

AMF

Radaray
XL

**INSTALLATION AND SERVICE
MANUAL**

Copyright 1997, AMF Bowling Products

ALL RIGHTS RESERVED

All rights to this Installation and Operation Guide are the property of AMF Bowling Products, including the diagrams, figures, and technical specifications. Reproduction or transmission of any of the material contained in this Guide is strictly forbidden without the prior permission of AMF Bowling Products. All of the product information contained in this manual was carefully prepared based on the latest information available and, to our knowledge, was believed to be correct at the time of printing. However, this publication could include inaccuracies or typographical errors, and AMF Bowling Products cannot be held responsible for inadvertent errors or omissions that may appear in this document. AMF Bowling Products reserves the right to revise and/or update this manual at any time without obligation to notify any person or entity of such revision.

TRADEMARK NOTICES

All trademarks and trade names mentioned in this manual are the property of their respective owners. AMF disclaims any proprietary interest in trademarks and/or trade names other than their own.

DOCUMENT UPDATES

In the interest of continual product and services improvement, AMF reserves the right to revise or update this manual at any time without obligation to notify any person or entity of such revision. The document number and revision date below indicate the edition and printing date of this manual.

Document/Part #: 610-460-902

Revision Date: 2/97

Copyright © 1997, AMF Bowling Products

AMF BOWLING PRODUCTS
New Center Products Division
Mechanicsville, Virginia 23111

AMFRADARAYXL

Installation & Service

FOUL DETECTOR

GENERAL

The Foul Detector provides a means of detecting encroachment upon the foul line on a pair of lanes. The unit employs a reflexive detection scheme, so that all active electronics are contained in the main chassis. All that is required externally are passive retro-reflectors mounted across the lanes from the foul detector chassis. The Radaray XL is designed to be used only with the XL Pinspotter Chassis.

The unit is powered by 12 VDC at .100 Ampere from the XL Pinspotter Chassis. When a foul is detected (the optical path between the unit and the external reflector is broken), two types of external signals are provided, one set for each lane. A 12 VDC signal with a 1k OHM source resistance is activated for 12 seconds. A loud buzzer is activated for approx. 1.5 seconds when a foul is detected on either lane. In addition, the control unit cover contains 2 LED's, one for each lane. The LED will light when a foul is committed and remain on for 12 seconds.

Input Power Requirements

12 VDC @ .100 Amperes

Outputs (one set per lane)

12 VDC with 1K OHM source resistance.

Installation & Service

FUNCTIONAL DESCRIPTION

The Foul Detector consists of the following:

- ① Two independent reflexive optics systems with emitters, detectors and video processing circuits.
- ② Detector electronics to determine when the beam is interrupted more than the preset amount of time.
- ③ The buzzer circuit which sounds when either beam is broken:
- ④ Solid state output to signal the pinspotter electronics when the beam is broken.
- ⑤ Power supply to generate the electronics operating voltage.

Reflexive Optics System

An infrared beam produced by a pulsed light emitting diode (LED) is projected across the lane by a collimating lens. The light bounces off the reflector across the lane and is directed onto a photodetector by a light gathering lens. The photodetector contains an infrared filter to reduce the detection of ambient light. The photodetector signal is amplified, filtered and routed to the detector electronics.

Detector Electronics

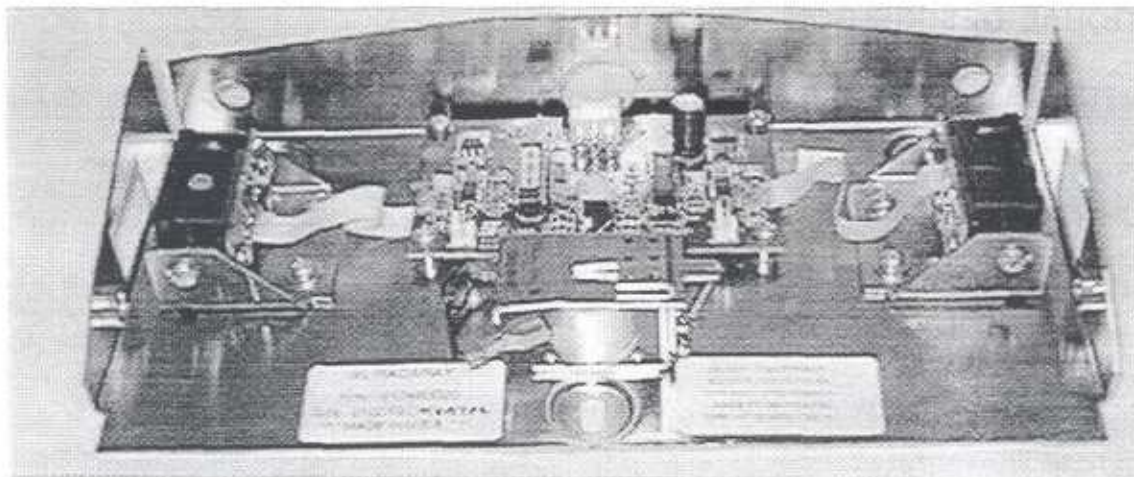
The detector electronics amplifies, filters and synchronously samples the signal to eliminate the effects of spurious noise. The electronics has two features which provide the system with a wide dynamic performance range. The first is an ambient light blocking circuit which minimizes the effects of unwanted light from external sources. The second is an adaptive system which automatically adjusts the threshold level for the return signal as conditions change.

Buzzer and Output Signals

The system is designed to detect the loss of the signal if the beam is interrupted for more than 1/4 second. When this condition occurs, the buzzer is sounded for approximately 1.5 seconds. Additionally, outputs are energized for approximately 12 seconds, providing both a 12 VDC signal through a 1k resistor for the pinspotter electronics and lighting an LED on the cover.

AMF RADARAY XL

Installation & Service



FOUL DETECTOR CHASSIS
FIG#1

AMF FOUL DETECTOR INSTALLATION AND ALIGNMENT PROCEDURE



NOTE: *Prior to installation, the foul signal wires to the pinspotter should be routed to the unit.*

Foul Detector Chassis (612-460-028)

The Foul Detector Chassis mounts above the underlane with its forward lens centered on the leading edge of the foul line. (Use alignment marks stamped on the chassis.) It should be positioned as square as possible with the lanes for ease of alignment and proper operation. The installation sequence is as follows:

- ① Mark the location of the three mounting holes using the chassis as a template. Then drill pilot holes as necessary for the three mounting screws. A typical pilot hole should be 5/32" diameter.
- ② Plug the six position RADARAY connector on the ball return cable (090-005-774) into the receptacle on the back of the unit.

Installation & Service

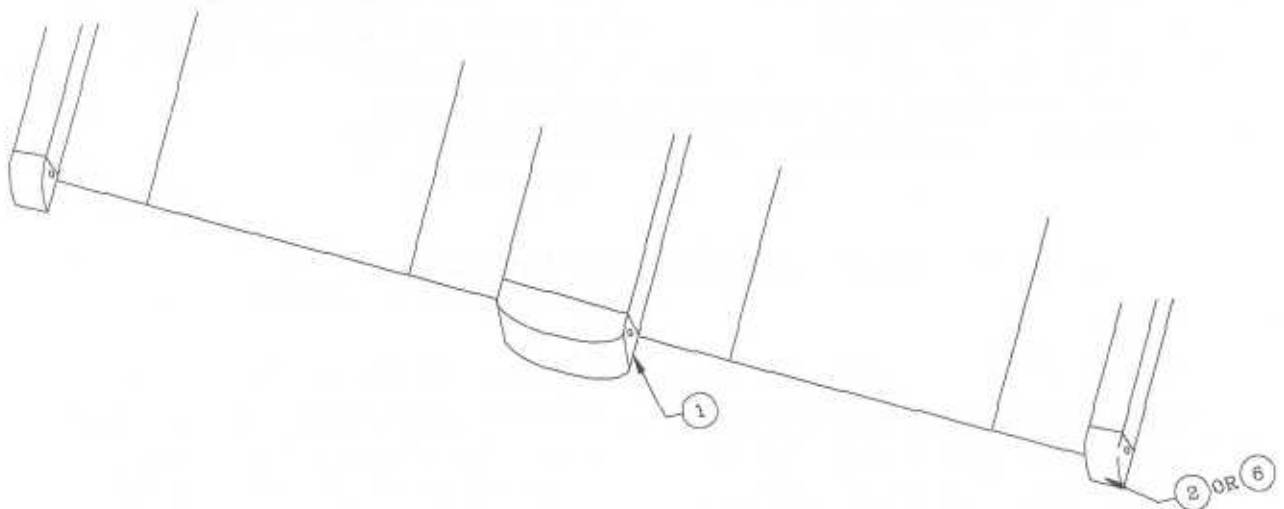
- ③ Secure the chassis with the three self-tapping #10 x 1" hex head screws provided.
- ④ Before installing the cover, install the reflector and complete the alignment procedure.
- ⑤ Install the cover. Secure each side using the two 1/4-20 x 1/2" screws provided.

Reflector Unit (612-460-027)

The reflector unit mounts at the end of the common lane division capping. The unit should be positioned so that the center of the reflectors are in line with the approach edge of the foul line. The installation sequence is as follows:

- ① Mark the location of the two mounting holes (forward and rear) using the base as a template. Then drill pilot holes as necessary for the two mounting screws. A typical pilot hole should be 5/32" diameter.
- ② Secure the reflector base with the two self-tapping #10 x 1" hex head screws.
- ③ Install the cover using the two 1/4-20 x 1/2" machine screws.

FOUL DETECTOR INSTALLATION DRAWING:



QTY	ITEM	P/N	DESCRIPTION
1	10	610-460-902	MANUAL SERVICE RADARAY
	9		
1	8	612-460-028	SUB ASSY., CHASSIS W/ELCTR
	7		
1	6	612-460-027	FOUL DETECTOR REFLECTOR
1	3	610-460-902	MANUAL
1	2	612-460-027	FOUL DETECTOR REFLECTOR
1	1	612-460-020	ASSY, FOUL DETECTOR UNIT

REPLACEMENT
KIT
FOR FIRST LANE
OR FOR EACH POST

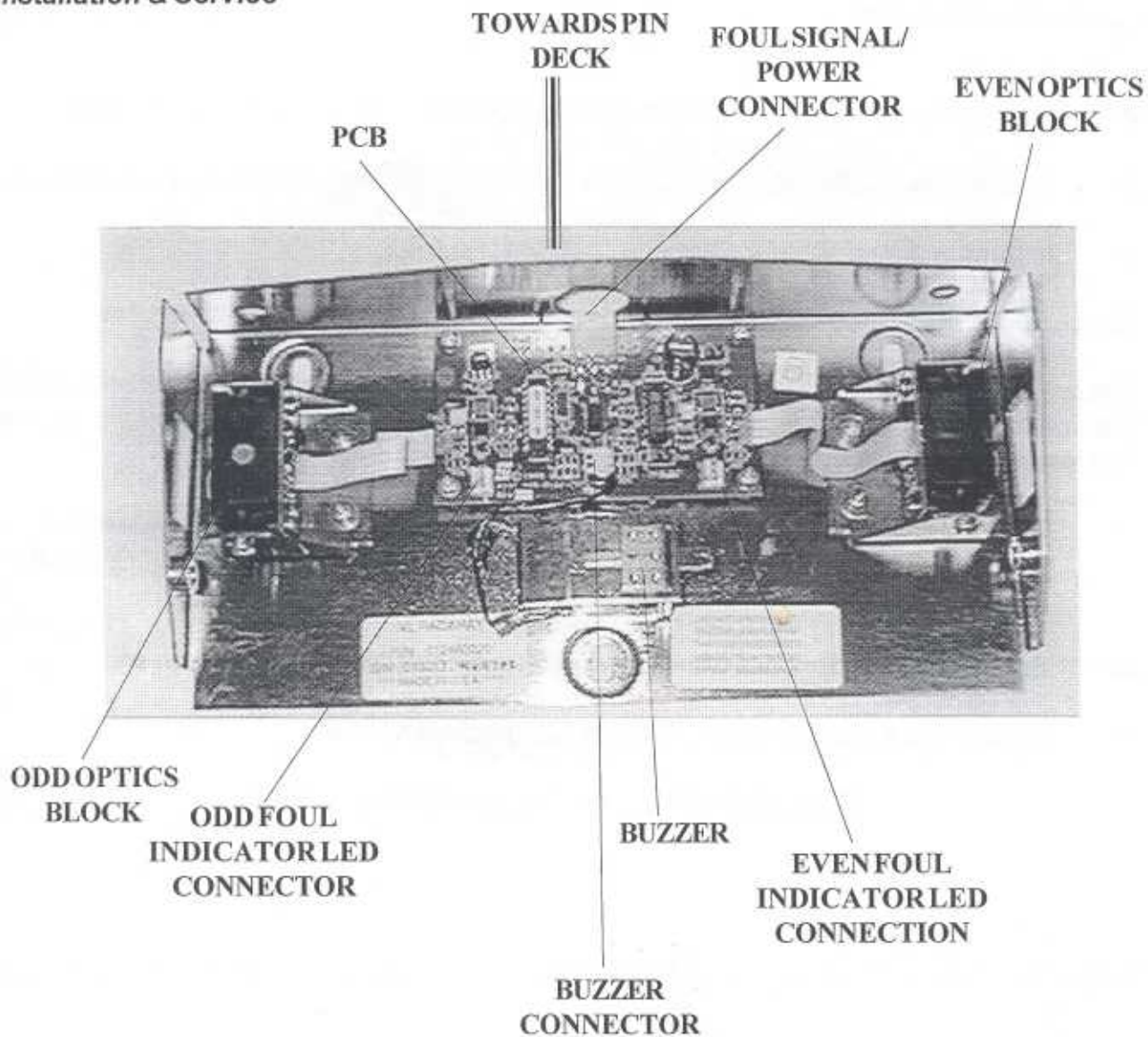
ONE PER INSTALLATION
SHIPPING CONFIG.

SHIPPING CONFIG.
612-460-027

SHIPPING CONFIG.
612-460-022

AMFRADARAYXL

Installation & Service



XL RADARAY CHASSIS
FIG#3

ALIGNMENT PROCEDURE

The Foul Detector is prealigned at the factory. On installations where the mounting surface is level and the foul detector is square to the lanes, additional alignment may not be necessary. In any event, alignment should be verified after installation.

Each optics assembly has two rotational axes of adjustment, one horizontal (left and right) and one tilt (up and down). It is only necessary to slightly loosen the mounting screws to align the optics, the screws should not be removed.

A red indicator lamp (LED) is used to indicate the proper alignment of the optics. There is a separate LED for each side. When poorly aligned, it will blink at a very low rate (1 to 3 times per second) or not at all. As the alignment improves, the blinking rate will increase. At best alignment, the blinking rate will be from 5 to 10 times per second. This may vary slightly from unit to unit or side to side.

A typical alignment procedure follows:

Make certain that there is a clear path between the foul detector optics and the retro-reflector mounted in the housing across the lane from the unit.



NOTE:

Disconnect the buzzer connector from the PCB to disable the buzzer during alignment. This is not a requirement, but is recommended to prevent the buzzer from repeatedly sounding during the alignment procedure. Do not disconnect the wire at the buzzer as this may break the buzzer terminal.

- ❶ Turn on the RADARAY from the MCU. [From the MCU keypad, press SPEC 2,9, ENTER {Lane #} ENTER].
- ❷ Loosen both end screws of one of the optics mountings slightly. (See FIG #5) The optics block will now be able to be tilted slightly up and down. The screw tightness should be such that there is some resistance to tilting. Tilt the unit up or down slightly until the maximum blink rate is observed. Retighten the mounting screws, making certain that the optics assembly does not move. Vertical alignment is now complete.

AMFRADARAYXL

Installation & Service

If the indicator lamp does not indicate that any improvement is obtained from step ②, the optics may be too far out of alignment in the horizontal direction. In this case, perform the adjustment in both directions at the same time until some improvement of alignment is obtained. Then return to step ② and proceed normally.

- ③ Loosen the two mount screws slightly, (See FIG #5) allowing the optics assembly to rotate from side to side. Rotate the assembly until the maximum blink rate is obtained. Secure the screws. The horizontal alignment is now complete.
- ④ Repeat step ② and ③ for the other side.
- ⑤ The unit is now aligned.
- ⑥ Reconnect the buzzer connector (center front edge of PCB) and verify that the buzzer sounds when the path between the optics and the retro-reflector housing is broken.

A suitable test is to place your hand in the optics path (on the foul line beyond the gutter).



NOTE:

A very white object placed directly within several inches of the optics may not trip the unit; however, this is not a situation that will occur in normal use.

Complete any remaining electrical hookup to the unit (foul indicator lamps, etc.). Check for proper operation.

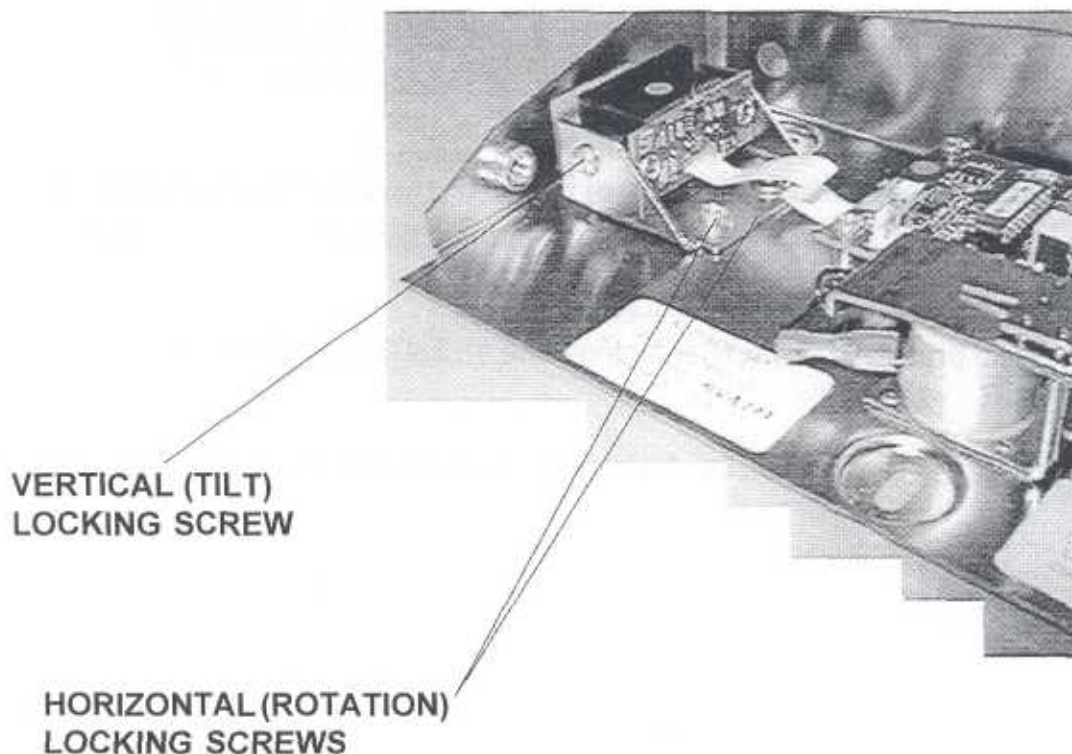
Install the cover with the 1/4-20 screws provided. Recheck for proper operation. The unit is now operational.

Installation & Service

SINGLE SIDE OPERATION

In an installation where only one detector is used (an odd number of lanes, for example), the following should be done to prevent erratic signals from the unused detector.

- ① Remove the cover of the fowl detector.
- ② Install a piece of reflective tape over the viewing hole in the chassis on the side that needs to be disabled. The tape should be on the inside of the chassis facing the optics block. The tape will present a constant return signal to the detector that is never interrupted.
- ③ Verify the alignment lamp for the disabled side is blinking at least a few times per second, indicating the detection of a suitable return signal.
- ④ Reinstall the cover.



FIG#5
OPTICS BLOCK

Installation & Service

ROUTINE MAINTENANCE

The system is designed to operate properly with a significant amount of dust and dirt accumulation on the optics. However, it is advisable to perform periodic cleaning of the reflector surfaces and optical windows.

IT IS RECOMMENDED THAT THE OPTICAL SURFACES BE COVERED DURING ANY LANE MAINTENANCE THAT GENERATES LARGE AMOUNTS OF DUST AND DIRT OR ALLOWS CHEMICALS TO SPLASH ABOUT.

Cleaning recommendations follow:

- ① Use a clean non-abrasive cloth to gently wipe the face of the reflectors on the reflector unit and the optics window on the chassis cover.
- ② If gently wiping does not remove the dirt, as may be the case for grease or wax accumulation, a mild soap (such as dishwashing liquid soap) and water solution may be used. First wash and then gently wipe dry.



CAUTION!

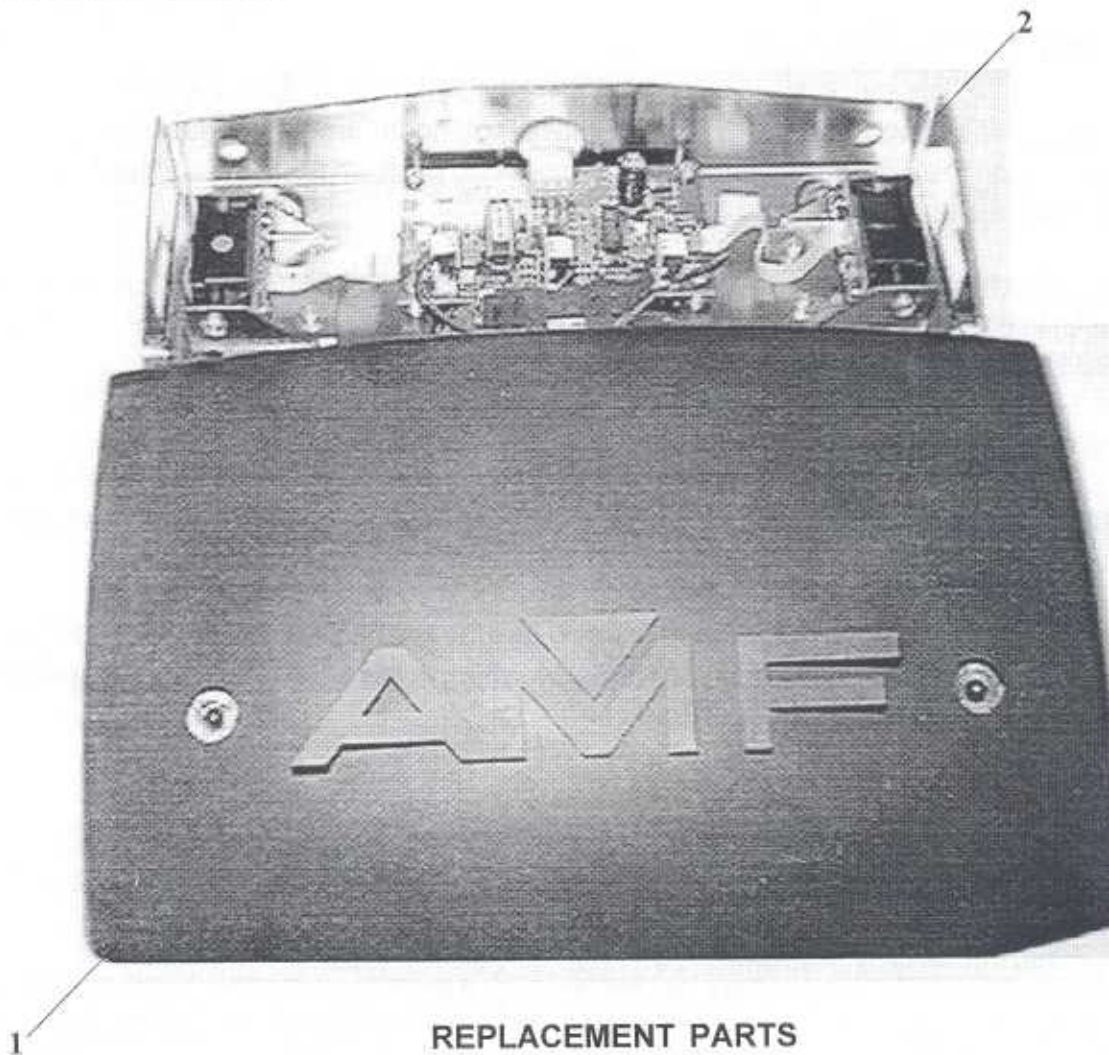
DO NOT USE ABRASIVE CLEANERS OR STRONG SOLVENTS AS THEY MAY PERMANENTLY DAMAGE THE SURFACES!

- ③ The black plastic covers may be cleaned with a protective cleaner such as ARMOR ALL, but care should be taken to protect the optical windows as described above. For this reason, it is recommended that the cleaner be sprayed on a non-abrasive rag and then the unit be gently wiped clean.

ARMOR ALL is a registered trademark of Armor All Products Corporation.

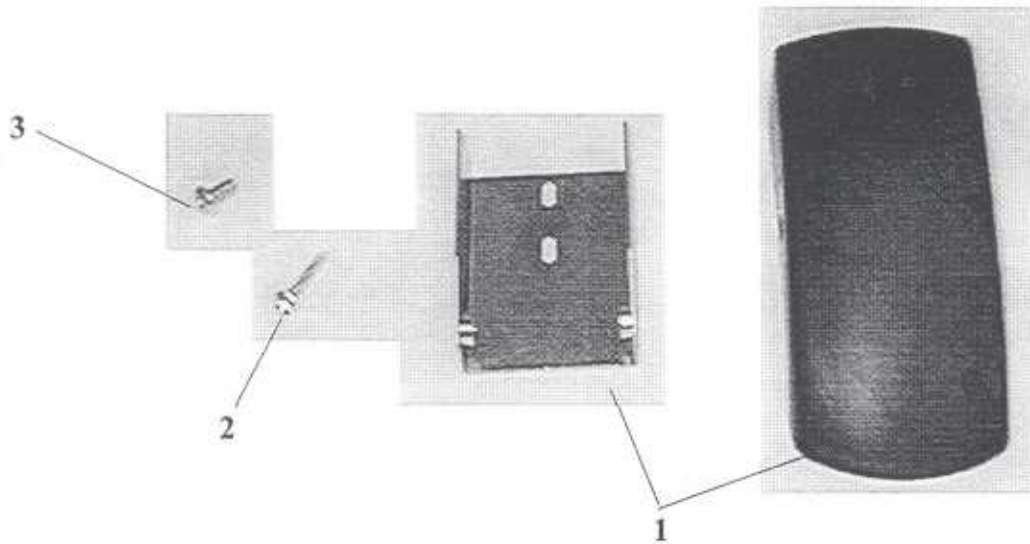
AMFRADARAYXL

Installation & Service



REPLACEMENT PARTS
FIG#6

1	090-005-892	XL RADARAY COVER ASSEMBLY WITH LED's
2	612-460-028	XL RADARAY SPARE ELECTRONICS KIT



REPLACEMENT PARTS
FIG#7

1	612-460-027	XL RADARAY REFLECTOR ASSEMBLY
2		#10 X 1" HEX HEAD SCREW
3		1/4-20 X 1/2 SCREW