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Model HDPC
Hole Detection Processing Computer
Operator's Manual

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S.1 Introduction

When paired with a 10XHD-Series or 10XSHD-Series sensor(s), the SCAN-A-LINE™ Hole Detection Processing Computer – Model HDPC is one of the most reliable and cost effective solutions for hole detection in the world today.

Figure S.1-1: Model HDPC

S.1.a Functional Description

The SCAN-A-LINE™ Hole Detection Processing Unit – Model HDPC is a universal signal processor for all Scan-A-Line™ 10XHD-Series and 10XSHD-Series Hole Detection Sensors. The Model HDPC is equipped to supply regulated power and full signal processing for one to three Scan-A-Line™ Hole Detection Sensors. The Model HDPC is programmed to determine the operational mode for each sensor automatically and thereby eliminates all needs for shuttering or manual system configuration. In addition to alarm relay outputs for each channel, the Model HDPC produces a digital report of hole location relative to the sensor scan and position along the length of the coil. The digital report is sent via RS-232 or RS-485 to a host computer or PLC.

When sensor 'A', 'B', or 'C' detects a 'hole event', the Model HDPC alarm function will close a normally open relay contact for that channel, and light the red Hole A, Hole B or Hole C detect lamp on the front panel. The alarm condition will remain set for approximately one (1) second to permit a PLC or host computer time to see the signal. During this alarm time, another hole cannot be detected on the same channel, however the other two channels are monitored and will also report hole events. When a 'hole event' occurs, a serial message is generated and sent to the RS-232 or RS-485 port. The serial message contains the Sensor ID (A,B, or C), the number of holes detected during the alarm scan, the 'X' position in the sensors scan where the first hole occurred, and the 'Y' position along the web. A rotary encoder with a resolution of 128 pulses per revolution is required to produce the strip 'Y' position report.

The system operation is monitored by a Fail Safe circuit to ensure that the sensors are receiving proper power and scanning sync signals. In the event of a failure, the Normally Closed contact of the Fail Safe Relay will open and the Fail Safe green indicator lamp on the front panel will go out. This will insure proper operation of the system at all times.

Lamp Color	Description	ON	OFF
Green Indicator	Fail-Safe Status	Proper Function	System Failure
Red Indicator Hole A	Sensor A Detect Status	Hole(s) Detected	No Hole(s) Detected
Red Indicator Hole B	Sensor B Detect Status	Hole(s) Detected	No Hole(s) Detected
Red Indicator Hole C	Sensor C Detect Status	Hole(s) Detected	No Hole(s) Detected

Table S.1.1: Front Panel Indicator Lamps

S.2 Operational Considerations

The Model HDPC is designed to operate in an industrial environment and can readily tolerate average factory conditions. Considerations for protection and maintenance of the Model HDPC will ensure it's operation for years to come.

NOTE:

If any welding is to be performed near the Model HDPC, or anywhere on the process line where the Model HDPC is installed, disconnect ALL cables from the Model HDPC. This prevents system overload by the current generated from welding.

S.2.a Temperature Range

Operational temperatures should fall in the range from 32°F to 122°F [0°C to 50°C]. Temperatures above 140°F [60°C] for prolonged periods of operation or storage can lead to the degradation of the integrated circuits in the Model HDPC. If temperatures outside the specified range are expected, special provisions should be made to protect the equipment.

S.2.b Vibration Considerations

SCAN-A-LINE™ processors can tolerate reasonable amounts of shock and vibration. The major problem with vibration is the increase in probability of loose hardware and/or connectors. Mount the Model HDPC to a solid, fixed mounting where vibration is at a minimum. When high levels of vibration or shock are likely, shock-absorbing mounts will reduce maintenance problems.

S.3 Specifications for Model HDPC

The electronics for the Model HDPC are housed in a NEMA-type steel enclosure. All enclosures are painted with corrosive resistant polane paint.

S.3.a Power Requirements

The Model HDPC has a switching power supply. The standard power requirements for the Model HDPC are 90VAC to 264VAC at 47Hz to 63Hz. The power supply has UL1950 and CSA C22.2 No. 234 safety approvals and meets FCC Class B conducted as well as VDE EN 60 950 Class B EMI conducted noise limits. The power supply will automatically adjust for voltages between 90VAC and 264VAC with no jumpers or switch settings necessary. The power line is filtered to suppress power line transient noise and power line induced RF interference. Quick disconnect power line connections are made directly to the internal power line filter inside the Model HDPC enclosure. The power supply for the Model HDPC is located under a red warning panel in the top-left corner inside the enclosure.

Short circuits to the regulated supplies will usually cause a thermal shutdown of the regulators without causing the fuse to blow. See Figure S.3-1 for the power supply fuse location. Contact Harris Instrument Corporation's service department for recommended replacement.

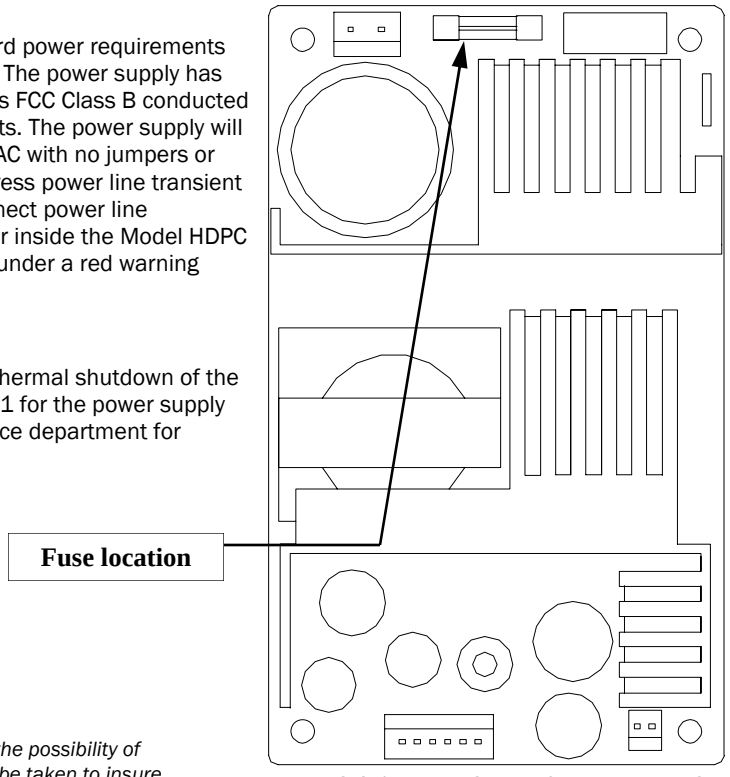


Figure S.3-1: Power Supply for Model HDPC

NOTE:

A good system earth ground can be helpful in reducing the possibility of interference from other electrical equipment. Care should be taken to insure that the SCAN-A-LINE™ earth ground is separate from the grounds used by other systems. This is most important when high current (ex. welding, cutting, etc.) and high voltage (ex. Hi Pot Testing) are involved.

S.3.b Relay Contacts

The relays used in the Model HDPC are special long life telecom relays, rated at a maximum of 2 Amps at a maximum of 125 VAC or 125VDC. The relays are meant mainly to supply signals to PLC's or other devices that will in turn control higher current operations.

The four relay contacts for FAIL-SAFE and Hole Detection are available to the customer inside the Model HDPC processing computer on the back panel terminal strip TS1 {Figure S.4-3 & S.4-4 Pg. 9 }.
Also See Drawing # 1306005 for locations of the terminal strip.

NOTE:

All alarm devices must be installed outside the Model HDPC box. AC Power brought into the box or run through the DC relays can cause electrical interference. Use external relays with proper noise suppression.

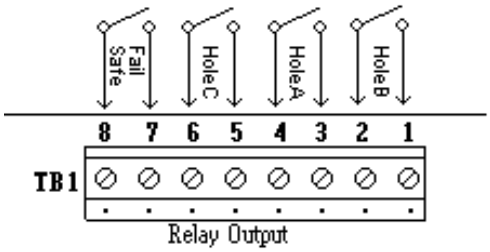


Figure S.3-2: Model HDPC Barrier Strip

S.3.c Physical Dimensions

Position #	Position Name	Description	Other Information
TS1-6 & TS1-7	Fail-Safe Relay	Normally Open (power off). Under normal operation this relay will be closed. It opens if system or power failure occurs.	125VAC or 125 VDC 2Amp
TS1-8 & TS1-9	Hole A Detect Relay	Normally Open (power off). Under normal operation this relay will be open. It closes if hole is detected.	125VAC or 125 VDC 2Amp
TS1-10 & TS1-11	Hole B Detect Relay	Normally Open (power off). Under normal operation this relay will be open. It closes if hole is detected.	125VAC or 125 VDC 2Amp
TS1-12 & TS1-13	Hole C Detect Relay	Normally Open (power off). Under normal operation this relay will be open. It closes if hole is detected.	125VAC or 125 VDC 2Amp

Table S.3-3: Customer Connections Pin Descriptions

The Model HDPC is housed in a steel enclosure measuring 12 inches [305 mm] wide by 14 inches [356 mm] tall by 6 inches [152mm] deep and painted with corrosive resistant polane paint. The weight of the unit is approximately 15.5 pounds [7 kg]. Sensor connections are located on the bottom panel through 7-pin MS-style circular connectors. The Model HDPC has four connections on the bottom panel. System power is connected through an IMC conduit cord grip located to the left of sensor C on the bottom panel. **See Drawing # 1406004** dimensions and bottom panel layout.

S.3.d Unit Configuration

The Model HDPC is self configuring upon installation for any weld hole or small hole detection application(s) using Model 10XHD-Series or 10XSHD-Series sensors. The Model HDPC supports from one to three sensor sets of the same size and type within a single application.

S.3.e Serial Message Output String

The Model HDPC generates an output string via RS-232 when a hole event has occurred. The output string can be viewed in any terminal program. The RS-232 port is located inside the Model HDPC and can be accessed through the spare access hole located on the bottom panel of the Model HDPC. (RS-485 Available upon request.)

TS1-5 - Transmit

TS1-4 - Receive

TS1-3 - Ground

To view the information string in Windows Hyper Terminal, follow these steps.

- Create a new connect
- Connect using COM1 (or other)
- Bits per second 57,600
- Data Bits 8
- Parity None
- Stop Bits 1
- Flow Control None

Click OK and the terminal program will now be active.

The serial message contains the Sensor ID (A,B, or C), the number of holes detected during the alarm scan, the 'X' position in the sensors scan where the first hole occurred, and the 'Y' position along the strip. A rotary encoder with a resolution of 128 pulses per revolution is required to produce the 'Y' position report. The string is as follows:

HnmX01234Y01234 followed by a carriage return & linefeed

H = Indicates a Hole Event

n = Number of holes detected (1,2,3) on the last scan

m = Sensor letter (A,B,C) Indicates which sensor detected a hole event

X01234 = The 'X' indicates that the number following is the 'X' position of the hole in the scan of the emitter (not fixed, depends upon emitter size)

Y01234 = Footage Indicates the number of feet into a new coil where the hole event occurred. This number will always be five digits long with a maximum count of 65536 from a 16 bit counter. (only active when a rotary encoder is used)

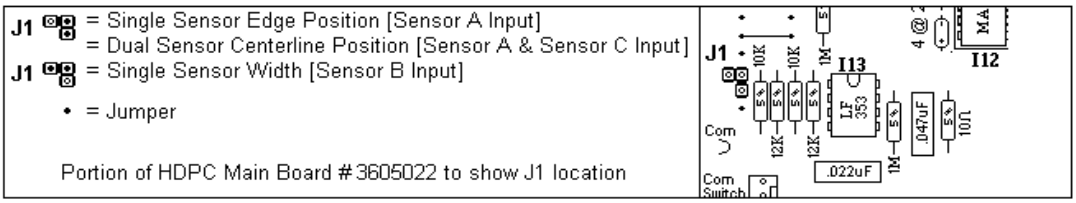
NOTE:

The 'Y' position report requires the use of an external rotary encoder with a sensitivity of 128 pulses per one foot of travel. If no encoder input is used, the report will send '00000' for each 'Y' position.

S.3.f Analog Outputs

An analog output is available to provide a centerline with two sensors only (Sensor A and Sensor C) or edge position (with a single sensor) output. The centerline is calculated by subtracting Sensor C from Sensor A. Edge position is determined by looking at Sensor A. See your system configuration sheet supplied with your system for sensor location and installation.

- +/- 10VDC output provides a centerline with two sensors connected. If your configuration uses three sensors, Sensor A and Sensor C must be on the out bound sides of the strip. (Analog Resolution is 1 inch with Model 10XHD-Series sensors and 0.2 inch with Model 10XSHD-Series sensors.)
- 0 - 10VDC output provides edge position with one sensor connected.



S.3.g Tachometer

A rotary encoder with a resolution of 128 pulses per revolution is required to produce the strip 'Y' position report. To connect the tachometer to the HDPC Processing Computer, See Drawing # 3497059.

S.4 Installation

When installing the Model HDPC processing computer, procedures to protect the unit from damage should be taken. Install the Model HDPC in a position near the line where it is protected as much as possible. Mount the Model HDPC vertically, with the cable and power connections pointed towards the floor. There are four mounting holes on the top and bottom flanges of the processing computer. The Model HDPC requires a good ground. Be sure to use the three-prong power cord for connecting system power. If running power through conduit, ensure that the system power has an adequate ground.

S.4.a AC Power

The Model HDPC comes standard with a three-prong AC power cord for 115VAC operation. {Figure S.4-1} shows the wire connections to the line filter located on the inside-bottom panel of the Model HDPC enclosure. If replacing the standard three-prong AC power cord with conduit, BE SURE THAT THE LINE AND NEUTRAL CONNECTIONS MATCH FROM THE POWER SOURCE SIDE TO THE POWER SUPPLY SIDE!

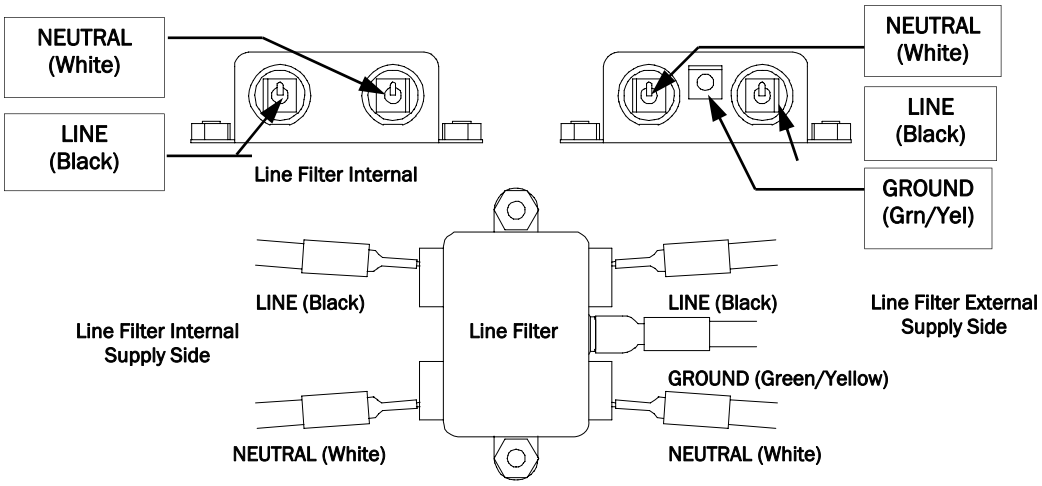


Figure S.4-1: Line Filter for AC Power Connection in Model HDPC

S.4.b Sensor Connections

The Model HDPC Processing Computer has three sensor connectors located on the bottom panel of the unit. The sensor connectors are labeled Sensor A, Sensor B, and Sensor C. Each sensor(s) used in your system is connected to the Model HDPC by a 7-pin emitter-to-processing computer cable. One 7-pin emitter-to-processing computer cable is required for each 10XHD-Series or 10XSHD-Series sensor(s) used in your system configuration.

Before connecting the emitter cable(s) to the processing computer, verify that the connectors are free of foreign materials and check the number of pins on each connector.

Single Sensor Connection: Requires one emitter-to-processing cable

Connect one emitter cable to the Sensor A 7-pin circular MS-style connector located on the bottom panel of the unit. {Figure S.4-2}.

Dual Sensor Connection: Requires two emitter-to-processing cables

Connect one emitter cable to the Sensor A 7-pin circular MS-style connector and the second emitter cable to the Sensor B 7-pin circular MS-style connector located on the bottom panel of the unit. {Figure S.4-2 }.

Triple Sensor Connections: Requires three emitter-to-processing cables

Connect one emitter cable to the Sensor A 7-pin circular MS-style connector the second emitter cable to the Sensor B 7-pin circular MS-style connector and the third emitter cable to the Sensor C -pin circular MS-style connector located on the bottom panel of the unit. {Figure S.4-2}

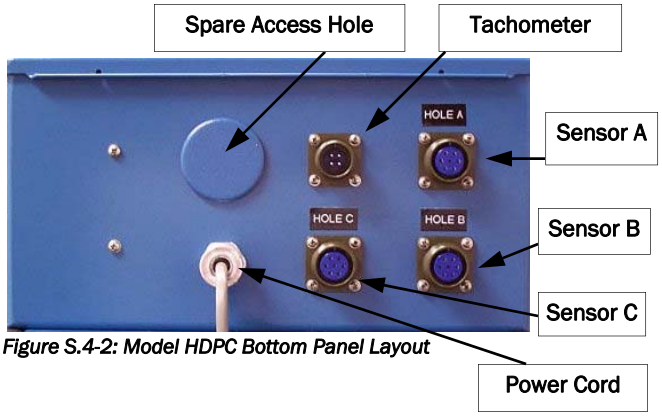


Figure S.4-2: Model HDPC Bottom Panel Layout

NOTE:

If any welding is to be performed near the Model HDPC processor and/or sensor(s), DISCONNECT ALL POWER LINES and CABLES from the processing computer to prevent damage to the unit.

S.4.c Operational Modes

The Model HDPC is programmed to determine the operational mode for each sensor automatically. There are three operational modes available. These modes are as follows:

Mode One: Detects ONE (1) or more holes with the emitter completely covered.

Mode Two: Detects ONE (1) or more holes with ONE (1) edge of the emitter not covered.

Mode Three: Detects ONE (1) or more holes with both edges of the emitter uncovered.

Connector	Pin Name
TS1-1 & TS1-2	ENABLE Switch
TS1-3	Digital Common/ RS232
TS1-4	RS232 Receive
TS1-5	RS232 Transmit
TS1-6 & TS1-7	FAIL-SAFE
TS1-8 & TS1-9	HOLE A
TS1-10 & TS1-11	HOLE B
TS1-12 & TS1-13	HOLE C
TS1-14	Analog Common
TS1-15	Position Out/Analog
TS1-16	N/A

Table S.4-3: ENABLE Jumper Specifications

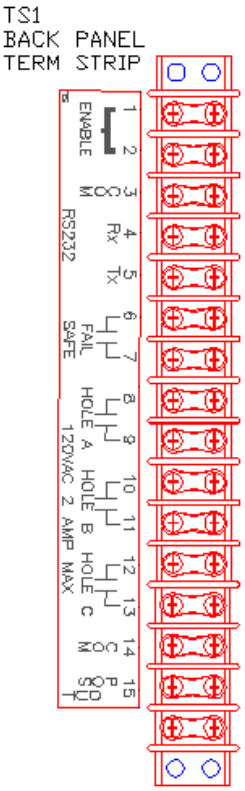


Figure S.4-3.1 Enable Switch Position

When using a Tachometer for footage readings, a PLC, host computer or another device is needed to open the ENABLE switch. Upon opening the switch, the footage will reset to zero "0". When the switch has been closed, the footage will restart the count.

S.4.d ENABLE Switch Jumper

The Hole Detection Processing Computer is jumpered ENABLE from the factory with a small wire jumper closing TS1-1 & TS1-2 positions on the back panel terminal strip {Figures S.4-3}. These connections can be used in conjunction with a tachometer for footage.

S.4.e Alarm Function

When sensor 'A', 'B', or 'C' detects a 'hole event', the Model HDPC alarm function will close a normally open relay contact for that channel, and light the red Hole A, Hole B, or Hole C detect lamp on the front panel. The alarm condition will remain set for approximately one (1) second to permit a PLC or host computer time to see the signal. During this alarm time, another hole cannot be detected on the same channel, however the other two channels are monitored and will also report hole events.

S.4.f Quad Relay Extender (Does not come standard on the HDPC)

The Quad Relay Extender Option will extend the time that relays will remain closed when triggered by a 'Hole Event' or a 'Fail-Safe Event' as detected by the Scan-A-Line™ Model HDPC Hole Detection Processing Computer. Extended relay closure times will help a busy or slow PLC detect an event that occurs and concludes in a period of time less than the duration of one complete PLC scan.

The relay closure time can be varied to suit the customer and can be independently set. Factory setting for the Quad Relay Extender Option is approximately one (1) second. Relay closure can be increased by turning the knob in a clockwise direction. The time can be increased up to ten (10) seconds. As multiple 'Hole Events' can occur during the period of time during which a hole event relay is closed, please note that each individual 'Hole Event' and 'Fail-Safe Event' will be logged in the RS232 output.

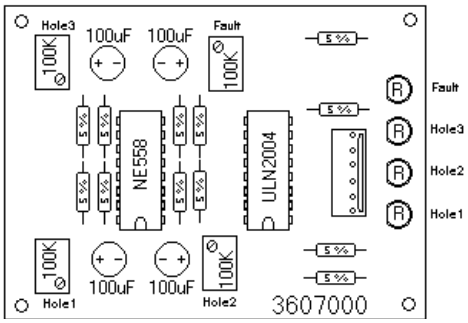


Figure S.4-4: Quad Relay Extender Option Board

S.5 General Maintenance

All SCAN-A-LINE™ processing computers are highly reliable and tolerant to most industrial environments. Maintenance of the Model HDPC after installation is extremely limited. Since there are no moving parts in the Model HDPC, there is nothing to lubricate. If any form of maintenance is performed on the line near the Model HDPC, be sure to disconnect all cables from the unit.

NOTE:

If welding is to be performed anywhere on the process line where the Model HDPC is installed, disconnect ALL cables from the Model HDPC. This prevents a system overload (and associated damage) from the current generated by the welding.

The only typical maintenance for the Model HDPC processing computer is:

1) Check all cable connections. All connections should be snug.
2) Make sure all cables are free of cuts, nicks, or crimps. Replace cables if they are damaged.
3) Check power connections and insure that power is available to the unit.
4) Check all mounting fixtures. Tighten if necessary. In high vibration environments, mounting plates can vibrate loose. If vibration is still causing problems, simple vibration dampening can solve most vibration interference.

NOTE:

Damaged cables can cause serious damage to the entire Hole Detection System. Repair or replace damaged cables as soon as the damage is discovered to prevent voiding the system warranty.

S.6 Troubleshooting

The following procedures are designed to isolate faulty components in systems that are installed and have been operating properly. This section only covers component or major assembly level trouble shooting. Sub-assembly or board level trouble shooting is NOT RECOMMENDED with SCAN-A-LINE™ equipment and may VOID THE WARRANTY. For installation problems, see the installation portion of this manual, or contact your SCAN-A-LINE™ representative or Harris Instrument Corporation Service Department for more information.

CAUTION:

To avoid personal injury and damage to the equipment, remove 117VAC (or 220VAC if applicable) power line from the processing computer BEFORE performing any maintenance or tests on the system.

S.6.a Preliminary Inspection

1) Begin with a thorough visual inspection of the system under test. Before testing for circuit malfunctions, ensure the power switch is ON and that power is supplied to the system.
2) Verify that the emitter and receiver lenses are unbroken, reasonably clean, and free of foreign material. Cracked lenses, excessive dirt, and foreign material on the lens can cause the system to perform incorrect detections.
3) Examine all cables for cuts, nicks, or crimps that could cause open or short circuits. Ensure that all connectors are secure and free of foreign material.
4) The FAIL-SAFE and DETECT lamps on the front panel are LED's. Switch the ON/OFF switch to OFF, then back to ON. The lamps will light momentarily when power is turned on if they are working correctly. If the lamps do not light, contact the Harris Instrument Corporation Service Department for assistance.

NOTE:

Caution should be taken when replacing possibly defective components with known good spares. Serious damage may occur to the known spares, as well as other components of the system. If there are any doubts about the condition of a spare, or the malfunctioning system, please contact Harris Instrument Corporation Service Department for assistance.

S.6.b Diagnostic Indicators

This section details the three diagnostic LED indicators located inside the Model HDPC case.

1) When the diagnostic indicators are functioning properly:

a) The +12VDC, -12VDC, and +5VDC indicators should be fully lit when power is turned on to the unit.

2) No diagnostic indicators are lit.

This condition may signal a short circuit somewhere external from the processing computer or may indicate a major malfunction in the processing computer itself.

a) Disconnect the emitter cable(s) and remove power from the processing computer. Check the AC input fuse located inside the Model HDPC case on the power supply {Figure S.3-1 pg. 5}. If the fuse is blown, replace it with a new fuse of the same type and rating. Restore power and reconnect the system in the following steps:
   1) Connect just the emitter cable to the Model HDPC. The +12V , -12V, and +5V indicators should be fully lit. If not, the cable is defective.
   2) Now connect the emitter to the emitter cable. The +12V, -12V, and +5V indicators should be fully lit. The FAIL-SAFE indicator on the front door of the Model HDPC should also be lit. If some or none are not fully lit, then the emitter is malfunctioning.
   3) Finally, connect the receiver cable to the emitter. The +12V, -12V, +5V, and FAIL-SAFE should be lit when the emitter is fully uncovered.

If the fuse is not blown, either the system power supply or the Hole Detection Processing Computer is malfunctioning. Contact Harris Instrument Corporation Service Department for more assistance.

S.6.c Missed Holes or False Triggering

The following list describes possible reasons for missed holes or false triggering with the hole detection systems.

- Misalignment may cause false triggering or missed holes. Be sure to mount the Detection System according to the layout drawing provided with your system.
- To optimize the system to detect small holes, a strip passline should be one to two inches from the emitters.
- The system optics should be free of debris. If there is excessive dirt or dust in the detection zone, appropriate air knives should be installed.
- Sensor(s) and lens's should be cleaned and checked at least once per shift.
- Primary to the translucent materials gauge, the edge's of the material should be smooth. Ragged edges, folds, and wrinkles in the strip can cause false triggering.
- The distance from the emitters to the strip must be even. If one side of the strip is different by 0.5 inch, the system will have trouble establishing the proper trigger level.
- All alarm devices must be installed outside the Model HDPC box. AC power brought into the box or run through the DC relays can cause electrical interference. Use external relays with proper noise suppression.
- Flashing lights or strobe lights in the immediate area may cause false detects. Some solutions are available. Please contact Harris Instrument Corporation Service Department for further assistance.

S.7 Related Drawings

The following pages contain Various drawings for the Model HDPC. For drawings of other configurations, please contact Harris Instrument Corporation.

Drawing #	Description	Drawing Format
1406004	Model HDPC Dimensions	AutoCAD LT Rel. 3
1306005 REV B	Model HDPC Interior View	AutoCAD LT Rel. 3
3497059 REV B	Tachometer, Cable	AutoCAD LT Rel. 3
3605022 REV 2	Hole Detection Processing Computer	AutoCAD LT Rel. 3

Table S.7-1: Drawing Information