GROUND FAULT DETECTOR

TECHNICAL REFERENCE MANUAL

Reference No.	Date	Approved
ZGFAULT0312E02	2003-12	

Printed in Canada

SERVO ROBOT
THINKING HI-TECH

Table of Contents

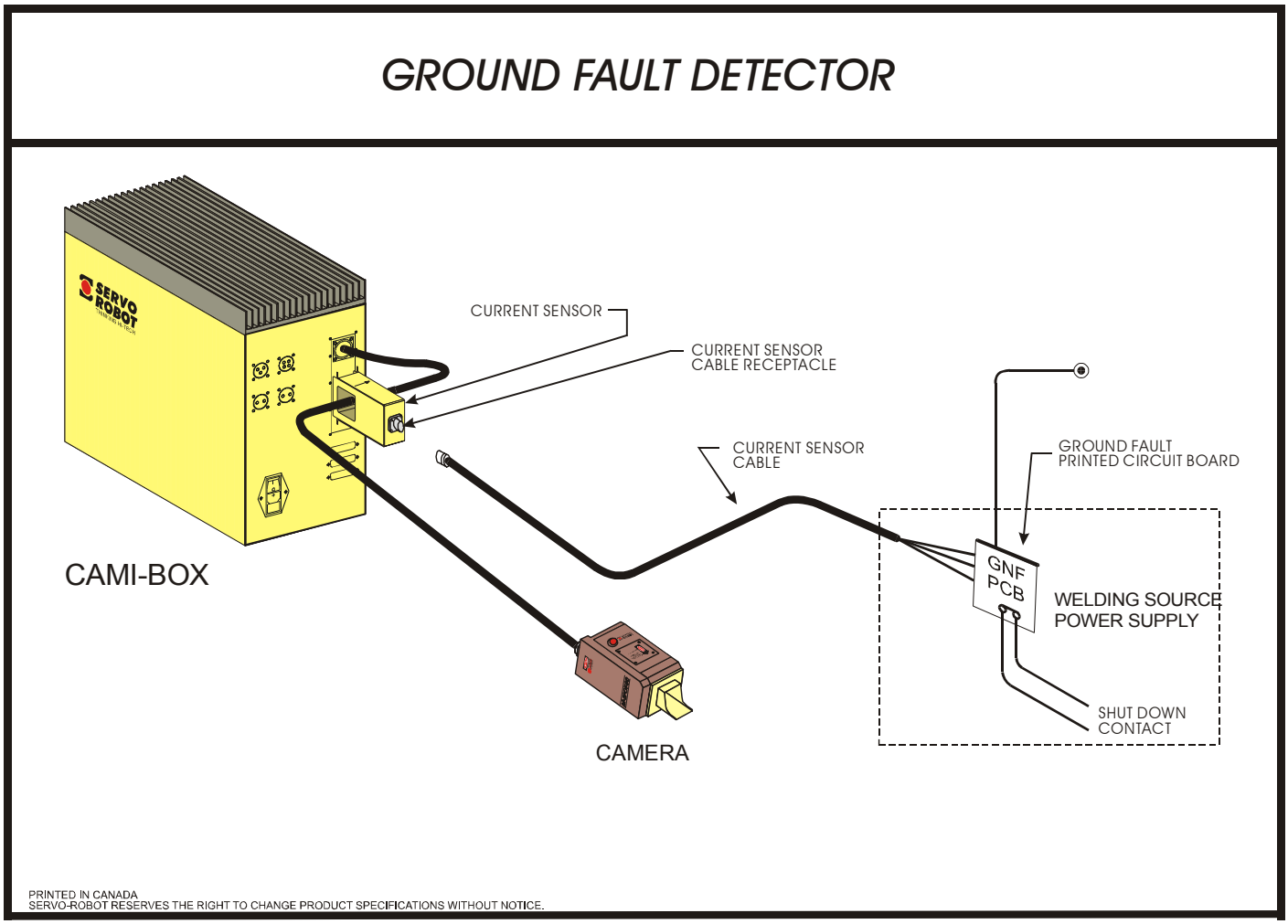
1. INTRODUCTION

The GROUND FAULT DETECTOR system is a safety device that is very useful in the case where Servo-Robot's vision systems are coupled with arc-welding machines. Its main purpose is to prevent damage to the camera or the camera cable if for any reason the welding current passes through the camera body and/or the cable instead of going straight through the welded part. For example, this could occur if the welding wire of an arc-welding torch came out of the torch and curled back onto the camera body.

The GROUND FAULT DETECTOR kit is composed of three components: the current sensor, the ground fault printed circuit board, and the current sensor cable. In most cases, the current sensor is mounted on the vision-system control unit near the camera receptacle. The camera cable is passed through the current sensor opening and then connected to the camera receptacle on the control unit. The ground fault printed circuit board is usually installed inside the welding power supply enclosure where it will be powered with 120 or 230 VAC and connected to a shutdown circuit in such a way that the welding power is cut off when a "ground fault" is detected.

2. Ground Fault Detector Application

Figure 1: Ground Fault Detector



3. Components Description & Installation

3.1 Current Sensor

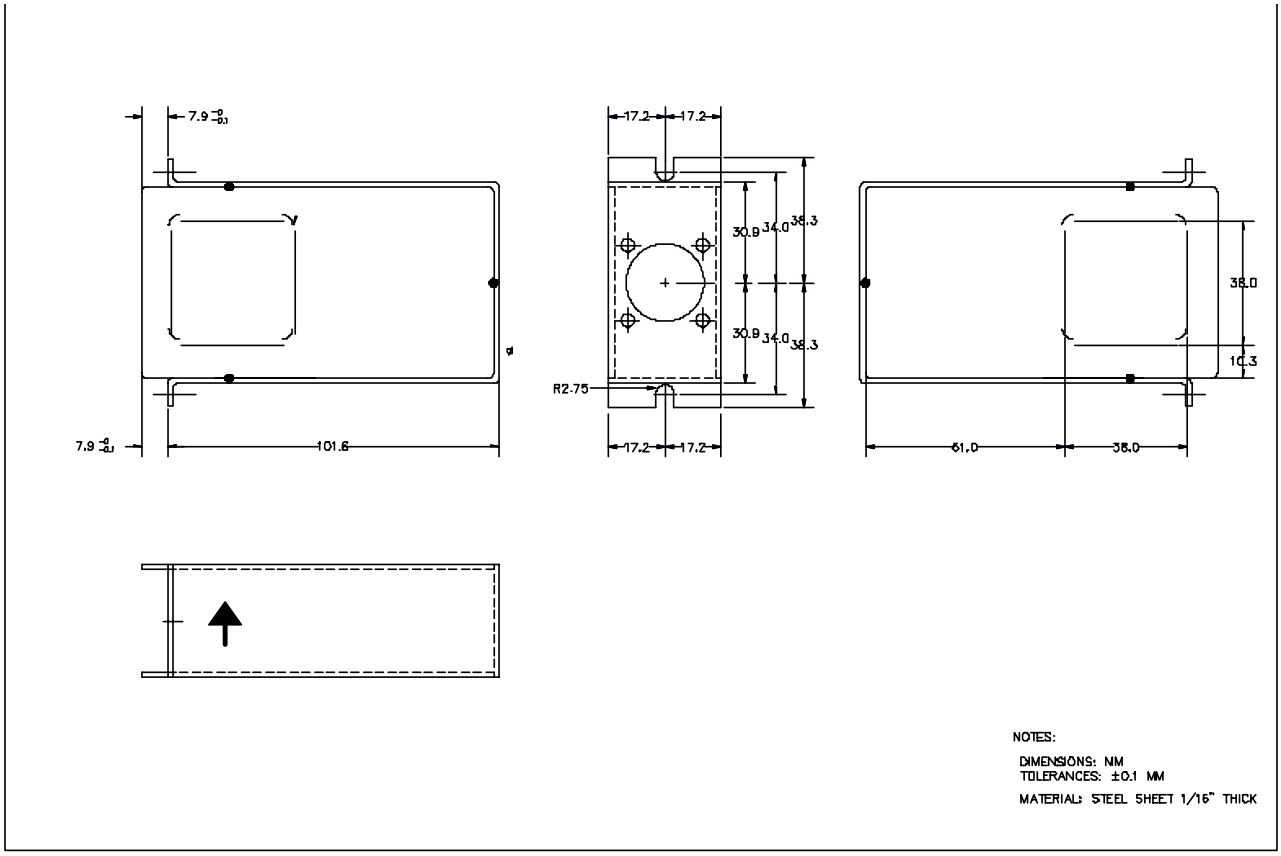
3.1.1 Current Sensor Installation

For shipment purposes, the ground fault current sensor may not be attached to the vision-system control unit when you receive it from the factory. If it is not, you need to mount it on the control unit enclosure near the camera receptacle.

Locate the two current sensor-mounting holes on the control unit enclosure near the camera receptacle. Using the two screws enclosed in the ground fault package, fix the current sensor on the enclosure. You will notice arrows on the side of the current sensor indicating the direction in which the cable will have to be inserted for proper operation. You can mount the current sensor in the orientation that will best suit the cable entry direction that you need.

3.1.2 Current Sensor Dimensions

Figure 2: Current Sensor Dimensions (mm)



3.1.3 Current Sensor Technical Data

Feature	Description	Reference
Operating Current @ 25C	Min. 2.2 A, Max 6.5 A	---
Release Current	Min. 0.60 A	---
Supply Voltage	8-16 Volt DC	TERM A (V+) TERM B (V-)
Output Current	100 mA	TERM C
Output Voltage	0.4 V	TERM C
Response Time	100 micro-seconds	---
Dimensions	61,8 x 109,5 x 34,4 mm (3.4” x 4.3” x 1.4”)	---

Table 1: Current Sensor Technical Data

3.2 Printed Circuit Board

3.2.1 Printed Circuit Board Installation

The ground fault printed circuit board (PCB) is usually installed inside the welding power source enclosure. It can also be installed inside the robot control unit if there is a remote shutdown signal that can be used to shut off the welding power source in the case of a problem (ground fault). Once you have found the proper location for the ground fault PCB, drill the required mounting holes according to the hole pattern shown in the printed circuit board description below. The PCB can be attached using any 0.25” (6.4mm) or longer mounting spacers depending on the space available inside the enclosure.

3.2.2

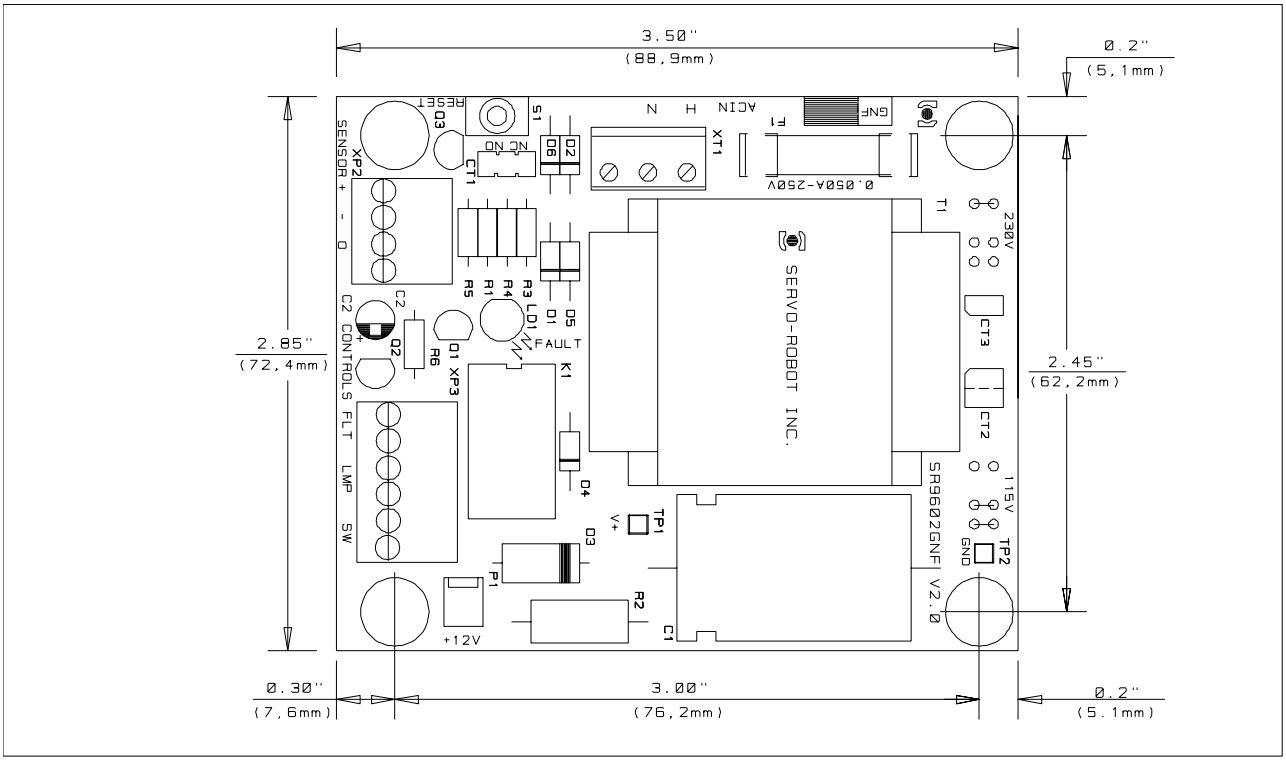


Figure 3: Printed Circuit Board Description

3.2.3

Feature	Description	Reference
AC Input Voltage	90-132 Vac or 180-264 Vac depending on CT2 and CT3 configuration	XT1 TERM 1 (HOT) XT1 TERM 2 (NEU)
Input Fuse Type	50mA Fast-Acting 5 x 20mm	F1
Shut-Down Output	Dry N.O. Contact: 1 A / 125Vac Max, 2 A / 30Vdc Max	XP3 TERM 1-2
External Reset Switch Input	Normally Closed Momentary push-button switch required. (Must be shorted if no switch connected)	XP3 TERM 5-6
Fault Indicator Lamp Output	+12Vdc	XP3 TERM 3 (+12) XP3 TERM 4 (GND)
Current Sensor Input	For Servo-Robot current sensor device	XP2 TERM 1 (V+) XP2 TERM 2 (V-) XP2 TERM 3 (IN)
Dimensions	88,9 x 72,4 x ~20 mm (3.5” x 2.85” x 0.78”)	---

Table 2: Printed Circuit Board Technical Data

3.2.4 Input Power Voltage Selection Jumper

Verify that the voltage selection jumper blocks are properly set to suit the input voltage that will be used to power the ground fault PCB.

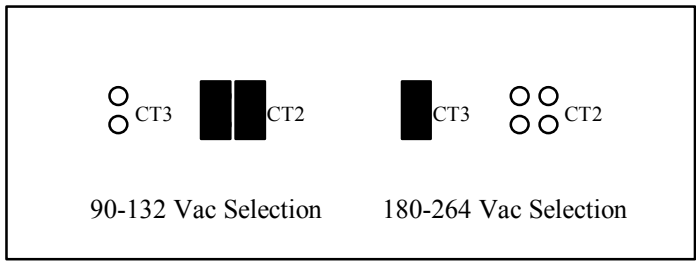


Figure 4: Input Power Voltage Selection Jumper

Once the proper voltage input range has been selected, the PCB needs to be powered with the proper AC voltage input. Determine where the AC voltage will be taken from, making sure it will be turned on and off by the welding power source main power switch. Connect the hot wire to terminal "H" of the XT1 terminal block and the neutral wire to terminal "N" of the XT1 terminal block.

3.2.5 XP3 Terminal Block Description

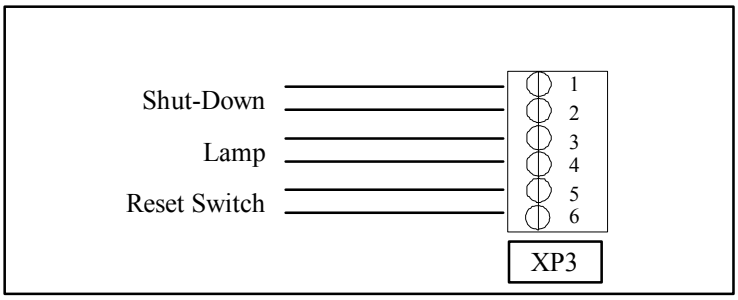


Figure 5: XP3 Terminal Block Description

3.2.6 Shut-Down Output Contact

The shutdown output contact is a normally open dry contact of an on-board relay. This contact remains closed when the ground fault detector circuit is powered and no current flows through the current sensor. When a current high enough to trigger the fault status flows through the camera cable, the shutdown output contact opens. This output has to be inserted in the shutdown circuit of the welding power source in such a way that the welding power is cut off when a fault is detected. The shutdown output contact can be accessed on terminals 1 & 2 of the XP3 terminal block.

3.2.7 Fault Indicator Lamp

The enclosed ground fault status indicator lamp can be installed on the front panel of the enclosure in which the ground fault PCB has been installed. To do so, you need to drill a 15/32" (12mm) hole in the panel where it will be mounted. Depending on the location of the lamp and the size of the enclosure, you may need to modify the wire length of the indicator lamp to suit your need.

Fix the indicator lamp on the enclosure and route the two wires toward the ground fault PCB. Connect the lamp wires on terminals 3 & 4 of the XP3 terminal block.

3.2.8 External Reset Switch

The external reset switch input has been shorted for shipment. The fault status can now be reset using the on-board reset switch. It is possible to install an extra switch on the front panel of the enclosure in which the ground fault PCB has been installed (near the fault indicator lamp). If you wish to do so, you need to use a normally closed momentary push-button type switch (not enclosed) and connect it on terminals 5 & 6 of the XP3 terminal block (you must then remove the bypass wire connected between those two terminals!).

3.3 Current Sensor Cable

3.3.1 Current Sensor Cable Description

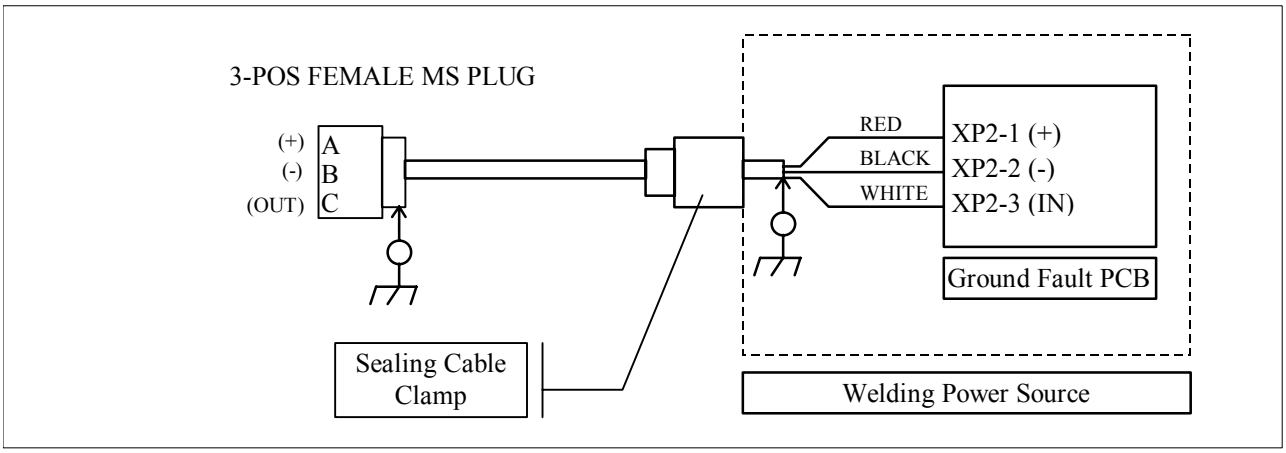


Figure 6: Current Sensor Cable Description

3.3.2 Current Sensor Cable Installation

The current sensor cable links the current sensor unit to the ground fault PCB. It has a connector at the current sensor end while the other end needs to be connected directly to the ground fault PCB inside the welding power source. A 7/8" (22,2mm) hole needs to be punched through the cable entry wall of the welding power source enclosure in order to pass the ground fault cable before connecting it to the ground fault PCB inside the welding power source enclosure. Use the enclosed sealing cable clamp that will fit in this mounting hole to seal, hold and protect the ground fault cable passing through the enclosure wall.

Connect the ground fault cable wires to the ground fault PCB as indicated in the above ground fault cable description diagram. Connect the other end of the cable to the current sensor mounted on the vision-system control unit.

4. Installation of Camera Cables

Before installing the camera cables, make sure that the power to the control unit has been turned off.

Route the camera cable from the robot or other machine toward the control unit, making sure it will not be pinched or grabbed during the operation of the system. Also verify that the minimum bending radius of the camera cable is not exceeded. As a rule of thumb, the bending radius of the cable shall not exceed about ten times its outer diameter.

Before connecting the camera cable to the control unit, pass it through the current sensor making sure to follow the arrow direction as indicated on the current sensor.

IMPORTANT!
The current sensor detects the current flowing through the shield of the camera cable and the camera body. In order to work properly, no part of the camera body, connector, air fittings, extension cable or any camera grounded parts should come in contact with the robot or machine on which the camera is attached.

- **If extension cables are used, verify that the junction connectors are properly insulated from the robot arm, machine or any grounded parts nearby.**

- **If the external CDU configuration is used, verify that the CDU-BOX is properly insulated from the robot arm, machine or any grounded parts nearby. In this case, make sure that the two cables that link the CDU-BOX and the vision-system control unit pass through the current sensor opening.**

5. Test Procedure and Schedule

It is very important to periodically (once a month) verify the functionality of the ground fault detector. Such preventive actions ensure that the tracking system is properly protected.

5.1 Testing the Ground Fault Detector

In order to correctly test the ground fault detector, an electrical current must pass through it, simulating a ground fault. The current supplied by a 1.5Volt D-cell alkaline battery is sufficient.

- Pass a 2-meter 16AWG or 18AWG wire (1.5mm² or 1mm²) three times through the ground fault detector. (See figure 7 below)
- Place one end of the wire on the + of the battery, and momentarily touch the other end of the wire on the –, thus discharging an electrical pulse from the battery through the detector.
- The red light located on the GNF Board should turn on when the sensor detects the current. The welding machine should also stop at this point.
- Reset the ground fault detector by pressing the reset button on the GNF board.

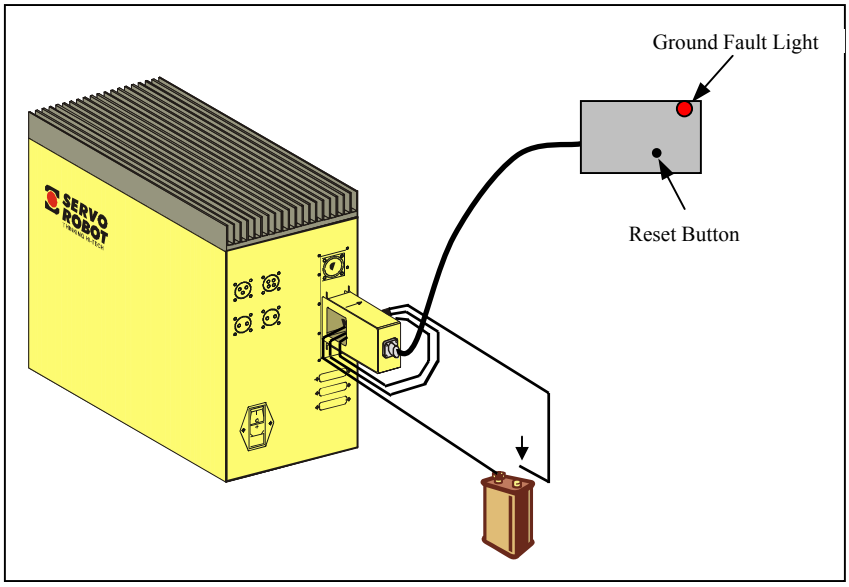


Figure 7. Testing the Ground Fault Detector

5.2 Testing Schedule

We recommend that this test be carried out **each month**. Servo-Robot may not be held responsible for any damage done to the vision system if a ground fault detector has not been installed properly or if the testing schedule (see next page) has not been followed faithfully.

Ground Fault Detector Test Checklist

Testing Schedule	Date	Tested by	Signature
Upon Installation			
Month 1			
Month 2			
Month 3			
Month 4			
Month 5			
Month 6			
Month 7			
Month 8			
Month 9			
Month 10			
Month 11			
Month 12			