF-Base Station performs the task of encoding and decoding RF data packets and then subsequently handling the RF transmission and reception from other RF devices in the system.

#### **1.1.4 RF-BATTLE VEST (PART # 960/BATUNIT06)**

The RF-Battle Vest is a major component of the system which players wear during the game. The RF-Battle Vest is packaged using standard military camouflage colors and is similar to putting on a jacket. A Phaser is attached to the Battle Vest via a cord and is used by the player to shoot laser light at opposing players. The Phaser also includes a display and an audio system to support visual and audio feedback to the player during the game.

The RF-Battle Vest is comprised of two basic elements as follows:

- Battle Vest - a vest with multi-color targets, backpack electronics, vest battery pack
- Phaser - a black laser gun attached to the vest backpack

The RF-Battle Vest can be put on similar to slipping into a jacket and then attaching the front vest clips. The Phaser is temporarily attached to the vest with the Phaser clip and the operator or player can disconnect the clip enabling the Phaser to be held in either hand by the player. Located at the rear of the vest on the backpack cover....

#### **1.1.5 RF-INTERACTIVE TARGET ( PART # 903/SENTRY001)**

The RF-Interactive Target is a major component of the system that players interact with during all game playing scenarios. Players in the game can score points by successfully de-activating an RF- Interactive Target and players loose points by being de-activated by the RF-Interactive Target.

The RF-Interactive Target can be configured to function in the game as a HomeBase or a Sentry Pod. The mode of operation for the target reflects on target / player interaction differently, regarding opponents and scoring, however the basic electronic functions of the target are identical. The RF-Interactive Target comprises three basic elements to facilitate laser tag game interaction and are listed as follows:

- IR Vest Detection/De-activation sub-system
- RF Transceiver sub-system
- LED Indication/Audio sub-system
- Peripheral Control (AC) sub-system

The IR Vest Detection/De-activation sub-system is constantly polling for the detection of a vest. When a vest has been detected and de-activation is authorized, the IR sub-system will emit a specific command to de-activate the detected Battle Vest. The de-activation is only realized if the Battle Vest is still within targeting range of the RF-Interactive Target.

The RF Transceiver sub-system functions as the complete RF link to the Lazer Runner Computer System/RF-Base Station. The RF Transceiver enables the transmission and reception of all data messages on the RF channel for the system.

The LED Indication/Audio sub-system provides the players with visual and audio feedback during the game playing experience. The visual and audio feedback is necessary for the players to understand and react to different functions of the RF-Interactive Target. The LED Indication/Audio sub-system supports all visual and audio feedback necessary such that the connection of peripheral components is not mandatory to realize all target functions.

The Peripheral Control (AC) sub-system is a connection of relays and AC receptacles within the RF-Interactive Target that is designed to switch the AC voltage 'on' and 'off' for the various peripheral components that may be plugged into the receptacles. The peripheral components controlled are intended to give larger and louder visual and audio effects to the players during the game playing experience. Peripherals such as specific color flood lights, strobe lights and audio sirens can be plugged into the AC controlled receptacles.

# SECTION 4

## BATTLE VEST

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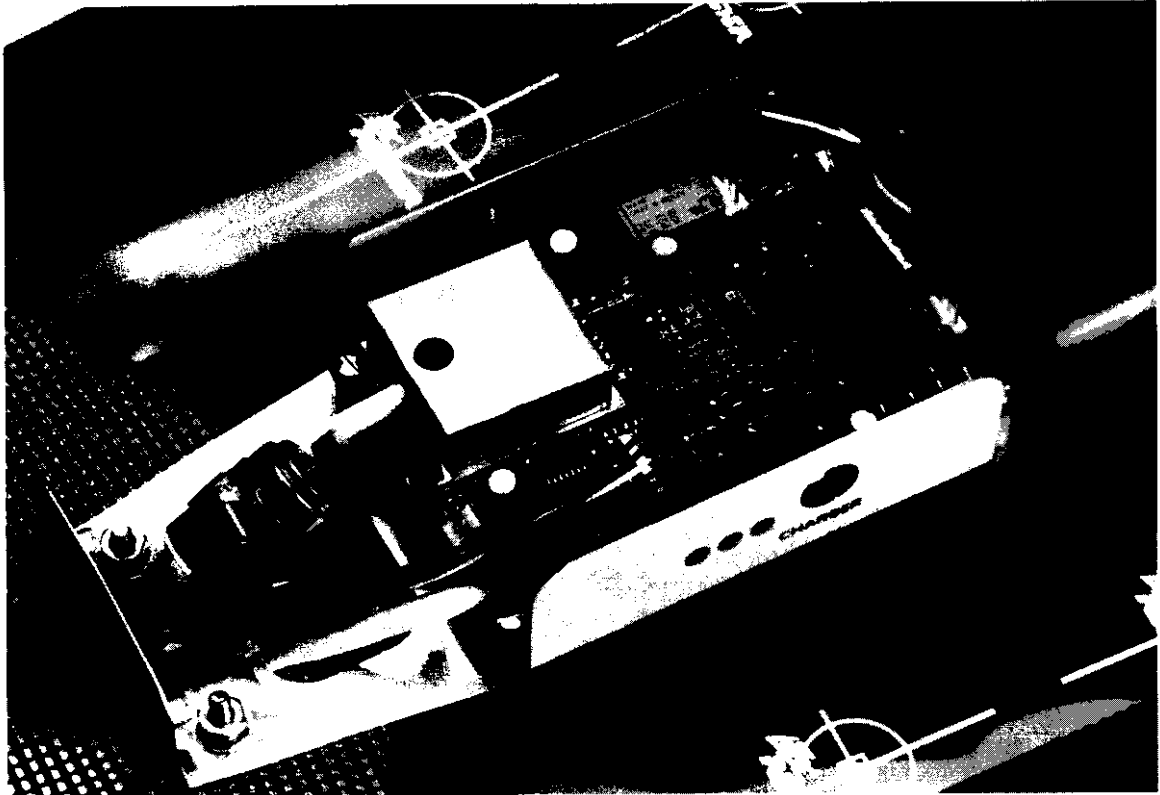
### **TECH SPEC**

<b>Maximum Input Power (Charge).....</b>	<b>20.5 Watts</b>
<b>Maximum Input Volts (Charge).....</b>	<b>17.0VDC</b>
<b>Maximum Input Current (Charge).....</b>	<b>1.2 Amps</b>
<b>NiCAD Battery Pack.....</b>	<b>7.2 VDC</b>
<b>Over Temperature Protection .....</b>	<b>45°C</b>
<b>Maximum Laser Output Power .....</b>	<b>1.0mW</b>
<b>Class II Laser Product</b>	
<b>Laser Wave Length .....</b>	<b>670nm</b>



#### 4.3.5 VEST BOARD REMOVAL / REPLACEMENT

- See 4.3.2 Backpack Cover Removal / Replacement
- Note the orientation of the Vest Battery Pack connector. Disconnect the Vest Battery Pack from the Vest Board.
- Note the orientation of connectors. Disconnect the remaining connectors ( J2 - J4 ) from the Vest Board.



**Figure 4-7: Disconnecting the Vest Board**

- Vestlight fibre optics - Loosen (do not remove) the allen screw holding the fibre optic tube on the mounting block with the LED. Pull out the fibre optic tube.
- VestRX fibre optics - Loosen (do not remove) the allen screw holding the fibre optic tube on the mounting block with the brass shield. Pull out the fibre optic tube.

## **4.1 MAJOR COMPONENTS**

The Battle Vest has been divided up into 6 major components (sub-assemblies) to aid in the isolation of faults and subsequent repair of the product. The major components are defined as follows:

- Phaser Board (c/w display)
- Phaser peripherals (Speaker, Trigger, Game Loading Jack, Phaser Shell)
- Phaser / Vest Cord
- Vest Board
- Vest Battery Pack
- Vest Jacket Assembly

### **4.1.1 PHASER BOARD (C/W DISPLAY)**

The Phaser Board is located inside the Phaser and comprises a microprocessor, a sound processing system, analog and digital inputs/outputs and the laser firing assembly. The Phaser Board receives DC power from the Vest Board and performs game processing functions. The Phaser Board controls the Battle Vest deactivation routines and the system power down cycle.

Software Versions 3.13 and higher for the Phaser include a LOBAT function which indicates to the Operator that the Vest Battery Pack requires charging. When a Phaser is flashing the LOBAT display, the Phaser will not load a game and will power down in 30 seconds (initial power up) or in 5 minutes (game previously played).

Various tests can be performed which supports troubleshooting and a unique number can be assigned to the Phaser by the setting of two rotary switches on the board.

#### **4.1.1.1 VERSION 3.00 AND PRIOR SCORING SYSTEM**

The scoring system for the Phaser Board is designed to reward players who are actively participating in the game and to penalize players who are hiding in the corner and not participating.

The resulting score indication from the Phaser is a calculation based on the number of times that the player was deactivated (shot/killed) and the amount of participation of the player in the game.

#### **4.1.1.2 VERSION 3.13 AND HIGHER SCORING SYSTEM**

The scoring system for the Phaser Board is designed to reward players who are actively participating in the game and to penalize players who are hiding in the corner and not participating. The scoring system is comprised of three score rating which are the Offensive Rating, the Defensive Rating and an Overall Player Rating.

The Offensive Rating is based on the premise that a good offensive player will actively pursue his opponents and will be shooting rapidly most of the time. The offensive rating rewards the player for consistent, sustained rapid fire game interaction. The player receives 2 points for each shot and a 10 point bonus for each second of rapid fire. Players hiding in the corner and not interacting in the game are penalized.

The Defensive Rating is based on the premise that a good defensive player will not get "hit" very often. The Defensive Rating rewards infrequent "hits" from other opponents. The player scores 50 points when not hit for a period of time and loses 10 points every time they get hit. Players hiding in the corner and not interacting in the game are penalized.

The Overall Player Rating is designed to reward the offensive player and is a combined calculation using the Offensive Rating and Defensive Rating results. The Overall Player Rating score is displayed on the Phaser only when the "GAME OVER" display is finished.



**Note:** SW1 must be in the F position prior to applying power to enter TEST MODE. Switching SW1 from F to 0 causes execution of the power down routine to turn the system OFF.

#### **4.1.2 PHASER PERIPHERALS (SPEAKER, TRIGGER, LOADING JACK, PHASER SHELL)**

Located within the Phaser are several peripherals which connect to unique connector header pins on the Phaser board.

- The speaker assembly is the peripheral driven by the sound system on the Phaser Board.
- The trigger assembly is the peripheral comprising of two switches provide an input signal to the Phaser Board depending on how far the user has pulled the trigger.
- The Game Loading Jack assembly is the peripheral which provides the interface connection from the Remote Loader plug to the Phaser Board for supporting the loading of games.
- The Phaser Shell is the custom plastic injected enclosure that contains the Phaser peripherals and the Phaser Board.

#### **4.1.3 PHASER / VEST CORD**

The Phaser / Vest Cord provides the hardwire connection for the Phaser Board and the Vest Board. The cord supports the connection of DC power, Vest Battery Pack voltage, hit signal, control of target lighting, control of vest vibration and the system power down from the Phaser to the Vest.

#### **4.1.4 VEST BOARD**

The Vest Board is located at the rear of the Battle Vest under the backpack cover. The Vest Board is comprised of the charging system for the battery pack, the vest vibrating driver, the target lighting driver and the target receiver circuitry.

##### **4.1.4.1 CHARGING CIRCUIT OPERATION**

The charging circuit on the Vest Board comprises 3 LED indicators and a hi-tech battery management circuit specifically designed for the NiCad Vest Battery Pack. The charging system is designed for easy use and is completely automatic to ensure that the Vest Battery Pack is not damaged when left connected to the Battery Charger for long periods of time.

The charging circuit is a quick charge design that automatically switches to trickle mode when the Vest Battery Pack is completely charged.

The DC power available to the Phaser is disabled when the Battle Vest is charging the battery pack from the Battery Charger Unit.

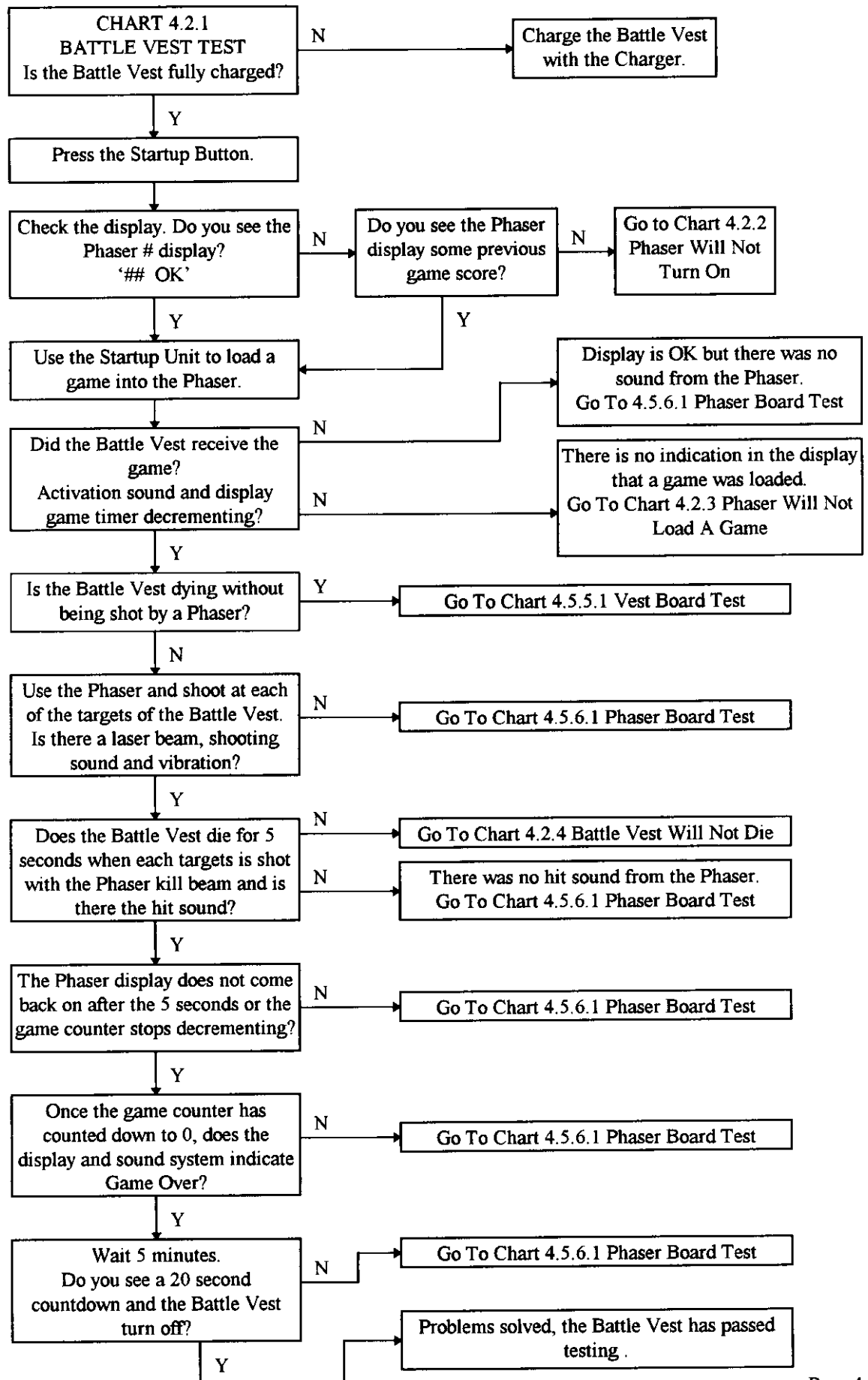
The charging status indicators have only four states and are as follows:

- The Green 'CG' indicator ON, is the quick charge state.
- The Green 'CG' indicator FLASHING, is the trickle mode state which indicates that the Vest Battery Pack is completely charged and the Battle Vest is ready to be used.
- The Red 'BF' indicator ON, is the battery fail state meaning that the Vest Battery Pack may require replacement. Refer to Table of Contents for troubleshooting charging problems.
- The Red 'OT' indicator ON, is the over temperature state meaning that the Vest Battery Pack has over heated. Refer to Table of Contents for troubleshooting charging problems.

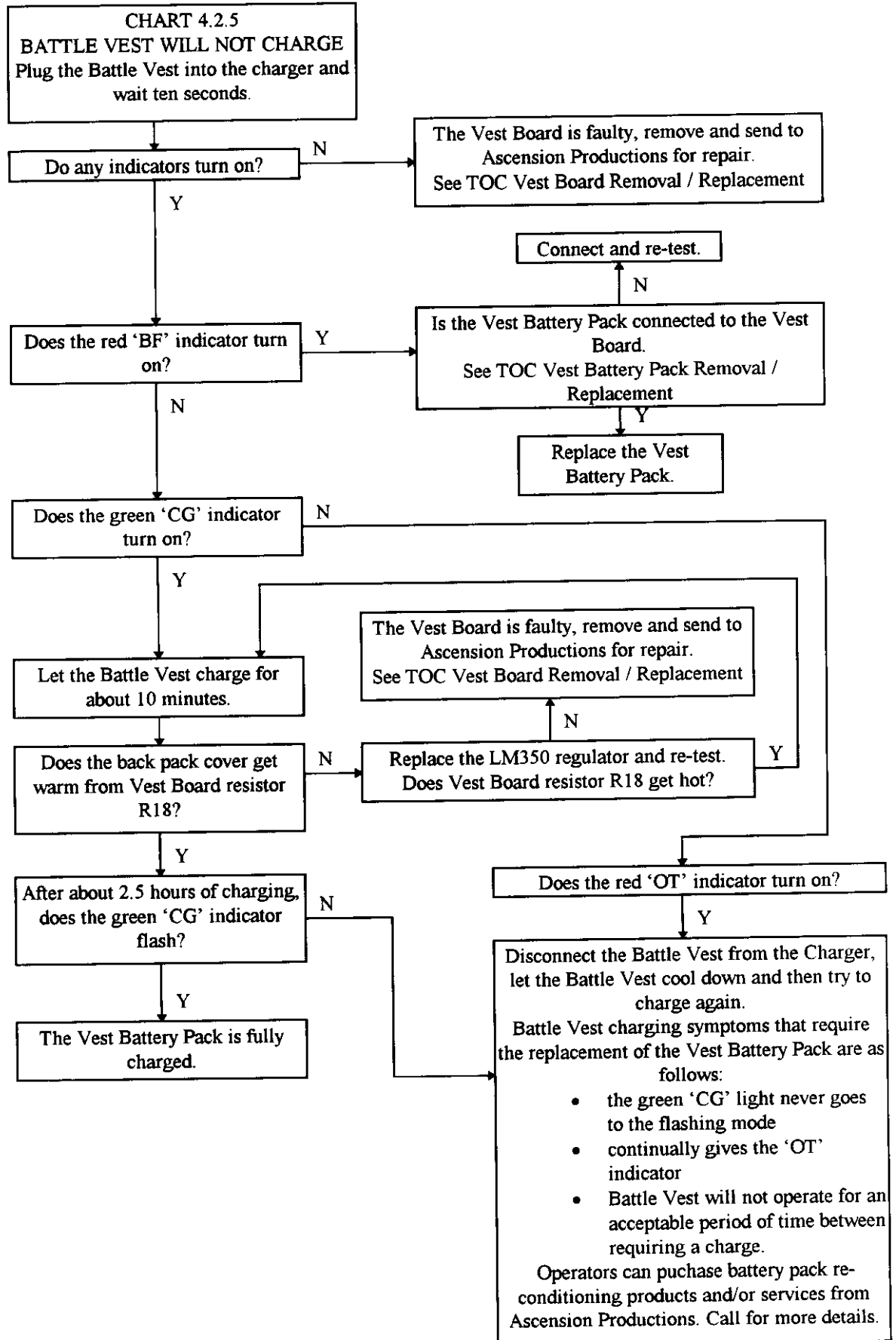
#### **4.1.5 VEST BATTERY PACK**

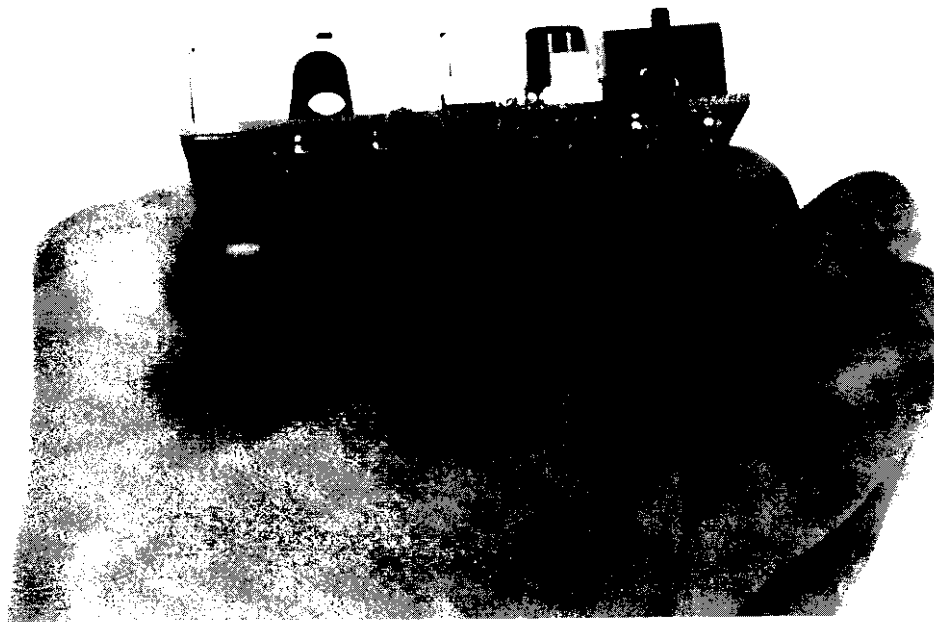
The Vest Battery Pack is located at the rear of the Battle Vest under the backpack cover and is securely fastened to the mounting plate with velcro and a strap. The Vest Battery Pack is a custom designed NiCad (Nickel Cadmium) battery pack and is the source of power for the entire Battle Vest system. The Vest

#### 4.2.1 BATTLE VEST TEST



#### 4.2.5 BATTLE VEST WILL NOT CHARGE





**Figure 4-10: View of Receiver Input**

- Remove the four screws which fasten the Vest Board to the mounting plate.
- Ensure that the standoffs on the mounting plate are tight.
- Replacement is in reverse order. Ensure that no wires are pinched or damaged.

#### **4.3.5.1 VEST BOARD TEST**

The testing of the Vest Board can be performed with diagnostic tools available from Ascension Productions Inc. Please contact Ascension Productions for information on testing services and/or products.

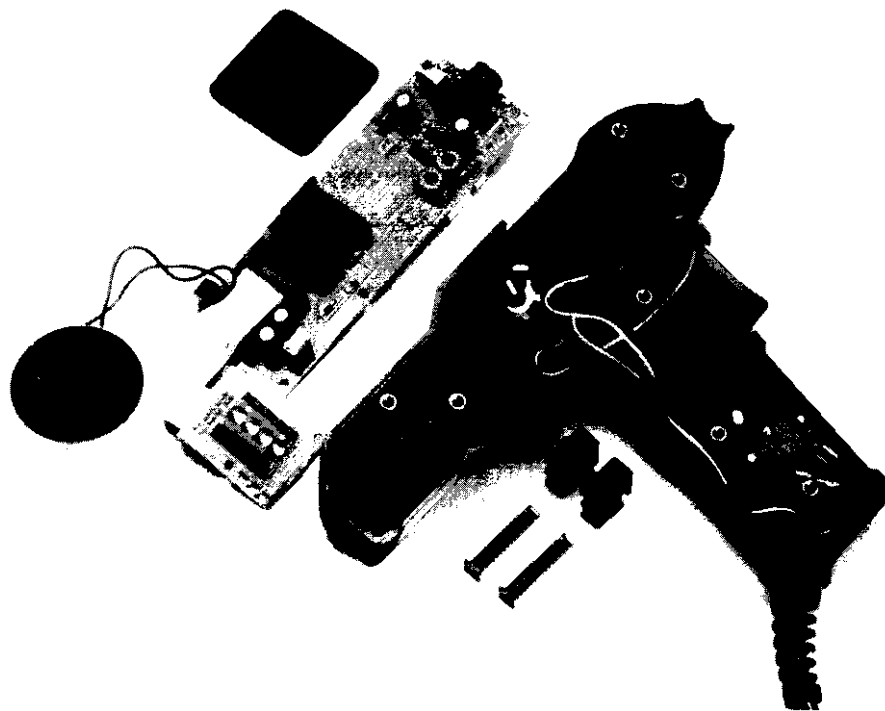
#### **4.3.5.2 REPLACEMENT OF CURRENT REGULATOR ASSEMBLY**

- See 4.3.5 Vest Board Removal / Replacement.
- Observe the orientation and then disconnect the connector which terminates the current regulator (3 pin TO-220 packaged device) to the Vest Board.
- Observe the mounting and then remove the current regulator assembly from the mounting plate.
- Replacement is in reverse order. Damage may result to a current regulator assembly if operated without proper mounting to an adequate heatsink.



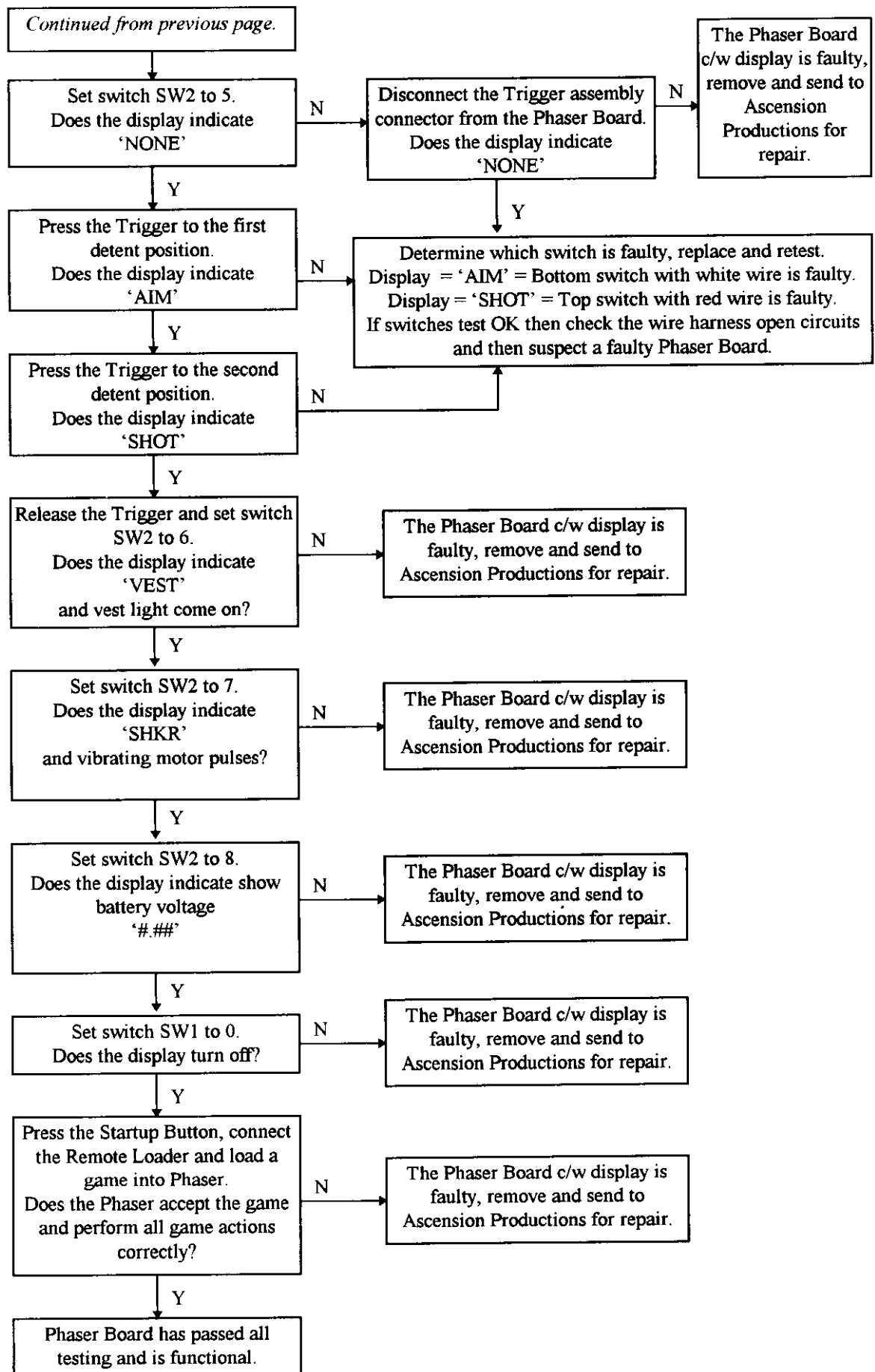
**Figure 4-12: Disconnection of Phaser Board**

- Pull out the Phaser Board and disconnect the 3 pin Speaker connector.



**Figure 4-13: Removal of Phaser Board**

- Replacement is in reverse order. Ensure that no wires are pinched or damaged.

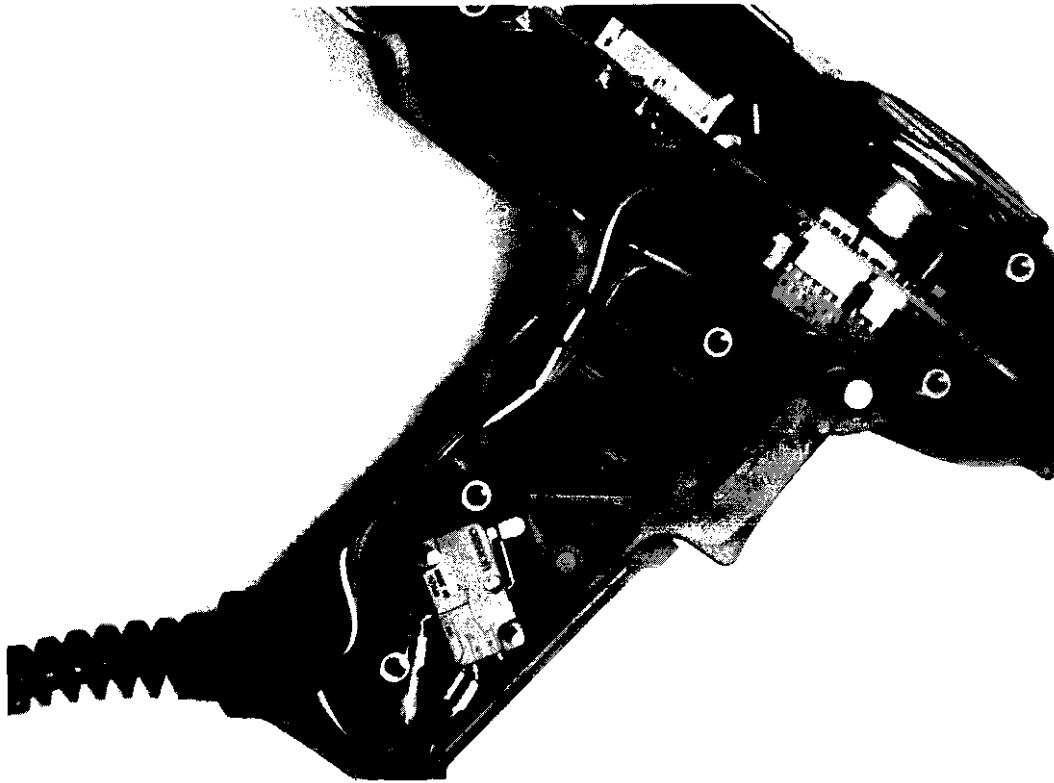


#### 4.3.7.2 PHASER / VEST CORD REMOVAL / REPLACEMENT (PHASER)

- Remove the seven screws from the right side (side opposite the loading jack) of the Phaser.
- Lift off the right side shell of the Phaser carefully. All of the contents of the Phaser should remain in the left side shell.

**NOTE:** There are two trigger return pins and springs which may spring out from the rear of the handle of the Phaser. Place your hand at the rear of the Phaser handle to stop and catch any parts.

- Note the orientation of the trigger parts. Remove the two trigger return pins, springs and sliders from the left side. Refer to 4.5.9.1 Trigger Parts Orientation Details for more information.
- Note the routing of the wires and orientation of connectors. The wires of the Phaser / Vest Cord and the wires of the trigger harness rest between the outer wall of the Phaser shell and two standoff pins and then passes through a channel beneath the trigger return springs. Disconnect the 6 pin Phaser / Vest Cord connector.



**Figure 4-15: Routing of wires in Phaser Shell**

- Remove the Phaser / Vest Cord. The cord is pressed into place at the bottom of the Phaser shell and will slide out of the slot. Note the spacing between the nut and the strain relief housing on the cord which is used to provide a snug fit onto the Phaser shell slot. Ensure that the strain relief housing is properly tightened at the correct location of the new cord when re-installing or replacing cord. The hex sides of the nut and the strain relief housing must be aligned.

#### 4.3.9 PHASER TRIGGER SWITCH ASSEMBLY REMOVAL / REPLACEMENT

- Remove the seven screws from the right side (side opposite the loading jack) of the Phaser.
- Lift off the right side shell of the Phaser carefully. All of the contents of the Phaser should remain in the left side shell.

**NOTE:** There are two trigger return pins and springs which may spring out from the rear of the handle of the Phaser. Place your hand at the rear of the Phaser handle to stop and catch any parts.

- Note the orientation of the trigger parts. Remove the two trigger return pins, springs and sliders from the left side. Refer to 4.5.9.1 Trigger Parts Orientation Details for more information.
- Lift the trigger switches up and off the guide pins.

**NOTE:** There is a wave washer on each of the guide pins and care should be taken not to lose them.

**NOTE:** The switch with the white wire is on the bottom and the switch with the red wire is on the top.

- REPLACEMENT OF DEFECTIVE SWITCH ONLY - Unplug, remove and replace the defective switch.
- REPLACEMENT OF TRIGGER SWITCH ASSEMBLY - Note the routing of wires and the orientation of connectors. Disconnect the 3 pin Trigger Switch Assembly connector located near the middle of the Phaser Board. Remove and replace the Trigger Switch Assembly from the Phaser shell.
- Replacement is in reverse order. Ensure that no wires are pinched or damaged.

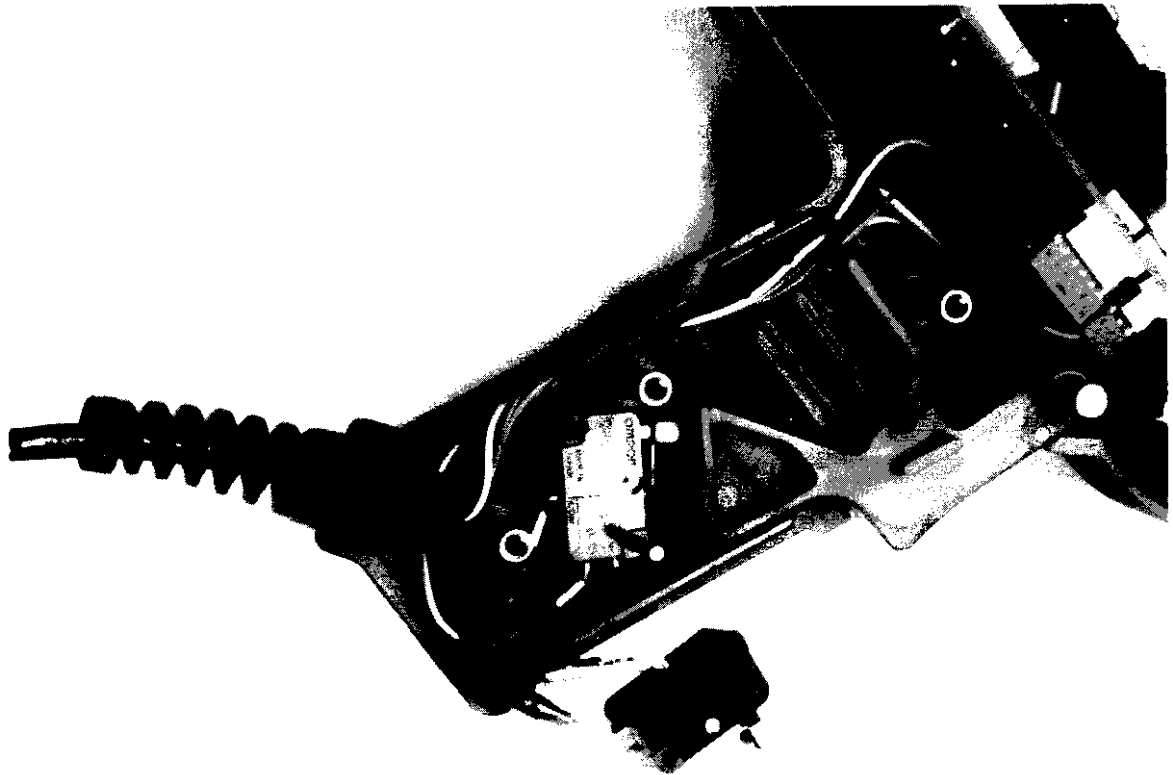


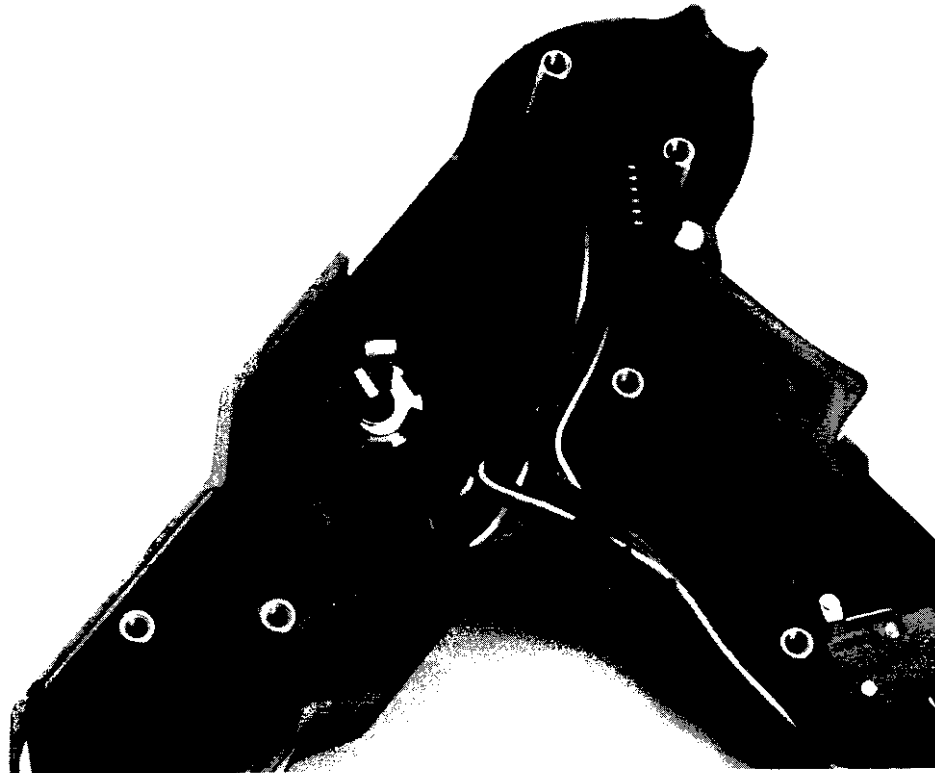
Figure 4-17: Removal of Trigger Switch



#### 4.3.10

#### PHASER GAME LOADING JACK REMOVAL / REPLACEMENT

- See 4.5.6 Phaser Board Removal / Replacement.
- Remove the Game Loading Jack with the 1/2" socket driver. Note the orientation of the jack within the shell. The orientation of the jack is important to protect the Phaser Board from damage when a Remote Loader is inserted during normal operation.
- Replacement is in reverse order. Ensure that no wires are pinched or damaged.



**Figure 4-19: Orientation of Game Loading Jack**