

Press
Manual

SmartPAC®

**Wintriss® Press Automation Control
includes optional DiPro® PAC and ProCam® PAC**

1100500

Rev. B October 2014

Tech Support Hotline 800-586-8324 8-5 EST



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Changes for Revision B of the SmartPAC User Manual (1100500)

Revision B of the SmartPAC User Manual covers SmartPAC software version 4.70 and above.

The changes for Revision B include:

- Addition of new feature descriptions, Chapter 1.
- Addition of password option to security access, including a separate password to control access to initialization mode, Chapter 4.
- Addition of parts/stroke and strokes/part under the “counters” option in the tool programming menu, Chapter 5.
- Addition of tool information, including “memo box”, under the tool programming menu, Chapter 5.
- Addition of error log to run menu, Chapter 6.
- Addition of error log information, including table of error codes and their meaning, Chapter 7.

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Whenever you need to contact Data Instruments for technical assistance, be ready to provide some important information to expedite a resolution to the problem. Please supply: **product name** (e.g. SmartPAC standard); **installed options** (e.g. DiProPAC, ProCamPAC, etc.); and **firmware version number** (e.g. Vs. 2.00). You can determine the last two items, by going into "Installed options" in the Initialization mode (see Chapter 4 for details). You can also determine firmware version number from the chip on the processor board (see "location of components" in Chapter 2).

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Table of Contents

Chapter 1 Introduction to SmartPAC	1
How SmartPAC will benefit your operation.....	1
Standard features:	1
Optional die protection and programmable cam switch features:	1
SmartPAC Front Panel.....	1
How SmartPAC works.....	3
Settings you can make on SmartPAC	3
Sensors available for DiProPAC.....	6
Understanding sensor terminology	6
Normally open, normally closed.....	6
Ready signal.....	7
Impedance	7
Sensor types	7
Considerations for setting sensor stop type	11
Connecting cam channels to your equipment	11
SmartPAC's three modes of operation	12
Specifications.....	13
Chapter 2 Installing SmartPAC	15
Before you start.....	15
An installation tip.....	16
Installation Guidelines	16
Overview of the installation.....	18
The first step—checking the press.....	18
Mounting the SmartPAC control enclosure.....	18
Installing SmartPAC as a panel mount	20
Standard Enclosure versus Optional Panel Mount	20
Preparation for mounting SmartPAC using your enclosure	20
Installing the resolver.....	22
Install and wire resolver.....	23
If you replace your resolver	29
Connecting AC wiring, stop circuits, and input check circuit.....	30
Adding or upgrading ProCamPAC or DiProPAC	33
Connecting programmable cam channels	35
Important change about the cam outputs assembly/enclosure.....	35
Making the connections	35
Connecting DiPro Sensor Interface to SmartPAC.....	41
Installing the DiPro Remote Connection Box (RCB).....	42
Connect AC power wires to power source	43
Turn on power to SmartPAC and check display.....	43
Checking for power.....	43
Verifying ProCamPAC and/or DiProPAC proper installation (optional)	44

Zero Resolver.....	44
To zero the resolver:	44
How to replace and rezero the resolver	45
Installing the position sensor (optional)	46
Setting high speed version of SmartPAC (optional).....	48
Upgrading SmartPAC firmware	49
Final checkout.....	50
Check cam channels (if the optional ProCamPAC is installed)	51
Wiring setup mode circuit (optional).....	51
Connecting to a non-Wintriss relay press control:.....	51
Wiring a remote reset switch (optional)	51
Wiring a sensor-disabled output (optional)	51
Wiring the ProCamPAC output with your mechanical top stop cam switch (optional).....	52
How to test the wiring.....	52
Final assembly if you have a panel mount.....	52
Chapter 3 About the keyboard and displays	53
Why using SmartPAC is easy	53
Your starting point in each mode.....	53
The first displays in each mode - menus.....	53
From the first display down	54
Selecting an item on a display	56
Using the keyboard	57
Number keys	57
Cursor keys	58
Moving the selection bar with the cursor keys	58
Using cursor keys to set timing.....	59
RESET and ENTER keys	61
Reset key.....	61
Enter key	62
Function keys.....	62
Chapter 4 Using SmartPAC in Initialization mode	63
Initializing SmartPAC.....	63
How to get into SmartPAC Initialization mode.....	63
Zeroing the resolver	65
Position sensor	65
Counter setup mode	66
View communications - press F4.....	66
Sort tool table - press F5	67
Show checksums - press F6	67
Installed options.....	68
Press name	68

Brake Monitor	68
Determining the press's stopping time	69
Calculating the press's stop time limit	70
Setting Stop Time Limit	71
Setting the Start Time Limit	72
Select cam names (optional)	72
Auto Advance and Slow RPM	74
Setting auto advance constant and slow RPM	75
Custom Sensor names	77
Sensor Enable mode	78
Enabling sensors	78
Sensor setup mode	78
Setting up tool information (optional)	79
Security access	82
Selecting Security access options	83
Reset Mode	84
Changing passwords	85
Communications (optional)	86
Chapter 5 Using SmartPAC in Program mode	89
About Program mode	89
The first display—the Programming menu	89
Copying a tool number	90
Creating a new tool number	91
Selecting an existing tool number	91
Set tool name	92
Bringing up the tool name display:	92
Counters	93
Bringing up the counter display:	93
Setting or clearing the counter presets	94
Setting or clearing the counter values	94
Clearing the total hits counter	94
Setting counter mode	95
Setting counter output mode:	95
Setting counter increment angle	96
Setting counter increment mode	96
Setting Parts/stroke or strokes/part (optional)	97
Die Protection	98
Setting "Auto Enable by Tool" counter value	98
Naming the sensor	100
Setting the "Auto Enable by <i>Sensor</i> and Tool" counter value	100
Setting sensor type	101
Setting stop type	102
Setting the ready signal for a green sensor	103
Setting the "ready on" and "ready off" angles	104
Setting counter value for green special sensor	104

Setting the other sensors for the tool	106
Going back to the Main Programming menu	106
Disable (enable) sensors	107
Cam switch.....	108
Bringing up the display of cam channels:.....	108
Selecting a channel and making an on-off setting	109
Selecting a channel and making a timed output setting.....	110
Selecting a channel and making an auto advance setting	112
Setting other channels for the tool	113
Deleting channel settings	113
Press speed	114
Tool number information (optional)	115
Load the tool number	116
How to modify the tool number settings.....	118
Delete the tool number	120
Chapter 6 Using SmartPAC in Run mode	121
About Run mode	121
What you can and cannot do in Run mode	121
Why some tasks are duplicated in each mode	121
Locking Run mode.....	121
The first display in Run mode — the Run menu	122
Settings locked in Run mode, or password required	123
Counters	123
Brake Monitor	124
Setting Stop Time, Stop Angle, and Start Time	124
Performing the 90° stop-time test	124
Calculating the safety distance	126
ANSI and OSHA safety distance formulas.....	127
Adding to safety distance for floating or blanking windows.....	130
Cam Switch	131
Show cam timing	131
Die Protection	133
Adjusting the ready signal for green sensors	134
Sensor on-off marker	135
How SmartPAC displays sensor actuation times.....	135
Show sensors.....	136
Disable (enable) sensors	137
Setup mode message	138
Press speed	139
Tool number information (optional)	140
Load new tool number	141
Error Log.....	143

Chapter 7 SmartPAC Fault Messages	145
Messages on the display	145
What happens when you get a fault message.....	145
How to clear the fault message from the display	145
Messages displayed when a counter preset is reached	146
Messages displayed for equipment or brake monitor problems	147
Messages displayed for programming problems	150
Messages displayed when a sensor signals a fault.....	151
Fault messages for green sensors.....	151
Fault message for yellow sensors "This N/O sensor is grounded"	153
Fault message for red sensors "This N/C sensor is open"	153
Miscellaneous Fault messages	153
Error log.....	155
Appendix A SmartPAC™ PM Monitor (optional)	159
About SmartPAC PM Monitor	159
Comparison with traditional preventive maintenance	159
How the PM Monitor works	159
Examples of how to use the PM Monitor	160
Installing the PM Monitor.....	161
Using the PM Monitor in Initialization mode.....	161
How to get into SmartPAC Initialization and PM Monitor	161
Initializing the PM Monitor	163
Assigning a new PM password number.....	165
Select PM Item names	165
Using the PM Monitor in Run mode	168
How to get into SmartPAC Run mode.....	168
Viewing and modifying PM Alerts.....	169
Glossary of Terms	171
Index	177

List of Figures (at the end of the manual)

- Figure 1 DiProPAC to DSI Wiring Diagram
- Figure 2 DiProPAC to DiPro RCB Wiring Diagram
- Figure 3 ProCamPAC 8 to Cam Output Wiring Diagram
- Figure 4 SmartPAC Wiring Diagram
- Figure 5 Loop-back Test for RS232 SmartPAC Connections Wiring Diagram
- Figure 6 Loop-back Test for RS485 SmartPAC Connections Wiring Diagram

SmartPAC setup forms are provided at the end of the manual after the wiring diagrams.

How to use the manual

This is the installation and reference manual for SmartPAC. It has information about how to install SmartPAC and use all the displays to make die protection sensor settings and programmable cam settings.

Chapter 1 introduces you to SmartPAC, tells how it works — specifically about the optional die protection (DiProPAC) and programmable cam (ProCamPAC) features, and explains how to use this product.

Chapter 2 is the installation chapter. Use it to install SmartPAC if you are installing it yourself. This chapter includes installation of the DiProPAC and ProCamPAC options.

Chapter 3 is an introduction to the SmartPAC displays and keyboard. Read this chapter to get started using SmartPAC. It shows you how to select items on the SmartPAC displays and how to perform key tasks. It also explains the various keys available. This chapter is the place to start for learning how to use the SmartPAC displays and keyboard.

Chapter 4 explains how to use SmartPAC in Initialization mode. Use it to look up things you need to know about using SmartPAC in Initialization mode.

Chapter 5 explains how to use SmartPAC in Program mode. Use it to look up things you need to know about Program mode.

Chapter 6 explains how to use SmartPAC in Run mode. You can look up things you need to know about Run mode.

Chapter 7 shows you fault messages or other types of messages you will see on your display when SmartPAC sends a stop command to the press or when there is an equipment or software problem. What the message means and how to correct the problem is explained. Use this chapter to learn about all the SmartPAC diagnostic messages.

Appendix A is about the optional PM (Preventative Maintenance) Monitor available with SmartPAC. It explains what it is, how it works, and application examples. It also provides instructions on using it in Initialization and Run modes (not used in Program mode).

A Glossary of Terms includes definitions of key terms related to SmartPAC.

Warranty

Wintriss Controls warrants that Wintriss electronic controls are free from defects in material and workmanship under normal use and service for a period of one year (two years for Shadow light curtains) from date of shipment. All software products (LETS/SFC and SBR), electro-mechanical assemblies, and sensors are warranted to be free from defects in material and workmanship under normal use and service for a period of 90 days from date of shipment. Wintriss's obligations under this warranty are limited to repairing or replacing, at its discretion and at its factory or facility, any products which shall, within the applicable period after shipment, be returned to Wintriss Controls freight prepaid, and which are, after examination, disclosed to the satisfaction of Wintriss to be defective. This warranty shall not apply to any equipment which has been subjected to improper installation, misuse, misapplication, negligence, accident, or unauthorized modification. The provisions of this warranty do not extend the original warranty of any product which has either been repaired or replaced by Wintriss Controls. No other warranty is expressed or implied. Wintriss accepts no liability for damages, including any anticipated or lost profits, incidental damages, consequential damages, costs, time charges, or other losses incurred in connection with the purchase, installation, repair or operation of our products, or any part thereof.

Please note:

It is solely the user's responsibility to properly install and maintain Wintriss controls and equipment. Wintriss Controls manufactures its products to meet stringent specifications and cannot assume responsibility for consequences arising from their misuse.

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SMARTPAC
USER MANUAL
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Chapter 1

Introduction to SmartPAC

SmartPAC is a smart modular interface for a multiple of press automation functions, including die protection and programmable cam switch. Every SmartPAC includes a control-reliable, resolver-based brake monitor, and extensive counter capabilities. SmartPAC features a large, bright LCD display, highly visible LED readout, a numeric keypad, and other easy-to-use keys to program and run the job.

SmartPAC can be optionally configured to include: up to sixteen-sensor die protection system, up to sixteen-channel programmable cam switch, solid-state dual microprocessor-based clutch/brake control, two or four-input load monitoring, and servo-feed interface. Each of these add-ons optimizes SmartPAC as a comprehensive press automation package. In addition, SmartPAC can be optionally linked to a remote computer that collects essential data from the pressroom.

How SmartPAC will benefit your operation

SmartPAC brings a multitude of press automation functions to one central location. Here are some of the benefits you will come to appreciate when using your SmartPAC.

Standard features:

- All the settings are made at the operator console using SmartPAC's large LCD display and keyboard.
- All settings for a die are automatically saved in SmartPAC's non-volatile memory. To use the settings when you run the job again, simply re-load your stored tool number and you are ready to go. SmartPAC can save settings for up to 200 tools.
- SmartPAC's built-in brake monitor constantly checks brake wear by measuring stop time every time the press stops and displays that value in milliseconds. SmartPAC also displays the number of degrees it took the press to stop.
- The display and error log show specific diagnostics when a malfunction occurs, when any counter presets have been reached, and when stopping/starting times exceed set limits

Optional die protection and programmable cam switch features:

- Monitors up to 16 sensors to detect malfunctions such as stock buckling, misfeeds, and improper part ejection
- Provides cam timings for feed, pilot release, air blow-off, lubricator, and other press equipment

SmartPAC Front Panel

When you turn power on to SmartPAC, the crankshaft angle reading appears in the LED display. As soon as the press is running, the display switches to show the press speed. A description of each component on the front panel plus an illustration of the front of SmartPAC follows:

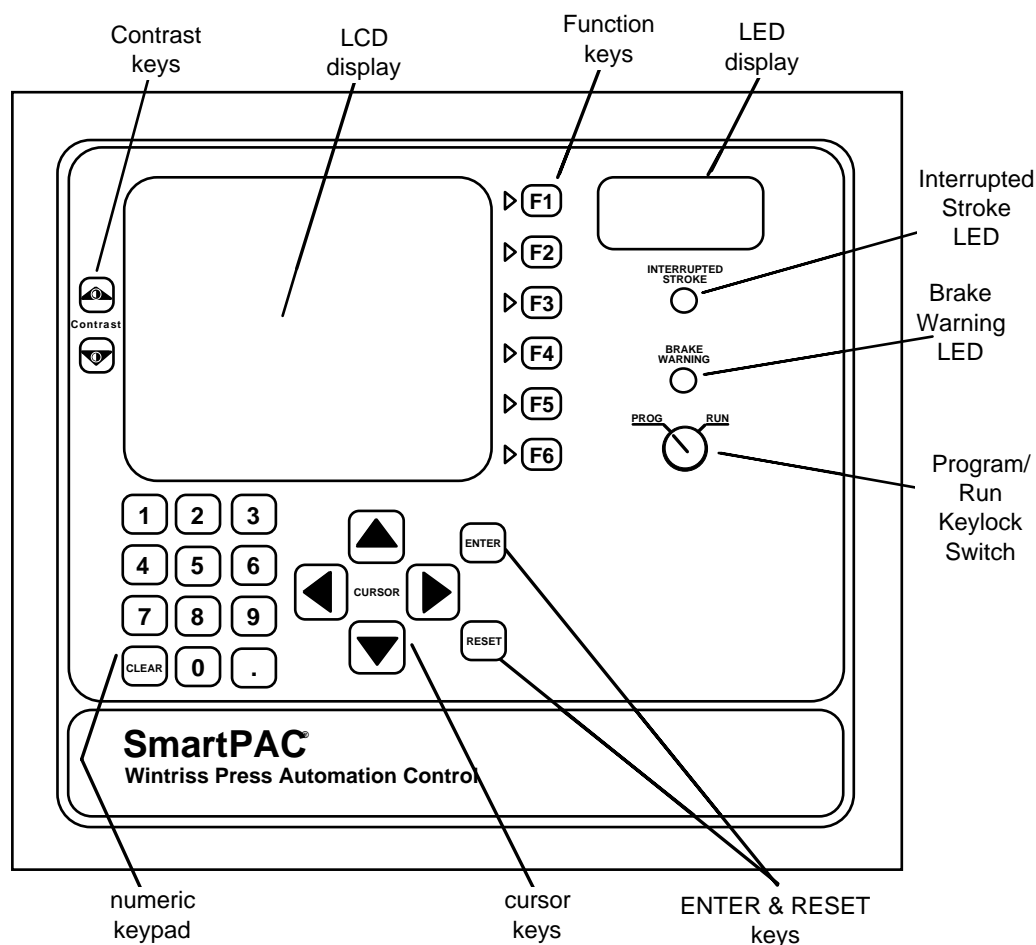


Figure 1-1. SmartPAC front panel

LED Display	Three-digit display shows strokes per minute when the press is running; when the press stops, the display shows the crankshaft angle
LCD display	A large, bright 4.88" x 3.69" (10.91 x 9.37 cm) liquid crystal display used along with the keyboard to make and adjust settings, to load tool numbers, and to view diagnostic messages
Screen contrast keys	These keys adjust the brightness of the LCD display; simply press either one to make the necessary adjustment
Program/Run key	Allows you to lock the Program mode so settings cannot be changed. The key must be set at "Run" to operate the press. Minor adjustments, including loading an existing tool number, can be made in Run mode
Keyboard	Consists of various key and a numeric keypad described below. You use these keys along with the LCD display to make settings (covered in detail in Chapter 3, "Using the keyboard")

Cursor keys	Used to move the selection bar over the item on the display you want to select; also used to select alphabetic characters and special symbols when naming the press, tools, cam channels, and sensors
Number keys	Used to input numeric values, such as counter presets or tool numbers
Function keys	Periodically used to perform certain tasks in SmartPAC. The message on the LCD display will identify the specific function key number to depress (from F1 to F6).
Enter key	Used after making a selection on the display. You also press the ENTER key after keying in a number to accept the number.
Reset key	Used to reset SmartPAC after fault messages appear on the display. Also used to let SmartPAC know you are "all done".

How SmartPAC works

The resolver lets SmartPAC know where the crankshaft is

SmartPAC is connected to a resolver mounted on the press which turns one to one (1:1) with the crankshaft. Similar to an electrical generator, the resolver has windings inside and works on the principle of inductance. As the resolver turns, the amplitude and the phase of its two outputs varies. These signals are interpreted by SmartPAC's electronics to determine the correct crankshaft angle at every point in the stroke. SmartPAC converts the analog signal from the resolver at any point in its rotation to a number that is the position of the resolver (and press crankshaft) in degrees.

SmartPAC makes various decisions simultaneously

SmartPAC comes with powerful counter and brake monitoring capabilities. SmartPAC with optional programmable cam and die protection capabilities can make instantaneous decisions for up to 16 cams and/or 16 sensors respectively. Because SmartPAC is microprocessor-based, it can monitor or control all these different functions during a press stroke even for very high speed presses. Additionally, it saves these settings up to 200 tools.

Settings you can make on SmartPAC

All settings are made using the keys on the SmartPAC keyboard. Up to sixteen sensors can be used with SmartPAC along with up to sixteen channels for controlling press equipment. For complete instructions on how to make settings, see Chapter 4—Programming. Here are settings you can make:

- **Assign tool numbers for tools.** You assign a tool number to your settings. This is how you keep track of all settings you make. Every tool can also be assigned a name for easy identification, and you can store additional reference information about each tool and its settings.

- **Load settings by tool number.** SmartPAC saves all counter settings, sensor settings, and cam switch settings (if DiProPAC and ProCamPAC are installed) in its electronic memory. The settings are stored by tool number. To use the settings for a tool again, you recall them by selecting the tool number from the tool display. You never need to make the same settings for a tool over again. You can save up to 200 tool numbers. Settings are saved automatically as you make them. You do not have to tell SmartPAC to save settings by pressing a key or issuing a command. When you load the stored tool number, SmartPAC loads all the settings for the tool. SmartPAC retains all settings for a tool even with power off. A lithium battery within the memory chip supplies power to save these settings for up to ten years when the unit is turned off.
- **Record information for each tool number.** With this option you can record up to 30 characters of customized information for each tool, plus six other useful pieces of information, such as feed rate, press speed, or material.
- **Protect settings with lockout and optional password security.** Using SmartPAC's security access menu in Initialization mode, you can lock many of the settings in Run mode or require a password in order to change them. This prevents anyone from changing settings in Run mode without the Program/Run key, or changing them at any time without the necessary password. To prevent unauthorized changes to the SmartPAC setup, you can require a special password in order to access the Initialization menu.
- **Set Brake Monitor.** You set the brake monitor stop time limit to a certain value (in milliseconds), that is longer than the actual stopping time. This extra time compensates for normal brake wear. When the stop time reaches the stop time limit, the brake monitor disables the press from further usage. This tells you that your brake has been worn to a point where it needs servicing. The brake monitor also flashes a brake warning light when the stopping time of the press gets within 10 milliseconds of the stop time limit. This allows you to schedule maintenance on the brake *before* the situation gets to the point where the press will not run.
- **Set counters.** The stroke counter increments at each press cycle. The good parts counter counts only "good" parts if the die protection and/or tonnage monitoring option does not generate a fault. SmartPAC has three batch counters that can be set to either top-stop the press or signal programmable limit switch (PLS) outputs when their presets are reached. The total hits counter counts all hits on a tool, and keeps track of the last recorded number for the previous job. With the optional Advanced counter mode, you can set up the good parts counter to give an accurate parts count when multiple parts are produced at each stroke or when multiple strokes are required to produce one part.
- **Reset SmartPAC.** You reset the unit after SmartPAC stops the press when a malfunction is detected. SmartPAC gives you specific fault messages for a malfunction, which makes it easy to troubleshoot. See Chapter 7 for a complete description of errors.

- **Review recent errors.** SmartPAC's new Error Log feature displays the 32 most recent errors that caused the press to stop. You can easily view the Error Log from the Run menu at any time. It lists the error code along with the stroke count and crankshaft angle when the error occurred.

SmartPAC with DiProPAC

- **Set timing sensor inputs.** You can monitor up to 16 sensors to detect malfunctions such as stock buckling, misfeeds, die overload, and improper part ejection.

SmartPAC with ProCamPAC

- **Set timing for cam channels.** You can activate your feed pilot release, assembly operations, air cylinders, transfer devices, lubricators, air blow-off, cut off, loader/unloader controls and other equipment that requires precise timing with the press. And you can assign a name to each cam channel.

Sensors available for DiProPAC

SmartPAC with DiProPAC is the controller, the part of your die protection system that checks signals from sensors and sends a stop signal to the press when a malfunction is detected. Sensors connected to SmartPAC are mounted to the press or die to monitor what is happening in the dies.

Any electro-mechanical sensor can be used with SmartPAC as long as it can switch between an open state (sensor circuit to SmartPAC open) and a closed state (sensor circuit closed to ground or "grounded"). All types of NPN electronic sensors (proximity, photoelectric, fiberoptic) can be used. Simple contact sensors and probes can be used as well. If you have questions about whether a certain sensor will work with SmartPAC, do not hesitate to call Data Instruments.

Data Instruments makes or sells a wide range of sensors. Below are sensors which can be connected to SmartPAC with DiProPAC. Many sensors made by other manufacturers can also be used. Detailed application information is available on Data Instruments sensors listed below.

- **Miniature fiberoptic photoelectric sensors**—thru-beam and reflective types with adjustable sensitivity detect objects as small as .0006 in. (.015 mm). Requires 12 to 24 Vdc for power.
- **Proximity sensors**—miniature electronic sensors that detect metal objects passing in front of the sensor barrel. Sensors have no moving parts and are not affected by water or oil. Requires 12 to 24 Vdc power source.
- **Misfeed detectors**—designed to monitor non-working spring loaded pilot punch position, stripper position, or other material location applications.
- **Short feed sensors**—for contacting material at the fully advanced position.
- **Overload sensors**—for preventing expensive die damage due to overload from slugging, material thickness variations, broken tooling, or other causes.
- **Die overload sensors**—designed to detect minor changes in shut height.
- **Buckling sensor**—for detecting material buckle
- **End of material sensor**—signals when material runs out.
- **Probes**—three types available for diverse applications.

Understanding sensor terminology

In order to make the proper settings for your sensors using the SmartPAC display, it is beneficial to know what certain terms mean. You will see words on the display, such as ready on, ready off, N/C (normally closed), N/O (normally open), green, green quick check, green constant, yellow, and red. If you are familiar with die protection sensors and controllers, you will know what most of these terms mean already. If you do not, these key words are explained below

Normally open, normally closed

These terms refers to the way a sensor operates. A **normally open** (N/O) sensor actuates (signals SmartPAC) when the sensor circuit to SmartPAC switches from open to closed to ground. Normally open sensors are broadly classified as yellow or green sensors.

A **normally closed** (N/C) sensor works just the opposite of normally open. The sensor circuit to SmartPAC is closed to ground in its normal state. The sensor actuates when the circuit opens. Normally closed sensors are classified as red sensors. Most contact type sensors can be used as either normally open or normally closed depending on how they are connected. Most sensors are used as normally open just because you do not have any current flowing in the normal state. Some electronic sensors can be switched to work either as normally open or normally closed.

Ready signal

The **ready signal** is the portion of the stroke where a sensor must actuate. For many of your sensors, like those that monitor part ejection, blow-off, or feed advance, you need to be sure that the event occurs during a specific portion of each stroke. If the event occurs late, or not at all, you are likely to have tooling damage. The ready signal tells SmartPAC when to expect the actuation from the sensor. A ready signal is set only for sensors classified as cyclic (green) sensors. These are sensors which monitor events that must occur on every stroke.

The term "ready signal" comes from older die protection systems where you had to set a mechanical cam switch on the press to send a signal to the die protection unit during the portion of the stroke where the sensor had to actuate. SmartPAC eliminates all this extra work because it automatically knows the position of the ram at every point in the stroke. But we still use the term "ready signal" because it is widely understood.

To set a ready signal on SmartPAC, you just key in the degrees of the stroke where the sensor must actuate. The beginning point is called **ready on**. The end point is **ready off**. A separate ready signal can be set for each green sensor. If the sensor does not actuate (closure to ground) during the ready signal, SmartPAC will send a stop command to the press. The type of stop can be a top stop, emergency stop, or smart stop (see "Considerations for setting sensor stop type" in this chapter).

Impedance

The term **impedance** refers to the opposition to the flow of electric current. Some die protection controls have inputs with different impedances for electromechanical sensors. As a rule of thumb, use a high-impedance input if the part is dirty or covered with a non-conductive lubricant. Use a low-impedance input if the part is covered with a water-based or conductive lubricant.

An optional "low impedance" 16-channel DiProPAC module (#9632904) is available. This option is necessary when wire probes depend upon a part/strip to complete the circuit, and the part/strip is covered with a water-based conductive lubricant. If you decide that you require this option rather than the standard DiProPAC, contact Data Instruments immediately to order that part, *prior to installing DiProPAC* (discussed in Chapter 2).

Sensor types

Sensors used with die protection systems are classified as red, yellow, or green. For SmartPAC with DiProPAC, there are four types of greens—green, green quick check, green constant, and green special.

When you make settings for a tool, you select the sensor type for each sensor connected to SmartPAC's sensor inputs. You can have any combination of reds, yellows, or greens for a tool. You will see how to select sensor type in Chapter 5 where you learn how to make sensor settings. Here we discuss what each type means.

Yellow sensors

Yellow sensors are normally open to ground. They are ideally suited to monitor events like stock buckling, end of stock, or die overload. SmartPAC sends a stop command to the press as soon as the sensor actuates. The stop type can be set for either an emergency, top stop, or smart stop (see "Considerations for setting sensor stop type" below). Because yellow sensors work independent of the crankshaft angle and do not actuate every stroke like green sensors, you do not set a ready signal for yellow sensors.

Red sensors

Red sensors are normally closed to ground. SmartPAC sends a stop command to the press — either top stop, emergency stop, or smart stop (see "Considerations for setting sensor stop type" below) — as soon as the sensor opens (actuates). Red sensors are used where it is more convenient to use a normally closed sensor instead of a normally open one. Red sensors can monitor the same types of events as yellow sensors—die overload, end of stock, buckling, etc. No ready signal is set for red sensors.

Green sensors

Any sensor set to green, green quick check, or green constant must be cyclic. In other words, it must actuate during a portion of each stroke (during the ready signal). An actuation is a closure to ground. If the sensor does not actuate, SmartPAC sends a stop signal to the press. You can select an emergency stop or top stop.

Green sensors are used to detect events that must occur during a certain portion of each stroke or intermittently every designated number of strokes. Examples are part ejection, stock feed, and part transfer.

SmartPAC displays the degrees of the stroke where the sensor turns on and where it turns off. This makes it easy to set the ready signal for the sensor. You just make the ready signal a little longer or shorter than the actuation time (depending on the sensor). See the procedures in Chapter 5 and Chapter 6 for complete instructions on making and adjusting sensor settings.

The four types of green sensors are described below.

Green

When you set a sensor input to "green," the sensor must turn on at least momentarily during the ready signal. Also the sensor must be off, at least momentarily, at any point outside of the ready signal.

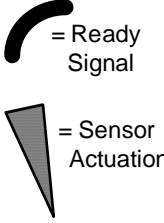
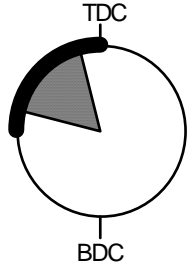
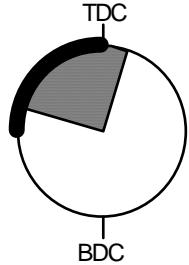
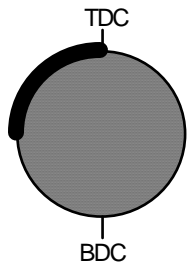
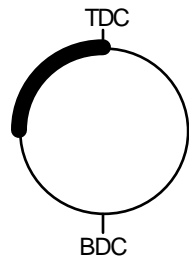
KEY	OK	OK	not allowed (press stops)	not allowed (press stops)
 = Ready Signal = Sensor Actuation	 TDC BDC Sensor actuates inside ready signal	 TDC BDC Sensor stays on after the end of ready signal	 TDC BDC Sensor isn't off outside ready signal. Stop signal sent at start of next ready signal.	 TDC BDC Sensor never turns on. Stop signal sent at end of ready signal.

Figure 1-2. How SmartPAC interprets signals from a sensor set to "green"

Green quick check

A sensor input set to "green quick check" is almost the same as the "green" setting. The sensor must turn on at least momentarily within the ready signal. However, a green quick check sensor *cannot stay on or turn on* outside the ready signal. The sensor must turn on, then turn off within the ready signal. Otherwise, SmartPAC sends the stop signal to the press.

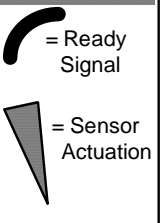
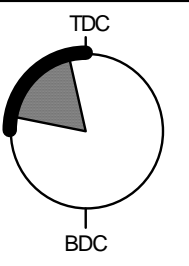
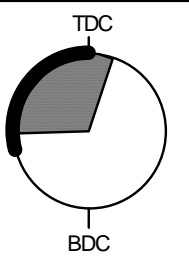
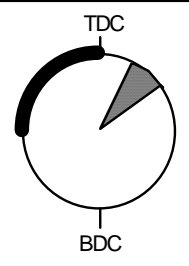
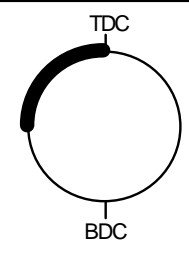
KEY	OK	not allowed (press stops)	not allowed (press stops)	not allowed (press stops)
 = Ready Signal = Sensor Actuation	 TDC BDC Sensor actuates inside ready signal	 TDC BDC Sensor turns on before start of ready signal. Stop signal sent when sensor turns on.	 TDC BDC Sensor turns on outside ready signal. Stop signal sent when sensor turns on.	 TDC BDC Sensor never turns on. Stop signal sent at end of ready signal.

Figure 1-3. How SmartPAC interprets signals from a sensor set to "green quick check"

Green constant

When you set a sensor input to "green constant," the sensor must turn on before the ready signal begins and turn off after the ready signal ends. That is, it must stay actuated constantly during the ready signal. However, the sensor must turn off, at least momentarily, outside the ready signal.

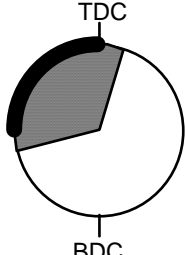
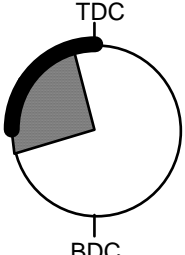
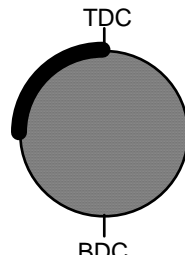
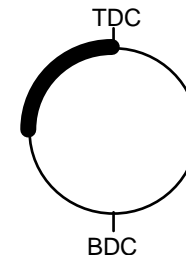
OK	not allowed (press stops)	not allowed (press stops)	not allowed (press stops)
 <p>Sensor stays on during complete ready signal.</p>	 <p>Sensor turns off before ready signal ends. Stop signal sent when sensor turns off.</p>	 <p>Sensor doesn't turn off outside ready signal. Stop signal sent at start of next ready signal.</p>	 <p>Sensor never turns on. Stop signal sent at beginning of ready signal.</p>

Figure 1-4. How SmartPAC interprets signals from a sensor set to "green constant"

Green special sensors

CAUTION

The green special sensor type is not foolproof. It is possible that an undesirable number of slugs could stack up in an ejection hole, while still satisfying a green special sensor's requirements.

Here is how it can happen: Referring to the example above, assume that the press makes five strokes without ejecting a slug. On the sixth stroke, one slug ejects and actuates the sensor. The green special sensor is satisfied and the press continues to run (remember, there are still five slugs in the ejection hole). The press then makes five more strokes without ejecting a slug. There are now ten slugs stuck in the hole! Using this logic, it is conceivable that an infinite number of slugs could stack up in the hole without the press stopping! Luckily, the laws of physics make this scenario unlikely. When slugs jam, it is usually because the bottom one is stuck. If the bottom slug ejects, it is very likely that the rest will soon follow.

Green special sensors are specifically designed to effectively monitor slug ejection. They are generally used to detect slugs excessively stacking up in a slug ejection hole. When slugs are ejected through the bottom of the die, they do not necessarily discharge on every stroke. It is normal for several strokes to occur with the slugs sticking in the hole before they finally break free and all fall out of the bottom of the die. If the slugs jam and too many stack up in the hole, the die can be damaged.

Slug stacking is virtually impossible to monitor with a standard green sensor. A red or yellow sensor is equally ineffective because the slugs must come out at some time and will cause the sensor to change state. Instead of happening once per stroke like a typical green sensor, the green special must actuate at least once during a preset number of strokes. Rather than setting a ready signal, you set the maximum number of strokes that the press can make without this sensor actuating.

Here is how it works: You install a sensor so that it will actuate when a slug passes through the slug ejection hole. In this example, assume that the die clears all the slugs out of this particular ejection hole about every four strokes. You know that something is wrong if the press makes six strokes without ejecting a slug. You would set the sensor type to "Green Special" and set the number of strokes to six. If no slugs are ejected after six strokes, the press will stop.

Considerations for setting sensor stop type

You can set the way SmartPAC stops the press for each sensor — emergency stop, top stop, and smart stop. Here are a few general guidelines for how to set stop type.

Use **emergency stop** (E-Stop) when you want to stop the press before the next hit. For instance, when monitoring part ejection on the upstroke, you can use the E-stop setting so SmartPAC will send a stop signal to the press immediately if a malfunction occurs. This ensures that the press will stop in time before the next hit. However, if you are monitoring a feed that takes place well into the downstroke (like a roll feed) you would probably want to set the feed sensor for a **top stop**. An E-stop setting here may cause the press to stick on bottom. That is because the stop signal would be sent just as the ram is about to contact the material. A **smart stop** is one where you set the critical angle (the last angle position in the crankshaft rotation to signal an emergency stop so that the ram can be stopped before the punches make contact with the material). If a die protection error is detected before the critical angle, the stop type executed becomes emergency-stop. Otherwise, if the error is detected after this angle, the stop type executed is top stop.

The general rule is to use smart stop when you have properly identified the critical angle, and you want SmartPAC to select the ideal stop type depending upon the die protection situation. Use emergency stop when you always want to ensure that the press will stop before the next hit. Use top stop when an E stop setting might cause the press to stick on bottom, and when one hit after a malfunction will not damage the die or press.

Connecting cam channels to your equipment

With SmartPAC and ProCamPAC you have received a separate assembly for wiring up to sixteen cam channels to your equipment. The assembly contains the relays that open and close on signals from SmartPAC to turn your equipment on and off. Different types of relays can be used depending upon the voltages of your equipment and your special needs. Refer to Chapter 2 for details on wiring the cam channels.

WARNING!

SmartPAC with programmable cam capability can be used with Wintriss Clutch/Brake Control. However, SmartPAC should not be used to provide timing inputs for any other clutch/brake control. It is designed to control auxiliary functions only.

SmartPAC's three modes of operation

You can do various things with SmartPAC depending on the mode you are in.

- **Initialization Mode.** Used to make settings that generally only need to be made once after installation. You can set cam names and lock out certain setting parameters. Initialization mode is discussed in detail in **Chapter 4**.
- **Programming Mode.** Used to make your sensor and cam timing, counter, and other settings (if installed) for your tools. You cannot use this mode while the press is running. You can load settings for a tool in this mode. The displays you see in Program mode are described in **Chapter 5**.
- **Run Mode.** You must be in Run mode to operate the press. You can adjust timing for your sensors and cam channels (if installed) while the press is running. You see actuation angles for green sensors. You can also load tool settings in Run mode. The settings you can make in Run mode are explained in **Chapter 6**.

Specifications

Equipment	Main enclosure 12.76" x 10.53" x 5.28" (32.41 x 26.75 x 13.41 cm), NEMA 12, shock mounted Panel mount: 12.3" x 10.3" (31.24 x 26.16 cm) Resolver: 0.75" (1.9 cm) keyed shaft; rated shaft loading: 200 lb axial, 200 lbs radial
Electrical	Input: 115/230 Vac 50/60 Hz, 30 VA Input check circuit: 12-250 Vac or Vdc
Oper. Temp.	32° to 122° F (0 to 50 C)
Speed	7-800 SPM; 14-1600 SPM optional at reduced accuracy
Accuracy	±. 2/3° (± 1.33° for high speed version)
Counters	Good parts, strokes, 3 batch with presets (7 digits) Number of hits on tool counter: Resettable to 0 after maintenance; counts all hits on tool
Display	20 line x 40 character; 4.88" x 3.69" (10.91 x 9.37 cm) liquid crystal display (LCD) 3-digit LED readout — displays SPM when press running, crank angle when stopped Brake warning LED, Interrupted stroke LED (only active with WPC)
Memory	Executive program: EPROM User program: non-volatile static RAM; allows storage of settings for 200 tools
Inputs/ Outputs	Inputs for resolver, position sensor (resolver slippage detection), input check circuit, remote reset input, setup mode input Top stop, emergency stop outputs: ratings 0-4A resistive @ 120V max (AC or DC); Normally open—Held closed Fault condition or power off opens relay(s)
Options	<ul style="list-style-type: none"> • <u>DiProPAC</u> which provides up to 16 sensor inputs <ul style="list-style-type: none"> • Power for electronic sensors (NPN only): 12 Vdc min, 100 mA total • Sensor inputs 1 through 4 and 9 through 12: Low impedance • Sensor inputs 5 through 8 and 13 through 16: High impedance • Optional sensor inputs for all 1-16: Low impedance (<1000 Ω) • DiPro Sensor Interface¹ : 5.88" x 4.35" x 3.35" (14.94 x 11.05 x 8.51 cm) • DiPro RCB: 4.56" x 2.56" x 4.06" (11.6 x 6.5 x 10.3 cm) • DiProPAC sensor-disabled output: open collector, 8 mA max • <u>ProCamPAC</u> which provides up to 16 programmable cam switch output channels <ul style="list-style-type: none"> • Programmable cam output assembly (NEMA 12; holds up to 8 outputs) • Enclosure: 9" x 11" x 3.5" (22.9 x 27.9 x 8.9 cm) shock-mounted • Relay SPDT 0-3A resistive @ 240V • DC solid state SPST 2A @ 5-60 Vdc • AC solid state SPST 1A @ 70-250 Vac • <u>AutoSetPAC</u>¹ 10.25" x 12" x 4" (26 x 30.5 x 10.2 cm) <ul style="list-style-type: none"> • 2 or 4 strain link inputs • Ability to store high, low, and repeatability setpoints with tool number • Display, adjust, recalculate "auto" setpoints and display actual load

¹ Consult that product's user manual. (i.e., DSI: #1100000; AutoSetPAC: #1101600; WPC: SmartPAC with WPC #1107600; PACNet Computerized Pressroom Reporting #1109000 [includes RSR] or RSR Standalone: #1110700, RamPAC: #1115200).

Specifications (continued)

Options (continued)	<ul style="list-style-type: none"> • <u>WPC</u>¹ (Wintriss Clutch/Brake Control) 16" x 16" x 9" (40.6 x 40.6 x 22.8 cm) <ul style="list-style-type: none"> • Ability to set press parameters using keyboard • Easy-to-understand error diagnostic messages at LCD display • Stroke selector switch • Optional 4-in-1 enclosure to hold WPC, AutoSetPAC, and 2 Programmable Cam outputs; 16" x 24" x 9" (40.6 x 61 x 22.9 cm) • <u>SFI</u>¹ ServoFeed Interface which integrates servofeed • <u>RamPAC</u>¹ which automatically sets shut height and counterbalance and cushion pressures • <u>Communications</u> with PACNet Computerized Pressroom Reporting¹ and RSR^{TM1} at host PC • <u>Preventative Maintenance (PM) Monitor</u> • <u>Bilingual</u>² (English/Spanish) status/adjust menus
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¹ Consult that product's user manual. (i.e., DSI: #1100000; AutoSetPAC: #1101600; WPC: SmartPAC with WPC #1107600; PACNet Computerized Pressroom Reporting #1109000 [includes RSR] or RSR Standalone: #1110700, RamPAC: #1115200).

² Optional bilingual (English/Spanish) manual available upon request (#1102900).

Chapter 2

Installing SmartPAC

WARNING!

SmartPAC with programmable cam capability can be used with Wintriss Clutch/Brake Control. However, SmartPAC's programmable cam switch should not be used to provide timing signals for any other clutch/brake control. It is designed to control auxiliary functions only.

This chapter describes how to install SmartPAC. It covers:

- Installation guidelines and overview
- Checking the press and setting press to top dead center (TDC)
- Mounting the SmartPAC control enclosure
- Installing panel mount (optional)
- Installing the resolver
- Connecting AC power, stop circuits and input check circuit
- Power-up pre-checks and turning power on
- Zeroing the resolver
- Final checkout

In addition, this chapter also covers installation of optional features, such as:

- Upgrading SmartPAC modules (ProCamPAC and DiProPAC)
- Connecting programmable cam channels
- Connecting DiPro Sensor Interface
- Connecting DiPro Remote Connection Box
- Installing the position sensor
- Setting high speed version of SmartPAC (optional)
- Wiring setup mode circuit
- Wiring remote reset switch
- Wiring a sensor-disabled relay output
- Wiring the ProCamPAC output with your mechanical top stop cam switch
- Final assembly if SmartPAC is installed as a panel mount

Before you start

If you plan to install SmartPAC yourself, read this installation chapter entirely before you start. Find out what is required and plan your steps before taking any action. SmartPAC is not hard to install. But like anything else, when you are working with something new, the best way to proceed is to learn all you can about it *before* cutting wires, drilling holes, or running conduit.

You will need to use the keyboard and display during installation. Therefore, before you start installation, you should have a good basic knowledge of how to use the SmartPAC keyboard and displays in order to make settings. This will speed things along. *If you run into any problems installing SmartPAC, remember that Data Instruments service advisors are available to help you.*

An installation tip

Here is a tip for learning how to use SmartPAC before you install it. Hook up AC power and the resolver only. You can do this in an office rather than on the press floor. You can then use all the menus and make settings. Once you are familiar with the SmartPAC displays and keyboard, start the installation. You will be able to get SmartPAC up and running faster.

Installation Guidelines

These guidelines cover major points that are important for proper SmartPAC operation. By following these guidelines, you will eliminate problems that could occur later. The points below are addressed again in the installation procedures.

- Never run wires for 120V and for lower voltages (such as 24V, 60V) inside the same conduit. Run flexible, liquid-tight conduit for high voltage lines (120V power, input check circuit, relay circuits) to the upper right-hand corner of SmartPAC. Run one or two low voltage conduits into the lower left-hand corner of SmartPAC for the resolver and communications control wires. Because SmartPAC is rated NEMA 12 (protected against dust and oil), you must use conduit of the same rating and make proper connections to ensure NEMA 12 protection with the enclosure.
- The AC power supply wires to SmartPAC should be run separately from the DC control wires run to the ProCam output assembly. Never use the SmartPAC power terminals as a junction point to provide power for external devices. In most cases, the AC power supply wires should be connected directly to the press control transformer at the press control.
- The communications wiring must not be run with any other wires. These wires will be installed if SmartPAC is connected to the WPC Wintriss Clutch/Brake Control, Servo Feed Interface (SFI™), AutoSetPAC, RSR™, Remote Storage & Retrieval, or Computerized Pressroom Reporting.
- Do not use the ProCam output enclosure as a junction box for the AC control wires. Provide a separate junction box for this purpose.
- Good grounds at SmartPAC are important. Make sure SmartPAC is properly grounded.
- The ground wire from SmartPAC should be connected to the main ground point of the press control. This may be in the area where the control transformer is grounded. Finding a good place for a ground is sometimes difficult, but it should be close to where the press receives its ground.
- All relays, solenoids, or other inductive loads that are controlled by SmartPAC must be suppressed. Suppressors should be installed across the load and as close to the load as possible. *Never install a suppressor across relay contacts.* The suppressors can fail shorted. In some cases, suppressors are required in the top stop and emergency stop (E-stop) circuits. Additional suppressors can be obtained from Data Instruments.

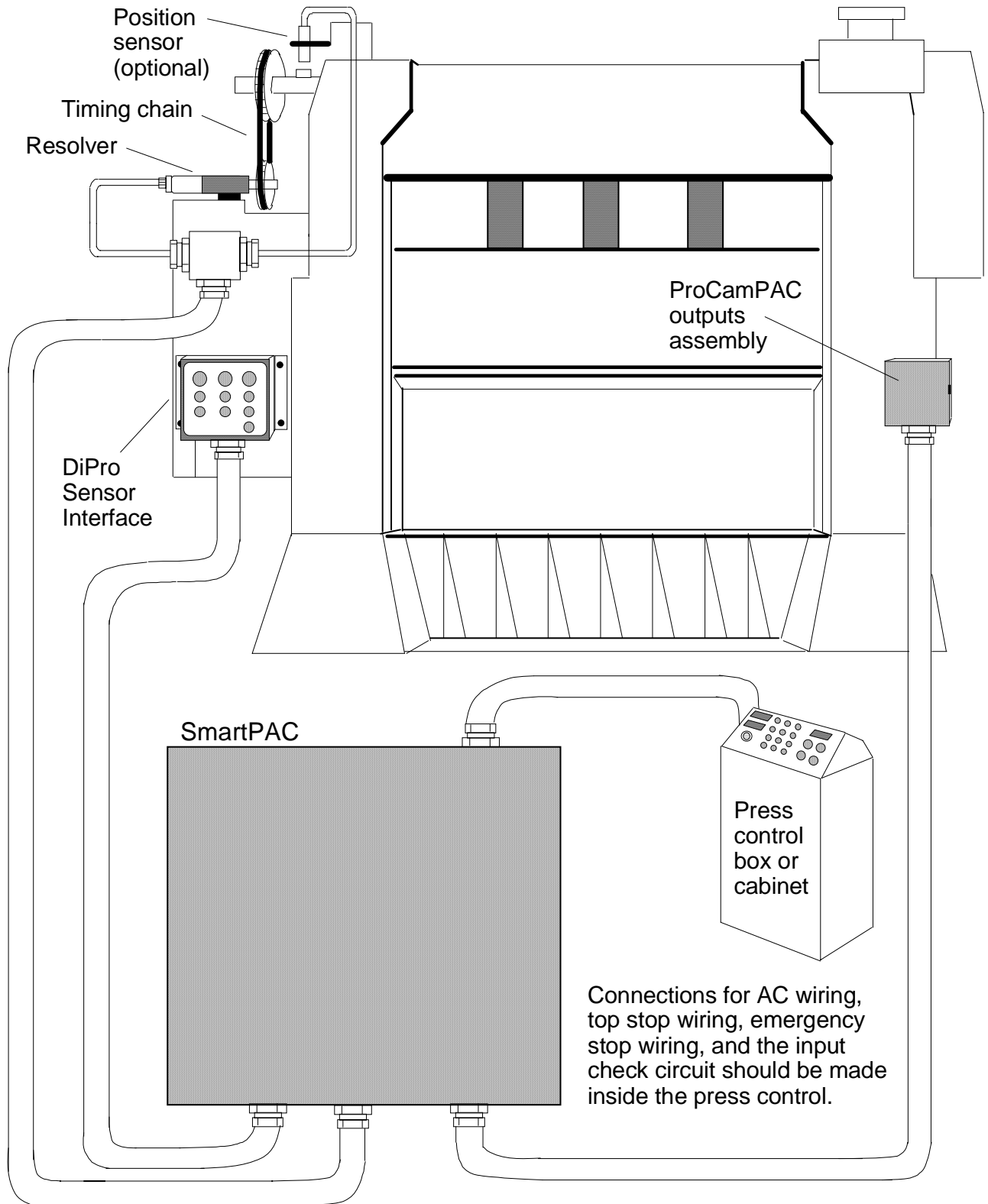


Figure 2-1. Installation overview

WARNING! PREVENT SHOCK!

Disconnect the main power before installation. All power to the press, presscontrol, and other equipment used with the press must be off during installation. Installation must be performed by qualified personnel only.

Overview of the installation

Figure 2-1 on the preceding page shows SmartPAC installed on a press. Study the drawing to get a general idea of what you will receive and what you will need to do. Of course, where you put the components (resolver, the SmartPAC itself, etc.) will probably be different for your installation. Your exact wiring scheme may also be different (where you connect AC power, stop circuits, etc.) However, in general, this is what your installation should look like when you are done.

The drawing also shows how to properly run your wiring based upon the previous guidelines. If you have top stop and emergency stop circuits that are 24V or other voltage *besides* 120V, you must run these wires separately.

A communications hook-up to a computer is not shown in the drawing. If you are installing wiring for communications, remember that communications wires must not be run with other wires.

The first step—checking the press

Before starting the installation, remove the die from the press. Then **check all modes of press operation**. Run the press in INCH, SINGLE STROKE, and CONTINUOUS modes. Make sure the press has working top stop and emergency stop circuits.

Verification that the press operates and stops properly is extremely important because SmartPAC will be tied in to the press stop circuits. Do not forget to mark your electrical prints where you wire in SmartPAC. Set the press ram to top dead center (TDC).

PRESS MUST BE AT TDC!

This is an important step because the press must be at top dead center (TDC) when you make final adjustments for the resolver. Be accurate when setting the press to TDC. Set to $0^\circ \pm 2^\circ$. *Use a dial indicator on the face of the ram if necessary.*

Mounting the SmartPAC control enclosure

To mount the enclosure, follow these steps:

PLACE SMARTPAC AT A CONVENIENT HEIGHT

SmartPAC should be installed at a convenient height for all users. An ideal height is to have the top edge of the unit approximately at chin level. Experiment to determine a good height for everybody before mounting.

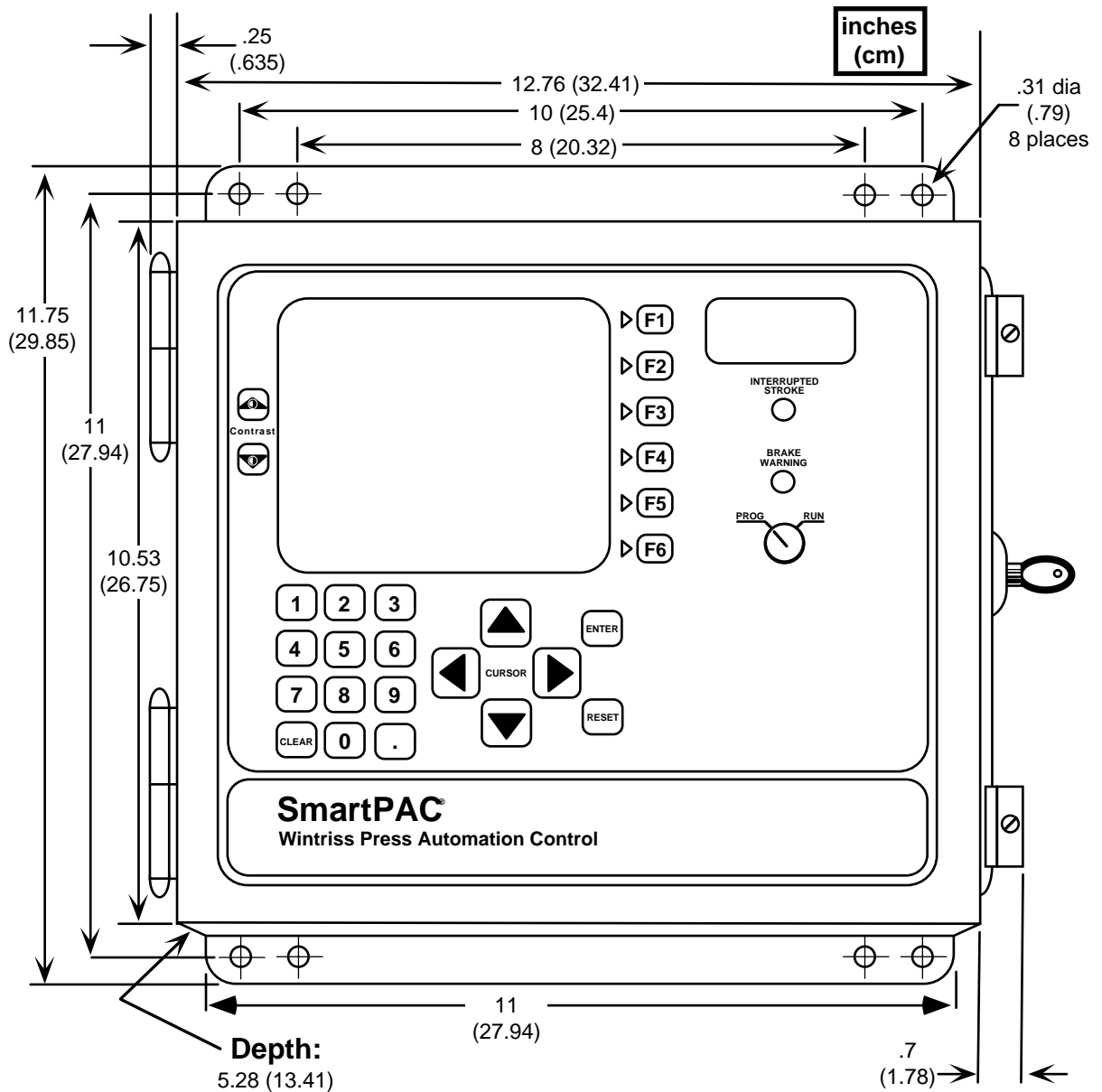


Figure 2-2. SmartPAC mounting dimensions

1. Determine a convenient place for the control enclosure. Ideally it should be close to where operators and setup personnel can easily see the readouts and reach the keyboard. Make sure all cables will reach. Leave enough room to open the door at least 120°. The enclosure can be mounted on a pedestal, pendant, or on the press itself. SmartPAC is also available for panel mounting

NOTE

If your SmartPAC is a panel mount, go to the next section for special installation instructions, as well as mounting and cutout dimensions.

2. Drill holes for mounting. Shockmount studs are 1/4-20. Tap holes (if necessary) and mount the enclosure using the enclosed shock mounts. Use a No. 7 drill and 1/4-20 tap.

Installing SmartPAC as a panel mount

This section explains how to install your SmartPAC as a panel mount. After you complete this section, refer to the remainder of the chapter to complete your installation.

Standard Enclosure versus Optional Panel Mount

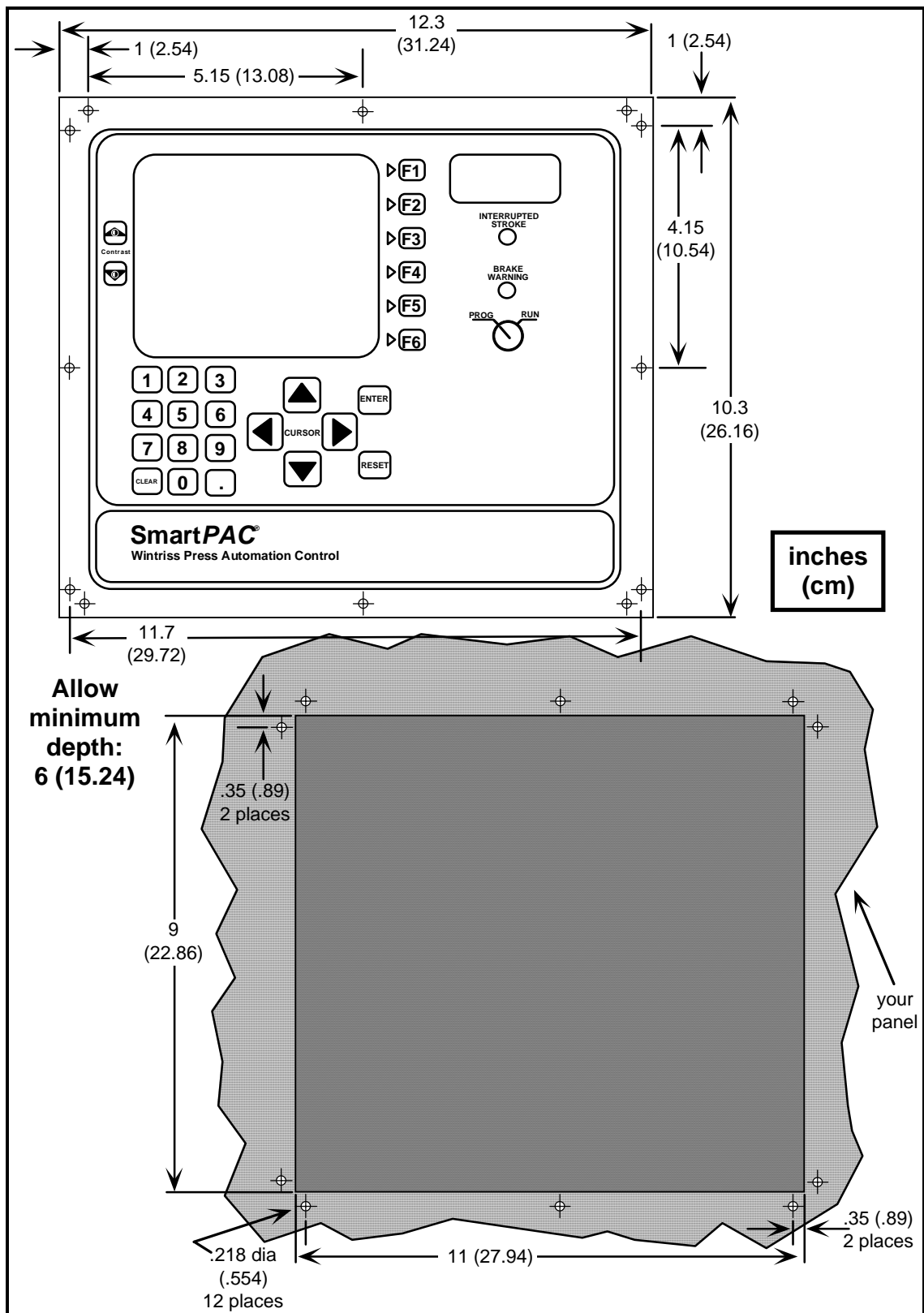
SmartPAC is available either with an enclosure or as a panel mount. The panel mount can be mounted from the inside or outside. Be sure to allow *at least* 4" (10.2 cm) of clearance behind the panel mounting plane to allow enough room for the electronics.

Preparation for mounting SmartPAC using your enclosure

To prepare for mounting SmartPAC using your panel enclosure, follow these steps:

1. Determine a convenient place to mount SmartPAC into your panel enclosure. Ideally it should be close to the press control so operators and setup personnel can easily see the readouts and reach the keyboard.
2. Cut out a hole in your panel enclosure, and drill and tap twelve holes for #10-32 screws. Refer to Figure 2-3 for mounting and "cutout" dimensions.
3. Temporarily mount SmartPAC near the location where it will ultimately be mounted. You can do this by connecting ty wraps from two of the left holes on the panel to the corresponding holes on the enclosure for a hinge-like effect. Allow up to 9" of service loop when performing the wiring connections. Also make sure all cables will reach.
4. Refer to the remainder of this chapter to complete the entire installation.
5. When the installation is complete, go to "Final assembly" at the end of this chapter to mount SmartPAC into your panel enclosure.

Figure 2-3. Mounting and cutout dimensions for SmartPAC panel and your enclosure

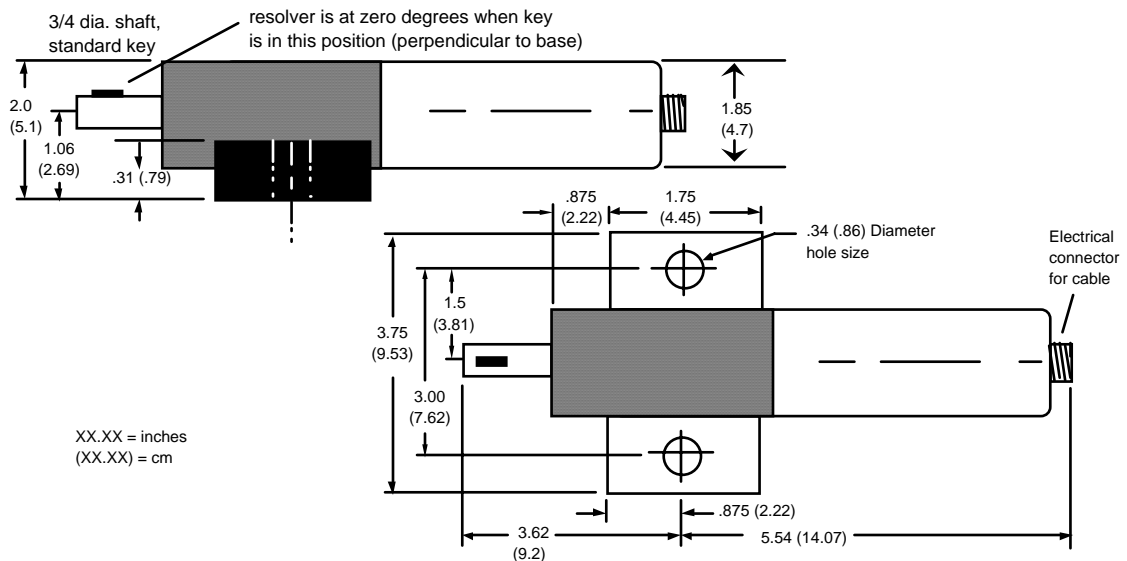


Installing the resolver

The resolver must be driven smoothly at a 1:1 ratio with the crankshaft of the press. The resolver provides SmartPAC with the exact position of the crankshaft at every degree of the stroke (see "How SmartPAC works" in Chapter 1). Design a method of driving the resolver directly from the crankshaft using a chain or timing belt (not a V belt) and sprockets. Use either an idler sprocket or spring loaded resolver base to compensate for slack or stretch. Data Instruments stocks a spring-loaded base with a hole pattern to match the resolver. It does not matter which way the resolver turns. You can switch two wires on the resolver connector to set the direction of rotation.

The drive you choose must also allow for adjustment of the resolver to its zero position at top dead center. All sprockets must be keyed or pinned. The resolver shaft has a standard key.

SIDE VIEW



TOP VIEW

Figure 2-4. Resolver (reflects dimensions with "military-style" connector)

When designing the drive for the resolver, here is what you should *not* do:

1. Do not use a long, sloppy chain.
2. Do not use gears, right angle joints, or shafts with universal joints because these will develop too much backlash or too much play.
3. Do not try direct coupling to the crank because this requires extreme precision. If the resolver is only slightly off-center, the resolver bearing will be subjected to side loads well in excess of its rated capacity and will ultimately fail.
4. Do not use V belts as these can easily slip.
5. Do not use a flexible shaft like a speedometer cable. The resolver will lag the crank because the shaft twists on start-up. When the crank stops, the resolver will turn past the true stopping point and snap backward.

Install and wire resolver

Once you have thought out your design and gathered the parts, mount the resolver by bolting it to the press or other platform at the spot you selected. Install your drive mechanism. It does not matter which way the resolver turns. You will set the direction of rotation when you wire it. You will also electronically zero the resolver later in this chapter. Set the resolver as close to zero as you can by turning the shaft so that the keyway is aligned with the arrow on the housing. See Figure 2-4. *The press should be at top dead center when you do this.* Turn the shaft before attaching the chain or other drive mechanism.

To wire the resolver:

1. Find the resolver cable (if not connected to the resolver). Plug the end with the connector into the resolver (it only goes one way). Twist the locknut so the connection is tight.
2. Run the resolver cable through 1/2" conduit from the resolver to the bottom right knockout at SmartPAC.

IF YOU INSTALL THE POSITION SENSOR (optional)

If you are installing the position sensor, you can also run the position sensor cable through the same conduit as the resolver wires. (See "Installing the position sensor" for an illustration of the position sensor — the cable is attached). You cannot install the position sensor until the resolver is electronically set to 359°. So run the cable through for now, and leave installation until later. Refer to installation overview Figure 2-1 to see where the position sensor must be installed. It is usually near the resolver.

3. See Figure 2-5a for the location of the resolver connector TB106. Measure the resolver wires to fit and cut the wires. (If you also ran the position sensor cable through, do not cut these wires until the position sensor is installed).
4. Pull the L-shaped connector from TB106.
5. Attach the wires to this connector as shown in Figure 2-6. Make sure you connect the black and yellow wires correctly based upon the way your resolver will rotate—clockwise or counterclockwise. To connect a wire, find the correct terminal and loosen the screw over it by turning it counterclockwise (see Figure 2-7). Strip the correct wire for this terminal 1/4" (6.4 mm) from end. Insert bare wire into the terminal 90% of the way. Tighten the screw. The metal tooth inside the terminal will clamp down on the bare wire for a tight connection. Make sure that the metal tooth is clamped down on the bare part of the wire, not on the insulation.

Figure 2-5a. Location of important components in SmartPAC main processor board (shown sideways and labeled)

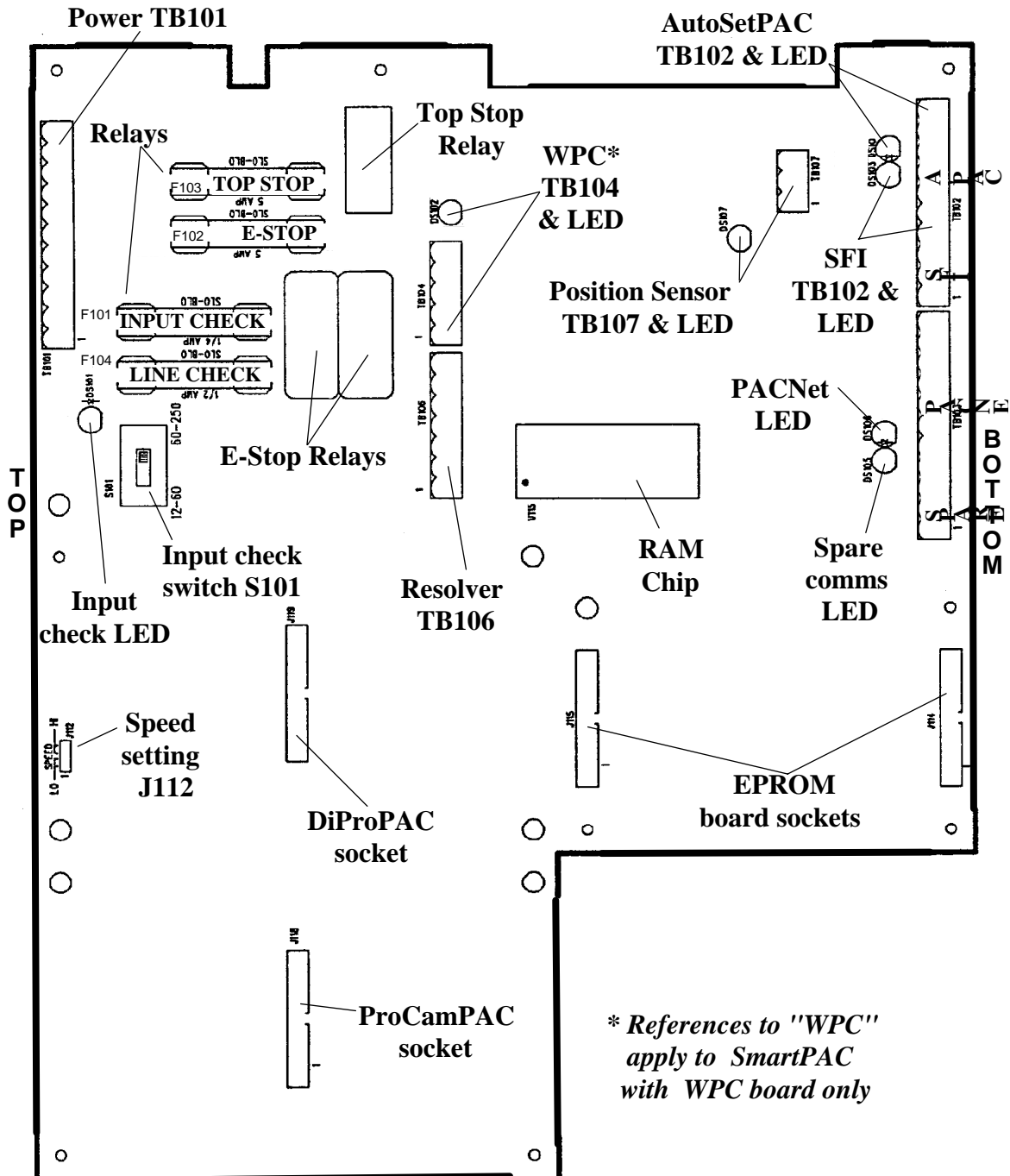


Figure 2-5b. Location of important components, DiProPAC boards
8 (left), 16 (right)

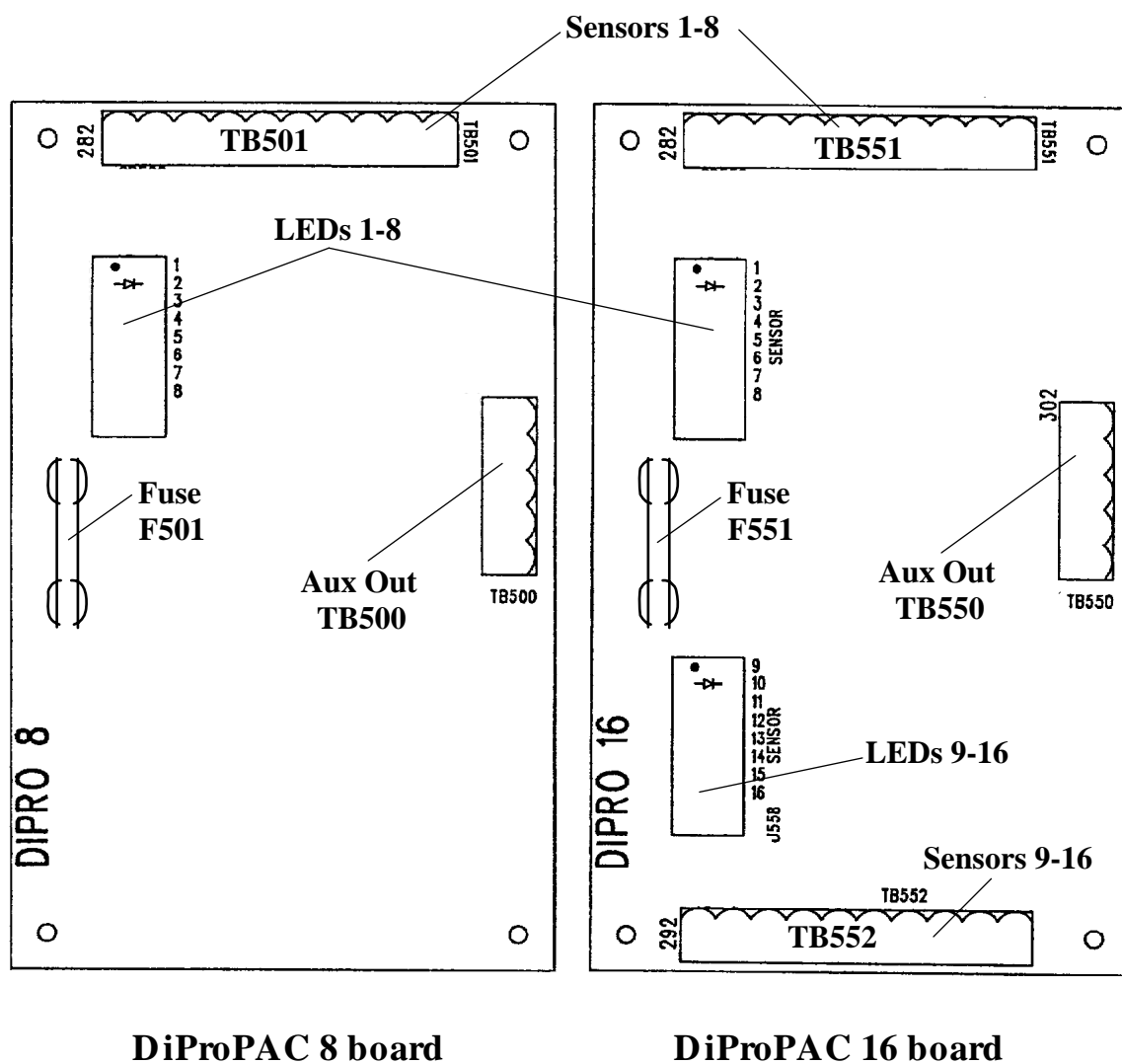


Figure 2-5c. Location of important components, ProCamPAC boards
8 (left), 16 (right)

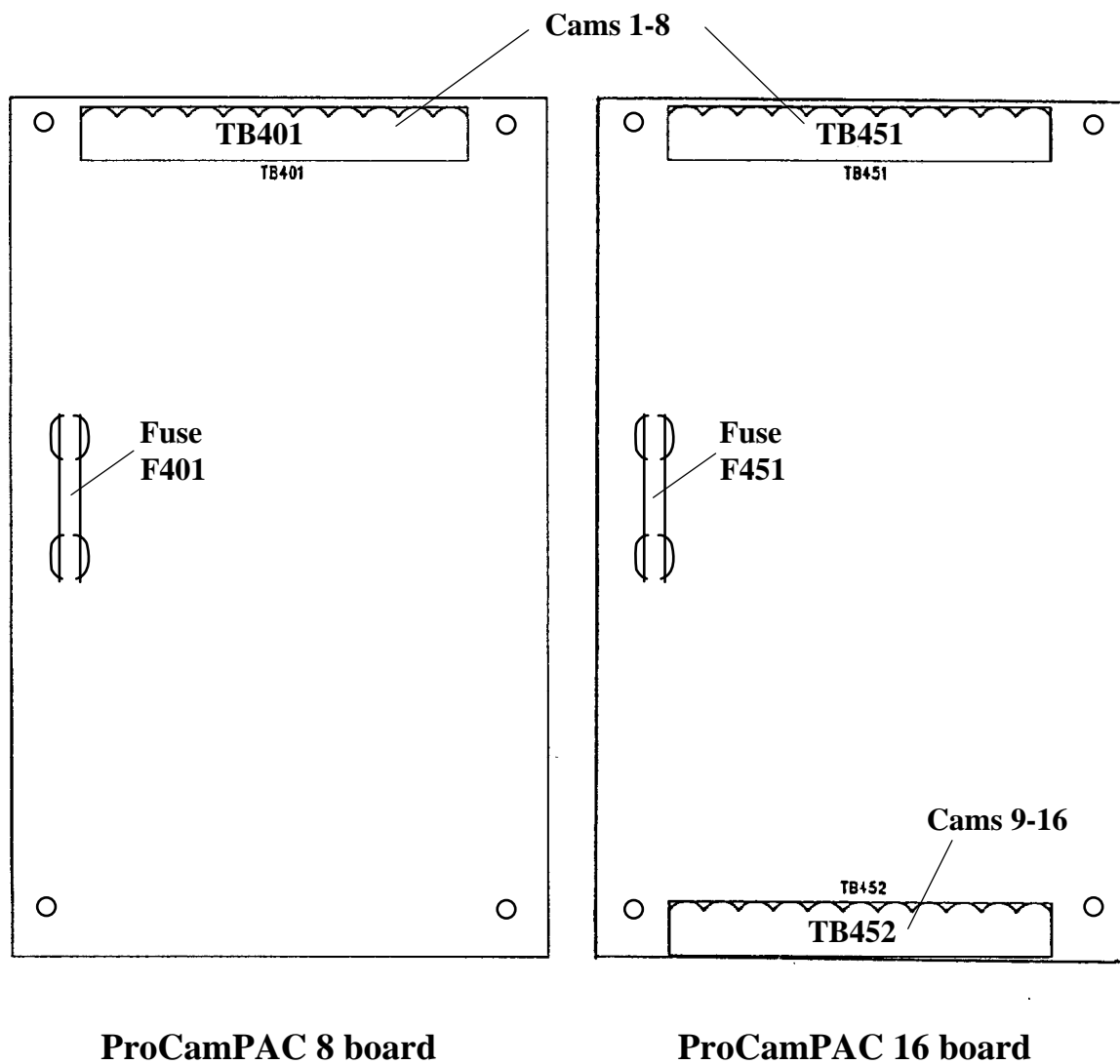


Figure 2-5d. ProCamPAC, DiProPAC, & Firmware boards superimposed on SmartPAC
(shown sideways)

NEITHER the Firmware, ProCamPAC, or DiProPAC boards are interchangeable.

Therefore, it is important that you install each of them correctly. The 8 and 16 channel ProCamPAC boards are interchangeable, as are the 8 and 16 sensor DiProPAC boards. SmartPAC will recognize whether the board is 8 or 16 configuration.

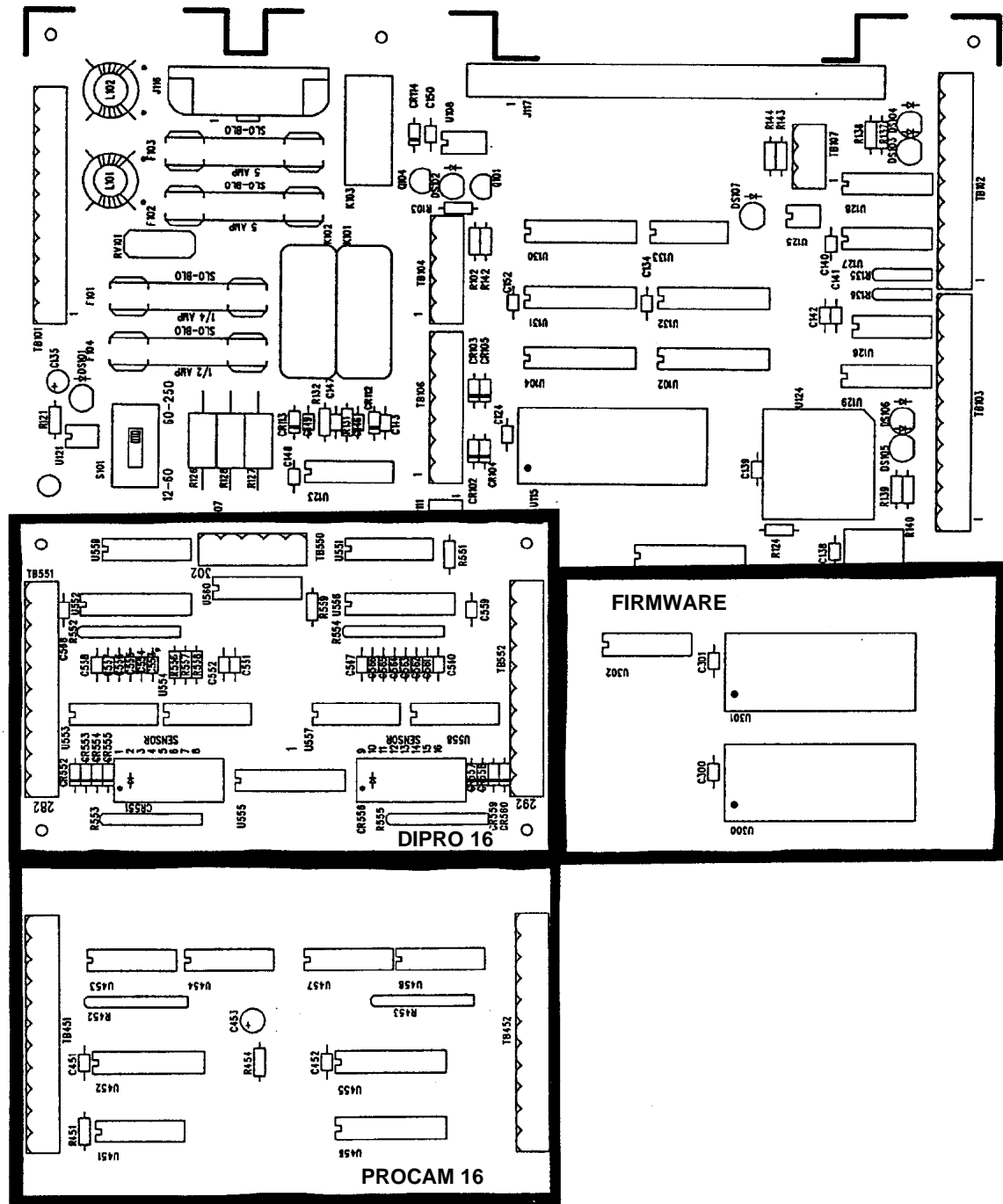
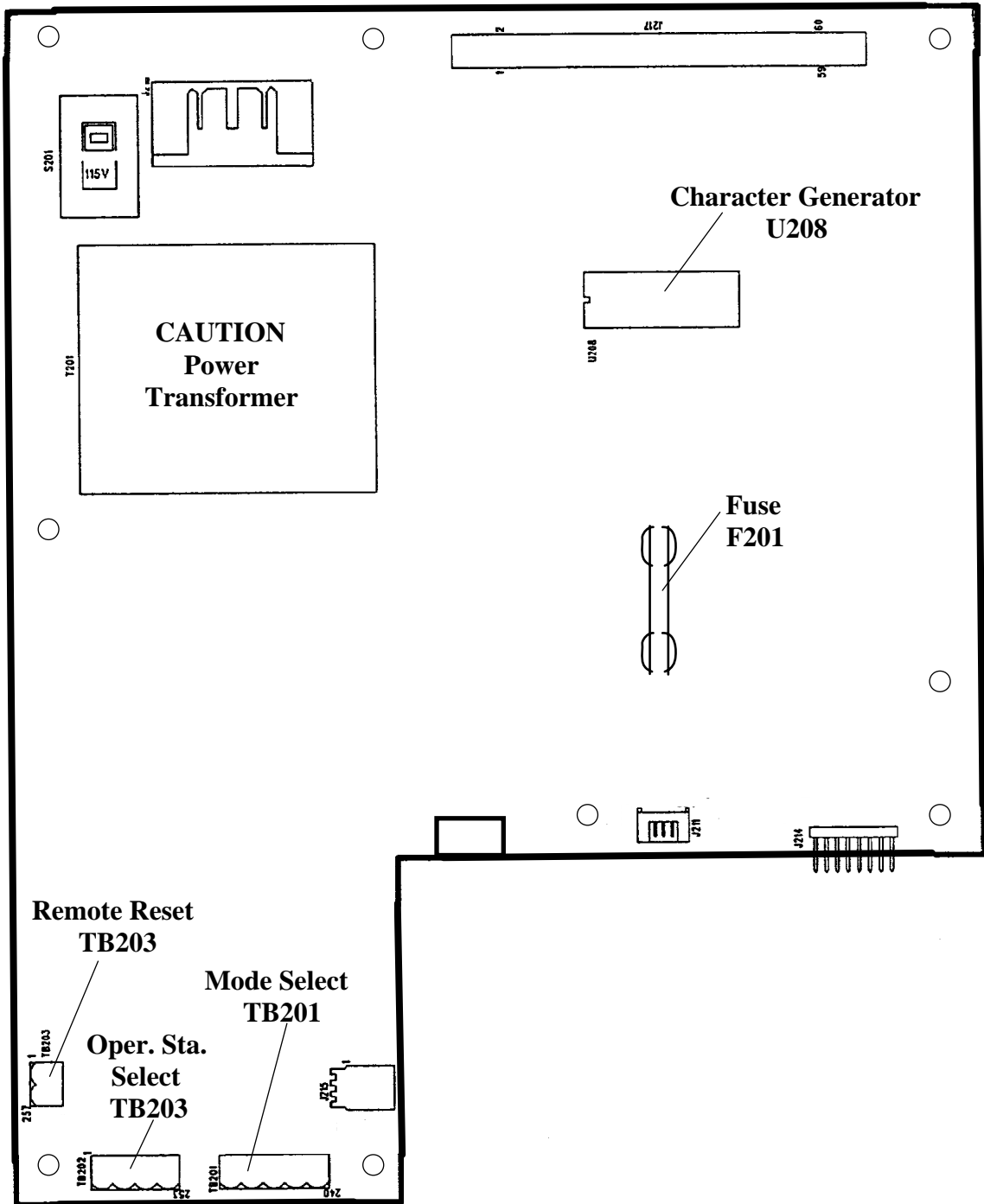


Figure 2-5e. Location of important components in SmartPAC power supply board (shown sideways and labeled)



NOTE: The connector can only plug in one way. Make sure you do not start at the wrong end when connecting wires. Put the connector over the base the way it will plug in and note the wire marking next to the base before starting.

6. Connect all wires and double check connections when done. Plug the L-shaped top firmly into base. It only can go one way.

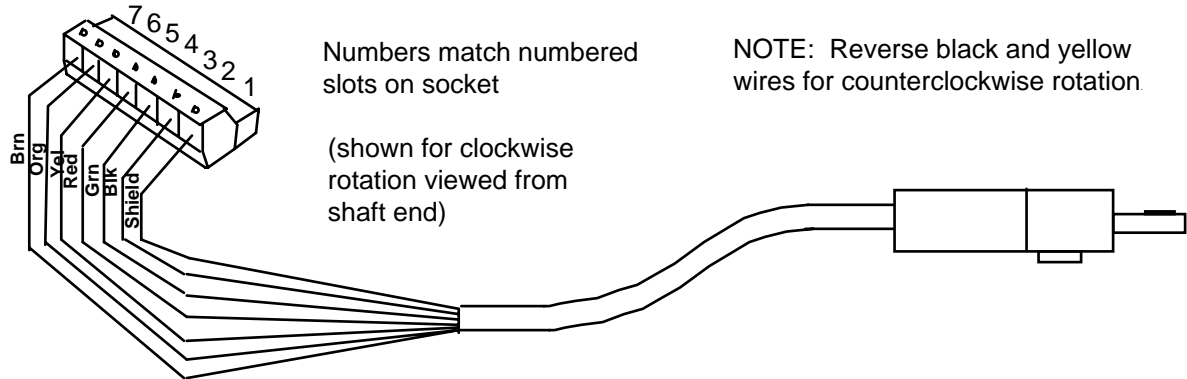


Figure 2-6. Pinout wiring for resolver cable (see Table 2-1 below)

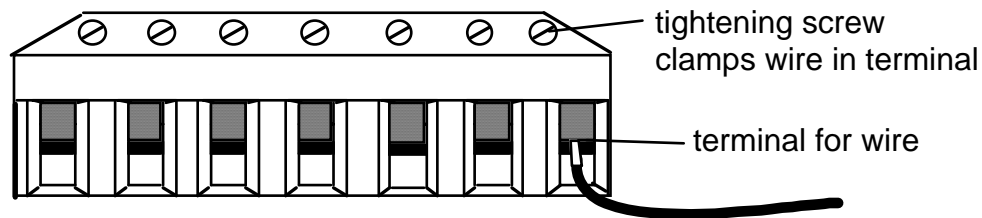


Figure 2-7. Attaching wires to connector

Table 2-1: Resolver Wiring

PIN # on TB106	Wire Color
212 (GND)	Shield
213 (S1)	Black
214 (S2)	Green
215 (R1)	Red
216 (S3)	Yellow
217 (R2)	Orange
218 (S4)	Brown

If you replace your resolver

If you need to replace your resolver, follow the instructions outlined in this section. Remember that you will also have to rezero the resolver. Refer to "Zeroing the resolver" and more specifically "How to replace and rezero the resolver" found in Chapter 3.

Connecting AC wiring, stop circuits, and input check circuit

All wires can be run through a common, flexible liquid-tight conduit to the control as long as all circuits are 115V. If your top stop circuits and emergency stop circuits are low voltage (for example, 24V), run two conduits—one for 115V wires and one for low-voltage wires.

Bring the wires for AC power, the emergency stop, and top stop circuits, and for the input check circuit just below the top right knockout. No. 16 wire (No. 14, if local codes require it) with a minimum 75°C temperature rating is recommended for these circuits. To wire the connector, follow these steps.

1. Locate the main processor board inside the unit. You will see the connector TB101 for AC power (see Figure 2-5a for location of components for this board).

WARNING! SHOCK HAZARD!

Never apply power to SmartPAC when the power supply cover is removed. To prevent shock, always replace the cover before applying power.

2. Determine how you will bring wiring from your 115 Vac power source (or 230V source if applicable) to the unit. These wires should be connected directly to the press control transformer at the press control. For 115 Vac, you need three wires—high (black), neutral (white) and ground (green). For 230 Vac, wires are black and red with green or green/yellow for ground.
3. Determine how you will connect the wires from SmartPAC to your press control top stop circuit and emergency stop circuit. You can wire these circuits at your press control. Refer to your press control manual or other electrical prints. You need four wires. Two for the emergency stop circuit and two for the top stop circuit.
4. Determine how you will connect wires to the input check circuit (terminals marked "IN A" and "IN B.") You need two wires. These inputs must be in parallel with one of the coils of the dual safety valve that controls the clutch/brake. When the clutch is engaged, 12–250 Vac or Vdc (50-60 Hz) must be present across terminals A and B (illustrated below). The connection can be made inside the press control where the circuits to the valve relays are wired in. Refer to your press control manual and electrical prints. It does not matter which wire goes to which terminal on the connector.

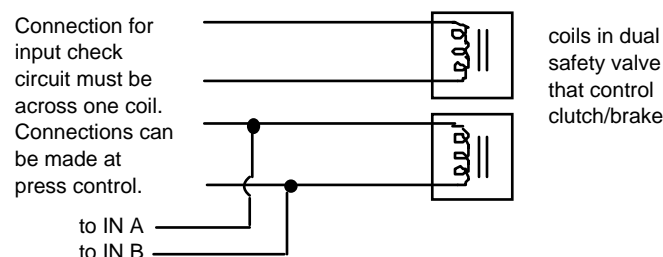


Figure 2-8. Schematic of input check circuit for 10-130 Vac or Vdc

- a. For applications where voltage is 60-250 V: Locate S101. S101 is located below and to the left of TB101 on the main processor board (See Figure 2-5e power supply board layout). Set switch S101 to the right. This is the factory setting.
- b. For applications where dual safety valve coil voltage is 12-60 Vac or Vdc: Set switch S101 to the left. The switch is marked 12-60 V. See below.

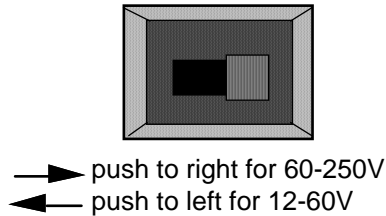


Figure 2-9. Input check switch (S101)

HOW THE INPUT CHECK CIRCUIT DETECTS RESOLVER CHAIN BREAKAGE

When the dual safety valve relay is energized by the press control to start the press, voltage will be produced in the input check circuit. This signals SmartPAC that the press ram should begin to move. If SmartPAC gets no signals from the resolver within a short period of time (resolver not turning), it opens the emergency stop circuit. A "loss of rotation" fault message is displayed on the screen. The press could have started but the resolver belt or chain broke or was significantly too loose so that the resolver shaft did not move. Other possible reasons for the fault could be low air pressure to the clutch or a bad clutch.

5. Find the 115V-230V voltage selector switch. It is located at the upper right-hand corner of the power supply board (see Figure 2-5e for components on power supply board). If your AC power is 115V, check to see that "115V" is displayed in the switch cavity. If your AC power is 230V, push the handle to the left.

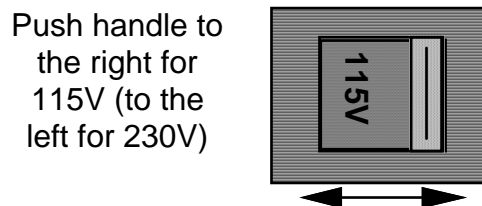


Figure 2-10. Setting voltage selector switch S201

6. Run the power, stop circuit, and input check circuit wires to SmartPAC through flexible liquid-tight conduit to the enclosure. Because SmartPAC is rated NEMA 12 (protected against dust and oil), you must use conduit of the same rating and make proper connections to ensure NEMA 12 protection with the enclosure. *Make ground connections as explained in the next step. Refer to the appropriate steps if you have an enclosure or panel mount.*
7. For SmartPAC enclosure: Your ground (green or green/yellow) wire must be connected to the ground block, not to ground (pin 203) on TB101. The ground block is located on the case of the unit just above the connector. To connect to the ground block, strip the ground wire about 1/4" (6.4 mm) from end, loosen screw on block,

slide wire in hole, and tighten screw to pin wire in place. A ground wire is attached from the connector to a case lug. Leave the ground wire attached to TB101 while making connections. *If you remove this wire in order to pull the connector all the way out of the unit, be sure to replace it when done.*

For SmartPAC panel mount: Connect the ground wire from your panel enclosure to the case lug located near the left side of the SmartPAC face plate (look on the underside of the SmartPAC panel). A ground wire is already attached from this case lug to SmartPAC TB101. Leave the ground wire attached to TB101 while making connections. *If you remove this wire in order to pull the connector all the way out of the unit, be sure to replace it when done.*

8. Locate connector TB101 for the other AC wires and stop circuits. It should be plugged into the socket. Connect power wires and the remaining wires from the press control to SmartPAC as shown in the table below. (Also refer to Figure 4 at the end of the manual.) For 230 Vac connect black wire to terminal 201 and red wire to terminal 202.

Table 2-2. Wiring to SmartPAC TB101

Terminal	Wiring Designation
201	Line 1 HI
202	Line 2 NEU
203	Ground
204	Chas
205	IN A
206	IN B
207	E-Stop
208	E-Stop
209	Top Stop
210	Top Stop
211	Zero (for AutoSetPAC only)

9. Plug the connector back into its slot. Double check connections with markings at the connector base to make sure that you did not wire it backwards.
10. Connect top stop, E-stop, and check input circuit wires at the press control or other box into which you are tying them.
11. Make all the necessary conduit connections to ensure NEMA 12 protection. SmartPAC is rated NEMA 12 (protected against dust and oil). *Be sure to number all wires in a way consistent with your press's electrical prints.*

WARNING!

PREVENT SHOCK!

Be sure you replaced the power supply cover. Do not connect AC wires to the power source until all other installation procedures are finished.

Adding or upgrading ProCamPAC or DiProPAC

The following instructions describe how to add die protection and/or programmable limit switch capabilities to a basic SmartPAC or upgrade your 8-cam or 8-sensor system to 16 cams or 16 sensors. *After completing these steps, proceed to the wiring for these options. For ProCamPAC, see "Connecting programmable cam channels". For DiProPAC, refer to "Connecting DiPro Sensor Interface to SmartPAC" or "Installing the DiPro RCB".*

Note: A "low impedance" 16-channel DiProPAC (#9632904) is available. This option is necessary when wire probes depend upon a part/strip to complete the circuit, and the part/strip is covered with a water-based conductive lubricant. For more information about this option, see "Sensor Terminology" in Chapter 1. If you decide that this is what you require, contact Data Instruments immediately to order that part. The installation procedure is the same as the standard version.

1. Turn power off to SmartPAC. The LCD display on the front panel should be blank and the angle/RPM display should be unlit.

CAUTION!

Always verify that power has been turned off to SmartPAC!

2. Before you proceed, you should ground yourself by touching any large metal object. This will remove any static electricity that you may be carrying around. A static electricity "zap" will destroy the components.

CAUTION

The ProCamPAC and DiProPAC boards are NOT interchangeable! Therefore, it is important that you install them correctly. The 8 and 16 channel ProCamPAC boards are interchangeable; and the 8 and 16 sensor DiProPAC boards are also interchangeable. SmartPAC will recognize whether the board is 8 or 16 configuration. See Figure 2-5d.

- If you are replacing an existing board, go to step 3.
 - If you are adding a new board, then locate where on the main SmartPAC processor board it should be placed (Figure 2-5d). Then go to step 4.
- 3. If replacing an existing board (or boards): Complete these steps for each board you are replacing.
 - a. Look inside SmartPAC, and locate the board that you wish to replace. Figure 2-5d illustrates ProCamPAC and DiProPAC superimposed on the main processor board.
 - b. Remove the connector(s) attached to this board. If you have an 8-sensor or 8-cam system, there will only be one connector. Conversely if you have a 16-cam or 16-sensor board, there will be two connector to remove.

If you are upgrading ProCamPAC, the connector or connectors in question go to the ProCam outputs assembly. If DiProPAC, the connector or connectors go to DiPro Sensor Interface or DiPro RCB. If you need to connect 9-16 of the cams or sensors, go back to the previous sections and complete the wiring.

- c. Remove the four screws which hold the board to the standoffs under the board, and put them aside for now.
 - d. Unplug and remove the board. Be sure not to confuse the old board with the new one you will be installing.
 - e. Verify that you are still "grounded", and then get the new board.
 - f. Plug the board in. The connectors on the underside of the board are keyed, so that they can only be plugged in one way. These connectors will connect correctly with the mating pins on the main SmartPAC processor board.
 - g. Once the board is properly seated, screw the four corners down again (from step 3c).
 - h. Reconnect the connector(s) from SmartPAC to the new board(s). Note that if you went from 8 to 16, you will have to connect cables to the board. These are the terminal blocks to which you will connect the cables:
 - ProCamPAC 8: Cam channels 1-8 to TB401
 - ProCamPAC 16: Cam channels 1-8 to TB451; 9-16 to TB452
 - DiProPAC 8: Sensors 1-8 to TB501
 - DiPro 16: Sensors 1-8 to TB551; 9-16 to TB552
 - i. You will have to verify that you properly installed the boards. Go to the section, "Checking that ProCamPAC and/or DiProPAC are properly installed". *You need to complete this before you use SmartPAC.*
4. If installing a new board (or boards): Complete these steps for each board you are adding. Refer to Figure 2-5d for the location of the board to be installed.
- a. Verify that you are still "grounded", and then get the new board.
 - b. Plug the board in. The connectors on the underside of the board are keyed, so that they can only be plugged in one way. These connectors will connect correctly with the mating pins on the main SmartPAC processor board.
 - c. Once the board is properly seated, use the four screws that came with the kit to secure the board.
 - d. Connect the cable(s) to the new board(s). Note that if you are going from an 8 to 16 system, you will have to connect two cables to the board.
- If you are upgrading ProCamPAC, the connector or connectors in question go to the ProCam outputs assembly. If DiProPAC, the connector or connectors go to DiPro Sensor Interface or DiPro RCB. *If you need to connect 9-16 of the cams or sensors, go back to the previous sections and complete the wiring.*
- These are the terminal blocks to which you will connect the ribbon cables:
- ProCamPAC 8: Cam channels 1-8 to TB401
 - ProCamPAC 16: Cam channels 1-8 to TB451; 9-16 to TB452
 - DiProPAC 8: Sensors 1-8 to TB501
 - DiPro 16: Sensors 1-8 to TB551; 9-16 to TB552
- e. You will have to verify that you properly installed the boards. Go to the section, "Checking that ProCamPAC and/or DiProPAC are properly installed". *You need to complete this before you use SmartPAC.*

Connecting programmable cam channels

WARNING!

SmartPAC with programmable cam capability can be used with Wintriss Clutch/Brake Control. However, SmartPAC's programmable cam switch should not be used to provide timing signals for any other clutch/brake control. It is designed to control auxiliary functions only.

Important change about the cam outputs assembly/enclosure

If you ordered the 8-channel cam outputs assembly with enclosure (item #4245301), it has been substituted with item #4245302, because the standard relays that had been used are no longer available. If you had ordered the 8-channel cam outputs assembly without enclosure (item #4241601), it is being substituted with item #4272501. The new standard relay item number is #XI20366A21. The same solid state relays will continue to be used as before (item #2212501 for DC solid state; item #2215301 for AC solid state). If you require more than 4 solid state outputs with the 8-cam assembly (or more than 8 solid state outputs with the 16-cam assembly) contact the factory before installation.

Making the connections

If installed, you must connect the optional cam channel board (either eight or sixteen configuration) inside the SmartPAC controller to the ProCam output assembly. The output assembly contains the relays that control the timing signals for your equipment. The relays open and close circuits to your equipment at the angles (degrees of the stroke) that you set.

You can purchase either the eight or the sixteen-cam option. While the instructions below explain how to install the sixteen-cam style, you can still use these steps if you have eight cams. *If you have an 8-cam board only then connect channels 1-8 to TB401.* Refer to Table 2-3a later in this section for wiring connections. To mount and wire ProCam output assembly:

1. Select a convenient location for running conduit from the output assembly to the equipment that it will control. Once installed and wired, you will not have to work with the ProCam output assembly again.
2. Mount the output enclosure using mounting holes on the flanges (see Figure 2-11a).

NO CONTACT TO METAL

If you are installing the output assembly without the enclosure, mount it in a clean area that is not contacting metal. The underside of the board must not touch metal, because this can cause shorting. Do not mount the board in highly traveled areas where it could get damaged.

3. The relays that will control your equipment should already be plugged into the board. The type of relays you have is marked on the relay. Decide which relays will be used with which channels and arrange them in the box. The relays just pull out of their sockets. When inserting, make sure that the pins line up with the socket holes. Then press in firmly. *Proceed further for important information about where to plug each style of relay:*

- a. If you are using only *standard relays* in your programmable cam (not optional solid state relays), they are plugged into channels 1 through 8 — slots labeled K301 through K305, K307, K309, and K311 (see Figure 2-11b).
 - b. If you plan to use solid state relays, then they can only be plugged into channels 5 through 8 only — slots labeled K306, K308, K310, and K312.
 - c. *Do not* plug both standard and solid state relays in the same channel locations for 5 through 8. For example, if you plug a solid state relay into channel 5 (location "K306"), you cannot plug a standard relay into location "K305". See Figure 2-11b.
 - d. As an example, say you wish to use three standard relays and one solid state. You would install the three standard relays in channels 1 through 3, and the solid state relay in channel 5 on the cam outputs board assembly. Then you must skip SmartPAC's channel 4 output for all wiring and programming, and instead use channel 5 for all wiring and programming.
4. Find the 12-conductor cables that run from the SmartPAC ProCam 16 PC board (see Figure 2-5c for an illustration of the board) to the terminal blocks marked TB301 inside the ProCam output enclosure. Notice that there are two cables: one for 1 through 8, and another for 9 through 16.
 5. Attach one end of the cable to the connector for TB451 for channels 1-8. Note that TB452 on the 16-channel board is for channels 9-16. Refer to the Table 2-3a and Table 2-3b in this section for proper wiring. *If you have an 8-cam board only then connect channels 1-8 to TB401.* The connector should be plugged into the socket.
 6. Run the cable through conduit to TB301 in the ProCam output enclosure. You can use the knockouts directly below the connectors on each enclosure.
 7. Attach the other end of the cable to the connector for TB301. A wire from CHAS to a lug on the ProCam output enclosure should already be connected (unless you bought the board assembly only).
 8. Plug cable connectors into their sockets.
 9. To connect the relays to your equipment, use connector TB302 and TB303. See Figure 2-12.

How you make connections depends on the type of relay you use. For 120 Vac relays you can connect wires from your equipment to "C" and either the N/O or N/C side of the relay. If you connect to N/O, the equipment will be on for the degrees set on SmartPAC. If you connect to N/C, the equipment will be on except for the degrees set. Generally, you use the N/O terminal; so equipment is off except when you use SmartPAC to turn it on. Use the N/C terminal only if it is more practical to do the reverse.

All solid state relays work only when the C and the N/O side is connected. Polarity must be right for some relays — refer to the above Table 2-3b ("Making connections to relays").

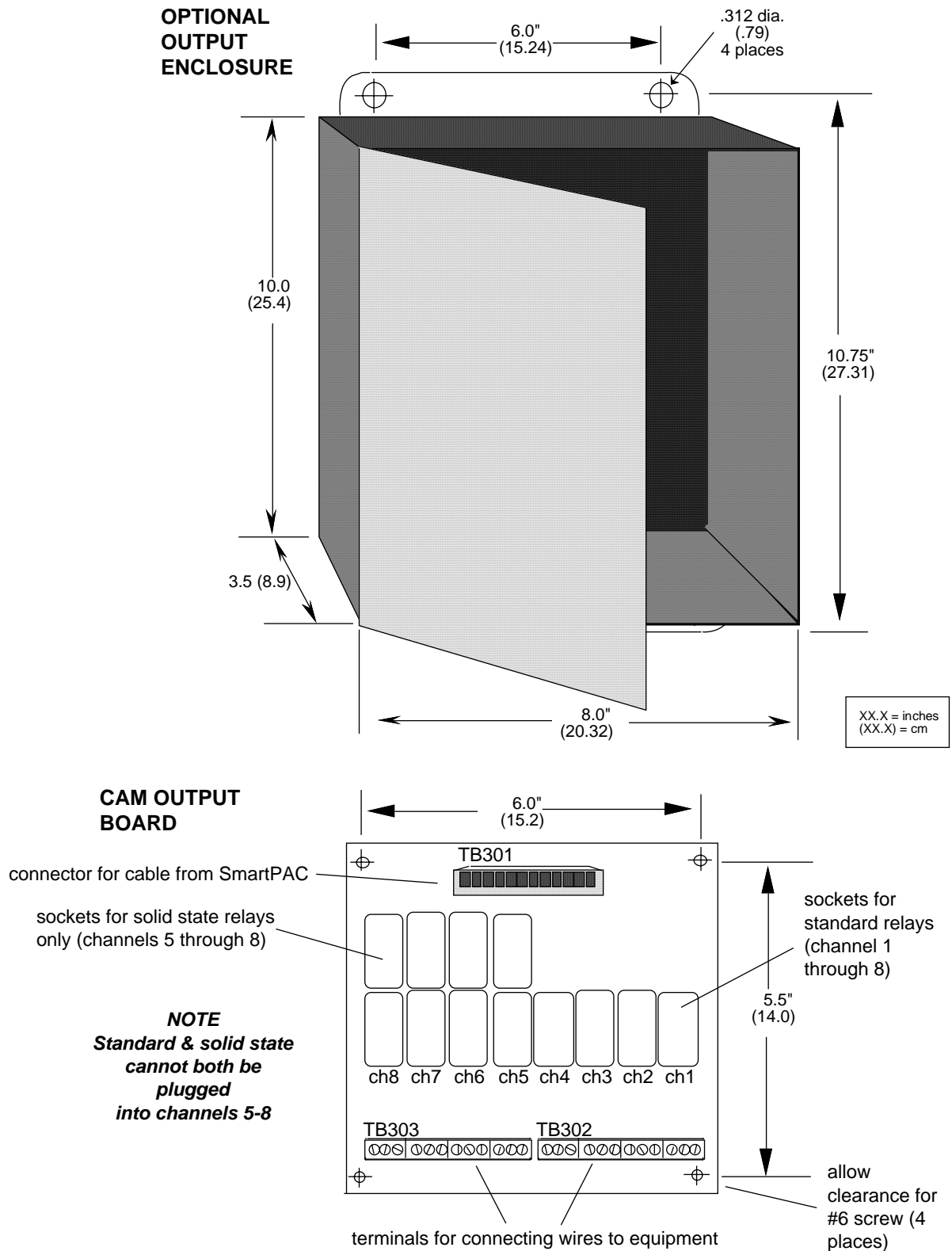


Figure 2-11a. ProCamPAC output assembly

Figure 2-11B. Cam outputs board assembly

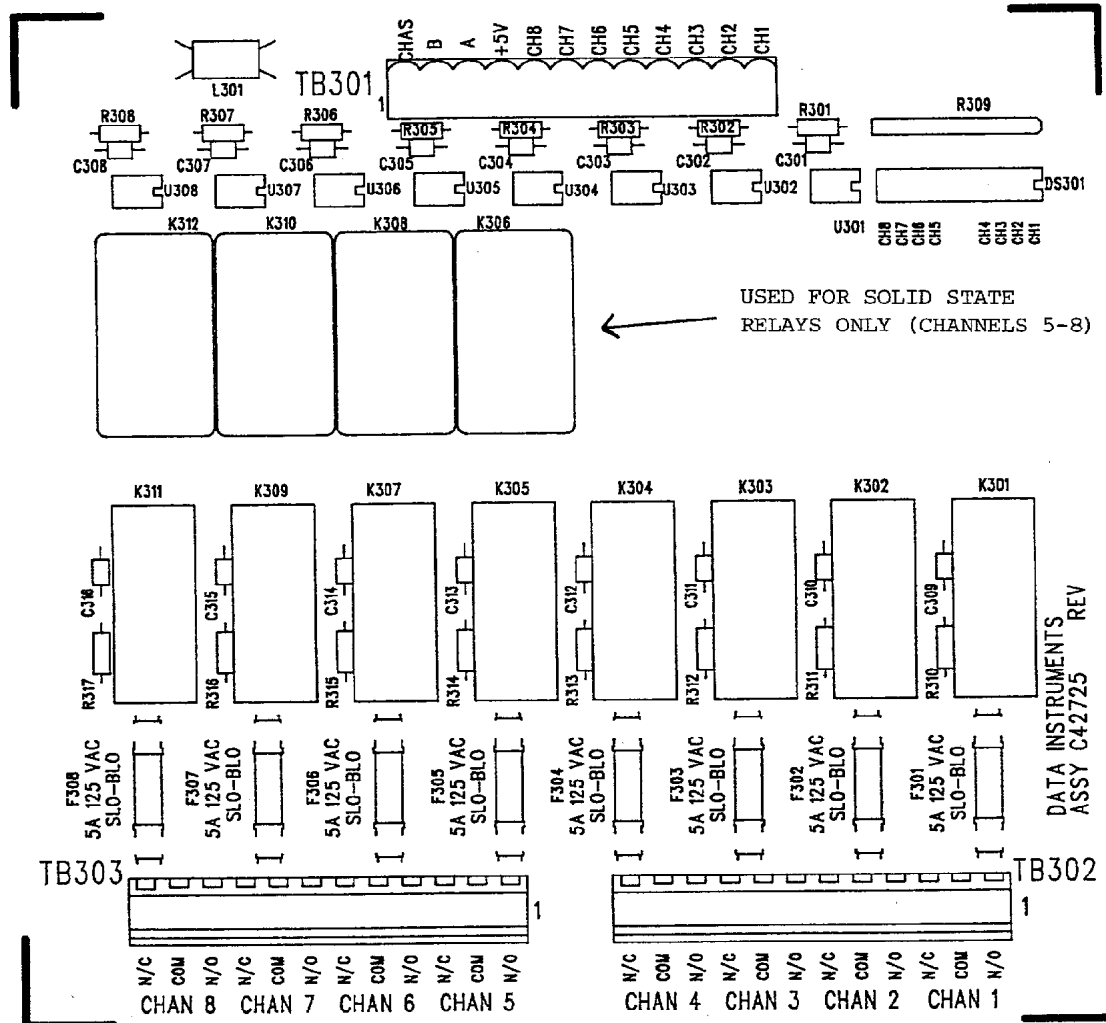


Table 2-3a: SmartPAC to ProCamPAC Output Assembly TB301

Wire	SmartPAC 8-cam TB401 (1-8) or 16-cam TB451 (1-8) (pin #)	1 st TB301 (pin #)
	CHAS (1)	
White	Relay Pwr (270)	A (3)
Black	Gnd (269)	B (2)
Red	+5 (268)	+5 Vdc (4)
Tan	Ch 8 (267)	Ch 8 (5)
Pink	Ch 7 (266)	Ch 7 (6)
Gray	Ch 6 (265)	Ch 6 (7)
Blue	Ch 5 (264)	Ch 5 (8)
Yellow	Ch 4 (263)	Ch 4 (9)
Orange	Ch 3 (262)	Ch 3 (10)
Purple	Ch 2 (261)	Ch 2 (11)
Brown	Ch 1 (260)	Ch 1 (12)

Wire	SmartPAC 16-cam TB452 (9-16) (pin #)	2 nd TB301 (pin #)
		CHAS (1)
White	Relay Pwr (281)	A (3)
Black	Gnd (280)	B (2)
Red	+5 (279)	+5 Vdc (4)
Tan	Ch 16 (278)	Ch 8 (5)
Pink	Ch 15 (277)	Ch 7 (6)
Gray	Ch 14 (276)	Ch 6 (7)
Blue	Ch 13 (275)	Ch 5 (8)
Yellow	Ch 12 (274)	Ch 4 (9)
Orange	Ch 11 (273)	Ch 3 (10)
Purple	Ch 10 (272)	Ch 2 (11)
Brown	Ch 9 (271)	Ch 1 (12)

Table 2-3b: Making connections to relays

Module	How to connect	Type
Relay	one wire to C, one wire to N/O or N/C, polarity does not matter	SPDT
DC Solid State	- to C, + to N/O	SPST
AC Solid State	one wire to C, one wire to N/O, polarity does not matter	SPST

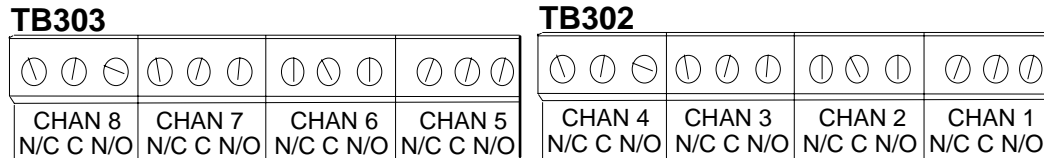


Figure 2-12. Connector TB302 and TB303 for wiring relays to equipment

10. You must install arc suppressors across each inductive load (motors, relays, coils, etc.) that is connected to an output relay. Suppressors are supplied with each relay. The suppressors reduce electrical noise and will extend the life of the relays. Find the suppressors supplied with the modules. They are blue and cylindrical in shape with leads at each end.

**DO NOT INSTALL SUPPRESSORS
ACROSS RELAY CONTACTS**

Suppressors must not be installed across the relay contacts inside the cam outputs enclosure. If a suppressor is installed across the relay contacts and it fails shorted, the equipment controlled by that relay will remain energized all the time.

11. Install the suppressors across the load and as close to the load as possible. Attach suppressors by connecting leads across existing terminals or junction points. See the following illustration for the correct way to install them.

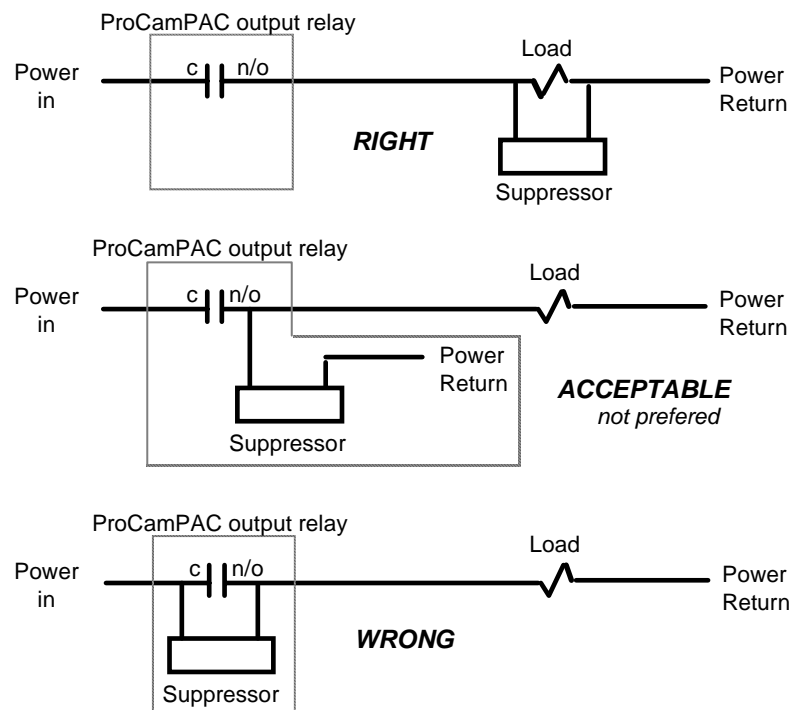


Figure 2-13. How to connect suppressors across the load

Connecting DiPro Sensor Interface to SmartPAC

If you are connecting DiPro Sensor Interface, connect the cable as shown below. There are 8 inputs for sensors at DiPro Sensor Interface (DSI). If SmartPAC is configured for 16 sensor inputs, you must use a second DSI. The wiring tables below explain how to install the sixteen-sensor style; therefore, use the first table for eight sensor inputs. *If you have an 8-sensor board only, then connect sensors 1-8 to TB501.* Consult the DSI user manual for complete installation and operating instructions.

Table 2-4: SmartPAC to DiPro Sensor Interface

Wire	SmartPAC TB501 or TB551 (pin #)	1 st DSI (pin #)
		Gnd (10)
Black	Gnd (291)	Gnd (9)
	Sensor power (290)	<i>no connection</i>
Gray	Sensor 8 (289)	Sensor 8 (8)
Violet	Sensor 7 (288)	Sensor 7 (7)
Blue	Sensor 6 (287)	Sensor 6 (6)
Green	Sensor 5 (286)	Sensor 5 (5)
Yellow	Sensor 4 (285)	Sensor 4 (4)
Orange	Sensor 3 (284)	Sensor 3 (3)
Red	Sensor 2 (283)	Sensor 2 (2)
Brown	Sensor 1 (282)	Sensor 1 (1)

Table 2-4: SmartPAC to DiPro Sensor Interface (continued)

Wire	SmartPAC TB552 (pin #)	2 nd DSI (pin #)
		Gnd (10)
Black	Gnd (301)	Gnd (9)
	Sensor power (300)	<i>no connection</i>
Gray	Sensor 16 (299)	Sensor 8 (8)
Violet	Sensor 15 (298)	Sensor 7 (7)
Blue	Sensor 14 (297)	Sensor 6 (6)
Green	Sensor 13 (296)	Sensor 5 (5)
Yellow	Sensor 12 (295)	Sensor 4 (4)
Orange	Sensor 11 (294)	Sensor 11 (3)
Red	Sensor 10 (293)	Sensor 3 (3)
Brown	Sensor 9 (292)	Sensor 1 (1)

Installing the DiPro Remote Connection Box (RCB)

If you are using the DiPro RCB with your SmartPAC, it should be installed near the die opening of the press where it can easily be reached but also is protected from lubricant and coolant splash or drip. The RCB is wired permanently to SmartPAC. The RCB can connect up to six sensors to SmartPAC, and is supplied with the interconnect cable already installed. To install and wire the DiPro RCB:

1. Mount the RCB to the press with the shock mounts provided using the mounting holes on each flange. Make sure sensor cables can be easily connected to it and that the RCB cable will reach SmartPAC.
2. Connect the RCB cable to SmartPAC's terminal block TB501 (if DiPro 8) or TB551 (if DiPro 16). If you are connecting a second RCB to SmartPAC, connect to terminal block TB552 at SmartPAC's DiPro 16. Refer to the wiring in the following tables. Because SmartPAC is rated NEMA 12 (protected against dust and oil), you must use conduit of the same rating and make proper connections to ensure NEMA 12 protection with the enclosure.
3. Plug the connector into TB501 (or TB551). See Figure 2-5b. This connector can only go one way. Double check your connections to make sure you started at the right end when connecting wires.

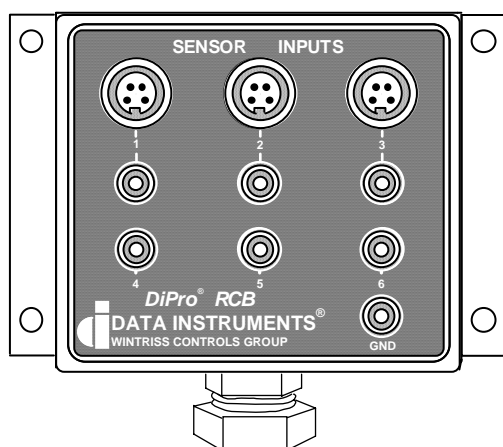


Figure 2-14. DiPro remote connection enclosure for sensors

Table 2-5: DiPro RCB to SmartPAC

Wire	RCB Sen. #	SmartPAC TB501 or TB551	At SmartPAC
Brown	1	282	Sensor 1
Violet	2	283	Sensor 2
Orange	3	284	Sensor 3
Yellow	4	285	Sensor 4
Green	5	286	Sensor 5
Blue	6	287	Sensor 6
Red*	none	290	Sensor power
Black	GND	291	GND

Table 2-5: DiPro RCB to SmartPAC (continued)

Wire	RCB Sen. #	SmartPAC TB552	At SmartPAC
Brown	1	288	Sensor 7
Purple	2	289	Sensor 8
Orange	3	292	Sensor 9
Yellow	4	293	Sensor 10
Green	5	294	Sensor 11
Blue	6	295	Sensor 12
Red*	none	300	Sensor power
Black	GND	301	GND

* Provides power for electronic sensors used in inputs #9-11 (Lumberg connectors);
12 Vdc; 100 mA total

Connect AC power wires to power source

Connect AC power wires from connector TB101 in SmartPAC to the power source. Be sure that power is off at the terminals where you are connecting wires.

Turn on power to SmartPAC and check display

Turn on power to SmartPAC. Turn the Program/Run key to "Program". Then press down on both the "1" and "CLEAR" keys at the same time for one second. (See "Using the keyboard" - Chapter 3 for assistance in using the keys) You will see this display:

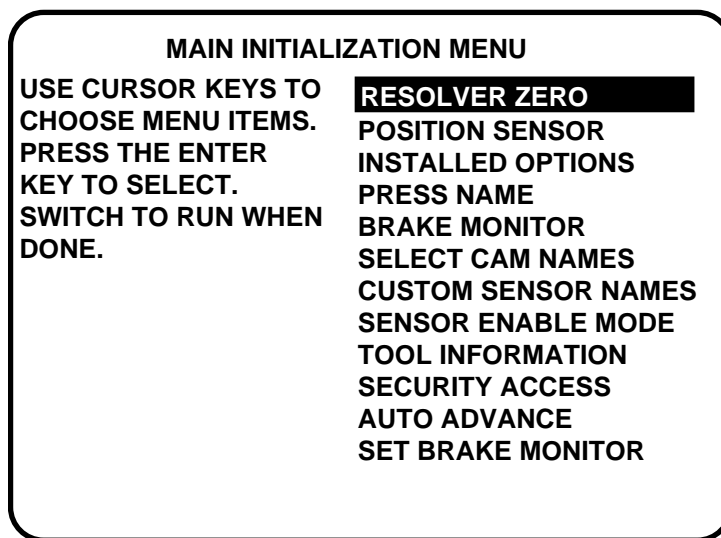


Figure 2-15. SmartPAC Initialization menu

Checking for power

If your screen is blank, first check the setting for the contrast adjust keys at the upper left-hand corner of SmartPAC. You will see the menu now. Adjust accordingly for best viewing.

If the contrast was not the problem, there is probably a problem with power to SmartPAC. Turn power to SmartPAC off and recheck all power connections. If you still cannot get the Initialization menu, call the technical staff at Data Instruments for assistance.

If you received an error message on your screen when you turned power on, first press the RESET key to clear the error message. If the message still appears, go to Chapter 7 in this manual and find the section describing that error message. Follow the instructions there for correcting the problem. If the error message is not described there, or you cannot fix the problem, call Data Instruments' technical advisors.

Verifying ProCamPAC and/or DiProPAC proper installation (optional)

If you had installed ProCamPAC and/or DiProPAC into SmartPAC, you need to verify that the installation was done correctly and that these options appear on the screen.

To do this, briefly get yourself out of Initialization mode and into the Run menu by turning the Program/Run key to "Run". Now look for these menu choices:

For ProCamPAC: "Cam Switch"

For DiProPAC: "Die Protection"

If you do not see these menu choices on your screen, go back to "Adding or upgrading ProCamPAC or DiProPAC" and verify that you proceeded with the installation properly. If you still cannot fix the problem, call Data Instruments' technical advisors.

Zero Resolver

Return to the Initialization Menu. See the section above "Turn on power to SmartPAC and check display". You can now zero the resolver.

Important

The press must be at top dead center — $0^\circ \pm 2^\circ$ —before you zero.

If you set the resolver to zero degrees when the press is, say at 160° , your timing settings will be way off.

If your press is at TDC

If you set the press to TDC ($0^\circ \pm 2^\circ$) before starting the installation and have not moved the ram, go to the instructions for zeroing.

If your press is not at TDC

If the ram is not at TDC, you must inch the press to $0^\circ \pm 2^\circ$. To do this now, you have to load settings for a tool. SmartPAC is now connected to your stop circuits; so you can no longer run the press without loading settings for a tool. Go into Program mode (see Chapter 5) and create some counter settings for a tool.

After settings are loaded, set the Program/Run key to "Run". Inch the press to $0^\circ \pm 2^\circ$. Do not rely on the readout to tell you where TDC is. This is inaccurate until the resolver is zeroed. Use a dial indicator or some other means to determine 0° . Once you are at 0° , go back to Initialization mode. Then go to the instructions below for zeroing the resolver. (Zeroing the resolver is also mentioned in Chapter 4, Initialization.)

To zero the resolver:

1. Select "Resolver zero" from the Initialization menu (Figure 2-15). This is the first choice on the menu. ("Resolver zero" may already be highlighted.)
2. You will see a display similar to the following. Here you can see actual resolver position. If the resolver is anywhere between 330° and 30° , you can go to step 3. SmartPAC will automatically correct the offset and the angle readouts will indicate

the true angle of the ram. By pressing the appropriate function key, a superimposed display LED readout also displays resolver diagnostic information.

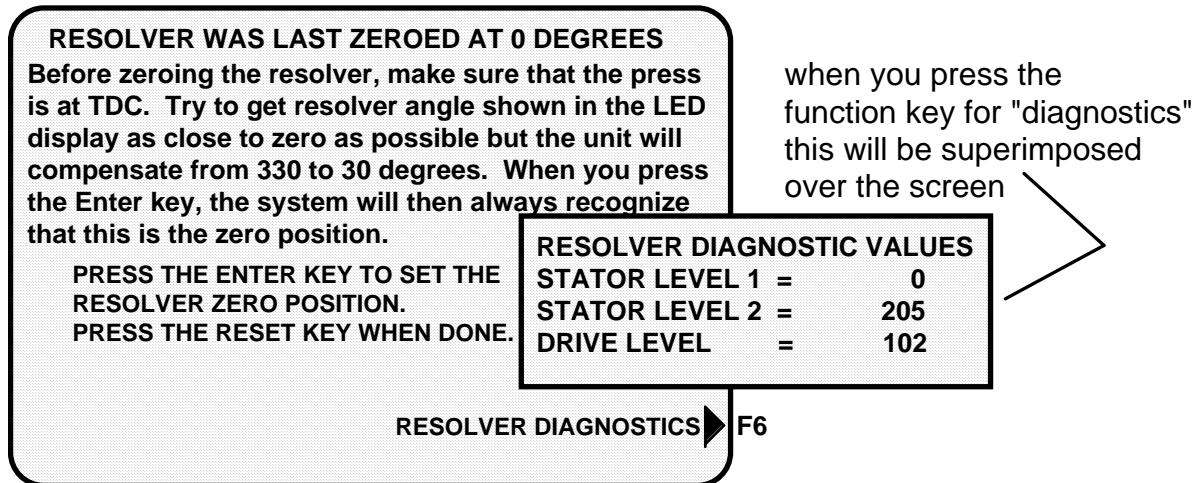


Figure 2-16. Illustrating "Resolver Zero" display

If the resolver is outside the range of 330° to 30°, you will have to turn the resolver shaft by hand until the LED display shows zero. The press must be at top dead center before you do this. Loosen the tension on your drive mechanism and turn the resolver shaft by hand until the reading on the Angle/SPM readout is 0°. It does not matter which way you turn the shaft. Set the resolver right at 0° (so the readout shows 0°). Once the resolver is set, tighten the drive mechanism, and go to step 3.

3. To zero, make sure the display shown in step 2 is on your screen. *Double check that the readout is between 330° and 30°.* Then press ENTER. The number shown will be the zero position of the resolver. SmartPAC electronically adds or subtracts the offset. Therefore, it always knows the true zero position of the ram. If the number is 0, it means the zero position of the resolver at TDC is 0°.
4. Press RESET to go back to the Initialization menu when you are done. If you are installing the position sensor, do it next. If not, go to "Final checkout."

How to replace and rezero the resolver

After you have successfully installed the new resolver (discussed in the section "Installing the resolver" in Chapter 2, you will need to rezero.

1. Go to the "Resolver Zero" screen. Notice the value in the LCD display (e.g. "Current Resolver Zero Position is 356" reflecting the original zeroed position) may not match the "unzeroed" angle position shown in the LED display.
2. Move the ram so that the crank-angle position shown in the LED display matches as close as possible to the value appearing in the LCD display. Remember that the readout must be between 330° and 30°.
3. Once you have done this, you can rezero the resolver. To do this, press ENTER.
4. Press RESET to go back to the Initialization menu when you are done.

Installing the position sensor (optional)

CAUTION

If you are installing the overrun limit switch for the SmartPAC with WPC configuration, you *must* follow the instructions ("Installing the overrun limit switch") in Chapter 2 of the *SmartPAC with WPC* user manual (DI Part no. 1101000). Do *not* refer to the steps below in this manual. This feature is not optional when SmartPAC is combined with WPC.

Installing a position sensor is optional. It must be installed only after the resolver is zeroed. It is a magnetic proximity switch that monitors the resolver's position. It consists of a magnet which you mount on the crankshaft (or other shaft) and a stationary sensor which is mounted just above the magnet so that it detects the magnetic field every time the shaft passes 0°. SmartPAC receives the signal from the sensor at 359° and checks that the resolver is also signaling 359°. If it is not, this means the resolver drive has slipped or has broken, or the resolver itself is broken. SmartPAC will signal an emergency stop and display an error message. Here are the steps to install the position sensor.

1. First load a tool number. This is so that you can switch SmartPAC to Run mode and see the angle of the crankshaft in the LED readout. If you have not made any settings for a tool, you will have to do so now. For simplicity, enter a tool number and make some counter settings (Chapter 5, Program mode). You can create any settings, then delete or change them later.
2. After loading a tool number, switch to Run mode (set the Program/Run key to "Run").
3. Check the number in the LED readout. If it is not zero, inch the press until the readout shows zero.

NOTE: *If the numbers in the readout decrease as you run the press instead of increasing (that is, the numbers go from 359°, 358°, 357°, ...to 0°), swap the black wire and yellow wire (terminals 2 and 5) on connector TB105.*

4. Now return to Initialization mode and re-select "Position sensor" (Figure 2-19). Check the number in the LED display. This is the "unzeroed" resolver position. This value must be 0° ±2 degrees before the position sensor can be installed. If it is not 0° ±2 degrees, take note of the unzeroed position, and go back to the Run mode. Inch the press to 360° minus the unzeroed resolver position. Return to Initialization and re-select "Position sensor". Verify that the unzeroed position is now 0° ±2 degrees. (Note: The number appearing in Initialization may be different from the angle position that you saw in Run mode (*that is the "corrected", zeroed resolver position*)).

IMPORTANT

The press must be at zero resolver degrees ± 2° before the position sensor can be installed. Keep repeating step 4 until you achieve this.

5. Now shut off power to SmartPAC and the press control. You are ready to install the position sensor. Select a mounting site for the switch and the magnet so that the magnet rotates 1:1 with the crankshaft of the press. Ideally this is on the crankshaft itself. See Figure 2-1 for an overview. However, you might also use the Pitman *above* the adjusting screw or a drive shaft to a feed or other device.
Never mount the magnet to the resolver shaft or sprocket or any of the drive components leading to the resolver. This is because both the resolver and position sensor would then be out of alignment with the crank if a failure occurred, but they might stay in alignment with each other. The position sensor would not signal the fault, and SmartPAC would not provide accurate timing for anything it controls.
6. Install the position sensor as shown in Figure 2-17. The magnet should be installed plastic side up with a non-ferrous metal screw. It is important not to use a ferrous screw because it could cause false signals. A brass screw (6-32) is supplied. Use a No. 36 drill and a 6-32 tap.
7. Once the switch is installed, wire it to SmartPAC terminal block TB107. Black wire goes to terminal 247 (GND); white or clear goes to terminal 246 (position sensor); red goes to terminal 245 (sensor power).
8. Turn on power to SmartPAC. Turn the Program/Run key to "Program". Then press both the "1" and "Clear" keys at the same time for one second.

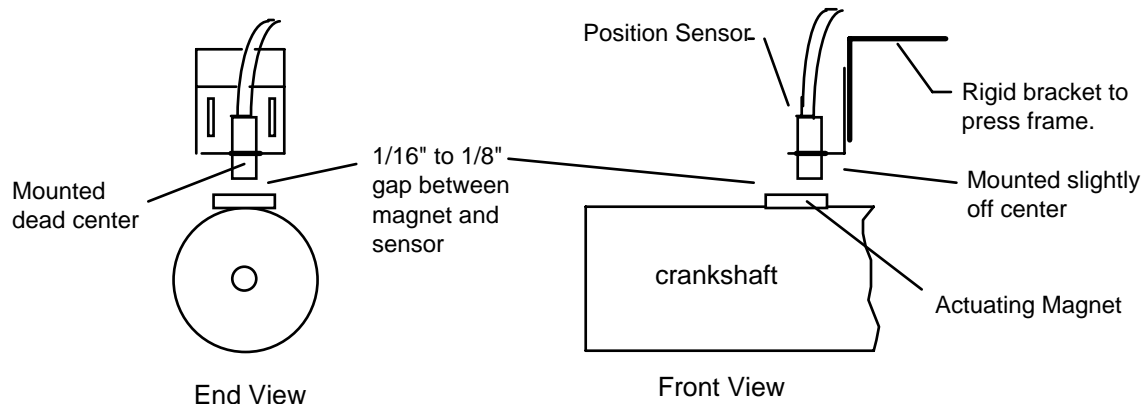


Figure 2-17. How to install the position sensor

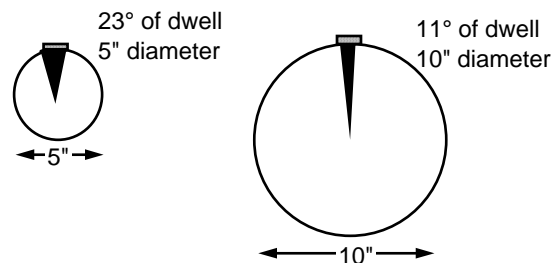


Figure 2-18. Position sensor dwell on different diameter shafts

9. You will now see the Initialization menu on your screen. Select "position sensor" from the menu. You will see a display like the one below. Press ENTER to enable the position sensor. The top line in the display above will say: "POSITION SENSOR ENABLED".

10. If you properly installed the position sensor, the second line in your display will say "POSITION SENSOR SWITCH CLOSED". If so, go to step 11.

If it says "POSITION SENSOR SWITCH OPEN", there is a problem. Since you just mounted the sensor and aligned it with the magnet, the sensor should be closed. Double check the wiring. Make sure the ram has not moved since you installed the sensor. If so, repeat step 4 in this section. If the ram has not moved, check the distance between the position switch and the magnet. Re-adjust if necessary. If you got a "position sensor incorrect" error message after running the press, it is also possible that the position sensor may not have enough dwell to provide an adequate signal at high speeds. The larger the diameter of the object on which the magnet is mounted, the shorter the dwell, as shown here. If this is the problem, the solution is to mount the magnet on a smaller shaft. If none of the above procedures change the display to "position sensor switch closed," the sensor may be bad. Try another sensor if available. Otherwise, call the factory for help. Do not go further until the problem is solved. You are done installing the position sensor.

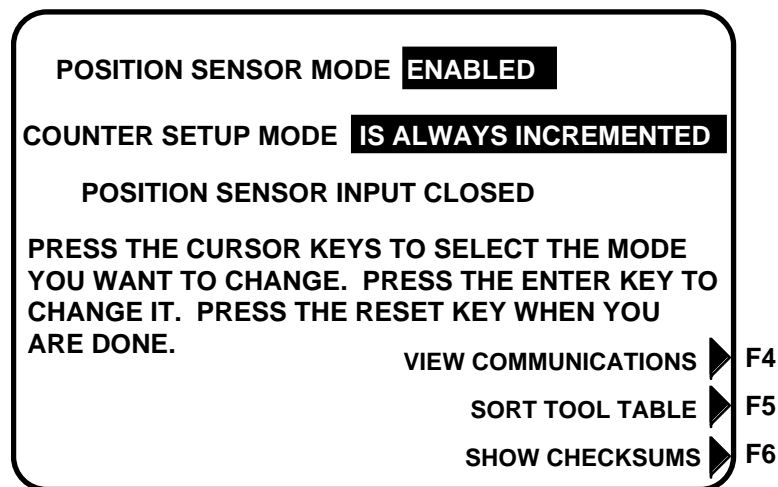


Figure 2-19. Enabling position sensor

DO NOT DISABLE POSITION SENSOR

Once installed, never disable the position sensor using Initialization to clear an error message. Misalignment between the resolver and crankshaft will not be detected.

Setting high speed version of SmartPAC (optional)

If you have a standard SmartPAC and wish to change the system to a high speed version (1600 SPM maximum), follow these instructions. You will also have to upgrade the SmartPAC firmware. To do this, refer to the next section.

1. See Figure 2-5a for the location of the jumper J112. Notice that the jumper is set on pins 1 and 2 (for "Low" speed).
2. Move the jumper so that it will be on pins 2 and 3 (for "High" speed).
3. You will also have to upgrade SmartPAC's firmware. Proceed to the next section.

Upgrading SmartPAC firmware

There may be times when you will need to upgrade SmartPAC or add SFIT[™] Servofeed Interface, communications capabilities, or other future product enhancements. Many times these upgrades require that you change SmartPAC's firmware. Follow these steps to upgrade the firmware.

CAUTION

The SmartPAC firmware board location is not interchangeable. Notice, too, that the style of the firmware board has changed. It is called the "4-meg" board and contains only 1 firmware chip, with 1 extra available slot (reserved by DI for future enhancement). It must be installed on the main processor board as illustrated in Figure 2-5d of this chapter.

1. Turn power off to SmartPAC. The LCD display on the front panel should be blank and the angle/RPM display should be unlit.

CAUTION!

Always verify that power has been turned off to SmartPAC!

2. Before you proceed, you should ground yourself by touching any large metal object. This will remove any static electricity that you may be carrying around. A static electricity "zap" will destroy the components.
3. Look inside SmartPAC and locate the firmware board, which is located toward the bottom left of the main processor board (Figure 2-5d). Take note of its orientation.
4. Remove the four screws which hold the board to the standoffs under the board, and put them aside for now.
5. Unplug and remove the board. Be sure not to confuse the old firmware board with the new one you will be installing. If necessary, jot down the version number that is found on the firmware chip's white label.
6. Verify that you are still "grounded", and then remove the new board from the package.
7. Plug the board in. The connectors on the underside of the board are keyed; so they can only be plugged in one way. These connectors will connect correctly with the mating pins on the main SmartPAC processor board.
8. Once the board is properly seated, screw the four corners down again (from step 4).
9. Turn the power on and verify the normal operation of the unit. If the unit powers up with a garbled display or "rolling" LEDs, turn the power off and check that the board is properly seated.

After some upgrades, you might find that SmartPAC generates a tool number checksum error the first time you try to reload each setup. SmartPAC creates a checksum for a tool number to check that the data stored in memory for the tool is the same as the data that comes out of memory when you load the tool number. (Checksum errors are explained further in Chapter 7.) To correct this problem, go back into Program mode and review the currently loaded tool number setup. Check your counters for accuracy; then reload this tool number again. If the unit is still malfunctioning, call Data Instruments for assistance.

Final checkout

If you have completed all procedures in this chapter, SmartPAC is almost ready to use. All you need to do is to make a few test press runs to ensure that SmartPAC is working properly. You will have to make some settings for a tool and load the tool number to run the press (refer to Chapter 5 for more assistance). If you are not familiar with how to use the SmartPAC keyboard and displays to create and load settings for a tool, begin to learn how to make settings now, and see Chapter 3 if necessary. Then complete the steps below for the final checkout:

Set up a "test" tool

1. Create a tool number and program counter settings.
2. Load the tool number and go into Run mode.

Check and set direction of rotation of resolver

4. Inch the press. Watch the angle/SPM readout. If the angle of the crankshaft decreases (goes from 359° towards 0°) instead of increasing, you have to switch two wires on resolver connector TB106. Switch the wires in terminals 2 and 5 (black and yellow). The angle will now increase as the ram moves.

Check for position sensor error messages (if installed)

5. If you installed a position sensor and a position sensor fault occurs, refer to step 11 of the *position sensor installation procedure*. For other error messages, go to Chapter 7 for a description of the error message. Follow the instructions under the error message for solving the problem. Once you correct the problem, press RESET and run the press again for a few strokes, checking for error messages. If none occur, go to step 3. If you cannot solve the problem, call Data Instruments' technical advisors for help.

Check the top stop circuit

6. Check the top stop circuit. Set the stroke counter preset to a small value (e.g. 10) using the keyboard and display. See Chapter 5 -- "Set counters" if you need help. Run the press in continuous mode until the preset value is reached. Check that the press top stops and that a message telling you that the preset was reached is displayed on the screen (see Chapter 7 for counter preset messages).
7. If the press did not top stop and SmartPAC displayed a message, there is a problem in your top stop circuit. Recheck all wiring and trace the cause of the problem. Do not continue with this procedure until the press top stops when you trip the sensor.

Check the emergency stop circuit

8. Perform the 90° stop-time test to verify the emergency stop circuit. Refer to the steps detailed in the section "Stop Time, Stop Angle, and 90° Stop-time Test", and specifically "Performing the 90° stop-time test", found in Chapter 6. If the press did not stop, there is a problem in your Emergency stop circuit. Recheck all wiring and trace the cause of the problem. Do not continue with this procedure until you get an immediate stop when you trip the sensor.

Check cam channels (if the optional ProCamPAC is installed)

9. Turn SmartPAC off, and plug in the connector to TB301. (Remember we told you to unplug this earlier). Go into Run mode and create some test settings for your cam channels. Load the tool settings, go into Run mode, and run the press. Ensure that the equipment (feed, blow off, lube, etc.) controlled by each channel is working properly according to the settings you made.

Test complete

11. If you got to this step, everything is working right. Clear any error message by pressing RESET. *Delete the test settings.* You can now load a tool, create settings for the tool, and begin to make parts using your new SmartPAC.

Wiring setup mode circuit (optional)

The setup mode allows you to disable green sensors and disable parts/batch counters using a remote switch. Typically the setup mode circuit is enabled when the "Inch" mode is selected on your clutch/brake control. Then when you inch the press, SmartPAC will not stop the press when a fault condition is detected. The setup mode terminal can be wired to an extra contact on the inch switch of your press control, or you can use an external switch to activate the circuit. If you plan to use the setup mode circuit, plan how you will run your wiring for this connector now so you do not have to disconnect conduit or rerun wires through conduit later.

Connecting to a non-Wintriss relay press control:

You must provide contact closure when a non-Wintriss press control is in Inch mode. Then connect a wire from SmartPAC terminal block TB201, terminal #249 (inch/setup) to one side on a normally open switch. Connect the other side of the switch to Gnd (TB201, terminal 252). Refer to your electrical prints or the manual for your press control to plan your wiring.

Wiring a remote reset switch (optional)

Like the setup mode terminal, the remote reset terminal can be wired to a normally open switch to activate the circuit. Be sure to plan how you will run your wiring for this connector so that you do not have to disconnect conduit or re-run wires through conduit later. Connect a wire from SmartPAC TB203, terminal 257, to a normally open switch. Connect another wire from the switch to Gnd (TB203, terminal 258). SmartPAC is reset with a momentary connection to ground.

Wiring a sensor-disabled output (optional)

You can wire a sensor-disabled output to a customer-supplied solid-state relay. This output can be used to warn personnel that the die protection capability (if installed) is disabled. You might connect this relay to a warning light, for instance. Connect the positive input wire from your 12Vdc solid-state relay to DiProPAC TB550, terminal 302 (relay power). Connect the negative input wire from this relay to DiProPAC TB550 terminal 306 (auxiliary 1). You cannot use more than 8 mA for your relay.

Wiring the ProCamPAC output with your mechanical top stop cam switch (optional)

This is how to wire ProCamPAC and your mechanical cam switch to be used for Top Stop.

WARNING

1. This does not affect or improve the safety of the system! Your clutch/brake control must be control reliable on its own. This only improves the efficiency of the system because of ease in adjusting the top stop and in utilizing the auto advance feature.
2. The system must be tested after wiring (as described below) to ensure proper functioning of the Top Stop circuit.

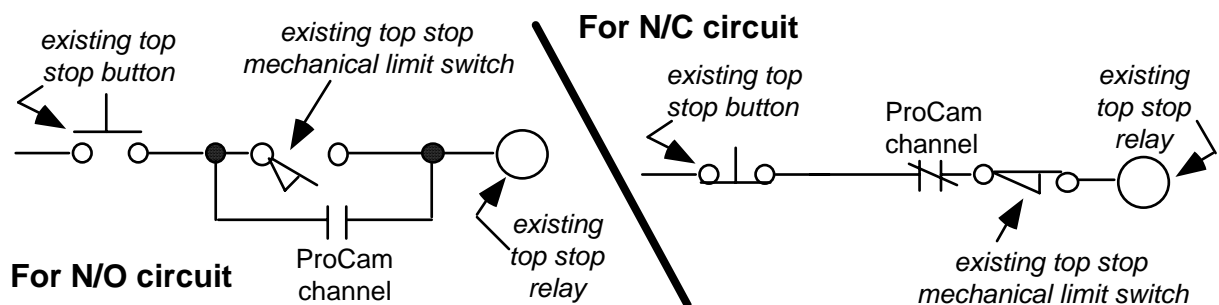


Figure 2-20. Optional top-stop wiring

How to test the wiring

For N/O circuit: Temporarily do not program the ProCamPAC channel used for this wiring, so that it is "off" (open) all the time. Confirm that the press will still top-stop as before.

For N/C circuit: Temporarily program the ProCamPAC channel used for this wiring, so that it is "on" (closed) all the time (i.e. On = 1°, Off = 0°). Confirm that the press top-stops as before.

Refer to Chapter 5 for proper programming of SmartPAC.

Final assembly if you have a panel mount

Once the final checkout has been confirmed and SmartPAC is working satisfactorily while it has been sitting outside the enclosure, you are ready to completely install the SmartPAC panel mount into your panel enclosure. Earlier (in the section, "Installing SmartPAC as a panel mount") you were instructed to cut out a hole in your panel enclosure. Mount the SmartPAC panel assembly into this cavity using fourteen #10-32 screws. Refer to Figure 2-3 for mounting and "cutout" dimensions for SmartPAC panel and your enclosure.

Chapter 3

About the keyboard and displays

This chapter gets you started in learning how to use the SmartPAC keyboard and displays. It explains how the displays are organized and how you perform tasks by selecting items on a display. It also explains the function of all keys on the keyboard.

Why using SmartPAC is easy

It is easy to use SmartPAC. Just read the messages to see what key to press in order to proceed to the next step. Once you get the knack of it, you will find it very fast and easy to make settings.

When you are learning, do not be afraid to try things. Push the keys. Select items on the displays. See what happens. You cannot hurt SmartPAC by pushing a wrong key or making a wrong selection. This chapter gives you the basics that will get you started. Later chapters explain in more detail how to use the different operating modes in SmartPAC.

Your starting point in each mode

When you use SmartPAC, you choose the displays you want to see to get the task at hand done. The displays you see depend upon which mode of operation you are in. SmartPAC has three modes of operation—Initialization, Programming, and Run. Each mode allows you to do different tasks.

In Initialization mode, you make certain settings you generally only once after installing SmartPAC. Chapter 4 explains this mode.

In Programming mode, you make counter settings, create, modify, and load tool numbers, and do other programming functions. See Chapter 5 for details.

You must be in Run mode to operate the press. In this mode, you can adjust your cams and sensors even while the press is running. You can switch between Program mode and Run mode by turning the Program/Run key to "Program" or "Run". Use Chapter 6 to operate SmartPAC.

Remember, what you can do in each mode is described in detail in later chapters. Here we show you how to get started in each mode.

The first displays in each mode - menus

From the first display in each mode, you can call up other displays to carry out specific tasks (set counters, adjust settings, etc.). Think of these displays as **menus**. You select from the menu what you want to do. Then you will see another display for that task. Here are the first displays—or menus—you see in each mode.

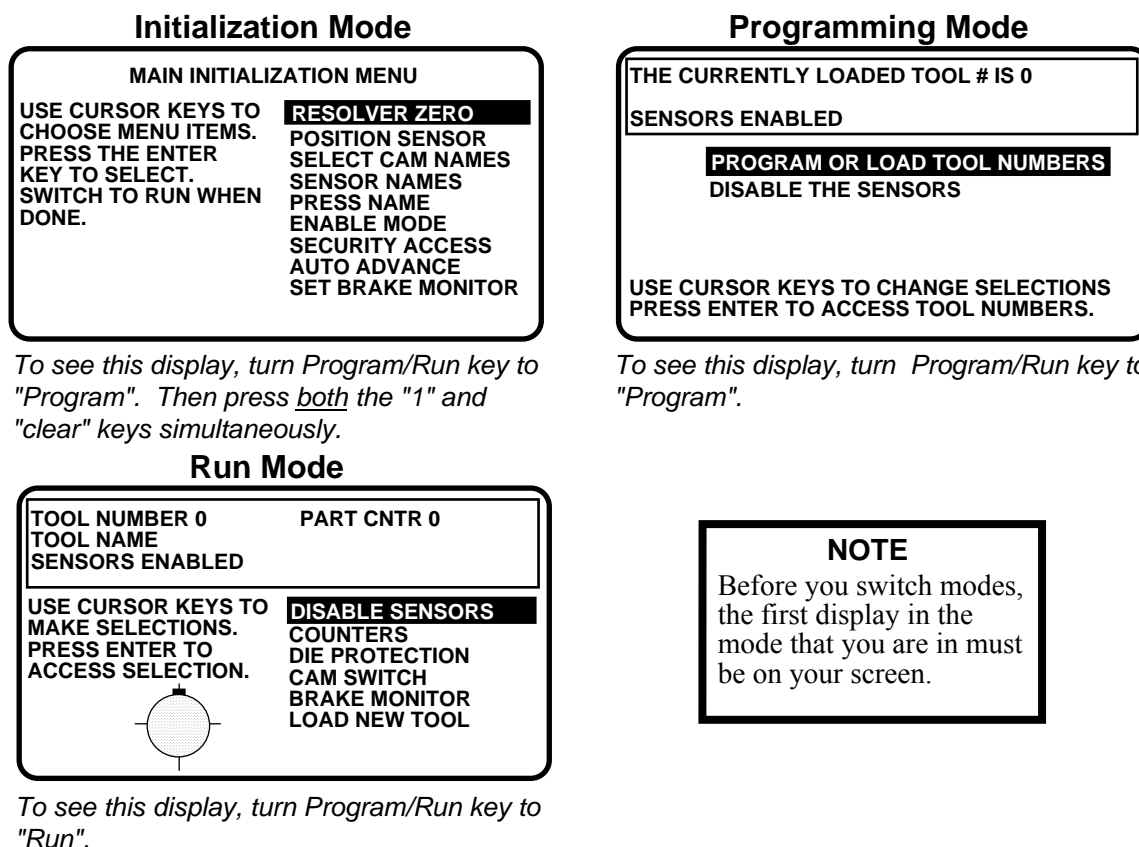


Figure 3-1. First "menus" for different operating modes in SmartPAC

From the first display down

Now look at the flow charts for each mode on the next page. They show how you move through the SmartPAC displays starting with the first display. Each box represents a choice you can make or a task you can perform. Follow the black arrows that point down. See how you work your way down, choosing the tasks you want to perform.

When you do this on SmartPAC, you will see a new display each time you make a selection. You continue to select items from each new display until your task is complete.

When you complete a task (like making settings for a tool), you have to go back up to start other tasks. You can go back just as easily as you go forward. See the gray arrows that point up. That is the route back. Try tracing a path down from the first menu. Then go back up. Try different routes. This will give you a good idea of how you carry out tasks using the displays.

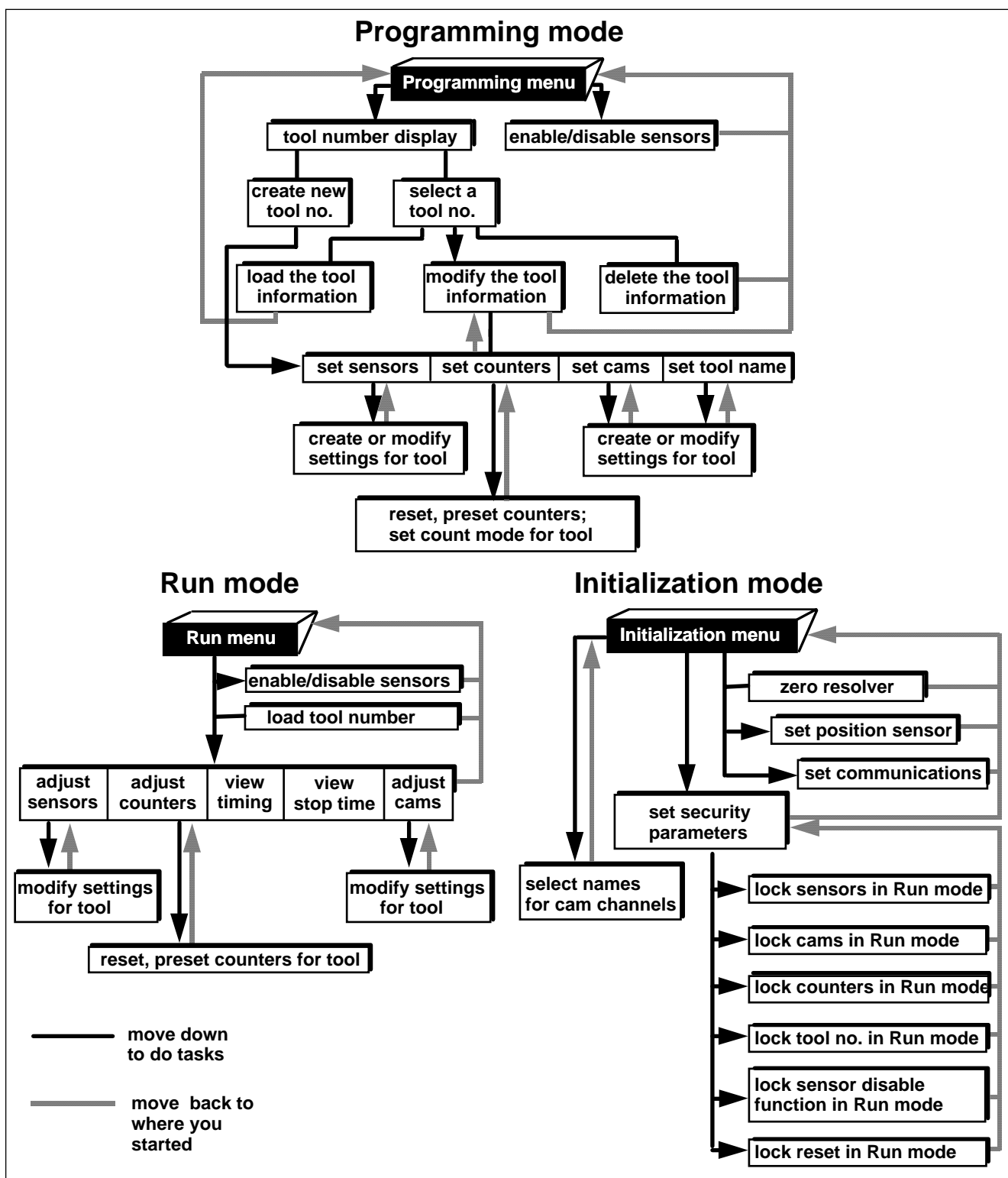


Figure 3-2. SmartPAC "road map"

Selecting an item on a display

Here is the first display you see in Programming mode -- the tool number display. Notice that the currently loaded tool number is highlighted. If no tool number has been loaded, then the word "NEW" is highlighted.

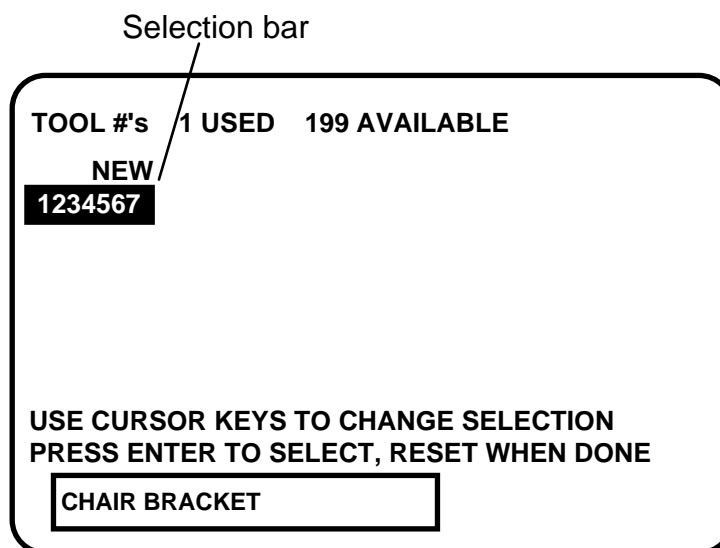


Figure 3-3. Illustrating selection bar at tool number display

The numbers (or letters) are white and are surrounded by a black box. The black box is the selection bar. Whenever an item in a display is highlighted like this, it is the one selected. In every menu you see, an item will be highlighted. You can move the selection bar to any item on the screen using the "up" and "down" cursor keys.

SELECT = HIGHLIGHT + ENTER

When we say SELECT in this manual, it means highlight the item and press ENTER.

Make the appropriate selection, and then press ENTER. SmartPAC shows you the next display, allowing you to make another selection or make a setting. A message at the bottom of every display tells you what to do next.

You will use the cursor keys, the RESET key, and the ENTER key a lot to move through the menus to get your work done. It is fast and easy. See "Using the keyboard" next for a description of all the keys. See Chapter 5—"Using SmartPAC in Program mode" to learn what happens when you make the selections above.

Using the keyboard

The SmartPAC keyboard is made up of number keys, cursor keys, function keys, an ENTER key, and a RESET key.

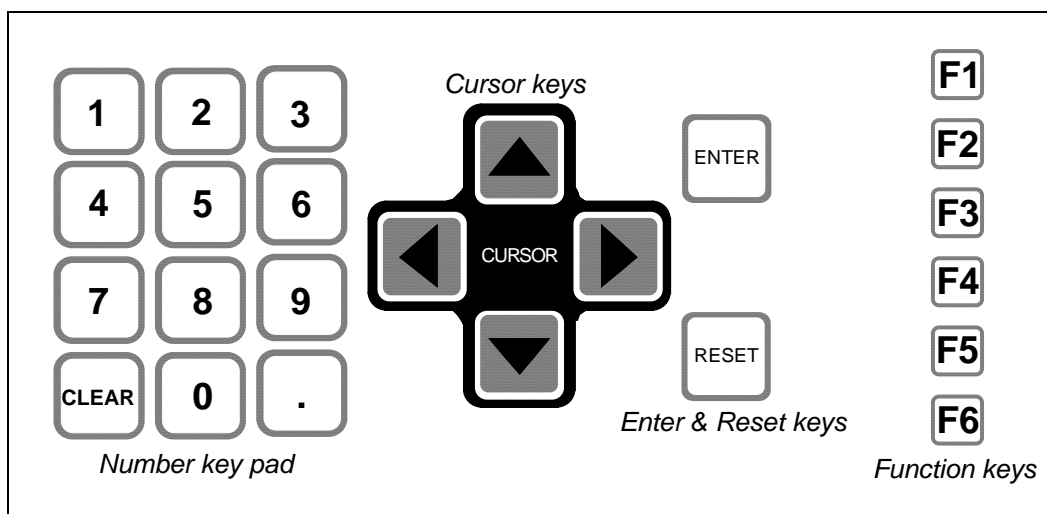


Figure 3-4. Illustrating available keys at SmartPAC

Number keys

You use the number keys to input numeric values, such as counter presets or tool numbers. You will see a display similar to the illustration below, which guides you on how to use the number keys, as well as the cursor keys. When you are done entering a number using the number keypad, press ENTER. SmartPAC will accept the number and move on to the next display. SmartPAC accepts numbers up to seven digits in length.

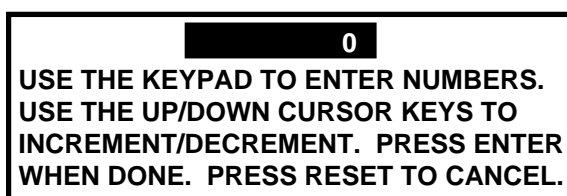


Figure 3-5. Superimposed instructions for entering numbers

You may also see the following display. This superimposed screen enables you to enter a variety of characters including: alpha-numeric, symbols, spaces, etc. Pressing the CLEAR key clears the text. You can "custom" name your press, cam channels, sensors, and the tool.

- a. To key in letters: Use the up, down, left, and/or right cursor keys to highlight the desired letter; then press ENTER.
- b. To key in numbers: Use the number keypad; then press ENTER.
- c. To accept your selection, press function key **F6** (to the right of the LCD display). To cancel your selection, press RESET.

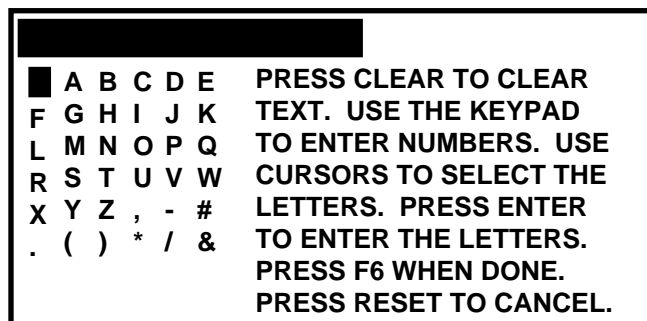


Figure 3-6. Superimposed custom name screen

Cursor keys

You use the cursor keys to move the selection bar over the item on the display you want to select.

Moving the selection bar with the cursor keys

Every menu has an item highlighted (usually the first item). The selection bar—a black bar—covers the item. The cursor keys control the selection bar.

Up, (▲), Down (▼)

These keys move the selection bar up and down a column of items on the display. For instance, if there are four items on a display, and you want to get to the fourth item, press the "down" key three times. You can also hold it down until you see the selection bar over the fourth item. If you go too far, press the "up" key to go back. When you hold a key down, the bar keeps moving.

If you have more than one column of items on a display, the bar will move from the bottom of one column to the top of the next column. It will continue moving through all the columns (and keep repeating) until you let up.

Left (◀), Right (▶)

If you have a display with two columns of items, you can move the selection bar from the first column to the second column quickly by pressing the "right" key. To go back to the first column, press the left key.

Sometimes a display has more columns than appear on the screen. A good example is the tool number display. It can have up to 40 columns (for 200 numbers). However, only four columns can appear on the screen at once. To see a new column, press the "right" cursor key to move the bar to the right-most column, then press the key again. A new column will appear at the right if there are more tool numbers.

You can keep pressing the "right" key to see more columns. To go back to the first four columns, move the selection bar to the left-most column using the "left" cursor key, then press the key again. New columns will appear at the left until you get back to the beginning.

If you keep holding the "right" key down when there are more than four existing columns, columns will continuously appear on the right until you let up. If you get to the end of all the columns, the columns will repeat from the beginning.

If you keep holding the "left" key down, columns will continuously appear on the left until you let up. When you get to the beginning of all the columns, they will repeat from the end.

Using cursor keys to set timing

You use the cursor keys to set timing for your optional programmable cam switch and sensors — in other words to set the angles where you want a cam channel or ready signal to turn "on" and "off".

Notice the circle diagram on your screen (see the next illustration). The **circle diagram** dynamically illustrates the on and off angle settings that you programmed for a sensor and/or cam channel. The cursor keys graphically move a circular arc around this circle diagram. These cursor keys function only when you have selected a display to make or change timing settings. See Chapter 5 for complete instructions on how to create a tool number and make all settings.

The "right" (▶) cursor key increases the "ON" setting — moves the arc clockwise.

The "left" (◀) key decreases the "ON" setting — moves the arc counter-clockwise.

The "up" (▲) cursor key increases the "OFF" setting — moves the arc clockwise.

The "down" (▼) key decreases the "OFF" setting — moves the arc counter-clockwise.

This is the starting point for setting sensor timings using cursor keys.

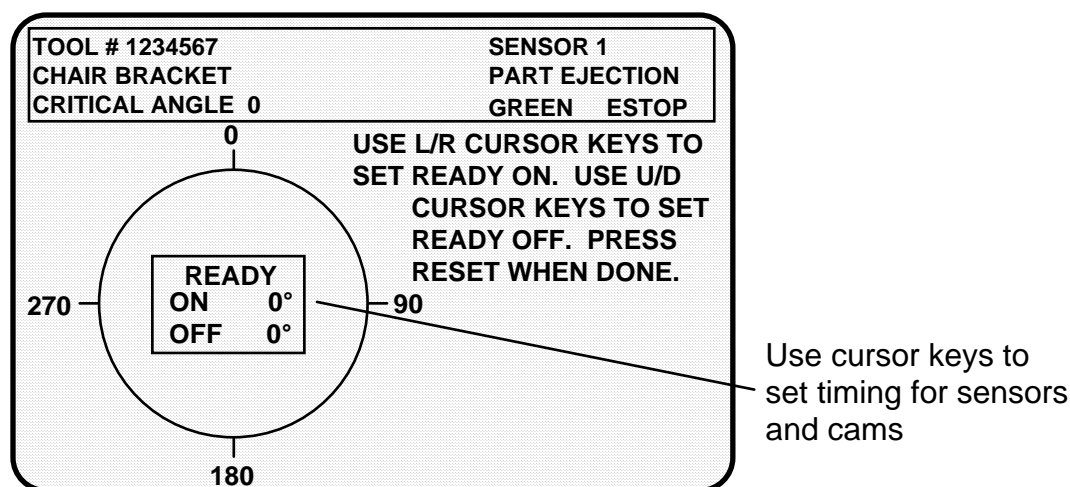


Figure 3-7. Setting timings using cursor keys

Press the "right" (▶) cursor key once. You will see this display:

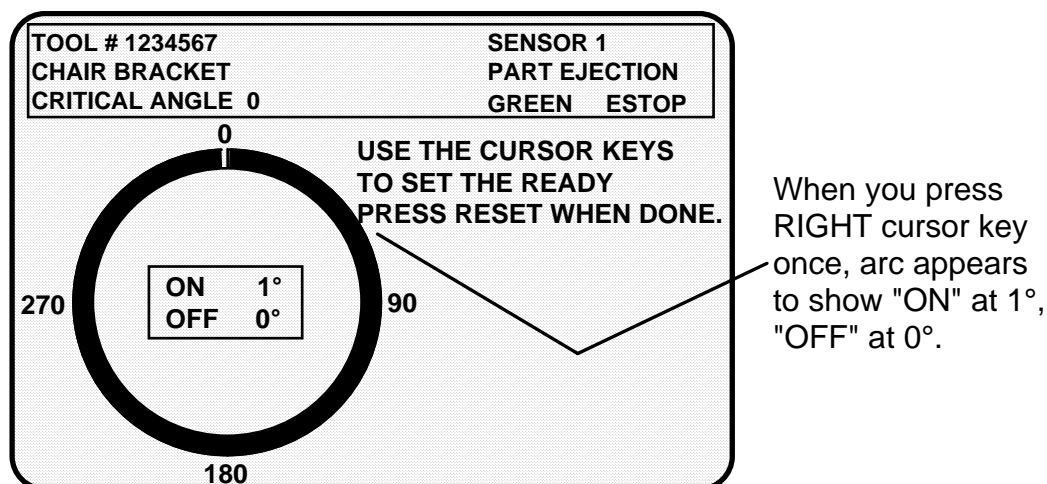


Figure 3-8. Illustrating "on" at 1°, "off" at 0°

The on/off box shows on at 1°, off at 0°, and the arc shows this graphically on the circle diagram.

NOTE: Remember, the 0 point and the 360 point on the scale beneath the screen are the same point on the crankshaft.

To make the "on" setting, press the right (►) cursor key. You can hold it down so the arc keeps moving. The arc will wrap around and begin to extend from 0 towards 90°. Stop when the arc reaches 40°. This is the desired setting. Look to see that "angle ON" in the box shows 40°. If you go too far, use the left (◄) cursor key to back up. The display will look like the following illustration:

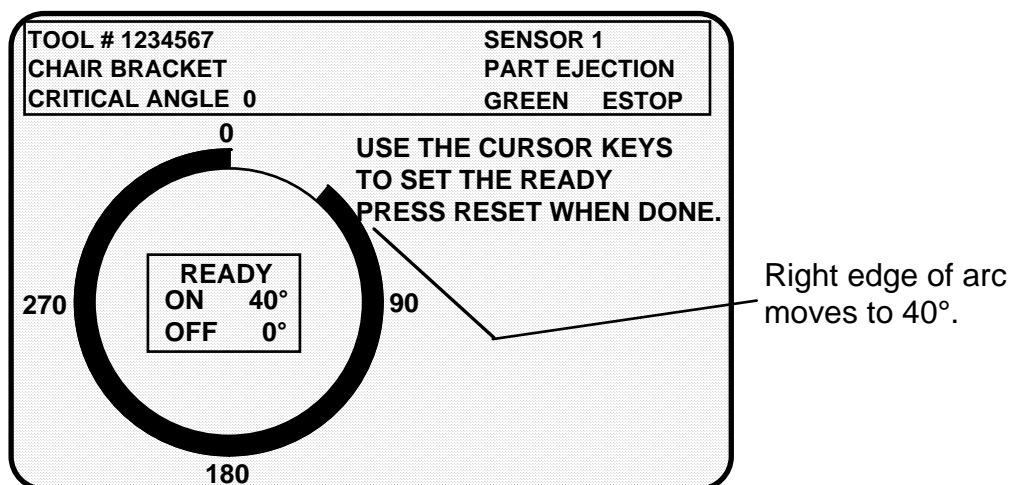


Figure 3-9. Setting "Angle ON"

To set the "off" setting use either the "up" or "down" cursor keys. In this example, press the "down" (▼) cursor key. You can hold it down and the arc will keep moving until you let up. The left edge of the arc moves counter-clockwise. Stop when the left edge is at 250°. Check the "off" setting in the box. It should show 250°. If you go too far, use the

"up" (▲) cursor key to back up. Now your sensor is on at 40°, off at 250°. Here is an illustration:

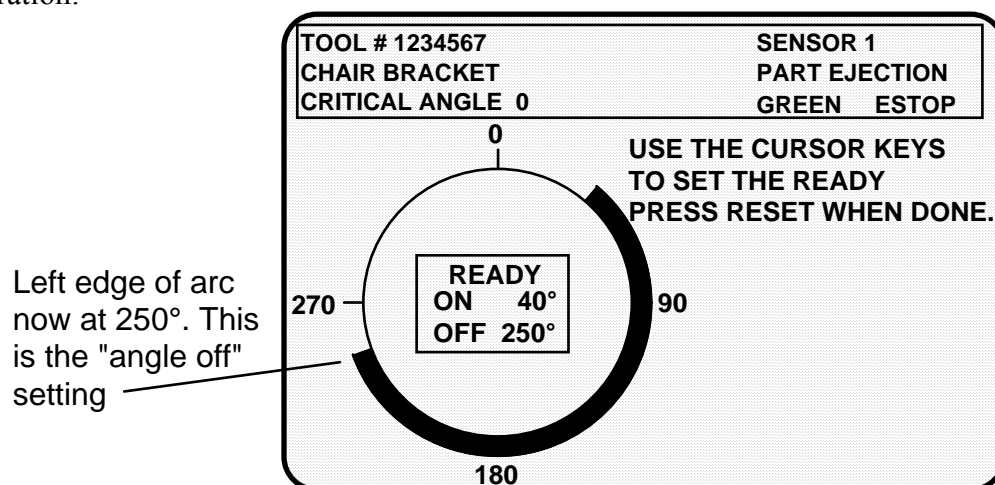


Figure 3-10. Setting "Angle OFF"

You are done making the ON-OFF setting for the sensor. You can adjust this setting any time you want using the cursor keys. The on and off setting will always show in the "ON/OFF" box.

RESET and ENTER keys

Reset key

The Reset key has two functions.

Going back to the previous display

The Reset key is used to go back to the previous display when making settings. For instance, say that you displayed your list of tool numbers on your screen. The next step is to create a new tool number or change settings for an existing one. But if you just want to see the tool numbers and then do something else, just press the Reset key, and you will go back to the previous display.

You are always told at the bottom of your screen when you can use the Reset key to go back to the previous display. For instance, the message will say, "Press Reset when done," or "Press Reset to cancel."

Resetting SmartPAC

The Reset key is used to reset SmartPAC when an error is generated or a counter preset is reached. When you press Reset, you are returned to the display where you were before the message appeared. You can once again run the press.

Enter key

You press the Enter key after moving the selection bar to an item on the display. When you press Enter, SmartPAC shows you a new display based on your selection. Using the cursor keys to make a selection and then pressing Enter or Reset are the three most frequent things you will do when using SmartPAC. You also press the Enter key after keying in a number. This tells SmartPAC to accept the number.

Function keys

Periodically you will be instructed to use function keys to perform certain tasks in SmartPAC. The message on the LCD display will identify the specific function key number (from **F1** to **F6**) to press, if applicable.

Chapter 4

Using SmartPAC in Initialization mode

This chapter describes how to use all the displays you will see in Initialization mode. It covers checking the resolver zero position and the position sensor, setting the brake monitor, locking settings in Run mode, setting the reset mode, and setting communications parameters.

This chapter also includes programmable cam-related functions, such as selecting channel names, locking settings in Run mode, and setting the auto advance constants; and die protection-related functions, such as setting auto enable.

Initializing SmartPAC

Now that you have completely installed SmartPAC, you are ready to initialize the system. In Initialization mode you make settings in SmartPAC that you typically only need to make once during or after installation. For example, you set Stop and Start Time Limits in Initialization mode. Also, you zero the resolver using Initialization mode, and you can lock certain settings in Initialization mode so unauthorized personnel cannot make adjustments or reset faults. These actions are only done once during installation. If installed, you can also enable the position sensor and check position sensor operation using Initialization mode. These actions are done only once during installation.

How to get into SmartPAC Initialization mode

NOTE

Before changing modes, make sure your screen shows the first display in the mode you are in. If that display is not shown, nothing will happen when you turn the Program /Run key. In that case, keep pressing the RESET key. When the first display in the mode is reached, SmartPAC will instantly switch to the new mode.

To get into Initialization mode, turn the Program/Run key to "Program" and then press both the "1" and "CLEAR" keys simultaneously for one second. See "Using the keyboard" - Chapter 3. You will see a display that looks similar to the next illustration.

NOTE: *Your screen may vary depending upon the additional capabilities built into your SmartPAC. This display shows ProCamPAC and DiProPAC options.*

SELECT = HIGHLIGHT + ENTER

When we say SELECT in this manual, it means highlight the item and press ENTER.

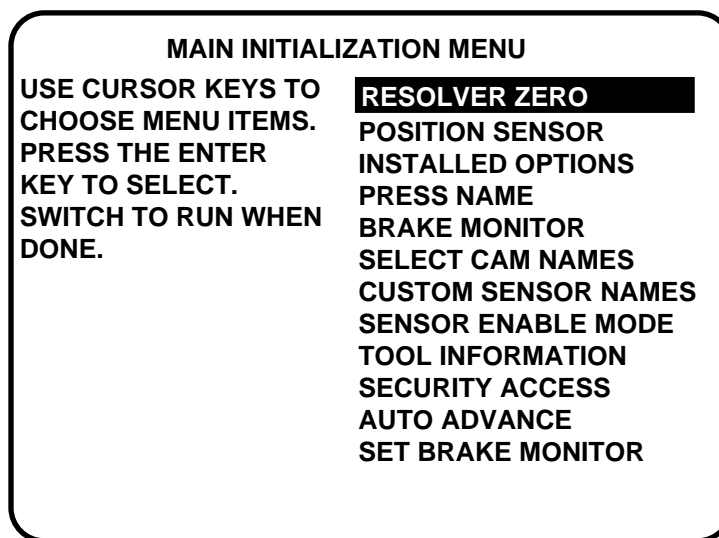


Figure 4-1. SmartPAC Initialization menu (the order may vary depending upon the options you have installed)

This is the Initialization menu—the first display in Initialization mode. From this display, you can call up all the other displays in Initialization mode.

Each of the available menu choices is described next.

To get out of Initialization mode

To get out of Initialization mode and into Program mode:

Turn the Program/Run key to "Run" to go into Run mode and back to "Program".

If the Initialization menu was not displayed on your screen when you turned the key, this means that you were farther into Initialization mode. Keep pressing the RESET key until you get back to the Initialization menu. Now when you turn the key, the new mode will appear. *Get into the habit of always backing out of one mode before entering another mode.*

Zeroing the resolver

Zero the resolver is discussed in detail in the section "Zero Resolver" found in Chapter 2.

If you replace resolver with a new one (installation steps are discussed in the section "Installing the resolver" in Chapter 2), you will need to rezero the resolver. This is discussed in the same section referenced above, "Zero Resolver" in Chapter (specifically "How to replace and rezero the resolver").

Position sensor

This choice on the Initialization menu allows you to enable the position sensor if one is used. (Using a position sensor is optional.) This choice also allows you to check that the position sensor is working properly after it has been installed.

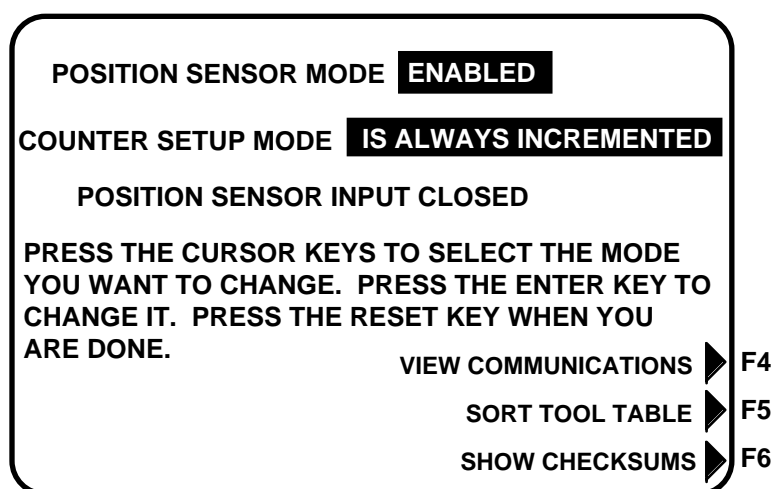


Figure 4-2. Position sensor display

If you are not using a position sensor, the only time you need to use this choice is to ensure that the position sensor is turned off. You should check this setting if SmartPAC stops the press and you get this error message: "Position sensor incorrect." This means you need to turn the position sensor off as described below. Refer to Chapter 7 for more information about this error message.

If a position sensor is installed

You use this menu item after the position sensor has been installed to turn the position sensor on and check operation. See "Install position sensor" in Chapter 2 for more information on the position sensor and how to use this menu choice.

If no position sensor is installed

If you do not use a position sensor, you should see this display when you select "Position sensor." This is the factory setting. If the message says "POSITION SENSOR ENABLED", press ENTER. The message will then correctly say, "POSITION SENSOR DISABLED". Then press RESET to return to the Initialization menu.

Counter setup mode

Depending upon how you wired SmartPAC, you can disable or enable the counter setup mode. (Refer to the section later in this chapter called "Wiring setup mode circuit".) If you performed this wiring, this made your SmartPAC "setup mode-ready". This means that you can activate (enable) or deactivate (disable) the setup mode at this screen.

Select "Counter setup mode" and determine the most appropriate choice by pressing Enter to toggle among items explained below. *Once you press Reset to exit the screen, your choice is confirmed.*

How any of your choices affect Strokes Counter

In all cases, strokes counter will increment regardless of the mode that you are in.

"IS ALWAYS INCREMENTED"

This means that the batch and parts counters will increment on every stroke whether you are in setup mode or not.

"NOT INCREMENTED IN SETUP MODE"

This means that the parts counter and batch counter (*when tied to "parts" counter only*) will not increment when you are in setup mode.

View communications - press F4

Perform this function when there is a need to verify the communications port between SmartPAC and the various installed modules, including SFI, Module (for AutoSetPAC), PACNet®, etc. Press function key **F4** for "View communications".

Now select the module in question that you want to test, such as: "PORT 1 (SFI)".

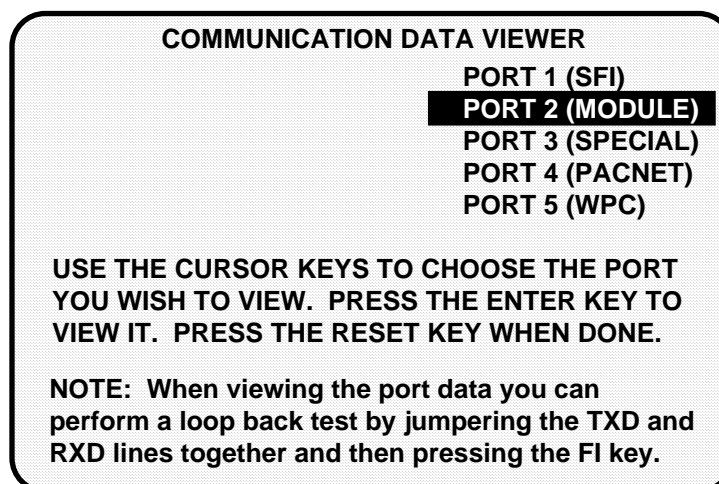


Figure 4-3. Communications data viewer screen

Here is the screen that will appear (see next page):

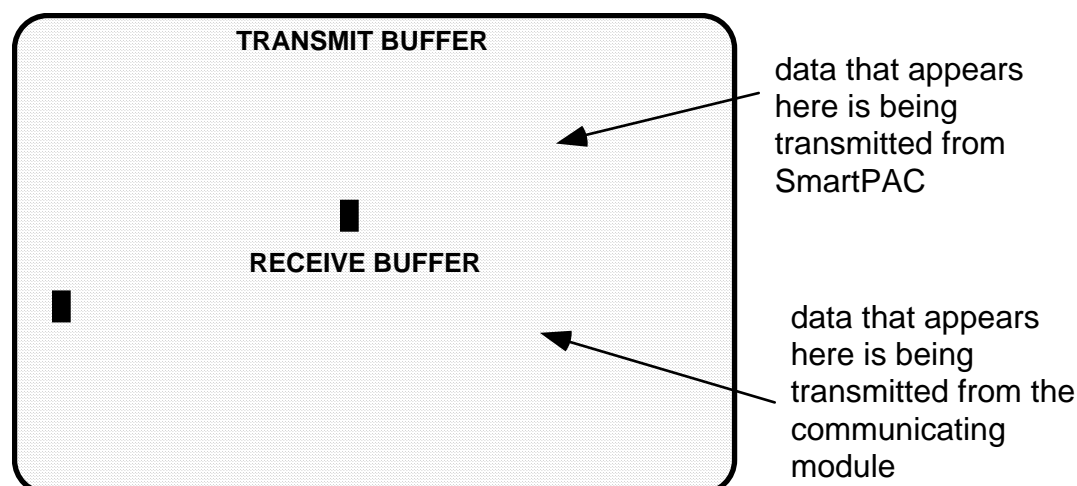


Figure 4-4. Actual communications

To view normal communications between SmartPAC and the communicating module (e.g. SFI), you should expect to see some text (data) in both the "transmit buffer" and "receive buffer" locations on the above screen. If you do not see any data (or only partial data), this means that SmartPAC and the other module are not communicating properly.

At this point if you detect a problem in communications, you may decide to perform a "loop-back test" (see Figure 5 for RS232 connections, or Figure 6 RS485 connections to properly wire the loop-back test for SmartPAC, located at the end of the manual). A loop-back test is one where you connect (or jumper) the TXD (transmit) and RXD (receive) lines together, and then press **F1** to check communications. In effect, you are actually "receiving" the communications data that you are transmitting. This test is useful when verifying the accuracy of the transmit and receive hardware and wiring. If you need further assistance or direction on performing the loop-back test, contact Data Instruments technical advisors. If you do, please supply: **product name** (e.g. SmartPAC standard); **installed options** (e.g. DiProPAC, ProCamPAC, etc.); and **firmware version number** (e.g. Vs. 2.00). You can determine the last two items, by going into "Installed options" in the Initialization mode (see the next section for details). You can also determine firmware version number from the chip on the processor board (see "location of components" in Chapter 2).

Sort tool table - press F5

Perform this function when there is a need to sort the tool number display in Program and Run modes. Sometimes, when you are adding more tools, or deleting some, SmartPAC may display them in a random order. Simply press the appropriate function key (see Figure 4-2), and the tool numbers are automatically resorted. Don't worry. The tool information is still intact.

Show checksums - press F6

The purpose for this display is to show checksum information. SmartPAC creates a checksum for a tool number to verify that the data stored in memory for the tool is the same as the data that comes out of memory when you load the tool number. *More than likely, you will never have to use this function unless specifically instructed to by Data Instruments technical personnel.*

Installed options

This is a very useful display that indicates how your SmartPAC has been configured. It includes software version numbers and the specific optional capabilities that have been installed. It also tells you how many cam channels and/or sensors you can connect to SmartPAC. Here is an example:

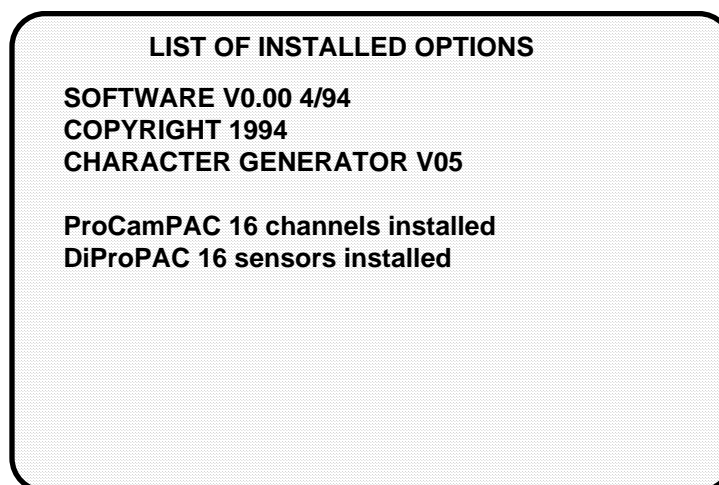


Figure 4-5. Installed options for easy identification

Press name

You use this choice to name the press on which SmartPAC is installed. As the screen suggests (refer to Chapter 3 or see Figure 4-11 in this chapter for an illustration), certain keys enable you to name the press. The name you choose can be any combination of alpha-numeric characters, symbols, etc. Pressing the CLEAR key clears the text. To make other entries, do the following:

1. To key in letters: Use the up, down, left, and/or right cursor keys to highlight the desired letter; then press ENTER.
2. To key in numbers: Use the number keypad; then press ENTER.
3. To accept your selection, press function key **F6** (to the right of the LCD display). To cancel your selection, press RESET. (For assistance in using the various keys, refer to Chapter 3.)

Brake Monitor

With its built-in brake monitor, SmartPAC checks the condition of the brake by measuring stopping time every time the press top-stops. *Stopping time* is the time that it takes the crankshaft to stop once the Dual Safety Valve (DSV) deactivates. SmartPAC measures how long it takes from the time that the dual safety valve is de-energized to the actual stopping of the press crankshaft. SmartPAC then displays this value in milliseconds. When SmartPAC is first initialized, the stop time limit is factory set at 500 milliseconds. (One millisecond equals 1/1000th of a second -- 1 mS = .001 second)

Be sure that you have completed the entire installation and that everything is operating properly. If so, you are ready to:

- determine what your press's top stopping time is
- calculate the press's stop time limit, and
- set the stop time limit

Determining the press's stopping time

First you need to determine the press's stopping time under normal stopping conditions, which is usually top stop. Therefore, the stop time limit must be calculated based upon stopping time at *top stop*.

The 90° stop-time test is required in order to set the proper safety distance for personnel guarding devices including light curtains, two-hand controls, and type-B movable barriers. This test is done at the press's most critical stopping point -- 90°. The worst case scenario occurs half-way through the downstroke at 90° while the press is running in continuous mode. Therefore, SmartPAC is designed to check stopping time at that critical crankshaft angle. (The 90° stop-time test is discussed in the section "Stop Time, Stop Angle, and 90° Stop-time Test" in Chapter 6.)

To find the press's stopping time, follow these steps:

1. Install the heaviest upper die set into your press. Adjust the counterbalance for ram weight (if the press has a counterbalance).

IMPORTANT

Before you can go into Run mode, a tool number must be programmed and loaded in Programming mode. For simplicity, you can program some counter values in a test setup. Consult Chapter 5 for assistance.

2. Set the PROG/RUN key to "Run" (make sure that you had pressed RESET first). This will get you into SmartPAC's Main Run menu. Now select "Show Stop Time", as seen below.

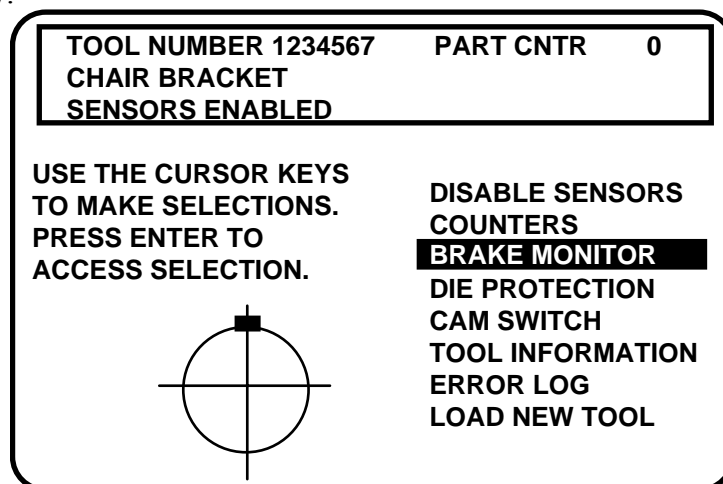


Figure 4-6. SmartPAC's Main Run menu featuring "Brake Monitor"

3. Start the press. Run it in continuous mode, allowing it to reach normal operating speed. Notice now that the actual press speed -- "SPM" -- automatically appears in the LED display.

4. Top stop the press. Look at the reading in the LCD display (seen below). This is the stopping time of your press. Remember that the number in the display is in milliseconds (mS).

TOOL NUMBER 1234567 PART CNTR 0		
CHAIR BRACKET		
SENSORS ENABLED		
STOP TIME STATUS		
	VALUE (MSEC)	LIMIT (MSEC)
STOP TIME	250	300
START TIME	155	200
STOP ANGLE	75	75
90 STOP	0	
PRESS THE UP CURSOR KEY TO START THE		
90 DEGREE BRAKE TEST.		
PRESS THE RESET KEY WHEN DONE.		

Figure 4-7. 90° stop time display

5. Do this test at least 5 more times. Record the highest reading from all your tests. This is the stopping time you will use to set the Stop Time Limit.

Calculating the press's stop time limit

Once you know the press's actual stopping time, you need to add extra time to this number to compensate for *normal* wear in your brake. Otherwise, SmartPAC would stop the press as soon as the stopping time increased just slightly. This extra time is referred to as "T_{bm}". The minimum value that you can set is 10 mS. The stopping time plus T_{bm} will be the stop time limit setting.

10% for old brakes, 20% for new brakes

The rule of thumb for determining the best stop time limit is to add 20% to the stopping time of your press if your brakes are new. Add 10% if your brakes are old.

Here is the reasoning behind this rule. Stopping time should be less with a new brake. So when the 20% is added to stopping time, the number should be approximately the same as the number you get when you add 10% to stopping time for an older brake.

Examples for calculating the stop time limit

Example 1: Your recorded stopping time is 207 mS and your brake is old:

Take 10% of 207: $T_{bm} = .10 \times 207 = 20.7$ -- round it up to 21 --

Add 21 to 207 $207 + 21 = 228$

228 mS is the calculated stop time limit.

Example 2: Your recorded stopping time is 175 mS and your brake is new:

Take 20% of 175: $T_{bm} = .20 \times 175 = 35$

Add 35 to 175 $175 + 35 = 210$

210 mS is the calculated stop time limit.

Setting Stop Time Limit

Now you need to set the Stop Time Limit based on the calculation above. Go to the Initialization mode (see the beginning of Chapter 4 for assistance).

1. Select "Set brake monitor" from the Main Initialization menu (Figure 4-1). Select "Stop Time". You will see this next display:

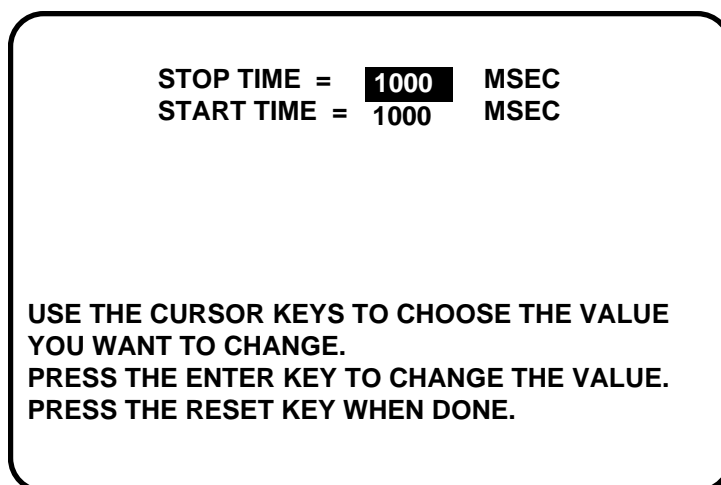


Figure 4-8. "Set Brake Monitor" display in SmartPAC's Initialization mode

2. The bar highlights the Stop Time Limit value. To change this value, press ENTER. Now the message at the bottom of the display reads:

USE CURSOR KEYS TO CHANGE VALUE
PRESS RESET WHEN DONE

CAUTION

*Any time you change the Stop Time Limit on SmartPAC, you **must** perform the 90° stop-time test, and you also must recalculate the new safety distance! Refer to the steps detailed in the section "Stop Time, Stop Angle, and 90° Stop-time Test", and specifically "Performing the 90° stop-time test", found in Chapter 6.*

3. Use the cursor keys to change the Stop Time Limit. Notice that each time you press either of the "up" or "down" cursor keys the number will change by 5 milliseconds. Press RESET when you are done. The "Start Time Limit" value is now highlighted. Go to the next section to determine the proper start time limit and enter the value.

Setting the Start Time Limit

Every press takes a finite amount of time from the point when the Dual Safety Valve (DSV) is energized to when the resolver signal indicates to SmartPAC that the crankshaft is turning. This elapsed time, primarily taken by the clutch mechanism, is called Start Time. SmartPAC needs an internal limit for the start time to detect resolver drive failure. You need to set a Start Time Limit. The factory setting is 1000 mS. It is a good rule of thumb to add 40% to the actual start time of your press to use as your Start Time Limit. Here is an example to determine the Start Time Limit.

Example: Your recorded starting time is 250 mS:

Take 40% of 250: $= .40 \times 250 = 100$

Add 100 to 250 $250 + 100 = 350$

1. Select "Set brake monitor" from SmartPAC's Initialization menu. Use the cursor keys to select "Start Time" (see Figure 4-7).
2. To change this value, press ENTER. Change the value using the cursor keys. Press RESET when done.
3. Press RESET again, and you will see the Initialization menu.

Select cam names (optional)

If your SmartPAC is equipped with ProCamPAC, you can provide individual names for each of your cam channels to adequately describe their function. You can name up to 16 cam channels depending upon your SmartPAC configuration.

1. Select "Select cam names". You will see this display (shows 16 channels to be named):

CAM CHANNEL NAME MENU	CHANNEL 1	CHANNEL 2	CHANNEL 3	CHANNEL 4	CHANNEL 5	CHANNEL 6	CHANNEL 7	CHANNEL 8	CHANNEL 9	CHANNEL 10	CHANNEL 11	CHANNEL 12	CHANNEL 13	CHANNEL 14	CHANNEL 15	CHANNEL 16
	UNNAMED	UNNAMED	UNNAMED	UNNAMED	UNNAMED	UNNAMED	UNNAMED	UNNAMED	UNNAMED	UNNAMED	UNNAMED	UNNAMED	UNNAMED	UNNAMED	UNNAMED	UNNAMED

USE CURSOR KEYS TO SELECT THE CHANNEL.
PRESS ENTER TO CHANGE THE NAME.
PRESS RESET WHEN DONE.

Figure 4-9. "Select cam names" display

Note: Notice that we are illustrating 16 cams. Depending upon the way that your SmartPAC has been configured (with ProCam 8 cams or with ProCam 16 cams), your display may vary. We are showing the complete ProCamPAC.

2. You can name any channel by selecting it. You will see the following display. Notice that each cam channel is "unnamed". When you start, notice that the display highlights channel 1. Usually you will want to give the channel a name that best describes its function; so first check the list for a suitable name. However, if you wish, you can leave it unnamed, and move onto the next channel.
3. To see the complete list of names press the "down" cursor key until the bottom name on the list is highlighted, then keep pressing it. A new name will appear each time you press the key.

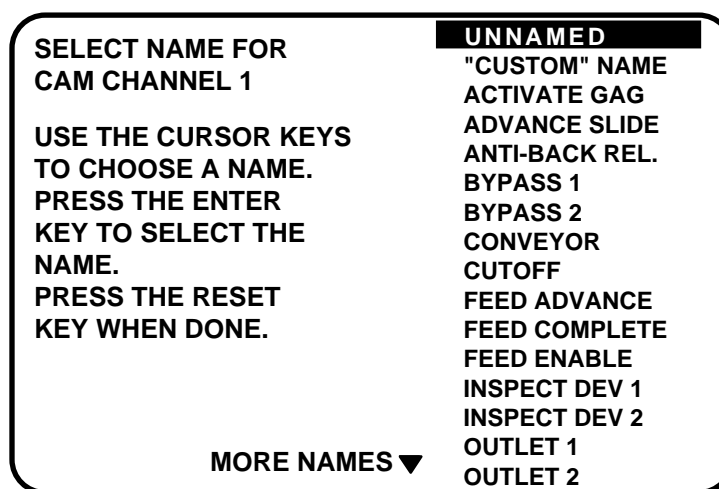


Figure 4-10. Selecting cam name for "channel 1"

4. If you do not find a suitable name but you still want to name the cam, you can select "'Custom' Name", by highlighting it and pressing ENTER.
5. As the screen suggests (see the illustration below), certain keys enable you to custom name the tool. Your names can be any combination of alpha-numeric characters, symbols, etc. Pressing the CLEAR key clears the text. To make other entries, do the following three steps:

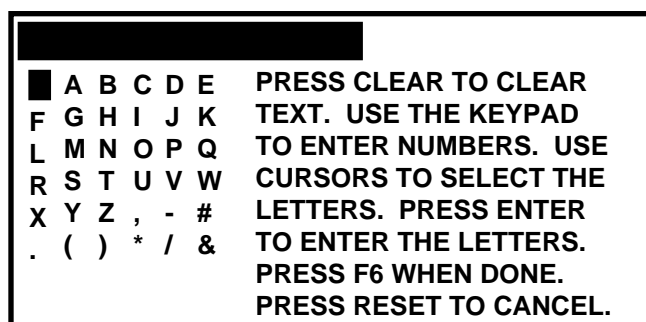


Figure 4-11. Custom Name screen superimposed over "Set cam names" display

- a. To key in letters: Use the up, down, left, and/or right cursor keys to highlight the desired letter; then press ENTER.
 - b. To key in numbers: Use the number keypad; then press ENTER.
 - c. To accept your selection, press function key **F6** (to the right of the LCD display). To cancel your selection, press RESET. (For assistance in using the various keys, refer to Chapter 3.)
6. After you have named channel 1, you will be returned to the previous menu where channel 2 automatically is highlighted for you. You can select a name for it. Continue in this manner until all your cam channels have been named.
 7. When you are completely done, press Reset to return to the Main Initialization menu.

NAMING CAM CHANNELS IN INITIALIZATION

Whatever name you select for the cam channel in Initialization is set for that channel number *no matter* what tool you program. For instance, if you "custom-named" channel 1 as "bypass 3", then channel 1 will always be "bypass 3" in the Programming mode for every tool loaded.

The display showing your channels will not change to show the new channel names. It will always say "channel 1," "channel 2," etc. This is so that you always know which channel you are naming. However, the actual channel names will appear in Program and Run modes along with their respective channel numbers.

Auto Advance and Slow RPM

You use this choice in the Initialization menu to set auto advance constants for up to two press auto advance functions. Some cam functions that may use auto advance are top stop, feed advance, pilot release, advance slide, and part lube. *This feature works best on presses that have speed ranges of several hundred to over a thousand strokes per minute.*

Advance constant is equal to the number of degrees of advance per 100 RPM increase in press speed... ***Advance Constant = # degrees /100 RPM***

To calculate the auto advance constant for top stop, follow these steps:

1. Determine the fastest press speed (**RPM_a**) and the angle at which the press stops at this speed (**A_a**).
2. Determine the slowest press speed (**RPM_b**) and the angle at which the press stops at this speed (**A_b**).

NOTE

If either stopping angle occurs after 0° (or 360°), then add 360° to the angle. For instance, 12° would really be 12°+360° or 372°.

3. Subtract the two angle values. We will call this result "**A_c**".

$$A_a - A_b = A_c$$

4. Subtract the two press speeds. We will call this result "**RPM_c**".

$$RPM_a - RPM_b = RPM_c$$

5. Divide A_c (the difference between the angles) by RPM_c (the difference between the press speeds), and multiply that value by 100. That is the number of degrees per 100 RPM.

$$\frac{A_c}{RPM_c} \times 100 = \#^\circ / 100 \text{ RPM}$$

Example for calculating the auto advance setting:

Your slowest speed is 50 RPM and the stopping angle is at 325°.

Your fastest speed is 100 RPM and the stopping angle is at 350°.

Subtract 100 RPM from 50 RPM... $100 - 50 = 50$

Subtract 350° from 325... $350 - 325 = 25$

Divide the difference in angles by the difference in RPM, and multiply this by 100. 50° is your advance constant.

$$25 / 50 \times 100 = 50.00 \Rightarrow \underline{50^\circ / 100 \text{ RPM}}$$

LIMIT ON AUTO OUTPUT SETTINGS

You can make up to two "auto" output settings in Program mode. The first advance constant that you set in Initialization affects the first channel that you set as "auto" in Program mode, and likewise the second advance constant affects the second "auto" output setting. It does not matter which channel numbers you set as "auto", so long as you do not set more than two of them.

See "Selecting a channel and making an auto output setting" in Chapter 5 for more information about making auto output settings.

IMPORTANT TO SET SLOW RPM

When you determine the correct auto advance constant, you also need to identify the "Slow RPM", or the slowest speed at which you will run your press. SmartPAC uses that value as a starting point to begin the auto advance process. If the incorrect number was entered in "slow RPM", SmartPAC would not auto advance certain press functions at the right time.

Setting auto advance constant and slow RPM

1. To set the auto advance constants and slow RPM, select "Auto Advance" from the Initialization menu. You will see the following display.
2. The bar highlights advance constant #1. Press ENTER to change advance constant #1. (If you prefer changing one of the other items on the screen, simply use the "down" cursor key to select that item. Then press ENTER.) The maximum value for the advance constants is 500.

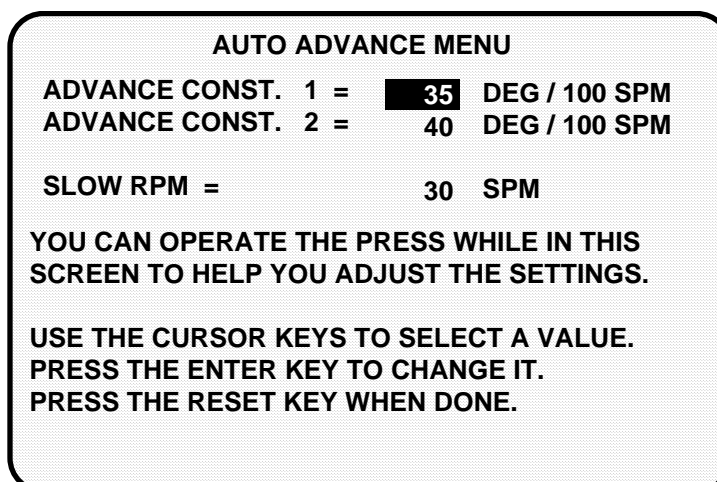


Figure 4-12. Illustrating "Auto Advance and Slow RPM"

3. You can use the number keys to enter the advance constants as the superimposed screen suggests (see below). Press the appropriate numbers and press Enter. If you use the "up" or "left" cursor keys to change "Advance constant #1", the number increases by 1, starting with 1. If you use the "down" or "right" cursor keys, the number decreases by 1, and then jumps down from 0 to 500, 499, 498, etc.

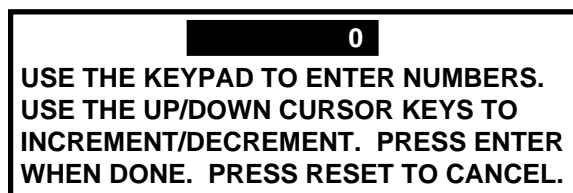


Figure 4-13. Superimposed instructions over "Auto advance" screen

4. Press RESET when you are done setting advance constant #1. As soon as you do this, the highlight bar skips to "Advance constant #2". Press ENTER to change this constant value. Repeat step 3 for advance constant #2.
5. When you are done, press RESET. As soon as you do this, the bar goes to "Slow RPM". Press ENTER to change this value.
6. Here again you can use either the number keypad or the cursor keys to set Slow RPM. Refer to step 3 on how to use these keys. The maximum value is 2000.
7. When you are done with slow RPM, press RESET. As soon as you do this, the bar jumps back to "Advance constant #1". You can repeat the above steps if you decide to modify any of your entries. Press RESET one more time to return to the Initialization menu.

AUTO ADVANCE IS ADJUSTABLE

One of the nicest things about SmartPAC's auto advance is that it is adjustable *while the press is running*. In other words, you can enter auto advance constants and a slow RPM value, and then run your press while you are in Initialization to see how accurate they are. If you need to, you can tweak the values until you get them right. This is especially useful when determining the auto advance constant for press feed functions, for instance, since you must use "trial and error".

Custom Sensor names

You select this choice to set custom sensor names (if DiProPAC is installed). This is the screen you will see.

HOW YOU USE THE CUSTOM SENSOR NAMES

You can create up to sixteen custom names for your sensors, *regardless if you have DiProPAC-8 or DiProPAC 16*. What this means is that when you actually assign names for each of your sensors in Programming mode, you can interchangeably choose from your entire list of customized names (created in Initialization). For example, you assign "custom 12" the name of "transfer arm" in Initialization mode. In Programming mode, you set sensor #1 to be named "transfer arm".

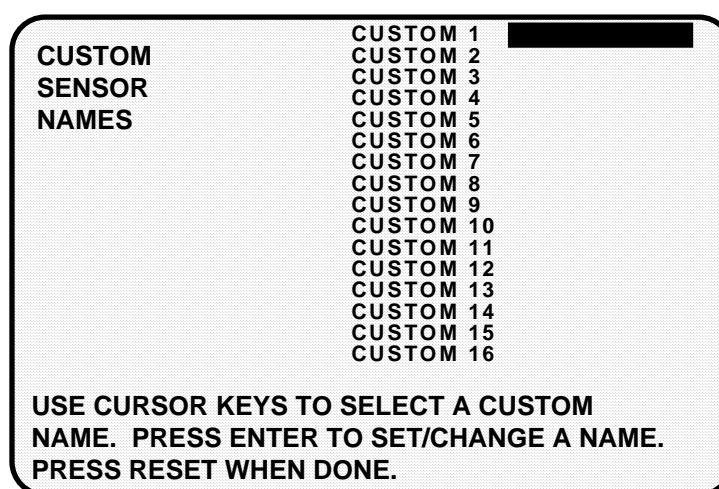


Figure 4-14. Custom naming sensors

1. Select "Custom 1", by highlighting and pressing Enter. Note that the custom name screen is superimposed over the above display (refer to Figure 4-11 for illustration).
2. As the screen suggests (see the illustration below), certain keys enable you to custom name the tool. Your names can be any combination of alpha-numeric characters, symbols, etc. Pressing the CLEAR key clears the text. To make other entries, do the following:
 - a. To key in letters: Use the up, down, left, and/or right cursor keys to highlight the desired letter; then press ENTER.
 - b. To key in numbers: Use the number keypad; then press ENTER.
 - c. To accept your selection, press function key F6 (to the right of the LCD display). To cancel your selection, press RESET. (For assistance in using the various keys, refer to Chapter 3.)
3. After you have named custom 1, you will be returned to the previous menu where custom 2 automatically is highlighted for you. You can select a name for it. Continue in this manner until you are done initializing the custom sensor names.

Sensor Enable mode

You use "Sensor Enable mode" screen if you have DiProPAC installed.

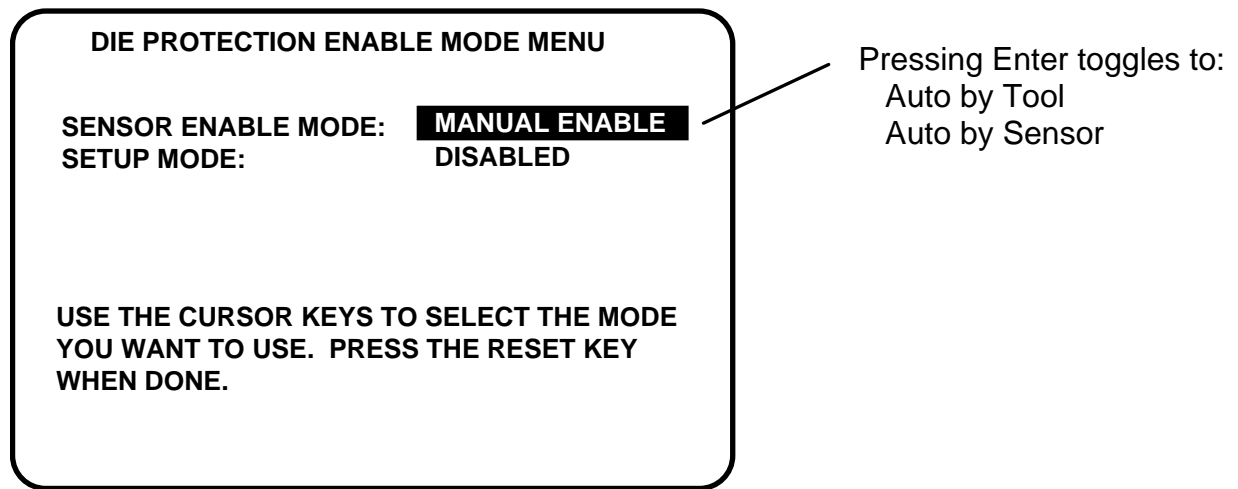


Figure 4-15. Sensor Enable mode (used with DiProPAC only)

Enabling sensors

Select **manual enable**, when you wish to manually enable or disable sensors in DiProPAC. Keep in mind that if you make this selection, DiProPAC will not re-enable sensors for you. You have to remember to do that yourself in Programming and Run modes. See "Disable (enable) sensors" discussed in both Chapter 5 and Chapter 6.

If you want SmartPAC to "remember" to re-enable sensors for you, choose one of the following "auto by" choices.

Select **auto by tool** when you want DiProPAC to automatically re-enable ALL sensors programmed to a specific tool. You set the specific number of "auto enable" strokes for the tool in Programming mode. Refer to the section "Die Protection" in Chapter 5.

Select **auto by sensor (and tool)** when you want DiProPAC to automatically re-enable each sensor individually. You set the specific number of "auto enable" strokes for each sensor in Programming mode. Refer to the section "Die Protection" in Chapter 5.

Sensor setup mode

Depending upon how you wired SmartPAC, you can disable or enable the sensor mode. (Refer to the section later in this chapter called "Wiring setup mode circuit".) If you performed this wiring, this made your SmartPAC "setup mode-ready". This means that you can activate (enable) or deactivate (disable) the setup mode at this screen.

When you enable the sensor setup mode, the green sensors will be disabled while you are inching the press. If you leave this setup mode disabled (even with the wiring done), the green sensors will function as usual. See Figure 4-15. Select the second line "Setup mode". Press Enter to enable this mode. The line in the display will say: "ENABLED". Press Enter again to toggle it back to "DISABLED".

Setting up tool information (optional)

With this option, you can record information about the same six items for every tool. In addition, you can enter up to 30 characters of special information about each tool. (See “Tool information”, chapters 5 and 6.) Follow the steps below to set up the six items.

IMPORTANT

Tool Information serves only as a convenient place to record information about the tool. It does not control any aspect of press operation.

Note: *This feature is not available if you have the optional PLC interface installed.*

1. From the main Initialization menu (Figure 4-1), select “Tool information.” You will see a display similar to the following:

	NAME	UNITS	PLACES
TOOL	1 NAME 1	UNS 1	0
INFO.	2 NAME 2	UNS 2	0
NAMES	3 NAME 3	UNS 3	0
	4 NAME 4	UNS 4	0
	5 NAME 5	UNS 5	0
	6 NAME 6	UNS 6	0

USE CURSOR KEYS TO SELECT A NAME. PRESS ENTER TO CHANGE. PRESS RESET WHEN DONE.

Figure 4-16. Tool information setup

2. Highlight the name next to number 1. Press ENTER. A screen like this appears:

"CUSTOM"

USE THE CURSOR KEYS TO CHOOSE A NAME. PRESS THE ENTER KEY TO SELECT THE NAME. PRESS THE RESET KEY WHEN DONE.

FEED LENGTH
FEED RATE
FEED ACCEL
FEED SPEED
SHUT HEIGHT
PASS LINE HT
LUBE TEMP.
MATERIAL #
CNTL. BAL.
CUSHION PRES
INSPECTION
LUBE PRESS.
LUBE TYPE
PILOT ANGLE
PRESS SPEED
CONVEYOR

MORE NAMES ▼

4-17. Tool information names

3. Use the cursor keys to highlight the name you want. Press ENTER to select it. If you want to make up a custom name, highlight “CUSTOM” and press ENTER. A screen overlay appears that allows you to enter up to twelve characters of text for a custom name, Figure 4-18.

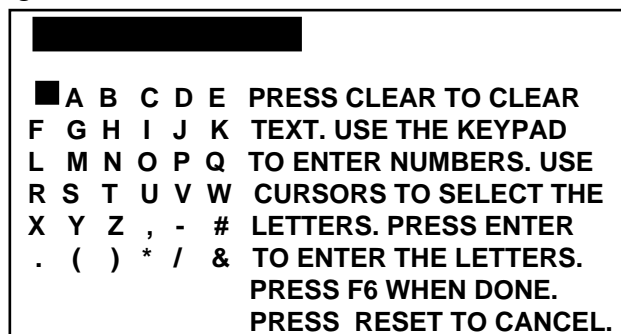


Figure 4-18. Overlay for entering text

3. To enter the units for each item, select the units column next to the desired item. A screen appears from which you can select the unit you want (see table below) or choose to enter a “Custom” unit.

Table 4-1. Units for Tool Information setup;

Screen name	Units	Screen name	Units
IN	inches	METERS	meters
FT	feet	FT/MIN	feet per minute
MM	millimeters	FT/SEC	feet per second
CM	centimeters	MM/SEC	millimeters per second
PSI	pounds per square inch	MM/MIN	millimeters per minute
BAR	bars	GALS	gallons
LBS	pounds	QTS	quarts
TONS	tons	GRAMS	grams
OUNCES	ounces	SPM	strokes per minute
DEG. F	degrees Fahrenheit	FPM	feet per minute
DEG. C	degrees Celsius	MPM	meters per minute

4. To enter the number of decimal places for each item, select the “places” column next to the desired item. A screen appears where you can enter the number of decimal places you want, from 1 to 4. For items that will list YES or NO instead of numeric values, enter eight (8) for the number of places. Table 4-2, below, gives examples of the different numbers of decimal places you can enter.

	NAME	UNITS	PLACES
TOOL	1 PASS LINE HT	IN	2
INFO.	2 STRAIGHTENER	IN	2
NAMES	3 HYD. OVLD.	TONS	0
	4 PRESS SPEED	SPM	0
	5 CONVEYOR		8
	6 PART LUBE		8

USE CURSOR KEYS TO SELECT A NAME. PRESS ENTER TO CHANGE. PRESS RESET WHEN DONE.

Figure 4-19. Completed Tool Number Information screen

IMPORTANT

Do not change the number of decimal places after you have entered values for any specific tools. If you change the number of decimal places, any value you entered will be changed by a factor of ten for each decimal place added or removed.

- When you have finished setting up the tool number information, press RESET to return to the main Initialization menu.

Table 4-2. Decimal places and formats

Number of decimal places Example	digits to left of decimal point	digits to right of decimal point	Range
0 whole numbers: press speed (SPM)	up to seven (7)	none (0)	0 to 9,999,999.
1	up to five (5)	one (1)	0.0 99,999.9
2	up to four (4)	two (2)	0.00 9,999.99
3	up to three (3)	three (3)	0.000 999.999
4 precise values: material thickness	up to two (2)	four (4)	0.0000 99.9999
8 Yes or No designation	not applicable		NO (0) YES (1)

Security access

Use the Security access choice in the Initialization menu to prevent unauthorized access to SmartPAC settings. For most items shown in Figure 4-21, on the next page, you can choose the level of security that meets your needs:

- **PROGRAM AND RUN MODES** - least secure: anyone can make changes anytime.
- **PROGRAM MODE ONLY** - changes can be made only when the Program/Run key is in the Program position. To keep users from entering Program mode and making changes, you must remove the Program/Run key after switching it to Run.
- **PASSWORD REQUIRED (optional)** - most secure: changes can be made only after the user enters a password.

Exceptions

The following items have different or additional security options:

- **Change Count** has an additional option of: No Changes Allowed. This prevents changes to actual counter values (for strokes, good parts, total hits, and batch counters) so that these counter values cannot be altered in either Program or Run modes.
- **Init Password**, if you have the password option, enables you to require the user to enter a password in order to access the Initialization menu. To require a password, select "Must Be Used." For no password, select "Not Required"
- **Load Monitor** has four options: Allow Recalc/Adjust, Allow Recalc Only, No Recalc/Adjust, and, if you have the password option, Password required.

**DO NOT SET INIT PASSWORD TO "MUST BE USED"
UNTIL YOU HAVE CHECKED YOUR PASSWORDS.**

Field upgraded SmartPACs may have different passwords from those listed in this manual. If you do not know the initialization password and change Init password to "Must be used" you will not be able to access the initialization menu again.

See Chapter 5—"Using SmartPAC in Program mode" and Chapter 6—"Using SmartPAC in Run mode" for more information about program and run modes.

When you attempt to access a menu that is password protected, the SmartPAC asks for your password in a display that looks like this:

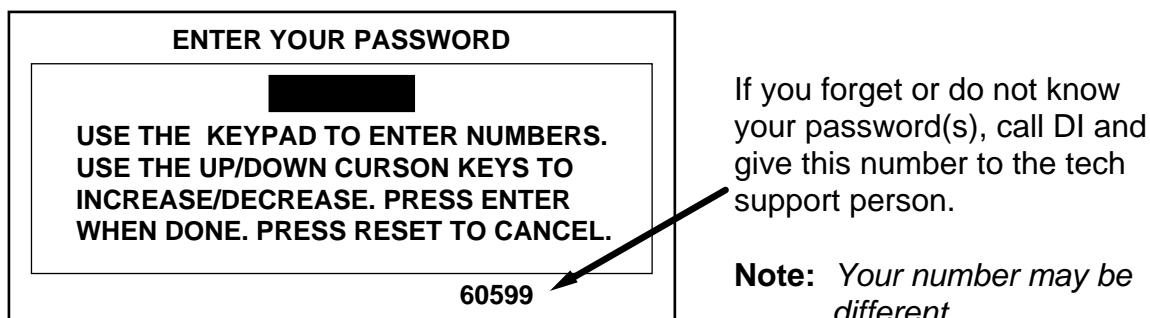


Figure 4-20. "Enter your password" screen

If you forget or do not know your password(s)

Call DI tech support at the telephone number on the cover of this manual. Give the tech support person the 5-digit number from the bottom of the "Enter your password" display.

Selecting Security access options

1. In the Initialization menu, select "Security access"

You will see a display similar to the one below. Yours may look different, depending on your SmartPAC's system configuration. Notice that the factory (default) settings allow all actions to be performed in both Program *and* Run modes.

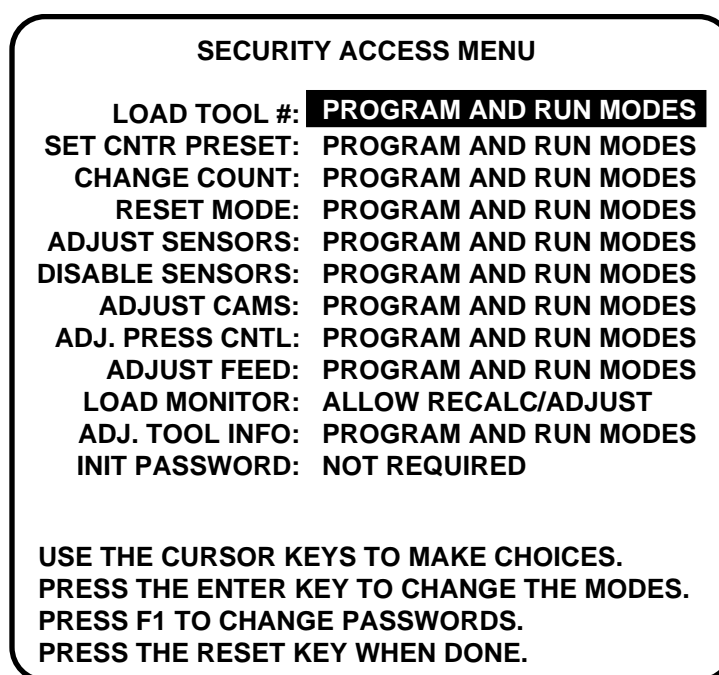


Figure 4-21. Security Access default settings

IMPORTANT

If you have the password option, be sure to check your passwords before changing any security access settings. Record the passwords in a safe place. See “Changing passwords” later in this chapter to check and change passwords.

2. To change the security access of an item, use the up and down arrows to highlight the access information for the item. Press ENTER one or more times until the type of access you want appears.

For most items, you can choose from the following access levels:

- “PROGRAM AND RUN MODES”
- “PROGRAM MODE ONLY”
- “PASSWORD REQUIRED” (if you have the password option)

If you have the password option:

**DO NOT SET INIT PASSWORD TO “MUST BE USED”
UNTIL YOU HAVE CHECKED YOUR PASSWORDS.**

Field upgraded SmartPACs may have different passwords than those listed in this manual. If you do not know the initialization password and change Init password to “Must be used” you will not be able to access the initialization menu again.

3. Press RESET to save your choice and return to the Initialization menu.

Examples

You want to prevent **loading a tool number** in Run mode. Set the security access for this item to Program Mode Only. Highlight the access level next to “Load Tool #.” Press ENTER one or more times until “PROGRAM MODE ONLY” appears. Press RESET. Now a tool can be loaded only when the Prog/Run key is switched to Prog.

You have the password option and want only certain individuals to **adjust the cams**. Set Adjust Cams to “PASSWORD REQUIRED,” and tell those individuals the password. Highlight the access level next to “Adjust Cams.” Press ENTER one or more times until “PASSWORD REQUIRED” appears. Press RESET. Now the cams cannot be adjusted without the user entering the correct password.

Reset Mode

Set the Reset mode security access with care. If you set access to “Program mode only” or “Password required,” personnel cannot reset SmartPAC in Run mode after a malfunction that stops the press. If you want the operator to reset the machine after errors, select “Program and Run Modes.” If you want one person to record or be aware of all faults that occur, give that person the Program/Run key, and set the access to Program mode only. He or she would be able to reset faults by turning the key to “Program” and pressing the RESET key. Turning the key back to “Run” allows the press to run again.

Changing passwords

If it has the password option, your SmartPAC has three passwords that secure different parts of its operation:

- **Init. password** allows access to the initialization menu
- **General password** allows access to all other menus and settings, except for PM Monitor (see next bullet).
- **PM password** allows access to the PM (preventive maintenance) Monitor setup in Program mode. See Appendix A, “SmartPAC PM Monitor (optional).”

IMPORTANT

Your SmartPAC comes from the factory with all three passwords set to the default password, “1234.” If you have upgraded your SmartPAC in the field, it may have different passwords.

A password is a one-to-four-digit number. Follow the steps below to change password(s).

1. In the Initialization menu, select Security access.
2. The display appears similar to Figure 4-21. Press **F1**.
3. The display shows the Set Passwords menu, Figure 4-22.

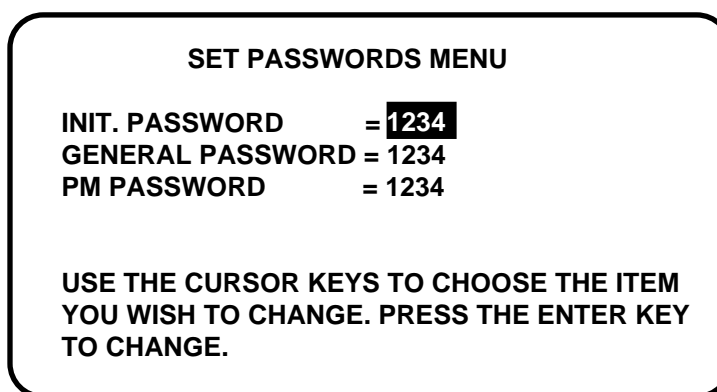


Figure 4-22. Set passwords menu

4. Highlight the password you want to change. Press ENTER. The display looks like Figure 4-23 (next page).

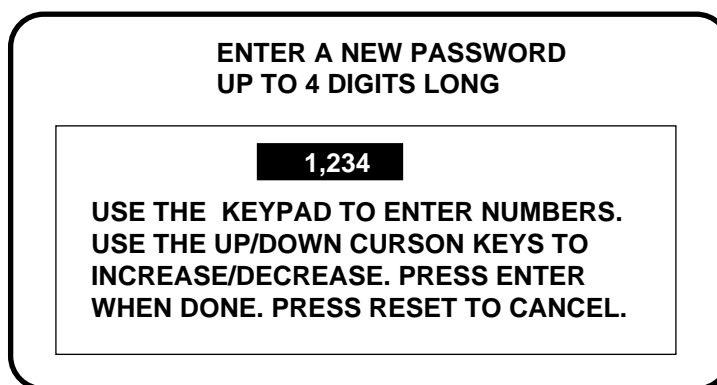


Figure 4-23. "Enter a new password" screen

5. Key in the new password. Press ENTER. The display returns to the Set passwords menu.

Communications (optional)

This choice on the Initialization menu lets you set an identification number for your SmartPAC if it is connected to one of Data Instruments' software products. SmartPAC can send and receive data from a computer running Computerized Pressroom Reporting or RSR™ — Remote Storage and Retrieval. Follow these steps to set the CPU number. *If you do not require communications, then ignore this item.*

Select "Communications" . You will see this display:

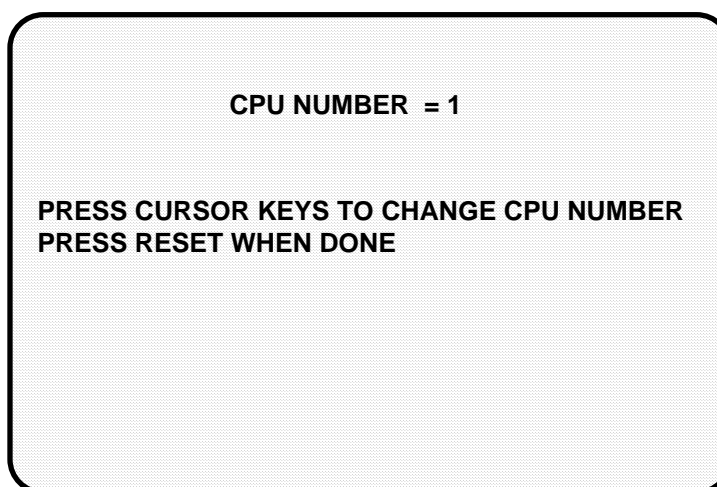


Figure 4-24. Setting CPU number

The CPU number is the identifying number of your unit. For instance, if you had several SmartPAC units (and possibly other controls in the network), identify them as 1, 2, etc.

You have the choice of using either the number keypad or the cursor keys. If you use the number keys, press the appropriate numbers and press enter. If you use the "up" or "left"

cursor keys, the number increases by 1. If you use the "down" or "right" cursor keys, the number decreases by 1, and then jumps down from 0 to 99, 98, etc. Once you have set a CPU number for the unit, press RESET to go back to the Initialization menu.

For more information on which CPU number to use or on other information about the Data Instruments' software products, refer to the user manual for either of those products.

Chapter 5

Using SmartPAC in Program mode

This chapter describes how to use all the displays you will see in Program mode. It covers making settings for a tool, loading tool information, deleting a tool number, and modifying a tool number.

This chapter also includes programmable cam-related functions, such as setting cam timing, and programming timed and auto events; and die protection-related functions, such as enabling and disabling sensors, and configuring sensors.

About Program mode

You use Programming mode to make all the settings for the tool. In Program mode, you enter a tool number; then make appropriate settings for that tool. You can change settings and delete (erase) all settings for the tool. You can see a display of all the tool numbers for which you have made settings.

You cannot run the press in Program mode. That can only be done in Run mode. Here is how you use the two modes. In Program mode, you can make settings for all your tools, but you cannot run the press. In Run mode, you can run the press and make certain minor adjustments for the installed tool only.

The first display—the Programming menu

To get into Programming mode from Initialization mode, turn the Program/Run key first to "Run", then to "Program". This is the first display that you will see.

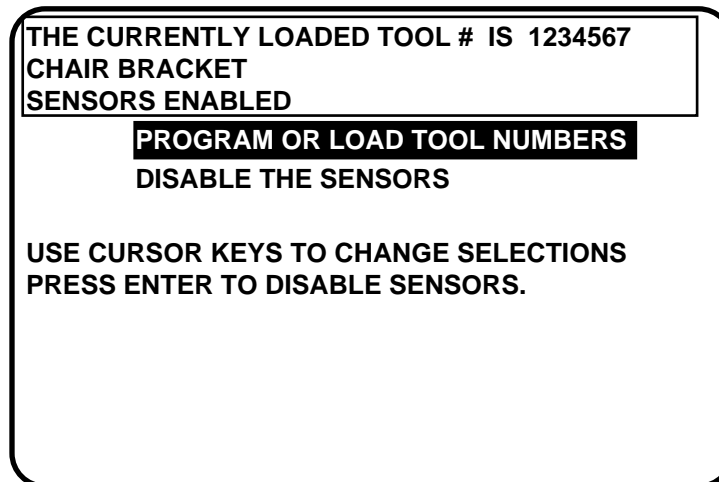


Figure 5-1. First display in Program mode

SELECT = HIGHLIGHT + ENTER

When we say SELECT in this manual, it means highlight the item and press Enter.

Select "Program/Load Tool Number" and you will see a list of available tools. This display will either highlight the currently loaded tool number, or "NEW" if no tool number has been programmed. From this display, you can call up all the other displays in Programming mode and carry out your tasks from this point. Notice that when a tool is highlighted, its "tool name" (if programmed) is also shown. However, when "NEW" is highlighted, it remains unnamed until you assign a number and name.

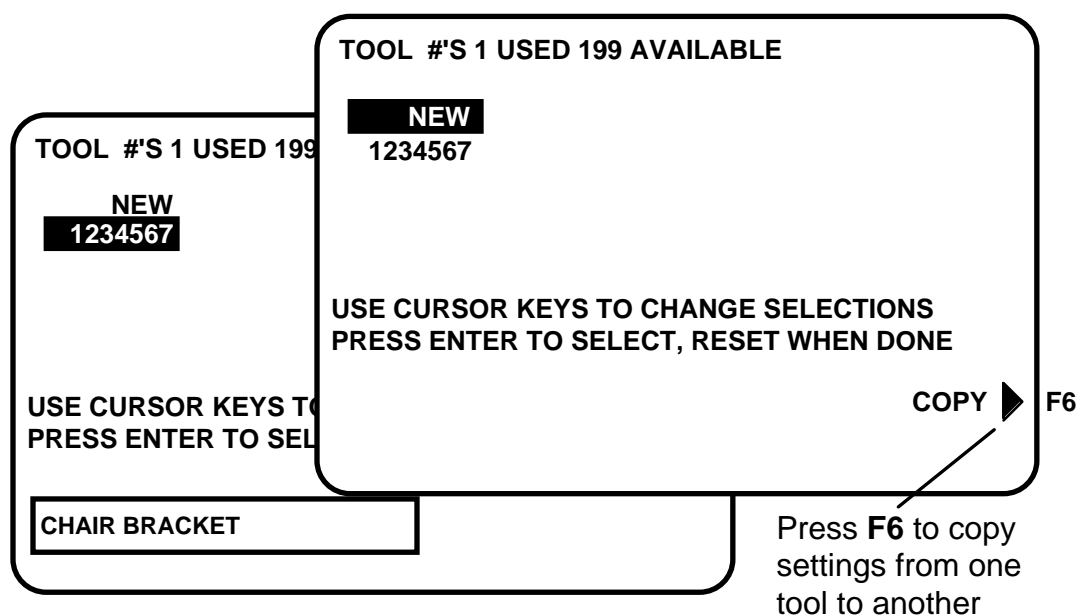


Figure 5-2. Program mode display highlighting "NEW" or "currently loaded tool"

Note: Before changing modes, make sure your screen shows the first display in the mode you are in. If that display is not shown, nothing will happen when you turn the Program/Run key. In that case, keep hitting the Reset key. When the first display in the mode is reached, you will instantly switch to the new mode.

This section explains how to create or select a tool number and then set (program) various parameters for that tool.

Before you can run the press, you have to load the SmartPAC settings for the tool being used. This retrieves the settings for the tool from SmartPAC's memory.

To load a tool number, see "Load the tool information" later in this chapter. To delete a tool number, refer to the section "Delete the tool information" also in this chapter.

Copying a tool number

Notice that from this screen, you can also copy all the parameters of one tool to another. To copy a tool, press **F6**. A message appears, "Tool number # has been selected to be copied. Enter the new tool number". To do this, use the number keys and then press Enter. For assistance on using the number keys, see Chapter 3.

Creating a new tool number

1. Select NEW to enter in a new tool number. You will see the following display superimposed over the tool display (as pictured in Figure 5-2):

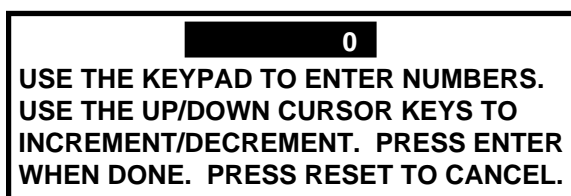


Figure 5-3. Superimposed instructions on Tool display

2. Key in the number for the tool. If you need assistance, see "Entering a number" in Chapter 3.
3. Press Enter after keying in the tool number. You will see the Main Programming menu display (Figure 5-5). Once you are done, go to "Set tool name".

Selecting an existing tool number

1. Select the tool number from the tool number display. In this example, we are selecting tool #1234567.

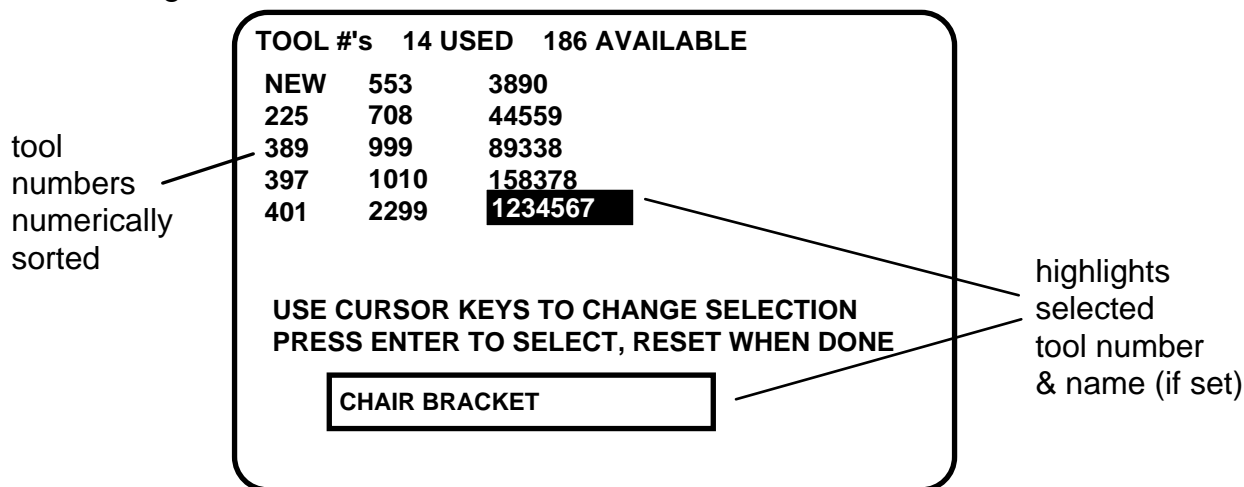


Figure 5-4. Selecting an existing tool number

2. You can move the selection bar to any number using the cursor keys (see "Using the keyboard" in Chapter 3 for more assistance). The tool number display can contain up to 200 tool numbers.

If you have more than four columns of numbers, you can see more tool numbers by pressing the "right" cursor key to move your selection to the right until a new right column appears. To go back, use the "left" cursor key to move your selection to the left until a new left column appears.

3. Press Enter to select the tool. The next screen that appears is the "Main Programming menu" (Figure 5-5). Next, go to "Set tool name".

Set tool name

To set tool name, you need to:

- Switch SmartPAC to Program mode
- Select either a new or existing tool number (see the beginning of this chapter)
- Select "Tool name" and bring up that display

SELECT = HIGHLIGHT + Enter

When we say SELECT in this manual, it means highlight the item and press Enter.

Bringing up the tool name display:

1. Select "Tool name" as shown below:

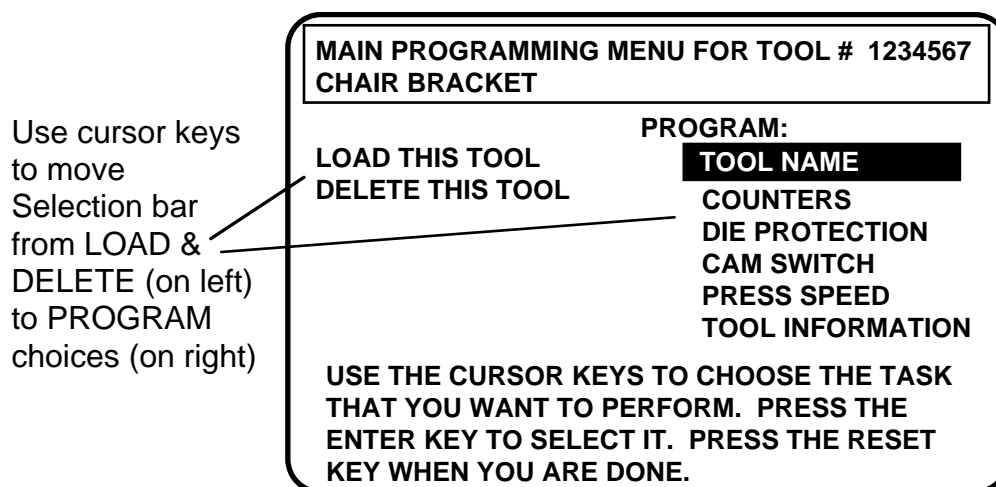


Figure 5-5. Main Programming Menu (the order may vary depending on the options installed)

2. You will then see this display superimposed over the "Tool name" screen:

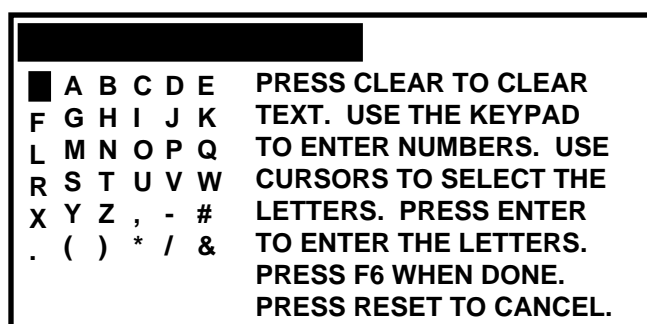


Figure 5-6. Naming the tool

3. As the screen suggests, certain keys enable you to name the tool. Pressing the CLEAR key clears the text. To make other entries, do the following:
 - a. To key in letters: Use the up, down, left, and/or right cursor keys to highlight the desired letter; then press Enter.
 - b. To key in numbers: Use the number keypad; then press Enter.

4. To accept your selection, press function key **F6** (to the right of the LCD display). (For assistance in using function keys, refer to Chapter 3.)
5. Once you are completely done naming your tool, press Reset to return to the Programming mode menu choices.

Counters

To set up the Counters, you need to:

- Switch SmartPAC to Program mode
- Select either a new or existing tool number (see the beginning of this chapter)
- Select "Counters" and bring up the counters display for the tool

Bringing up the counter display:

1. Select "Counters" from the Main Programming menu (Figure 5-5):

ARE YOU 'LOCKED OUT'?

If you cannot change items in this display, the ability to make these changes may be locked out or limited to password access. To check the security access setting, see "Security Access" in Chapter 4.

2. You will then see this display:

		COUNTER MODES	F1
		PRESET VALUE	
STROKES	COUNT 0	0	
GOOD PARTS	0	0	
BATCH 1	0	0	
(TOP STOP)			
BATCH 2 CHANNEL 7	0	0	
(TOGGLE)			
BATCH 3 CHANNEL 8	0	0	
(PULSE)			
TOTAL HITS	0	0	
USE CURSOR KEYS TO MAKE SELECTION.			
PRESS ENTER TO SET THE COUNTER.			
PRESS RESET WHEN DONE.			

Figure 5-7. Counter display

The strokes counter counts all press strokes.

The good parts counter counts the press strokes unless a die protection or other fault occurred. When the good parts preset has been reached, SmartPAC signals the press to top stop.

There are three batch counters. You can set individual preset values for each of the batch counters. The batch counts can be incremented either to the good parts counter or the strokes counter. You can also set each batch counter to either top stop or toggle, or pulse a programmable limit switch (PLS) output when its preset is reached. If you set the batch counters to either toggle or pulse, the counter display shows the PLS channel that is controlled by that batch counter (see Figure 5-7).

The total hits counter counts all hits on a tool. If the tool number is loaded again after other tools are used, the counter starts counting from the last recorded number for the previous job. The counter is useful for deciding when a tool needs regrinding.

Note: *In Run mode, when the Total Hits counter reaches its preset value, the status box flashes to indicate that this has happened.*

Setting or clearing the counter presets

1. Highlight the value displayed in the "preset" column that you want to set, and press Enter. You will see a display superimposed over the Counter display (see Figure 5-3). This applies to either strokes, good parts, or batch.
2. As the screen suggests, use the number keys to input a value. See "Entering a number" in Chapter 3 for step-by-step instructions for entering a number. Then press Enter, and the value will "jump to" the designated preset value location.
3. If you want to clear the counter, press the CLEAR key, then Enter. If you do not want to make a change to that counter preset value, just press Reset.
4. To set another counter preset value, move the cursor down to the desired choice, press Enter, and then repeat the steps shown above.

Setting or clearing the counter values

Note: *If "Change count" was set under security access to "no changes allowed", you cannot change the count.*

1. Highlight the number displayed in the "counter value" column that you want to set, and press Enter. This applies to either strokes, good parts, or batch counters. Under some circumstances, you may want to "adjust" the count upward or downward. In this case, use the Up/Down keys.
2. Sometimes, you may want to start the count at some value other than zero. As the screen suggests (Figure 5-8), use the number keys to input a value. See "Entering a number" in Chapter 3 for step-by-step instructions for entering a number. Then press Enter, and the value will "jump to" the designated counter value location.
3. If you want to clear the counter, press the Clear key. A warning message will appear asking you to confirm the "Clear" command. Press the "Up" cursor key to confirm this selection. If you do not want to make a change to that counter value, just press Reset.
4. To set another counter value, cursor down to the desired choice, press Enter, and then repeat the steps explained above.

Note: *You can disable counters by setting the preset value for parts and batch counters to zero.*

Clearing the total hits counter

1. Select "total hits".
2. To clear, press the "Clear" key. A warning message will appear asking you to confirm the "Clear" command. Press the "Up" cursor key to confirm this selection. If you do not want to make a change to that counter value, just press Reset.

Setting counter mode

The counter mode provides several selections. First, it lets you determine what will happen when any of the three batch counters reach their presets. You have three choices:

If you select **top stop**, the top stop relay is opened when the batch preset is reached. This is useful when stopping the press to change bins or chutes before resuming production.

If you choose **toggle**, this switches the state of the output relay. In other words, if the state of the relay is open, it would then be closed, and vice versa. You can use this option to activate a parts diverter. If you select **pulse**, this actuates the channel for a presettable amount of time in milliseconds. You can connect this output to any device that needs to be turned on once every fixed number of strokes (equal to the batch counter).

IMPORTANT

"Pulse" and "toggle" are only available when the optional ProCamPAC is installed. If you attempt to use these features without programmable cam, SmartPAC will display a message telling that it is not available. With ProCamPAC installed, you can still program channels 6 through 8 and get two on-off settings per cycle by programming the batch preset to 1.

You can also determine if the strokes or good parts counter will increment each batch.

Setting counter output mode:

1. Press **F1** to select "Counter mode" (Figure 5-8). To illustrate the various options in counter setup mode, the previous display (Figure 5-7) shows batch 2 set to "toggle", and batch 3 to "pulse". Factory settings are configured to "top stop" and "stroke".
2. Using cursor keys, highlight the output mode for "batch 1".
3. As you press Enter, notice that the selections change from "top stop", to "toggle" to "pulse", and back again. Make your selection, and then cursor down to "batch 2".

COUNTER MODE SELECTIONS

ADV. MODES ▶ F1

	OUTPUT MODE	PULSE (MSEC) TIME	INCREMENT MODE
BATCH 1	PULSE	250	STROKE
BATCH 2	TOP STOP	0	GOOD PARTS
BATCH 3	PULSE	0	GOOD PARTS

COUNTER INCREMENT ANGLES

STROKE, GOOD PARTS, BATCH 1	270
BATCH 2	270
BATCH 3	270

USE THE CURSOR KEYS TO CHOOSE THE ITEM
YOU WISH TO CHANGE. PRESS THE ENTER KEY
TO CHANGE. PRESS RESET WHEN DONE.

Figure 5-8. Counter setup mode menu

4. Repeat step 2 for "batch 2" and "batch 3".
5. If you selected "pulse" for any of the batch counts, use your "right" cursor key to scroll to the "pulse (msec) time" column for that counter. Press Enter.
6. A screen overlay appears enabling you to enter a value for channel on-time. Use the number keys to set the channel on-time in milliseconds, up to a maximum of 9,999 ms, or about 10 seconds. See "Entering a number" in Chapter 3 if you need assistance. Then press ENTER to accept the change.

Note: When you select "toggle" or "pulse", the channel affected appears with the batch counter on the original counter display (Figure 5-7).

Setting counter increment angle

SmartPAC also provides the ability to set counter increment angles for strokes, good parts, and batch counters. The factory setting is 270°, which is satisfactory for counting parts, means that the counters are incremented when the press passes 270°. However, if the batch counter outputs are being used to control automation, the increment angles for these counters should be set to the angle where you want the automation to activate.

1. Move the cursor over and down to the "increment mode" column at the bottom of the screen. You will be setting "stroke, good parts, batch 1". Press Enter, then use the number keys to make your selection. Press enter when done.
2. Next, move the cursor down to the next one (batch 2), and repeat step 1.
3. Repeat the above steps for batch 3.

Setting counter increment mode

A third selection in "count mode" is the ability to set counter increment mode. Here you determine whether the batch counter increments with the good parts counter or the strokes counter. If you want the batch to count ALL strokes, then select "stroke". However, if you want the batch to count the press strokes unless a die protection or other fault occurred, then select "good parts". Follow these steps:

1. Move the cursor to the third column "increment mode". You will be setting batch 1. Press Enter to toggle the selection between "stroke" and "good parts".
2. Next, move the cursor down to the next one (batch 2), and repeat step 1.
3. Move the cursor down to the last one (batch 3), and again repeat step 1. Once you are completely done, press Reset to return to the Main Programming menu.

Setting Parts/stroke or strokes/part (optional)

If your SmartPAC has the Advanced counter option, you can set the number of parts produced per stroke or the number of strokes per part to make the parts count reflect the actual number of parts made.

1. From the Counter Mode Selections screen, press **F1** (ADV. MODES). The screen appears similar to Figure 5-9.

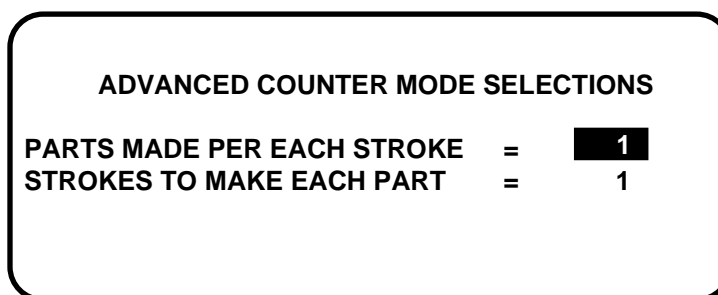


Figure 5-9. Advanced counter mode

2. Highlight the item you want to set. Press ENTER. A box appears on the screen, as shown in Figure 5-10.

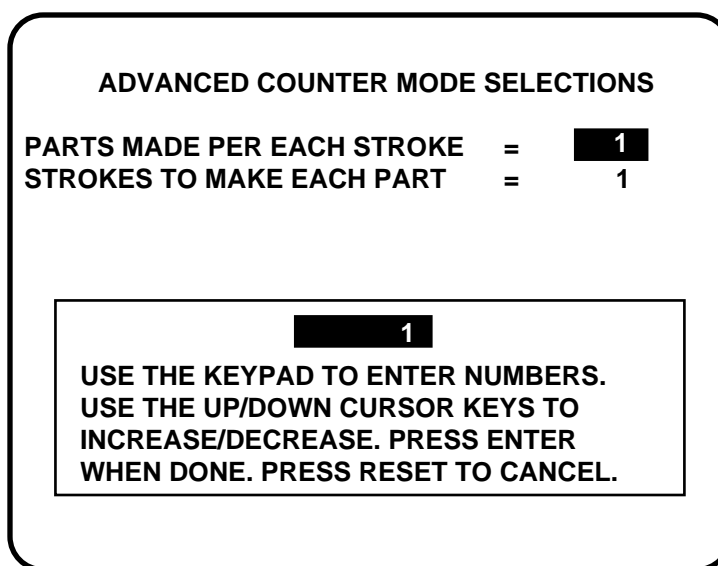


Figure 5-10. Setting parts/stroke or strokes/part

3. Use the keypad or cursor keys to change the number of parts/stroke or strokes to make each part. Press ENTER. Press RESET to return to Counter Mode Selections.

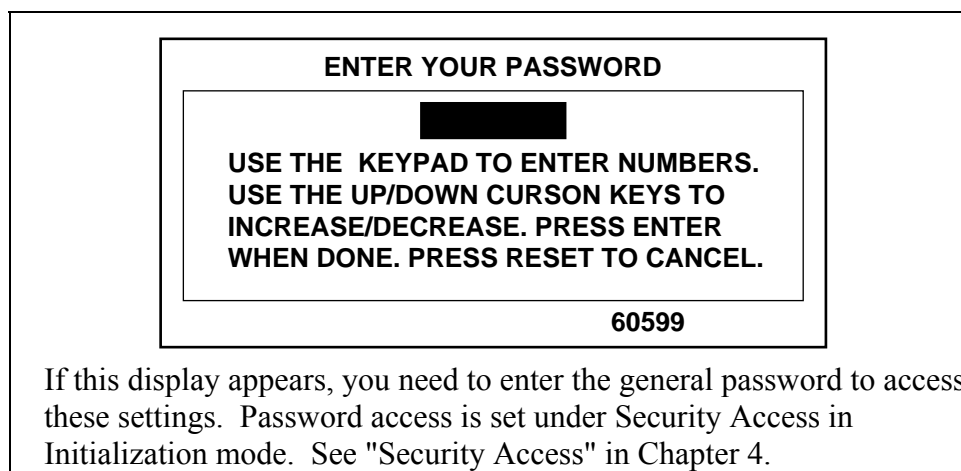
Die Protection

To set Die Protection parameters, you need to:

- Select "Die protection" from the Main Programming menu
- Set the "Auto enable by tool" stroke counter *if this was your selection in Initialization ***
- Assign a name for each sensor
- Set the "Auto enable by sensor" stroke counter *if this was your selection in Initialization***
- Set sensor type
- Set stop type
- Set the ready signal (for a green sensor)
- Set the other sensors for the tool

****** *Depending on how you Initialized DiProPAC, you may be prompted to do one or the other, not both.*

1. You will see the Main Programming menu (Figure 5-5) after entering a new tool number or selecting an existing one. Select "Die Protection".



Setting "Auto Enable by Tool" counter value

2. *If you had selected "Auto enable by tool" in Initialization mode (Chapter 4), a screen appears asking you to enter the stroke value. If you had selected "Auto Enable by Sensor and tool" in Initialization, this screen will not appear (refer to Figure 5-14 further down in this section).*

Use cursor keys to change the number of strokes. *The maximum number of strokes that you can enter is 24.* Then press Enter when done (see Chapter 3 for help in using cursor keys).

number of
strokes for
DiProPAC
to auto
enable ALL
sensors in
the tool

TOOL NUMBER 1234567
CHAIR BRACKET

AUTO ENABLE COUNTER FOR THIS
TOOL IS **10** STROKES

AUTO ENABLE COUNTER DETERMINES HOW MANY
STROKES THE SENSORS CAN BE DISABLED AT
A TIME. THEY ARE AUTOMATICALLY ENABLED
AFTER REACHING THE COUNT.

USE THE CURSOR KEYS TO CHANGE THE NUMBER
OF STROKES. PRESS THE ENTER KEY WHEN
DONE. PRESS THE RESET KEY TO CANCEL.

Figure 5-11. Setting "Auto enable by tool" counter

3. Next you will see a list of sensors to program.

<p>TOOL #1234567 CHAIR BRACKET</p> <p>USE CURSOR KEYS TO CHOOSE A SENSOR. PRESS THE ENTER KEY TO PROGRAM. PRESS THE RESET KEY WHEN DONE.</p>	<p>SENSOR 1</p> <p>SENSOR 2</p> <p>SENSOR 3</p> <p>SENSOR 4</p> <p>SENSOR 5</p> <p>SENSOR 6</p> <p>SENSOR 7</p> <p>SENSOR 8</p> <p>SENSOR 9</p> <p>SENSOR 10</p> <p>SENSOR 11</p> <p>SENSOR 12</p> <p>SENSOR 13</p> <p>SENSOR 14</p> <p>SENSOR 15</p> <p>SENSOR 16</p>
--	---

Figure 5-12. List of sensors to program

Note: Notice that we are illustrating 16 sensors. Depending upon the way that your SmartPAC has been configured (with DiPro 8 sensors or with DiPro 16 sensor), your display may vary. We are showing the complete DiPro module.

4. You can select any sensor, but it is a good idea to start with the first sensor. Select "sensor 1". After selecting it, the first thing you do is name it.

Naming the sensor

1. You see this display when you select a sensor. It allows you to name the sensor.

TOOL NUMBER 1234567	SENSOR 1
CHAIR BRACKET	PART EJECTION
CRITICAL ANGLE 0	GREEN ESTOP
<div> <div>SENSOR NAME FOR DIPRO SENSOR 1</div> <div> <div>UNNAMED</div> <div>CUSTOM NAME</div> <div>AIR PRESSURE</div> <div>BLANK FEED</div> <div>CAM DRIVE 1</div> <div>CAM DRIVE 2</div> <div>CLAMP PRESSURE</div> <div>DIE OVERLOAD</div> <div>END OF STOCK</div> <div>HIGH LOOP</div> <div>MATERIAL BUCKLE</div> <div>MISFEED</div> </div> </div>	
USE CURSOR KEYS TO CHANGE SELECTION PRESS ENTER TO SELECT, RESET WHEN DONE	
MORE NAMES ▼	

Figure 5-13. Naming the sensor

2. Use the "down" cursor key to move the bar and highlight the name you want. More names appear from the bottom of the name column as you keep pressing the key. You can scroll back and forth through the name column using these keys.
3. There are several names from which to choose. You can also choose not to name a sensor by selecting "unnamed".
4. If you do not find a suitable name but you still want to select a name the sensor, you can select "Custom Name", by highlighting it and pressing Enter.
5. If you select "Custom name", another display appears that lists all the customized names (up to 16 possible choices) that you set in Initialization mode (see "Custom sensor names" in Chapter 4).

Assign any one of these names to each of your sensors by highlighting the name and pressing Enter. The names are interchangeable. This means, for instance, that you can assign "Sensor 3" the custom name set for "Custom 15".

Setting the "Auto Enable by Sensor and Tool" counter value

6. *If you had selected "Auto enable by sensor and tool" in Initialization mode (Chapter 4), a screen appears asking you to enter the stroke value. If you had selected "Auto Enable by tool" in Initialization, this screen will not appear (refer to Figure 5-9 towards the beginning of this section).*

Use cursor keys to change the number of strokes. Then press Enter when done (see Chapter 3 for help in using cursor keys).

number of
strokes for
DiProPAC
to auto
enable ALL
sensors in
the tool

TOOL NUMBER 1234567
CHAIR BRACKET

**AUTO ENABLE COUNTER FOR THIS
TOOL IS **10** STROKES**

**AUTO ENABLE COUNTER DETERMINES HOW MANY
STROKES THE SENSORS CAN BE DISABLED AT
A TIME. THEY ARE AUTOMATICALLY ENABLED
AFTER REACHING THE COUNT.**

**USE THE CURSOR KEYS TO CHANGE THE NUMBER
OF STROKES. PRESS THE ENTER KEY WHEN
DONE. PRESS THE RESET KEY TO CANCEL.**

Figure 5-14. Setting "Auto enable by sensor" counter

7. After you have assigned a name for sensor 1 and set the auto enable counter value, you will be returned to the previous menu where sensor 2 automatically is highlighted for you. You can select a name for it. Continue in this manner until all your sensors have been configured accordingly.

Setting sensor type

After selecting the sensor name, you will see this display. You can set sensor type. Notice that the sensor name now appears at the top right of the display. This display shows "Part ejection".

TOOL NUMBER 1234567	SENSOR 1
CHAIR BRACKET	PART EJECTION
CRITICAL ANGLE 0	GREEN ESTOP

NOT USED	GREEN
RED (NC)	GREEN QUICK CHECK
YELLOW (NO)	GREEN CONSTANT
	GREEN SPECIAL

**USE CURSOR KEYS TO CHANGE SENSOR
TYPE. PRESS ENTER TO SELECT. PRESS
RESET WHEN DONE.**

Figure 5-15. Setting sensor type

Select the sensor type you want for that sensor. You have six choices: yellow, red, green, green quick check, green constant, and green special. See Chapter 1 for a detailed description of each of these sensors. (The "not used" setting is for sensor inputs that are not used with the tool.) Notice that the sensor function appears at the top middle of the display and the sensor type at the top right.

Setting stop type

After selecting sensor type, you will see this display for all sensors except green special.

You do not have to set the stop type for a green special sensor. SmartPAC automatically stops the press on the upstroke.

You can set stop type for the other sensors — emergency stop, top stop, or smart stop. Emergency stop is highlighted.

Use **emergency stop** (E-Stop) when you want to stop the press before the next hit. For instance, when monitoring part ejection on the upstroke, you can use the E-stop setting so SmartPAC will send a stop signal to the press immediately if a malfunction occurs. This ensures that the press will stop in time before the next hit.

If you are monitoring a feed that takes place well into the downstroke (like a roll feed) you would probably want to set the feed sensor for a **top stop**. An E-stop setting here may cause the press to stick on bottom. That is because the stop signal would be sent just as the ram is about to contact the material.

Selecting **smart stop** allows SmartPAC to initiate either an emergency stop or top stop depending upon the angle where the sensor detected the fault. Highlight "variable" stop" and press Enter.

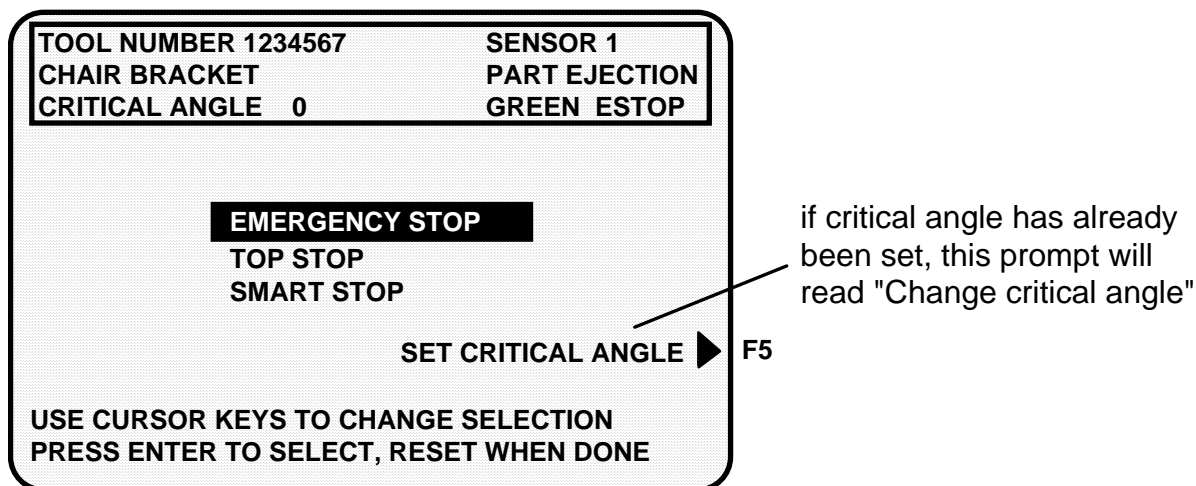


Figure 5-16. "Setting stop type" display

After you select smart stop, SmartPAC prompts you to set the *critical angle* (the last angle position in the crankshaft rotation to signal an emergency stop so that the ram can be stopped before the punches make contact with the material — the intent being to avoid jamming the press at the bottom of the stroke). If a die protection error is detected before the critical angle, SmartPAC will execute an emergency-stop. Otherwise, if the error is detected between this angle and 185°, SmartPAC will execute a top stop. There is only one critical angle value for all sensors programmed for a tool. However, a critical angle can vary for different tools. *In other words, you cannot change the critical angle from sensor to sensor in the same tool. You just have to set it once for the tool.*

To set stop type for red, yellow, green, green quick check, and green constant, select the setting you want for the sensor—emergency stop, top stop, or smart stop.

Once you make the stop type settings for red and yellow sensors, you are done. Green sensors, however, need additional settings to be made. SmartPAC brings you back to the display listing the remaining sensors. You can set another sensor. Go to the section, "Setting the other sensors for the tool".

When you highlight "Smart stop" and press Enter, a display immediately appears which asks you to set "critical angle". **Critical angle** is the last angle position in the crankshaft rotation to signal an emergency stop so that the ram can be stopped before the punches make contact with the material. The critical angle affects all the sensors that are set for smart stop, and only needs to be set *once* for the tool.

If you need to modify the critical angle at a later time, you can access the "Set the critical Angle" display by pressing **F5** from the "Setting stop type" display (Figure 5-16).

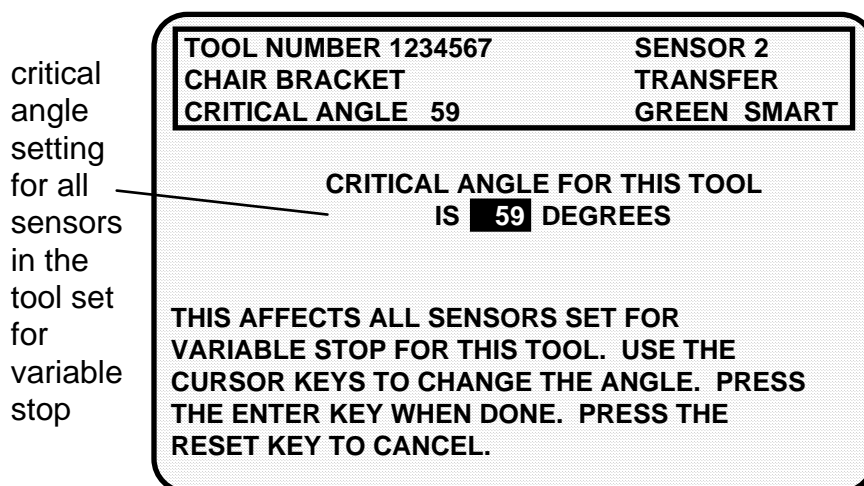


Figure 5-17. Setting critical angle for variable-stop sensors

Use cursor keys to change the angle value. Then press Enter when done (see Chapter 3 for help in using cursor keys). You will be able to continue setting up the sensor.

Next we explain how to set the ready signal for green, green quick check, and green constant sensors and the counter for green special sensors.

Setting the ready signal for a green sensor

After selecting stop type for a green sensor, you will see the display in which you set the ready signal the "ready on" angle and "ready off" angle (the "ready signal"). The ready signal is the timing window during which the sensor must actuate or SmartPAC sends the stop signal to the press.

You set the ready signal so that it is a little longer than the sensor's actuation time for green and green quick check sensors. For green constant sensors, you set it so that it is a little shorter than the sensor's actuation time. See Chapter 1 for an explanation of the different types of green sensors.

Note: If you are not sure how to set the ready signal, estimate it. You can adjust the setting later in Run mode after you run the press. SmartPAC will display the sensor actuation angles in the Run mode.

Setting the "ready on" and "ready off" angles

1. Use the cursor keys to move the arc around the "circle diagram". The **circle diagram** dynamically illustrates the on and off angle settings that you programmed for a sensor and/or cam channel. To set the "Ready ON" time, you increase the angle with the "right" cursor key and decrease with the "left" cursor key. Conversely, to set the "Ready OFF" time, you increase the angle with the "up" cursor key, and decrease with the "down" key. Notice how the bar changes to reflect these keystrokes. Also the numeric values appear in the "Ready" box on the screen. If necessary, see "Cursor keys" under "Using the keyboard" in Chapter 3 for step-by-step instructions. This display shows a green sensor with the ready signal for part ejection set to 180° on, 265° off.

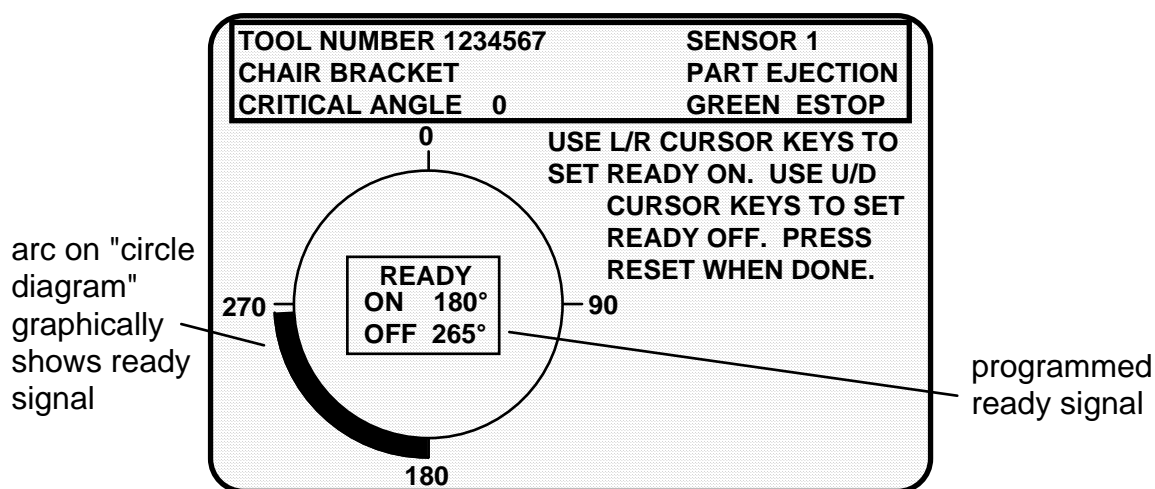


Figure 5-18. Example of a programmed ready signal for part ejection

2. After setting the ready signal, press Reset to go back to the sensor menu. If you are completely done, press Reset one more time to return to the Programming mode menu. *The highlight bar automatically scrolls down to the next sensor to program.*

Setting counter value for green special sensor

After setting the sensor type for a green special sensor, you will see the following display. You can set the maximum number of strokes that the press can make without this sensor actuating. The preset limit is 99. Use your up or down cursor keys to set the value. Then press the Reset key to set the next sensor.

number of
strokes to set
for green
special sensor
can be from 1
to 99

TOOL NUMBER 1234567	SENSOR 1
CHAIR BRACKET	PART EJECTION
CRITICAL ANGLE 0	GREEN ESTOP

THIS SENSOR MUST TURN ON
AT LEAST ONCE EVERY
11 STROKES

USE CURSOR KEYS TO CHANGE # OF STROKES
PRESS THE RESET KEY WHEN YOU ARE DONE

Figure 5-19. Setting "green special" sensor

FOR MORE INFORMATION

Refer to the section "Understanding Sensor Technology" in Chapter 1 for a detailed description of the green special sensor and other types of sensors.

Setting the other sensors for the tool

After you make the last setting for the sensor, you will again see this display (Figure 5-10). The name of your sensor will appear in the display. The next sensor is automatically highlighted.

To set more sensors, select the next sensor from the list and make settings for the sensor. Make settings in the same way for the rest of the sensors you are using.

Going back to the Main Programming menu

When you are done making settings for all sensors and have the list of sensors on your display, press Reset once more. You will again see the main Programming menu (Figure 5-5). You can select tool name, counters, or cam timing and make those settings for the tool. You can also select "Die Protection" again to display the list of sensors for the tool and check or change settings.

If you press Reset again instead of choosing to make more settings, you will see the display allowing you to load, modify, or delete the tool number (Figure 5-4). If you press Reset again, you go back to the first Programming display in Program mode (Figure 5-5).

Note: *SmartPAC saves your settings automatically. You do not have to press any key or issue any command to save settings.*

ABOUT CHANGING SETTINGS FOR A TOOL

When you change settings for a loaded tool number, a display will pop up allowing you to immediately load the tool number with the new settings. This display appears when you press Reset to go back to the Programming menu. You can load the tool number or go back without loading it. *You should load the tool number.* The old settings will be used until you reload the tool number with the new settings.

What to do about sensor inputs that are not used

If a sensor input is not used for a tool, do not make any settings for the sensor. SmartPAC will ignore any signals from that input, even if a sensor is connected. SmartPAC will list an unused sensor on the sensor list as "sensor 1" or "sensor 2", whatever number it is. Sensor type is automatically set to "not used" if no settings have been made.

To change a sensor input to "not used", select "not used" for sensor type. The list of sensors will be immediately displayed. Any sensor settings for this sensor are erased.

Going back to the sensor list using the Reset key

If you press Reset instead of Enter when making a setting for a sensor, you go back to your list of sensors. The item highlighted when you pressed Reset is the item selected.

Fine tuning the settings for green sensors

To set a precise ready signal for your green sensors, you should fine-tune the ready signal after seeing each sensor's actuation angle. You do this by loading the settings, then turning the Program/Run key to "Run". When you run the press, SmartPAC will record all actuation times and display the earliest "on" and latest "off" times for each sensor.

In Run mode, you can call up the display for each green sensor. The display will show each green sensor's actuation angle along with the ready signal you set. It is easy to adjust the ready signal based on what the actuation angle is. You can display and adjust your sensors quickly, even while the press is running. To learn how to use Run mode, see Chapter 6—"Using SmartPAC in Run Mode".

Disable (enable) sensors

Depending on how you initialized the "Sensor enable mode" in Initialization (Chapter 4), there are various ways to enable die protection. If you selected "Manual enable/disable" in Initialization, you can manually enable and disable your sensors using the keyboard and display screen. If you chose either of the "Auto enable" selections in Initialization, refer to the sensor programming section called "Die Protection" in Chapter 5 to make the appropriate settings for the tool. *Even in Auto mode, you can manually enable sensors at any time.*

No matter which choice you had made, you should always have sensors enabled to protect your tool. But sometimes you may want to disable sensors during setup. SmartPAC will *not* stop the press when sensors are disabled even if a sensor signals a malfunction. *If you do this, be sure to set sensors to "enabled" before you start making parts.*

Follow these steps to disable sensors.

IMPORTANT

When sensors are disabled, the LED display will *flash* while the press is running to remind you to reactivate die protection.

1. Return to the Programming menu — the first display you see in Program mode. Notice that the second line shows whether sensors are enabled or disabled. The factory setting is enabled. In the display shown below, sensors are enabled.

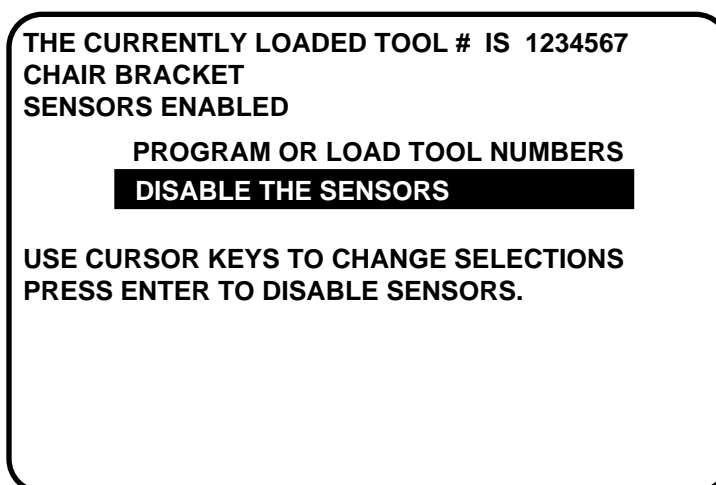


Figure 5-20. Disable/enable sensors

2. To disable sensors, highlight that second line and press Enter.
3. Now notice at the top left of the display, it shows that sensors have been "disabled". Note that "Disable sensors" has changed to "Enable sensors". To enable sensors, just repeat the process, and "disabled" will toggle back to "enabled".

Cam switch

WARNING!

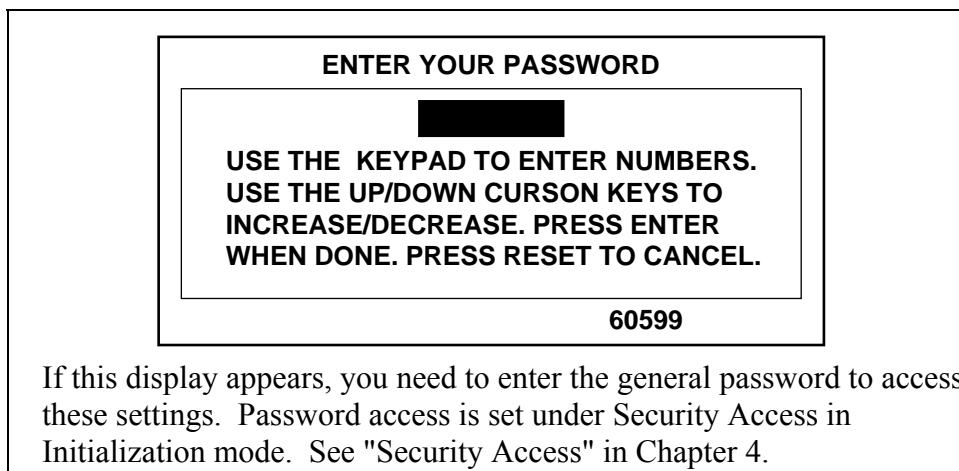
SmartPAC with programmable cam capability can be used with Wintriss Clutch/Brake Control. However, SmartPAC's programmable cam switch should not be used to provide timing signals for any other clutch/brake control. It is designed to control auxiliary functions only.

To use cam switch, you need to:

- Select "Cam switch" from the Main Programming menu
- Select a channel and make an on-off, auto, or timed output setting
- Set all other channels for the tool

Bringing up the display of cam channels:

1. Select "Cam switch" from the Main Programming menu (Figure 5-5)



2. This is your list of cam channels. Now you can select and set a channel. (If you named your cam channels in Initialization mode, those names will appear, instead of channel 1, channel 2, etc.)

NOTE: Notice that we are illustrating 16 cams. Depending upon the way that your SmartPAC has been configured (with ProCam 8 cams or with ProCam 16 cams), your display may vary. We are showing the complete ProCamPAC module. Also, if you had named the cam channels in Initialization mode (Chapter 4), the channel number will be replaced with the name.

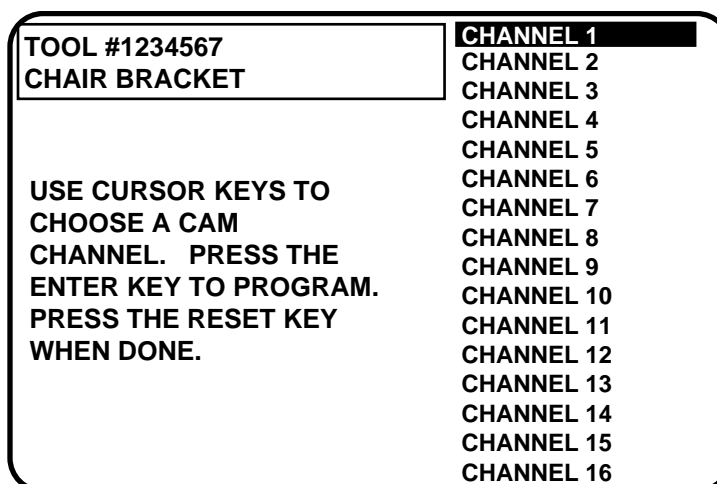


Figure 5-21. Programming cam channels

Selecting a channel and making an on-off setting

An on-off setting means you set the stroke angles where you want the channel to turn on and turn off.

To make an on-off setting for a channel:

1. Select a channel from the complete list. You will see the display below. Notice that the tool number and channel name selected are shown in the display. Select "Program on/off angle".

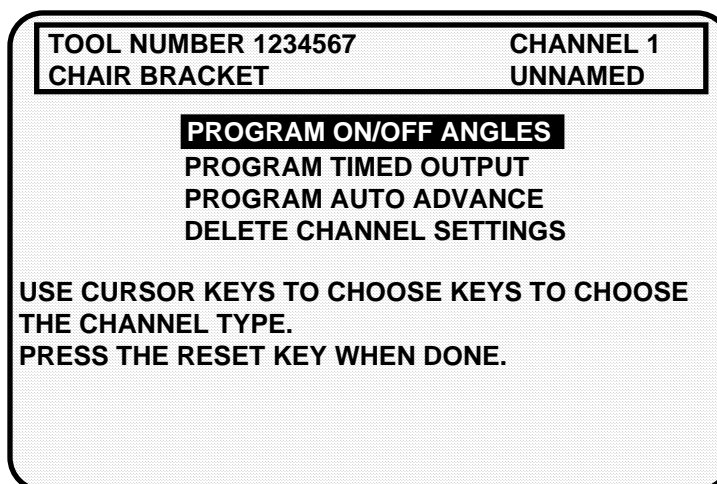


Figure 5-22. Selecting "Program on/off angles"

2. You see a display (similar to Figure 5-23) which includes information about the tool and cam channel. Notice also the circle diagram on the display.
3. Set the "on angle" and "off angle" using the cursor keys. An arc will move around the circle diagram as you set the "on" and the "off" angles. These settings are also shown numerically in the box on the display. See "Cursor keys" under "Using the keyboard" in Chapter 3 for instructions on how to set the "on" and "off" angles.

4. Press Reset to go back to the display showing the cam channels. You can select another channel to set.

Here is an example of a display for a part blow-off set at 185° on, 220° off.

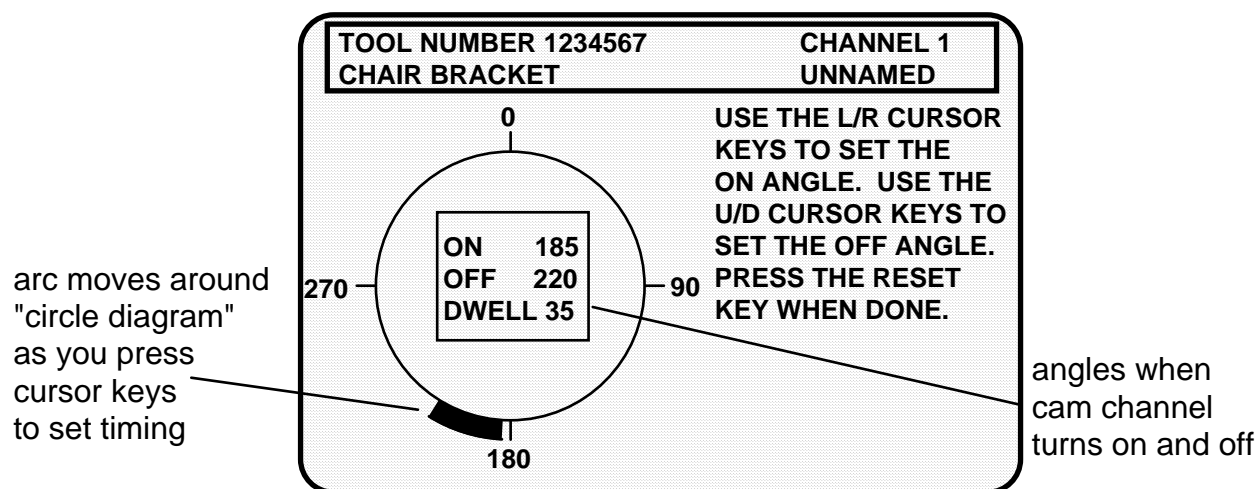


Figure 5-23. Illustrating programmed channel 1 "part blow-off"

Selecting a channel and making a timed output setting

A timed output setting means that you set the stroke angle where you want the channel to turn on and the dwell duration time in milliseconds (in other words, how long you want the channel to stay on). This makes the channel "on-duration" independent of press speed.

With on-off settings, "on-duration" decreases with press speed. Timed output settings are recommended for functions such as controlling air and lubricators to ensure consistent "on-duration" regardless of press speed. Also, when you use the timed output setting, the channel will turn off after the set time, even if the press stops at the "on" angle. With "on-off" settings, the channel will stay on if the press stops within the "on" setting for the channel. Therefore, you could waste air or lube. *You can set up a maximum of four channels as "timed".*

To make a timed output setting for a channel:

1. Select the channel you want to set from the list of cam channels. You will then see the display for choosing an on/off output, timed output, or auto advance settings.
2. Select "Program timed output." You see a display which includes the tool number and name of the channel you are setting shown at the top.
3. Use the RIGHT or LEFT cursor keys to set the degrees where the channel should turn on. The letter "T" and the 0 next to it will move across the scale at the bottom of the display as the key is pressed. Hold down the key until the "T" moves to the degrees you want. If you overshoot your setting, press the left cursor key to go back. The degrees setting is also shown in the box next to "angle."

Note: The zero next to the "T" indicates the "on-time" which is set next.

4. Use the UP or the DOWN cursor keys to set the time that the channel should be on in milliseconds. (A millisecond is 1/1000th of a second.) Press these keys to increment (up) or decrement (down) until you reach the right number. The number will change in increments of 10 milliseconds. If you overshoot, use the DOWN cursor key to go back. The number is shown in the box and next to the "T" on the scale. You can go up to 500 milliseconds (.5 seconds). When you are done with the setting, your display should look similar to the next illustration (the settings here are 270° on-angle, 250 mS on-time):

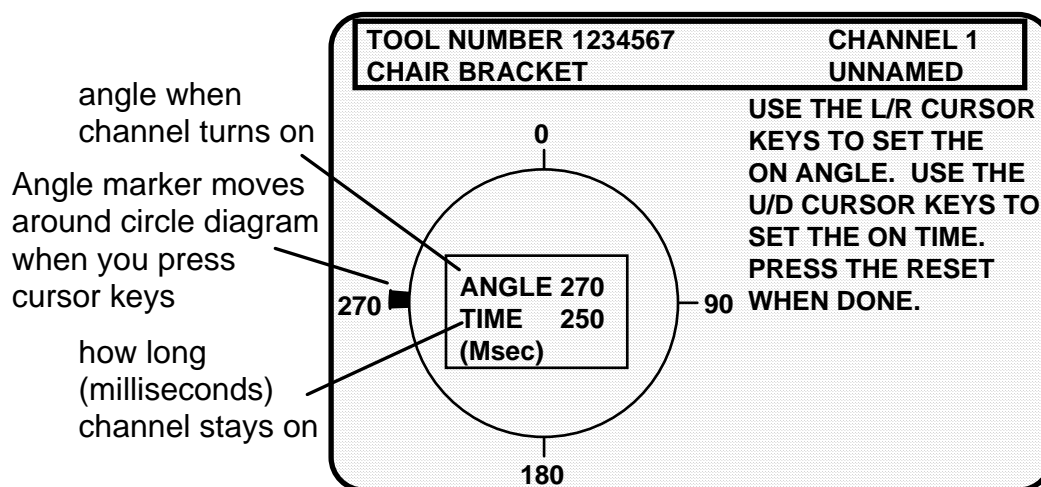


Figure 5-24. Illustrating a timed output channel

5. Press Reset to go back to the list of channels.

For applications requiring more than 500 milliseconds

If you have an application where more than a 500-millisecond "on-time" is required, use one of the batch counters instead of programming a timed output setting (as explained above). To accomplish this, set the "batch count" to a value of 1 and the "counter angle" accordingly. Next, set the cam's "on-time" as the batch's "pulse time". For more assistance in programming batch counters, see "Setting Counter Mode" earlier in this chapter.

Note: *SmartPAC saves your settings automatically. You do not have to push any key or issue any command to save settings.*

Selecting a channel and making an auto advance setting

You can make an auto advance setting whenever you want SmartPAC to automatically compensate the cam timing for changes that occur in press speed. A good example of this is top stop because it ensures the same top stop position, regardless of varying press speeds. You can also use "auto" settings for feed, pilot release, lube, etc. *You can set up a maximum of two channels as "auto".*

IMPORTANT

You can program up to two "auto" output settings in Program mode. The first advance constant set in Initialization mode affects the *lowest-numbered* channel that you set as "auto" in Program mode, and likewise the next *numerically higher* channel number uses the second "advance constant" setting. In other words, if channel 3 and channel 5 are programmed using Auto Advance, channel 3 will use the first advance constant, and channel 5 will use the second. See "Auto Advance" in Chapter 4 for more information about advance constants.

To make an auto advance setting for a channel:

1. Select the channel you want to set from the list of cam channels. You will then see the display for choosing an on/off output, timed output, or auto advance settings.
2. Select "Program auto advance." You see a display showing the tool number, channel number, and name of the channel you are setting shown at the top of the screen.
3. Set the "on angle" and "off angle" using the cursor keys. Notice that an arc will move around the circle diagram as you set the "auto on" and the "auto off" angles. These settings are also shown numerically in the box on the display along with the dwell. See "Cursor keys" under "Using the keyboard" in Chapter 3 if necessary.

When you are done with the setting, here is an example of how your display would look like. (the settings here are 270° auto on, 330° auto off):

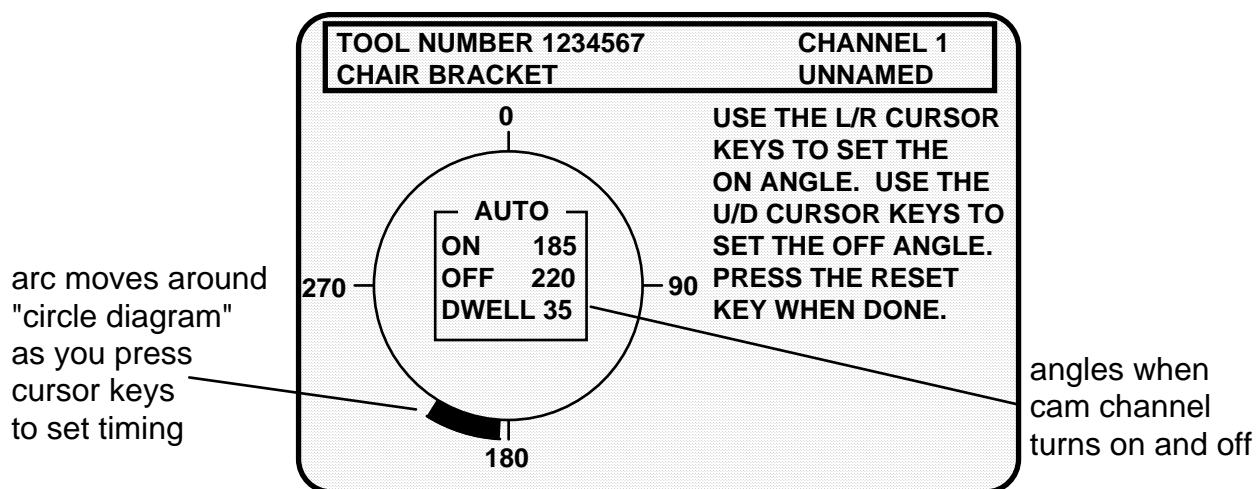


Figure 5-25. Illustrating an auto advance channel

4. Press Reset to go back to the list of channel names.

Setting other channels for the tool

When you are done setting a channel, make settings for the rest of your channels. To finish making settings:

1. Choose the next channel from the list of channel names. Make settings for that channel.
2. Make settings for all your other channels.
3. When you are done with all channels, display the list of channels. Then press Reset. You will return to the display allowing you the choice of setting counters, cams or batch mode. You can perform other tasks. If you press Reset again, you will return to the first display in Programming mode.

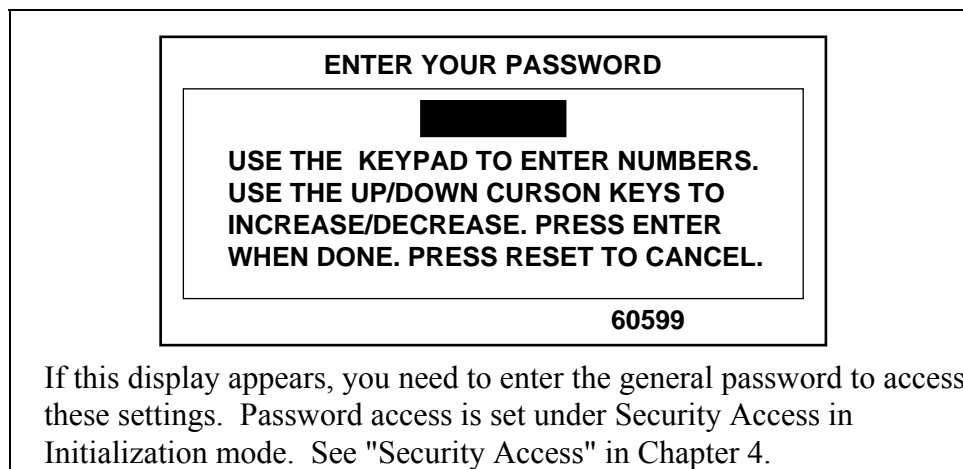
Note: *SmartPAC saves your settings automatically. You do not have to push any key or issue any command to save settings.*

Deleting channel settings

To delete settings for a cam channel, select the cam channel, then select "Delete channel settings" from the next display. The settings for the channel will go back to 0° on—0° off (or 0° On—0° time on for timed settings). You will automatically go back to the list of cam channels.

Press speed

If you have a variable speed press, you can program different speed limits for different tools. Select "Press Control" from the main Programming menu (Figure 5-5),.



A display similar to the following appears:

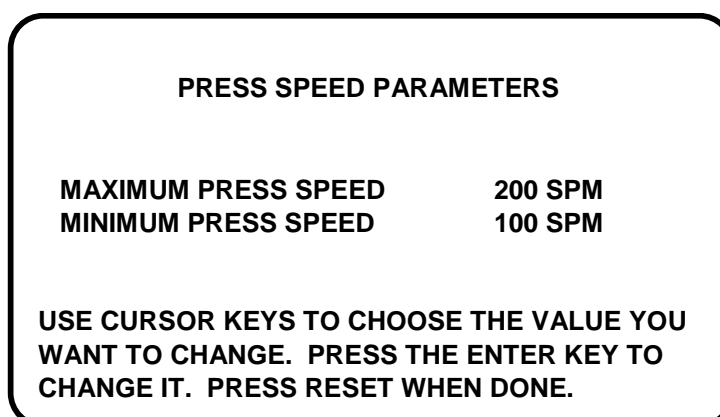


Figure 5-26. Press speed parameters

This choice allows you set upper and lower limits for the press's operating speed. Make sure that you set a greater value for the "Maximum" than for the "Minimum". SmartPAC will not allow you to inadvertently enter a smaller number in "Maximum". Instead, it will display a value one digit greater than the "Minimum". If you wish to disable this choice, set both maximum and minimum press speed parameters to 0 (zero).

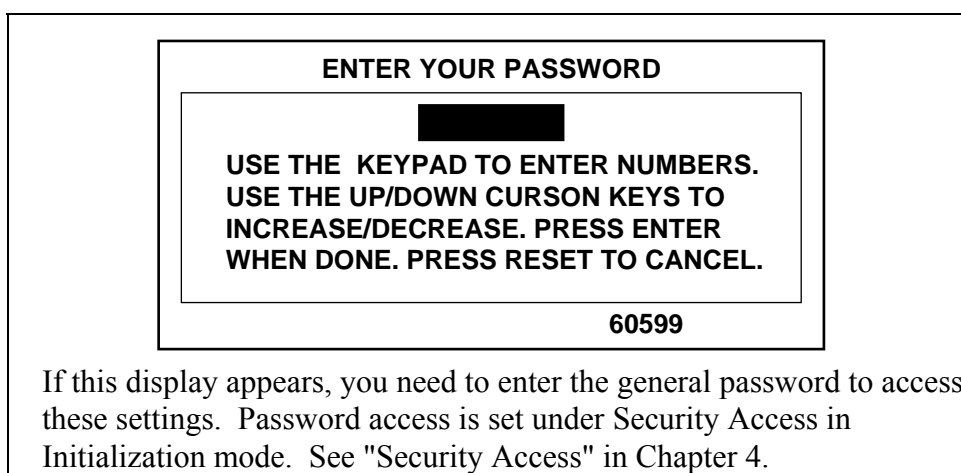
Tool number information (optional)

IMPORTANT

Tool Information serves only as a convenient place to record information about the tool. It does not control any aspect of press operation.

Note: *This feature is not available if you have the optional PLC interface installed.*

Select “Tool Information” under the main Programming menu (Figure 5-5) to record useful information about the tool you are programming. See “Tool number information” in Chapters 4 to set up the information items.



You will see a display similar to the following:

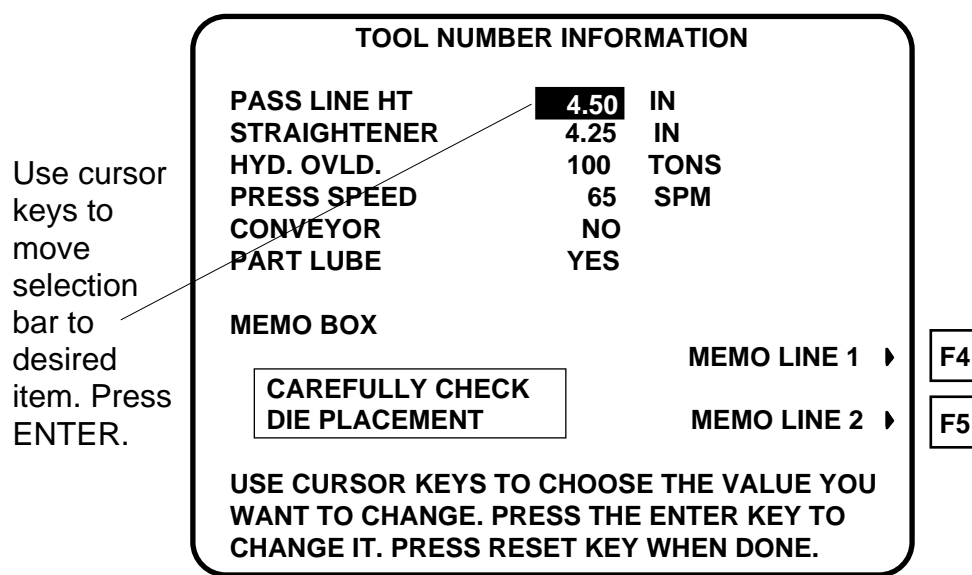


Figure 5-27. Tool number information screen

To enter information about the items:

1. Select the desired item. A screen overlay appears in which you can enter the appropriate value. For Yes/no items, enter 0 (zero) for NO, and 1 (one) for YES.
2. Enter text into the memo box, by pressing **F4** for the first line, and **F5** for the second line. A screen overlay (Figure 5-28) appears that enables you to enter fifteen characters of numbers and alphabetic text for each line. When you complete each line, press **F6** to accept it.

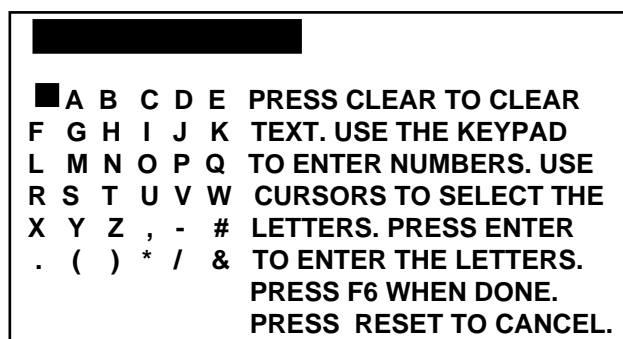


Figure 5-28. Overlay for entering memo box text

3. When you have finished entering information into the tool number information screen, press RESET to return to the main Programming menu.

Load the tool number

Before you run the press, you have to load the SmartPAC settings for the tool being used. This retrieves the settings for the tool from SmartPAC's memory and allows SmartPAC to use the settings to control the press.

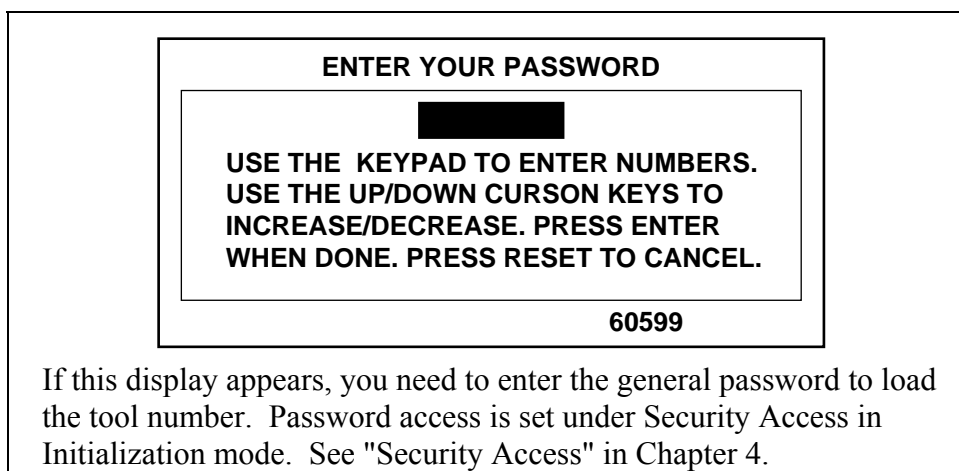
*** WARNING ***

Equipment may operate when you load tool settings

When you load a tool number, auxiliary press equipment may start if the press crankshaft is within the on-off setting for that device. All employees must stay away from the press and equipment that the cam operates before a tool number is loaded.

To load the settings for a tool number:

1. Select "Program or load tool numbers" from the first Programming menu.



Note: *You can also load tool numbers in Run mode, if allowed by security access, as long as the press is stopped.*

2. Select the tool number you want to load from the tool number display. (See the beginning of this chapter if you need assistance in selecting a new or existing tool number). After selecting the tool number, the main programming menu for the tool appears:

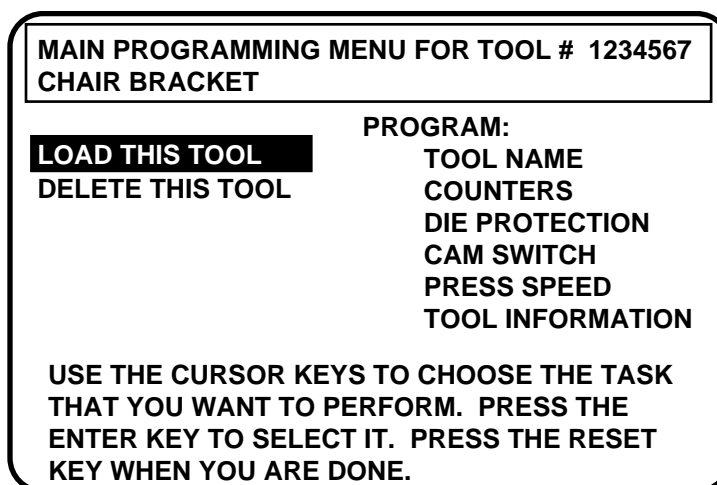


Figure 5-28. Main Programming menu for tool number

NOTE: *If you started programming the tool and then pressed RESET, SmartPAC interprets this as an order to load the tool, and shows you the warning screen shown in Figure 5-29.*

3. Select "Load this tool." You will see this warning message superimposed over the "Load Tool" screen (above):

WARNING! ! WARNING!!
ANCILLARY EQUIPMENT MAY OPERATE
WHEN THIS SETUP IS LOADED. WARN
ALL PERSONNEL TO STAND CLEAR.
PRESS ENTER TO LOAD THE SETUP
PRESS RESET TO CANCEL

Figure 5-29. Warning message when loading tool number

4. Press Enter to load the tool settings (a setup). You can go back without loading the tool settings by pressing Reset. When the tool number has been loaded (which takes only a few seconds), this message quickly appears on the screen:

TOOL NUMBER 1234567 IS BEING LOADED

IMPORTANT

If this message does not appear, but instead the screen shows an error message, find the description of that error message in Chapter 7. Follow the instructions there for correcting the problem. If the error message is not described there, or you cannot fix the problem, call Data Instruments' technical advisors. Be ready to provide the following important information to expedite a solution to the problem: **product name** (e.g. SmartPAC standard); **installed options** (e.g. DiProPAC, ProCamPAC, etc.); and **firmware version number** (e.g., Vs. 2.00). You can determine the last two items, by going into "Installed options" in the Initialization mode (see Chapter 4). You can also determine firmware version number from the chip on the processor board (see "location of components" in Chapter 2).

5. Once the tool is loaded, you will again see the first Programming menu. Note that the Programming menu shows the tool number you just loaded. You can always check which tool number is loaded on this display. With settings loaded, you can switch to Run mode and run the press.

How to modify the tool number settings

Note: *When you change settings for a currently loaded tool number, a display will pop up allowing you to immediately load the tool number with the new settings. This display appears when you press Reset to go back to the Programming menu. You can load the tool number or go back without loading it. You should load the tool number. The old settings will be used until you reload the tool number with the new settings.*

After you have created a tool number (see the beginning of this chapter if you need to review the steps), it is easy to change settings for the tool. Changing settings is done the same way as you made them originally. To change settings for a tool you need to:

- Bring up the Main Programming Menu
- Select the item you want to modify
- Change the settings

Bringing up the display to modify counters, cams, batch, or counter angle

To bring up the Main Programming menu (Figure 5-5):

1. Select "Program/load tool numbers" from the first display in Programming mode (the Programming menu) to see the list of tool numbers already created.
2. Select the tool number you want to change. (Remember, if you need help in selecting an existing tool, refer to the beginning of this chapter.)
3. You will be at the Main Programming menu. Select which action you wish to perform (counters, die protection, cam switch, etc.)

Modifying sensor settings

1. Select "Die Protection" from the Main Programming menu (Figure 5-5). You will see your list of sensors for the tool.

NOTE: If necessary, refer to the section "Die Protection" earlier in this chapter for illustrations of the different displays, plus detailed step-by-step instructions.

2. To change a setting, select the sensor you want to change. Then modify settings in the same way you originally made them. You can change any setting for a sensor. Or you can leave any setting the same by not changing the selection already made. (When you change sensor type, you have to reset the ready signal).
- When you are done making changes, display your list of sensors, then press Reset to see the Main Programming menu again. If you press Reset again and the tool number you changed is loaded, you will see a display allowing you to immediately reload the tool number with the new settings. If the tool number you changed is not loaded, you will see the display allowing you to load, modify, or delete the tool number. Press RESET once more and you go back to the Programming menu.

Modifying cam channels

1. Select "Cam switch" from the display giving you the choice of settings. You will see a display listing your cam channels. Remember, you set names for your channels in Initialization mode— Chapter 4.

Note: If necessary, refer to the section "Cam switch" earlier in this chapter for illustrations of the different displays, plus detailed step-by-step instructions.

2. To modify a setting for a channel, select the channel you want to change. Then you can modify settings in the same way as you originally made them.
3. When you are done making changes, display your list of cam channels; then press Reset to go back to the display to select settings. Press Reset again, and you see the tool number display.

REMEMBER TO LOAD THE TOOL NUMBER

When you press Reset after changing settings for a tool, a display pops up allowing you to load its new settings. You can load the tool number or go back without loading it. You should load the tool number. The old settings will be used until you reload the tool number with the new settings.

Delete the tool number

When you delete a tool number, you remove it completely from the tool number display and from SmartPAC's memory. All tool information will be lost. Here is how to delete a tool number.

1. Select "Program/load tool numbers" from the Programming menu (first display in Program mode).
2. Select the tool number that you want to delete (erase) from the tool number display. (See the beginning of this chapter if you need assistance to select a tool number.)
3. Select "Delete this tool" (see Figure 5-5).
4. Next, you see this message superimposed over the above display (here, we are deleting tool #1).

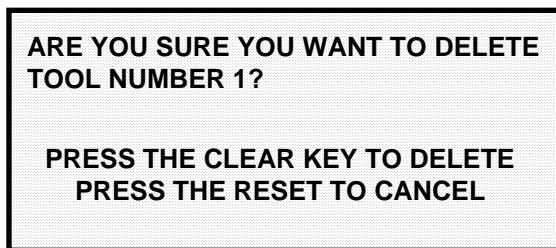


Figure 5-30. Confirmation message to delete tool

5. Delete the tool number by pressing the "Clear" key. You will then get this confirmation (your tool number may vary):

DELETING TOOL NUMBER 1

6. If you do not want to delete the tool number, just press Reset to go back to the first display in Programming mode.

Chapter 6

Using SmartPAC in Run mode

This chapter describes how to use all the displays you will see in Run mode. It covers how to adjust counter settings for a tool, set stop and start times, and load a tool number.

This chapter also includes programmable cam-related functions, such as adjusting and viewing cam timing; and die protection-related functions, such as adjusting sensors, viewing sensor timing, and enabling and disabling sensors.

About Run mode

The Program/Run key must be set to "run" before you can operate the press. In Run mode, you can select from the displays to perform tasks just as you do in Program mode. The difference between Program mode and Run mode is this: in Program mode you can make and change settings for all existing tools and any new tool numbers you create. In Run mode, you can only adjust certain settings for the loaded tool number. You cannot view settings for a tool number if it is not loaded.

What you can and cannot do in Run mode

In Run mode you can load a tool number, adjust counters and cam settings, view stop time and view cam channel timing. You cannot create new tool numbers, nor can you modify settings for a tool number if it is not already loaded.

Why some tasks are duplicated in each mode

If you are wondering why certain tasks (like loading a tool number and adjusting timing) are duplicated in Run mode and Program mode, here is why. Sometimes you may not want personnel to get into Program mode. So you keep SmartPAC in Run mode by setting the key to "Run" and removing the key. Now Program mode is locked out. However, the operator can still load a tool number in Run mode and make timing adjustments when necessary in order to correct malfunctions. He or she cannot change tool settings in any other way, however, or create new tool numbers. Creating and organizing tool settings might be left to another person, such as a supervisor or setup person.

Locking Run mode

You can lock out choices on the Run menu or, if you have the password option, require a password to prevent personnel from changing settings or loading tool numbers. See Chapter 4—"Security access"—for instructions on how to lock and unlock Run menu items, and how to require a password.

The first display in Run mode — the Run menu

To get into Run mode, set the Program/Run key to Run.

NOTE

Before changing modes, make sure your screen shows the first display in the mode you are in. If that display is not shown, nothing will happen when you turn the Program /Run key. In that case, keep hitting the RESET key. When the first display in the mode is reached, you will instantly switch to the new mode.

A tool number must be loaded before switching to Run mode

If no tool number is loaded, you cannot switch from Initialization mode or Program mode to Run mode. A tool number must be loaded before SmartPAC will allow the press to run.

If you try to switch to Run mode without a tool number loaded, you will get this error message on your screen:

NO TOOL NUMBER HAS BEEN LOADED

If so, turn the Program/Run key to "program". Press RESET to clear the error message. Then load a tool number. Now set the Program/Run key to "run". You will go into Run mode.

The Run menu is the first display you see in Run mode.

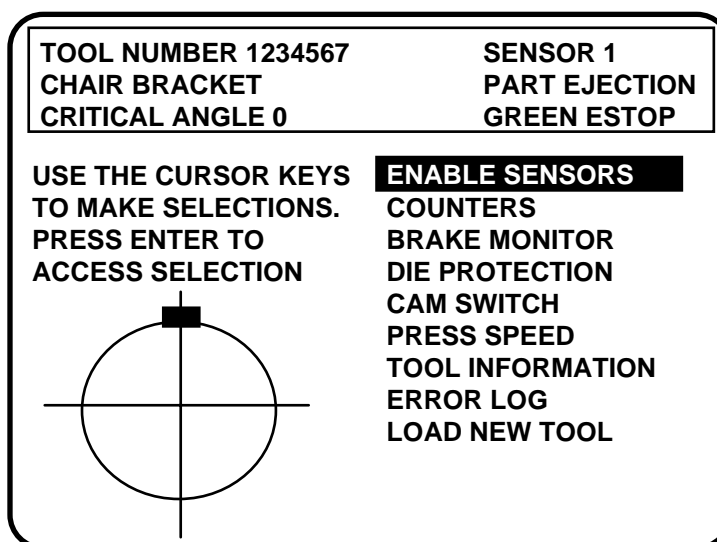


Figure 6-1. Main Run menu (the order may vary depending on the options installed)

From this display you can access all the other Run menu. A description of these displays follows.

SELECT = HIGHLIGHT + ENTER

When we say SELECT in this manual, it means highlight the item and press ENTER.

Settings locked in Run mode, or password required

SmartPAC's security access feature can lock settings in run mode, or require a password for settings to be changed if you have the password option. Whenever settings are locked in Run mode, you will see a message on the screen telling you so when you select the item. If a password is required, enter it at the screen overlay that appears, Figure 6-2.

ENTER YOUR PASSWORD

**USE THE KEYPAD TO ENTER NUMBERS.
USE THE UP/DOWN CURSOR KEYS TO
INCREASE/DECREASE. PRESS ENTER
WHEN DONE. PRESS RESET TO CANCEL.**

60599

Figure 6-2. "Enter your password" display

If settings are locked in Run mode, you can display the information, but nothing happens if you try to make an adjustment. "Adjust mode locked" means you cannot adjust settings. If counters are locked, you cannot change the current count. If cam settings are locked, a message appears on the screen that reads, "CAM ADJUSTMENT IS LOCKED OUT. PRESS RESET WHEN DONE." The item "Load new tool" does not appear on the Run menu if tool numbers are locked in Run Mode.

For more detail, see "Security access" in Chapter 4.

Counters

To set or adjust counters in Run mode, select "Counters" from the Run menu. You will see this display:

TOOL NUMBER 1234567		SENSOR 1
CHAIR BRACKET		PART EJECTION
CRITICAL ANGLE 0		GREEN ESTOP
	COUNT	PRESET VALUE
STROKES	0	0
GOOD PARTS	0	0
BATCH 1	0	0
(TOP STOP)		
BATCH 2 CHANNEL 7	0	0
(TOGGLE)		
BATCH 3 CHANNEL 8	0	0
(PULSE)		
TOTAL HITS	0	0
USE CURSOR KEYS TO MAKE SELECTION. PRESS ENTER TO SET THE COUNTER. PRESS RESET WHEN DONE.		

Figure 6-3. Modifying counters screen

Now you can change or reset the strokes, good parts, batch and total hits counters and presets in exactly the same way you did when you first set them. See "Counters" in Chapter 5 for detailed, step-by-step instructions for setting up the counters.

Note: *When the Total Hits counter reaches its preset value, the status box flashes to indicate that this has happened.*

Brake Monitor

Setting Stop Time, Stop Angle, and Start Time

In Run mode, you can view stop time and stop angle, and you can perform the 90° stop test to determine the longest stop time of the press. You can also get a reading for the start time of the press.

Stop time is the time that it takes the crankshaft to stop once the dual safety valve (DSV) has been de-energized. *Start time* is the time it takes for the crankshaft to start turning after the DSV has been activated. *Stop angle* is the number of degrees that it takes the press to stop. It is equal to the stopping position in degrees minus the crankshaft position when the DSV is closed. (Stop angle does not compensate for the complete rotation when it takes more than 360° to stop.) The stop angle helps you when you set up the top stop cam. For example, if the stop angle is 100°, set the top stop cam to turn on at 260°. For a discussion on the brake monitor, see the section "Brake Monitor" in Chapter 4.

You need to determine the press's stopping time under normal stopping conditions, which is usually top stop. Therefore, the stop time limit must be calculated based upon stopping time at *top stop*.

Performing the 90° stop-time test

The 90° stop-time test is required in order to set the proper safety distance for personnel guarding devices including light curtains, two-hand controls, and type-B movable barriers. This test is done at the press's most critical stopping point -- 90°. The worst case scenario occurs half-way through the downstroke at 90° while the press is running in continuous mode. Therefore, SmartPAC is designed to check stopping time at that critical crankshaft angle, and provides you the T_s value referenced in ANSI B11.1 1988.

Follow these steps to perform the 90° stop-time test:

1. Install the heaviest upper die set into your press. Adjust the counterbalance for ram weight, if your press has a counterbalance.
2. Set the PROG/RUN key to "Run" to get into Run mode. Then select "Brake monitor" from the Main Run menu. You will see this display:

TOOL NUMBER 1234567 PART CNTR 0		
CHAIR BRACKET		
SENSORS ENABLED		
STOP TIME STATUS		
	VALUE (MSEC)	LIMIT (MSEC)
STOP TIME	250	300
START TIME	155	200
STOP ANGLE	75	75
90 STOP	0	
PRESS THE UP CURSOR KEY TO START THE 90 DEGREE BRAKE TEST. PRESS THE RESET KEY WHEN DONE.		

Figure 6-4. Using "Brake Monitor" display for 90° Test

IMPORTANT

Before you can go into Run mode, a tool must be programmed and loaded in Program mode. Consult Chapter 5 for assistance.

3. Run the press in Continuous mode. If the press has a variable speed drive, set the speed to the fastest that you will normally run.
4. Press the UP cursor key to start the 90° stop-time test. The message at the bottom of the display will now say:
90 DEGREE BRAKE TEST ARMED
PRESS RESET TO CANCEL TEST

5. The next time that the press reaches 90°, the emergency stop relays will open and stop the press.
6. Record the information displayed on the LCD display. The stop time value is displayed in milliseconds. One millisecond = 1/1000th of a second = .001 sec.
7. Repeat the test at least 5 more times. Record the highest reading from all your tests. This is the stop time value to use when calculating safety distance.
8. Press RESET when done to be returned to the Main Run menu.

CAUTION

Any time you change the stop time limit on SmartPAC, you *must* perform the 90° stop-time test, and you also must recalculate the new safety distance!

Calculating the safety distance

Before you can calculate the correct safety distance, you must know your press's stopping time. You can find the press's stopping time using SmartPAC. You must use the 90° stop time test to find stopping time. This is required by OSHA regulation 1910.217. During this test, the press control stops the press at 90° of the stroke and displays stop time. How to perform this test is covered in the previous section.

Once you know the press's stopping time, you can calculate the safety distance. Shadows must be mounted away from the pinch point (or hazardous area) of the machinery at a specific distance. This distance is based on stopping time. The safety distance must be calculated using a precise formula. This ensures that Shadow can send the stop signal to the press, and the press will stop, before the operator's hand reaches the hazardous area. (The safety distance is also discussed in the Shadow V user manual.)

CAUTION

No matter what safety distance you calculate, it is recommended that Shadow units *never* be mounted closer than 7-1/2" (19.1 cm) from the nearest pinch point hazard. The illustration below shows how you would measure the distance between the pinch point (or hazardous area) of your press and the light curtain. This distance must be greater than the calculated safety distance or Shadow may not be able to stop the machinery before an operator's hand reaches the hazardous area.

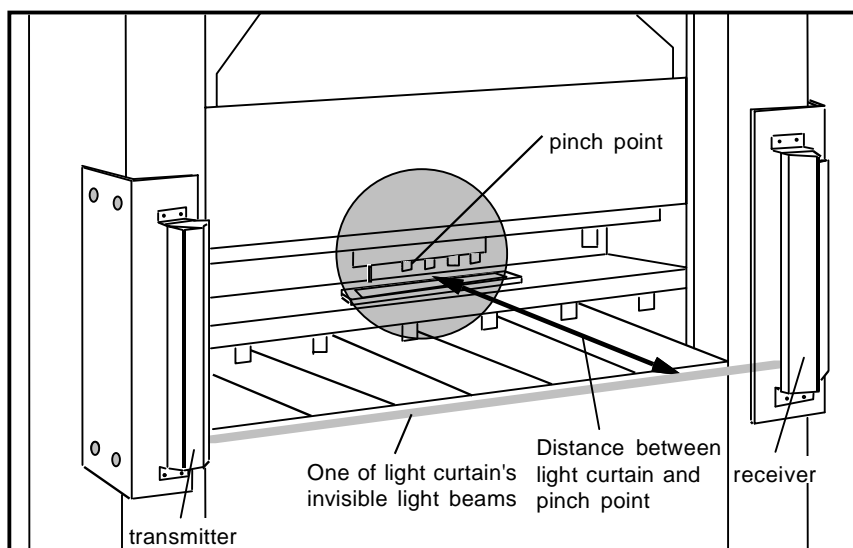


Figure 6-5. Measuring distance between pinch point and light curtain on a press

ANSI and OSHA safety distance formulas

You are governed by Occupational Safety and Health Administration (OSHA) regulations when mounting Shadows. The Shadow, must be located at the correct safety distance from the pinch point. OSHA regulation 1910.217 specifies requirements for light curtains when used with mechanical power presses.

When calculating safety distance, however, Data Instruments recommends you use the formula from the American National Standards Institute (ANSI)—standard B11.1-1988. The formula represents a new consensus among manufacturers on the proper installation of light curtains. It takes into account more factors (such as brake monitor setting, object sensitivity, and depth penetration factor) than the OSHA formula. It has been developed specifically for guarding of mechanical power presses. Both the ANSI and OSHA formulas are explained in the next sections.

WARNING

Safety distance must be correct

Properly calculating the safety distance is a very important part of Shadow installation. If you install Shadows too close to the point of operation, the Shadow may not be able to stop the press before an intrusion, like an operator's hand, reaches the dangerous area. Then the machine guarding function of Shadow is lost. If you are not sure how to calculate the safety distance for your press, contact Data Instruments. We will be able to provide you with the information you need to properly calculate safety distance.

The ANSI safety distance formula

This is the formula Data Instruments recommends for calculating the safety distance:

$$D_s = K \times (T_s + T_c + T_r + T_{bm}) + D_{pf}$$

D_S is the safety distance we will find using the formula.

K is the OSHA-recommended hand-speed constant. This constant is 63 inches-per-second. The hand-speed constant indicates how far you could theoretically move your hand and arm in one second.

T_S is the stopping time of a press in seconds. It is measured at approximately 90° of crankshaft rotation (or at maximum closing velocity).

T_C is response time of the press control. This is the time it takes for the control to activate the machine's brake. In the 90° stop time test using SmartPAC, the stop time readout includes the stop time of the press and response time of the press control. How to do the 90° stop time test is described earlier in this chapter.

T_R is response time of the light curtain. Response time for Shadow V is 30 milliseconds (50 milliseconds for 36" and 48" Shadow V light curtains)

T_{bm} is additional time added to the stop time of the press to allow for brake wear. You must allow extra time for brake wear because any safety distance based only on stop time will become too short as the brake wears. **T_{bm}** is calculated when you set the brake monitor for SmartPAC. You must calculate and set the stop time limit before calculating safety distance for the light curtain. You are told how to calculate **T_{bm}** when setting the stop time limit.

D_{pf} is the depth penetration factor. This is a measure of how far an object, like an operator's hand, can move through the light curtain before the light curtain reacts. **D_{pf}** is related to the object sensitivity of Shadow. Object sensitivity is the smallest diameter object Shadow will detect anywhere in its field.

Object sensitivity (**S**) for Shadow V is 1.25" (3.2 cm). Based on **S** and ANSI B11.1–1988, **D_{pf}** = 3.3" (8.4 cm)

For Shadow V with one beam blanked, **S** = 2" (5.1 cm) and **D_{pf}** = 5.9" (15 cm). This means **D_{pf}** increases by 2.6" (6.6 cm) when you add one blanking window.

An example for calculating the safety distance using the ANSI formula

Below is an example of how to use the formula to calculate safety distance (**D_S**). First take another look at the formula we must use:

$$D_S = K \times (T_S + T_C + T_R + T_{bm}) + D_{pf}$$

Let's use these numbers for our variables in the formula, and assume that the 90° Stop-time Test indicated 190 milliseconds:

$$K \text{ (hand speed constant)} = 63 \text{ inches per second (set by OSHA)}$$

$$T_S + T_C = 0.190 \text{ sec.}$$

$$T_R = .030 \text{ sec. (response time of Shadow)}$$

Let's take **T_{bm}** from example 2 from the Stop Time Limit calculations performed earlier in this chapter.

$$T_{bm} = 0.210 \text{ sec. (brake monitor setting)} - 0.175 \text{ sec} = .035 \text{ sec.}$$

$$D_{pf} = 3.3$$

Now let's put our numbers into the formula:

$$D_S = K \times (T_S + T_C + T_R + T_{bm}) + D_{pf}$$

$$D_S = 63 \times (0.190 + .030 + .035) + 3.3$$

$$D_S = (63 \times .255) + 3.3$$

$$D_S = 16.1 + 3.3$$

$$D_S = 19.4''$$

The distance the light curtain must be mounted from the pinch point in our example is 19.9". When using the formula, be sure to do all calculations in this order:

- (1) Add **T_S + T_C + T_R + T_{bm}** first.
- (2) Multiply the result by 63.
- (3) Add this result to **D_{pf}**. This is **D_S**.

If you do not follow this order, your safety distance calculation will be incorrect.

The OSHA safety distance formula

The OSHA safety distance formula as specified in OSHA regulation 1910.217 is explained below. *As noted earlier, Data Instruments recommends you use the American National Standards Institute (ANSI) formula for calculating safety distance. It contains more factors that allow you to calculate the safety distance more precisely. The ANSI formula is explained in the previous section.*

Here is the OSHA formula:

$$D_S = 63 \text{ inches/second} \times T_S$$

D_S is safety distance.

63 inches-per-second is the OSHA-recommended hand-speed constant.

T_S is the stop time of the press in seconds.

T_S is measured at approximately 90° of crankshaft rotation (or at maximum closing velocity). T_S must include all components that are involved in stopping press. It must include response time of the press control that activates the brake and response time of the light curtain (30 mS for Shadow V).

In the 90° stop time test using SmartPAC, the stop time readout includes the stop time of the press and response time of the press control. How to do the 90° stop time test is described earlier in this chapter.

Since some increase in stop time can invariably be anticipated due to clutch/brake system deterioration, a percentage factor must also be added to the actual measured stop time of your press when determining your safety distance.

A percentage factor of 20 percent is recommended for presses with new brakes or brakes in good condition; a percentage factor of 10 percent is recommended for presses with older brakes. This is because the stopping time for older brakes will be longer due to wear. Therefore, you add less time for older brakes.

WARNING

Your number for T_S must include stop time of the press, the response time of the SmartPAC, response time of the light curtain, and the percentage factor added in for brake wear. Otherwise, the safety distance will be too short.

An example for calculating the safety distance using the OSHA formula

The OSHA formula for finding safety distance is: **$D_S = 63 \text{ inches/sec.} \times T_S$**

We will use a stop time of .190 seconds for this example. This number includes press stopping and response time of SmartPAC.

Next we will add in the braking percentage factor. Let's say our brakes are new. Then we will add 20% additional time to the stop time measurement ($.20 \times .190 = .038$).

We also must add response time of Shadow V (.030 seconds). Then:

$$T_S = .190 \text{ sec.} + .038 \text{ sec (braking factor)} + .030 \text{ sec. (Shadow response time)}$$

$$T_S = .258$$

Now, we will calculate safety distance:

$$D_S = 63 \text{ in/sec} \times T_S$$

$$D_S = 63 \times .258$$

$$D_S = 16.3 \text{ in.}$$

Shadow must be mounted more than 16.3 inches from the pinch point using the OSHA formula.

Adding to safety distance for floating or blanking windows

The above examples showed how to calculate the safety distance for Shadows when blanking windows were not used. If using blanking windows, you must add 2.6" (6.6 cm) to the calculated safety distance. This applies whether you use the ANSI or OSHA formula.

So remember this rule: when a blanking or floating window is used, you must add 2.6" (6.6 cm) to the safety distance. Blanking windows and floating windows are discussed in your Shadow V user manual.

Refer to Figure 3 (for Herion valve) or Figure 5 (for Ross) found at the end of the WPC user manual shows wiring connections between Shadow V and SmartPAC.

For Shadow I or Shadow II wiring, contact Data Instruments. Note that when you connect Shadow I to SmartPAC, SmartPAC requires the use of a device called a level shifter, available from Data Instruments. This is because SmartPAC checks Shadow I for proper operation on every stroke. The level shifter is required for Shadow I because it has no specific terminals for making this test. Shadow V, on the other hand, has built-in terminals.

Cam Switch

WARNING!

SmartPAC with programmable cam capability can be used with Wintriss Clutch/Brake Control. However, SmartPAC's programmable cam switch should not be used to provide timing signals for any other clutch/brake control. It is designed to control auxiliary functions only.

In Run mode, you can adjust the timing signals for each programmed cam channel. To adjust cam timings for the loaded tool number:

1. Select "Cam switch" from the first display you see in Run mode.
2. You will see a display showing the list of cam channels. If you assigned names for your cam channels in Initialization mode, you will see the names, instead of channel 1, channel 2, etc. You will only see those changes that are programmed.
3. Select the channel number you want to change.

ARE YOU LOCKED OUT?

Access to changing the information on this screen may be limited to Program mode or may require a password. The security access settings in the Initialization menu determine when changes can be made. See "Security access" in Chapter 4.

Adjust the on-off time for the channel in much the same way you made settings in Program mode—using the cursor keys. For help with these keys, see "Cursor keys" in Chapter 3 for complete instructions. *For instructions on setting cam channels in Program mode, see these sections in Chapter 5:*

- Standard on/off channel: "Selecting a channel and making an on-off setting"
 - Timed channel: "Selecting a channel and making a timed output setting"
 - Auto channel: "Selecting a channel and making an auto advance setting"
4. When you are done adjusting a particular cam channel, press RESET to go back to the display of channels. You can adjust other channels. When you are completely done adjusting the timing for your channels, press RESET to return to the Run menu.

Show cam timing

You can view real-time graphic timing information about the currently loaded tool in Run mode. You will see the degrees of rotation from 0° to 360° at the bottom of the display, and a chart showing channel numbers from 1 through 8 (press ENTER to see 9 through 16, if installed) at the left of the display. The on-off angles and auto advance for each channel are shown on the diagram as horizontal bars. These bars indicate when a channel is to be activated.

Auto advance is shown with the letter "A" on both sides of the horizontal bar. You can actually see how auto advance timing changes whenever you change press speed.

The **timed outputs** are shown with the letter "T" and a number designating the number of milliseconds that the channel is to be activated.

This display is updated once per second with the current timing information.

1. Select "Cam switch" from the main Run menu and you will see the list of cam channels that you set in Program mode. Now press **F6** to access "Show timing". You will see a display like the one below (your channels will be different).
2. Press ENTER for channels 9-16 (if installed). When you are done viewing your cam timing settings, simply press RESET. You will return to the list of cam channels.

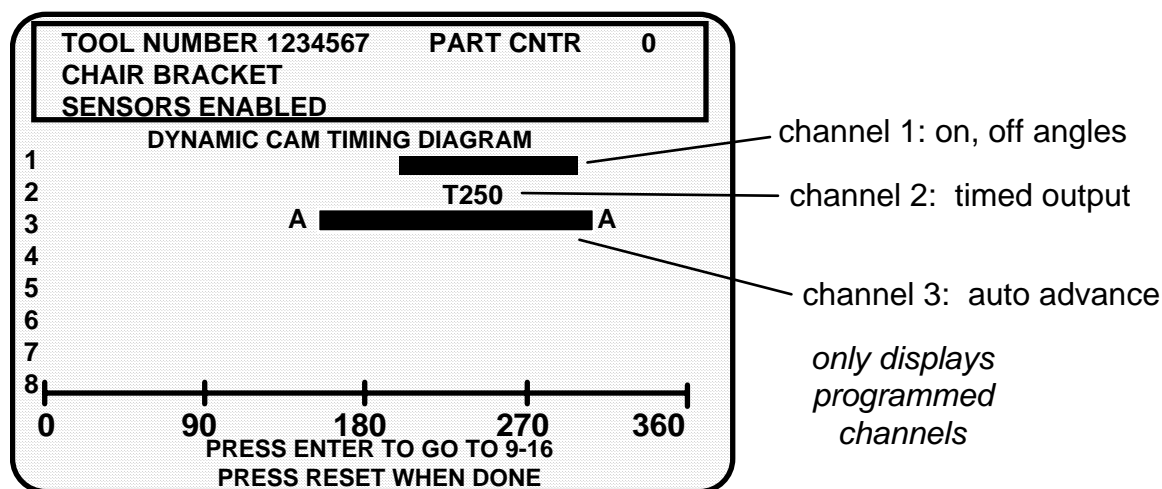


Figure 6-6. Displaying cam timing

Die Protection

In Run mode, the tool number must be loaded before you can adjust settings for the tool. You can only change the ready signal for green sensors and the preset value for the green special sensors. You cannot change any other sensor settings. Sensors set to "unused" in Program mode will not appear in Run mode. For example, if two sensor inputs are set to "unused", you will only see the sensors used displayed in Run mode. To adjust settings for the loaded tool number:

1. Select "Die Protection" from the first display you see in Run mode.
2. You will see the list of sensors names you assigned for your programmed tool.
3. Choose the sensor you want to adjust. The display will show the sensor number, name, and type. For green sensors, it will show the ready signal and sensor actuation angle. If you choose a yellow or red sensor, settings will be displayed, but you cannot make any changes.

ARE YOU LOCKED OUT?

Access to changing the information on this screen may be limited to Program mode or may require a password. The security access settings in the Initialization menu determine when changes can be made. See "Security access" in Chapter 4.

4. For green, green quick check, and green constant sensors, you can adjust the ready signal while the press is running or stopped. *See the next section for more information on how to use the display to easily adjust the ready signal for green sensors.*
5. Adjust the maximum number of strokes for the green special sensor, in the same way you set it in Program mode (Chapter 5). Use the up or down cursor keys to adjust the number from 1 to 99.
6. When you are done adjusting sensors, return to the Run menu (the first display in Run mode), by pressing Reset. You will go back to the display of your sensors. You can choose another sensor to view and/or adjust.

FOR MORE INFORMATION

Refer to "Understanding Sensor Technology" in Chapter 1 for a detailed description of the different types of sensors available in SmartPAC with die protection. Refer to "Die Protection" in Chapter 5 for more in-depth instructions on modifying sensors.

Adjusting the ready signal for green sensors

Adjusting the ready signal in Run mode is almost the same as adjusting it in Program mode. To adjust sensors, select "Die Protection" from the Main Run menu. There are two differences from adjusting sensors in Program mode.

First, you see the sensor's on and off time (its actuation angle), so that it is easy to set the ready signal precisely.

Second, the ready signal arc moves around the circle diagram much slower than in Program mode when you press the cursor keys. This is so that it is easier to zero in on an exact setting (and so it is harder to make big changes in the setting).

Here is an example of a display for a green sensor:

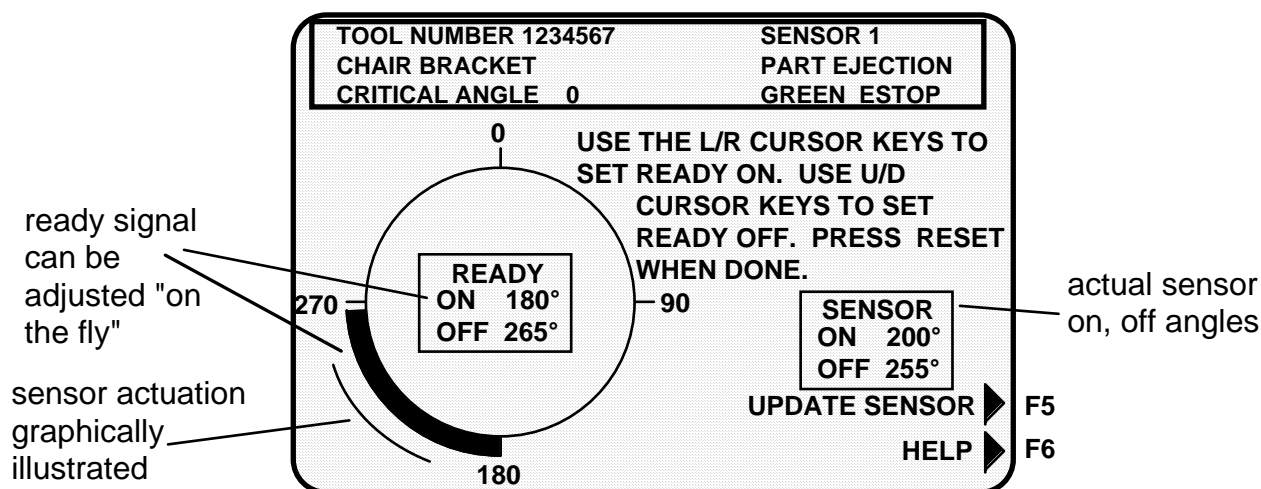


Figure 6-6a. Programmed green sensor

The above display is for a part ejection sensor. This display shows that the sensor turns on and off within the ready signal. You can change the ready signal using the cursor keys. To update the sensor information or to get additional help, press the appropriate function key. (Function keys are discussed in Chapter 3.) Below is the "Help" display:

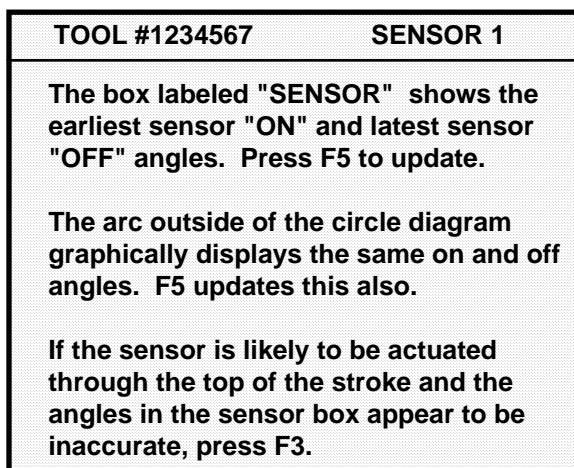


Figure 6-6b. Sensor "Help" screen (superimposed over Figure 6-6a display)

Sensor on-off marker

Notice the "sensor on-off" box at the right of the screen and the on-off marker outside the ready signal arc. The numbers in the box show the degrees the sensor actuated when you ran the press. You can press the **F5** function key to refresh the screen (refer to the section on "Function keys" in Chapter 3 if help is needed). The marker outside the arc graphically shows the sensor's actuation time — the earliest "on" angle and latest "off" angle.

It is easy to adjust the ready signal so it is just a little shorter than the sensor's actuation angle (for green constant sensors) or just a little longer (for green and green quick check sensors).

Any time you run the press and display the ready signal for a green sensor, you will also see the sensor's actuation angle. Notice in the above illustration how the sensor actuation marker wraps around with the ready signal circle diagram. The **circle diagram** dynamically illustrates the on and off angle settings that you programmed for a sensor and/or cam channel.

How SmartPAC displays sensor actuation times

SmartPAC does not show every stroke-to-stroke change when displaying sensor actuation time. For sensors set to green and green quick check, it shows the earliest on angle for the sensor and the latest off angle (that is, shows an increase in the actuation angle). For sensors set to green constant, it shows the latest on angle and earliest off angle (shows a decrease in the actuation angle).

For instance, if a green quick check sensor's on angle fluctuates between 190° and 195° from stroke to stroke, SmartPAC would show 190°. However, if the on angle changed to 189° or lower, SmartPAC would immediately display the earlier on angle.

A green quick check sensor's off angle is recorded the same way. Only with the off angle, SmartPAC displays the *latest* off angle.

For green constant sensors, SmartPAC would only show a change when the actuation angle decreased, not increased. That is, it shows the latest on and earliest off. SmartPAC displays actuation angles this way so that you can set the ready signal using the worst case actuation angles for the sensor. Another reason is because if SmartPAC showed every change on the display, it might change so rapidly that you could not read it from stroke to stroke.

Updating the sensor's on and off angles for a sensor

Press the **F5** function key. This clears the actuation angles displayed for any sensor. Zeros will be displayed. SmartPAC will display the actuation angles for the very next stroke. You can press the key while the press is running or stopped.

If a sensor is "on" through the top of the stroke, you may notice that the actuation angles shown in the Sensor on/off box may appear to be inaccurate. The angles shown are the earliest and latest actuations of the sensor in reference to 0° (top of stroke). If a sensor turns "on" before 0° (say, at 350°), SmartPAC will not recognize 350° as the earliest actuation because the number "350" is higher in value than the number "0". If the information in the Sensor on/off box does not appear to match the arc on the circle

diagram, press the **F3** function key, which changes the on/off reference point to 180° instead. This allows SmartPAC to correctly display the timing for a sensor that is actuated through the top of the stroke.

NOTE: When you press F3 you will see dashes (— —) next to "ON" and "OFF" in the sensor box just before the information updates. Press F3 again to toggle back to normal actuation mode.

NOTE

Pressing **F3** will not properly update sensor actuations when you are using a mechanical sensor which vibrates constantly during the stroke. In cases like this, it is better to use an electronic sensor which is not prone to constant contact bounce.

Show sensors

To access "Show sensors", first select "Die Protection" from the Main Run menu and you will see a list of sensors. Press the **F6** function key for "Show sensors" which allows you to see the status of all your sensors at once while the press is running or stopped.

The following display shows the status of every sensor for a loaded tool number. The sixteen sensor inputs are indicated by the numbers 1 through 8, and 9 through 16 (if installed). The type of sensor connected to each input is indicated by the letters (and/or numbers) under the numbered inputs. G = green; GCON = green constant; RED is a red sensor; GQC = green quick check; YEL = yellow; GS = green special (11 represents maximum number of strokes allowed); N/U = not used. The dark square above a sensor — the "actuation block" — indicates that it is actuated.

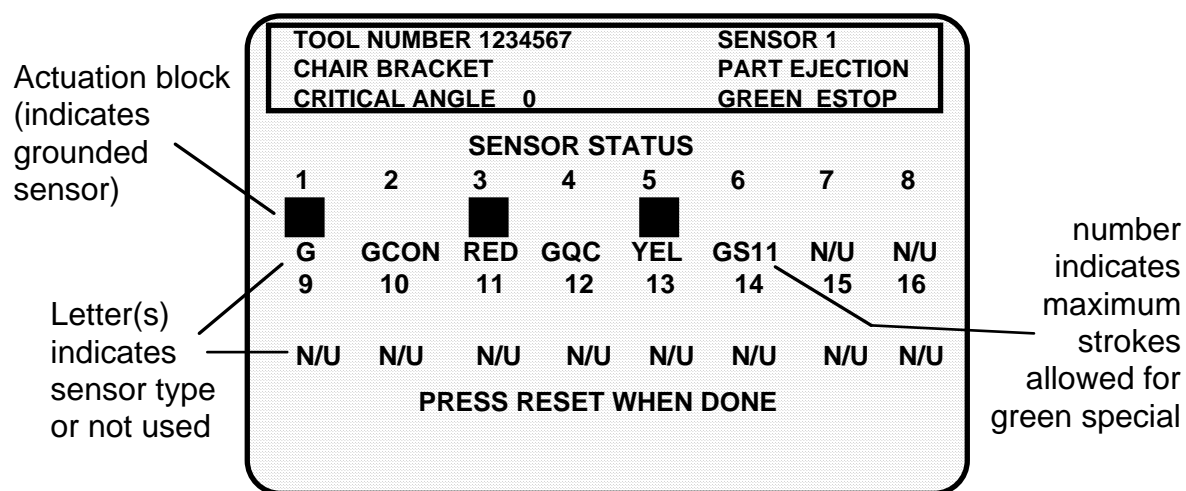


Figure 6-7. Show sensors

How to use the show sensors display

The "Show sensors" display can be used to quickly check the status of all your sensors and correct programming or wiring mistakes. When you select the show sensors display with the press running, you will see the actuation blocks for green sensors flashing. That is because green sensors normally actuate once every stroke. You will periodically see an

actuation block for a green special sensor because they should actuate at least once during the preset value. You will always see an actuation block for any red sensor since they are normally grounded. You will never see an actuation block for a yellow sensor. When the press is stopped, you will see the condition that the sensor is in at that point in the stroke.

- Red sensors: Normally grounded
- Yellow sensors: Normally ungrounded
- Green, green quick check, and green constant sensors: Can be either grounded or ungrounded depending upon when they actuate during the stroke.
- Green special sensors: The counter decrements as the press runs. For example, if the counter starts at 11 and the press makes a stroke without the sensor activating, the counter will count down to 10. If another strokes occurs without a sensor actuation, the counter drops down to 9, and so forth. When the sensor activates, the counter automatically resets to 11.
- Unused sensors: It is possible to see an actuation block. This may occur if you had a sensor connected to the input by mistake. The display shows any change in an input's state, whether the sensor input is being used or not.

Due to the slow update rate, this display oftentimes misses the actuation of some sensors. This display, however, is an ideal way to catch mistakes in setting a sensor or mistakes in wiring sensors during setup. If a yellow sensor was mistakenly plugged into an input that is set to red, you could immediately detect the error when you saw that the red input has not actuated. You can also check actuation of all your green sensors, making sure the actuation blocks are flashing when the press is running. No actuation blocks would indicate wiring or setup problems. When a sensor signals a fault, you could use the display to see the status of all your sensors at the stroke angle where the press stopped.

REMEMBER

Actuation signals from green sensors may not be seen in this display on every stroke.

Disable (enable) sensors

Depending on how you initialized the "Sensor enable mode" in Initialization (Chapter 4), there are various ways to enable die protection. If you selected "Manual enable/disable" in Initialization, you can manually enable and disable your sensors in Run mode. If you chose either of the "Auto enable" selections in Initialization, refer to the sensor programming section called "Die Protection" in Chapter 5 to make the appropriate settings for the tool. *Even in Auto mode, you can manually enable sensors at any time.*

No matter which choice you had made, you should always have sensors enabled to protect your tool. But sometimes you may want to disable sensors during setup or for troubleshooting. SmartPAC will not stop the press when sensors are disabled even when a sensor signals a malfunction. *If you do this, be sure to set sensors to "enabled" before you start making parts.*

NOTE: *With sensors disabled, the LED display will flash when the press is running.*

1. Get the first Run menu on your screen (Figure 6-1). Look at the next display.
2. Depending on how the sensors are set, you will see either of these status settings. Selecting the first line item toggles the status from "disabled" to "enabled" and back.

NOTE: If you manually disable sensors, you will get an additional message "PRESS THE FIVE KEY TO DISABLE SENSORS". This is your confirmation that you really want to disable sensors. Press "5" to confirm, or RESET to cancel.

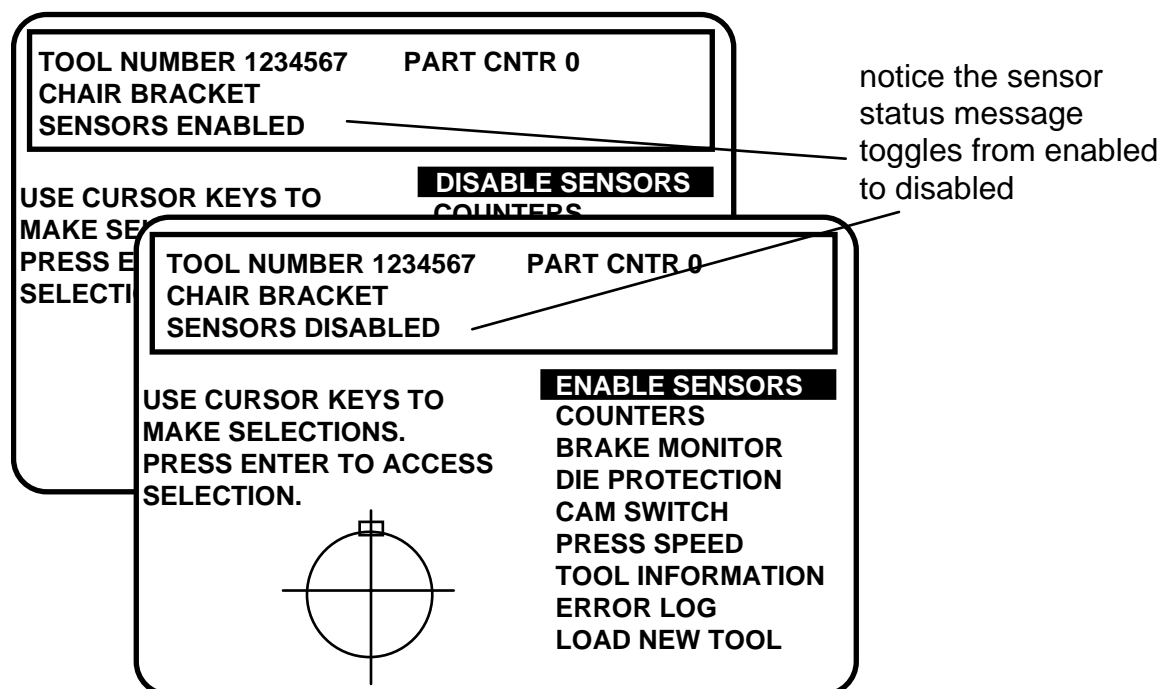


Figure 6-8. Display showing "sensors enabled" or "sensors disabled"

Setup mode message

If the setup mode circuit is connected and active, you will see this message at the top left of the Run menu under the tool number: **SENSORS IN SETUP MODE**

This means green sensors are disabled. SmartPAC will not send a stop signal to the press when a green sensor signals a fault. The setup mode circuit is typically connected to the press control. When the press control is set to INCH, the circuit is grounded and green sensors are automatically disabled. To wire this circuit, see "Wiring a remote reset switch or setup mode circuit" in Chapter 2.

Press speed

If you have a variable speed press, you can program different speed limits for different tools. Select "Press Control" from the main Programming menu (Figure 5-5).

You will see a display similar to the following.

PRESS CONTROL PARAMETERS

TOP STOP ANGLE	288 DEGREES
MAXIMUM PRESS SPEED	200 SPM
MINIMUM PRESS SPEED	100 SPM

USE CURSOR KEYS TO CHOOSE THE VALUE YOU WANT TO CHANGE. PRESS THE ENTER KEY TO CHANGE IT. PRESS RESET WHEN DONE.

Figure 6-9. Press speed parameters

This choice allows you set upper and lower limits for the press's operating speed. Make sure that you set a greater value for the "Maximum" than for the "Minimum". SmartPAC will not allow you to inadvertently enter a smaller number in "Maximum". Instead, it will display a value one digit greater than the "Minimum". If you wish to disable this choice, set both maximum and minimum press speed parameters to 0 (zero).

ARE YOU LOCKED OUT?

Access to changing the information on this screen may be limited to Program mode or may require a password. The security access settings in the Initialization menu determine when changes can be made. See "Security access" in Chapter 4.

Tool number information (optional)

IMPORTANT

Tool Information serves only as a convenient place to record information about the tool. It does not control any aspect of press operation.

Note: *This feature is not available if you have the optional PLC interface installed.*

If you have this option, select “Tool Information” from the Run menu (Figure 6-1) to change the information about the tool you are using. (See “Tool information” in Chapter 5.) You will see a display similar to the following.

TOOL NUMBER INFORMATION

PASS LINE HT	4.50	IN
STRAIGHTENER	4.25	IN
HYD. OVLD.	100	TONS
PRESS SPEED	65	SPM
CONVEYOR	NO	
PART LUBE	YES	

MEMO BOX

**CAREFULLY CHECK
DIE PLACEMENT**

MEMO LINE 1 ▶ **F4**

MEMO LINE 2 ▶ **F5**

USE CURSOR KEYS TO CHOOSE THE VALUE YOU WANT TO CHANGE. PRESS THE ENTER KEY TO CHANGE IT. PRESS RESET KEY WHEN DONE.

Figure 6-10. Tool number information screen

ARE YOU LOCKED OUT?

Access to changing the information on this screen may be limited to Program mode or may require a password. The security access settings in the Initialization menu determine when changes can be made. See “Security access” in Chapter 4.

To enter information about the items:

1. Select the desired item. A screen overlay appears in which you can enter the appropriate value. For Yes/no items, enter 0 (zero) for NO, and 1 (one) for YES.
2. Enter text into the memo box, by pressing **F4** for the first line, and **F5** for the second line. A screen overlay appears that enables you to enter fifteen characters of numbers and alphabetic text for each line. When you complete each line, press **F6** to accept it.
3. When you have finished entering information into the tool number information screen, press RESET to return to the main Programming menu.

Load new tool number

You can load any *existing* tool number in Run mode from the tool number display. *However, a tool number cannot be loaded while the press is running.*

If the press is running when you attempt to load a tool number, a message will appear telling you that the press must be stopped before a tool number can be loaded. Follow these steps to load a tool number in Run mode.

IMPORTANT

"Load new tool" does not appear on the display in Run mode if "loading tool numbers" has been locked out by the security access setting in Initialization mode. You cannot load a tool from Run mode if it is locked out. With other security settings, a password may be required. For more information, see "Security access" in Chapter 4.

1. Select "Load new tool" from the Run menu. A Tool number display appears similar to this:

ARE YOU LOCKED OUT?

Loading a new tool number may be limited to Program mode or may require a password. The security access settings in the Initialization menu determine when changes can be made. See "Security access" in Chapter 4.

A display appears similar to the following:

NEXT TOOL NUMBER = 6,160

**PRESS THE ENTER KEY TO LOAD THE
NEXT TOOL NUMBER SHOWN ABOVE OR
PRESS THE RESET KEY TO SELECT
ANOTHER TOOL.**

Figure 6-11. Next tool number display

If you want to run the tool number shown, press ENTER. Otherwise, press RESET.

A Tool Number display appears similar to this:

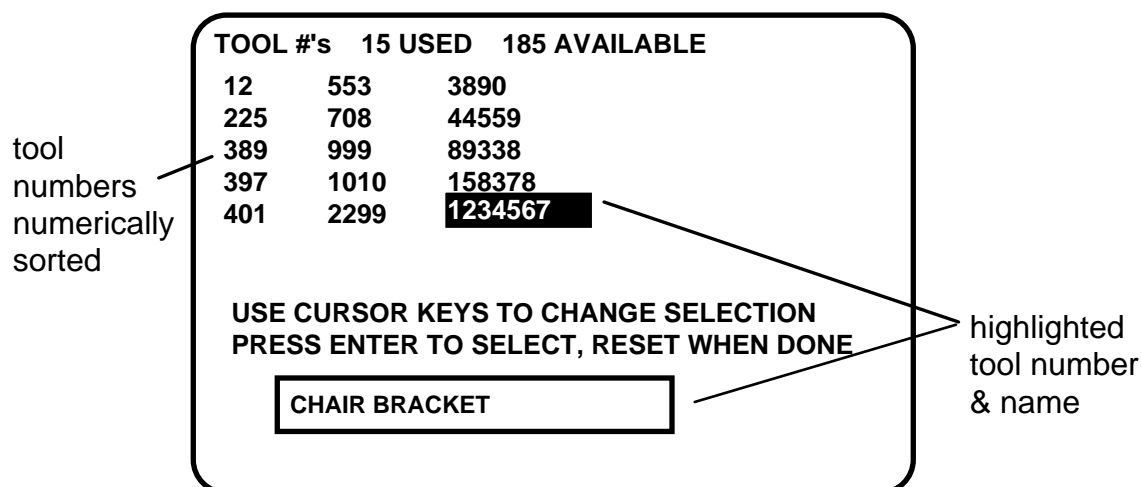


Figure 6-12. Tool display shows available tools with selected tool highlighted

The display is the same as in Program mode, but you can only select an existing tool number. Notice that the tool numbers are in numerical order on the screen and that when a tool is highlighted, its "tool name" (if set) is also shown. You cannot select a "NEW" tool number. The display shows only the *existing* tool numbers.

- Highlight the tool you want to load and press ENTER. You will see this warning message superimposed over the Tool Number display screen (shown above):

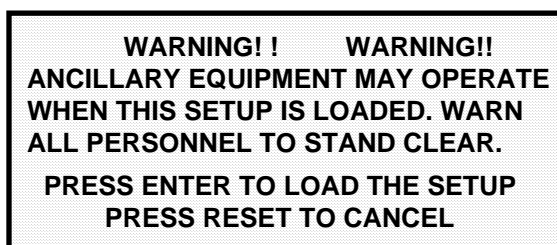


Figure 6-13. Warning message when loading tool number

- Press ENTER to load the tool settings (a setup). You can go back without loading the tool settings by pressing RESET. When the tool number has been loaded (which takes only a few seconds), this message quickly appears on the screen: (Remember, your tool number may be different.)

TOOL NUMBER 1234567 IS BEING LOADED

NOTE

If you did not receive this message, but instead received an error message on your screen when you tried to load the tool, go to Chapter 7 and find the section describing that error message. Follow the instructions there for correcting the problem. If the error message is not described there, or you cannot fix the problem, call Data Instruments' technical advisors, and be ready to provide some important information to expedite a resolution to the problem. Please supply: **product name** (e.g. SmartPAC standard); **installed options** (e.g. DiProPAC, ProCamPAC, etc.); and **firmware version number** (e.g. Vs. 2.00). You can determine the last two items, by going into "Installed options" in the Initialization mode (see Chapter 4 for details). You can also determine firmware version number from the chip on the processor board (see "location of components" in Chapter 2).

Note that the first display shows the tool number you just loaded. You can always check which tool number is loaded on this display.

***** WARNING *******Equipment may operate when you load tool settings**

When you load a tool number, auxiliary press equipment may start if the press crankshaft is within the on-off setting for that device. All employees must stay away from the press and equipment that the cam operates before a tool number is loaded.

Error Log

As a troubleshooting aid, your SmartPAC keeps an error log that you can view in Run mode. Each time the press is stopped, the log records the error number (which gives the reason for the stop), the stroke count when the stop occurred, and the crankshaft angle when the stop occurred. When you stop the press to load a new tool, the error log shows the tool number. The log retains this information for the 32 most recent errors.

To see the error log, select "Error Log" from the Run menu. The display shows the log of the latest sixteen errors, with the most recent error first. To see information about the previous sixteen errors, press **F6**. To see the most recent errors again, press **F6** again. For more information about the error log and a listing of error numbers and what they mean, see "Using the error log" in Chapter 7.

Chapter 7

SmartPAC Fault Messages

This chapter explains the diagnostics and other messages that you may see on your LCD display or in the error log. These messages record the error or other condition when the press stops or when a fault occurs. Display messages are shown in the next section. Error log codes are listed at the end of the chapter.

Messages on the display

These types of messages are explained below:

- Messages displayed when a counter preset has been reached
- Messages displayed for brake monitor equipment or programming problems
- Messages displayed when a sensor signals a fault

What happens when you get a fault message

If you get a fault or error message when the press is stopped or you are in Run mode, the letters "Err" will blink in the LED display, as shown here. (To see where the "LED" display is located on the SmartPAC, refer to Chapter 1.)



Figure 7-1. "Err" on LED display

If the press stops because one of the counter presets count is reached, the letters "Ctr" will blink on the LED (shown below).



Figure 7-2. "Ctr" on LED display

PROVIDE IMPORTANT INFO!

When you contact Data Instruments for technical assistance, be ready to provide some important information to expedite a resolution to the problem. Please supply: **product name** (e.g. SmartPAC standard); **installed options** (e.g. DiProPAC, ProCamPAC, etc.); and **firmware version number** (e.g. Vs. 2.00). You can determine the last two items, by going into "Installed options" in the Initialization mode (see Chapter 4 for details). You can also determine firmware version number from the chip on the processor board (see "location of components" in Chapter 2).

How to clear the fault message from the display

To resume operation after an error message occurs, clear the error message by pressing the Reset key (or Remote Reset Button, if installed). Correct the malfunction or other problem *before* running the press.

If you cannot correct the problem after reading the remedy, contact Data Instruments technical support. Whenever you need help, just remember that we have expert representatives available to help you by phone. Never hesitate to call Data Instruments if you have trouble with SmartPAC.

Messages displayed when a counter preset is reached

"Good parts counter preset reached"

Explanation: The value set for the parts counter has been reached. The press should stop at top dead center.

Remedy: Press RESET to clear the message. If your part run is complete, you would need to change tooling, material, etc. You can then run the press again.

NOTE: When this message appears, the good parts count is automatically reset to 0.

"Strokes counter preset reached"

Explanation: The value set for the strokes counter has been reached. The press should stop at top dead center.

Remedy: Press RESET to clear the message. If your part run is complete, you would need to change tooling, material, etc. You can then run the press again.

NOTE: When this message appears, the strokes count is automatically reset to 0.

"Batch # counter preset reached"

Explanation: The value set for the one of the three batch counters has been reached when they are set to "top stop" (not "toggle" or "pulse"). The press will stop at top dead center (see Chapter 5 Program Mode, "Setting count mode")

Remedy: Press RESET to clear the message.

NOTE: When this message appears, the corresponding batch count is automatically reset to 0.

Messages displayed for equipment or brake monitor problems

These messages tell you that something is wrong with the SmartPAC resolver, input circuit, or position sensor or with the way your press is running. Some fault messages indicate that there is a problem related to the brake monitor. These messages may also indicate an internal problem with SmartPAC itself.

If you cannot correct the problem after reading the remedy, contact Data Instruments technical support. Whenever you need help, just remember that we have expert representatives available to help you by phone. Never hesitate to call Data Instruments if you have trouble with SmartPAC.

Once you have corrected the problem, press RESET. If the problem is corrected, you will be able to run the press again. If not, you will get the same fault message.

"Loss of rotation detected"

Explanation: The resolver did not start rotating within the start time limit that is preset in Initialization mode. Or the resolver could have stopped turning while the press was running. SmartPAC knows when the clutch/brake valve is energized. If it sees that the valve is energized but the resolver is not turning, this message appears. For an explanation, see "How the input check circuit works" in Chapter 2. One possible cause is that the resolver's drive belt may be loose or broken so the resolver does not turn (or stops turning) even though the press crankshaft is turning. Also you may have low air pressure to the clutch or a bad clutch; so the crankshaft (and therefore the resolver) did not move even though the clutch control valve has been activated. An internal SmartPAC problem could also have occurred, or the resolver could be defective.

Remedy: Check the resolver and resolver drive. Check and repair the clutch. If these solutions do not work, an internal problem may have occurred. Call Data Instruments' technical service advisors.

"Angle Resolver Failure"

Explanation: The problem may be that wiring in the resolver circuit to SmartPAC is loose or bad or that the resolver has failed. It may also be that the press is going faster than 800 (or 1600 SPM, depending on the speed setting at SmartPAC).

Remedy: If SmartPAC's rated press speed is exceeded, reduce the speed. If not, check the resolver wiring and connections for shorts, breaks, or loose connections. See Chapter 2 "Mounting the resolver" or Setting high speed version of SmartPAC" (be sure you set the speed correctly). If these are not the problem, the resolver may need to be replaced. Contact the factory for assistance.

NOTE: To clear this fault, you must turn SmartPAC off. (RESET will not work.)

"Input check circuit failure"

Explanation: The resolver turned five times (in other words, the press was running), but SmartPAC received no signal from the input check circuit.

Remedy: The input check circuit has not been connected or wired properly. If this message occurs when the press stops, your press is taking more than five revolutions to stop after the brake is activated. You should check your brake for wear. For wiring the input check circuit, see "Connecting AC wiring, stop circuits and input check circuit" in Chapter 2.

"Position sensor incorrect"

Explanation: If installed, the position sensor has not closed at 0° or was not open at 180°. The position sensor cross-checks the position of the resolver to ensure that it is working correctly. It is supposed to be installed so that it closes at 0 resolver degrees. If it does not close at 0° or is not open by 180°, the press stops and you see this message.

Remedy: The resolver drive has slipped or broken. It is also possible that the position sensor may not have enough dwell to close at high speeds. The larger the diameter of the object on which the magnet is mounted, the shorter the dwell, as shown here. If this is the problem, the solution is to mount the magnet on a smaller shaft.

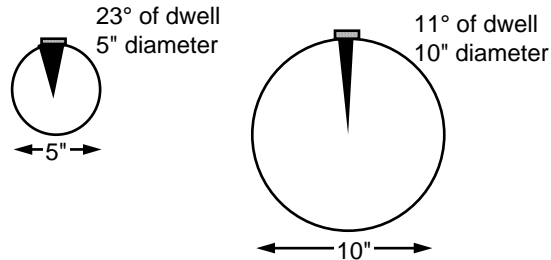


Figure 7-3. Position sensor dwell on different diameter shafts

If none of the above procedures change the display to "position sensor switch closed," the sensor may be bad. Try another sensor if available. Otherwise, call the factory for help. Do not go further until the problem is solved.

Also, the resolver or position sensor may be defective or not installed properly. Check the wiring and installation of the resolver and position sensor. Refer to the installation procedures in Chapter 2.

If the position sensor is not installed, the position sensor has not been disabled. To disable it, use the Initialization menu. See Chapter 4.

NOTE: *If a position sensor is used, do not disable it in Initialization mode to clear the error message. Misalignment between the resolver and crankshaft will not be detected.*

E-Stop errors

Explanation: If a message appears on the display that references "ESTOP", this has to do with either of the emergency stop relay circuits not working satisfactorily. One or both of these E-STOP circuits may be defective.

Remedy: You cannot reset the error. Instead, turn the unit off, then on. If the error continues to occur, contact Data Instruments technical service advisors for assistance.

"Onboard ram test failure"

Explanation: This means that something is wrong with the main SmartPAC main processor board and the system cannot be reset. SmartPAC may need to be serviced or replaced.

Remedy: As stated above, pressing RESET will not reset the error. Try turning the power off then on. If the problem does not go away, contact Data Instruments technical service advisors for assistance or replacement.

"Resolver signals incorrect" or "Resolver drive signal incorrect"

Explanation: In either of these cases, there is a problem with the resolver assembly.

Remedy: You will need to check the resolver and wiring. Specifically check that the terminals are tightened on bare wire and not on insulation. See Chapter 2 - "Mounting the resolver". If necessary, contact Data Instruments technical service advisors for assistance or replacement.

"Stop time exceeded"

Explanation: The stopping time of the press has exceeded the limit that you set in SmartPAC Initialization. This could be because your limit is not large enough to account for normal wear. A more serious situation could be that the brake is excessively worn and needs to be serviced by your maintenance personnel. If this is the case, a dangerous safety problem may exist, and needs to be corrected immediately. *It is assumed that you were pre-warned by the brake warning LED, which illuminates whenever the stopping time is within 10 milliseconds of the stop time limit.*

Remedy: First perform a 90° brake test several times to get an actual reading for your press's stop time. Compare these results to the last time that you performed the test. Decide if the stop time limit that you had set is realistic or needs to be changed slightly. See Chapter 4 -- "Brake Monitor" to calculate the correct stop time and Chapter 6 -- "Stop Time and Stop Angle" to perform the 90° brake test. If you change the limit, you may have to relocate your light curtains and/or two-hand controls. Refer to the appropriate manual for assistance.

You may need to have your maintenance service the brake immediately.

Messages displayed for programming problems

These messages tell you that there is a problem with the tool number or that a tool number is not properly loaded. These messages can also may indicate an internal problem with SmartPAC itself.

If you cannot correct the problem yourself after reading the remedy for the problem below, contact a Data Instruments representative for assistance.

Once you have corrected the problem, press RESET. If the problem is corrected, you will be able to run the press again. If not, you will get the same fault message.

"No tool number has been loaded"

Explanation: A tool number is not presently loaded. You will see this message if you try to go into Run mode without a tool number loaded. A tool number must be loaded before entering Run mode.

Remedy: Turn the Program/Run key to "Program", and then press RESET. Now you can program and load the appropriate tool number in Program mode.

"Tool number table checksum error"

Explanation: The information, or "**checksum**", created for the tool number loaded has become corrupted. This can occur when SmartPAC has been turned off while you are in the middle of programming a setup, or when you have not properly exited (by pressing RESET) from a Programming or Run menu.

This can also occur when you upgrade SmartPAC. Sometimes the information in the older firmware does not correspond properly with the new firmware.

What is a Checksum: SmartPAC creates a checksum for a tool number to check that the data stored in memory for the tool is the same as the data that comes out of memory when you load the tool number. The checksum value calculated when data went into memory must be the same as the value calculated when the data is loaded.

Remedy: These checksum values may not match if SmartPAC has been turned off while you were in the middle of programming or adjusting settings for a tool. It will also happen if the stored tool number settings got damaged due to an internal SmartPAC malfunction.

Go back into programming and review the tool number setup in question. Make sure that all the information you programmed is correct; then reload this tool number. If the problem was caused because the system was turned off while in Program or Run modes, perform these steps:

- 1) Press the RESET key to clear the fault message.
- 2) Go to Program mode, and select "Program/load tool numbers."
- 3) Select the tool number in question from the tool number display.
- 4) Select "Modify the tool information" from the next display.
- 5) Select "Set cams" from the next display.
- 6) Press RESET. SmartPAC will create a new checksum for the tool number.
- 7) Select the tool number again, bring up the display of cams, and verify that all settings are correct.
- 8) Reload the tool number. You should not get this fault message.

If the problem is due to a system malfunction, the tool number settings will have to be created again from scratch. If this happens more than once, contact Data Instruments for assistance.

Messages displayed when a sensor signals a fault

Fault messages for green sensors

"Green sensor missed"

Explanation: A green or green quick check sensor did not turn on during the ready signal and it did not come on late (within 50 milliseconds after the ready signal). No stroke angle is displayed with this error message since the sensor never turned on.

Remedy: Check for the malfunction that the sensor was supposed to detect (part ejection problem, misfeed, transfer problem, etc.). If that is not the cause, check to be sure that the ready signal is set properly for this sensor. Check that a sensor is actually plugged into this input on the remote connection box. Remember, if no sensor is connected to a sensor input, that input must be set to "unused". Check connections between sensors and controller.

"Green sensor actuated late"

Explanation: A green or green quick check turned on late after its ready signal was completed. That is, it turned on within 50 milliseconds after the end of the ready signal. If a green or green quick check sensor does not come on during its ready signal, SmartPAC continues to look for the sensor signal. If it saw the sensor come on within 50 milliseconds after the ready signal, the angle where the sensor turned on is shown in the message.

Remedy: Check for the malfunction the sensor was supposed to detect (like a part ejection problem or misfeed, etc.). Check that the ready signal is set properly. You may just have to adjust the ready signal.

"Green sensor failure"

Explanation: For a green or green constant sensor, the sensor has stayed on from the end of one ready signal to the beginning of the next ready signal for the next stroke. No stroke angle is shown with this fault.

Remedy: Check for a shorted sensor. Make sure the ready signal has been set correctly. Check to see if a press or equipment malfunction is causing the sensor to stay on—for instance, a part wedged against a sensor or a pinched wire.

"Green constant fault"

Explanation: A green constant sensor turned off during its ready signal. Green constant sensors must stay on throughout the entire ready signal. The angle where the sensor turned off is shown.

Remedy: Check for the malfunction that the sensor was supposed to detect. If no malfunction at the press has occurred, check to be sure that the ready signal is set properly. Remember, for green constant sensors, the ready signal must be a little shorter than the sensor's actuation angle. Check that a sensor is actually plugged into this input. Check connections between remote connection box and controller.

"Green quick check sensor actuated outside ready"

Explanation: A green quick check sensor actuated or stayed on outside the ready signal. The stroke angle where the sensor was first detected on outside the ready is shown.

Remedy: Check for the malfunction the sensor is supposed to detect (part ejection problem, misfeed, etc.) Check for a part wedged against the sensor, a shorted sensor, a pinched wire, or other cause that would keep the sensor on or cause it to go on outside its ready signal. Make sure the ready signal is set correctly.

"Green special fault"

Explanation: A green special sensor did not actuate within the maximum number of strokes set in Programming mode (SmartPAC did not see a contact closure to ground). In other words, the press made strokes without this sensor actuating.

Remedy: Check for the press or equipment malfunction that the sensor was supposed to detect. Check for any cause that would keep the sensor from going on. Make sure the maximum number is set correctly — not too low. See Chapter 1 for a complete description, and Chapter 5 to program this type of sensor.

Fault message for yellow sensors "This N/O sensor is grounded"

Explanation: A yellow sensor turned on (there was a contact closure to ground). When this message appears, the angle where the condition was detected is also shown on the LCD display.

Remedy: Check for the press or equipment malfunction that the sensor was supposed to detect. If none has occurred, check for a shorted sensor or pinched wire.

Fault message for red sensors "This N/C sensor is open"

Explanation: A red sensor has actuated (is open to ground). When this message appears, the angle where the condition was detected is also listed shown on the LCD display.

Remedy: Check for the press or equipment malfunction that the sensor was supposed to detect. If none has occurred, check for a malfunctioning sensor. Check for loose or detached wiring at the remote connection box or controller. Check for a severed wire from the sensor to the RCB or controller.

Miscellaneous Fault messages**"Maximum press speed exceeded"**

Explanation: This message is generated when the press is running at a speed greater than the maximum limit set at SmartPAC.

Remedy: After clearing the error, either run the press at a slower speed, or adjust the maximum limit set at SmartPAC. Refer to Chapter 4.

"Minimum press speed exceeded"

Explanation: This message is generated when the press is running at a speed less than the minimum limit set at SmartPAC.

Remedy: After clearing the error, either run the press at a higher speed, or adjust the minimum limit set at SmartPAC. Refer to Chapter 4.

"Host computer top stop"

Explanation: This message is only generated with SmartPAC is communicating with Data Instruments' Computerized Pressroom Reporting software. The user at the computer has sent a top stop command to that SmartPAC. When this occurs, SmartPAC in turn stops the press.

Remedy: Because this condition was generated by someone at the computer, it is important to investigate the reason why the stop command was issued. A problem may be present. Check with personnel before proceeding. Once the situation is clear, press RESET to continue.

"The resolver position is different from when the unit was turned off"

Explanation: This message will only appear if SmartPAC detects a different resolver angle position from the time that the press was turned off to when it was turned on again. This can happen when you move the press or upgraded SmartPAC firmware.

Remedy: Press Reset to clear. If the message reappears, call Data Instruments.

One of the sensor auto enable counters is greater than 24

Explanation: Normally this fault will not ever occur since SmartPAC does not let you enter a value greater than 24. However, it could appear if there is a problem with the internal workings of SmartPAC.

Remedy: First press Reset. If the message reappears, contact Data Instruments.

Error log

As a troubleshooting aid, your SmartPAC keeps an Error Log that you can view in Run mode. Each time the press is stopped, the log records the error number (which gives the reason for the stop), the stroke count when the stop occurred, and the crankshaft angle when the stop occurred. When you stop the press to load a new tool, the error log shows the tool number. The log retains this information for the 32 most recent errors.

To see the error log, select “Error Log” from the Run menu. The display shows the log of the latest sixteen errors, with the most recent error first. To see information about the previous sixteen errors, press **F6**. To see the most recent errors again, press **F6** again. See Table 7-1 on the following pages for a listing of error numbers and what they mean.

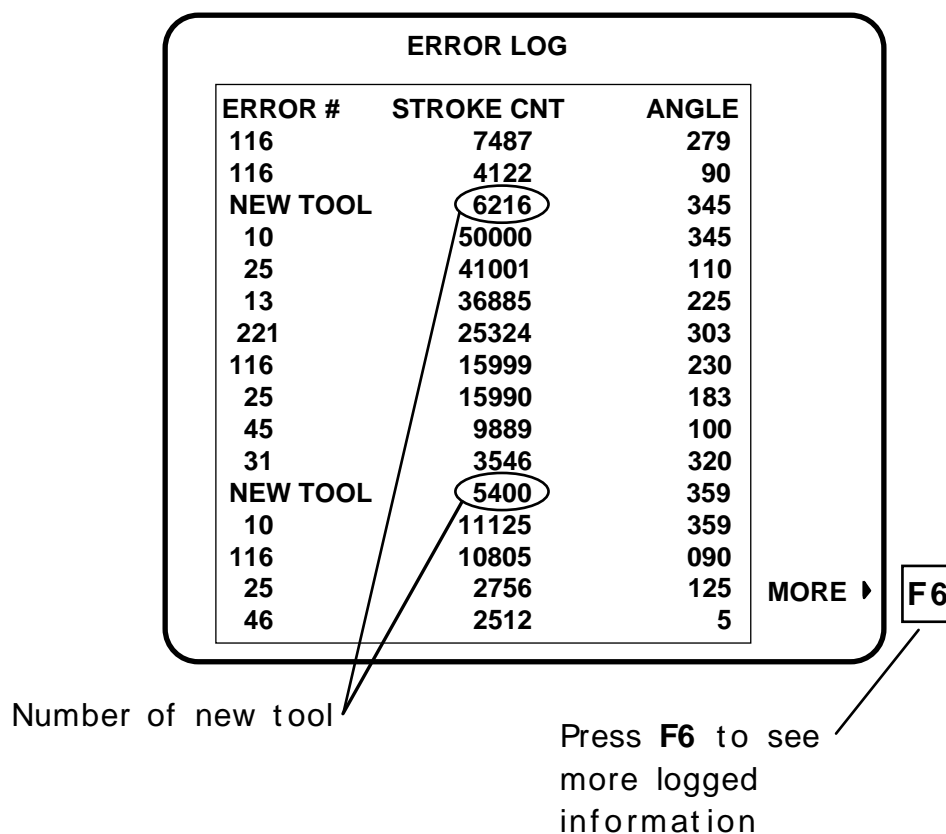


Figure 7-4. Error Log Display

Table 7-1. Error log status codes

Error #	Description
General status codes	
0	System OK
8	Estop driver failure
12	Position sensor incorrect
13	System failure
14	Angle resolver problem
17	Input module failure
19	Module, WPC, SFI, or PLC communication error
23	Stop time exceeded
24	Loss of rotation or outside max/min speed
25	Setup table checksum, loaded setup checksum or no setup loaded
31	Stroke counter preset
32	Good parts counter preset
33	Batch counter preset (1, 2, and 3)
34	Host computer top stop
35	MultiPAC fault
36	RamPAC fault
AutoSetPAC status codes	
51-58	High setpoint exceeded, ch. 1-8
61-68	Low setpoint exceeded, ch. 1-8
71-78	Repeatability setpoint exceeded, ch 1-8
101-108	Zero offset exceeded, ch. 1-8
DiProPAC status codes	
114-129	Yellow probes 1-16
131-146	Red Probes 1-16
148-163	Green quick check on outside ready 1-16
165-180	Green missed 1-16
182-197	Green failure 1-16
199-214	Green late 1-16
Dialog status codes	
221	Coil change
222	Tool change
223	Bin full
224	Forklift

Table 7-1, continued. Error log status codes

Dialog status codes, continued	
Error #	Description
225	Quality control
232	Lube problem
233	Air problem
234	Electrical problem
235	Mechanical problem
237	Part ejection
239	Part quality
227	Special #1
228	Special #2
229	Special #3
230	Special #4
241	Special #5
242	Special #6
243	Special #7
244	Special #8
245	Special #9
246	Special #10
247	Special #11
248	Special #12
249	Special #13
250	Special #14
251	Special #15
252	Special #16
WPC codes = FXX (F + normal WPC code), except:	
FXX	F+normal code = WPC codes
F13	Estop open
F100	Stop time exceeded
F102	Lockout mode
F103	Off mode
F104	Undefined operating mode F23
F105	Motor off
F106	Motor in reverse
F107	Power saver shutdown

Appendix A

SmartPAC™ PM Monitor (optional)

This appendix explains how to initialize, set up, and use the features of the SmartPAC PM Monitor. This appendix serves as an add-on to the chapters in this manual. References will be made to certain sections. Complete all the steps in each of those sections unless otherwise noted.

UPGRADING FIRMWARE

If you have a SmartPAC system with AutoSetPAC, you must upgrade the firmware to accept PM Monitor functionality. Check the version of your AutoSetPAC firmware at "Installed Options" in the Initialization mode. If you have 2-channel AutoSetPAC and your firmware is less than vs. 1.26 (or 4-channel AutoSetPAC with firmware less than vs. 1.22), contact DI technical support immediately to receive the correct AutoSetPAC firmware.

About SmartPAC PM Monitor

The SmartPAC PM (Preventative Maintenance) Monitor is an option which allows the maintenance department to manage its time more effectively. The PM Monitor tracks up to 64 items on the press based on specific usage, rather than merely signaling when a period of time has passed. Consequently, the entire stamping process is monitored automatically, and maintenance is alerted only when equipment requires attention.

Comparison with traditional preventive maintenance

Equipment used on or around the press need to be checked at regular intervals, such as daily, weekly, or number of strokes. Traditional preventive maintenance programs are based upon elapsed time, and would be adequate if your presses were used in the same way all the time. However, with just-in-time manufacturing, shorter job runs, and more tool changes, presses and auxiliary equipment must frequently change the way that they operate. Each change results in varying degrees of wear and tear on the machinery. As a result, traditional PM programs are not the most effective way to handle these kinds of variations.

Here is an example. A traditional PM program may alert maintenance to inspect a press's braking system every three months. During that time, the press is idle or running a continuous coil-fed job, and the brake experiences minimal wear. As a result, any time spent checking the brake will be wasted. On the other hand, if the press were running a hand-fed job in the single stroke mode, the many starts and stops of the machine will have caused greater-than-normal brake wear, and three months may be too long to wait between inspections.

How the PM Monitor works

In the previous example, the SmartPAC PM monitor would keep track of machine stops and could be set to signal a PM alert for the braking system after 50,000 machine stops,

for example. If the press is idle or running coil fed jobs, the time between alerts will be long. If the press is used for hand-fed jobs, the time between alerts will be shorter.

Up to 64 items can be set up in the PM Monitor's schedule. "**Tracking units**", such as machine starts or stops, strokes, motor-on hours, cam channel actuations, die changes, tonnage overloads, etc., (depending on how SmartPAC is configured) can be assigned to each item in the schedule. The PM Monitor can also track hours, days, weeks and months for items that need to be maintained according to a specific time schedule. A **tracking frequency** is assigned to each item to tell the PM Monitor when to signal an alert. At that time, an alert message appears in SmartPAC's status bar in the Run mode.

The entire PM **schedule** can be viewed in the Run mode. The schedule shows each item, its units, frequency, and current value. Any items in **alert status** are highlighted. Items with alert status will be highlighted until the alert is cleared and the item is reset. The PM monitor continues to track alerted items until they are reset. Please note that SmartPAC does not stop the press when an item is in alert status. SmartPAC's PM schedule is password-protected to keep unauthorized personnel from clearing an alert.

Examples of how to use the PM Monitor

Here are some examples to help you properly set up your PM monitor. Refer to the lists (shown below) — "PM items" and "PM tracking units". If you do not find a suitable PM item name, you can program in a "custom" name to match your application. Examples below provide such "custom" suggestions. To obtain further assistance on using the PM Monitor, don't hesitate to contact the Data Instruments technical advisors.

The tracking unit "**Ch. cycles**" (for cam channels 1 through 8 or 16²), can be used to track the usage of various ancillary devices controlled by SmartPAC. Some PM items might include: feeder, pilot release solenoid, and ejection cylinders.

The tracking unit "**Die changes**" can be used to track the usage of components that are directly related to changing tools at SmartPAC. Some PM item examples might include: hydraulic clamping mechanism and the ram adjust motor.

"**F###**" WPC press control faults can be used to monitor items connected to the user-definable inputs set when SmartPAC is integrated with the Wintriss Clutch/Brake Control (WPC). Here are some examples: lube pressure, lube level, Nitrogen pressure (related to Nitrogen die spring systems).

PM items

air rotary seals	back shaft bearing (1 through 4)
brake	bull gear
clutch valve	conveyor (1 through 6)
counterbalance system	drive belts
DSV	feeder
flywheel bearing	gibs
lube filter	lube motor
lube system	main bearing (1 through 4)
main motor	oil level
pilot solenoid	pinion key
pitman bearing (1 through 4)	"Custom" name

PM tracking units

run hours ¹	days
weeks	months
die changes	ch. cycles (1 through 16) ²
F## WPC press control faults (#: 45 - 59) ³	press overloads ⁴

¹ For SmartPAC (without WPC), "run hours" refers to the length of time that SmartPAC is "on". For SmartPAC with WPC, it means how long the motor is "on". (The version of SmartPAC that you currently have is without WPC. Contact DI if you require WPC.)

² Ch. cycles 1 through 16 can be used only if you have a 16-channel ProCamPAC. Only ch. cycles 1 through 8 can be used for an 8-channel configuration.

³ These are only available if you have SmartPAC with WPC and if you have wired and assigned press functions to the user-definable inputs. (The version of SmartPAC that you currently have is without WPC. Contact DI if you require WPC.)

⁴ "Press overload" is only available with AutoSetPAC option.

Installing the PM Monitor

For new systems from the factory

If you purchased a SmartPAC system with the PM Monitor *pre-installed* at the factory, there is nothing more to install, as it was already done prior to shipment. Proceed to the section, "Using the PM Monitor in Initialization mode", for further instructions.

For existing systems

If you ordered the PM Monitor options separately (in other words, if you already had a SmartPAC, and you were just adding on the PM option), you must first physically upgrade your SmartPAC system for compatibility. To upgrade your SmartPAC firmware, refer to the section called "Upgrading SmartPAC firmware", found in Chapter 2 of this manual.

Once this has been completed, proceed to the section, "Using the PM Monitor in Initialization mode", and you will be instructed to access and initialize this option. *The PM Monitor must be initialized before you can use it.*

Using the PM Monitor in Initialization mode

How to get into SmartPAC Initialization and PM Monitor

SELECT = HIGHLIGHT + ENTER

When we say SELECT, it means highlight the item and press ENTER.

NOTE

Before changing modes, make sure your screen shows the first display in the mode you are in. If that display is not shown, nothing will happen when you turn the Program /Run key. In that case, keep pressing the Reset key. When the first display in the mode is reached, SmartPAC will instantly switch to the new mode.

1. To get into Initialization mode, turn the Program/Run key to "Program" and then press both the "1" and "CLEAR" keys simultaneously for one second.

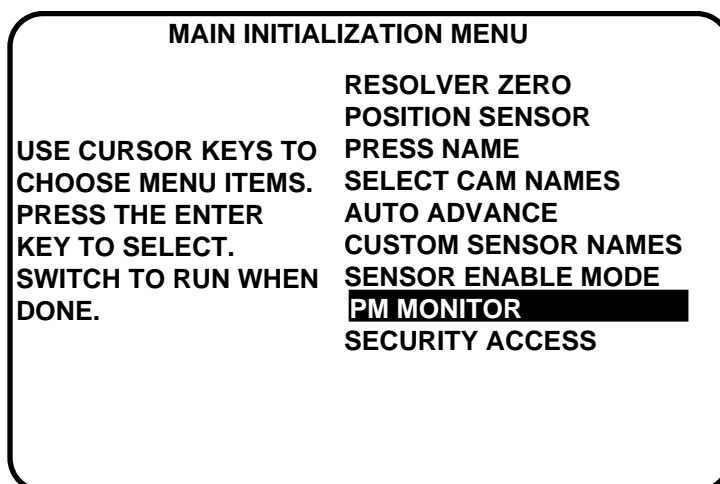


Figure A-1. "PM Monitor" highlighted at SmartPAC Initialization menu (the list of options may vary depending upon the features you have installed)

2. Select "PM Monitor" from the main Initialization menu (Figure A-1). A screen will appear asking for your password.

Note: The password prompt will appear EVERY time that you select "PM Monitor" from the Initialization mode.

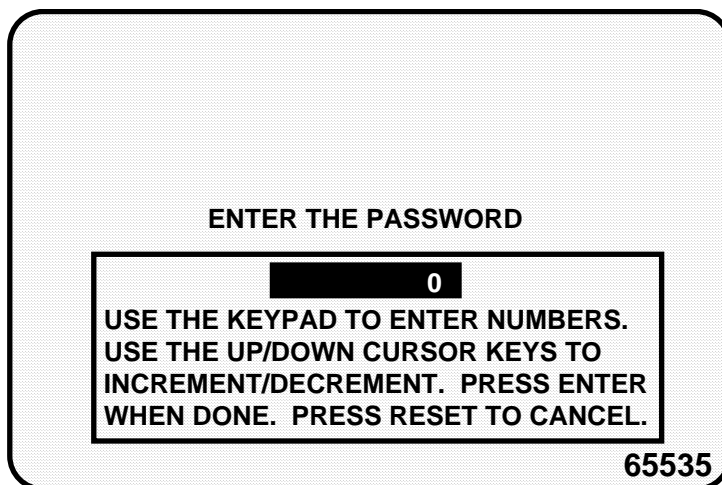


Figure A-2. PM password screen

3. At this point, consider the applicable alternatives below, depending on whether you have a *new system* (which includes the PM option already installed at the factory), or an *existing* SmartPAC (where you have to install and initialize this option yourself). Proceed with the one that corresponds with your system.

For new systems from the factory

If you purchased a SmartPAC system with the PM Monitor pre-installed at the factory, it is not necessary for you to clear/initialize the PM Monitor. However, you do need to complete the steps below as directed.

1. Enter the password "1234" at the "PM password" screen. This will take you immediately to the "PM Entry" screen.
2. As we mentioned above, you do not need to initialize your PM Monitor option, as it has already been done at the factory. However, it is advisable for you to change your password from the default "1234" to a different number, for security reasons.
3. To do this, press **F6** which is labeled "Init". It is at this screen ("Initialize PM" - see Figure A-5) where you can also change your password. Proceed to the section "Assigning a new PM password number" to change your password (skip "Initializing the PM Monitor" altogether). Once you have done that, you can use the PM Monitor.

For existing systems

If you ordered the PM Monitor options separately, you *must* initialize this option before you can actually use it. Complete all the steps in this section to initialize the PM Monitor.

Note: You should already have installed the upgrade. If not, go back to the section, "Installing the PM Monitor" before proceeding further.

Initializing the PM Monitor

1. Select "PM Monitor" from the main Initialization menu (Figure A-1). A screen will appear asking for your password.

Note: The password prompt will appear EVERY time that you select "PM Monitor" from the Initialization mode.

2. To determine the password for your system, note the number at the bottom-right corner of the password screen, and call the factory at (800) 333-3282 (DATA). (Because you have an upgraded system, the password may not be "1234".)

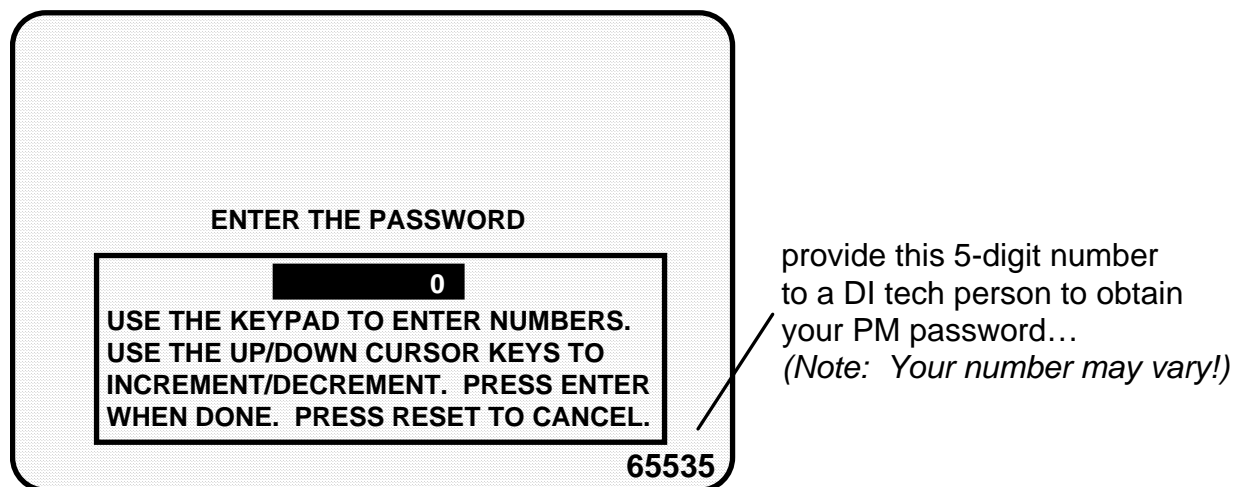


Figure A-3. PM password screen

3. Enter the password, that you obtained from Data Instruments, by using the number keypad. This will take you to the PM Screen (see below). Don't worry if erroneous information appears on the screen, as it will disappear once you have completed step 5.

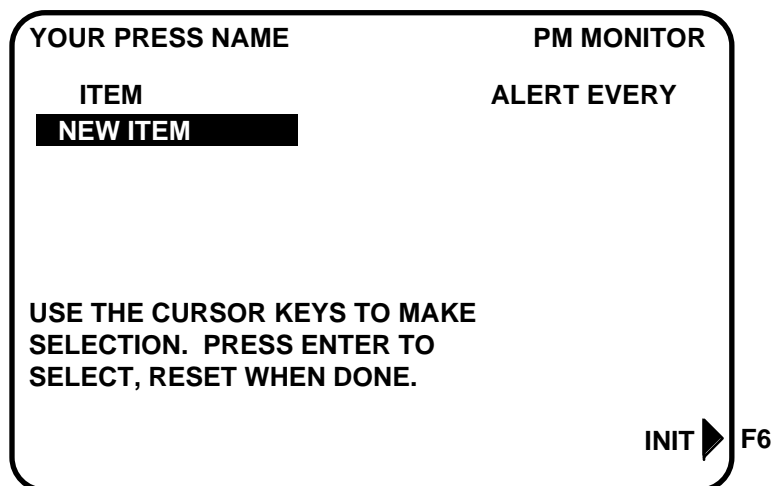


Figure A-4. PM entry screen

4. Press the function key **F6**, which is labeled "Init".
5. From this screen you can initialize the PM Monitor. To initialize, select "Clear PM Info". (Notice that you can also change your password at this screen. To change your password, refer to the next section, "Assigning a new PM password number".)

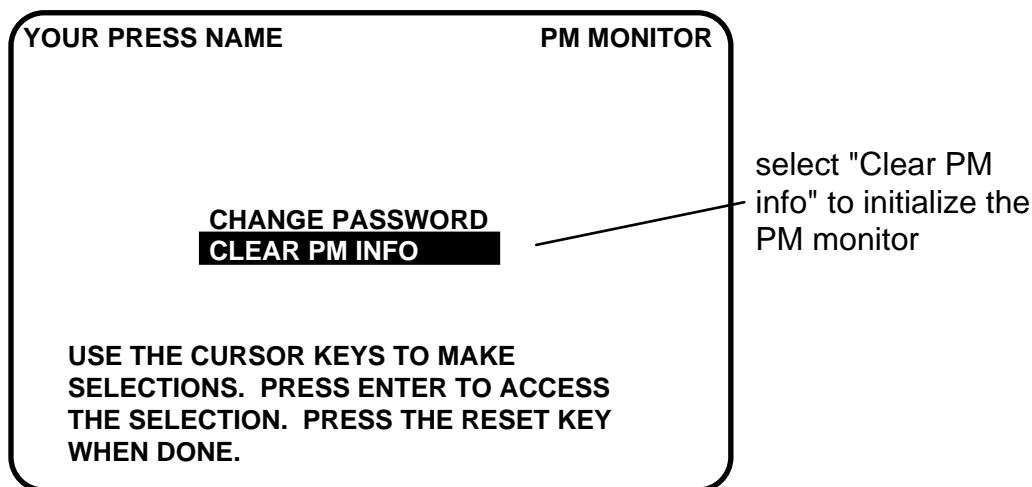


Figure A-5. Initialize PM screen

6. Notice the "Warning" message and accompanying instructions appearing on the screen (see below). Press the "Clear" key to initialize. (If you decide not to, then press Reset.)

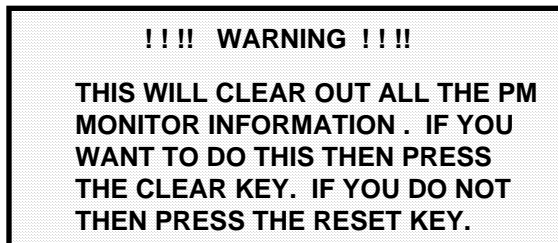


Figure A-6. Initialize warning screen

6. Once you press "Clear", you will briefly see the confirming message "INITIALIZING PM MONITOR".
7. Next, press Reset to exit from the "Initialize PM" screen. You will be returned to the PM entry screen. Proceed to the next section to assign a new password number.

Assigning a new PM password number

Before you can actually set up and use the PM Monitor, you may want to assign a new password number. (The default password is "1234".) For security reasons, it is advisable to change it. Follow the steps below to change the password. You can also change the password under the Security access menu in the Initialization menu (see Chapter 4).

1. Go to the "PM Entry" screen (Figure A-4). Press F6 "Init".
2. You will see the "Initialize PM" screen (Figure A-5). Select "Change Password".
3. As the screen indicates, enter a new password, up to 4 digits (numeric only). Use the number keypad or the up/down cursor keys. Then press Enter.
4. Make sure that you record this number somewhere else. Without it, you cannot change settings in the PM Monitor. You are now ready to use the PM Monitor. Go to the next section.

Select PM Item names

You are now ready to set up PM parameters in Initialization. You can select names for each preventative maintenance item which adequately describes its function. SmartPAC provides about 35 names. If there is a function for which you cannot find a suitable name, you can create a new name using the "Custom" feature (This procedure is explained in step 5 below.)

1. Select "New item" from this display. (You may be asked for a password before getting to this screen. If so, enter it):

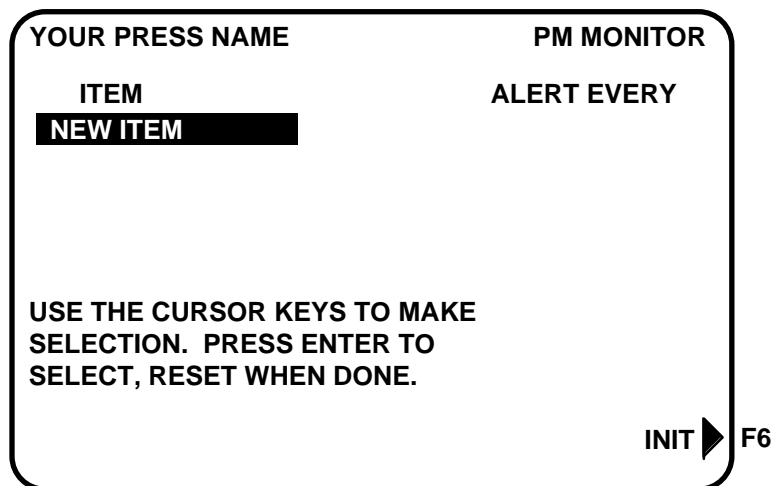


Figure A-7. PM monitor screen

2. Next, you will see the following display. You can give the item a name that best describes its function; so first check the list for a suitable name.

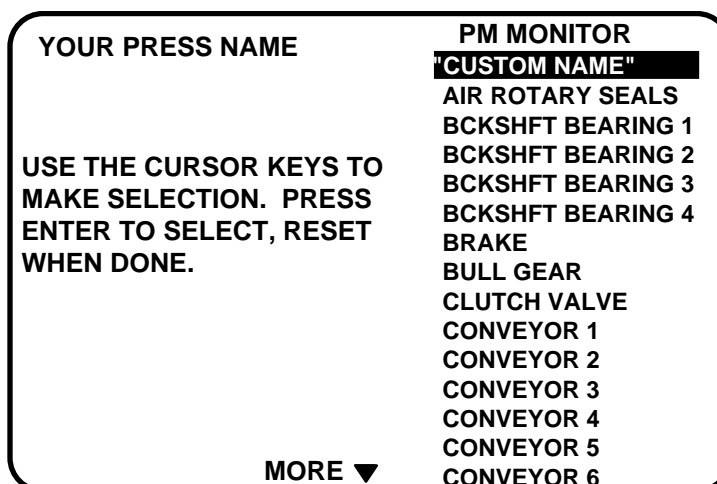


Figure A-8. Displaying available list of PM names

3. To see the complete list of names press the "down" cursor key until the bottom name on the list is highlighted, then keep pressing it. A new name will appear each time you press the key. You can also use the "up" cursor key to reverse direction.
4. If you do not find a suitable name but you still want to name the item, you can select "Custom Name", by highlighting it and pressing Enter.
5. As the screen suggests (see the next illustration), certain keys enable you to custom name the item. The name you select can be any combination of alpha-numeric characters, symbols, etc. Pressing the CLEAR key clears the text. To create a custom name, do the following:
 - a. To select letters or symbols: Use the up, down, left, and/or right cursor keys to highlight the desired letter; then press ENTER.
 - b. To select numbers: Use the number keypad.
 - c. When finished, press function key **F6** (to the right of the LCD display). To cancel your selection, press Reset. (For assistance in using the various keys, refer to Chapter 3 of this manual.)

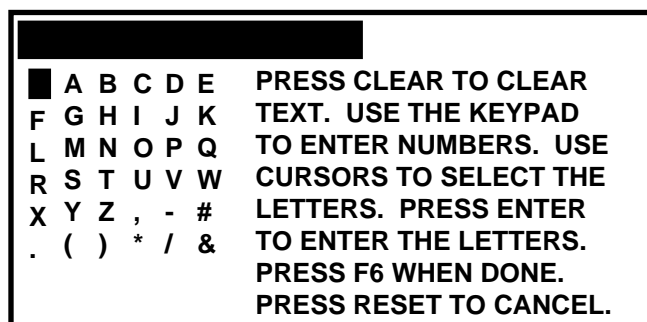


Figure A-9. Alpha-numeric display superimposed over PM names screen

6. After you have named the item, you are prompted to set the PM monitor tracking units. You can select a time-based measure, such as: run hours, days, weeks, months; or you can select measures linked to the process, such as: strokes, die changes, or programmable cam channel cycles. Select the most applicable tracking unit of measure.

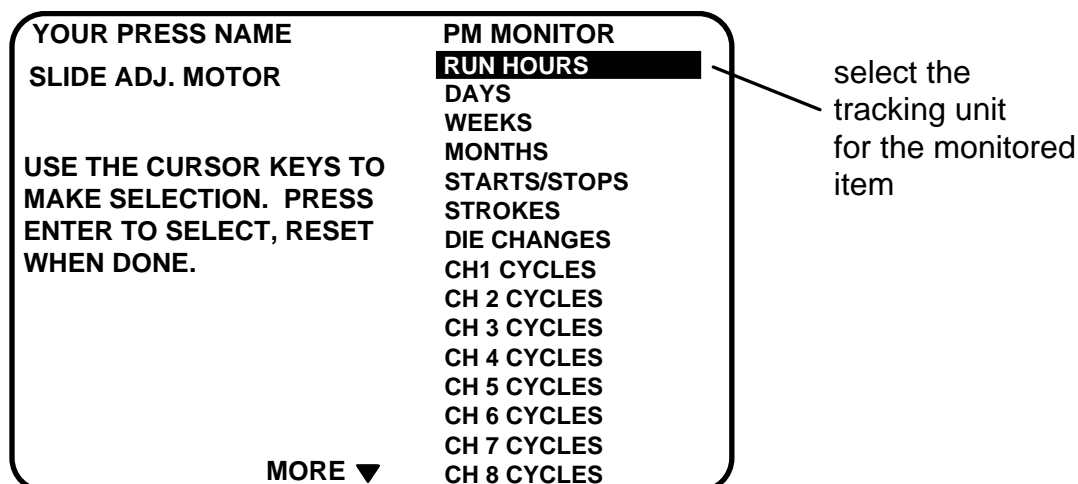


Figure A-10. Selecting tracking unit of measure

7. Next, the number display appears superimposed over the previous display (see the next illustration). Use the number keys or cursor keys to set the tracking frequency for the PM item.

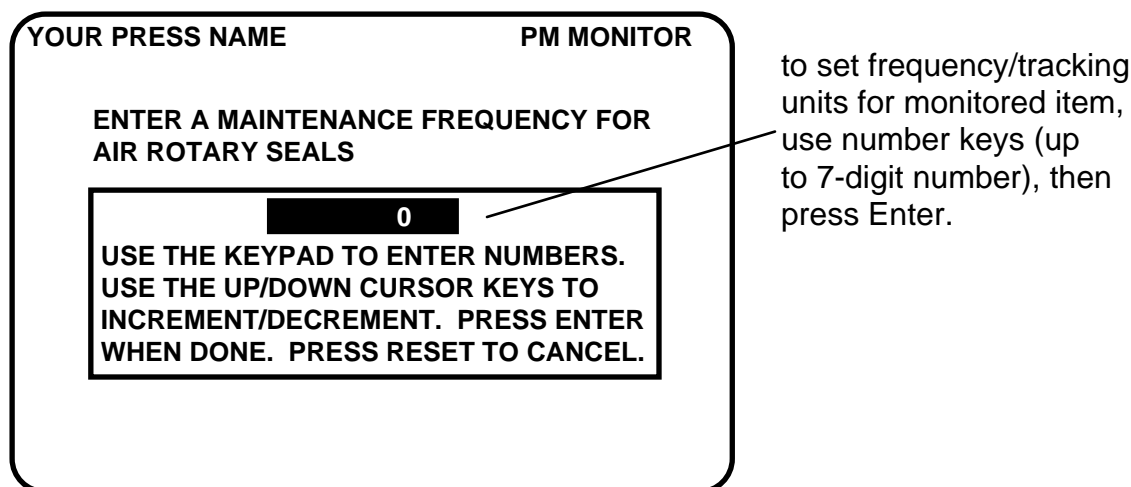


Figure A-11. Superimposed number display

8. In the following illustration, we entered the slide adjust motor as our first PM item, set the tracking unit of measure to be "die changes", and the frequency at "100". Notice that item is listed just below "new item".

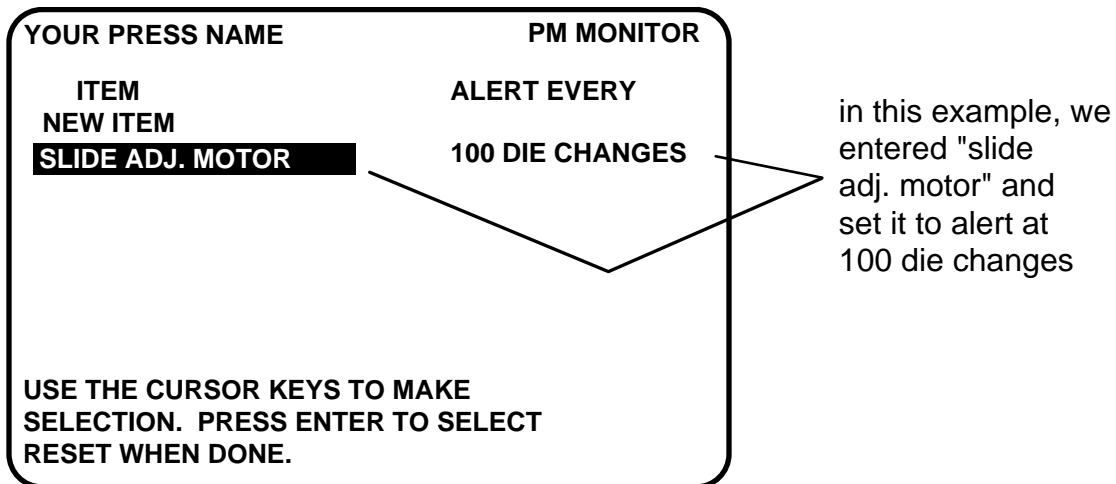


Figure A-12. Example

9. To set more PM items, repeat steps 1 through 8. When you are completely done initializing the PM items, press Reset to return to the main Initialization mode.
10. You can now go to the Run mode to view the PM Monitor status conditions. There is no PM information to set in SmartPAC's Program mode. You made all the required settings in the Initialization mode.

Using the PM Monitor in Run mode

How to get into SmartPAC Run mode

To get into Run mode, set the Program/Run key to Run.

NOTE

Before changing modes, make sure your screen shows the first display in the mode you are in. If that display is not shown, nothing will happen when you turn the Program /Run key. In that case, keep pressing the RESET key. When the first display in the mode is reached, you will instantly switch to the new mode.

A tool number must be loaded before switching to Run mode

If no tool number has been loaded, you cannot switch from Initialization mode or Program mode to Run mode. A tool number must be loaded before SmartPAC will allow the press to run.

If you try to switch to Run mode without a tool number loaded, you will get this error message on your screen:

NO TOOL NUMBER HAS BEEN LOADED

If so, turn the Program/Run key to "Program". Press Reset to clear the error message. Then load a tool number. Now set the Program/Run key to "Run". The Run menu, shown below, is the first display you see in Run mode. From this display you can access the PM Monitor selection.

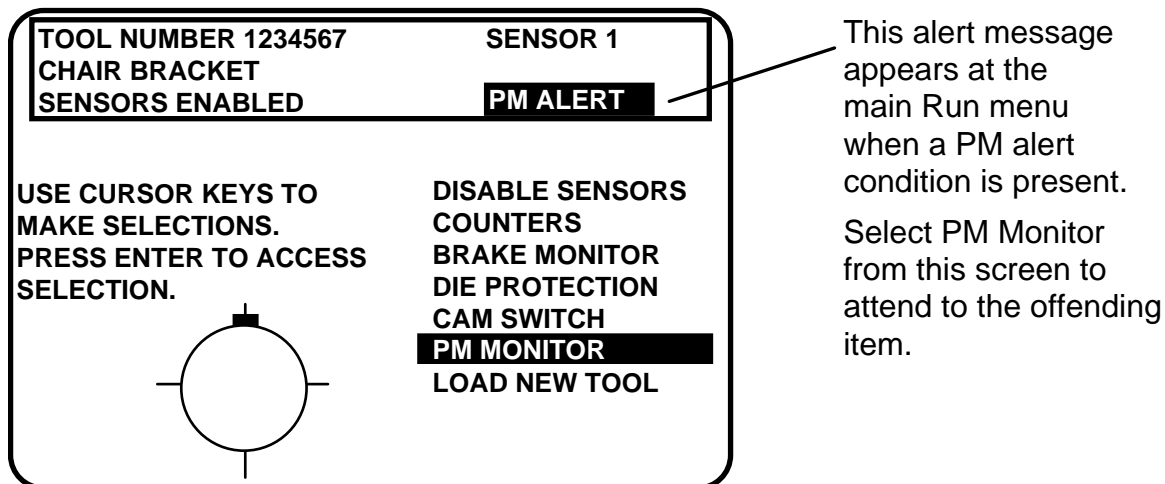


Figure A-13. "PM Monitor" highlighted at SmartPAC Run menu (the list of options may vary depending upon the features you have installed)

Viewing and modifying PM Alerts

1. Select "PM Monitor" from the first display in Run mode.
2. You will see the list of PM items that you previously assigned in the Initialization status. The first item is highlighted in the next example. Use the cursor keys to view the other items on the schedule. Currently the PM status for all items is "normal" (see display). This means that none of the items have reached the limits set in Initialization.

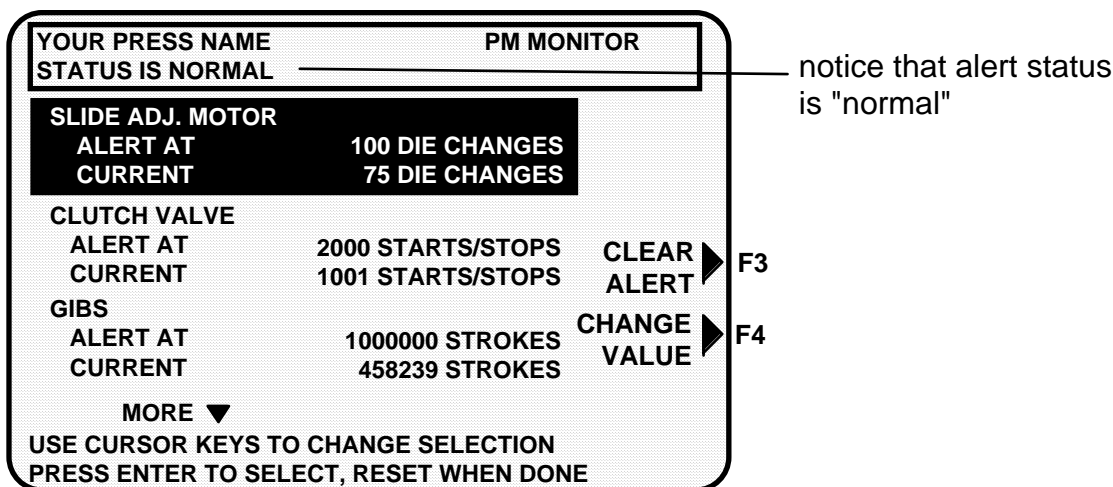


Figure A-14. Display showing PM monitor in "normal" status mode

Note

You may notice that some of the current values do not update on every stroke while the press is running. SmartPAC is keeping track of these items, but does not refresh the display until the press actually stops.

- The next display shows that one of the items, "Slide Adjust Motor" is now in "alert" status mode. It flashes on the screen. Also, the number of items in alert status mode appears at the top of the screen.

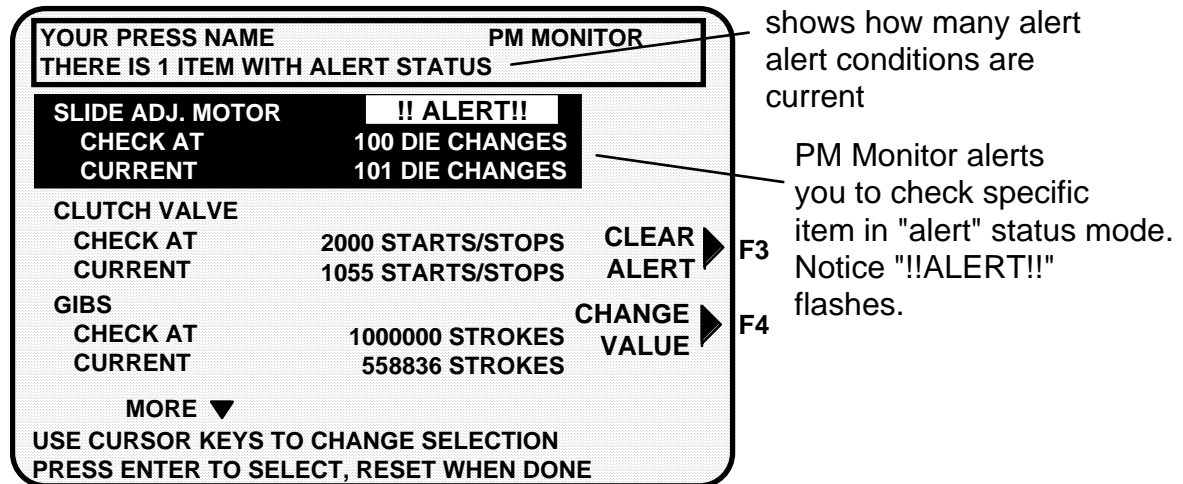


Figure A-15. Shows "Slide Adjust Motor" in "alert" mode

- To view other items in the schedule that may or may not be in "alert" status, use the cursor keys. If more than three PM items were set in Initialization, they will not all appear on the screen. To view them, simply use the cursor keys to scroll down the list.
- To clear the alert, first highlight that item, press the appropriate function key (designated on your screen), and enter the PM password.

CAUTION

When you clear the alert condition for a certain item, you automatically reset its current value to zero. You cannot recall the previous value.

- If you want to change the frequency value on a given PM item, first highlight that item, press the designated function key, and enter the PM password. The number display will be superimposed over the screen (similar to Figure A-11). Use the number keys or cursor keys to modify the tracking frequency for that PM item.
- Once you are done viewing or modifying this screen, press Reset to return to the main Run menu.

Glossary of Terms

actuation block	dark square above a sensor on the "Show sensors" display in Run mode which indicates that a sensor is actuated.
actuation	change in state or condition
actuation angle	sensor's on and off angle; dwell
ANSI	stands for American National Standards Institute; U.S. clearinghouse and coordinating body for voluntary standards activity on the national level
auto advance	equal to the number of degrees of advance per 100 RPM increase in press speed
auto enable by sensor	die protection mode where the die protection module automatically enables an <i>individual</i> sensor after a designated number of strokes
auto enable by tool	die protection mode where the die protection module automatically enables <i>all</i> sensors in a tool after a designated number of strokes
batch counter	can be set to either top-stop the press or signal programmable limit switch (PLS) outputs when its preset is reached
brake monitor	built-in mechanism that checks for brake wear
cam channels	relays that open and close on signals from the programmable cam switch to turn equipment on and off
checksum	numeric value created for a tool number to check that the data stored in memory for the tool is the same as the data that comes out of memory when the tool number is loaded; this value is calculated when data went into memory and must be the same as the value calculated when the data is loaded
circle diagram	arc that dynamically illustrates the on and off angle settings that have been programmed for a sensor and/or cam channel
communications	ability to send and receive data from a computer running PacNET™ and/or RSR™, Remote Storage Retrieval
counters	incremented press cycles; see also <i>strokes</i> , <i>good parts</i> , and <i>batch</i>
CPU number	identifying numeric designation of the unit communicating with PacNET or RSR software products.

critical angle	the last angle position in the crankshaft rotation to signal an emergency stop so that the ram can be stopped before the punches enter the material
cursor keys	used to move the selection bar over the item on the display to be selected; also used to make certain programming and adjusting entries, and to select alphabetic characters and special symbols when naming the press, tools, cam channels, and sensors
depth penetration factor	measurement of how far an object, like an operator's hand, can move through the light curtain before the light curtain reacts
dwel duration time	how long the cam channel and/or sensor are expected to stay activated
enable mode	ability to activate or deactivate sensors connected to the die protection mode; see also <i>manual enable</i> ; <i>auto enable by tool</i> ; and <i>auto enable by sensor</i>
emergency stop	signal sent to the press as soon as a malfunction occurs; should be used when the operator wants the press to stop immediately
Enter key	used after highlighting a selection or keying in a value on the display
error message	diagnostics that indicate why the press was stopped, identify the problem, and suggest how to correct
function keys	periodically used to perform certain tasks in SmartPAC; the message on the LCD display will identify the specific function key number to depress (from F1 to F6)
good parts counter	increments only "good" parts if the die protection and/or tonnage monitoring option does not generate a fault
green sensors	must actuate at least momentarily during the ready signal
green special sensor	designed to effectively monitor slug ejection (described in detail in Chapter 1)
green constant	must turn on before the ready signal begins and turn off after the ready signal ends; that is, it must stay actuated constantly during the ready signal
green quick check	like a green sensor, <i>except</i> that it cannot stay on or turn on outside the ready signal
hand-speed constant	indicates how far one could normally move one's hand and arm in one second; OSHA recommended measurement at 63 inches-per-second

impedance	refers to the opposition to the flow of electric current; some die protection controls have inputs with different impedances for electromechanical sensors; as a rule of thumb: use a high-impedance input if the part is dirty or covered with a non-conductive lubricant; use a low-impedance input if the part is covered with a water-based or conductive lubricant
keyboard	consists of various key and a numeric keypad described below; used along with the LCD display to make settings
LCD display	L iquid C rystal D isplay used along with the keyboard to make and adjust settings, to load tool numbers, and to view diagnostic messages
LED Display	three-digit L ight E mitting D iode display showing strokes per minute when the press is running, and crankshaft angle when the press is stopped
manual enable	die protection mode where sensors are manually enabled or disabled by the operator
menu	display enabling one to carry out a specific task such as: set counters, adjust settings, etc.
N/C (normally closed)	when the sensor circuit to the die protection control is closed to ground in its normal state
NEMA 12	rating indicating that the control is protected against dust and oil; imperative to use conduit of this same rating and make proper connections to ensure NEMA 12 protection with the enclosure
N/O (normally open)	when the sensor circuit to the die protection control switches from open to closed to ground
number keys	used to input numeric values, such as counter presets or tool numbers
object sensitivity	smallest diameter object that a light curtain will detect anywhere in its field
on-off setting	stroke angle settings where the cam channel and/or sensor is to turn on (actuate) and turn off (deactivate)
OSHA	stands for Occupational Safety and Health Administration, which governs regulations pertaining to presence-sensing devices for point-of-operation guarding on mechanical power presses.
pinch point	hazardous area in and around the die; light curtains, two-hand controls, and/or other barriers must be mounted to protect the operator from it

position sensor	magnetic proximity switch that monitors the resolver's position; consists of a magnet which can be mounted on the crankshaft (or other shaft) and a stationary sensor
Program/Run key	allows one to access the Program and Run modes by positioning the key to "Program" or "Run"; can also be used to lock out access to these modes so settings cannot be changed by removing the key
ready signal	portion of the stroke where activity in the die area is monitored
red sensors	normally closed to ground; a stop command is sent to the press as soon as the sensor actuates — opens to ground
reset	ability to resume operation after the control stops the press when a malfunction is detected; a specific fault message for a malfunction is communicated along with suggestions on how to troubleshoot.
Reset key	used to reset the control after fault messages appear on the display; also used to communicate "all done"
resolver	mounted on the press which turns one to one ratio (1:1) with the crankshaft; has windings inside and works on the principle of inductance
response time	how long it takes for the control to activate the machine's brake
safety distance	calculated using the results from the 90° emergency stop time test to determine the distance outside of which the light curtains, two-hand controls, and type-B movable barriers must be mounted; determined by using a precise formula set by OSHA regulations and/or ANSI standards; critical for proper machine guarding
screen contrast keys	adjust the brightness of the LCD display
Security access	ability to prevent or allow personnel access to programming and operating functions in the control
selection bar	black box with white alpha-numeric characters that appears on menu displays; to select, use cursor keys to move the bar up or down and press Enter
sensor on-off box	contains numbers showing the degrees the sensor actuated when you ran the press
settings	modifications made using the keypad on the control
slow RPM	slowest speed at which the press will be operated

smart stop	signal where the critical angle is set; if a die protection error is detected before the critical angle, the stop type executed becomes emergency-stop; otherwise, if the error is detected after this angle, the stop type executed is top stop
stop types	ability to set the way the control stops the press for a malfunction
stopping angle	crankshaft rotation angle that it takes for the press to stop; stopping position in degrees minus the crankshaft position when the dual safety valve (DSV) is closed; useful when setting up die protection system
stopping time	how long it takes the crankshaft to stop once the Dual Safety Valve (DSV) deactivates
strokes counter	increments each press cycle
suppressor	reduces or eliminates electrical noise
timing	"on" and "off" settings for sensors and/or cam channels
tool name	alpha-numeric designation linked to the tool number which aids in easier identification
tool number	a numeric value assigned to keep track of all settings made
top stop	signal which allows the press to stop at top of stroke (0°); used when an emergency-stop setting might cause the press to stick on bottom, and when one hit after a malfunction will not damage the die or press
total hits counter	increments all hits on a tool; if the tool number is loaded again after other tools are used, the counter starts counting from the last recorded number for the previous job; useful for deciding when a tool needs regrinding
voltage selector switch	enables the setting of the power supply from 115V to 230V; located on the power supply board
yellow sensors	normally open to ground; a stop command is sent to the press as soon as the sensor actuates — closes to ground

Index

A

- accessing Initialization mode 64
- actuation 171
- actuation angle 171
- actuation block 136, 137, 171
- actuation times 135
- Adjusting the ready signal 134
- advance, auto 131
- advanced counter modes 97
- alert status 160
- ANSI 127, 128, 171
- auto advance 74, 131, 171
- auto advance setting 112
- auto by sensor 78
- auto by tool 78
- auto enable by sensor 171
- auto enable by tool 171

B

- batch counters 4, 93, 171
- battery 4
- brake monitor 4, 71, 171

C

- calculated safety distance 128
- cam channel 171
- cam channels cycle 160
- cam switch 108, 131
 - adjust 131
 - display 108
 - program auto advance 112
 - program on/off angles 109
 - program timed output 110
 - setting other channels 113
- case lug 32
- change settings for a tool 118
- channels 74
- checksum 49, 67, 150, 171
- circle diagram 59, 104, 109, 112, 134, 135, 171
- clear counters 94
- codes, error log 157

- communications 16, 86, 171

- control enclosure 19
- copy tool number 90
- count mode display 95
- counter
 - batch 93
 - display 93
 - good parts 93
 - parts/stroke or strokes/part 97
 - presets 94
 - setting 94
 - setting mode 95
 - strokes 93
 - total hits 94
- counter increment angles 96
- counter increment mode 96
- counters 4, 123, 171
 - adjust 94, 124
 - batch 94
 - good parts 94
 - locked 123
 - preset 146
 - strokes 94
- CPU number 86, 171
- crankshaft 22
- creating a new tool number 91
- critical angle 11, 102, 103, 172
- cursor keys 58, 62, 172
- custom naming cam channels 74
- custom naming sensors 77
- cutout dimensions 21

D

- delete settings for a cam channel 113
- depth penetration factor 128, 172
- diagnostics 145
- die protection 133
- DiPro RCB 42
- DiPro Sensor Interface 41
- disable green sensors 51
- disable sensors 107, 137
- Dual Safety Valve 68, 72
- dwell duration time 110, 172

E

electrical noise 40
electronic sensors 7
emergency stop 7, 11, 102, 172
emergency stop circuit 30
enable mode 172
enable sensors 108
Enter key 3, 62, 172
error codes 157
error log 155
error message 145
exiting Initialization mode 64

F

fault messages
 E-Stop error messages 149
 green constant 152
 green quick check sensor 152
 green sensor actuated late 151
 green sensor failure 152
 green sensor missed 151
 green special 152
 Input failure 148
 Loss of rotation 147
 No tool number loaded 150
 Onboard ram test failure 149
 Position sensor incorrect 148
 red sensor 153
 Resolver failures 147, 149, 154
 stop time exceeded 149
 Tool number checksum incorrect 150
 yellow sensor 153
final checkout 50
front panel 2
Function keys 3, 62, 93, 172

G

good parts counter 4, 93, 172
green constant 9, 172
green constant fault 152
green quick check 9, 172
green quick check sensor fault 152
green sensor 172
 actuated late 151
 failure 152
green sensor missed 151
Green sensors 8

green special fault 152
Green special sensor 10, 104, 172
ground block 31
ground wire 16, 32
grounding SmartPAC enclosure 32
grounding SmartPAC panel mount 32
guidelines 16

H

hand-speed constant 128, 129, 172
high impedance 7
How to connect suppressors across the load
 40

I

impedance 7, 33, 173
Initialization menu 43, 63, 64
 Auto Advance 74
 Brake monitor 68
 Communications (optional) 86
 Installed options 68
 Position sensor 65
 Resolver zero 65
 Select cam names 72
Initialization Mode 12, 53
initializing SmartPAC 65
input check circuit 30
Installation guidelines 16

K

Keyboard 2, 57, 173

L

LCD display 2, 173
LED Display 2, 173
level shifter 130
load a tool number
 Programming mode 117
 Run mode 141
lock settings 4
locking Run mode 121, 123
lockout 82, 123
loop-back test 67
low impedance 7, 33

M

- main processor board 30
- malfunction 151
- manual enable 78, 173
- memo box 116, 140
- menu 53, 173
- menus 53
- messages
 - equipment or brake monitor 147
 - good parts counter preset reached 146
 - programming problems 150
 - strokes counter preset reached 146
- military-style resolver connector 22
- modifying cam channels 119
- modifying the tool information 118
- mounting into your panel enclosure 20
- mounting the resolver 22

N

- N/C (normally closed) 7, 173
- N/O (normally open) 6, 173
- NEMA 12 173
- NEMA 12 protection 16, 32, 42
- ninety-degree (90°) stop-time test 124
- number keys 57, 173

O

- object sensitivity 128, 173
- off angle 135
- on angle 135
- on-duration 110
- on-off setting 109, 173
- OSHA 127, 129, 173

P

- panel mount 20
- password 82
 - changing 85
 - checking 85
 - forgotten or unknown 83
- password required 123
- pinch point 126, 129, 173
- places, decimal 81
- PM items 160
- PM tracking units 161
- position sensor 23, 46, 174
- position sensor disabled 65

- power supply cover 30
- preset reached
 - batch counter 146
 - good parts counter 146
 - strokes counter 146
- presets, setting and clearing 94
- press functions 161
- press overload 161
- press speed 114
- Program mode 142
- Program/Run key 2, 174
- programming a tool number 117
- Programming menu
 - cam switch 108
 - Counters 93
 - delete the tool information 120
 - disable sensors 107
 - display 89
 - modify the tool information 118
 - set Die Protection 98
 - set tool name 92
- Programming Mode 12, 53, 89
- pulse batch 96

R

- RCB 42
- ready signal 7, 103, 104, 174
- Red sensors 8, 174
- relays 11, 35, 39
- Remote Connection Box 42
- Remote Connection Box (RCB) 42
- reset 4, 174
- Reset key 3, 61, 145, 174
- resolver 3, 22, 45, 65, 174
- resolver zero 44, 65
- response time 128, 129, 174
- run hours 161
- Run menu 122
 - Cam switch 131
 - Counters 123
 - Die Protection 133
 - Disable (enable) sensors 137
 - Load tool number 141
- Run Mode 12, 53, 121
- Run Mode locked 123

S

- safety distance 126, 127, 129, 130, 174
- schedule 160
- scratchpad 4
- Screen contrast keys 2, 174
- security access 82, 83, 174
- Select cam names 72
- Selecting an item on a display 56
- selection bar 56, 58, 62, 174
- sensor on-off box 174
- Sensor on-off marker 135
- sensor terminology 6
- sensor types 8
- sensors 6
- Set brake monitor 71, 72
- set Cam Switch 108
- setting 174
- setting Cam Switch
 - deleting channel settings 113
 - program auto advance 111
 - program on/off angles 109
 - program timed output 110
 - setting other channels 113
- setting counter mode 95
- setting counters 94
- setting Die Protection
 - set the ready signal 103
 - naming the sensor 99
 - set more sensors 106
 - set sensor type 101
 - set stop type 102
- setting Stop Time Limit 71
- Setting up tool information 79
- settings 3
- Setup mode 138
- SFI communications verification 66
- Shadow I wiring 130
- Shadow II wiring 130
- show sensors 136
- show timing 132
- Slow RPM 75, 174
- smart stop 11, 102, 175
- Specifications 13, 14
- speed, press 114
- Start Time 72, 124
- Start Time Limit 72

- Stop angle 124
- stop time 124, 129
- stop time limit 68, 71
- stop type 175
- stop types 11, 102
- stopping angle 75, 175
- stopping time 69, 70, 128, 175
- strokes counter 4, 93, 175
- suppressor 175
- suppressors 16, 40

T

- theory of operation 3
- timed output setting 110
- timing 5, 175
- toggle batch 96
- tool information 115, 140
 - places, decimal 81
 - setting up 79
 - units 80
- tool name 92, 142, 175
- tool number 3, 116, 122, 141, 168, 175
- Tool number display 141, 142
- tool numbers locked 123
- top stop 7, 11, 102, 175
- top stop batch 96
- top stop circuit 30
- total hits counter 4, 94, 175
- tracking frequency 160
- Tracking units 160

U

- Units for Tool Information setup 80
- unused sensor 106
- updating the sensor's on and off angles 135
- user-definable inputs 161

V

- voltage selector switch 31, 175

W

- wiring tips 16, 30

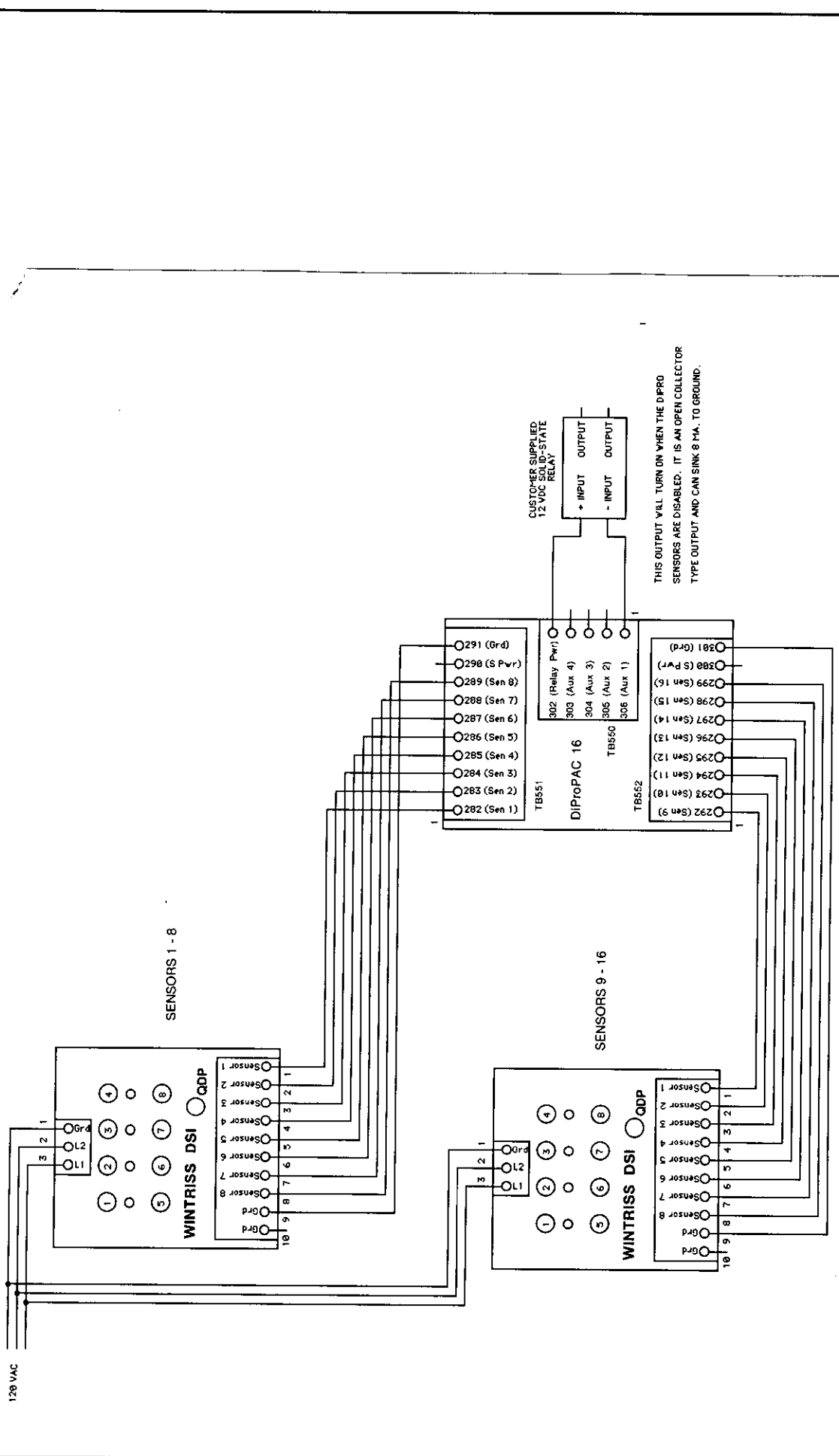
Y

- Yellow sensors 8, 175

Z

- zero the resolver 44, 65

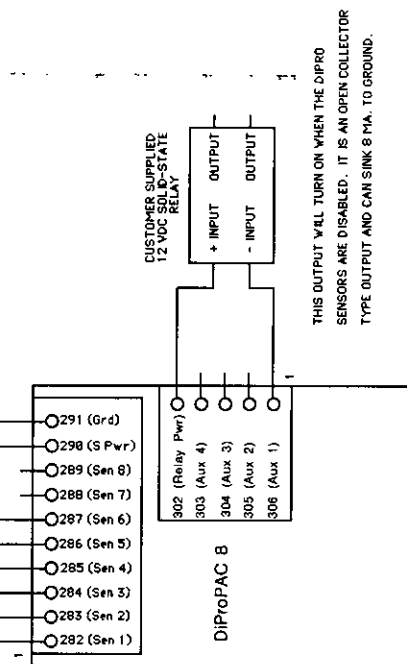
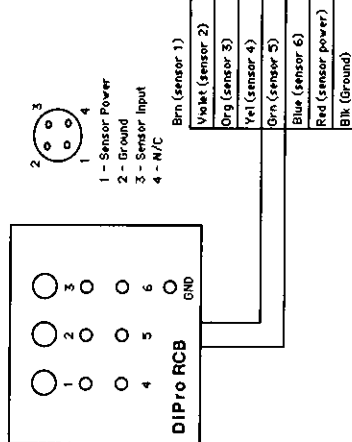
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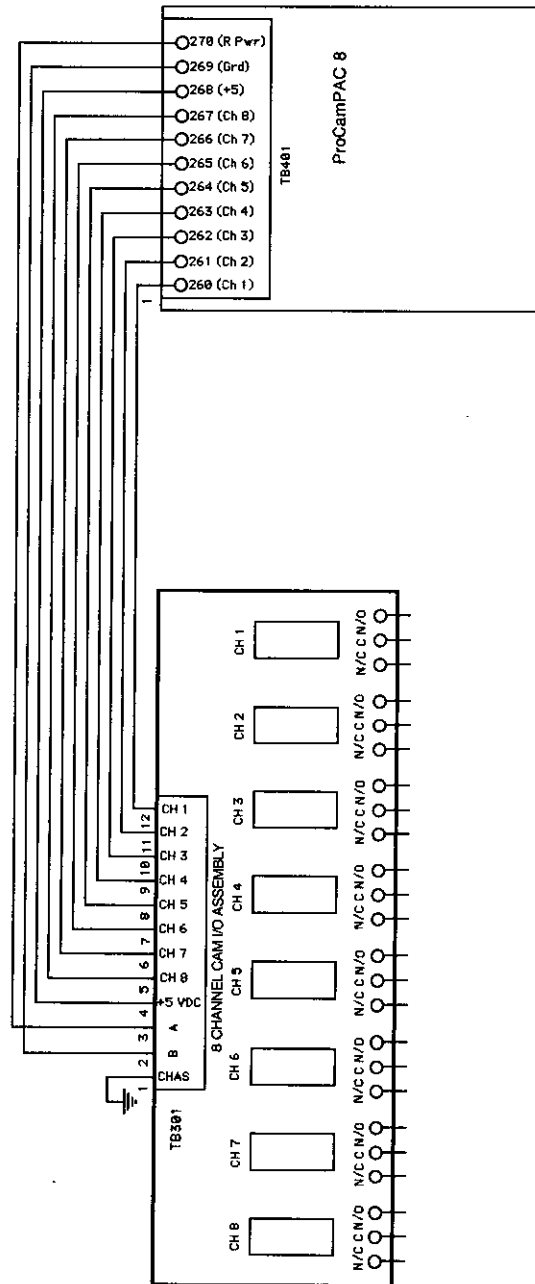


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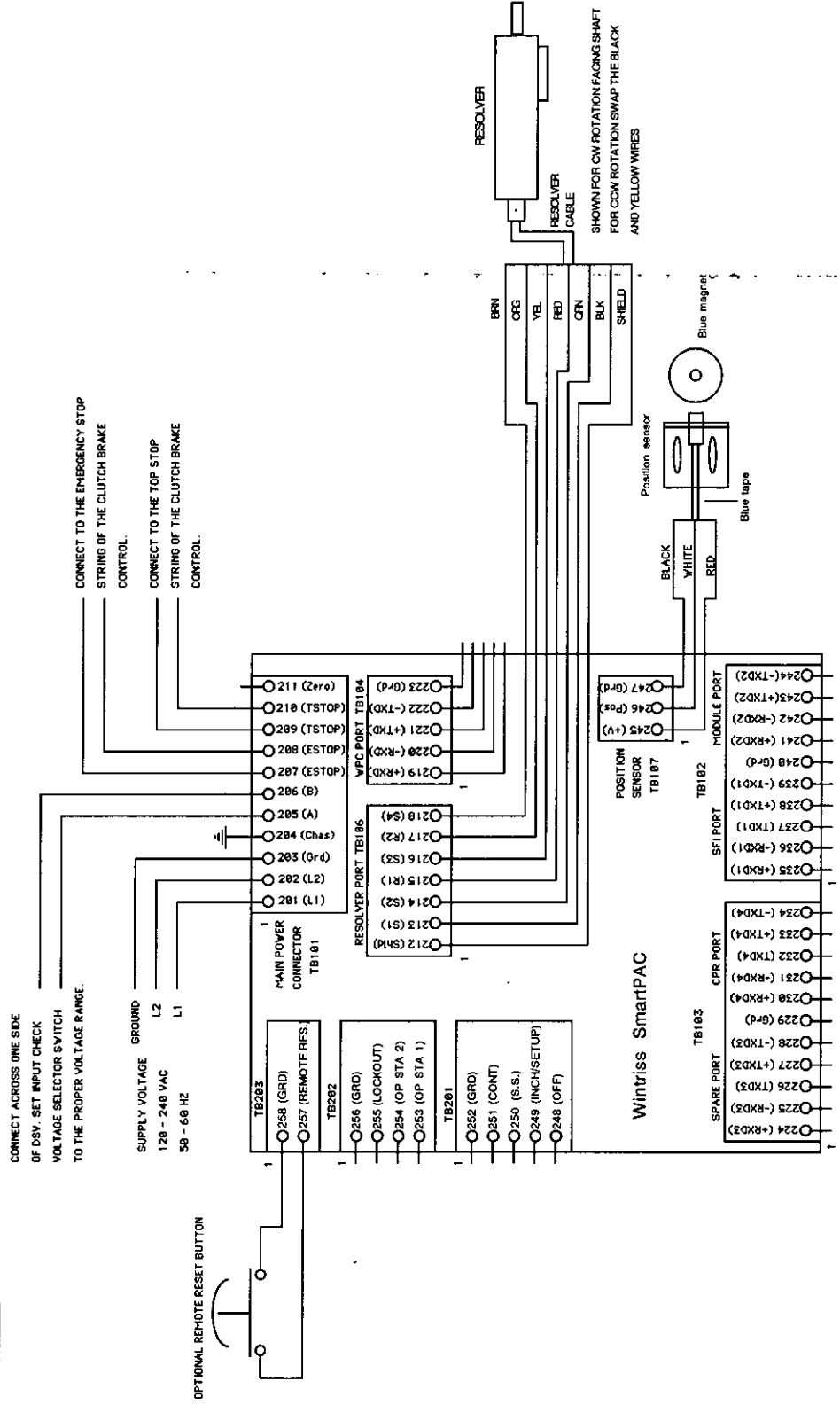
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RS 232 CONNECTIONS

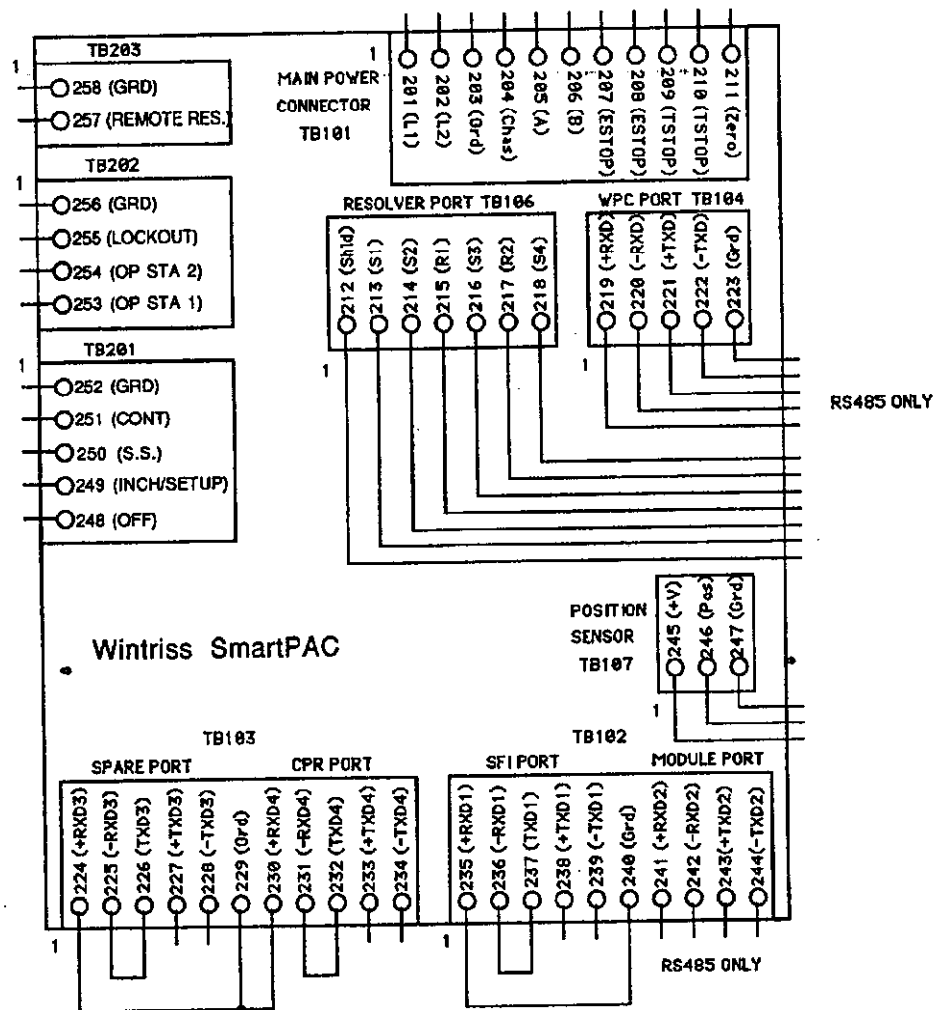


Figure 5. Loop-back test for RS232 SmartPAC connections

RS 485 CONNECTIONS

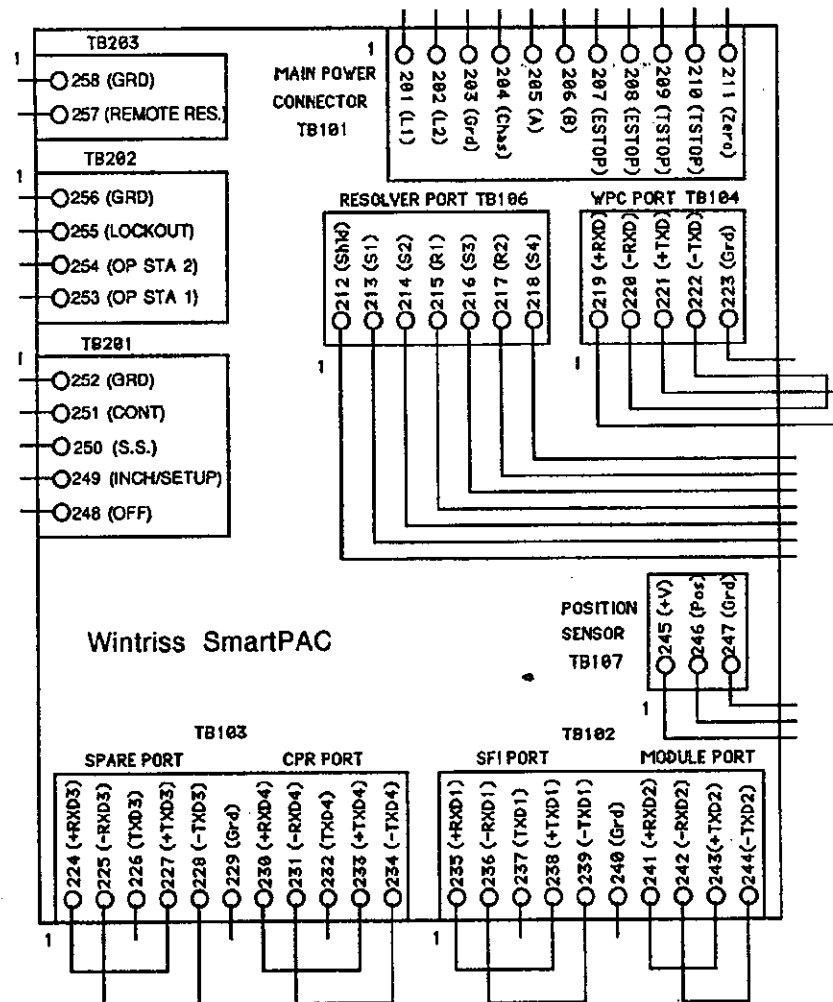


Figure 6. Loop-back test for RS485 SmartPAC connections

SmartPAC™ Setup Form

Tool #: _____

Counter Presets

Strokes: _____ Good Parts: _____

	Batch 1 (Ch. 6)	Batch 2 (Ch. 7)	Batch 3 (Ch. 8)
Preset value			
Output mode (circle one)	TOP STOP TOGGLE PULSE FOR _____mS	TOP STOP TOGGLE PULSE FOR _____mS	TOP STOP TOGGLE PULSE FOR _____mS
Increment mode (circle one)	STROKES GOOD PARTS	STROKES GOOD PARTS	STROKES GOOD PARTS
Increment angle (degrees)			

This tool should be serviced when the TOTAL HITS count reaches: _____

Tool Name: _____

ProCamPAC

Chan. No.	Cam Name (function) (same for all tools)	Auto (√)	ON angle (degrees)	OFF angle (degrees) or Time (mS)
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				

SmartPAC™ Setup Form

Tool #: _____

Counter Presets

Strokes: _____ Good Parts: _____

	Batch 1 (Ch. 6)	Batch 2 (Ch. 7)	Batch 3 (Ch. 8)
Preset value			
Output mode (circle one)	TOP STOP TOGGLE PULSE FOR _____mS	TOP STOP TOGGLE PULSE FOR _____mS	TOP STOP TOGGLE PULSE FOR _____mS
Increment mode (circle one)	STROKES GOOD PARTS	STROKES GOOD PARTS	STROKES GOOD PARTS
Increment angle (degrees)			

This tool should be serviced when the TOTAL HITS count reaches: _____

Tool Name: _____

ProCamPAC

Chan. No.	Cam Name (function) (same for all tools)	Auto (√)	ON angle (degrees)	OFF angle (degrees) or Time (mS)
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				

SmartPAC™ Setup Form

Tool #: _____

Counter Presets

Strokes: _____ Good Parts: _____

Batch 1 (Ch. 6)

Batch 2 (Ch. 7)

Batch 3 (Ch. 8)

Preset value			
Output mode (circle one)	TOP STOP TOGGLE PULSE FOR _____mS	TOP STOP TOGGLE PULSE FOR _____mS	TOP STOP TOGGLE PULSE FOR _____mS
Increment mode (circle one)	STROKES GOOD PARTS	STROKES GOOD PARTS	STROKES GOOD PARTS
Increment angle (degrees)			

This tool should be serviced when the TOTAL HITS count reaches: _____

Tool Name: _____

ProCamPAC

Chan. No.	Cam Name (function) (same for all tools)	Auto (√)	ON angle (degrees)	OFF angle (degrees) or Time (mS)
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				

SmartPAC™ Setup Form

Tool #: _____

Counter Presets

Strokes: _____ Good Parts: _____

Batch 1 (Ch. 6)

Batch 2 (Ch. 7)

Batch 3 (Ch. 8)

Preset value			
Output mode (circle one)	TOP STOP TOGGLE PULSE FOR _____ mS	TOP STOP TOGGLE PULSE FOR _____ mS	TOP STOP TOGGLE PULSE FOR _____ mS
Increment mode (circle one)	STROKES GOOD PARTS	STROKES GOOD PARTS	STROKES GOOD PARTS
Increment angle (degrees)			

This tool should be serviced when the TOTAL HITS count reaches: _____.

Tool Name: _____

ProCamPAC

Chan. No.	Cam Name (function) (same for all tools)	Auto (√)	ON angle (degrees)	OFF angle (degrees) or Time (mS)
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				

SmartPAC™ Setup Form

Tool #: _____

Counter Presets

Strokes: _____ Good Parts: _____

	Batch 1 (Ch. 6)	Batch 2 (Ch. 7)	Batch 3 (Ch. 8)
Preset value			
Output mode (circle one)	TOP STOP TOGGLE PULSE FOR _____mS	TOP STOP TOGGLE PULSE FOR _____mS	TOP STOP TOGGLE PULSE FOR _____mS
Increment mode (circle one)	STROKES GOOD PARTS	STROKES GOOD PARTS	STROKES GOOD PARTS
Increment angle (degrees)			

This tool should be serviced when the TOTAL HITS count reaches: _____

Tool Name: _____

ProCamPAC

Chan. No.	Cam Name (function) (same for all tools)	Auto (√)	ON angle (degrees)	OFF angle (degrees) or Time (mS)
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				

SmartPAC™ Setup Form

Tool #: _____

DiProPAC

Sensor Number	Sensor Name (function)	Sensor Type (circle one)	Stop Type (circle one)	Ready Signal Timing
1		G	GC	ON
		R	GQ	OFF
		Y	GS	
2		G	GC	ON
		R	GQ	OFF
		Y	GS	
3		G	GC	ON
		R	GQ	OFF
		Y	GS	
4		G	GC	ON
		R	GQ	OFF
		Y	GS	
5		G	GC	ON
		R	GQ	OFF
		Y	GS	
6		G	GC	ON
		R	GQ	OFF
		Y	GS	
7		G	GC	ON
		R	GQ	OFF
		Y	GS	
8		G	GC	ON
		R	GQ	OFF
		Y	GS	
9		G	GC	ON
		R	GQ	OFF
		Y	GS	
10		G	GC	ON
		R	GQ	OFF
		Y	GS	
11		G	GC	ON
		R	GQ	OFF
		Y	GS	
12		G	GC	ON
		R	GQ	OFF
		Y	GS	
13		G	GC	ON
		R	GQ	OFF
		Y	GS	
14		G	GC	ON
		R	GQ	OFF
		Y	GS	
15		G	GC	ON
		R	GQ	OFF
		Y	GS	
16		G	GC	ON
		R	GQ	OFF
		Y	GS	

Auto Enable Counter _____

Critical Angle _____° (for Smart Stop)

G=GREEN STD; R=RED; Y=YELLOW; GC=GREEN CONSTANT; GQ=GREEN QUICK-CHECK; GS=GREEN SPECIAL

SmartPAC™ Setup Form

Tool #: _____

DiProPAC

Sensor Number	Sensor Name (function)	Sensor Type (circle one)	Stop Type (circle one)	Ready Signal Timing
1		G	GC	E-STOP
		R	GQ	TOP STOP
		Y	GS	SMART STOP
2		G	GC	E-STOP
		R	GQ	TOP STOP
		Y	GS	SMART STOP
3		G	GC	E-STOP
		R	GQ	TOP STOP
		Y	GS	SMART STOP
4		G	GC	E-STOP
		R	GQ	TOP STOP
		Y	GS	SMART STOP
5		G	GC	E-STOP
		R	GQ	TOP STOP
		Y	GS	SMART STOP
6		G	GC	E-STOP
		R	GQ	TOP STOP
		Y	GS	SMART STOP
7		G	GC	E-STOP
		R	GQ	TOP STOP
		Y	GS	SMART STOP
8		G	GC	E-STOP
		R	GQ	TOP STOP
		Y	GS	SMART STOP
9		G	GC	E-STOP
		R	GQ	TOP STOP
		Y	GS	SMART STOP
10		G	GC	E-STOP
		R	GQ	TOP STOP
		Y	GS	SMART STOP
11		G	GC	E-STOP
		R	GQ	TOP STOP
		Y	GS	SMART STOP
12		G	GC	E-STOP
		R	GQ	TOP STOP
		Y	GS	SMART STOP
13		G	GC	E-STOP
		R	GQ	TOP STOP
		Y	GS	SMART STOP
14		G	GC	E-STOP
		R	GQ	TOP STOP
		Y	GS	SMART STOP
15		G	GC	E-STOP
		R	GQ	TOP STOP
		Y	GS	SMART STOP
16		G	GC	E-STOP
		R	GQ	TOP STOP
		Y	GS	SMART STOP

Auto Enable Counter _____

Critical Angle _____ ° (for Smart Stop)

G=GREEN STD; R=RED; Y=YELLOW; GC=GREEN CONSTANT; GQ=GREEN QUICK-CHECK; GS=GREEN SPECIAL

SmartPAC™ Setup Form

Tool #: _____

DiProPAC

Sensor Number	Sensor Name (function)	Sensor Type (circle one)	Stop Type (circle one)	Ready Signal Timing
1		G	GC	E-STOP
		R	GQ	TOP STOP
		Y	GS	SMART STOP
2		G	GC	E-STOP
		R	GQ	TOP STOP
		Y	GS	SMART STOP
3		G	GC	E-STOP
		R	GQ	TOP STOP
		Y	GS	SMART STOP
4		G	GC	E-STOP
		R	GQ	TOP STOP
		Y	GS	SMART STOP
5		G	GC	E-STOP
		R	GQ	TOP STOP
		Y	GS	SMART STOP
6		G	GC	E-STOP
		R	GQ	TOP STOP
		Y	GS	SMART STOP
7		G	GC	E-STOP
		R	GQ	TOP STOP
		Y	GS	SMART STOP
8		G	GC	E-STOP
		R	GQ	TOP STOP
		Y	GS	SMART STOP
9		G	GC	E-STOP
		R	GQ	TOP STOP
		Y	GS	SMART STOP
10		G	GC	E-STOP
		R	GQ	TOP STOP
		Y	GS	SMART STOP
11		G	GC	E-STOP
		R	GQ	TOP STOP
		Y	GS	SMART STOP
12		G	GC	E-STOP
		R	GQ	TOP STOP
		Y	GS	SMART STOP
13		G	GC	E-STOP
		R	GQ	TOP STOP
		Y	GS	SMART STOP
14		G	GC	E-STOP
		R	GQ	TOP STOP
		Y	GS	SMART STOP
15		G	GC	E-STOP
		R	GQ	TOP STOP
		Y	GS	SMART STOP
16		G	GC	E-STOP
		R	GQ	TOP STOP
		Y	GS	SMART STOP

Auto Enable Counter _____

Critical Angle _____ ° (for Smart Stop)

G=GREEN STD; R=RED; Y=YELLOW; GC=GREEN CONSTANT; GQ=GREEN QUICK-CHECK; GS=GREEN SPECIAL

SmartPAC™ Setup Form

Tool #: _____

DiProPAC

Sensor Number	Sensor Name (function)	Sensor Type (circle one)	Stop Type (circle one)	Ready Signal Timing
1		G	GC	ON
		R	GQ	TOP STOP
		Y	GS	SMART STOP
2		G	GC	ON
		R	GQ	TOP STOP
		Y	GS	SMART STOP
3		G	GC	ON
		R	GQ	TOP STOP
		Y	GS	SMART STOP
4		G	GC	ON
		R	GQ	TOP STOP
		Y	GS	SMART STOP
5		G	GC	ON
		R	GQ	TOP STOP
		Y	GS	SMART STOP
6		G	GC	ON
		R	GQ	TOP STOP
		Y	GS	SMART STOP
7		G	GC	ON
		R	GQ	TOP STOP
		Y	GS	SMART STOP
8		G	GC	ON
		R	GQ	TOP STOP
		Y	GS	SMART STOP
9		G	GC	ON
		R	GQ	TOP STOP
		Y	GS	SMART STOP
10		G	GC	ON
		R	GQ	TOP STOP
		Y	GS	SMART STOP
11		G	GC	ON
		R	GQ	TOP STOP
		Y	GS	SMART STOP
12		G	GC	ON
		R	GQ	TOP STOP
		Y	GS	SMART STOP
13		G	GC	ON
		R	GQ	TOP STOP
		Y	GS	SMART STOP
14		G	GC	ON
		R	GQ	TOP STOP
		Y	GS	SMART STOP
15		G	GC	ON
		R	GQ	TOP STOP
		Y	GS	SMART STOP
16		G	GC	ON
		R	GQ	TOP STOP
		Y	GS	SMART STOP

Auto Enable Counter _____ Critical Angle _____ ° (for Smart Stop)

G=GREEN STD; R=RED; Y=YELLOW; GC=GREEN CONSTANT; GQ=GREEN QUICK-CHECK; GS=GREEN SPECIAL

SmartPAC™ Setup Form

Tool #: _____

DiProPAC

Sensor Number	Sensor Name (function)	Sensor Type (circle one)	Stop Type (circle one)	Ready Signal Timing
1		G	GC	ON
		R	GQ	OFF
		Y	GS	
2		G	GC	ON
		R	GQ	OFF
		Y	GS	
3		G	GC	ON
		R	GQ	OFF
		Y	GS	
4		G	GC	ON
		R	GQ	OFF
		Y	GS	
5		G	GC	ON
		R	GQ	OFF
		Y	GS	
6		G	GC	ON
		R	GQ	OFF
		Y	GS	
7		G	GC	ON
		R	GQ	OFF
		Y	GS	
8		G	GC	ON
		R	GQ	OFF
		Y	GS	
9		G	GC	ON
		R	GQ	OFF
		Y	GS	
10		G	GC	ON
		R	GQ	OFF
		Y	GS	
11		G	GC	ON
		R	GQ	OFF
		Y	GS	
12		G	GC	ON
		R	GQ	OFF
		Y	GS	
13		G	GC	ON
		R	GQ	OFF
		Y	GS	
14		G	GC	ON
		R	GQ	OFF
		Y	GS	
15		G	GC	ON
		R	GQ	OFF
		Y	GS	
16		G	GC	ON
		R	GQ	OFF
		Y	GS	

Auto Enable Counter _____

Critical Angle _____ ° (for Smart Stop)

G=GREEN STD; R=RED; Y=YELLOW; GC=GREEN CONSTANT; GQ=GREEN QUICK-CHECK; GS=GREEN SPECIAL