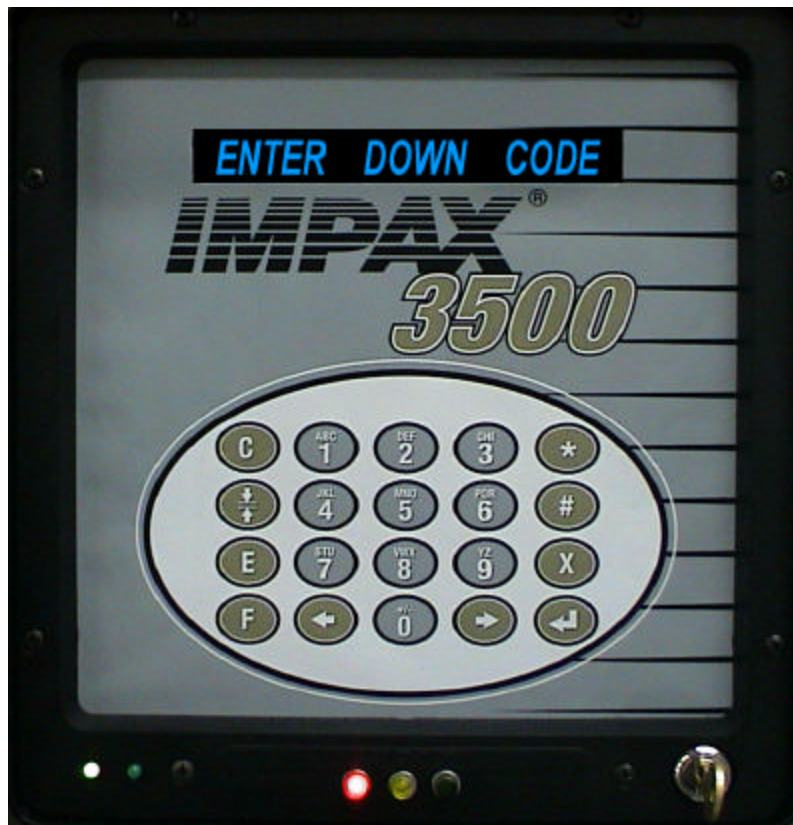


# **IMPAX™** 3500



# **User's Guide**

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This manual is a guide to the IMPAX 3500 Process Control System.

This User's Guide should be read and kept for reference by operators, managers, and supervisors responsible for the setup, operation, and repair of IMPAX monitoring systems. It is assumed that the software in the IMPAX 3500 is version 58.

If you are not sure of the software version in your IMPAX 3500 unit please refer to chapter 8 in the Supervisor's Guide.

If you still have a question, problem, or an idea to make our system better, please let us know.

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## ***IMPAX 3500 SPECIFICATIONS***

Controller type: Microprocessor-controlled monitoring and control system for forming machines.

Measuring System: Force and pressure sensing by piezoelectric transducers; typical size 1-1/8 inch diameter by 1/8 inch thick, or less. Output range: .4 to 200 volts. Interpreted by 8-bit analog-to-digital converter.

Timing System: Parts counting and measurement timing by non-contact metal detecting switches on cams or other machine parts. 10-volt output pulse.

Operator Controls and displays: At console: Alphanumeric display for measurement and messages, push-button controls, and 'Mode Change/Data Entry' keyswitch.

Machine Control: Two relays (4 optional), operating independently. Immediate, timed, or cycled delay. Each rated 8 amps, 250 volts AC maximum. May be used to stop machine, feed, output diverter, or other accessories.

Power Requirements: 115 volts at 1 amp or 230 volts at 1/2 amp, 50/60 Hz AC.

Dimensions: Machine Interface: 8" H x 6" W x 4" D  
Control Console: 11-3/4" H x 10-3/4" W x 9" D  
Satellite Cable: multi conductor, oil resistant covering, 10 foot length  
Console weight: Approx. 30 lbs  
Distance from IMPAX to machine: Recommended maximum of 20 feet

Environmental Protection: Machine Interface and fittings are sealed to NEMA 13. Resistant to oil, heat, and vibration.

Control Console: Keyboard and case are resistant to oil, smooth and easy to clean. Withstand extremes of temperature and humidity. Resistant to static electrical discharge.

Battery Backup: Lithium - rated for 6-8 year life.

## Chapter 1 - Introduction and Theory of Operation

### INTRODUCTION

IMPAX can assist the operator of a forming, threadrolling or metal stamping machine by counting parts produced, and monitoring stroke to stroke consistency. It is capable of stopping the machine instantly when the job is completed or when it detects a problem.

IMPAX prevents smashups, scrap production, and overruns, thus making the forming operation more productive and making the operator's job easier. Because it is merely a tool, it cannot replace skilled people, but it can help by reducing the drudgery of frequent inspections and repairs.

Operation of the machine is not changed by the addition of IMPAX. IMPAX is 'smart' enough to simply do its job, without interference or complication.

Although IMPAX operates mainly without attention, it does require the machine operator to push a button once in a while. To get the best results from the system, you should become familiar with its operation.

Operator attitude is very important when introducing and implementing IMPAX. Like any other tool, its effectiveness depends on how well it is used. If machine operators perceive it as unnecessary, complicated, an invasion of their routine, or a threat to their jobs, it will not work even if it is technically perfect. It is vital that everyone understand that IMPAX can make forming operations easier and more productive; that makes the whole company more competitive, which in turn makes everyone's job more secure.

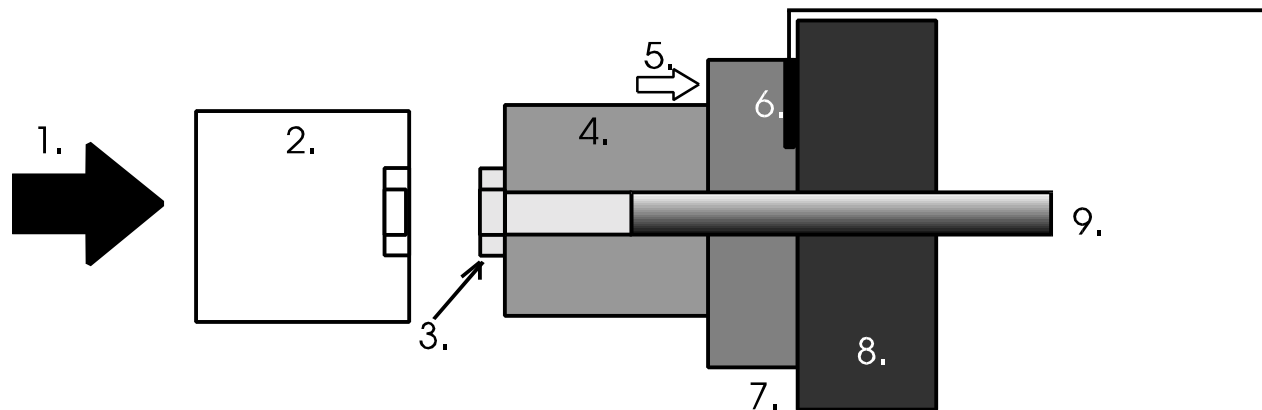
### THEORY OF OPERATION

The IMPAX monitoring system measures and remembers the forming force generated in each forming station, for every machine stroke. The principle of operation is simply that when the forming process changes (due to tool breakage, material variation, machine problems, etc.) The forces required to form the part also change. IMPAX can be set up to detect a variety of changes and stop the machine before further damage or waste occurs.

The heart of this system is the force measurement. Attached behind each forming station is a piezoelectric force sensor. The piezoelectric element generates a voltage each time a part is struck, twisted, deflected, etc. Another device, the machine position sensor, is turned on by a timing cam when it is time for the part to be formed, at that time, the IMPAX monitor measures the impulse from each force sensor. This measurement is converted to a number and stored in memory. (The number is relative; it is not calibrated in any engineering units.) After a number of new parts have been made, an average force level is determined and limits are set above and below this average. Because some jobs run better than others, these limits are adjustable. When the force of any stroke exceeds the limits, the process is stopped.

Stopping the machine is all the process monitor can do. It cannot fix the problem or restart the machine. When a problem is detected a red light turns on to attract your attention and an error message is displayed on the IMPAX unit's display. The machine is stopped, and any accessories are shut down in an orderly manner. A gate or diverter may also be used to trap the part which is suspected to have caused the shutdown error.

Obviously, this system does not directly measure the quality of the parts; it indirectly measures the consistency of the process. If a machine is running erratically or the raw material is inconsistent, this monitor will not perform as well. Remember that IMPAX will not remedy any problems with the manufacturing process, it can only detect them and shut the process down.



- |  |                                |
|--|--------------------------------|
| <b>1. Ram Motion</b>                                   | <b>6. Piezoelectric Sensor</b> |
| <b>2. Punch</b>  | <b>7. Backplate</b>            |
| <b>3. Finished Part</b>                                | <b>8. Machine Bed</b>          |
| <b>4. Die</b>  | <b>9. Kickout</b>              |
| <b>5. Transmitted Force that will reach the sensor</b> |                                |

## CONTROL CONSOLE

The IMPAX 3500 Control Console contains a message display panel, a data entry keyboard, and a locking keyswitch. The display panel shows information which is requested, or supplies prompts or questions during operation. The **Keypad\*** is used to enter commands or information, and the keyswitch enables authorized users to program the unit. The function buttons may operate differently depending on the position of the key switch. If the key is removed, IMPAX will only display information. If the key is inserted, the **Keypad** can be used for programming and diagnostics.

There are three kinds of buttons on the keypad. *Functions* buttons let you command IMPAX to display or change things, *Control* buttons are used to enter commands and *Data* buttons let you enter in numbers and codes.

### Keypad Description \*

Displays number of parts to be made number remaining on the job, or permits job quantities to be programmed or reset.

Displays tolerance settings for each station, or permits tolerance levels to be set or changed..

Indicates when machine was stopped by IMPAX and gives details.

Shows force measurements for each station, including average values and and tolerance limits.

Erases a digit entry or steps backward to a previous message.



Has special meanings; may be used as a decimal point.

Used for special functions, such as programming and diagnostics.

Erases the display, or clears out certain machine settings.

Advances display to following message or 'skips' entry.

Machine cycle signal

Machine state indicators

Mode change & Data Entry Switch

## Chapter 2 - Setup and Operation

### *Getting Started*

To “Program” the IMPAX 3500 Controller, you must supply several basic types of information:

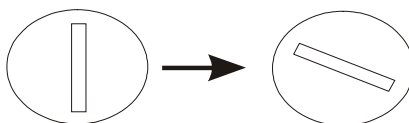
1. *The total number of parts to be made on work order. (Up to 99,999,999)*
2. *The number of parts to be made prior to a predetermined inspection or tool change (this feature may be omitted).*
3. *The force variation tolerance settings (scale of 1 to 9, automatic tolerance, or no tolerance) for each forming process.*
4. *A “trend limit” which limits how much the force values can change as the machine heats up or tools wear down (this feature may be omitted).*
5. *The desired number of exceptions, which let-by a small percentage of “bad” parts (this feature may also be omitted).*

Setting up the IMPAX 3500 unit for a new job may be done any time before beginning the job, by anyone who has a “**Program and Mode Change**” keyswitch.

### *Clearing the old job*

Before setting up a new job you must Clear (C) the existing functions which do not apply to the new setup. When the old job is finished, insert the Supervisor’s Key and turn it to the left so it is in a horizontal position.

Insert Key and turn to the left from the  
Vertical position





## Clearing Shift, Break, and Production Counters:

Press C. The display will show “SELECT TO CLEAR”. This display means that the IMPAX unit wants to know what to erase.

<u>Press</u>	<u>Display Will Show</u>
C	SELECT TO CLEAR

Press Q. The display shows “CLEAR SHIFT?”. The IMPAX unit is now asking whether or not you want to erase the total number of parts made during the shift. If not press →. (You may want to record this number before erasing; to do so, see Chapter 4, Information Displays.) If you wish to erase this press ←.

Q	CLEAR SHIFT?
---	--------------

**IF YOUR ANSWER IS YES:**

←	SHIFT CLEARED
	CLEAR BREAK?

**IF YOUR ANSWER IS NO:**

→	CLEAR BREAK?
---	--------------

**IF YOUR ANSWER IS YES:**

←	BREAK CLEARED
	CLEAR PROD?

**IF YOUR ANSWER IS NO:**

→	CLEAR PROD?
---	-------------

**IF YOUR ANSWER IS YES:**

←	PROD CLEARED
	CLEAR EXPTS?

**IF YOUR ANSWER IS NO:**

→	EXPTS CLEARED?
---	----------------

Now the shift total is erased and the display shows “CLEAR BREAK?”. The IMPAX unit is now asking whether or not you want to reset the counter which makes the periodic stops for tooling changes or inspection. If you do not wish to do this, press →. If you desire to, press ←.

Now the break counter is reset and the display shows “CLEAR PROD?”. The IMPAX unit is now asking whether or not you want to completely erase the record of that preset production count. This clears the total of parts made, as well as the break counter. If you do not wish to do this, press →. If you desire to, press ←.

The display will show “CLEAR EXCEPTIONS”. If you wish to clear this counter press ←. If you do not, press →, and the display will return to the default message display.

# Clearing The Tolerance and the Error Record:

The IMPAX monitor production counters are now cleared. It is ready to be set up for a new set of quantities. In fact, it will not run (except in TEST mode) until a new production quantity is entered.

The  $\frac{\uparrow}{\downarrow}$  and the E records can be cleared by pressing C until the "SELECT TO CLEAR" screen appears and then pressing the respective button on the **Keypad**. Remember these steps can be avoided without harm to the unit or the data for the next job.

The IMPAX 3500 is now cleared and is ready to be set up for a new job. In fact, it will not run (except for short setup runs) until new production quantities and tolerance values have been re-entered.

The display will show "CLEAR EXCEPTIONS?". Press  $\leftarrow$  to clear the record of the Exceptions.

## Press

## Display Will Show

### *TOLERANCE:*

C

SELECT TO CLEAR

$\frac{\downarrow}{\uparrow}$

CLEAR TOLERANCE?

$\leftarrow$

TOLERANCE CLEARED

### *ERROR:*

C

SELECT TO CLEAR

E

CLEAR ERRORS?

$\leftarrow$

ERRORS CLEARED

CLEAR EXCPT?

$\leftarrow$

EXCPT CLEARED

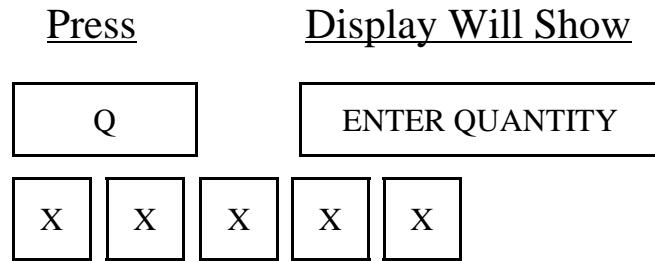
# Entering the Quantities Needed To Start a New Job:

Insert the **Supervisor's Key** and turn it to the left. Press the **Q** button and the display will show "ENTER QUANTITY", which asks you to type in the total number of pieces to be made on this job.

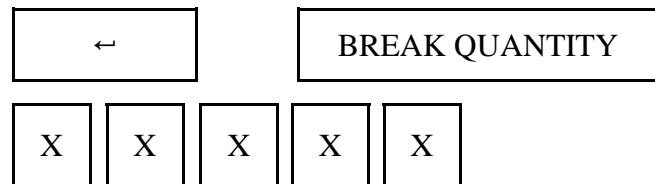
Insert Key and turn to the left



Press the number buttons to show the quantity you want to produce. If you make a mistake, use the **←** button to change the number. Check the display to be sure you have typed in the correct number. Press the **⇐** button to enter the quantity.



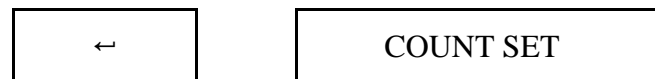
(up to 99,999,999)



(up to 99,999,999)

The display will now ask for the "BREAK QUANTITY" which is the number of pieces to make before stopping for inspection or tool change. (This reminds you of periodic adjustments, inspections, maintenance, etc. that are based on machine or production cycles). Press the number buttons to show the quantity you wish to make without interruption. Use the **←** button if you make a mistake. If you do not want any interruptions due to the *Break Quantity* counter, press the **Q** button and the IMPAX unit will skip this. When you have typed in the correct *Break Quantity*, press the **⇐** button.

*If the tolerances are set and you are done:*



*If the tolerances need to be set :*



If tolerance values have already been entered into the IMPAX system, the unit is ready to begin monitoring and the display will read "COUNTS SET."

If any tolerances need to be set, IMPAX reminds you to continue by displaying "CHANNEL 1 ?" If "COUNTS SET" appears, you have completed the basic program set up.

*Note: There is a way to change the piece counts after the job has begun, or to begin a job with the counters set to some number other than zero.*

## Setting Tolerances:

You will be asked to give a tolerance number to each measuring channel. This value controls how closely that station is to be monitored. (Refer to page 23 of this guide)

The display now shows “CHANNEL 1?”, asking for a tolerance number for the first station. Press a number from 1 to 9, 0, “\*”, or “#”. (Remember that low numbers give tight control and higher numbers permit more variation; zero means that the station has no tolerance limits applied at all. “\*” sets the tolerance automatically). If fixed limits are enabled in channel definition (see Programming section of Supervisor’s Guide for this procedure) then you can press the # key to switch between fixed and normal limits. These limits are usually only used when the tolerance needs to be tighter than a “9” will give or looser than a “1” will give without being zero.

If you enable this the screen by pressing #, it will show “C1 LOW LIM 0”. It is asking you what you want the lower limit to be. Enter the lower limit and press ←. The next screen will say “C1 HIGH LIM 0”. The monitor is now asking for the upper limit of tolerance. Enter the value and press ←. If you go to the Force screen, you will see the limits you just entered.

For ideas on setting Normal tolerances, see Section 5, Tolerance setting guide. When you have entered the number, press ←.

The following options will only be available if they are enabled in the channel definition part of programming.

Press                      Display Will Show

CHANNEL 1 ?

*Z can be from 0 to 9, \*, or #.*

Z

CHANNEL 1 Z

**NOTE:** *If Fixed limits are enabled in Programming, then press:*

#

*to toggle between normal and fixed.*

### **IF FIXED LIMITS CHOSEN:**

X

C1 LOW LIM 0

*X can be from 0 to 253 in both low and high limits.*

←

C1 HIGH LIM 0

X

*Display might show “ALL FACTORS SET” or it might go on.*

### **IF NORMAL LIMITS CHOSEN:**

*Z can be from 0 to 9, \*, or #.*

Z

CHANNEL 1 Z

*(Same as if fixed limits not enabled)*

## Setting Tolerances - cont.

### ***Trend Setting***

After the Tolerance has been set for the first channel, press the ← key. If Trending is turned on in Channel Definition, the next display will show "C1 TREND 0%". By entering a number here from 1 to 99, you can limit the amount that the force measurement can drift due to gradual changes such as tool wear. For example, pressing 50 displays "C1 TREND 50%", which will stop the machine after the force changes (gradually) by 50%; you would then clean or replace the tool. Set the Trend Factor by pressing the ← key.

#### Press

#### Display Will Show

*(Trend can be set from 1% to 99%)*

*For Example:*

These options will only be available if turned on in Channel Definition in programming.

### ***Exception Setting***

If Exceptions are turned on in Channel Definition, the next display will show either "C1 CUMU EX 0" or "C1 CONS EX 0." An exception is an IMPAX detected error which you can allow the monitor to ignore. This feature is extremely useful if you have a diverter installed on the machine. If a diverter is installed, you can set one of the relays to be an exception relay and it will trip the diverter and divert the part without stopping the machine.

**To permit exceptions, backstrokes, and/or low force readings: (All described below)**

*X can be from 1 to 9,999*

**To not permit exceptions, backstrokes, and/or low force readings:**

*or*

"CUMU" stands for cumulative. This means that IMPAX will allow a certain number of errors out of 100 to be ignored. For example, if I set the number to 2, IMPAX would allow 2 parts out of 100 to exceed either the HI or the LO limit without shutting down the machine.

**Once all tolerances, fixed limits, excpts, nofeeds, and trend information is set:**

"CONS" stands for consecutive. This means that IMPAX will allow a certain number of errors in a row to be ignored.

## Setting Tolerances - cont.

For example, if I set the number to 2, IMPAX would allow 2 errors in a row but the 3rd error in a row would cause the machine to stop. When tuning the IMPAX unit, it is often helpful to set a large number of exceptions, say 10 or 15 and watch the force values in the Error/Exceptions buffer. This can tell you what the values were for the exceptions and can give you information needed to establish the proper settings for the tolerances.

### ***Backstroke Exception Settings***

Backstroke is only used for threadrolling applications. It is used to detect a part not being properly ejected and remaining in the dies. It is always a high force error. If Backstroke Hi Limit and Backstroke Exceptions are turned ON in Channel Definition, the display will show "R1 BKSTR 00/100". This function is always cumulative. You may put in a number between 1 and 99. Backstroke exceptions are rarely ever allowed but can be when there are problems with a threadroller which causes nuisance shutdowns in the backstroke cycle, if all other causes for backstroke noise have been eliminated.

### ***No Feed Settings***

No Feeds are cycles of the machines where no material is fed to the machine for processing. Usually No Feeds are used with piece-fed machines like threadrollers, but under special circumstances can be used with continuous or bar stock fed headers or other such applications. No Feeds can be either Consecutive or Cumulative. If this feature is turned on in Channel Definition, the display will show "R1 CONS NF 0000" or "R1 CUMU NF 0000." You can enter a number between 1 and 9999. In a threadrolling application, this feature is extremely functional since it will allow the machine to keep running even though the feed rail is not completely full or does not feed a part every time

### ***No Feed Exceptions***

No Feed Exceptions is a special feature which will divert a certain number of parts immediately after a No Feed condition. This may be used if, for example, there were several consecutive no feeds and the dies cooled off. The first ten parts may not be as good quality as those produced after the dies heated up. No Feed Exceptions could be set to eject these parts if they did not meet the tolerance parameters. If this feature is activated in Channel Definition, the display will show "R1 NOFEED EXCP." You cannot enter anything on this display, it is just informing you that No Feed Exceptions has been turned on. The next display is "\* 000 AFTER 000." The number entered here (0-999) is the number of "Fixed" cycles (when the Feed resumes) that the Special Exceptions will be allowed. Enter a zero, 0, if you want the number of special exceptions to be based on the amount of time the machine runs without feed. When the asterisk is in front of the leftmost number, it means you can change that number. After you enter a number, press the ← key and the asterisk will move to in front of the rightmost number.

The number entered here (0-999) is the number of consecutive nofeeds which must be detected before the Special Exceptions (for 15 cycles, in this case) will be allowed. Press ← after entering your number.

## Setting Tolerances - cont.

The next display will be “PLUS 1/ 0000.” The number entered here (0-9999) will allow a Special Exception for 1 machine cycle per each group of x cycles the machine runs without feed. Example: If the number programmed here is 100, and the machine runs 600 cycles without feed, the forces will be allowed outside normal limits during the first 6 machine cycles during which the feed is again detected.

Enter the proper number and press the  $\leftarrow$  key. The next display will show “ALL FACTORS SET.”

## MACHINE OPERATION

Machine operation is not changed by IMPAX except that it may be stopped automatically when a problem occurs or a certain parts count is reached. The only additional control is the Mode change keyswitch and three lights: red, yellow, and green located under the keypad.

The IMPAX 3500 unit has four modes of operation: STOP, TEST(set up), LEARN, and PRODUCTION. These modes are indicated on the IMPAX unit with three colored lights.

STOP mode is indicated by a red light only. When the IMPAX 3500 unit is turned on, it comes up in STOP mode. STOP mode will prevent the machine from running. If the machine is running and the IMPAX is switched to STOP mode, the machine will stop and in most cases the material or parts feed will be interrupted.

TEST (set up) mode is indicated by a yellow light only. Turning the keyswitch once to the right (which is the same keyswitch used for programming ) switches the IMPAX 3500 from STOP to TEST mode. TEST mode will allow the machine to run, but IMPAX does not increment the parts counter or process force information during this time. There is no machine or tooling protection. Because there is no protection in TEST mode, a TEST LIMIT (T LIM) quantity is built in as a fail-safe. If the machine is left running past the test limit quantity, IMPAX stops the machine (red light) and displays T LIM. The test limit is set to 100 parts.

LEARN mode is indicated by the yellow and green lights lit together. Turning the keyswitch again will put the IMPAX 3500 into LEARN. This should only be done when the machine is at production speed and producing good parts. During the initial LEARN following set-up, the IMPAX learns the parts that the machine is producing, assigns a numerical value to the force signal, establishes how much change or variation occurs during normal forming, and makes this information available to you. This information is retained in memory for subsequent restarts. Initial LEARN takes approximately 150 parts. However, machine protection starts around 20-25 parts.

Upon completion of LEARN, the yellow light goes out but the green light stays on. This indicates the IMPAX is in PRODUCTION mode, and is watching forces for levels outside the limits established by the tolerance settings. If you wish to return to the yellow (setup) mode when the green light is on, turn the keyswitch to the right again. The green light will turn off, and the yellow light will turn on.



## Chapter 3 - IMPAX Information Displays

Useful information is available from the IMPAX console simply by pressing buttons. This may be done whether the machine is running or stopped. Unless otherwise instructed, the **Supervisor's Key** should be removed or turned to the vertical position while performing these steps.

To inquire about Quantity settings or production totals, Tolerance settings, Error conditions which have occurred, or Force measurements and limits, press the appropriate button.

### Quantity Displays:

Press **Q**. The display will show "MADE \* 750" if 750 parts have been produced on this job. If the machine is running and the green light is on, the number will be counting up.

#### Press

Q

#### Display Will Show

MADE \* 750

Press **→** again and the display changes to "TO GO \* 99250", which is the number of parts remaining to be made. This number counts down when the machine is running.

*Pressing Enter will start Autoscroll, pressing Enter again will stop it on the current screen. During scroll, Next/No will not work.*

→

TO GO \* 99250

Press **→** again and the display changes to "SHIFT \* 750", which means that 750 parts have been made during the current shift.

→

SHIFT \* 750

Press **→** again and IMPAX shows "B MADE \* 750", which means that 750 parts have been made during the current shift.

→

B MADE \* 750

Press **→** again and the display becomes "B TO GO \* 4250", meaning that 4250 more pieces will be made before the machine is stopped for an inspection break. This also counts down. If exceptions are turned on in Channel Definition, then the next display will show them.

→

B TO GO \* 4250

*If exceptions are turned on:*

→

EXPTS

Press **→** and the display will show "RPM 300" which is the speed that the machine is running at.

→

RPM 300

Press **→** and the display will show the date and the time.

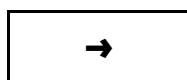
Press **→** again and the display shows “TOTAL \* 100000”, which tells the total number of parts to be made on that job. (Note that parts MADE plus parts TO GO add up to the parts TOTAL.)

Press **→** again and the display shows “BREAK \* 5000”, which means that the BREAK counter is set up to stop after every 5000 parts.

Pressing **→** again brings the display back to “MADE \* 750”, which brings up the first display again; continuing to press **→** takes you through all the choices again. At any time, pressing **←** moves backward to the previous choice in the order listed above. You may select which counter you wish to be displayed while the machine is running. To do so, display the chosen counter as explained above, then press **←**. The selected counter will remain visible.

<u>Press</u>	<u>Display Will Show</u>
→	(Date and Time)
→	TOTAL * 100000
→	BREAK * 5000
→	MADE * 750

**To display chosen counter:  
Keep pressing**



**until chosen counter appears.**



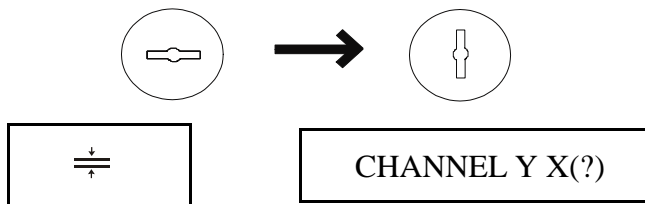
## Tolerance Displays:

(numbers are for example only)  
Be sure the Supervisor’s Key is removed or turned off (vertical).

Press  $\frac{\uparrow}{\downarrow}$ . The display will show the tolerance setting for the first channel. For instance, if it reads: “CHANNEL 1 5(?)”, then the tolerance setting for channel 1 is set to 5.

--You will know which tool the IMPAX unit is referring to by the display: ex. “STATION 1” or “BLOW 1”.

**Make sure the Supervisor’s Key is turned off**



*X is the tolerance setting for channel Y  
X can be from 0 to 9, or \*.*

## Tolerance Displays - cont.

--The number in parenthesis is the variance IMPAX is detecting in the forming process, also on a scale of 1 to 9. The tolerance can be set lower or higher than the variance. When there is a (?) in the variance, it means that IMPAX is still learning.

--If the tolerance is set for automatic, the "\*" will appear after the channel number and it may be accompanied by a (number) which indicated the equivalent tolerance level or a (?) Which means no tolerance has been computed yet.

--An "N" means that no tolerance has been set; the setup is not complete and the job may not be started.

Press **→**. The display will show the next channel, for instance, "STATION 2 8(6)", which would mean that channel 2 is set for tolerance level 8 but should be set lower. IMPAX is suggesting that it would run on a tolerance of 6.

Press **→** again, and the next channel will be displayed. This may be repeated until all the desired channels have been displayed.

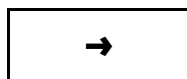
Press **←** at any time to return to the previous display.

If you wish to change a tolerance setting you must insert the **Supervisor's Key** and proceed as instructed in Chapter 5, **Tolerance Setting Guide**.

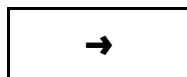
Note: Roller tolerances are set the same way as header tolerances, except that "CHANNEL 1" will be replaced by "ROLL" or whatever name is assigned.

Press

Display Will Show



*X is the tolerance setting for channel Y  
X can be from 0 to 9, or \*.*



*until all channels have been displayed*

## Error Displays:

(messages are for example only):

Press E. If there have been no problems since the job began (or since the Error display was last cleared,) the display will show “NO ERROR”. If an error is recorded on a multi-station header, the display might show “CHANNEL 3 ERROR”. This would mean that the problem was detected on the station connected to channel 3. On a threadroller the display might show “BKSTR HI LIM”, meaning a problem on the backstroke. Pressing → will show the Date and Time of the Error.

Press →. The display will show “ERROR 750”. This means that the most recent error stopped the machine when the 750th part was made.

Press →. The display will show “FORCE TOO HIGH or “FORCE TOO LOW”, indicating which of the control limits was breached.

Press →. The display will now show “SINGLE HIT”. This means that the force change was severe enough to warrant stopping after just one hit. It may instead show “LO COUNT”, “MED COUNT”, or “HI COUNT”; these tell how many parts were run before the force difference became severe enough to stop. HI COUNT means a small change in force was detected over an average of many blows. Generally, a single blow fault is due to a smash up, double feed, or other sudden, severe problem. An error detected over a larger number of blows is often due to a chipped tool, hard material, or other small change.

### Press

### Display Will Show

*If there have been no errors since the errors were last cleared*

E

NO ERRORS

*If there have been errors since the errors were last cleared*

**NOTE: These displays will be different if exceptions are**

CHANNEL X ERROR

**turned on in Channel Definition. You can clear the errors by pressing Enter when the “VIEW ERRORS?” screen appears. Exceptions can be cleared by pressing Next and then Enter.**

→

(Date and time of error)

→

ERROR XXX

*XXX is the number of the part where the most recent error occurred.*

→

FORCE TOO HIGH

FORCE TOO LOW

→

SINGLE HIT

LO COUNT

MED COUNT

HI COUNT

*COULD BE ANYONE OF THESE: (SINGLE HIT, LO COUNT, MED COUNT, OR HI COUNT)*

## Force Displays:

In certain cases, the above two messages may be replaced by a special message. "PEAK SATURATION" would mean that the force input was higher than IMPAX could measure; an electronics adjustment may be required. "TREND ERROR" means that the force changed very slowly and reached a previously set trend limit. This is usually caused by tool wear or some other slow change. "NOFEED ERROR" means that too many strokes have occurred without any forming force being measured. "BKSTR HI LIM" means that an excessive force was measured on the backstroke of the ram or slide.

Press →. The display now shows numbers, such as "101\*157\*150 6(3)". This shows the force measurement which caused the IMPAX to stop the machine. Note that the middle number must always be either above the upper limit or below the lower limit for an error to occur in force. In this case it is above the upper limit. The number 6 is the current tolerance setting. The 3 is the variance IMPAX is detecting in the forming process.

Press →. The display will show "CHANNEL 1 ERROR". This is information about the fault which occurred before the error at 750 (described above). Continuing to press → will display the faults which have been recorded in reverse order. At any time, you may press ← to return to the beginning of that Error message. Pressing ← again steps backward to the beginning of the previous Error message. Pressing C returns the display to the selected (default) screen. After the last Error is displayed, pressing → will display "END OF ERRORS." Refer to page 10 to clear errors.

### Press

### Display Will Show

PEAK SATURATION

*or*

TREND ERROR

*or*

NOFEED ERROR

*or*

BKSTR HI LIM

*Only in special cases where certain errors have occurred!*

*numbers are for example only*

→

101\*157\*150 6(3)

→

CHANNEL 1 ERROR

→

(All other errors in reverse order)

→

END OF ERRORS

(default screen)

*At any time during errors:*

C

(default screen)

## Force Displays:

(numbers are for example only):

Press F. The display will show “C1 098\*120\*142” which means that the force measurement for channel 1 is 120 and the machine will be stopped if that number falls to 98 or goes up to 142. (Remember that the numbers are relative; they do not represent pounds or tons). The middle number may change with every stroke; the other numbers will change most when IMPAX first ‘learns.’ These numbers are devised by IMPAX based on the average force value and the tolerance number entered for that channel.

Press

Display Will Show

F

C1 098\*120\*142

Press →. The display will now show “C2 105\*125\*150” which is the force measurement for the next channel, channel 2. Pressing Next always advances the display to the next channel; pressing ← returns to the previous channel.

→

C2 105\*125\*150

→

(All other channels)

Press 1. The display for the channel being shown will change to “C2L 110\*124\*140”. The first digit shows that it is still channel 2, and the force measurement (middle number) remains approximately the same. The “L” means that the measurement now shown is a “Low Count” sample, which is the average of a few successive blows. Note that the middle number does not change as often or as greatly as before. Therefore the upper and lower limits can be closer.

1

CXL 110\*124\*140

*where X was the channel being displayed*

Press 2. The display will change again to “C2M 115\*125\*135”. This is the “Medium Count” sample for channel 2 (shown by “C2M”) which is an average of sixteen (16) blows. The limits are closer yet, and the middle number changes even less than before.

2

CXM 115\*125\*135

*where X was the channel being displayed*

Press 3. The display will now show “C2H 118\*125\*132”. This is the “High Count” sample for Channel 2 (“C2H”) and it is an average of sixty four (64) measurements. The middle number is very steady so the limits can be very close to it.

Press

Display Will Show

3

C2H 118\*125\*132

Press 4. The display will show “C2T 065\*125\*185”. This is the “Trend” display for channel 2 (“C2T”) and it shows how far the force can slowly change before it is stopped.

4

C2T 065\*125\*185

*If*

*any of these limits have been disabled, no limits will be shown, only the measurement:*

If any of these limits have been disabled by special programming, the display will show the measurement without any limits, for instance: “C1H \*125\* ”.

C1H \*125\*

Press 9. The display will show “C1 M 120\*128\*136”. The upper and lower limits show the highest high and the lowest low in the last 64 strokes. This is used to determine the correct tolerance setting.

9

C1 M 120\*128\*136

Each of these measurement levels is sensitive to certain kinds of problems. The single blow limits can catch a smash up in one stroke, but may not be sensitive enough to notice a tool chip because the force measurement varies too much. The High Count limits will not stop a smash up quickly enough, but may notice a small chip and stop the machine after a few dozen have been made. The Trend program can catch tool wear and other gradual changes. Remember that all of these limits are working all the time; the force display only controls which one is being displayed at that moment.

Another useful force function is the \*. Typically IMPAX multiplies the force measurements by a scale factor. If you wish to see the actual measurements instead of the scaled numbers, press the \* button while looking at the force display. The display will change to show actual sensor measurements, on the scale from 0 to 65000. This is useful for comparing force displays to error messages, which always show unscaled, actual measurements. To change the display back to scaled numbers, press the \* button again.

Note for roll-forming controllers: IMPAX controllers applied to rolling machine monitor forces exactly as described above, except that there are only two channels, one for the forward rolling stroke and one for the backstroke. Since no part should roll back through the die, there is never a minimum limit on backstroke force.

## Backstroke and Nofeed Limits:

To see the **Backstroke limit**, press F then 9 (Minimum/Maximum settings), then 9 again. This will display “018\*128\*002”. The first number, 018, is the **Backstroke High Limit**, the middle number, 128, is the **Force**, and the last number, 002, is the **Current Backstroke Force**.

If you press 9 again and Nofeeds are turned on in Channel Definition, then this display will show: “C2 N 043\*128\*045”. The first number is the NoFeed Threshold. This can be used to check if Nofeeds are working correctly. Just stop the feed and the **Average Force Value** should go below the 043 **Nofeed limit**. The middle number is once again the force and the last number does not mean anything.

Note: For backstroke and nofeeds to display, these features must be turned on in Channel Definition.

Press

Display Will Show

*(only for threadrolling applications)  
(numbers are for example only)*

F

C2 105\*125\*150

9

C2 M 120\*128\*136

9

C2 B 018\*128\*002

**018: Backstroke High Limit**  
**128: Force**  
**002: Current Backstroke Force**

9

C2 N 043\*128\*045

**043: NoFeed Threshold**  
**128: Force**  
**045: (meaningless)**



## Chapter 4 - Tolerance Setting Guide

IMPAX tolerance limits are adjustable because every forming job is different. If a machine is running well and making high quality, consistent parts, a low tolerance number can be used. If the job is sloppy, or the material is inconsistent, or the quality of the part is not critical, a higher number may be chosen. Tolerance selection is a compromise; there are several factors to consider. The best compromise is a tolerance setting which is slightly wider than the normal force variation; unnecessary stopping is minimized, but all real problems will be caught.

Consistency is important. IMPAX works best when the forming forces are unchanging. Sometimes this may be improved by careful setup, tight tooling, and uniform material. This also improves the quality of the finished part, which is an objective of any good manufacturing operation.

Unnecessary Stops must be prevented. If the tolerance is set too tightly, productivity may actually go down. When IMPAX stops a machine frequently for no reason, the tolerance setting is too low (or the job is too sloppy; see paragraph above). When IMPAX catches every problem but seldom stops when nothing is wrong, the tolerance is set properly.

### MANUAL TOLERANCE

To set the tolerance on a new job, begin with a fairly high number such as 7, 8, or 9. Watch the job and, if it runs well, set the tolerance lower after each few thousand parts are made. Look at the force display to see how close the limits have been set. When the IMPAX begins to stop the machine and no problem is found, 'back off' by raising the tolerance setting. Check the force display occasionally to be sure the force limits are as close as they can be; adjust the tolerance as needed. Also, check the tolerance display; it may indicate that a different tolerance setting may be used. (The current variation may change slightly over a time.) These adjustments should be made slowly, over a period of time.

### AUTOMATIC TOLERANCE

This option may also be used to learn the settings for a new job. This is helpful if you are busy, or if the machine has many stations. To use Auto-Tolerance, enter a \* instead of a number when setting up the tolerances for the job (see Chapter 3). IMPAX will automatically adjust the limits on that station. The tolerance information display will then show the equivalent tolerance which has been set, for instance; "CHANNEL 1 \*(5)" would mean that, for Channel 1, Auto-Tolerance has set a tolerance level equal to 5 on the scale from 1 to 9.

One problem with Auto-Tolerance is that if the forming process becomes inconsistent very gradually, IMPAX may 'track it' and not catch the problem. You should set the tolerances manually after the job is running well; the Auto-Tolerance numbers may be used as a guide.

Remember that the worst mistake is setting too loose a tolerance (high numbers) or no tolerance at all (zero). IMPAX will count parts, but it will not catch important process changes.

The **Supervisor's Key** is needed to set or change the tolerance settings. This helps to prevent tampering by those who are not authorized to set tolerances.

## Chapter 5 - Troubleshooting and Service

### PROBLEM

### CAUSE/REMEDY

IMPAX does not turn on.

Not plugged in. Not turned on.

No display or lights.

Check rear panel fuses.

Green light will not come on when button is pushed.

Production quantity not set. Tolerances not set.  
Job totals completed. Light burned out.

Yellow light will not go off although yellow and green have been on together for hundreds of parts. (Learning mode)

Force measurements are erratic. Check force display, check setup.

After yellow and green are on together, yellow goes off but quickly changes to red.

Tolerance is too tight for the job. Job is not steady enough for tolerance selected. Check setup, check forces and tolerance.

IMPAX stops header repeatedly but no problem is found with parts made.

Tolerance is too tight for job. Force measurements are changing. Check tooling, header, material Uniformity. Run header; observe forces and parts Produced. Check for loose tooling.

IMPAX fails to stop header when problems occur; smashups, breakage, dropped parts. Green light stays on.

Tolerance is set too wide of set to zero. Enter lower tolerance number. **Supervisor's Key** is in The bypass position.

Green light goes off, "RPM+" or "RPM-" appears on the display.

Running speed of header is changing. Check Header, check IMPAX machine position sensors.

Green light is on and header is running, but IMPAX does not count.

Check position sensor, wires, and rear panel fuses.

IMPAX counts parts, but force measurement numbers are zero for one or more channels.

Check force sensors and wires.

## CUSTOMER SERVICE

If you have a problem which cannot be fixed by any of the procedures in this book, do not hesitate to call IMPAX for service. Often, the problem can be fixed by simple instructions over the telephone. Before calling, be sure you know all of the facts and symptoms of the problem, information about the model and program revision numbers of the IMPAX unit, and the make and the model of the header, roller, or other machine which it controls. This makes it possible to quickly pinpoint and solve the problem.

Before calling, you should know:

IMPAX Serial number (on side of console): \_\_\_ - \_\_\_ - \_\_\_

Software Version:           Version \_\_\_\_\_ (should be in the form of XXXXXX-XX)

Definition Package       P\_\_TH\_\_D\_\_

\*Note: Refer to Chapter 8 of the Supervisor's Guide for instructions on  
accessing the IMPAX software version and definition package.

Machine Make: \_\_\_\_\_

Machine Model: \_\_\_\_\_

Number of Stations: \_\_\_\_\_