Die Sentry Manual

Table Of Contents

INTRODUCTION

The Rexcon Die Sentry combines powerful die protection capabilities with simple programming and operation and puts it all in one small package. Five probes are provided which can be independently programmed into any one of four modes of operation. This manual contains instructions on installation and operation of the Die Sentry.

MOUNTING A DEVICE

There are a few general things to be considered when mounting any of the machine monitoring devices in the Rexcon family. The suggestions that follow should always be considered when a new installation is made.

DIRT

All Rexcon devices are housed in NEMA Type 12 Oil-tight enclosures. The micro-electronics in the Rexcon devices, while powerful, are not very tolerant of a dirty environment. It is important

that they not be removed from the supplied enclosure. Also, make sure the enclosure remains tightly sealed while in operation, and that the punched holes be located and sealed properly to avoid leakage into the enclosure.

VIBRATION

The Rexcon devices are intended to be used with machines - and are designed to survive in such an environment. Just as drivers try to avoid potholes with their cars though, Rexcon devices should be installed in the most vibration-free location available. If possible, mount the devices on the control panels located off the machine; rubber shock absorbing mounts are recommended and provided.

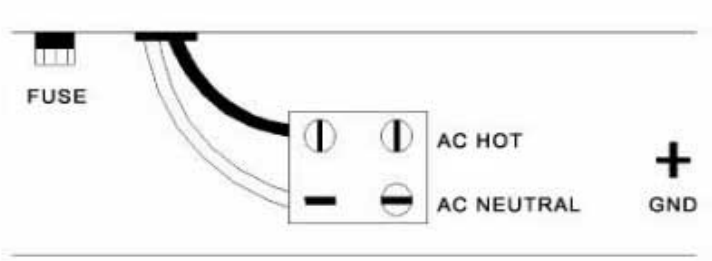
NOISE

The micro-electronics that make up Rexcon devices can be highly susceptible to **"ELECTRICAL NOISE."** While every precaution has been taken to avoid noise related problems, there are several installation considerations which can further protect against electrical noise. Noise can enter the Rexcon device in two (2) basic ways - direct (through wires) and Radiated (through the air). Methods for avoiding direct noise will be discussed in detail in the **WIRING SECTIONS** which follows. There are several ways to help avoid radiated electrical noise while installing a device. First, relays are a tremendous source of radiated noise - avoid mounting any Rexcon device in or on a relay panel. Second, all wires act as antennas so keep them as short as possible. Coils of unused wire (even small ones) can amplify noise to problem causing levels. Finally, the more wires there are, the more chances that one of them is radiating a lot of noise - DO NOT use the Rexcon device as a junction box. Keeping the wires in the enclosure to a minimum (both in length and number) can greatly reduce the risk of radiated noise problems.

WIRING A DEVICE

In this section, the wiring of devices will be detailed. All Rexcon monitoring devices are designed to operate from 110 volt AC power lines and use optically isolated I/O module (AC or DC) for connections to the outside world. AC power connections the Rexcon devices all operate on 85-130 VAC at 60 Hz. The AC power drives a power supply in the Rexcon device enclosure which in turn provides +5 Volts DC to the circuit board. Because this is what powers the sensitive micro-electronics, it is important that the AC power be as noise free as possible. There are a couple of things which can be done to improve the quality of the AC power input to the machine the device is being installed on. Using the AC power from the most convenient point may save some wire, but it may play a part if noise problems develop later. Along those same lines, when AC I/O modules are used, DO NOT take common connections from the device's AC power inputs. If AC connections are needed for the I/O modules, run separate wires to the AC source. The AC power connections should be wired as shown in

the Figure below. A two (2) position, straight through, terminal block is provided for AC power connection. The terminal block is located on the aluminum shelf at the edge of the circuit board. A fuse is located next to the terminal block (3 AMP Slow-Blow).



NOTE: Some newer devices may have a combination fuse/switch installed rather than the conventional fuse pictured above. If the fuse/switch is installed, remember to make sure that it is in the "on" position to operate the device.

I/O CONNECTIONS

All connections to the Rexcon Die Sentry are made through optically isolated I/O modules. The modules are available in several versions including DC input (WHITE), DC output (RED), AC input (YELLOW), and AC outputs (BLACK). Refer to Appendix A for detailed specifications about the various modules.

The DC modules are polarity sensitive. When wiring devices with two terminals per module, the leftmost of the two terminals is the positive terminal and the rightmost of the two is the negative or ground terminal.

The input modules have an LED located on top of the modules to indicate when the module is "ON." The module will go "ON" when voltage is sensed across its two input terminals. The DC input module's two input terminals are polarity sensitive. The output modules act as switches and also have an LED on top to indicate they are "ON", or in this case closed. When the LED is "ON", the output is "ON" and current is allowed to flow between the module's two terminals. The DC output module's two terminals are polarity sensitive. The output modules also have a button type fuse on top. Refer to appendix A for replacement information.

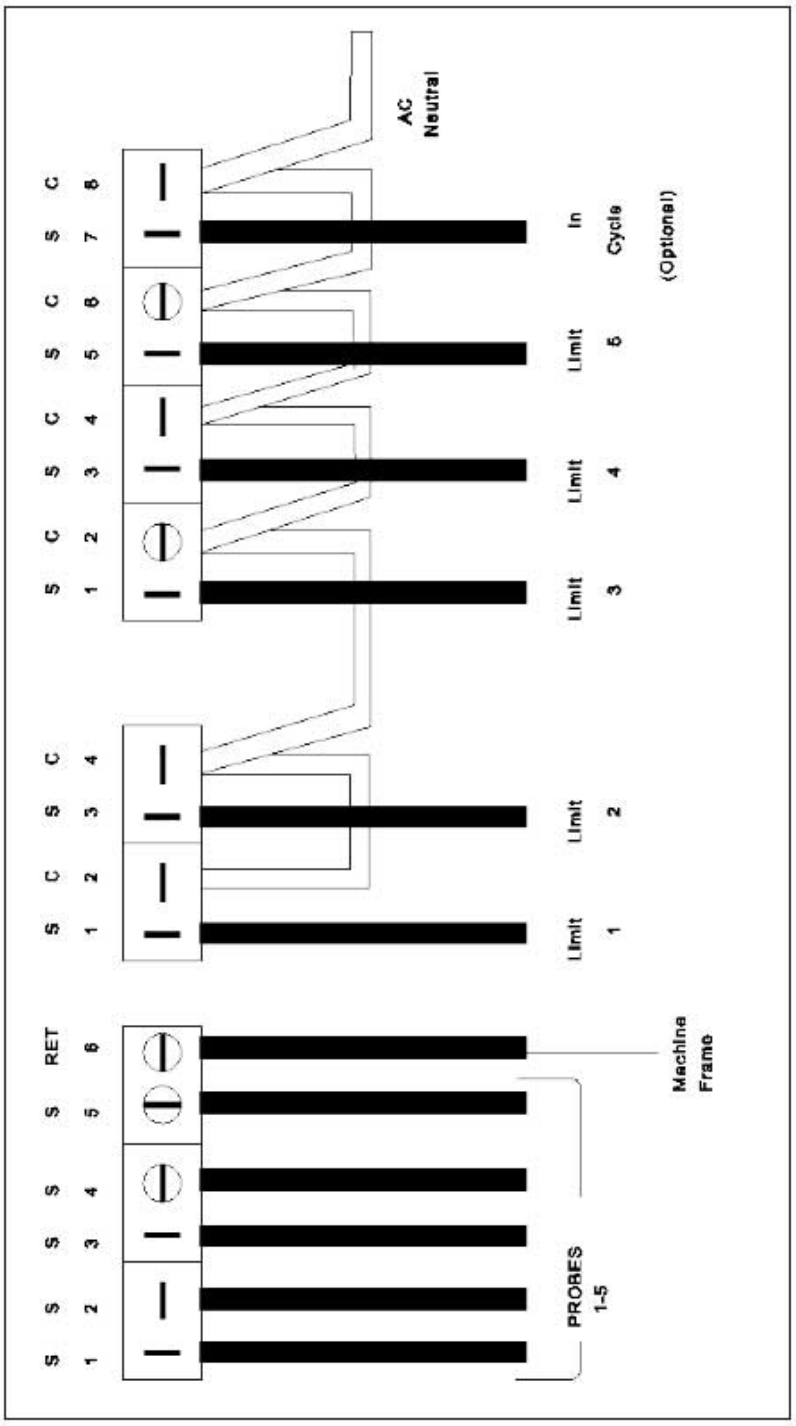
DIE PROTECTION INPUTS

The Die Sentry allows for five probes which can be independently run in any of four modes - TIMED MODE, CAM MODE, NORMALLY OPEN, NORMALLY CLOSED. Unused probes can be turned off. Die protection requires one or two signals for each probe to be used. Each TIMED or CAM probe channel needs a probe connection and a limit switch connection. Limit switches may be optionally chained together to operate multiple probes from one signal. Probes that are to be used as NORMALLY OPEN or

NORMALLY CLOSED need only a probe connection. For detailed information about timing or probe signals, refer to the section on probe THEORY OF OPERATION.

The diagram shows a Die Sentry wired with all probes connected. The Die Sentry has a built-in +12 Volt DC power supply to operate the probes. The power supply is capable of supplying up to 1 AMP of current to allow remote sensors such as proximity sensors to be used. Make sure that the total current draw from all five probe inputs does not exceed 1 AMP. To use the probe inputs, make sure that the terminal labeled **RET** is connected to the machine's frame. Whenever a probe input is touched to the machine, the probe circuit will be completed and the probe input will go ON. NOTE: The probe inputs should never be wired in a way that will connect them to anything other than ground - Severe damage will result. Always use DC input modules in the probe input sockets.

Limit switch inputs are not fixed and may be either AC or DC. An AC setup is shown above. The IN CYCLE connection is optional - Refer to the section on PROBE THEORY OF OPERATION for information about the IN CYCLE connection



Typical 5 Probe Wiring

FAULT CONNECTIONS

The Die Sentry main board has space for two (2) outputs but only one is actually used. The output labeled as FAULT 1 is used to stop the press whenever a fault condition has been detected by the Die

Sentry. The unused output should not be connected to anything.

USING THE DIE SENTRY

The following sections provide all of the information about the actual operation of the Rexcon Die Sentry. The Theory of Operation behind die protection is discussed, in addition to the OPERATION of the Die Sentry.

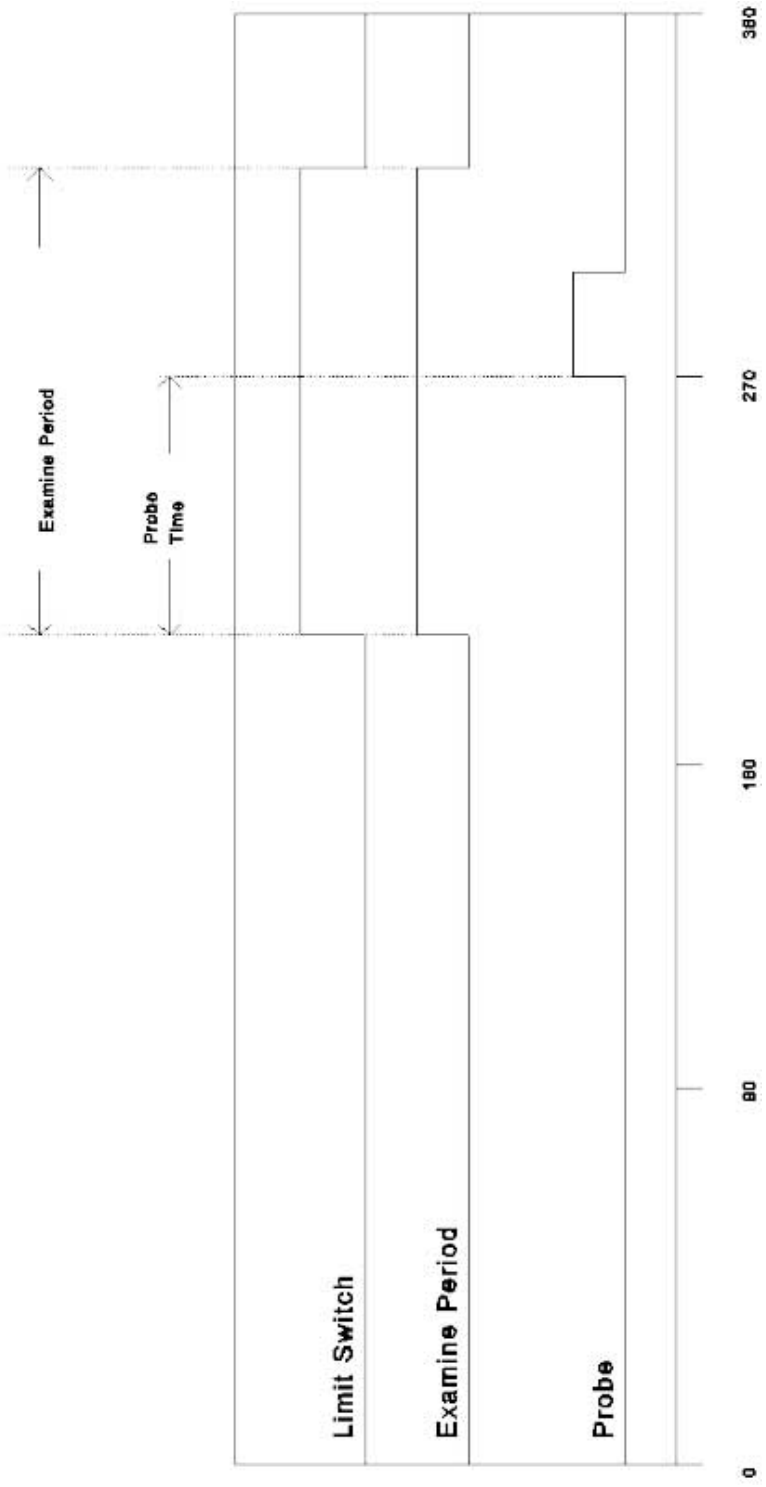
DIE PROTECTION

A Die Sentry uses five probes to implement Die protection. The probe can be used independently in one of four modes - TIMED MODE, CAM MODE, NORMALLY OPEN, and NORMALLY CLOSED. Unused probes can be TURNED off. In addition, there is an optionally available program which checks to make sure that limit switches change states on every press cycle.

The Normally Open and the Normally Closed modes are straightforward in their operation. If a NORMALLY OPEN probe is closed, it will cause a fault. Normally Open probes are use in Buckle Detection. Likewise, if a Normally Closed mode is intended as an OUT of STOCK Detection but can be used anywhere a Normally Closed probe is needed.

TIMED and CAM modes are more complex in their operation and are the main subject of this section. Both TIMED and CAM modes have a set "Window" in which the probe must be seen as "ON." The simpler of the two Modes of OPERATION is the CAM (or Limit Switch) Mode. In this mode, when a probe's limit switch goes "ON", an examine period begins. The examine period ends when the limit switch goes back "OFF." The probe must be seen as "ON" before the examine period ends. If the probe goes ON during the examine period, the Die Sentry reports the time from the start of the examine period until the probe goes "ON" as the probe time. If the probe is already "ON" when the examine period begins, a probe time of 0.000 will be reported. Probe faults are generated while the device is in SETUP MODE but the FAULT OUTPUT is always LEFT ON (doesn't stop the press).

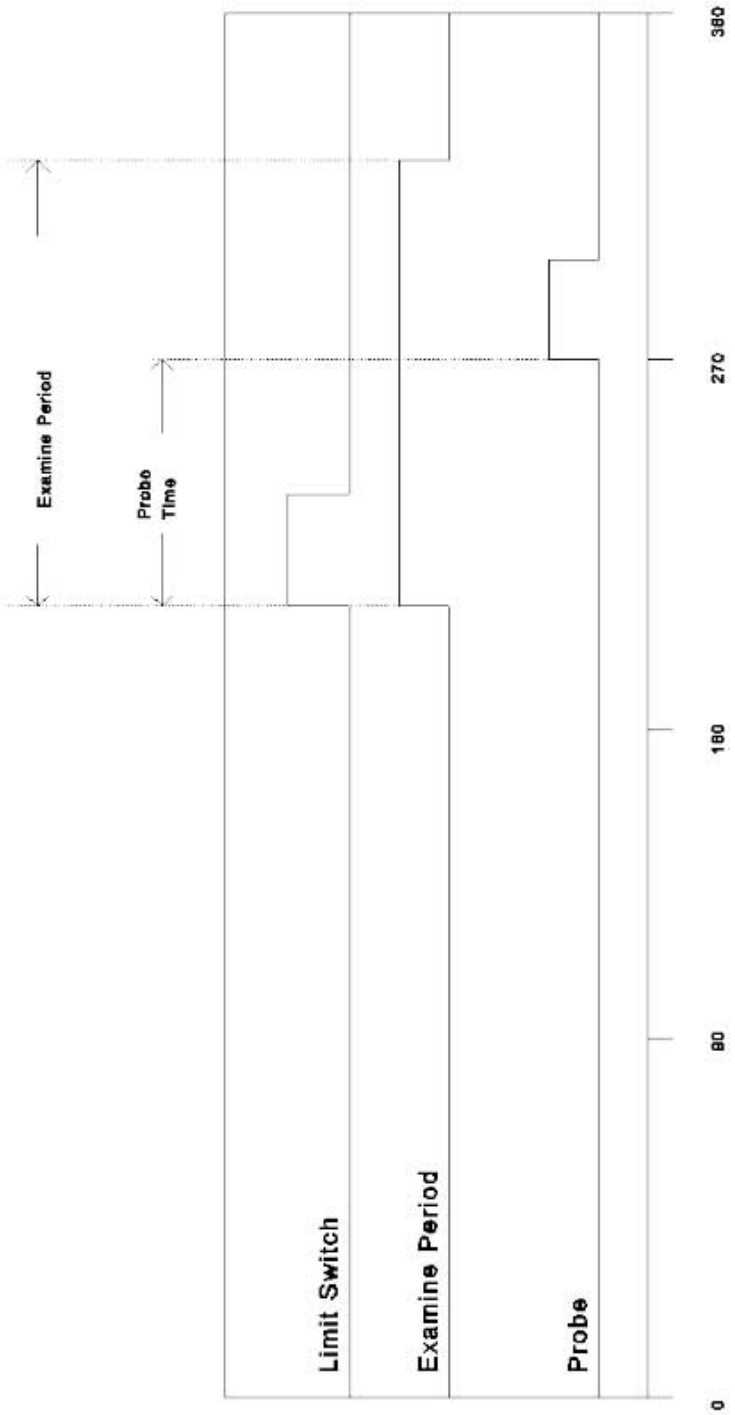
Here is a typical probe Timing Diagram using the CAM Mode.



Probe Timing - CAM Mode

The TIMED MODE of OPERATION is basically the same as the CAM MODE with one exception - the length of the examine period is determined by the user entered TIME. In TIMED Mode, the operator (or supervisor) sets a probe time from 0.001 seconds up to

9.000 seconds. When the limit switch goes ACTIVE, the examine period starts just like in the CAM MODE. However, once the examine period begins, the Die Sentry begins waiting for the specified probe TIME setting. At the end of the SET TIME, the examine period ends. The probe must still be seen as "ON" during the examine period or a probe fault will occur just as in the CAM MODE. The reported probe times are still the amount of time it took the probe to go "ON" after the examine period began. A normal case is given below.



Probe Timing - Timed Mode

The final aspect of probe operation is that of a probe or limit switch stuck "ON" or "OFF" while in TIMED OR CAM modes. In both modes, if a probe has not changed states before the next examination period begins, a fault will occur and a probe time of zero will be reported.

Because the limit switch is used to start the examine period, it is harder to tell if it is stuck in one position or the other. If the optional IN-CYCLE program is installed, the Die Sentry provides a MODE of OPERATION that requires any TIMED or CAM MODE limit switches to be seen in both states (ON and OFF) on every press cycle. To do this, the IN-CYCLE input must be wired to provide a pulse every time the press completes a cycle. Refer to the section of Operating the Die Sentry for more information on how to put the Die Sentry into this Mode of Operation. If no checking is required and the 50 part setup limit is not desired, the IN-CYCLE input need not be connected.

DIE SENTRY OPERATION

This section deals specifically with using and programming a Die Sentry. The front panel of the Die Sentry is described in detail first, followed by general operation information.

The FRONT PANEL

A - Probe Status Area: The Probe Status Area indicates the current status of the five available probes. The first column of green lights indicates that a given probe is ACTIVE. The second column (Yellow lights) indicates that a limit switch for a given probe is ACTIVE. The third column (Red Lights) indicates any probe faults. For information on the operation of the probes, refer to the section on PROBE THEORY.

B - Probe Selector Lights: These lights display which probe is currently being displayed or set.

C - Probe TIME/MODE Window: The probe TIME/MODE window is used to display the last time for the currently selected probe when the key switch is in the RUN position. When the key switch is in the SET position, the probe TIME/MODE window will display the MODE or TIME setting for the currently selected probe.

D - SELECT Button: This button is used to select a probe for displaying or setting. The currently selected probe is indicated by the probe selector lights. Pressing the SELECT button will step through the probe one at a time.

E - ARROW Buttons: The ARROW Buttons are used to select the proper probe operating mode or to set the probe TIME settings.

F - RESET Button: This button is used to reset any probe errors that occur.

G - KEY SWITCH: The key switch is used to switch between SETUP Mode and RUN Mode. These modes are discussed under Modes of Operation.

MODES OF OPERATION

Die Sentry can be in two basic Modes of Operation - SETUP Mode and RUN Mode. Most of the time the key switch should be in the RUN position for complete process monitoring.

SETUP MODE

This mode is used when installing probes or changing dies and coils. In SETUP Mode, faults will be detected and displayed but will not stop the press. If the IN-CYCLE is being used, the Die Sentry keeps an internal count while in SETUP Mode and will not allow more than 50 cycles to be run in the SETUP Mode. After 50 parts have been run in SETUP Mode, the display will flash "RUN" and the fault output will be turned OFF. If it is desired to run more parts in SETUP Mode, move the key switch to the RUN position and then back to SET - This will allow 50 more cycles. During normal press operation, the Die Sentry should require little, if any, operator control. However, if probe faults occur, they MUST be reset using the RESET button.

To change the settings for a probe or view the current settings, put the Die Sentry into SETUP Mode using the key switch and select the desired probe using the SELECT button. Once the desired probe is selected, its current settings should be displayed in the probe TIME/MODE window. Use the UP & DOWN arrow buttons to change the current settings. The settings are arranged in the following order:

9.000 (Nine Seconds MAX)

0.003

0.002

0.001

"OFF"(Probe NOT in USE)

"LS"(Probe in CAM MODE)

"OP"(NORMALLY OPEN MODE)

"CL"(NORMALLY CLOSED MODE)

By pressing the DOWN arrow once from 0.001, the display will read "OFF." Pressing the DOWN arrow again will go to "LS" and so on. The maximum time setting is nine (9.000) seconds.

The Die Sentry stores the settings into "NON-VOLATILE" memory so they are not lost during power outages. The values are only stored when the key switch is moved from SET to RUN. However,

after any changes have been made, always remember to move the key switch back to RUN when done to allow the Die Sentry to save the new settings.

As mentioned in the section THEORY of OPERATION, the Die Sentry can be set to check for stuck limit switches on every press cycle. This MODE of OPERATION is available only if the optional IN-CYCLE program has been installed in the Die Sentry. If the IN-CYCLE program has been installed and the additional checking is desired, the IN-CYCLE input must be wired to provide a pulse after every press cycle. Refer to the sections on WIRING and the THEORY of OPERATION for more information. If it is desired to use the Die Sentry in this mode, a switch must be set inside the Die Sentry enclosure. Open the enclosure and locate the two (2) small switches near the top center of the main circuit board. To use the IN-CYCLE input, Switch 1 should be in the "ON" or "CLOSED" position. If the IN-CYCLE is not being used, Switch 1 should be "OFF" or "OPEN." Switch 2 is not used and may be in either position.

APPENDIX A - I/O MODULES

All I/O is done through removable I/O modules from OPTO22. The modules provide isolation from up to 4000 VRMS signals. The part numbers and specifications for the previously mentioned modules are listed below.

MODULE STYLE	OPTO PART NUMBER	VOLTAGE RANGE	MAX. CURRENT	RESIST. (IN) LEAK. (OUT)
DC Input	G4 IDC5D	2.5 - 28 V DC	25 mA	900 OHMS
AC Input	G4 IAC5	90 - 140 V AC	11 mA	14 KOhms
DC Output	G4 ODC5	5 - 60 V DC	3 A	1 mA
AC Output	G4 OAC5A	24 - 280 V AC	3 A	2.5 mA

Output modules contain 250 Volt, 3 AMP Fuses for added protection. Replacements are available from LITTLE FUSE - Part Number 275-004 (275004).

APPENDIX B - Die Sentry ERRORS

Under normal operation, the Die Sentry should only stop the press for the two reasons already discussed - Probe Faults and Excessive Setup Parts. There is however one other error condition that may be seen. If the probe TIME/MODE window is flashing a line and all the probe faults are flashing, it means that the probe settings have been lost due to a hardware problem. To recover from this error until the Die Sentry can be repaired or checked out, put the key switch in the SET position and make the changes to all of the probe settings. If the setting is already correct (i.e. already "OFF" for an unused probe) just press the ARROW UP once to return to the original setting. Once all the settings have been changed, return to RUN Mode to store the new settings. If any of the faults are still flashing, the setting for that probe was not

changed. Go back to the SETUP Mode and make a change.

If the above described failure occurs - or any other unit failures occur - a Rexcon service representative should be contacted. There are no user serviceable parts inside the Die Sentry Units.

APPENDIX C - TROUBLESHOOTING

PROBLEM: NUISANCE STOPS

CAUSE: REMEDY:

1. Pinched or Broken probe wire. Check and Repair if necessary.

2. Inconsistent Feed Time. Check solenoid valves, air pressure, etc. on feeder.

3. Press Speed (Cycles per Minute). Increase Speed of press is slower than the probe TIME or Reset TIME of probe examine window.

CAM SETUP.

4. False Sensing of probe during cycle. Check to see NO other obstacle comes in contact with the probe.

Check probe light on unit to see if it comes on anytime other than when part is in place.

5. Loss of Examine Light on unit for Check CAM switch contact closure for the a probe. probe.

Check examine time for the probe.

PROBLEM: PRESS DID NOT STOP WHEN IT SHOULD HAVE

CAUSE: REMEDY:

1. False Sensing on probe before or during Check probe so it does not hit top of die during examine period cycle.

Check Scrap metal so it does not flip up to touch probe.

Check probe so that it only senses material at the very end of feed length.

2. Press speed faster than when probe times Readjust examine setting with CAM and/or were set. TIME.

3. Examine light stays on too long . Decrease length of CAM (CAM

base timing) or TIME (TIME base timing) for examine window.

PROBLEM: PRESS STOPS AFTER BDC (BOTTOM DEAD CENTER)

CAUSE: REMEDY:

1. Low counterbalance pressure. Adjust pressure.

2. Feeder feeding too late in cycle. Adjust feeder to advance material as soon as possible at low speed (stroke per minute) of press.

3. Excess travel on Clutch/Brake of press. Adjust Clutch/Brake air pressure to proper setting.

Adjust Clutch/Brake braking pads.

Determine if Clutch/Brake Assembly needs repair.

Slow press down.