

BASIC PROGRAMMING MANUAL

NCT 1 part 1

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REGISTRATION FORM

CLASS FEEDBACK

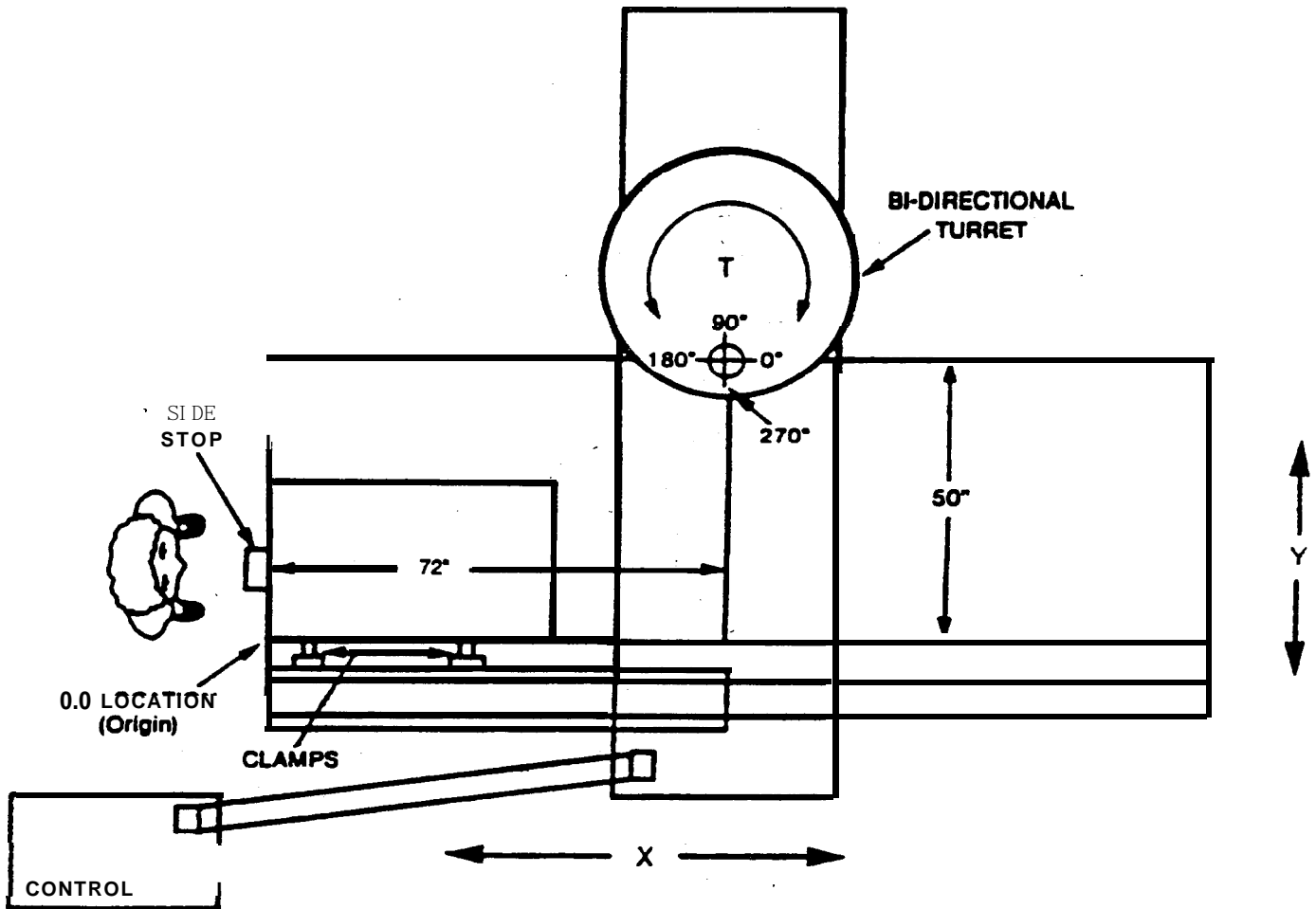


**BASIC
PROGRAMMING**

SECTION I

PLAN VIEW

Reference point from zero, zero location to punch center is 72" (X axis), 50" (Y axis).
i.e. G92X72.T50.



CO-ORDINATES

When material is placed against the work clamps the Y axis is located and the X axis is by the gauge block on the operator's side of the machine as shown in Fig. 1.

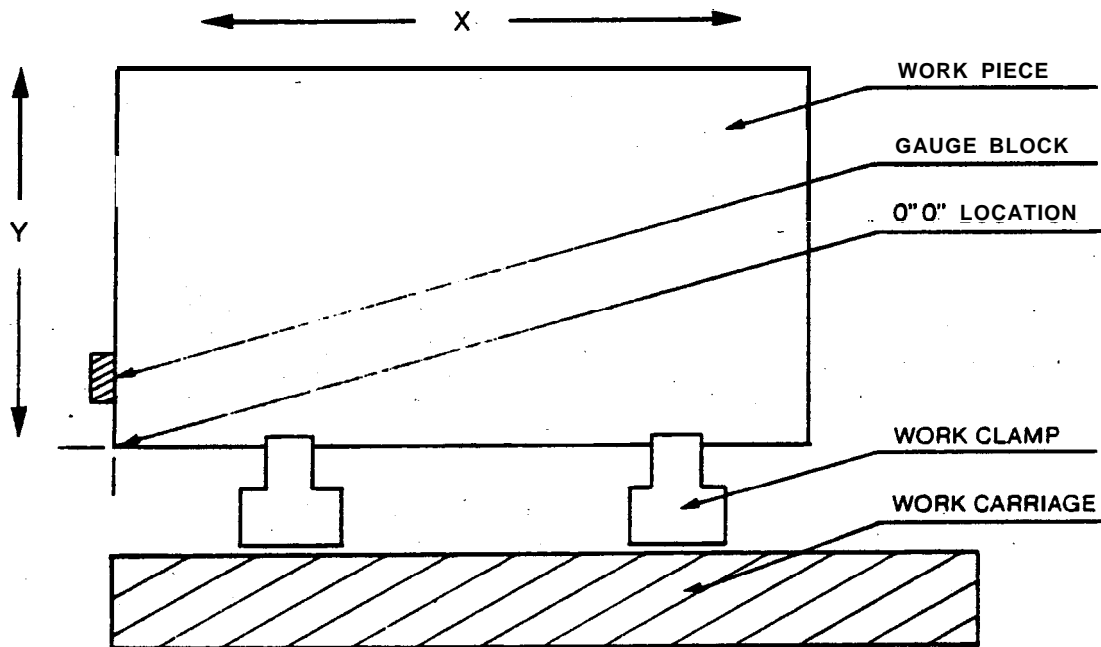


FIGURE 1

In programming, the lower left hand corner of the sheet is considered as the origin (0" 0" location) and dimensions are programmed from that origin point. X and Y dimensions are entered in inches with three trailing zeros* or by using a decimal point. An X value of 1 inch would be written as X1000, or X1., a value of X1 without a decimal point would be equivalent to .001 inch. The control would move three places to the left of a given dimension unless a decimal is used.

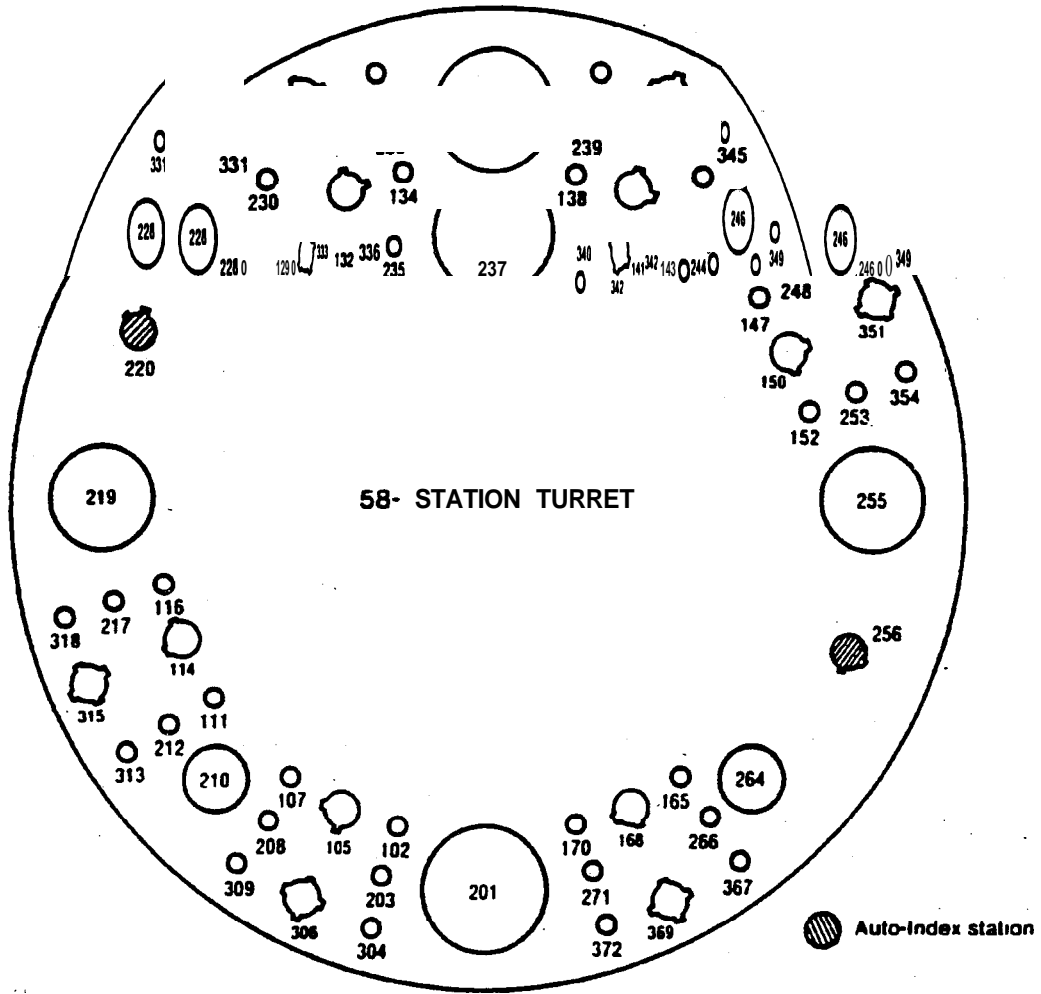
X dimensions are considered positive to the right of the origin and negative to the left.
Y dimensions are positive up from **the origin** and negative down from the origin.

*Note: Machines with! 200B or 3000C controls must use three trailing zeros. Decimal degrees are two places.

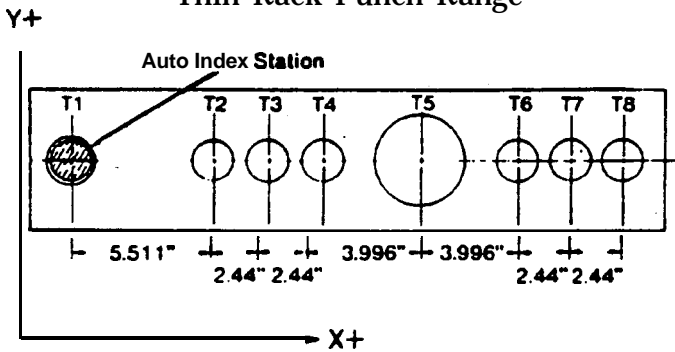


7

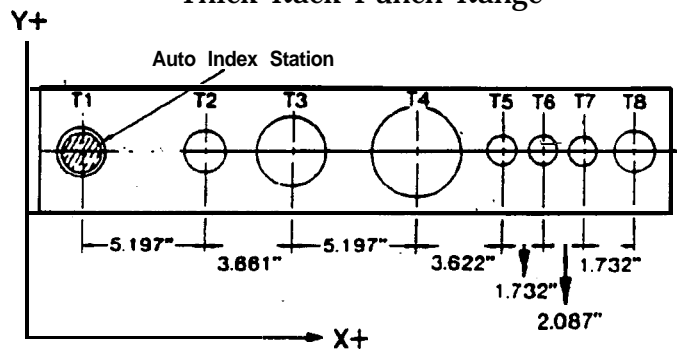
TURRET WITH AUTO-INDEX DEVICE STATION ARRANGEMENT 58-STATION TURRET



OCTO AUTO INDEX
Thin Rack Punch Range



OCTO AUTO INDEX
Thick Rack Punch Range



G92 ESTABLISHING CO-ORDINATE SYSTEM

The **G92** command is used at the beginning of each program. This command indicates to the control the position of the origin relative to the punch center as shown in Fig. 2.

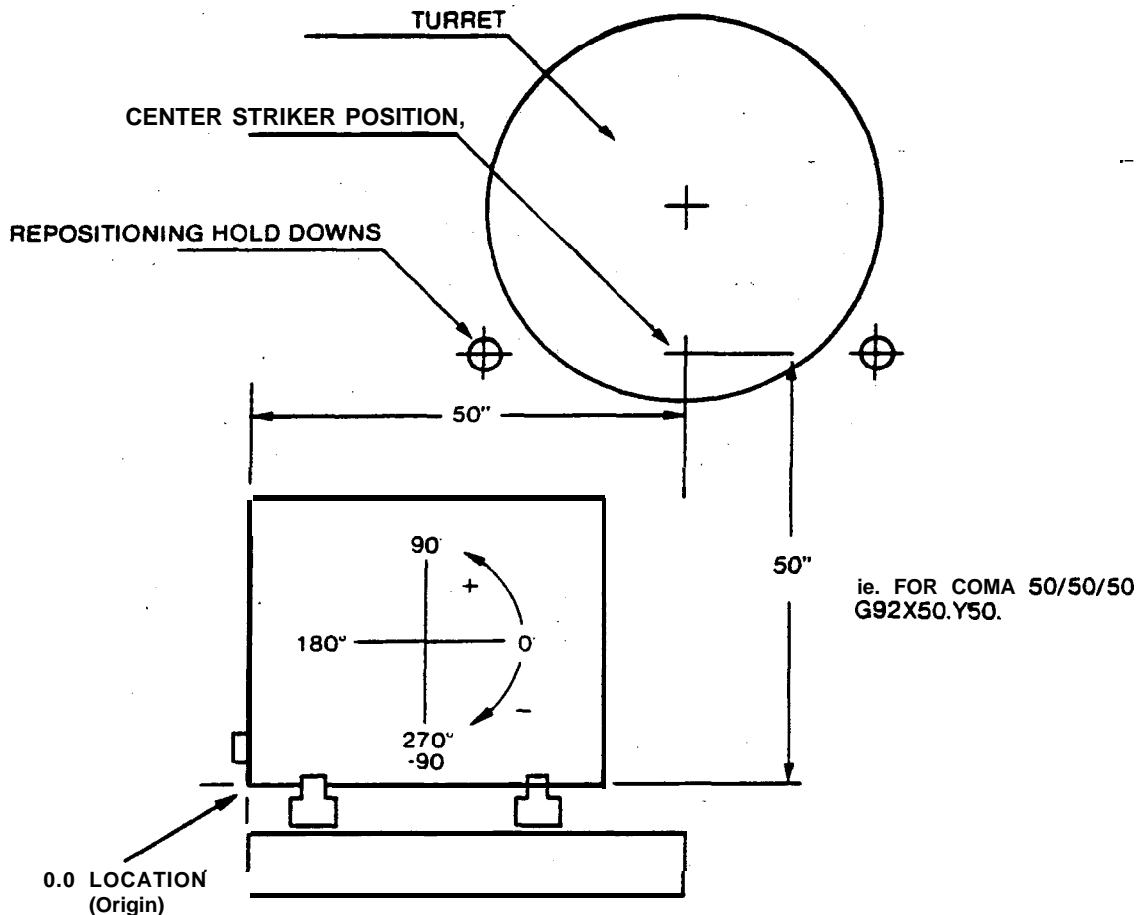


FIGURE 2

For Aries 222: **G92X23.622Y23.622**
 For Aries 224: **G92X39.37Y23.622**
 For Aries 245: **G92X50.Y39.37**
 For a Pega 244: **G92X39.37Y40.945**
 For a Pega 344: **G92X39.37Y39.37**
 For a Pega 345: **G92X50.Y39.37**
 For a Pega 357: **G92X72.Y50.**
 For a Pega 367: **G92X72.Y60.**

For a Coma 555: **G92X50.Y50.**
 For a Coma 557: **G92X72.Y50.**
 For a Coma 567: **G92X72.Y60**
 For a Coma 588: **G92X78.74Y80.3**
 For an Octo: **G92X39.37Y29.5**
 For a Vela II: **G92X50.Y50.**
 For a Vipros 357: **G92X72.Y50.**

After reading the **G92** command the control knows the position of the origin relative to the punch center.



G90 ABSOLUTE

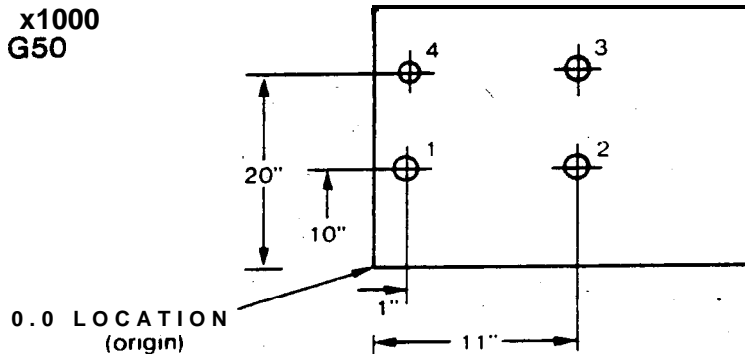
After the **G90** command is entered, then all co-ordinates are relative to the origin. (**G90** will stay in effect until changed by **G91** incremental command.) **G90** need not be entered on every line.

Format example:

1. G92X---Y---
2. G90X1.000Y1.0000T---
3. X11.000
4. Y20.000
5. X10.000
6. G50

OR

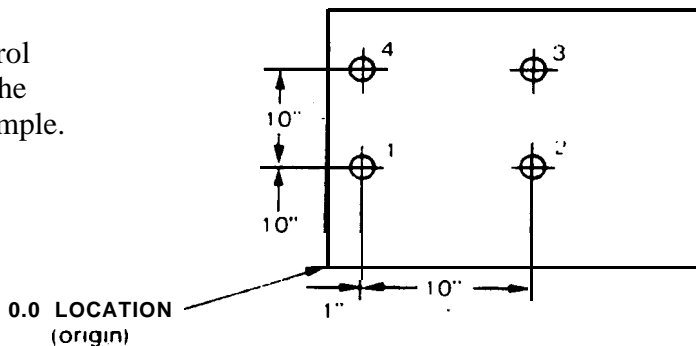
1. G92X---Y---
2. G90X1.Y10.T---
3. X11.
4. Y20.
5. X10.
6. G50



G91 INCREMENTAL

When a **G91** incremental command is entered in a program, then the X and Y co-ordinates are incremental from the last hole punched (**G91** will stay in effect until changed by **G90**). **G91** need not be entered on every line.

Note: 200B control must use the above example.



1. G92X---Y---
2. G90X1.000Y1.0000T---
3. G91X10.000
4. Y10.000
5. X-10.000
6. G50

Absolute
Incremental

OR

1. G92X---Y---
2. G90X1.Y10.T---
3. G91X10.
- 4.
5. X-10.
6. G50

Note: Each hole is incremental from the last hole punched, so hole 3 is incremental from hole 2 and hole 4 is incremental from hole 3. **If one hole is mislocated, all of the following holes programmed incrementally, would be mislocated.**

Note: Regardless of absolute or incremental value, the value of X or Y coordinate, which does not change, can be omitted.



G50 PROGRAM END, HOME RETRACT

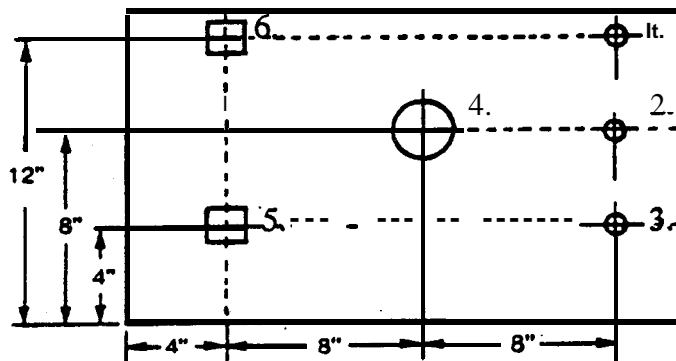
The **50** command is entered on a line by itself at the end of the program. This command brings the carriage to the origin as specified in the last **G92** statement and signals the control that the program has ended. Offset values (**G93 & G98**) are cancelled and the program is ready to start again.

A SIMPLE PROGRAM

When preparing a program the following general procedure is recommended:

1. Begin in the upper right hand corner to save approach travel time to the turret.
2. Punch small holes first, then progress to larger holes and notching. Forming operations **such as** lowering should be done last.
3. Axis movements are generally more rapid than turret indexing, so all holes of the same size should be punched before indexing to the next tool.

Example:



T266 = 1/2" RD
T201 = 3" RD
T255 = 2" SQ

```
G92X50000Y50000
1. G90X20000Y12000T266
2. Y8000
3. Y4000
4. X1 2000Y8000T201
5. X4000Y4000T255
6. Y12000
G50
```

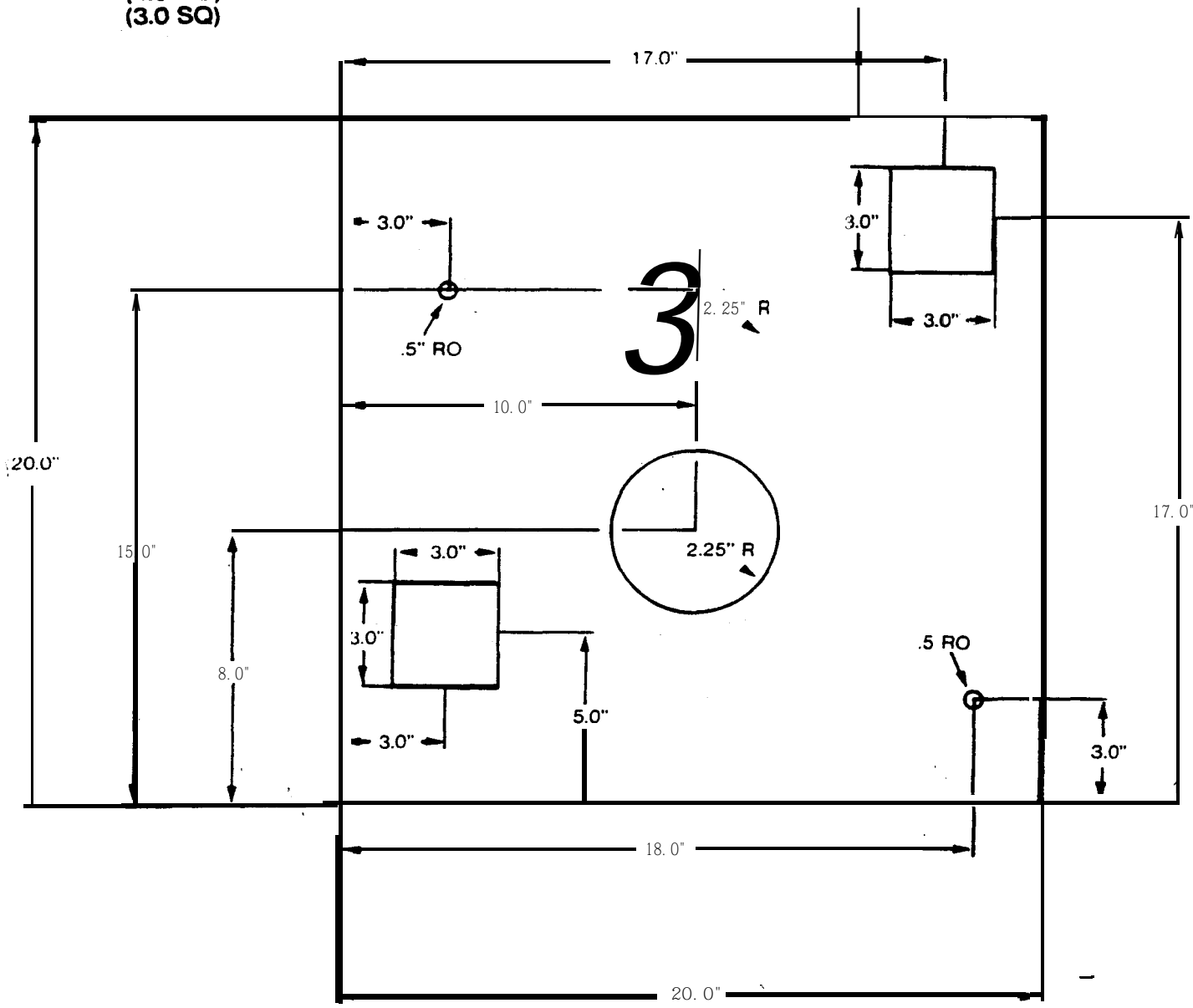
Note:

1. Only the values **which** change need be entered **from** line to line.
2. Punching smaller holes first can eliminate inadequacies in certain situations.
3. Program louver in one direction only to eliminate possible damage.
4. Striker movement is normally as fast as table positioning.



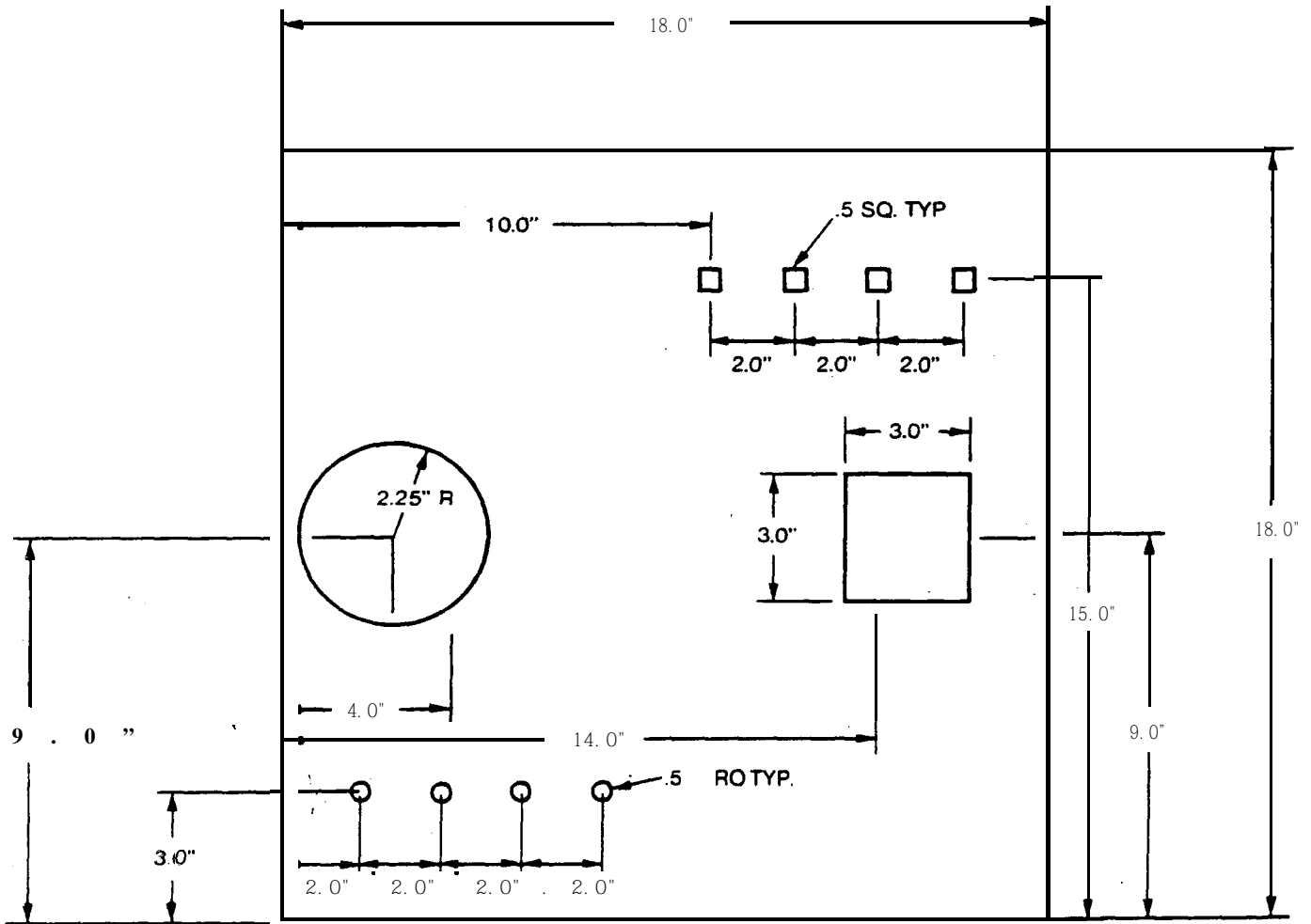
PROGRAM NO. 1

(.5 RO)
(4.5 RO)
(3.0 SQ)

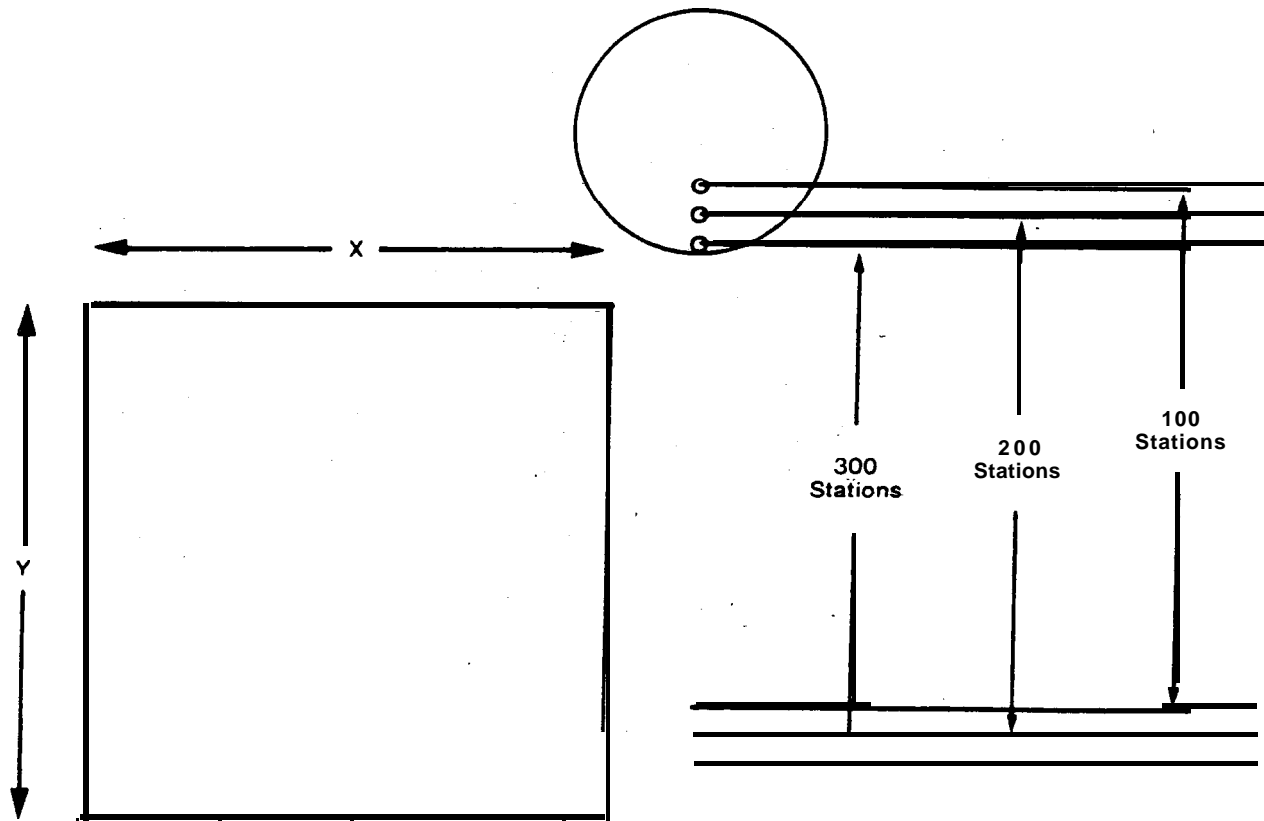


PROGRAM NO. 2

(.5 RO)
(4.5 RO)
(3.0 SC?)
(.5 SQ)



PROGRAMMING AREA LIMITS

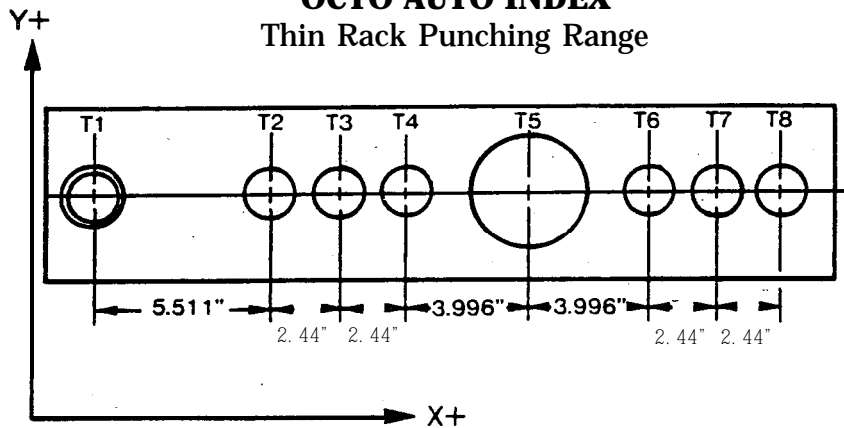


	X-Axis Origin	Y-Axis Origin	Y-Axis Movable Distance Accordance to Track Numbers			
Models	Origin Statement		X-Axis Movable Dist.	Inner No. 100 Stations	Center No. 200 Stations	Outer No. 300 Stations
	23.622	23.022				
Aries 22:2	G92 x 23.622 y 23.622		-400 to 24.023	N/A	-400 to 24.023	N/A
	39.370	23.622				
Aries 224	G92 x 39.370 y 23.622		-401 to 39.772	N/A	-401 to 24.023	N/A
	50.00	39.37				
Aries 245	G92 x 50.00 y 39.37		-401 to 50.401	N/A	-401 to 39.771	N/A
	39.37	140.945				
Pega 244	G92 x 39.37 y 40.945		-400 to 39.770	N/A	-400 to 41.346	-1.975 to 39.771
	39.37	39.37				
Pega II	G92 x 39.37 y 39.37		-400 to 39.770	1.175 to 41.345	-400 to 39.770	-1.975 to 38.195
	39.37	39.37				
Pega 344 Q	G92 x 39.37 y 39.37		-400 to 39.770	1.175 to 41.345	-400 to 39.770	-1.975 to 38.195
	50.00	39.37				
Pega 345 K	G92 x 50.00 y 39.37		-400 to 50.400	1.175 to 41.345	-400 to 39.770	-1.975 to 38.195
	72.000	50.000				
Pega 357 A	G92 x 72.000 y 50.000		-400 to 72.440	1.175 to 51.575	-400 to 50.000	-1.975 to 48.425
	50.000	50.000				
Vela 355	G92 x 50.000 y 50.000		-400 to 50.400	1.175 to 51.575	-400 to 50.000	-1.975 to 48.425
	50.000	50.000				
Coma 555	G92 x 50.000 y 50.000		-400 to 50.400	1.175 to 51.575	-400 to 50.000	-1.975 to 48.425
	72.000	50.000				
Coma 557	G92 x 72.000 y 50.000		-400 to 72.440	1.175 to 51.575	-400 to 50.000	-1.975 to 48.425
	72.000	60.000				
Coma 567	G92 x 72.000 y 60.000		-400 to 72.440	1.175 to 62.015	-400 to 60.440	-1.975 to 58.865
	78.74	80.315				
Coma 588	G92 x 78.74 y 80.315		-394 to 79.134	1.181 to 82.283	-394 to 80.709	-1.969 to 79.134



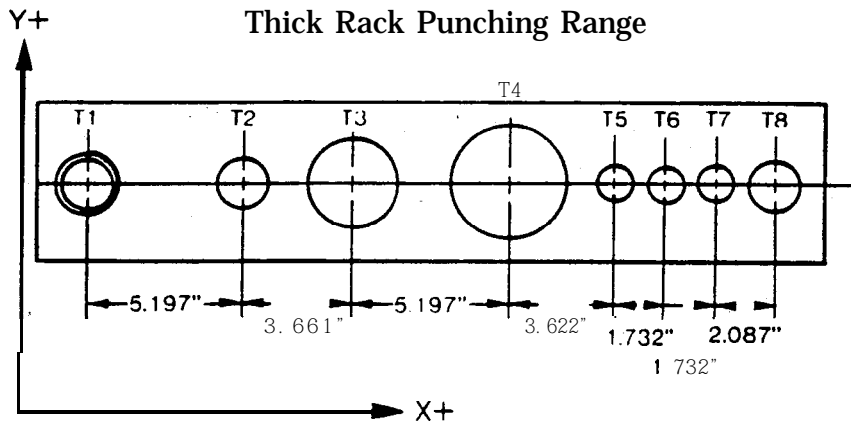
PROGRAM AREA LIMITS(Continued)

OCTO AUTO INDEX
Thin Rack Punching Range



STATION#	X-TRAVEL	Y-TRAVEL
1	-23.628 -- 39.770	-0.400 -- 29.900
2	-18.117 -- 45.282	
3	-15.666 -- 47.723	
4	-13.235 -- 50.164	
5	-9.239 -- 54.160	
6	-5.282 -- 58.117	
7	-2.841 -- 60.558	
8	-0.400 -- 62.999	

OCTO AUTO INDEX
Thick Rack Punching Range



STATION#	X-TRAVEL	Y-TRAVEL
1	-23.628 -- 39.770	-0.400 -- 29.900
2	-18.432 -- 43.432	
3	-14.770 -- 48.628	
4	-9.573 -- 53.825	
5	-5.951 -- 57.447	
6	-4.219 -- 59.180	
7	-2.487 -- 60.912	
8	-0.400 -- 62.999	



HINTS ON PROGRAMMING

PUNCHING RANGE

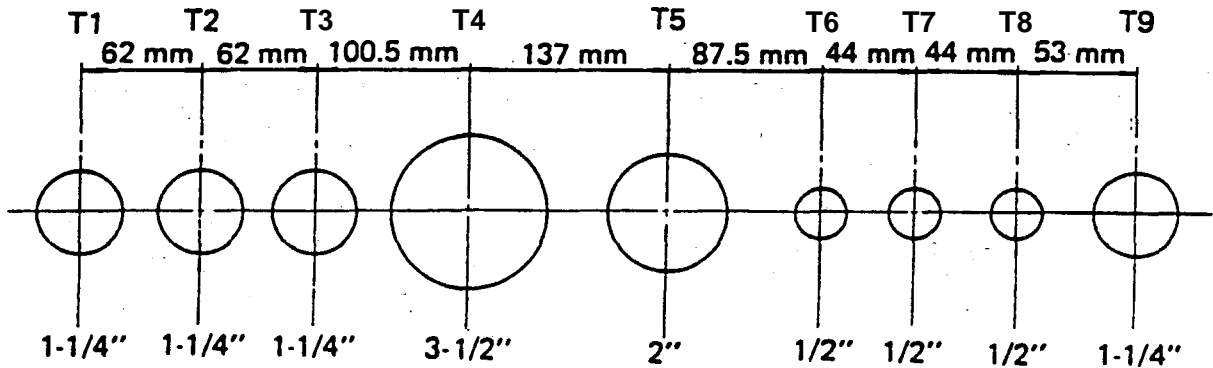
Punching range common to all stations

X-axis: -10.2mm to 1010.2mm

Y-axis: -10.2mm to 760.2mm

X-axis punching range for each station

● H-type



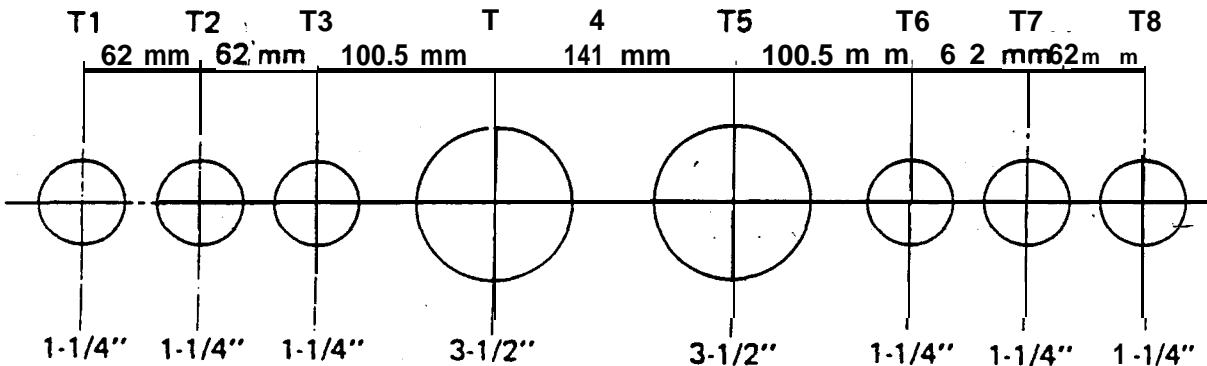
H-TYPE

T1	-600.2mm to 1010.2mm
T2	-538.2mm to 1072.2mm
T3	-476.2mm to 1134.2mm
T4	-375.7mm to 1234.7mm
T5	-238.7mm to 1371.7mm
T6	-151.2mm to 1459.2mm
T7	-107.2mm to 1503.2mm
T8	-63.2mm to 1547.2mm
T9	-10.2mm to 1600.2mm

L-TYPE

T1	-600.2mm to 1010.2mm
T2	-538.2mm to 1072.2mm
T3	-476.2mm to 1134.2mm
T4	-375.7mm to 1234.7mm
T5	-234.7mm to 1375.7mm
T6	-134.2mm to 1476.2mm
T7	-72.2mm to 1538.2mm
T8	-10.2mm to 1600.2mm

● L-type

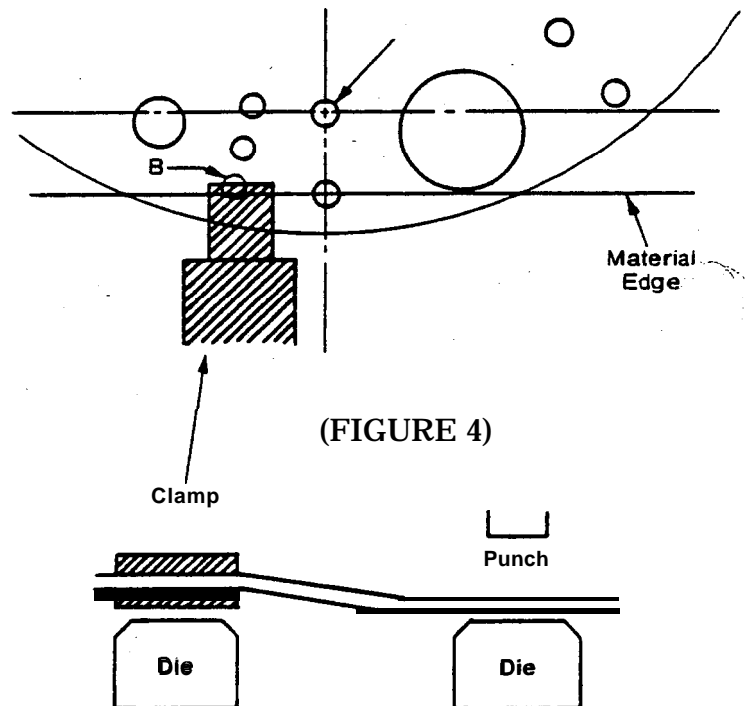
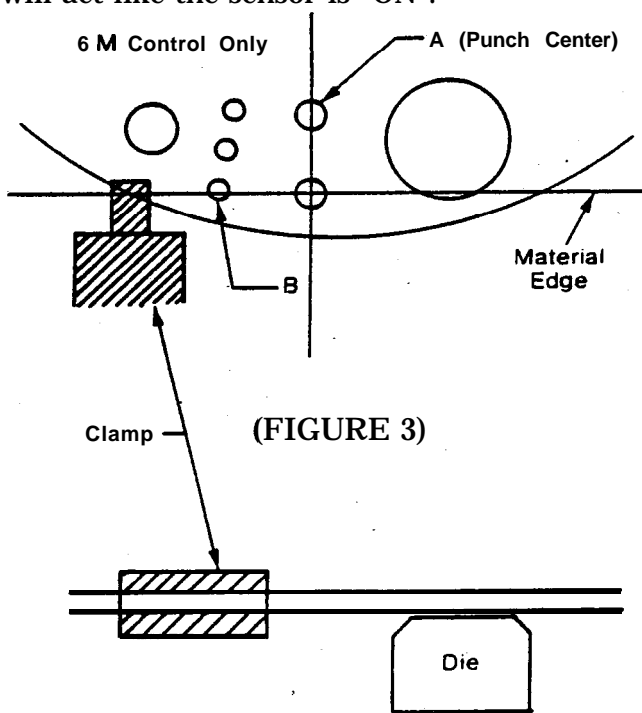


CLAMPSENSOR

The clamp sensor is a safety feature of the machine which prevents punching of the work clamps. The sensor should be turned on when a new program is placed in the machine. With the sensor "ON", the machine will position the material, but will not punch a hole in the clamp sensor area. For holes in the clamp sensor area the operator checks visually and overrides the sensor if the clearance between the punch and work clamp is adequate. If collision is possible the part should be re-programmed or the clamp position changed. After the program has been proofed the sensor is turned "OFF" and on subsequent runs of the program the machine will punch automatically in the clamp sensor area.

As an extra feature, the machine automatically operates as if the clamp sensor is "ON" when a program is first run through the machine.

Example: Any new program called out of memory or anytime you edit a program, the machine will act like the sensor is "ON".



CLAMP AND DIE

When A station is punching
there is no clamp at B
(figure 3)

When A station is punching,
the clamp rides on station B
(figure 4)

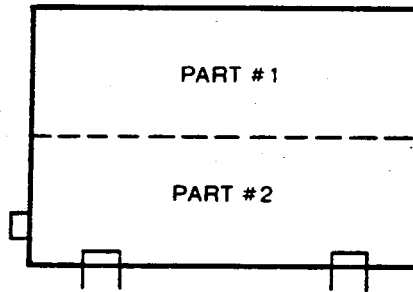
Overriding the sensor allows punching in the clamp sensor area. The operator should never override the sensor if there is any doubt as to whether the punch will miss the work clamp or not. The work clamps have the ability to pass through the turrets; however, when punching occurs close to the work clamp, distortion may occur because the work clamp is raised up over an adjacent die button as illustrated in Fig. 4. The extent of distortion depends on material thickness and the proximity of the work clamp to the punch center.



CLAMP SENSOR (Continued)

When clamping the material is impossible due to the high density of holes along the edge of the sheet, the following options may be considered:

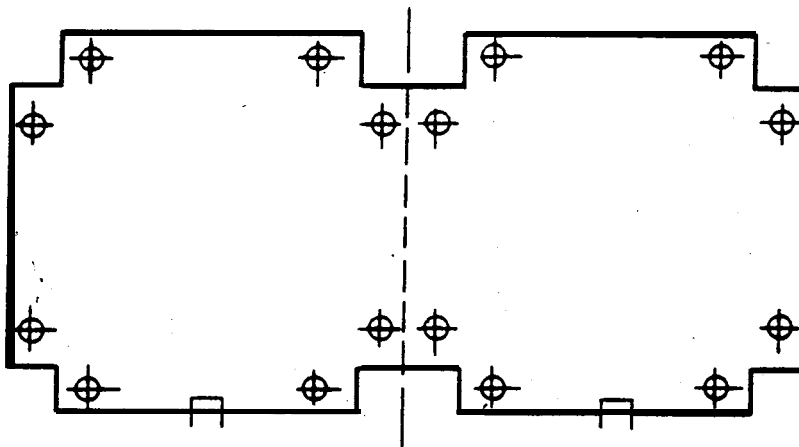
1. Use enough to avoid clamps.
2. Use **repositioning** during the program to move the work clamps to a previously punched section of the sheet edge.
3. Program a double part:



Part #1 is punched and returned to the home position and flipped so that running the same program will punch part #2. Separation of the parts may be accomplished on the CNC Punch press by using a slotting tool or by shearing after punch completion.

4. Program a multiple part

Example:



MISCELLANEOUS FUNCTIONS

M99 punch delay, (COMA only) change in number of punching strokes

When "M99" is entered, the hit rate is changed from the lower hit rate to the standard hit rate. This mode is effective in the memory or tape operating modes only.

Example:

```
M99
G92x _____ Y _____
G90X _____ Y _____
.
.
.
G50
```

Notes:

1. M99 must be entered on a block by itself.
2. G50 cancels M99.
3. M99 should be used for material .125" thick or less.
4. 1980 controls and before, M99 will slow down the punching.
5. New 6M controls on Comas will read M99 and punch faster.
6. Comas are made for heavier material's and, therefore, default to the slower speed.

MOO Program Stop

This command is used to stop the machine for slug or part removal.

Format example:

```
X-Y-
X-Y-
X-Y-
X-Y-
MOO Machine stops until restarted.
X-Y-
X-Y-
```

The machine is restarted by depressing any circle start button.

M01 Optional Stop

Same as MOO except the operator has the option to make effective or ineffective by selector switch on control panel.



MISCELLANEOUS FUNCTIONS (Continued)

N***Sequence Number

Entering a sequence number is optional. The four digit number beginning with "N" may be entered with each block, occasional blocks, or not at all, depending on programmer's preference. The block number is displayed on the control and is sometimes valuable for program checking.

Any number (from 1 to 9999), preceded by the letter "N" may be used to identify blocks of data numerically. Sequence numbers (if used) must appear at beginning of the block, no space is used.

Example:

```
N0001G92X39370Y29500
N0002G90X20000Y20000T201
N0003X30000
N0004Y10000
N0005G50
```

Notes:

1. Sequence numbers may be omitted if desired. We recommend their use at key program blocks to aid in identification of certain areas of the program.
2. Zero's directly following "N" may be omitted.
i.e.: N0001 may be written N1
3. If sequence numbers are used it is recommended to use numbers 5 or 10 digits apart to allow editing, especially the addition of new blocks. i.e.:

```
N0001G92X50.Y50.
N0005G90X30.Y30.T304
N0010G72X24.Y23.
N0015G28I.1.J45.K3T201
N0020G50
```

Block Delete

When the BLOCK DELETE switch on the control panel is turned "ON", the command to the block preceded by the slash is disregarded.

If the switch is turned "OFF", the command in this block is not disregarded but executed.

Example:

```
G90X13000Y8400T203
G91X20000
/X4000Y4000T304
G90X23000Y12000T304
```

In cases where the block-next to BLOCK DELETE is given an incremental command, the position when the switch is "ON" differs from that when it is "OFF". If the block with the / character includes a T command, then the following block must also include a T command (see the above example).

If blocks of data are to be omitted on time and not omitted the next time the block delete function may be used. A slash (/) is placed at the beginning of the block to be skipped. This will then be executed or ignored depending upon the condition of the block delete push button on the CNC control. When



MISCELLANEOUS FUNCTIONS (Continued)

the button is "ON", the block following the slash will be ignored. When the button is "OFF", the slash is ignored and the block is executed normally.

Example:

```
G92X50000Y50000
G90X24000Y23000T201
/X15000Y17000
/X17000Y19000
X25000Y10000
G50
```

These blocks will be ignored when the block delete button is "ON".

Notes:

1. Block delete should not be used in incremental positioning because the reference position will be different when the switch is "ON" than it was when it was "OFF".
2. If the block to be skipped contains a tool command, the tool change will be ignored when the block delete is "ON". The tool command should be repeated in the block after the block delete i.e.:

```
XI000Y10000T201
/X12000Y1000T203
X1900Y5000T203
```

3. When using block delete, it is recommended to confirm clamp dead zones with the block delete switch in the position it will be in during the part's run.

M08 Start of punching completion signal delay.

M09 End of punching completion signal delay.

By delaying the punch completion signal, the beginning of X or Y movement is also delayed. When extrusion or louvering, etc. is performed, more punching time is necessary for the tooling to escape from the workpiece after punching. The delayed punch completion signal is needed to give the punch enough time to retract before the work piece moves.

M08 or M09 must be a single block by itself.

Example:

```
M08 Delays Movement In "X" and "Y" Axis)
x4006
x4000

x4000
M09 (Resumes Normal Travel Speed)
```

The delay is 60 mili seconds per hit.

M12 Nibbling Start
M13 Nibbling Stop

When a series of moves is less than or equal to maximum pitch, nibbling mode may be utilized. In this case, each coordinate of punching positions must be given. Maximum distance between each punching position must be less than **.236 Aries 245; .188 Aries 222; .200 OCT; .315 PEGA/VELA; .250 PEGA KING; .470 COMA**. The nibbling mode may be used with software commands (G28, G36, etc.).



MISCELLANEOUS FUNCTIONS (Continued)

Example:

Using X ---Y --- points.

M12 <Nibbling-Start

X###Y###

X###Y###

G28IJK ---

Punching Hits Per Minute

Nibbling Hits Per Minute On 1" Centers

X###Y###	350 PEGA/VELA	220
M13 <Nibbling Stop	300 COMA	200
	300 OCTO	150
	475 PEGA KING	-275
	200 ARIES	120

Note: "M12" or "M13" must be given in a single block by itself.

Example:

(Using software command)

M12

G72X---Y---

G36I---J---P---K---T---

M13

F FUNCTION

The NC has an F function which allows the axis speed to be varied. The F function may be programmed as follows:

F1: Maximum speed (Default)

F2: Approximately 75% of F1

F3: Approximately 50% of F1

F4: Minimum programmable speed (Approximately 25% of F1)

Example:

G90 X_ Y_ T_

F2 Axis speed F2 (75% of maximum),

x_ Y_

== ==

F3 Axis speed F3 (50% of maximum)

- -

F1 Axis speed F1 (maximum)

== ==

G50



MISCELLANEOUS FUNCTIONS (Continued)

Notes:

1. F setting will remain as programmed until another value of F is programmed or G50 is read.
2. The value of F can be adjusted on the NC console. If the programmed value of F and the value entered on the NC console are different, the machine will operate under the slowest speed selected.
3. G50 returns to F1.

Normally, it is not necessary to change the value of F during a program. When the sheets being processed are large and heavy, it is advisable to program the feed rate at F2 or F3. For large sheets of 1/4" material, a feed rate of F4 would be recommended F3 and F4 also slow turret rotation.

DWELL FUNCTION (G04)

Danger For Operator

The dwell function stops the machine for a specified time. The minimum dwell value is 1/100 second.

Example:

```
G90X20.Y20.T104
G91Y2.
G04X10. (machine stops for 10 sec.)
G90X20.Y25.
```

== ==

The dwell function is usually used in conjunction with a work chute command.

M80 - Work Chute Open

Must be programmed on a line by itself.

M81 - Work Chute Close

Must be programmed on a line by itself.

Notes:

1. Maximum part size for Work Chute is 7.75" x 7.75" (PEGA II is 13.78" x 13.78").
2. Piece parts drop through the Work Chute by gravity so parting tool selection should be on the outside 1.25" track stations to locate parts over chute area before separation.
3. Machine should be slowed to allow the part ample time to drop through the chute (M08 F2).

Alternative method: G70 command to push part into work chute.

PROGRAM I.D. NUMBER 0----

When a program is to be stored in memory, a number (1 to 8999), may be entered after the letter "0". The program number must appear, at the beginning of the program and it is used for identification purposes only.

```
Example: 01000
          G92X50000Y50000
          .
          .
          G50
```



PROGRAM I.D. NUMBER 0---- (Continued)

Notes:

1. Zero's directly following "O" may be omitted.
i.e.: 00001 may be written 01
2. Program numbers may be entered directly from the CNC control keyboard when storing programs in memory.
3. The letter "O" identifies I.D. number only, and should never appear in any other place in a program.

Comments (16GA.CRS 40/48 sheet)

Comments may be inserted in a program to help convey messages of other information to the operator.

Example: 01111
 G92X393370Y39370
 (Set clamps at 10. and 34.)

Notes:

1. Parenthesis must be used to enclose all comments.
2. Comment must appear on a line by themselves. Do not mix comments with program data.
3. Do not place more than 30 characters between each set of parenthesis.
4. There are no keys on the control for parenthesis, therefore, comments may not be entered from the keyboard.

Never program as follows:

G92X50.Y50. (Comment) --This is incorrect

G92X50.Y50.
(Comment) --This is correct

PREPARING A MACHINE TAPE

Machine tapes are generally prepared using either AMACOM, a Flexowriter or a teletype machine. The machine tape is 1 inch wide, 8 channel tape with either EIA or ASCII coding (EIA is a code using an odd number of holes for each character, ASCII uses an even number of holes for each character).

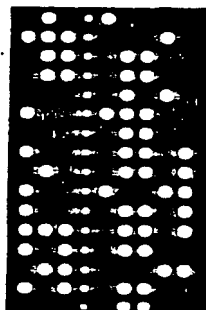
Definitions:

CHARACTER: each block is made up of a series of characters (letters and digits).

WORD: a letter and number forms a word, eg G90 or X10000.

BLOCK: each line of the program is a block of information.

Example of ASCII tape format:



LIST OF TAPE CODES

The ASCII and EIA codes explained in the table below can be used in the FANUC.

	ASCII Code									EIA Code								Meaning
	8	7	6	5	4	3	2	1		8	7	6	5	4	3	2	1	
0			○	○					0			○					Numeral 0	
1	○		○	○				○	1					○		○	Numeral 1	
2	○		○	○				○	2					○		○	Numeral 2	
3			○	○				○	3			○		○		○	Numeral 3	
4	○		○	○				○	4					○		○	Numeral 4	
5			○	○				○	5			○		○		○	Numeral 5	
6			○	○				○	6			○		○		○	Numeral 6	
7	○		○	○				○	7					○		○	Numeral 7	
8	○		○	○					8				○				Numeral 8	
9			○	○				○	9			○		○		○	Numeral 9	
A		○						○	a		○	○				○	Angular dimension around X axis	
B		○						○	b		○	○				○	Angular dimension around Y axis	
C	○	○						○	c		○	○	○			○	Angular dimension around Z axis	
D		○						○	d		○	○				○	Cutter compensation number	
E	○	○						○	e		○	○	○			○		
F	○	○						○	f		○	○	○			○	F function (feed function)	
G		○						○	g		○	○				○	G function (preparatory function)	
H		○						○	h		○	○				○	Tool offset number	
I	○	○						○	i		○	○	○			○	X-axis element of arc center, etc.	
J	○	○						○	j		○					○	Y-axis element of arc center, etc.	
K		○						○	k		○					○	Z-axis element of arc center, etc.	
L	○	○						○	l		○					○	Fixed cycle number	
M		○						○	m		○					○	M function (miscellaneous function)	
N		○						○	n		○					○	Sequence number	
O	○	○						○	o		○					○	Same as N in normal direction (EIA)	
P		○						○	p		○					○	Dwell in Fixed cycle, Dwell, Program copy	
Q	○	○						○	q		○					○	Step dimension or sift value in Fixed cycle. Program copy	
R	○	○						○	r		○					○	Point R in Fixed cycle, Program or sub tape	
S		○						○	s		○	○				○	S function (spindle-speed function)	
T	○	○						○	t		○					○	T function (tool function)	
U		○						○	u		○	○				○	Secondary motion dimension parallel to X	
V		○						○	v		○					○	Secondary motion dimension parallel to Y	
W	○	○						○	w		○					○	Secondary motion dimension parallel to Z	
X	○	○						○	x		○	○				○	Primary X motion dimension	
Y		○						○	y		○	○				○	Primary Y motion dimension	
Z		○						○	z		○					○	Primary Z motion dimension	
DEL	○	○	○	○	○	○	○	○	Del		○	○	○	○	○	○	** Delete (punch! " Space)	
NUL									Blank							○	Starting program, Stopping search	
BS	○								BS		○					○	Control Out	
HT									Tab		○	○	○	○	○	○	Control In	
LF or NL									CR or EOB	○						○	** Positive direction	
CR	○																Negative direction	
SP	○								SP			○				○	Same as N in normal direction (ISO)	
%	○								EOR				○			○	Optional block skip	
(
)	○																	
+									+		○	○	○			○		
-									-		○					○		
:									:									
/	○								/			○	○			○		

* Can be used in the FANUC system with options.

** Ignored by NC equipment. An alarm is given for a blank character position in significant information in the EIA code



PROGRAMMING PROCEDURE

1. Check tool used and station number

Example:

6" dia. round hole nibbling with a 2.5" dia. punch
20" x 24" square hole shear proof punching with a 2" square punch
Check if all tools can be loaded in the turret

2. Determining processing method

Many small parts to be punched can be produced from one large sheet. Shearing may be performed after punching, thus, saving time and a second handling to the material.

3. Determining clamp position

Make the area as large as possible.

Make the distance between clamps as long as possible.

Check dead zone (see Dead Zone Dimensions).

Be sure a clamp is not under the punch at time of punching.

Remedy when clamp enters dead zone.

1. When testing a program on the NC, turn on the "Override" toggle switch on the carriage base panel.
2. When one of the clamps comes into the dead zone; X, Y, movement stops at once.
3. Be sure not to punch clamps.
4. Once you are sure the clamps will not be punched, press "Confirmation" button. Program will continue.
5. If it appears that the clamps might be punched, check and modify the clamp position.

4. Determining punching procedure

Make a decision taking into consideration processing time and accuracy.

Decision of general procedure:

1. Begin in the upper right hand corner and finish with the upper right hand of a drawing to save travel and retract time.
2. Begin with small holes, then square holes and notching in that order; extrusion and countersinking come last.
3. In multiple-piece processing, parting should be done last.
4. Group tools of compatible size in same striker area.

Mark punching order numbers in the drawing.

5. Calculating coordinates

Calculate dimensions down to one-thousandth, degrees to one-hundredth.

6. Checking

Check the clamp position, punching order and coordinate values.

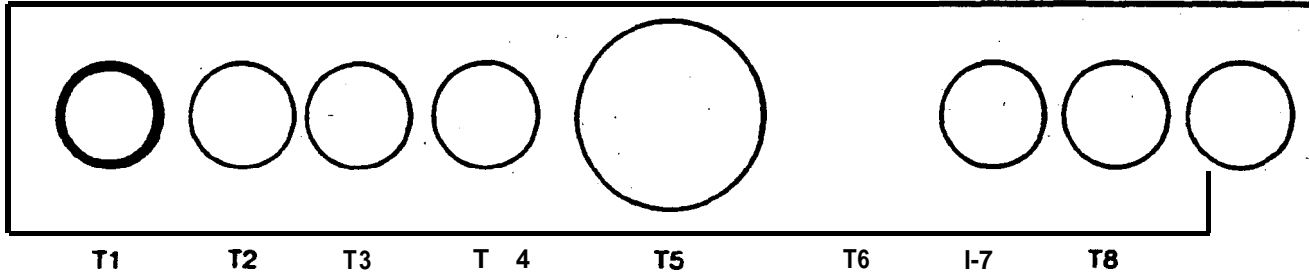


CNC AMADA OPERATOR WORK SHEET

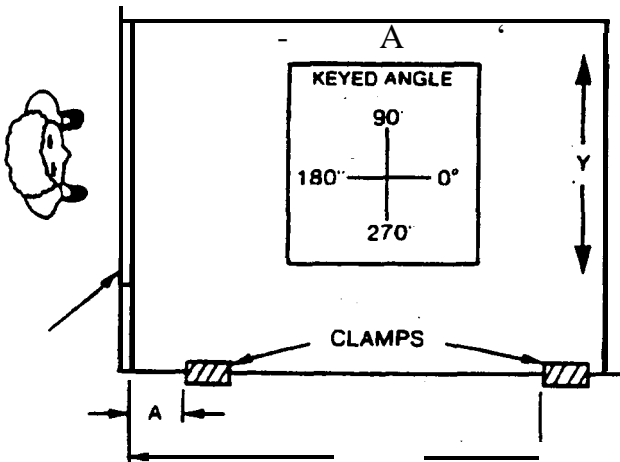
CUSTOMER NAME	PART NO.:	REV.:
----------------------	------------------	--------------

MATERIAL REQUIRED: _____

SHEARED BLANK SIZE: _____ x _____ **PIECES PER BLANK:** _____



STATION NUMBER	PUNCH and DIE		SHAPE	CLEARANCE	KEYED ANGLE
	NUMBER	SIZE			
T1					
T2					
T3					
T4					
T5					
T6					
T7					
T8					



CLAMP POSITIONS	REPOSITIONING USED
A: _____	YES: _____
8: _____	NO: _____
NIBBLING MODE USED	PATTERN DWG AVAILABLE
YES: _____	YES: _____
NO: _____	NO: _____



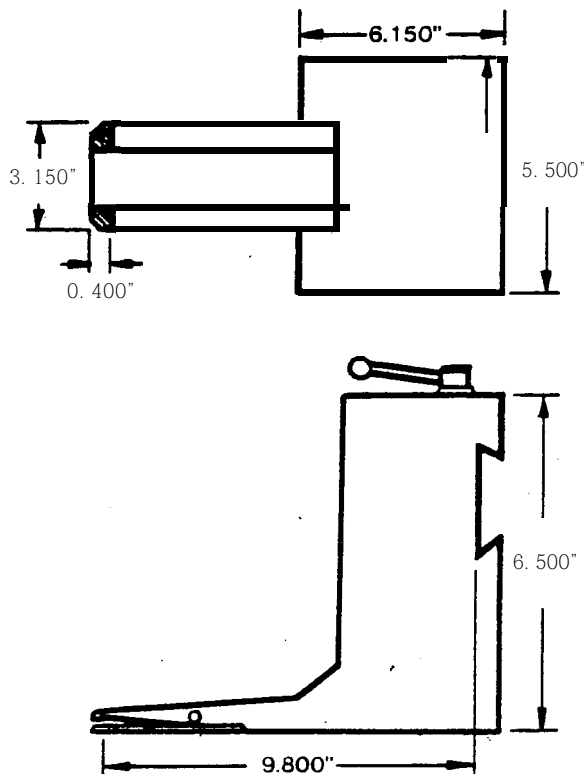
CLAMP DEAD ZONE

Station	Size	Guide Assembly Size	Minimum Distance From Center of Clamps "X" Axis	Minimum Distance From Front Edge of Clamps "Y" Axis
A	1/2"	1"	2.075	.900
B	1-1/4"	1-7/8"	2.512	1.337
C	2"	3-1/2"	3.325	2.150
D	3-1/2"	4-15/16"	4.043	2.868
E	4-1/2"	5-1/4"	4.200	3.025
F	6"	g-17164"	5.709	4.634

Using the above dimensions, the punch will hit within a few thousandths of the clamp. To be on the safe side **and** to eliminate possible operator error in clamp set up, add one inch to the above dimensions.

Material distortion may occur due to a **clamp** resting on an adjacent die.

STANDARD CLAMP DIMENSIONS

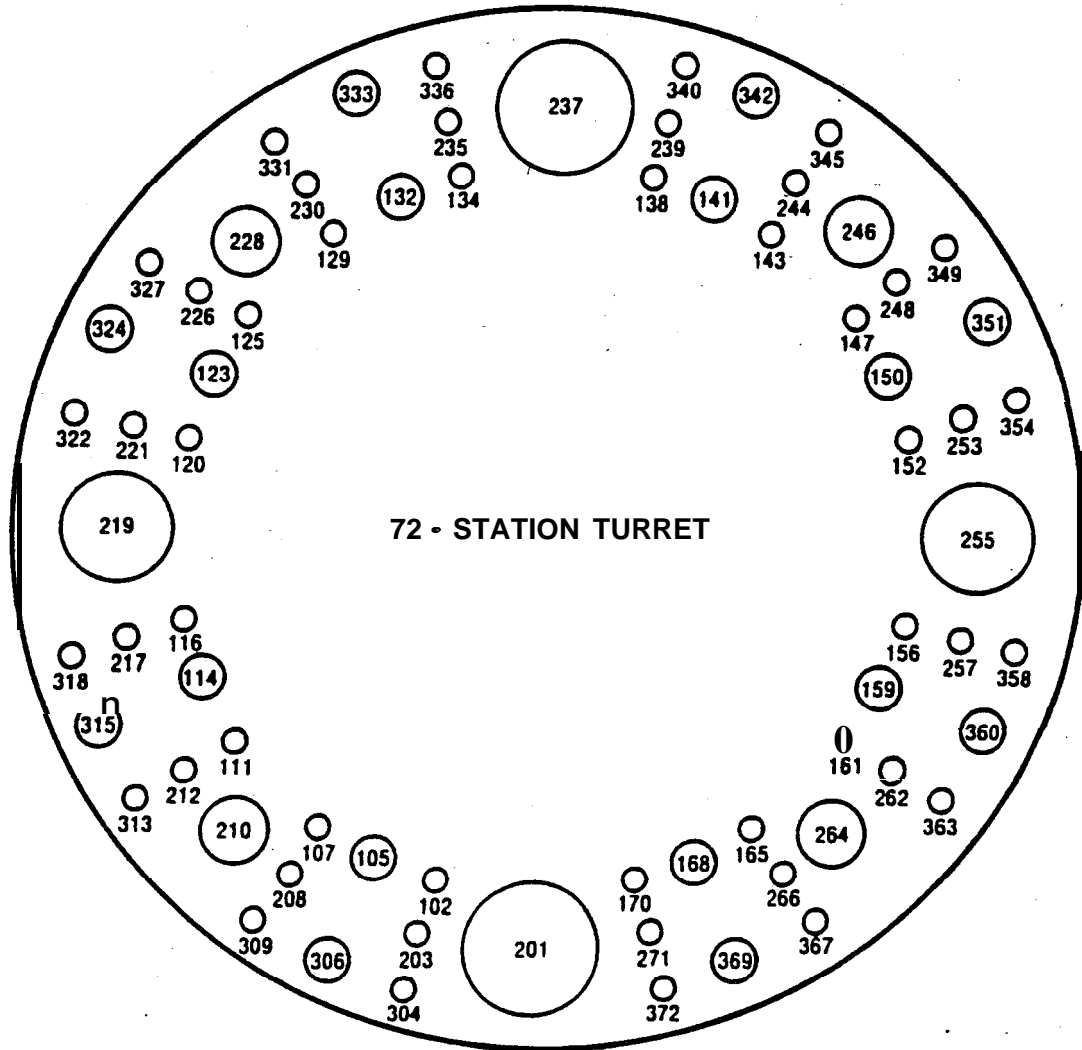


Smallest part that can be clamped = 5-1/2" (with both clamps)



72 STATION TURRET

The distribution of station on each turret and the punches available, are as follow:



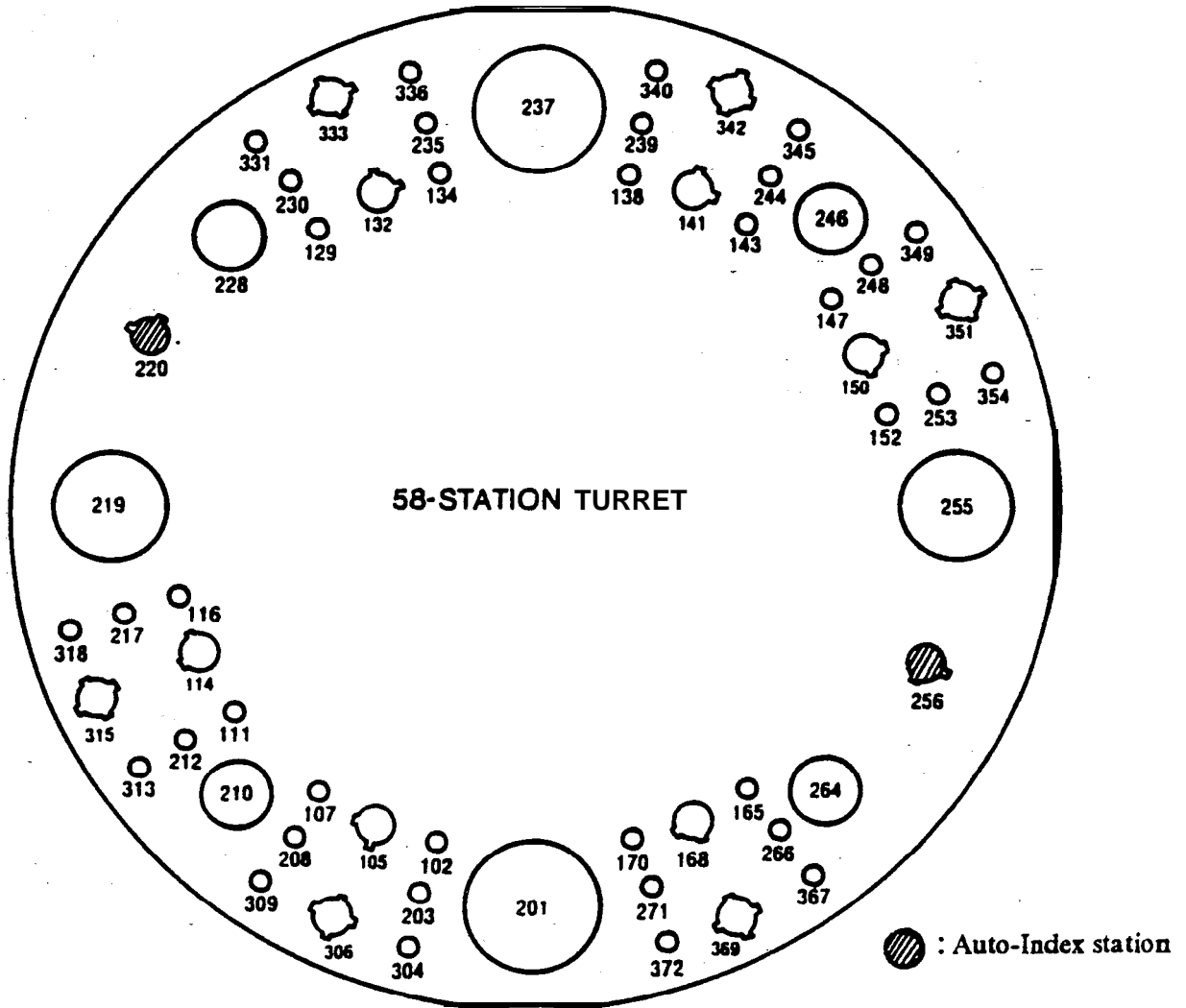
Punch Type	Nominal Punch Size	Standard Punch Size	Number of Stations Available
A	1/2"	1.6 - 12.7 mm dia.* (0.063" - 0.5" dia.)	4 8 (16)**
B	1-1/4"	12.8 - 31.7 mm dia. (0.501" - 1.25" dia.)	16 (8)
c	2"	31.8 - 50.8 mm dia. (1.251" - 2" dia.)	4 (4)
D	3-1/2"	50.9 - 88.9 mm dia. (2.001" - 3.5" dia.)	2 (2)
E	4-1/2"	89.0 - 114.3 mm dia. (3.501" - 4.5" dia.)	2 (2)

*The punches are available in gradations of 0.1 mm dia.

**The numerals in parentheses indicate keyed stations which can accept shaped punches.



TURRET WITH AUTO-INDEX DEVICE STATION ARRANGEMENT

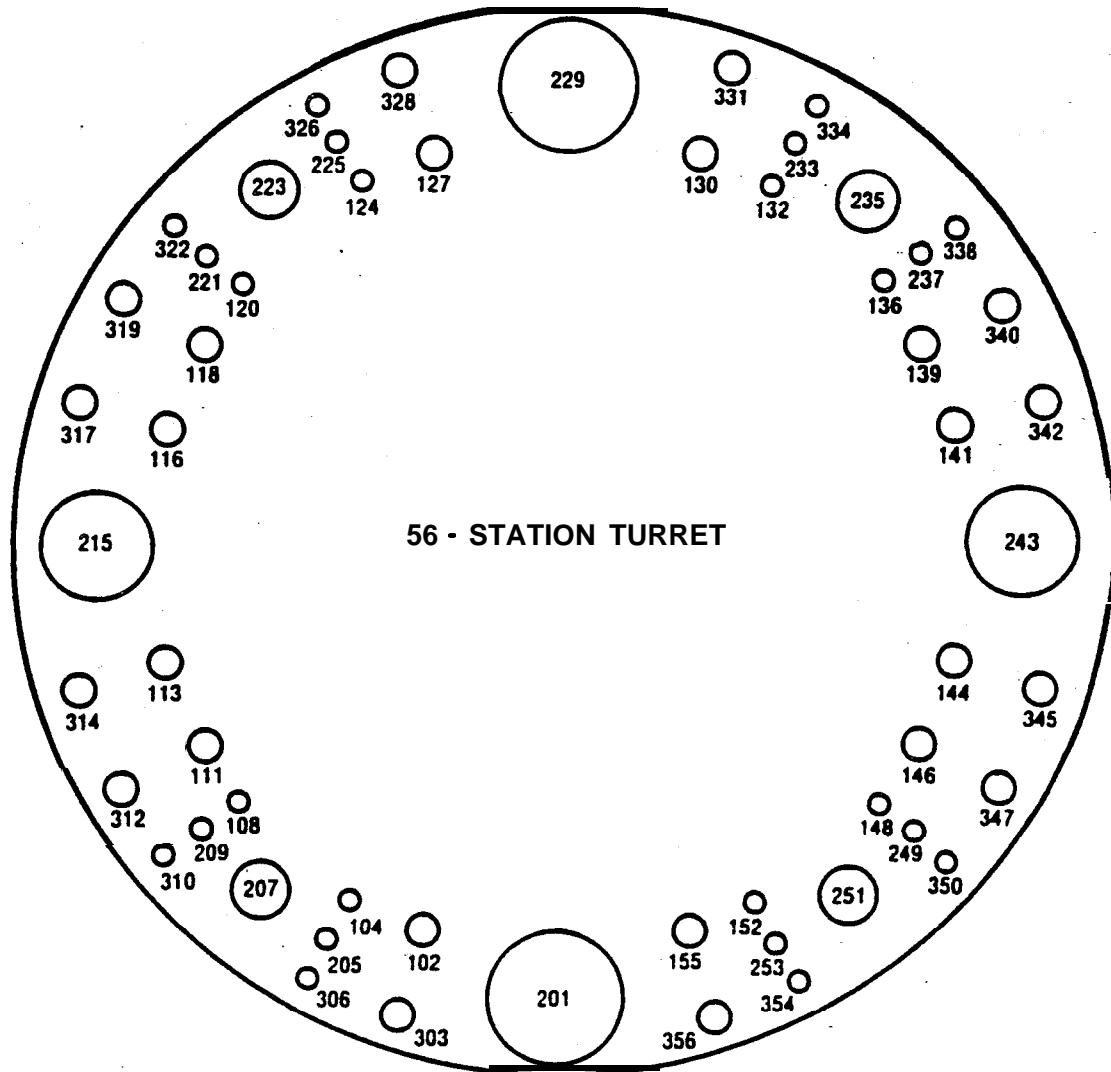


Punch Type	Nominal Punch Size	Standard Punch Size	Number of Stations Available
A	1/2"	1.6 - 12.7 mm dia. (0.063" - 0.5" dia.)	3 6 (12)*
B	1-1/4"	12.8 - 31.7 mm dia. (0.501" - 1.25" dia.)	14 (14)
C	2"	31.8 - 50.8 mm dia. (1.251" - 2" dia.)	4 (4) -
D	3-1/2"	50.9 - 88.9 mm dia. (2.001" - 3.5" dia.)	2 (2)
E	4-1/2"	89.0 - 114.3 mm dia. (3.501" - 4.5" dia.)	2 (2)

*The numerals in parentheses indicate keyed stations which can accept shaped punches.



**TURRET WITHOUT AUTO INDEX DEVICE
STATION ARRANGEMENT (PEGA 344)**

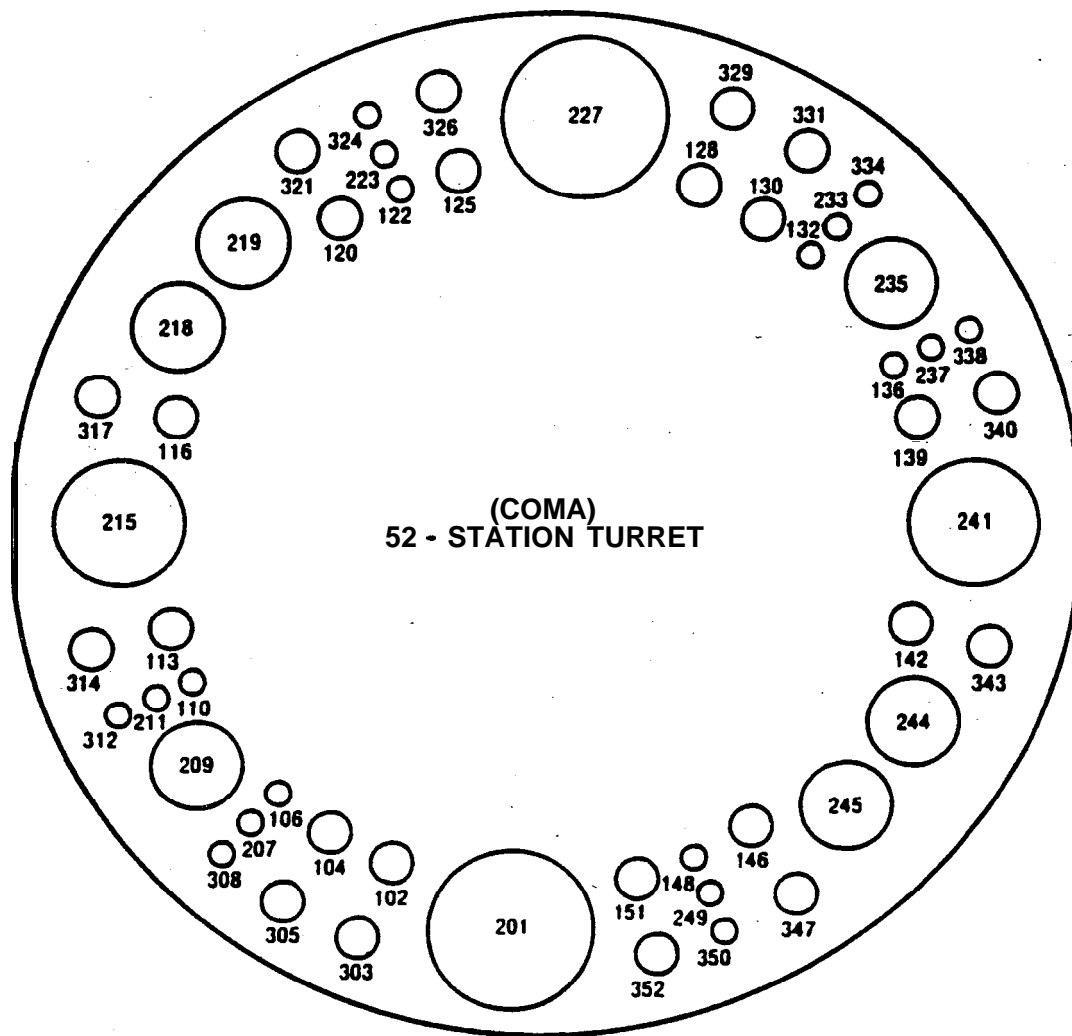


Punch Type	Nominal Punch Size	Standard Punch Size	Number of Stations Available
A	1/2"	1.6 - 12.7 mm dia. (0.063" - 0.5" dia.)	24 (8)*
B	1-1/4"	12.8 - 31.7 mm dia. (0.501" - 1.25" dia.)	24 (1 2)
c	2 "	31.8 - 50.8 mm dia. (1.251" - 2" dia.)	4 (4)
D	3-1/2"	50.9 - 88.9 mm dia. (2.001" - 3.5" dia.)	2 (2)
E	4-1/2"	89.0 - 114.3 mm dia. (3.501" - 4.5" dia.)	2 (2)

*The numerals in parentheses indicate keyed stations which can accept shaped punches.



52 - STATION TURRET (COMA)



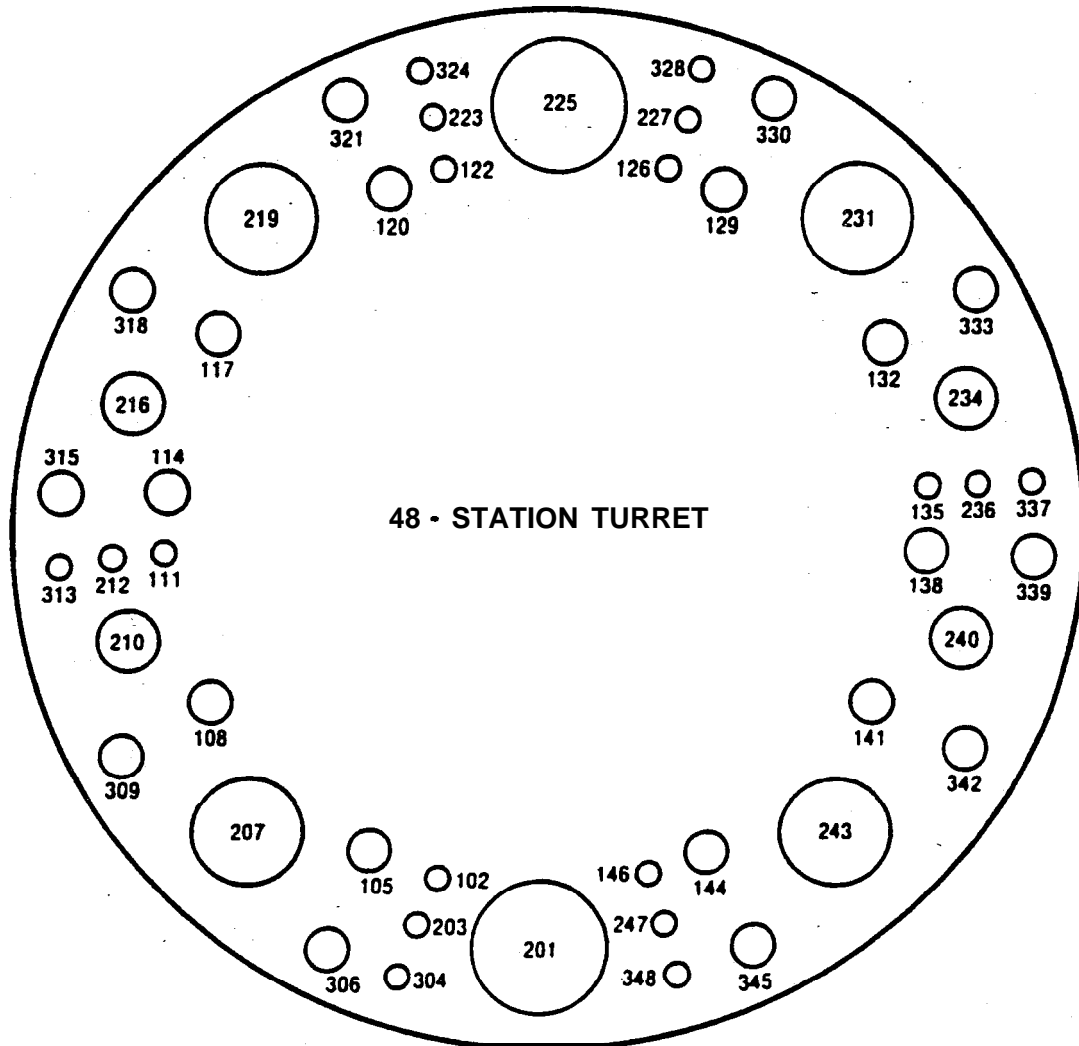
Punch Type	Nominal Punch Size	Standard Punch Size	Number of Stations Available
A	1/2"	1.6 - 12.7 mm dia.* (0.063" - 0.5" dia.)	18 (6)**
B	1-1/4"	12.8 - 31.7 mm dia. (0.501" - 1.25" dia.)	24 (12)
C	2"	31.8 - 50.8 mm dia. (1.251" - 2" dia.)	6 (6)
D	3-1/2"	50.9 - 88.9 mm dia. (2.001" - 3.5" dia.)	2 (2)
E	4-1/2"	89.0 - 114.3 mm dia. (3.501" - 4.5" dia.)	2 (2)

* The punches are available in gradations of 0.1 mm dia.

**The numerals in parentheses indicate keyed stations which can accept shaped punches.



48 - STATION TURRET



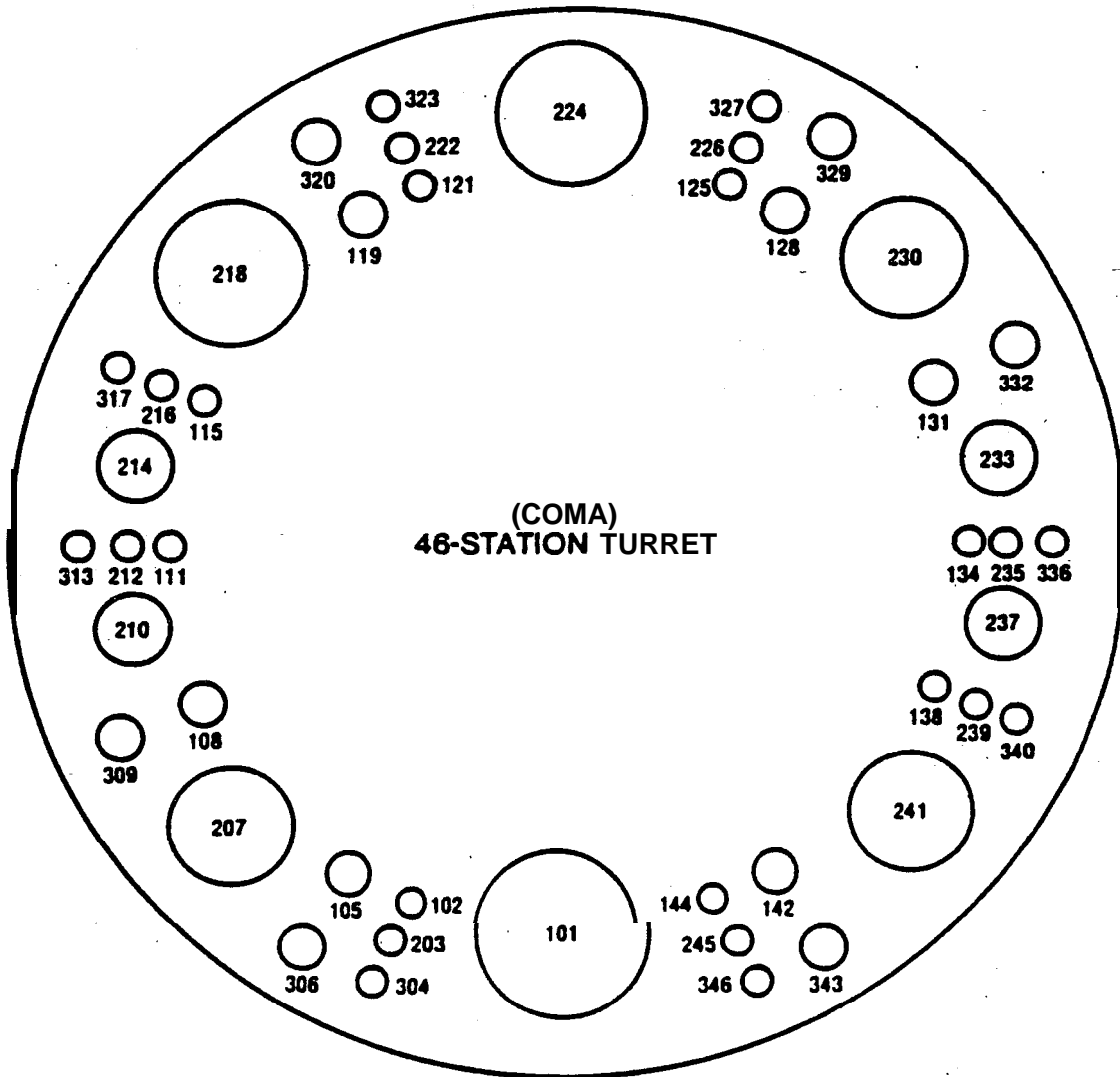
Punch Type	Nominal Punch Size	Standard Punch Size	Number of Stations Available
A	1/2"	1.6 - 12.7 mm dia.* (0.063" - 0.5" dia.)	18 (6)**
B	1-1/4"	12.8 - 31.7 mm dia. (0.501" - 1.25" dia.)	20 (10)
C	2"	31.8 - 50.8 mm dia. (1.251" - 2" dia.)	4 (4)
D	3-1/2"	50.9 - 88.9 mm dia. (2.001" - 3.5" dia.)	4 (4)
E	4-1/2"	89.0 - 127.0 mm dia. (3.501" - 5" dia.)	2 (2)

* The punches are available in gradations of 0.1 mm dia.

**The numerals in parentheses indicate keyed stations which can accept shaped punches.



46 - STATION TURRET (COMA)

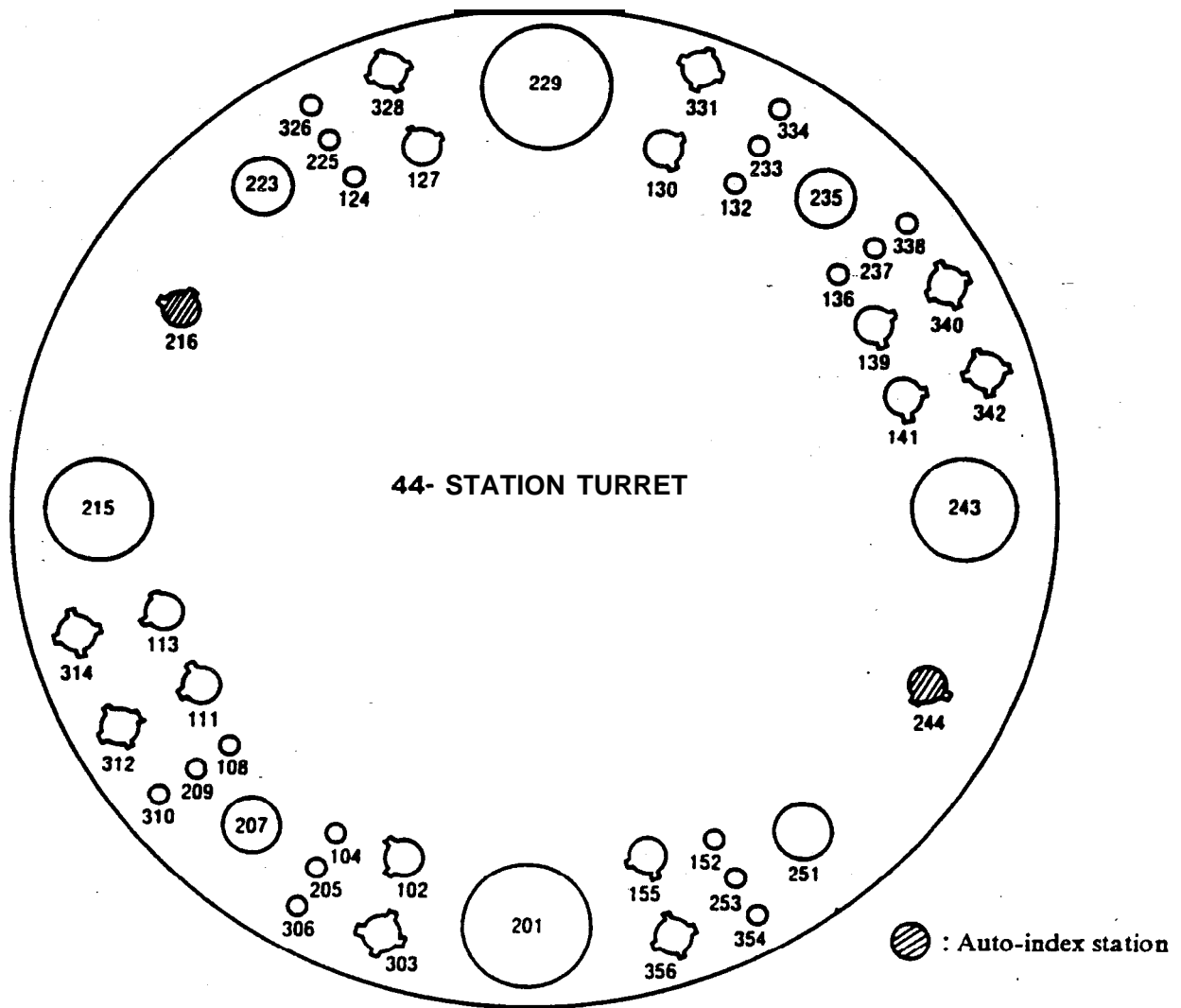


Punch Type	Nominal Punch Size	-Standard Punch Size	Number of Stations Available
A	1/2"	1.6 - 12.7 mm dia. (0.063" - 0.5" dia.)	24 (8)*
B	1-1/4"	12.8 - 31.7 mm dia. (0-501" - 1.25" dia.)	12 (6)
C	2"	31.8 - 50.8 mm dia. (1-251" - 2" dia.)	4 (4)
D	3-1/2"	50.9 - 88.9 mm dia. (2.001" - 3.5" dia.)	3 (3)
E	4-1/2"	89.0 - 114.3 mm dia. (3.501" - 4.5" dia.)	2 (2)
F	6"	114.4 - 152.4 mm dia. (4.501" - 6" dia.)	1 (1)

*The numerals in parentheses indicate keyed stations which can accept shaped punches.



44 - STATION TURRET



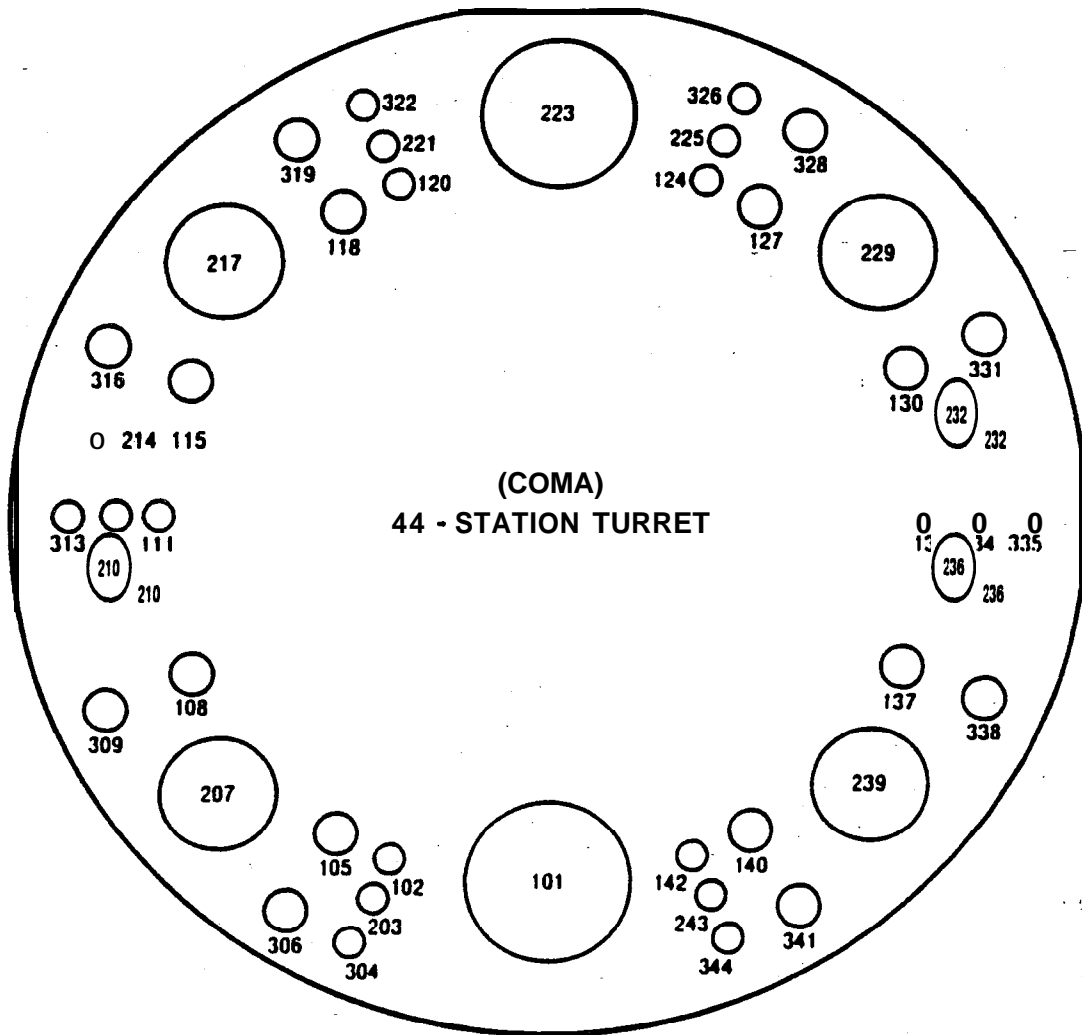
Punch Type	Nominal Punch Size	Standard Punch Size	Number of Stations Available
A	1/2"	1.6 - 12.7 mm dia. (0.063" - 0.5" dia.)	18 (6)*
B	- 4"	2.8 - 31.7 mm dia. (0.501" - 1.25" dia.)	18 (18)
C	2"	31.8 - 50.8 mm dia. (1.251" - 2" dia.)	4 (4)
D	3-1/2"	50.9 - 88.9 mm dia. (2.001" - 3.5" dia.)	2 (2)
E	4-1/2"	89.0 - 114.3 mm dia. (3.501" - 4.5" dia.)	2 (2)

a.

*The numerals in parentheses indicate keyed stations which can accept shaped punches.



44 - STATION TURRET (COMA)



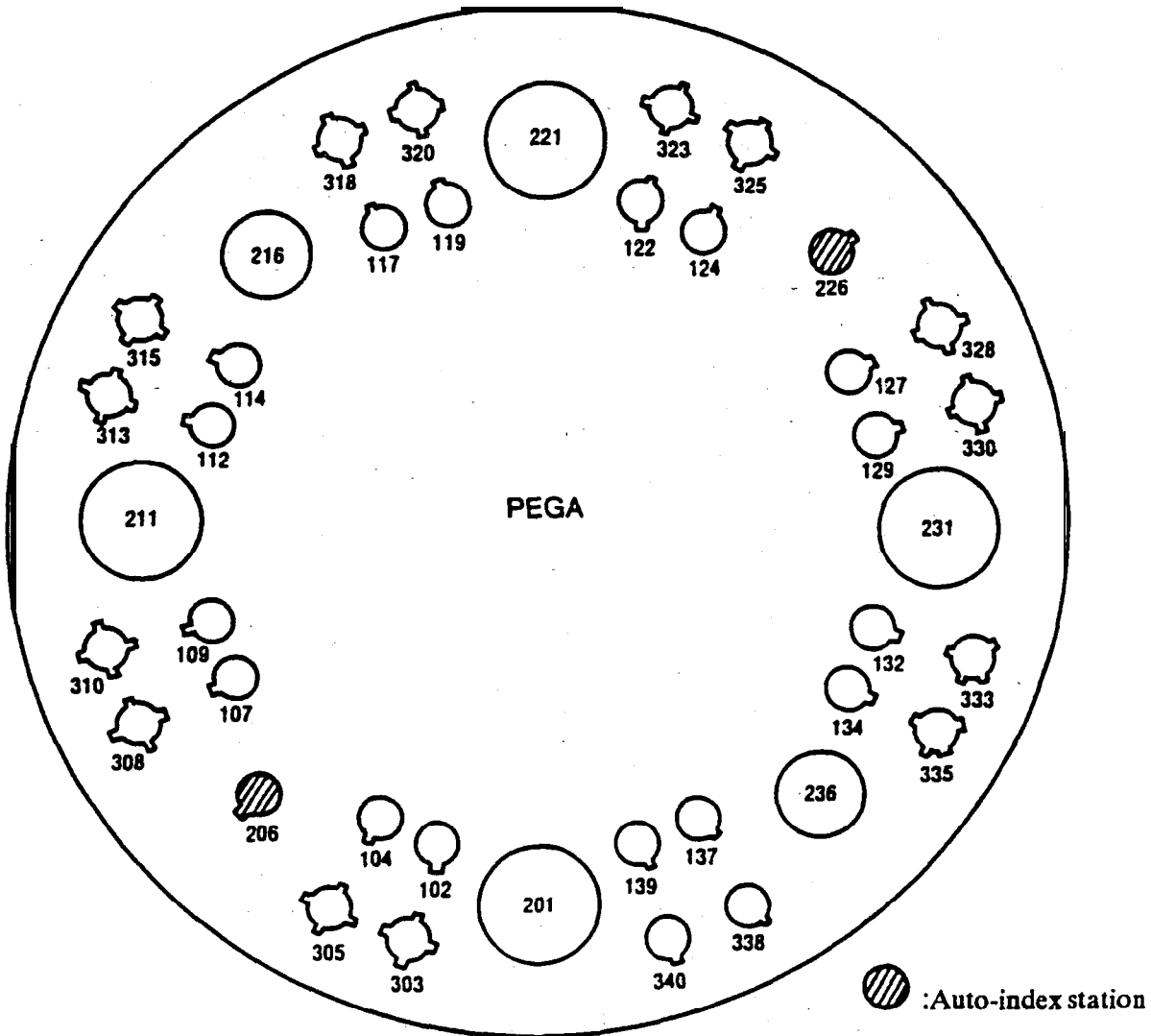
Punch Type	Nominal Punch Size	Standard Punch Size	Number of Stations Available
A	1/2"	1.6 - 12.7 mm dia.* (0.063" - 0.5" dia.)	18 (6)**
B	1-1/4"	12.8 - 31.7 mm dia. (0.501" - 1.25" dia.)	16 (8)
C	2"	31.8 - 50.8 mm dia. (1.251" - 2" dia.)	4 (4)
D	3- 2"	50.9 - 78.7 mm dia. (2.001" - 3.5" dia.)	4 (4)
E	4-1/2"	89.0 - 114.3 mm dia. (3.501" - 4.5" dia.)	1 (1)
F	6"	114.4 - 152.4 mm dia. (4.501" - 6" dia.)	1 (1)

* The punches are available in gradations of 0.1 mm dia.

**The numerals in parentheses indicate keyed stations which can accept shaped punches.



THIN TURRET 40 - STATION WITH AUTO INDEX

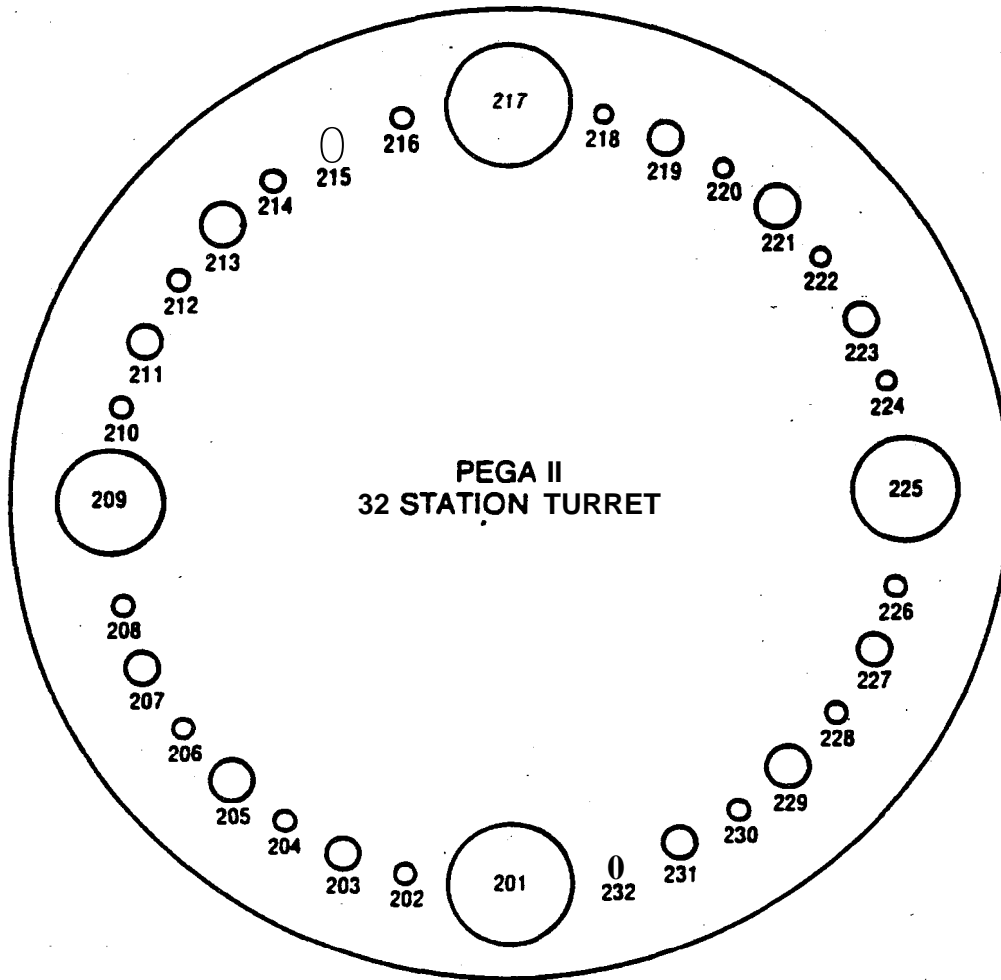


Punch Type	Nominal Punch Size	Standard Punch Size	Number of Stations Available
B	1-1/4"	12.8 - 31.7 mm dia. (0.501" - 1.25" dia.)	32 (32)*
C	2"	31.8 - 50.8 mm dia. (1.251" - 2" dia.)	2 (2)
D	3-1/2"	50.9 - 88.9 mm dia. (2.001" - 3.5" dia.)	4 (4)
B Auto-Index	4"	12.8 - 31.7 mm dia. (0.501" - 1.25" dia.)	2 (2)

*The numerals in parentheses indicate keyed stations which can accept shaped punches. An adapter is available for (B) stations to (A) stations.



32 - STATION TURRET

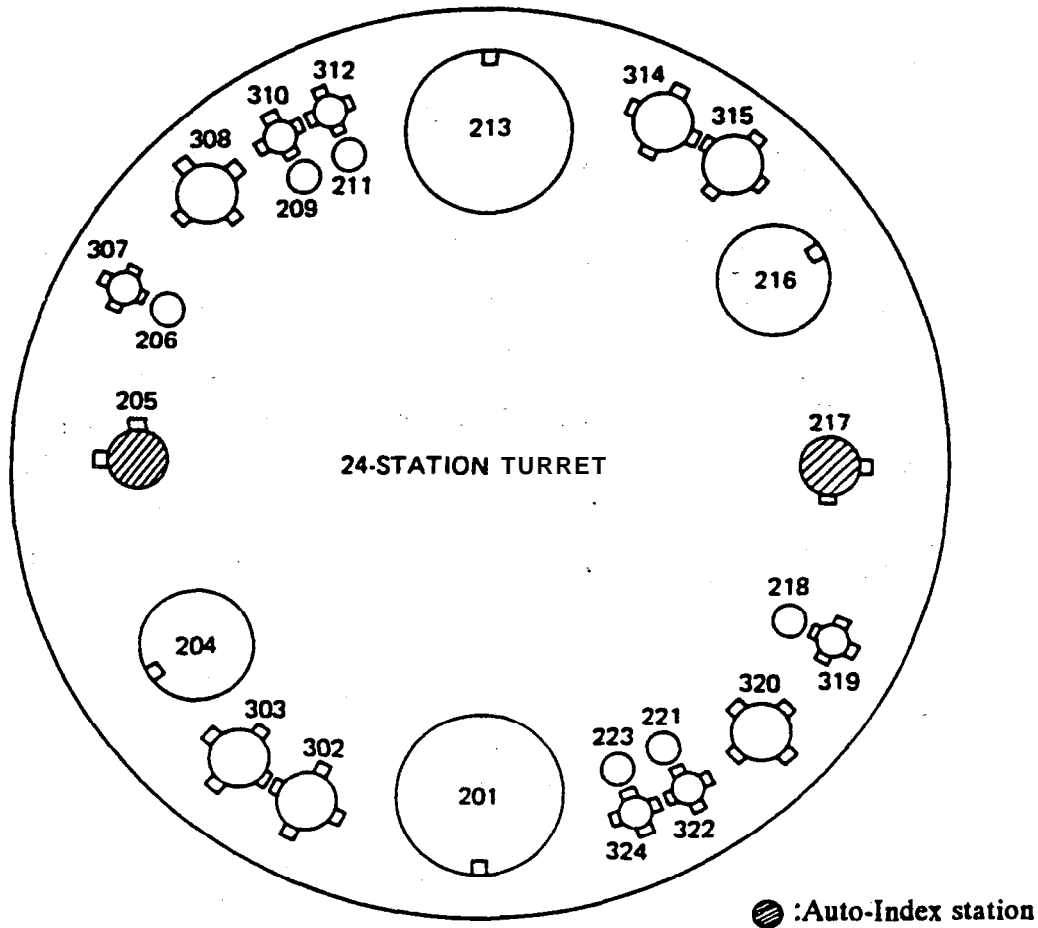


Punch Type	Nominal Punch Size	Standard Punch Size	Number of Stations Available
A	1/2"	1.6 - 12.7 mm dia. (0.063" - 0.5" dia.)	16
B	1-1/4"	12.8 - 31.7 mm dia. (0.501" - 1.25" dia.)	8
C	2"	31.8 - 50.8 mm dia. (1.251" - 2" dia.)	4
D	3-1/2"	50.9 - 88.9 mm dia. (2.001" - 3.5" dia.)	2
E	4-1/2"	89.0 - 127.0 mm dia. (3.501" - 5.0" dia.)	2

All stations are considered keyed stations which can accept shaped punches.



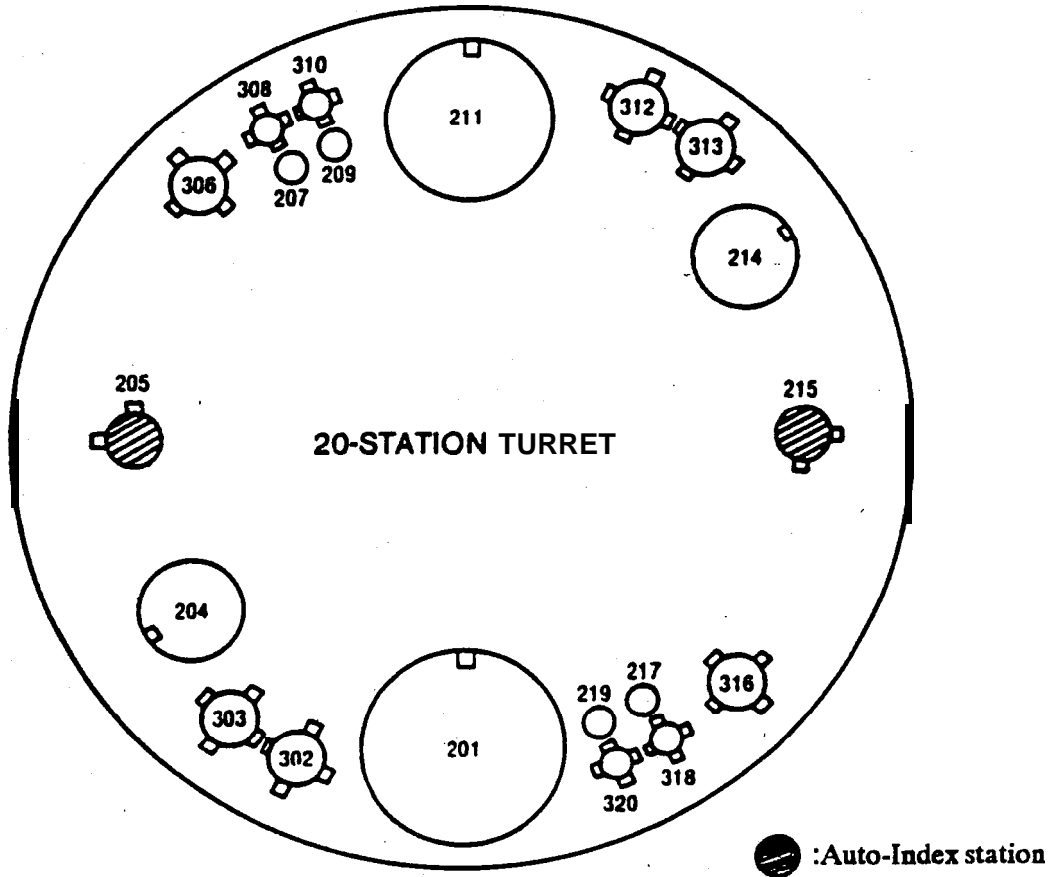
THICK TURRET WITH AUTO-INDEX 24- STATION



Punch Type	Nominal Punch Size	Standard Punch Size	Number of Stations Available
A	1/2"	1.6 - 12.7 mm dia. (0.063" - 0.5" dia.)	12 (6)*
B	1-1/4"	12.8 - 31.7 mm dia. (0.501" - 1.25" dia.)	8 (8)
C	2"	31.8 - 50.8 mm dia. (1.251" - 2" dia.)	2 (2)
D	3-1/2"	50.9 - 88.9 mm dia. (2.001" - 3.5" dia.)	2 (2)

*The numerals in parentheses indicate keyed stations which can accept shaped punches.

THICK TURRET WITH AUTO-INDEX 20 - STATION

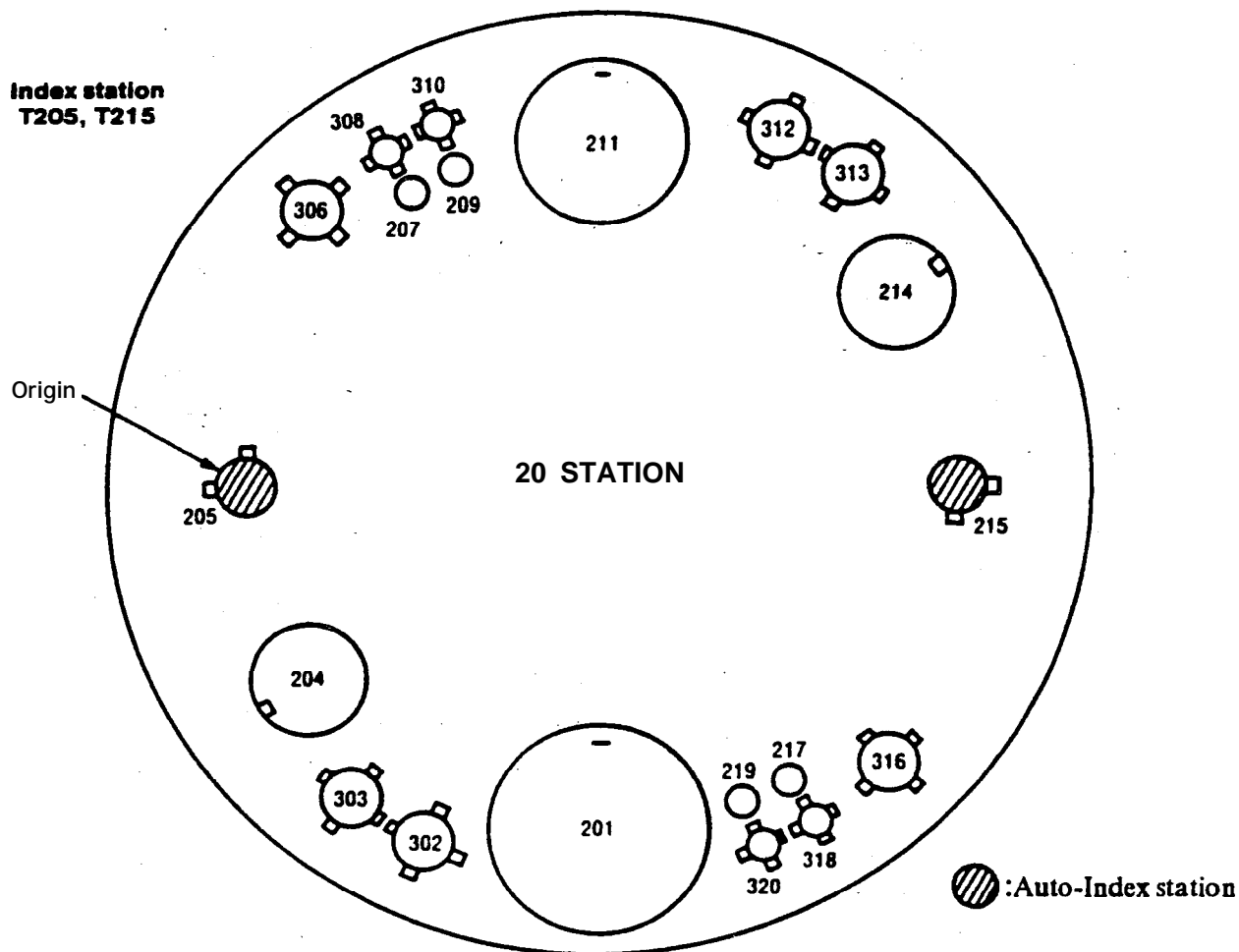


punch Type	Nominal Punch Size	Standard Punch Size	Number of Stations Available
A	1/2"	1.6 - 12.7 mm dia. (0.063" - 0.5" dia.)	8 (4)*
B	1-1/4"	12.8 - 31.7 mm dia. (0.501" - 1.25" dia.)	8 (8)
C	2"	31.8 - 50.8 mm dia. (1.251" - 2" dia.)	2 (2)
D	3-1/2"	50.9 - 88.9 mm dia. (2.001" - 3.5" dia.)	1 (1)
E	4-1/2"	89.0 - 114.3 mm dia. (3.501" - 4.5" dia.)	1 (1)

*The numerals in parentheses indicate keyed stations which can accept shaped punches.



PEGA - 244 H TYPE WITH AUTO INDEX 20 - STATION

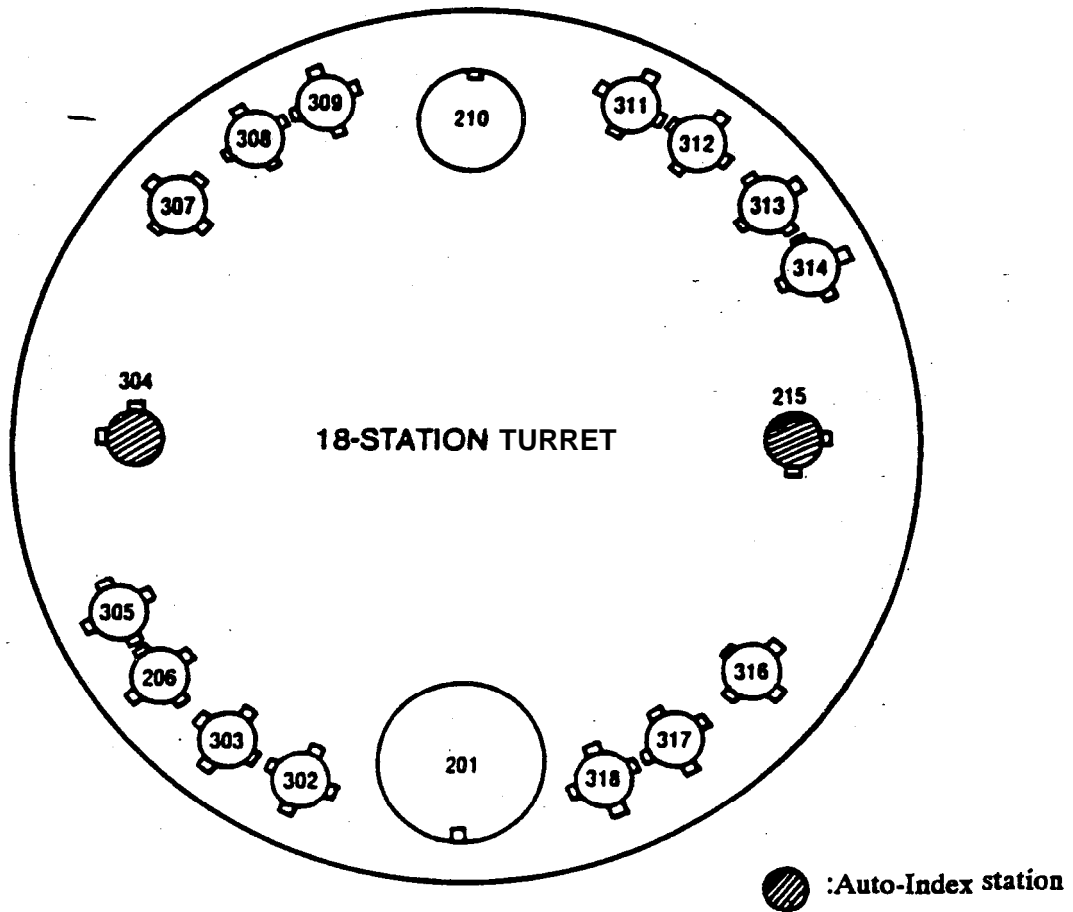


Punch Type	Nominal Punch Size	Standard Punch Size	Number of Stations Available
A	1/2"	1.5 - 12.7 mm dia. (0.067" - 0.5" dia.)	8 (4)*
B	4"	125 - 317 1.25" dia.	6 (6)
C	2"	31.0 - 50.8 mm dia. (1.25" - 2" dia.)	2 (2)
D	3-1/2"	50.9 - 88.9 mm dia. (2.001" - 3.5" dia.)	1 (1)
E	4-1/2"	89.0 - 114.3 mm dia. (3.501" - 4.5" dia.)	1 (1)
B	1-1/4"	12.9 - 31.7 mm dia. (0.501" - 1.25" dia.)	2 (2)
Auto-Index			

*The numerals in parentheses indicate keyed stations which can accept shaped punches.



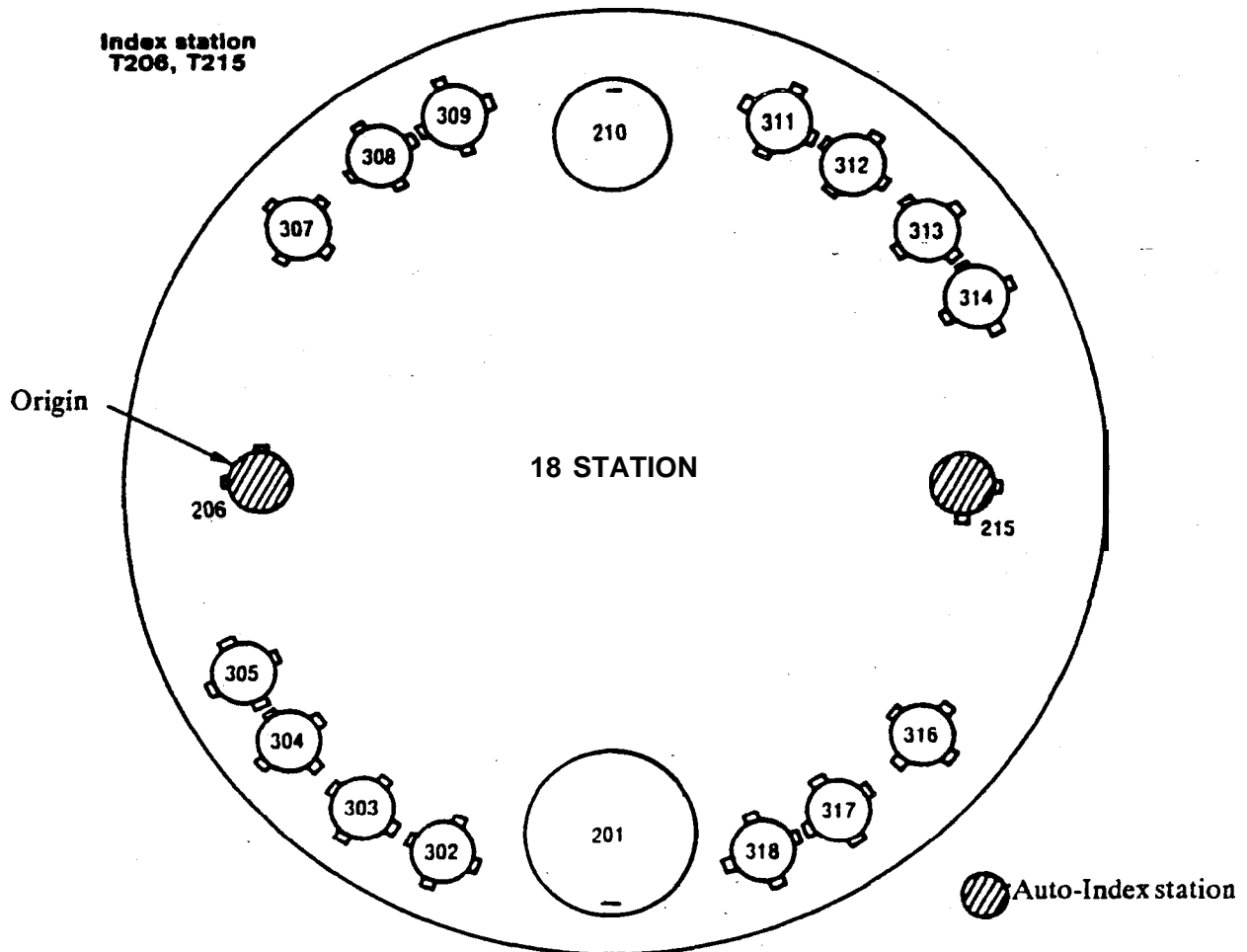
**THIN TURRET WITH AUTO-INDEX
18 - STATION**



Punch Type	Nominal Punch Size	Standard Punch Size	Number of Stations Available
A	1/2"	1.6 - 10.9 mm dia. (0.063" - 0.43" dia.)	14
B	1-1/4"	110 - 311 mm dia. (0.431" - 1.25" dia.)	2
C	2"	318 - 508 mm dia. (1.251" - 2" dia.)	1
D	3-1/2"	509 - 889 mm dia. (2.001" - 3.5" dia.)	1



PEGA - 244 L TYPE WITH AUTO INDEX 18 - STATION

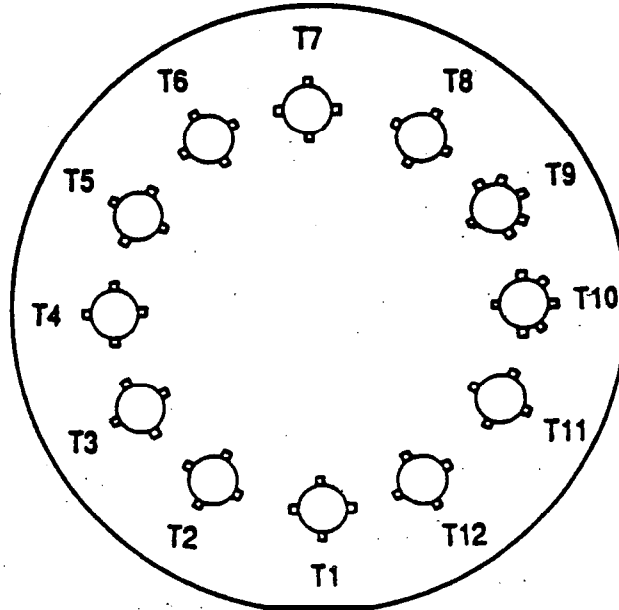


Punch Type	Nominal Punch Size	Standard Punch Size	Number of Stations Available
B	1-1/4"	12.8 - 31.7 mm dia. (0.501" - 1.25" dia.)	14
C	2"	31.8 - 50.8 mm dia. (1.251" - 2" dia.)	1
D	3-1/2"	50.9 - 88.9 mm dia. (2.001" - 3.5" dia.)	1
B Auto-Index	1-1/4"	12.8 - 31.7 mm dia. (0.501" - 1.25" dia.)	2

All stations can accept shaped punches.



12 - STATION TURRETS FOR TYPES A & B TOOLS

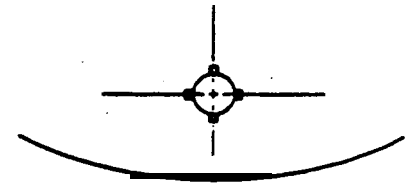


Keys & keyways in turret stations

10 - station turret
small-dia. tool stations T2, T3, T4, T5, T7, T8

12 - station turret
small-dia. tool stations T1 to T8, T11, T12

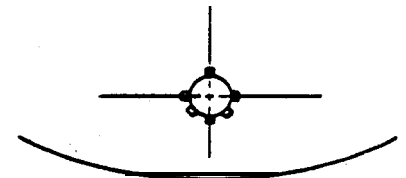
4 keyways at 0, 90, 180 & 270 deg.



10 - station turret
small-dia. tool stations T9, T10

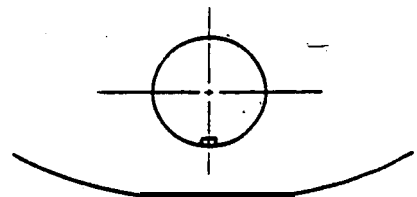
12 - station turret
small-dia. too stations T9, T10

6 keyways at 0, 90, 180, 225, 270 & 315 deg.

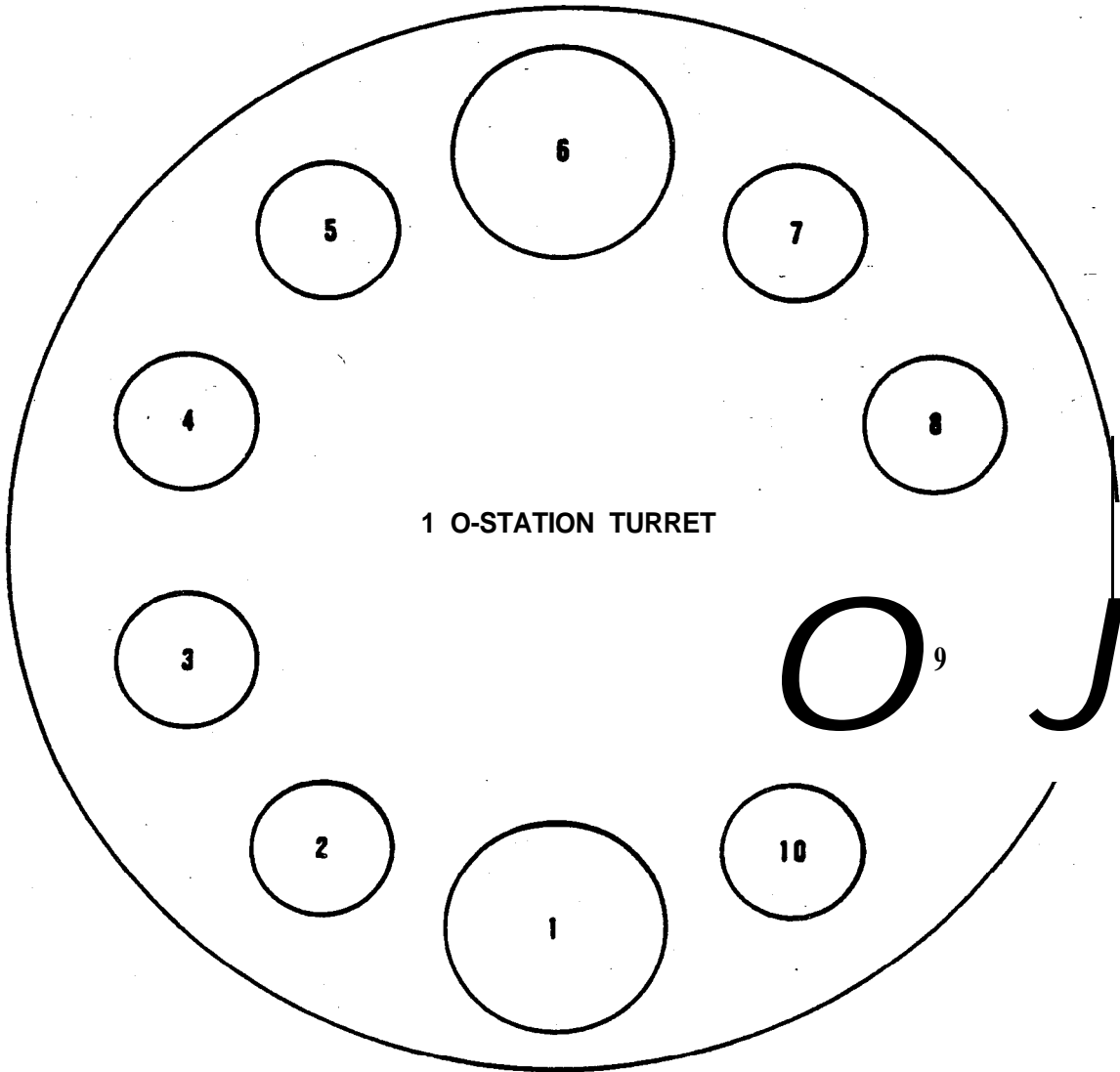


10 - station turret
large-dia. tool stations T1, T6

One key at 270 deg.



**ARIES - 222 THIN TURRET
10 - STATION**



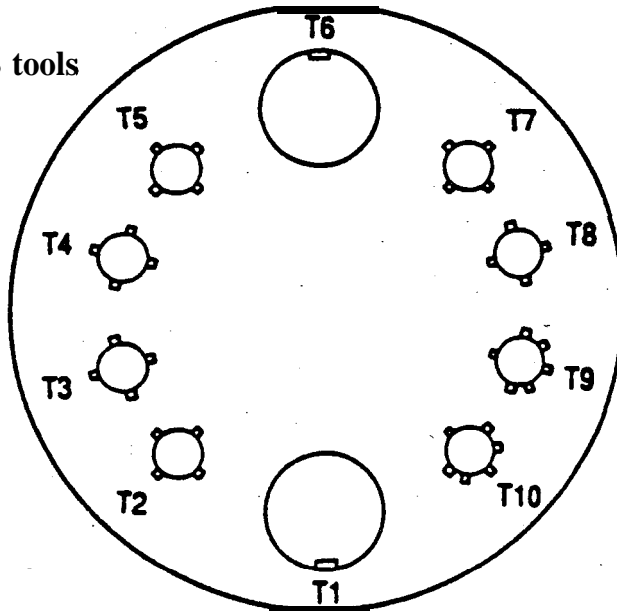
Punch Type	Nominal Punch Size	Standard Punch Size	Number of Stations Available
B	1-1/4"	12.8 - 31.7 mm dia. (0.501" - 1.25" dia.)	8 (8)*
D	3-1/2"	50.9 - 88.9 mm dia. (2.001" - 3.5" dia.)	2 (2)

*The numerals in parentheses indicate keyed stations which can accept shaped punches.



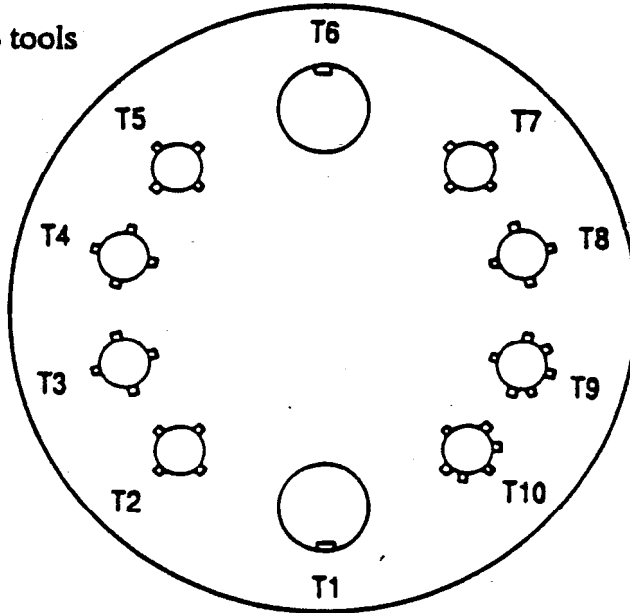
10 - STATION TURRET (I)

8 stations for types A & B tools
2 stations for type D tools

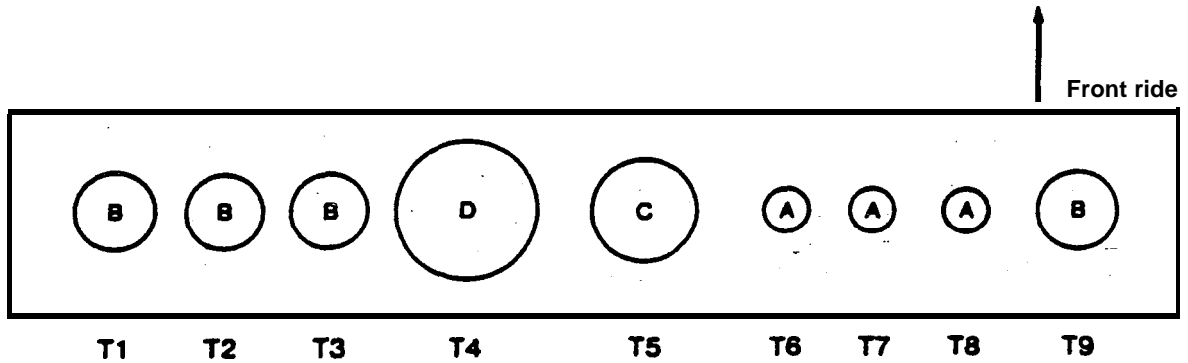


10 - STATION TURRET (II)

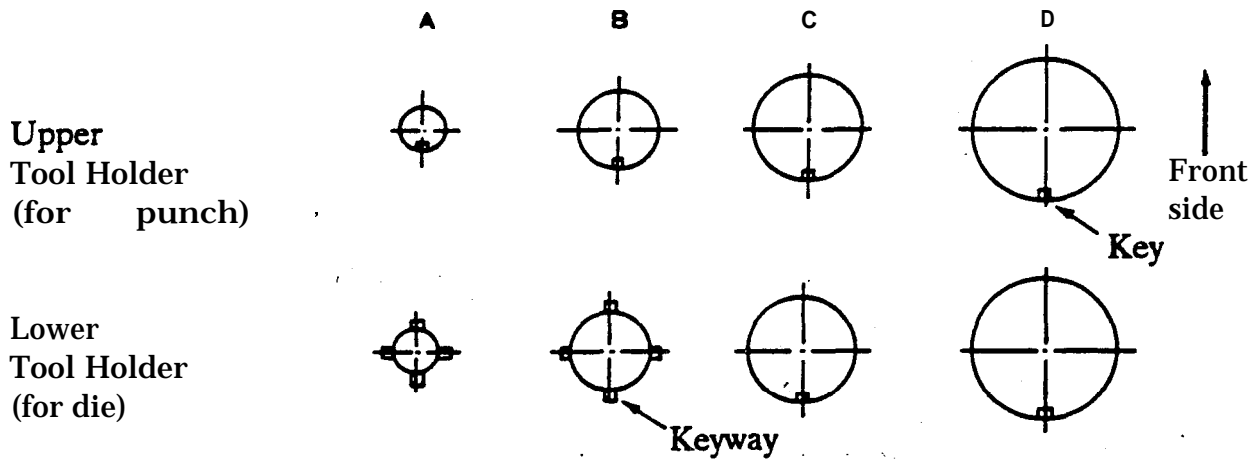
8 stations for types A & B tools
2 stations for type c tools

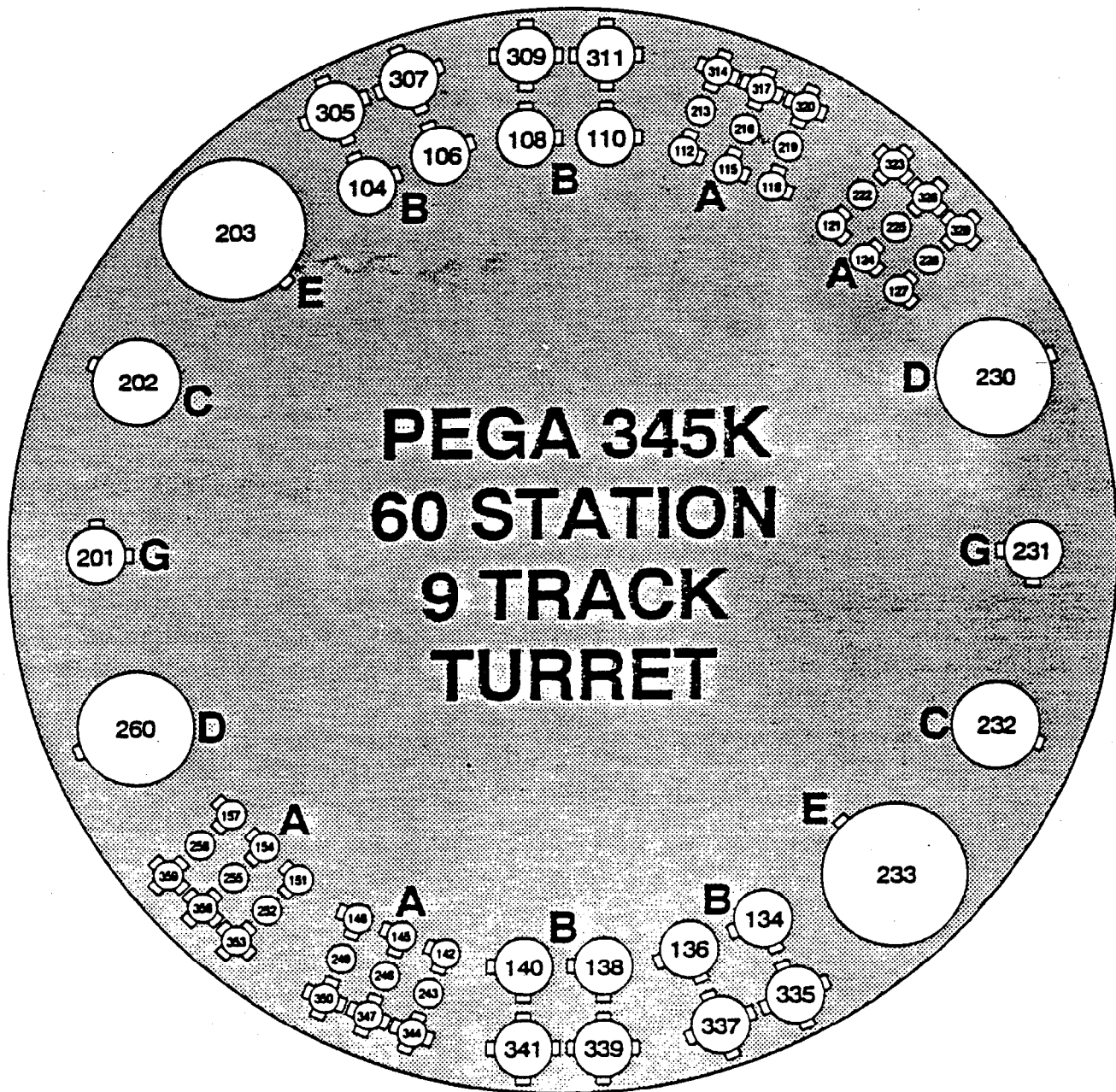


STATION ARRANGEMENT H-Type Tool Holder (9 Stations)



Punch Type	Nominal Punch Size	Standard Punch Size	Number of Stations Available
A	1/2"	1.6 - 12.7 mm dia. (0.063" - 0.5" dia.)	3
B	1-1/4"	12.8 - 31.7 mm dia. (0.501" - 1.25" dia.)	4
C	2"	31.8 - 50.8 mm dia. (1.251" - 2" dia.)	1
D	3-1/2"	50.9 - 88.9 mm dia. (2.001" - 3.5" dia.)	1



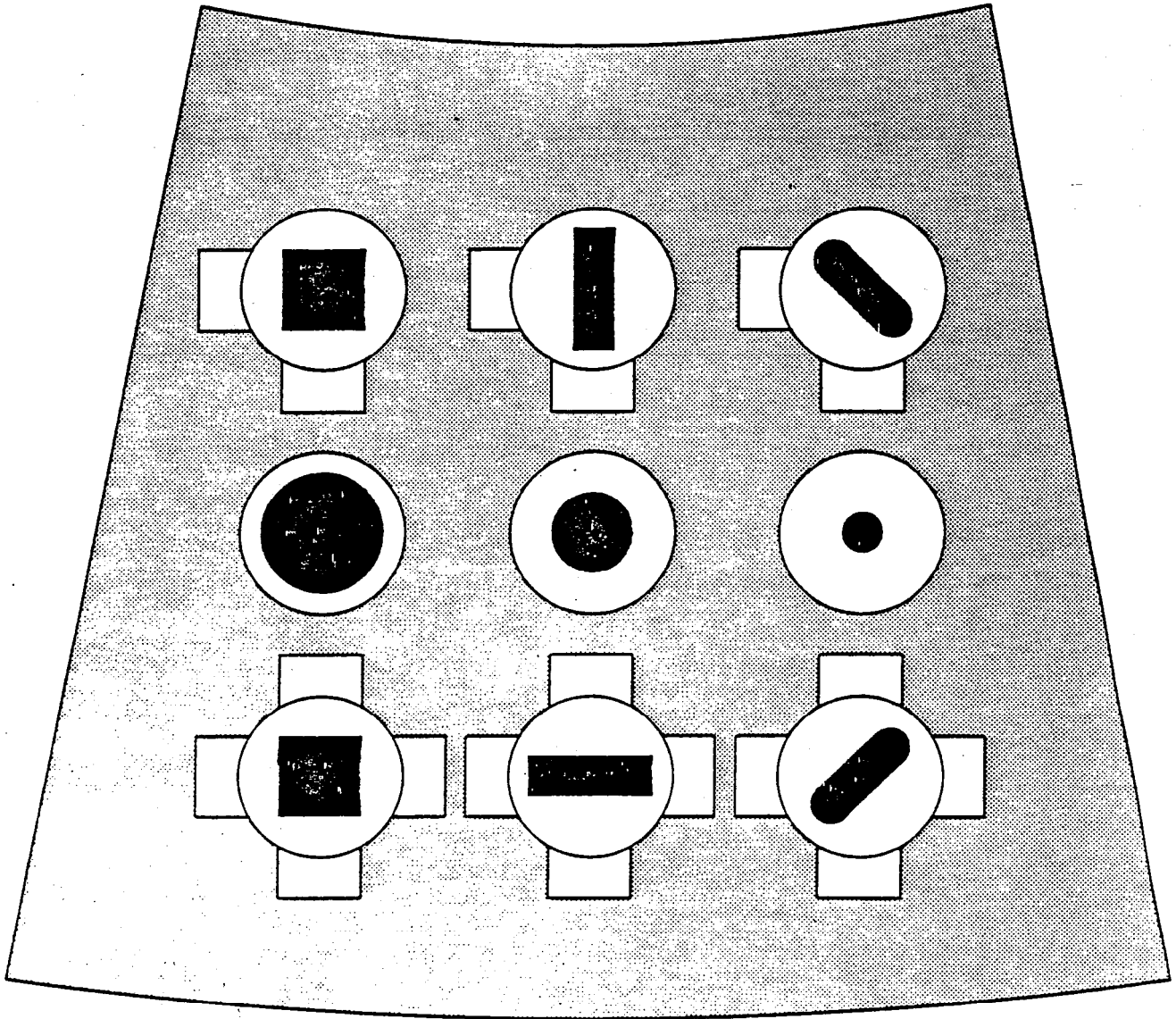


**PEGA 345K
60 STATION
9 TRACK
TURRET**

	MAXIMUM SIZE ROUND		NUMBER OF STATIONS (KEYED)	
A	1/2"	12.7mm	36 (24)	
B	1-1/4"	31.7mm	16 (16)	
C	2"	50.8mm	2 (2)	
D	3-1/2"	88.9mm	2 (2)	
E	4-1/2"	114.3mm	2 (2)	
AUTO INDEX	G	1-1/4"	31.7mm	2 (2)



PEGA 345K



60 STATION
9 TRACK TURRET
SECTION A



3

SOFTWARE

SECTION

II

QUICK REFERENCE FOR PROGRAMMING U.S. AMADA CNC TURRET PUNCH PRESSES

G** FUNCTIONS

- G21 Inch/metric selection
- G92 Establishes co-ordinate system. load position
- G90 Absolute
- G91 Incremental
- G70 Punch off
- G74 Octo punch off with offset
- G72 Pattern origin
- G28 Line at angle
I = spacing
J = angle: + or -
K = no. spaces
- G29 Arc
I = radius
J = starting angle; + or -
P = angle increment; + or -
K = no. holes
- G26 Bolt hole circle
I = radius
J = starting angle: + or -
K = no. holes
- G36/G37 Grid X/Grid Y
I = X spacing; + or -
P = no spaces X
J = Y spacing; + or -
K = no. spaces Y
- G66 Shear proof slotting
I = slot length
J = angle;
P = punch length; + or - } Must be
Q = punch width; + or - } same Sign
D = tab: + or -
- G66 No slug window using K
I = Window length in J direction measured.
from G72 point Positive value only.
J = Angle measured from 0 degrees, positive
angle only measured CCW from 0 degrees.
P = Tool length, positive or negative value
(the tool dimension in the "I" direction).
Q = Tool width. Positive or negative value
(the tool dimension in the "K" direction).
K = Window length perpendicular to "I".
C = Angle of auto index tool, if applicable.
T = Tool station number
- G67 Rectangular cut-out
I = hole length X axis; + or -
J = hole length Y axis; + or -
P = punch width X axis
Q = punch width Y axis - optional
- G68 Nibbling arc
I = radius
J = starting angle; + or -
K = moving angle; + or -
P = punch; +, -, or zero
Q = nibbling pitch
- G69 Nibbling line
I = length
J = angle
P = punch, +, -, or zero
Q = nibbling pitch

G** FUNCTIONS

- G78 Punching arc
I = radius
J = starting angle; + or -
K = moving angle; + or -
P = punch; +, -, or zero
Q = pitch
D = material thickness
- G79 Punching line
I = length
J = angle; + or -
P = punch, +, -, or zero
Q = pitch
D = material thickness
- G73 Mirror image X... Y... W... Q...
- G27 Auto repositioning
- G25 Auto repositioning with offset
- G93 Origin offset
- G04 Dwell function
- G50 Return home, program end

MISCELLANEOUS FUNCTIONS

- | | |
|----------------------------------|--------------------------------------|
| <u>M00</u> Program stop | <u>M15</u> Tapping rear |
| <u>M01</u> Optional stop | <u>M80</u> Work chute open |
| <u>M02</u> Program end | <u>M61</u> Work chute closed |
| <u>M06</u> Punch delay effective | <u>M62</u> Slug selector left |
| <u>M09</u> Punch delay finish | <u>M63</u> Slug selector right |
| <u>M12</u> Nibbling start | <u>M96</u> P-subprogram call |
| <u>M13</u> Nibbling stop | <u>M97</u> Subprogram end |
| <u>M14</u> Tapping front | <u>M99</u> "Coma" - punch speed chan |
| <u>A1</u> Single block storage | <u>F*</u> Feed rate control |
| <u>B1</u> Single block recall | / Block delete |

MULTIPLE PART PROGRAMMING

- G98 Multiple part layout
X...Y...I...J...P...K...
X = reference point for lower left hand part in X axis
Y = reference point for lower left hand part in Y axis
I = distance between reference points in X direction
(note: add slotting tool width)
J = distance between reference points in Y direction
(note: add slotting tool width)
P = number of parts in the X axis- excluding the bottom left part
K = number of parts in the Y axis- excluding the bottom left part
Example: G98X1000Y3000I8000J5000P3K2

PUNCHING EXECUTION OF G98 MULTIPLE PARTS

- G75 Execution of punching in horizontal direction (X direction).
- G76 Execution of punching in vertical direction (Y direction).

MACROS - U-V

- | | | |
|-----------------------------------|-------|-----------------------|
| <u>U*-V*</u> Multiple block store | 1-59 | Processes while stori |
| <u>W*</u> Multiple block recall | 60-89 | Stores only |
| Parameter 435 setting | 90-99 | Multiple macro store |

- 0: Programs which do not use software for multiple product punching.
- 1: Trial punching with programs using software for multiple product punching.
- 2: Remaining punch work after trial punching.
- 3: Entire punch work of multiple product punching.



QUICK REFERENCE FOR ALARM MESSAGES U.S. AMADA CNC TURRET PUNCH PRESSES

- 009 Prohibited address characters are input.
010. A prohibited G code is used.
- 070 The data input exceeds the memory capacity.
- 072 The number of registered programs exceeds the maximum value.
- 073 The program number to be registered already exists in memory.
- 144 A T code or M code is instructed in the nibbling command (between M12 and M13).
- 146 An illegal T code is instructed
- 147 The incremental value of X-axis and Y-axis movement in the nibbling operation is greater than the specification.
- 150 In the G26 command (BHC), no value is specified for I, J, or K In the G26 command, the value of I is zero or negative, or the value of K is zero.
- 151 In the G28 command (LAA). no value is specified for I, J, or K In the G26 command the value of K is zero or negative.
- 152 In the G29 command (ARC), no value is specified for I, J, P, or K In-the G29 command, the value of I is zero or negative, or the value of K is zero or negative.
- 153 In the G36 command (GAD-X) or G37 command (GRD-Y), no value is specified for I, J, P, or K In the G36 command or G37 command, the value of P or K is zero or negative.
- 154 In the G66 command(SHP), no value is specified for I, J, or P. In the G66 command, the value of P or Q is zero, or the value of I is less than 1.5 times as large as that of P.
- 155 In the G67 command(SQR), no value is specified for I, J, or P. In the G67 command, the value of P is zero or negative, or the value of I or J is less than 3 times as large as that of P.
- 156 In the G66 command (NBL-A), no value is specified for I, J, K P, or Q. In the G66 command the value of Q is zero or negative, or the value of Q exceeds the specified range. In the G68 command, the value of I is zero or negative.
- 157 In the G69 command (NBL-L), no value is specified for I, J, P, or K In the G69 command, the value of Q is zero or negative, or the value of Q exceeds the specified range.
- 156 In the G76 command (PNC-A), no value is specified for I, J, K P, Q or D. In the G78 command the value of Q is zero or negative, or the value of Q is less than the value of D. In the G76 command, the value of I is zero or negative.
- 159 In the G79 command(PNC-L), no value is specified for I, J, P, Q, or D. In the G79 command, the value of D is zero or negative.
- 160 X-axis movement instruction exceeds its travel end [positive (+) direction].
- 161 X-axis movement instruction exceeds its travel end [negative (-) direction].
- 162 Y-axis movement instruction exceeds its travel end [positive (+) direction].
- 163 Y-axis movement instruction exceeds its travel end [negative (-) direction].
- 164 The Pattern Memory/Recall number is other than 1 to 5.
- 165 An attempt is made to input another macro where one macro is already stored. Although a macro is not being input, the V code is instructed There is no correlation between macro numbers U and V.
- 166 Illegal macro number is used
- 167 An attempt is made to store macros exceeding the memory capacity.
- 188 A macro not stored in the memory is called
- 169 Macros are caked more than three-fold
In storing the 90 series macros, an attempt is made to store more than 15 macros
- 190 In the G75 command (Multiple Punching Execution-X) or G76 command (Multiple Punching Execution-Y), no value is specified for W or Q.
- 191 In the G75 or G76 block, the value of Q is wrong
- 192 Macro data called by the G75 or G76 block is not in memory.
- 193 G75 or G76 is instructed when the Multiple Part Punching Program Setting is 0.
- 194 G75 or G76 is instructed between the Uo and Vo commands
- 196 G75 is instructed although PO is specified in the G96 block
G76 is instructed although KO is specified in the G96 block
- 197 The value of Q in the G76 block is neither 1 nor 3, although PO is specified in the G96 block
The value of Q in the G75 block is neither 1 nor 2, although KO is specified in the G96 block

G70 PUNCH OFF

Allow the table to be moved to a specified location by means of X and/or Y command(s) with no punch activity.

G70 can be used with either **G90** (absolute) or **G91** (incremental) modes.
i.e. **G90G70X10.Y10.** or **G91G70X10.Y10.**

G70 can also be used to set a new machine **origin** when used in conjunction with a new **G92** statement. This feature is used for limiting table travel when **punching** narrow strips in the Y direction. The format is as follows:

G70Y30. (Moves table to this location)

G92X50.Y30. (Establishes this position as new table origin)

G90X--.Y--.T- (Punching command)

G50 (Returns table to new set origin of Y 30.)

Note: At the end of production run, the machine must be returned to the home origin by using the retract mode.

After a G70 is executed, the table does not stop; the next command is read and the punch responds to the new programmed command.

The primary use for the G70 is to position the table without punching as a preparation for a repositioning command. Table position is important to allow existing hold downs to support the material during the reposition process. Material size and hole locations must be considered.

G72 PATTERN ORIGIN STATEMENT

G90G72X...Y...

G91G72X...Y...

G72 is used to locate the coordinates of pattern origin.

Example:

G90G72X20000Y 12000

When a pattern command is given to the next block, pattern processing takes place with **X20", Y12"** as the pattern origin.

The G72 command will be covered in detail over the next few pages.

The command can be made both at an absolute value and at an incremental value.

G72 simply selects a coordinate; neither positioning nor punching is made.

The block-after G72, a pattern command must always be given.

Never command M or T function in the block for G72.

Never program as follows:

G90G72X12000Y8000T20 1

G91G72X6000Y10000M00

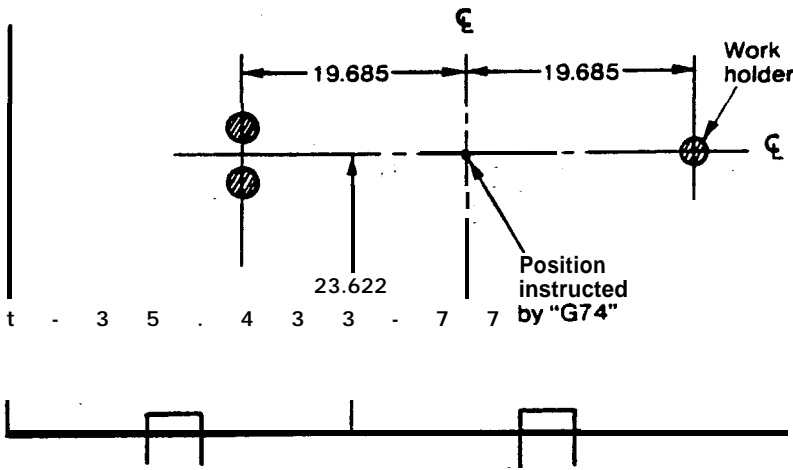
In case an incremental value of X, Y is given after a pattern of command, it must refer from the point of pattern completion.



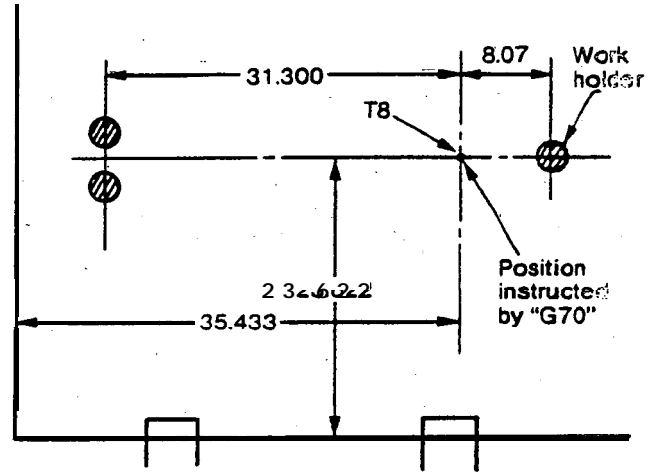
G74 - PUNCH OFF WITH OFFSET (OCTO ONLY)

When "G74 X___ Y___" is read, the worksheet is moved without punching to a position where the **instructed position** comes to the center of the left and right work holders. When **using** the auto repositioning **function**, the work holder **position** will be easily calculated by using this **code**. "G74" can be entered along with "G90" or "G91".

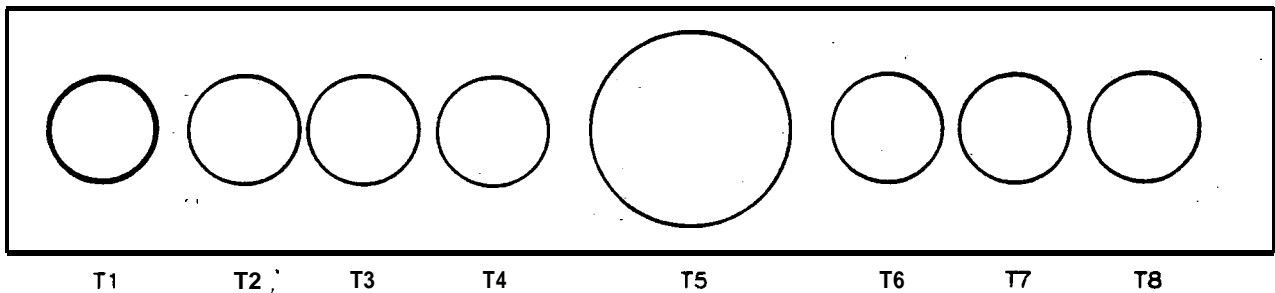
Positioning by "G74"
 G90X11.811Y15.748T8
 G74X35.433Y23.622



Positioning by "G70"
 G90X11.811Y15.748T8
 G70X35.433Y23.622



Octo Tool Station Rack



Note: Using G74 will position selected X and Y axis approximately in the center of the carriage.



G27 REPOSITIONING

Format: G27X+ or G27X-

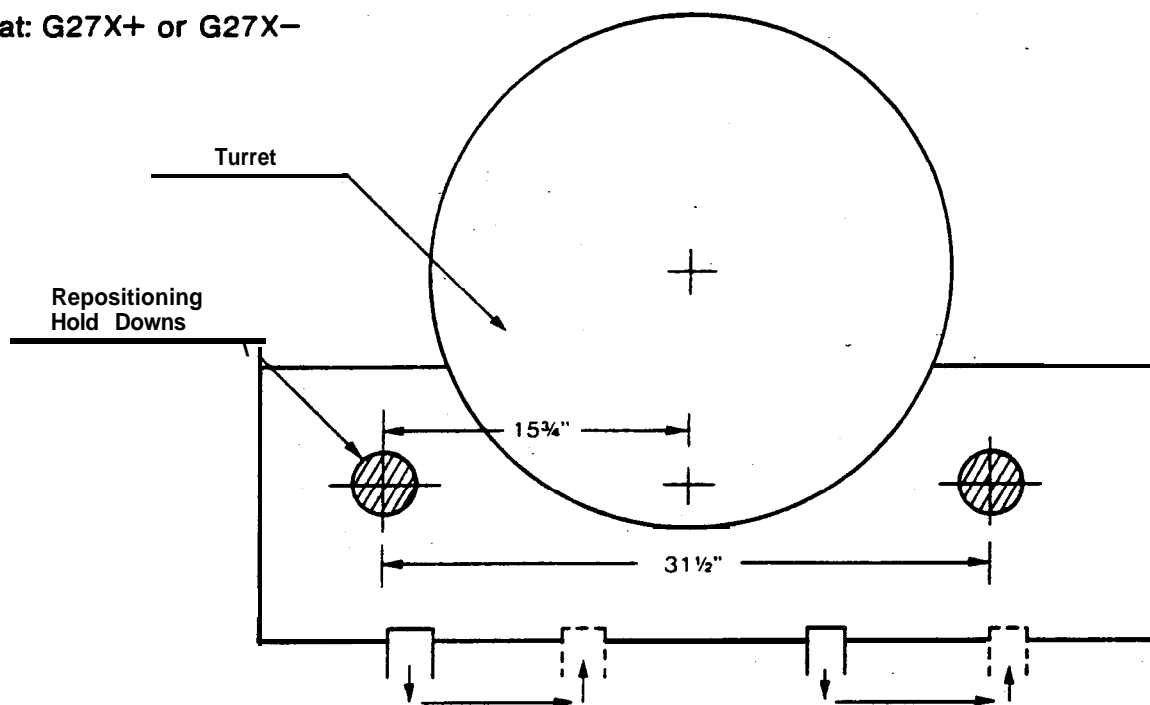


Figure 5

The sequence of repositioning is as follows:

1. Work holders secure the material (both work holders should contact material).
2. Work clamps release.
3. Carriage backs away **.094** inch.
4. Carriage moves programmed amount in X axis. (Positive X value repositions as shown in Fig. 5, negative X value will cause repositioning in reverse direction.)
5. Carriage moves in **.094** inch to original position, work clamps reclamp material.
6. Work holders release material.

Note: Over-travel error may occur during a repositioning move. Example: If the X axis is at the position X30000 prior to repositioning, the maximum repositioning move is **G27X30000**. The amount to be repositioned with the G27 must be less than or equal to the X axis position before the G27 command.

Example:

G70X30000Y 15000
G27X25000

(Right)

G70X30000Y 15000
G27X35000

(Wrong)

Overtravel

Note: MINIMUM Y VALUE for repositioning is 5 inches.

- A. If a value less than Y5.000 is used, the override light will come on and the machine will stop.
- B. Pressing the START button **will** restart the machine and continue operation.

CAUTION: DAMAGE MAY OCCUR. A clamp may hit the turret or a holddown pad.

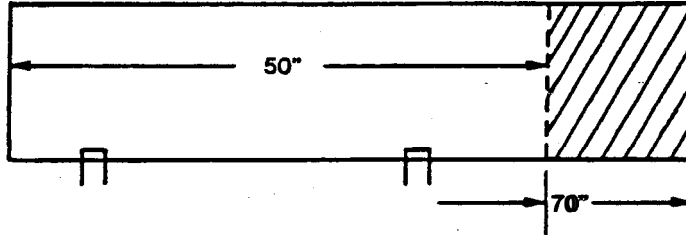


G27 REPOSITIONING (Continued)

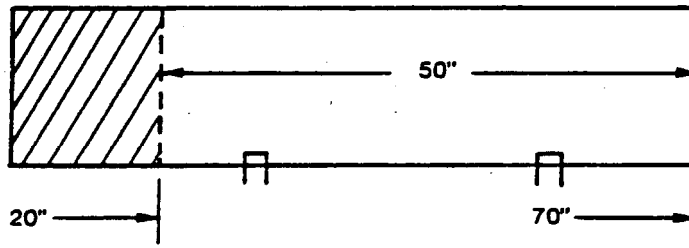
With repositioning, the programming limits relative to the X axis are changed **by the** programme amount.

Example: **G27X20000** (For Coma 50/50/50)

1. Before repositioning, punching area is 0" to 50" X value.



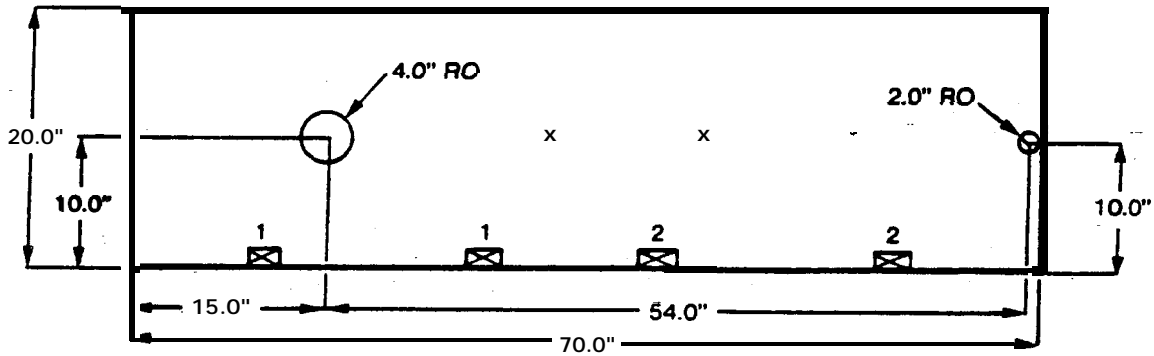
2. After repositioning (positive 20 inches), punching area is 20" to 70" X value.



After repositioning, absolute dimensions are still relative to the origin. The control automatically compensates for the repositioning move. Repositioning may be in a positive or negative direction.



EXAMPLE NO. 1



G92X39.37Y39.37

G90X15.0Y10.0T210

G70X39.0Y 15.0

G27X3 1.0

X69.0Y10.0T215

G70X39.Y15.

G27X-31.

G50

(SETS ORIGIN FOR PEGA)

(PUNCHING OF 4" RO. HOLE)

(POSITIONS SHEET UNDER HOLDDOWNS)

(REPO OF 31" IN X AXIS)

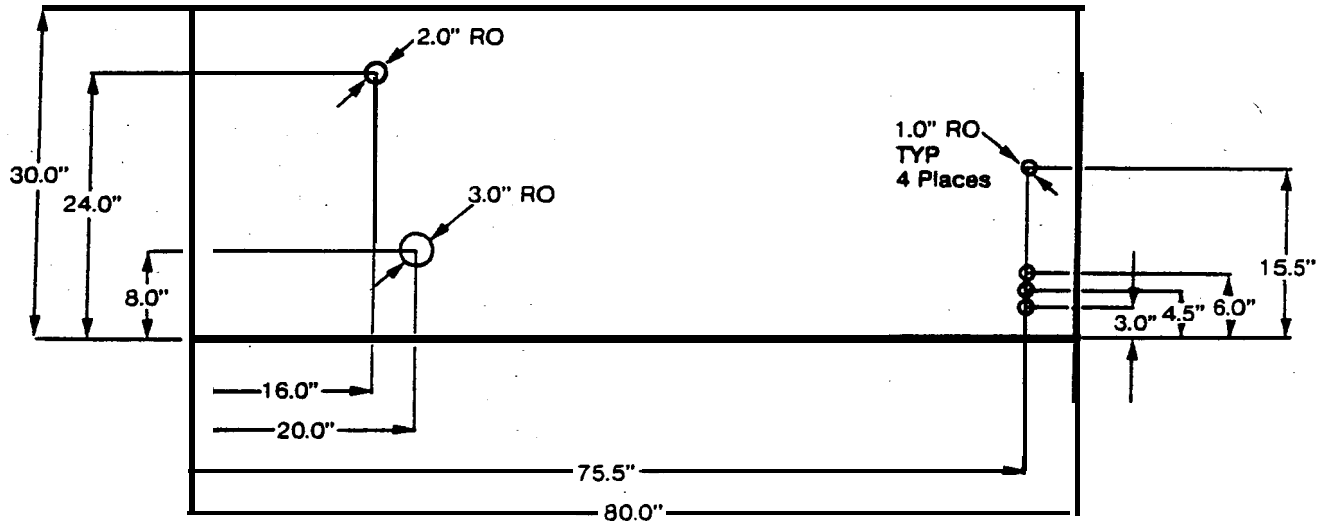
(PUNCHING OF 2" RO. HOLE)

(RETURN HOME)



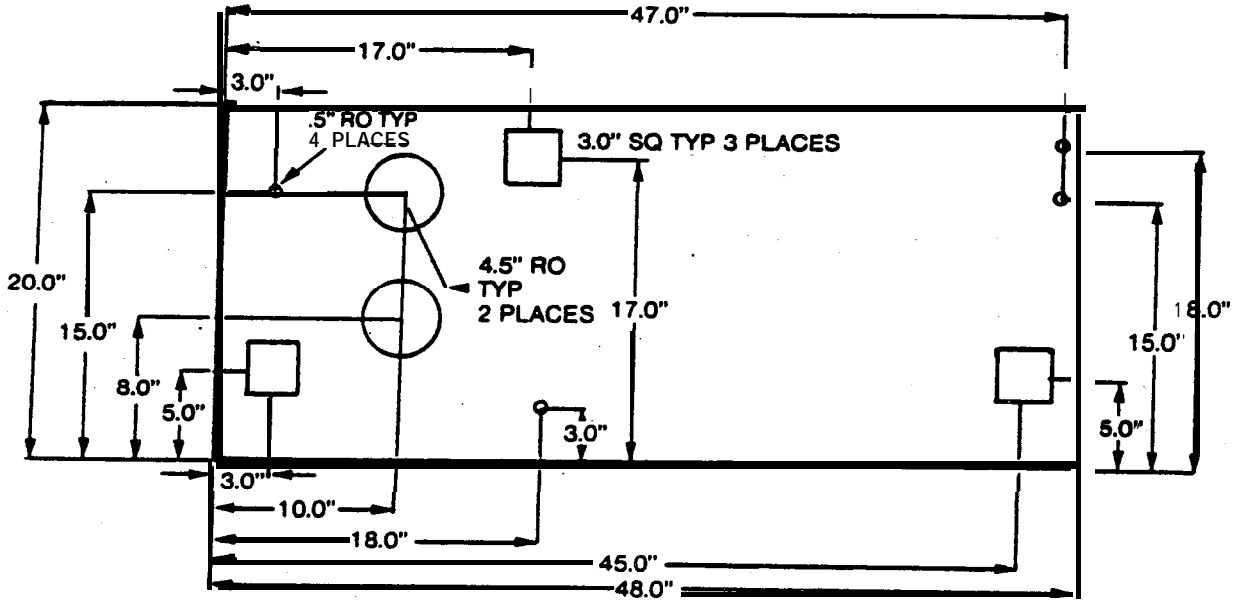
PROGRAM NO. 3

- (2.RO)
- (3. RO)
- (1. RO)



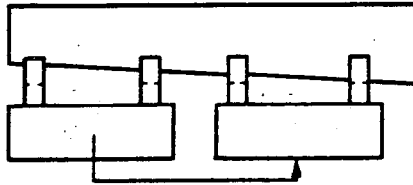
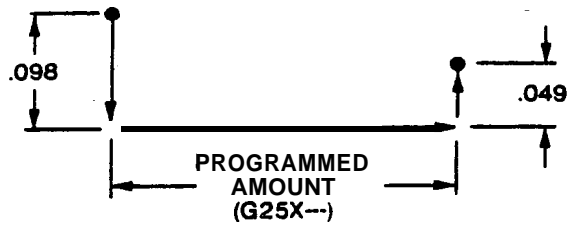
PROGRAM NO. 4

(.5 RO)
(4.5 RO)
(3. SQ)

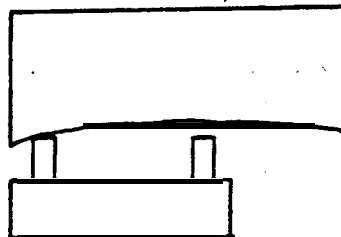
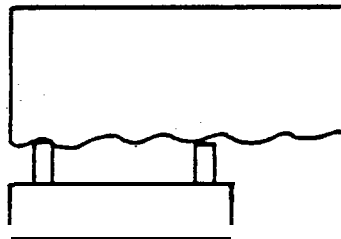
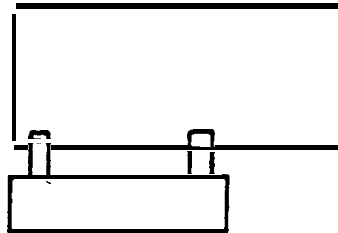


OPTIONAL REPOSITIONING

The **G25** repositioning move is executed as shown below:



Note: The offset value is automatically compensated for by the computer.



G28 LINE AT ANGLE (LAA)

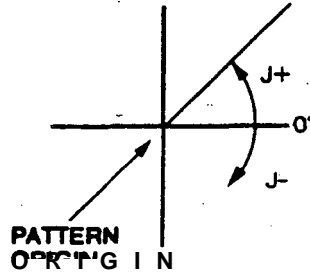
G28 I (Spacing +) J (Angle + or -) K (# of Spaces) T XXX

Allows punching along a line at an angle to the X axis by specifying, in order, the increment value between holes, angle of line, and number of spaces. First pattern origin coordinate must be given.

I: Spacing + Positive value only.

J: **Angle + or -**

K: Number of Spaces (Not Holes)

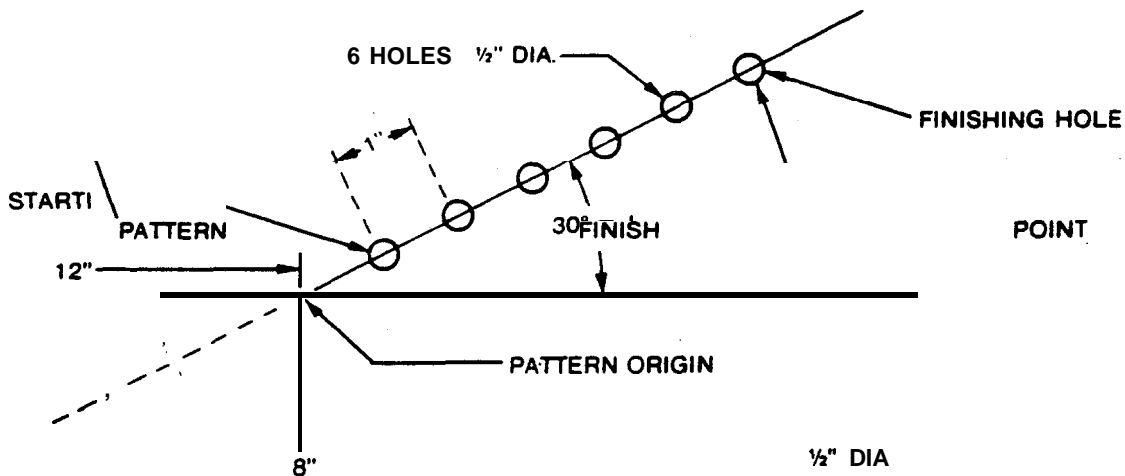


Note: Minutes must be converted to decimal notation. (One possible formula to convert-minutes to decimal is $1.666 \times \text{Minutes} = \text{decimal notation}$.)

I and J are given as follows:	I 38"	38000	38.
	J22° 30'	2250	2 2 . 5

Example:

G72G90X12000Y8000
G28I1000J3000K6T203

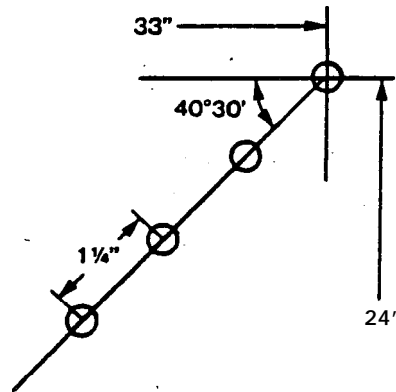


When a hole is made at pattern origin (X12", Y8"), neglect G72 and give **T203** in the **same** block.



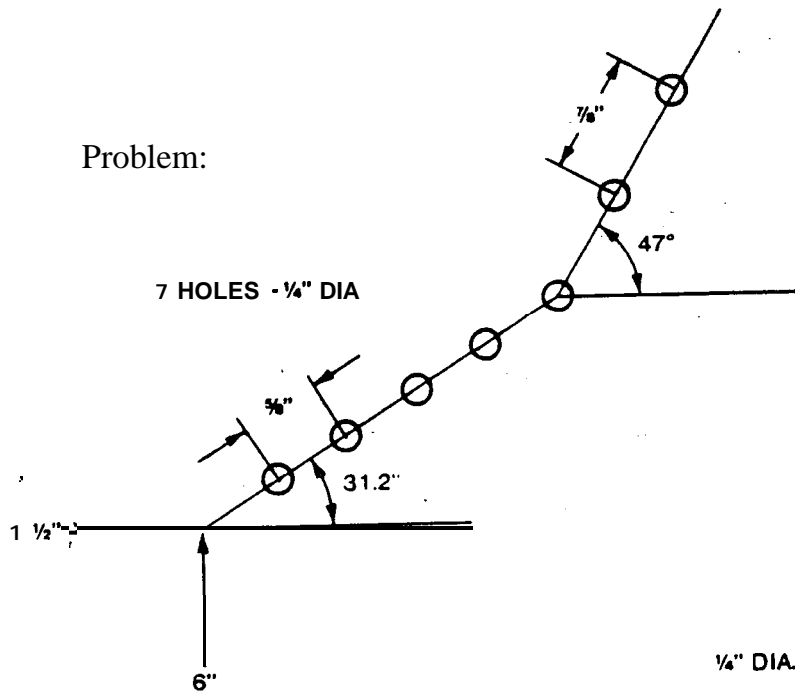
G28 LINE AT ANGLE (LAA) (Continued)

Problem:



4 HOLES - $\frac{1}{2}"$ DIA $\frac{1}{2}"$ DIA.

Problem:



7 HOLES - $\frac{1}{4}"$ DIA

$\frac{1}{4}"$ DIA.



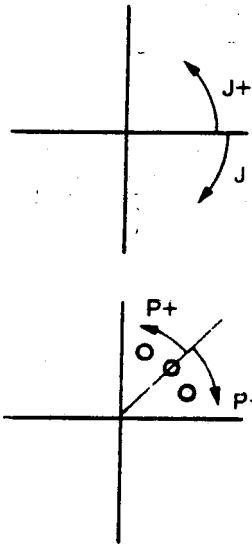
G29 ARC OF HOLES (ARC)

G29 I (Radius) J (Starting **Angle ±**) P (Angle Increment **±**) K (**#** of Holes) T **XXX**

Allows for computation of holes along an arc by specifying, in- order, the radius of arc: I, angle from X axis of first hole: J, incremental angle between holes: P, number of holes: K.

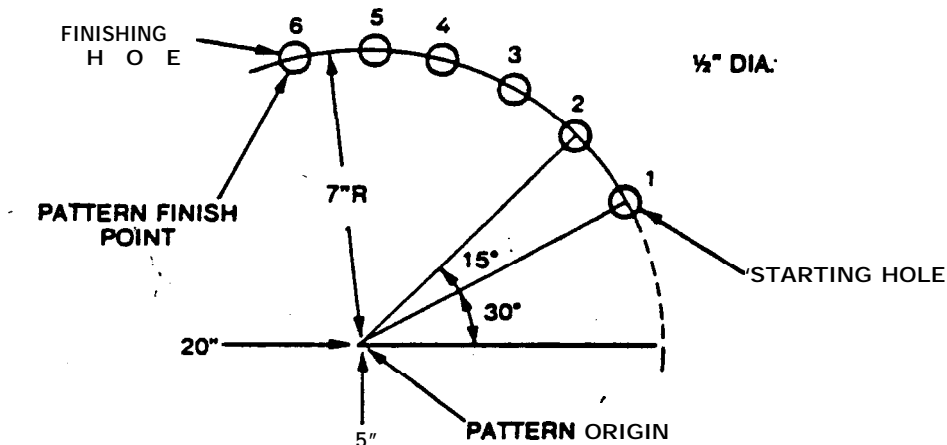
Pattern origin coordinate (arc Center) must first be given in G72 block.

- I: Radius Positive Number
- J: Starting angle
counterclockwise-positive,
clockwise - negative.
- P: Incremental angle
Positive - counterclockwise
Negative - clockwise
- K: Number of holes



Example:

G72G90X20000Y5000
G29I7000J3000P1500K6T203

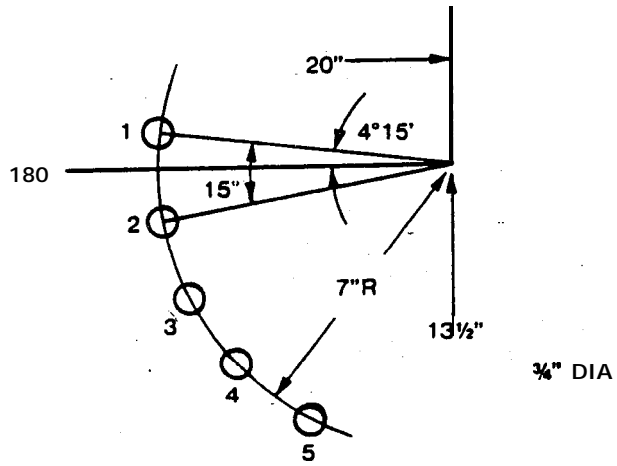


Notes: When a hole is made at pattern origin (X20", Y5") neglect G72 and give T203 in the same block. When P-1500 is given, punching is performed in the clockwise direction from the starting point.



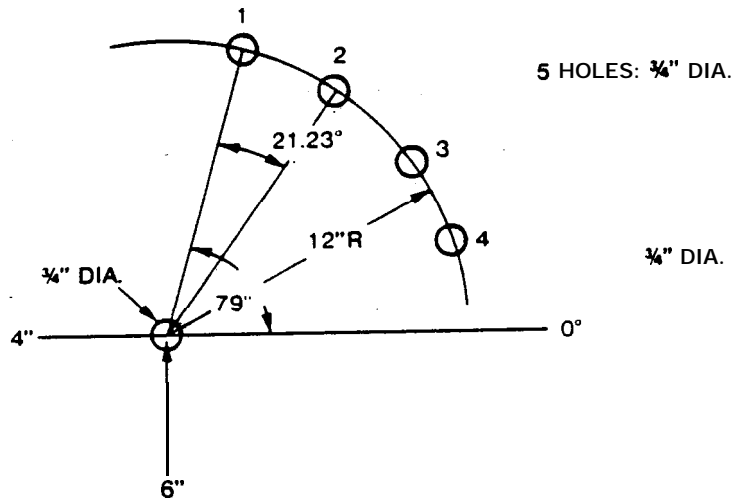
G29 ARC OF HOLES (ARC) (Continued)

Problem:



5 HOLES: 3/4" DIA.

Problem:



5 HOLES: 3/4" DIA.

3/4" DIA.

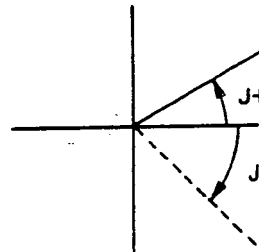


G26 BOLT HOLE CIRCLE (BHC)

G26 I (Radius) J (Starting Angle \pm) K (# of Holes)

Allows for computation of bolt holes by specifying, in order, the radius of circle: I, angle from X axis of first hole: J, and number of holes: K. Pattern origin coordinate (circle center) must first be given in G72 block, or punching.

- I: Radius of circle (I) positive number
- J: -Starting angle:
Counterclockwise: Positive
Clockwise: Negative
- K: Number of holes: positive number only

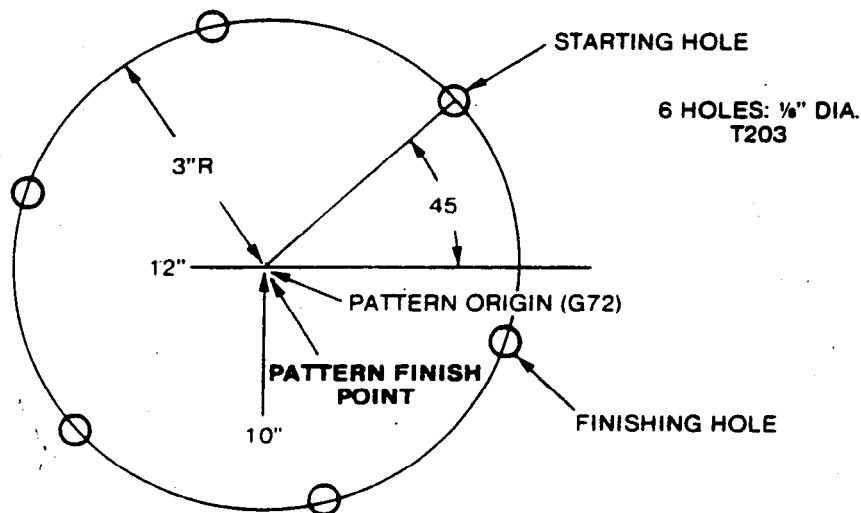


Example:

G72G90X12000Y10000
G26I3000J4500K6T203

OR

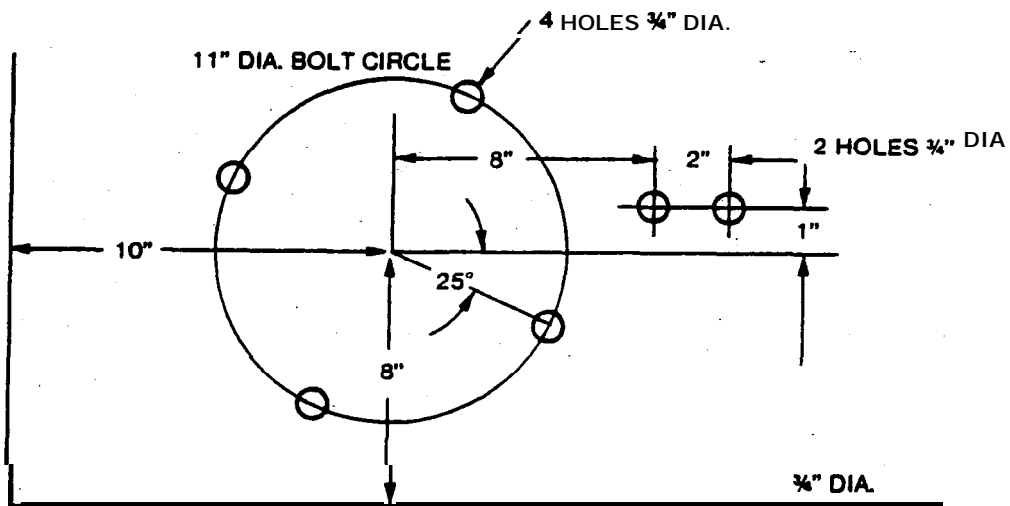
G72G90X12.Y 10.
G26I3.J45.K6T203



Notes: When a hole is made at pattern origin, neglect G72 and give **T203** in the same block. (Pattern finish point coincides with pattern origin).

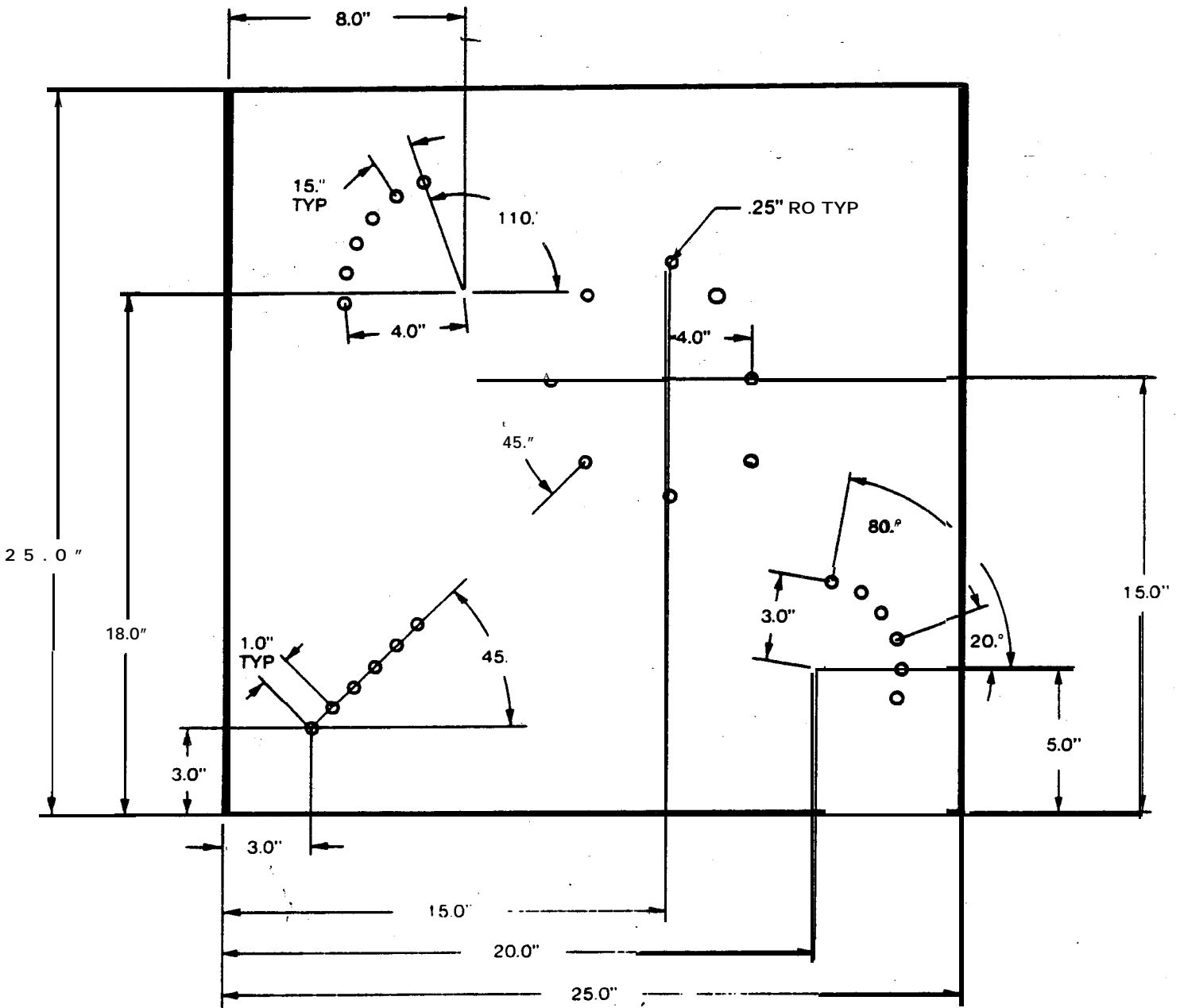
G26 BOLT HOLE CIRCLE (BHC) (Continued)

Problem: Process BHC first, then process two holes $3/4"$ dia. by means of incremental instruction.



PROGRAM NO. 5

(.25" R O)



G36 GRID (GRD-X) / G37 (GRD-Y)

G36 (Grid **X**) **I** (Spacing "**X**" \pm) **P** (No. of spaces "**X**") **J** (Spacing "**Y**" \pm) **K** (No. of Spaces "**Y**") **T** XXX

Allows for computation of holes in a grid pattern by specifying, in order: direction, increment and number of spaces of each axis.

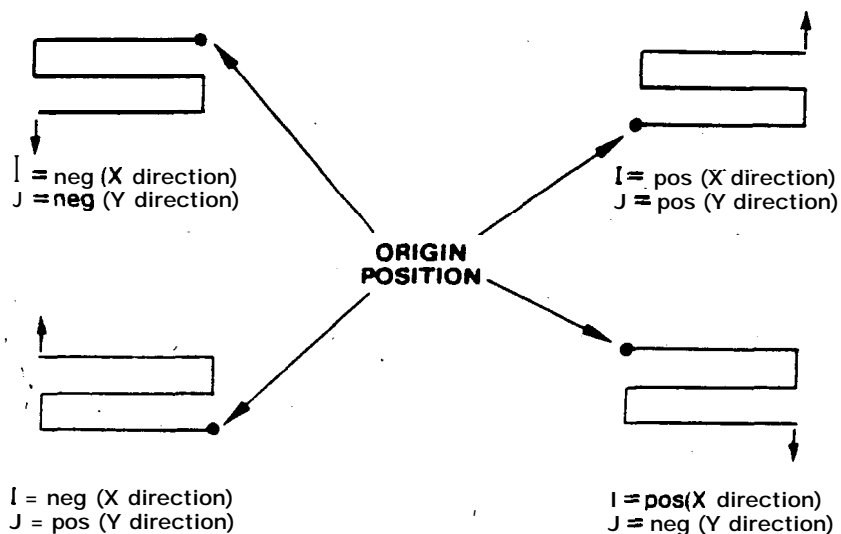
Pattern origin coordinate must first be given. (G90 or G72)

G36: Punching in **the X** axis direction.

G37: Punching in the Y axis direction.

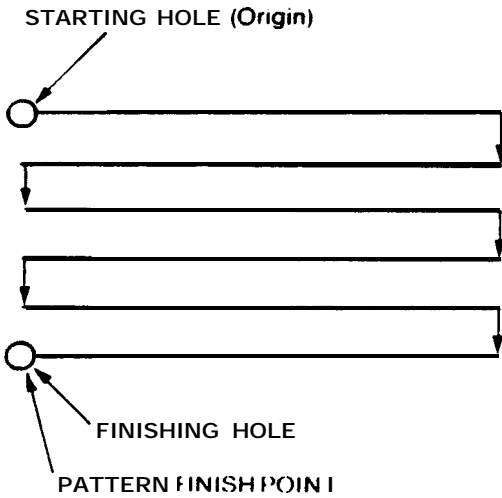
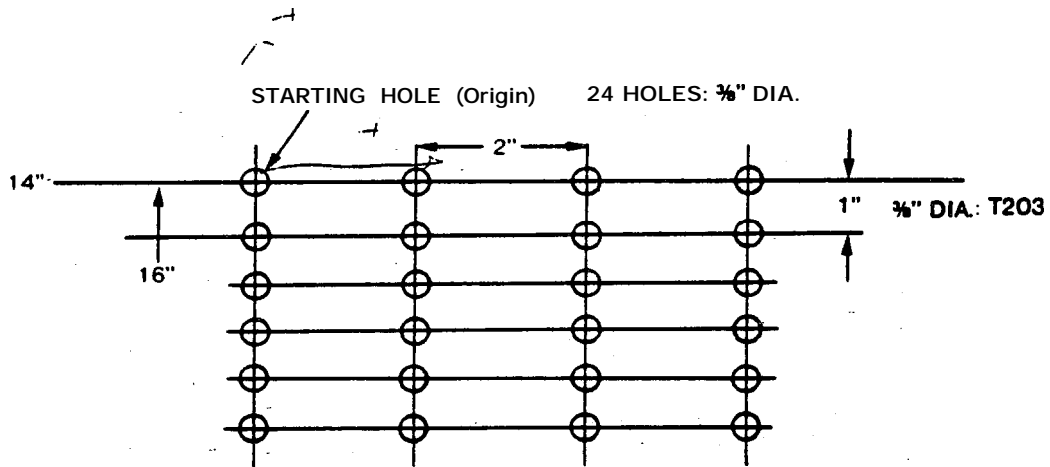
- I:** Increment or Spacing \pm
 - + X direction: positive
 - X direction: negative
- P:** Number of spaces in X direction:
- J:** Increment or Spacing \pm
 - + Y direction: positive
 - Y direction: negative
- K:** Number of spaces in Y direction:

The sign of I and J

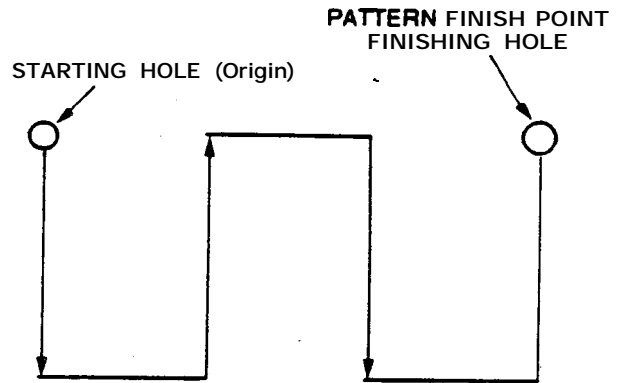


G36 GRID (GRD-X) / G37 (GRD-Y) (Continued)

Example:



G90X14000Y16000T203
G36I2000P3J-1000K5



G90X14000Y16000T203
G37I2000P3J-1000K5

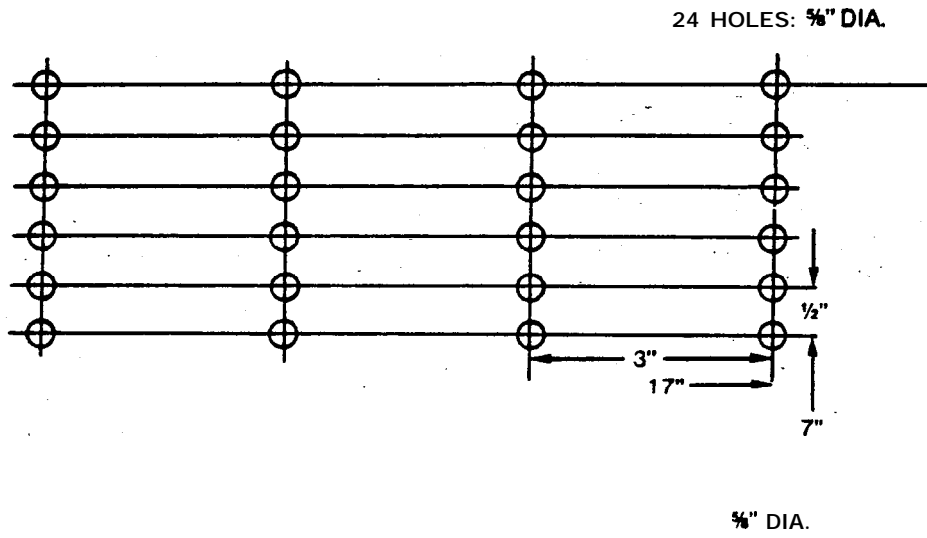
When a hole is omitted at pattern origin (14", 16"), add G72 and neglect T203 in the same block.

G72G90X14000Y 16000
G36I2000P3J-1000K5T203



G36 Grid (GRD-X) / G37 (GRD-Y) (Continued)

Problem: Choose the most appropriate direction to punch the grid below.

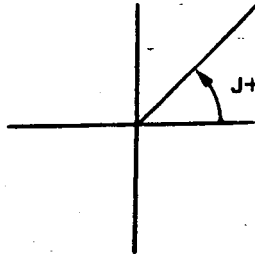


G66 SHEAR PROOF (SHP)

G66I (Hole Length +) J (Angle +) P (Punch Length \pm) Q (Punch Width?) D (Compensation Value \pm) T XXX

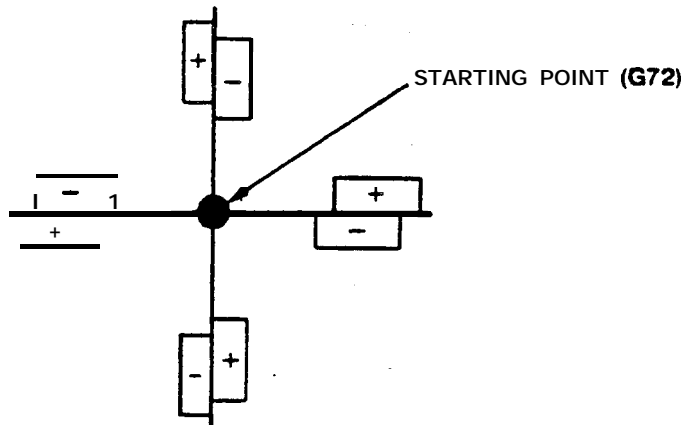
Allows for computation of holes in a shear proof pattern along a line at an angle to the X axis by specifying, in order: hole length: I, angle: J, punch length: P punch width Q and compensation value D. Pattern origin coordinate must first be given in G72 Block.

- I: Hole length: +, incremental value
- J: Angle: +
Positive - counterclockwise direction only.
- P: Punch Length: \pm
- Q: Punch Width: \pm
- D: Compensation Value: \pm



The signs of P and Q must be the same. When a punch is square, Q can be neglected.

If "D" = 0, "D" can be omitted.



When G72 is neglected, the pattern origin (14", 8") is also punched.

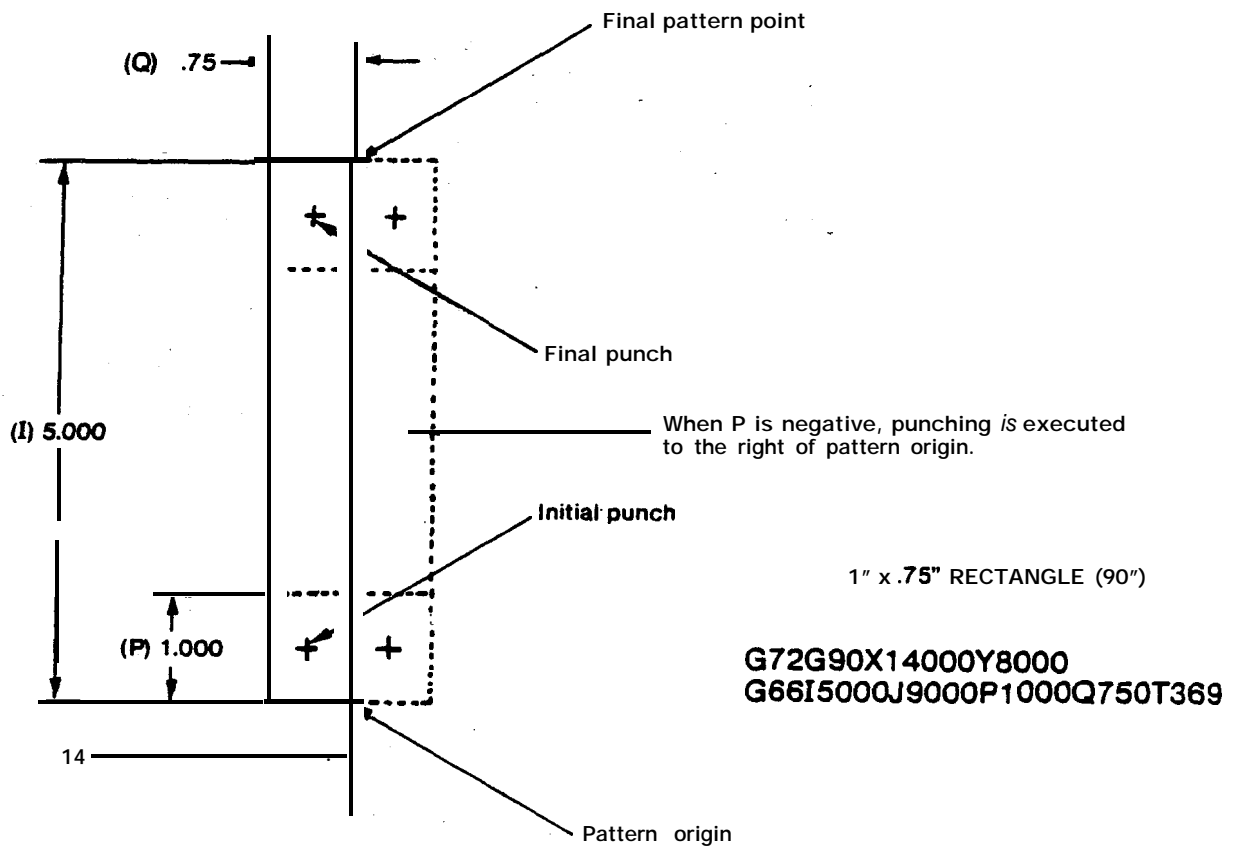
Note: **I (punching length) must be at least 1.5 times as long as P (Punch Length). Pattern finish point does not coincide with finishing hole center.**

When "D" is **negative**, "I" is shortened by "D" the amount of D, at each end of "I" dimension.

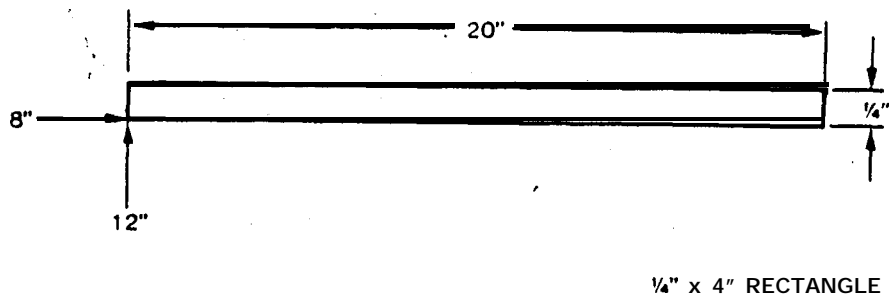


G66 SHEAR PROOF (SHP) (Continued)

Example:



Problem:



BASIC PROGRAMMING MANUAL

NCT 1 part 2

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REGISTRATION FORM

CLASS FEEDBACK

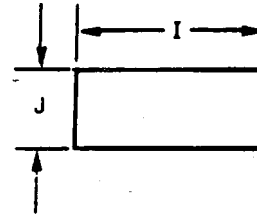


G67 SQUARE (SQR)

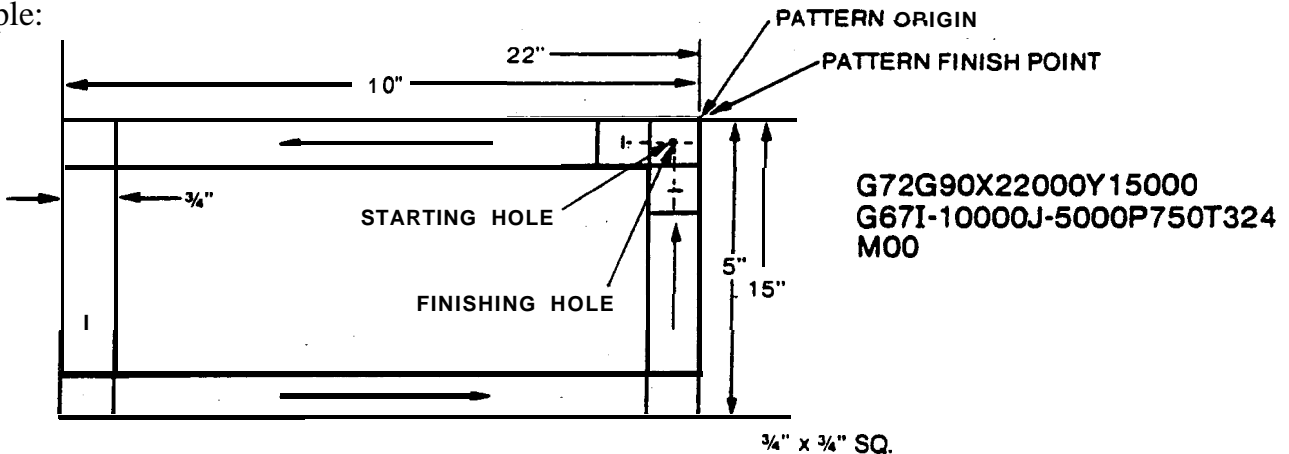
G67 I (Hole Length \pm "X") J (Hole Length \pm "Y") P (Punch Size)

Allows for computation of holes in a square pattern by specifying, in order, hole length: I and J punch size: P. Pattern origin coordinate must first be given in G72 block.

- I: Hole length: \pm
 - + X direction: length value is positive
 - X direction: length value is negative
- J: Hole length: \pm
 - + Y direction: length value is positive
 - Y direction: length value is negative
- P : Punch size: Positive value only
 - Square punch (rectangle optional)
- Q: Punch width Y axis (optional)



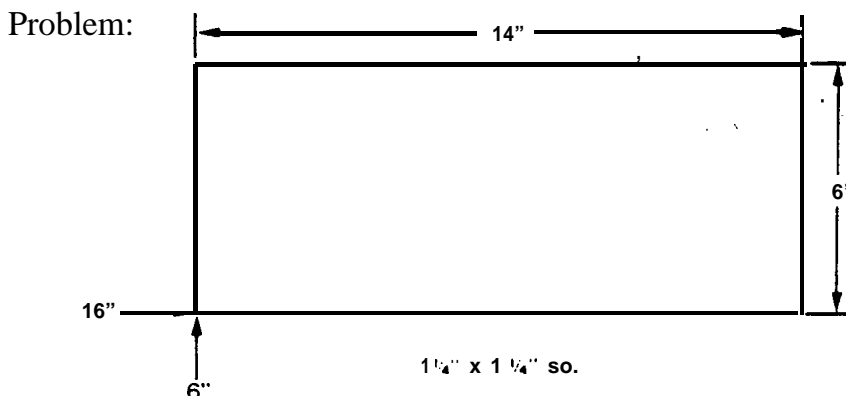
Example:



When G72 is neglected, the pattern origin (22", 15") is also punched. MOO or M01 should be commanded when a workpiece slug remains.

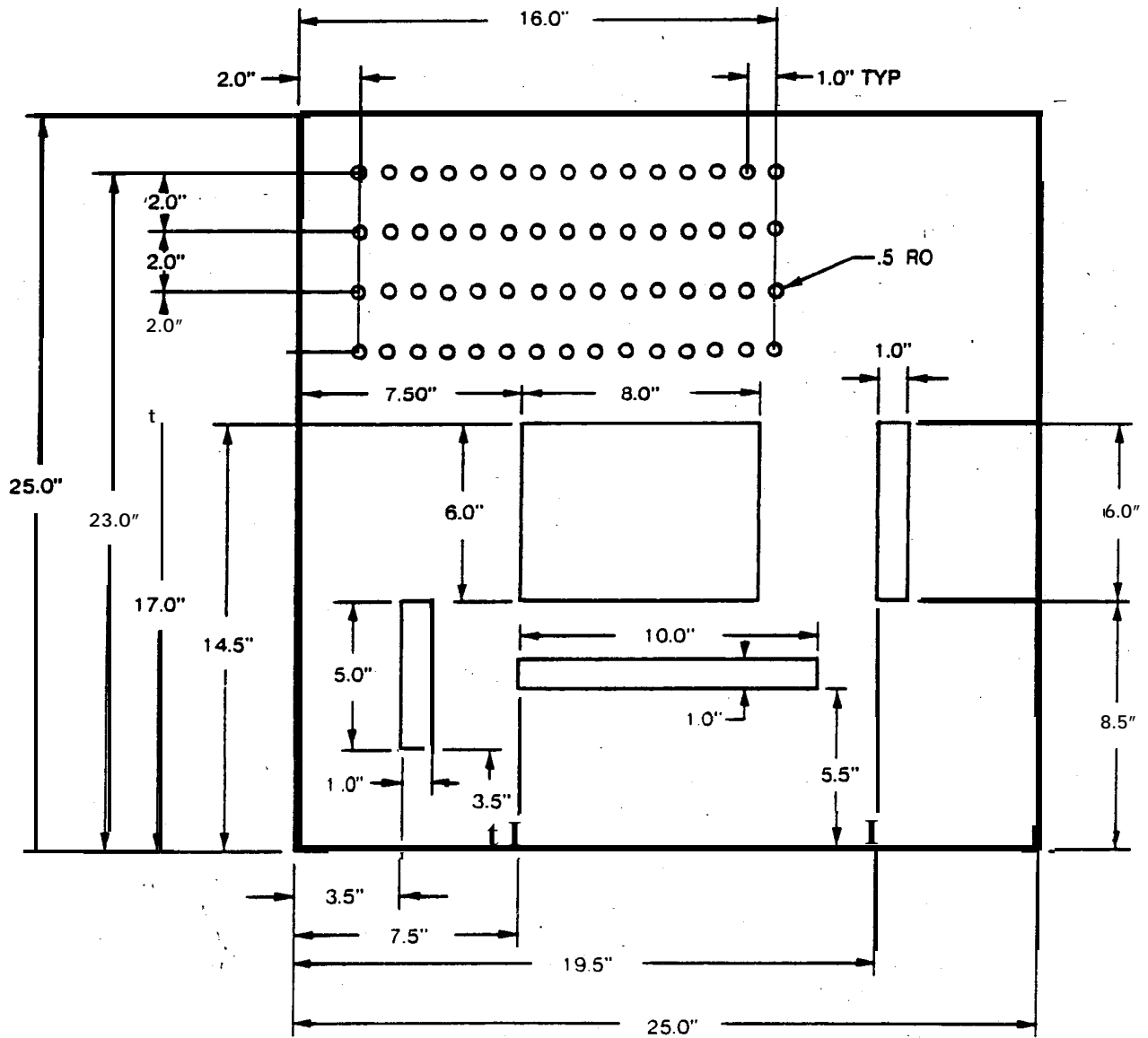
The pattern origin is normally located in the upper right-hand corner, to make scrap removal easier. Therefore both I and J will be negative..

Note: Both I and J lengths in the X and Y directions, respectively, must be at least three times as large as the punch width.



PROGRAM NO. 6

(.5 RO)
(1. SQ)



G66 WITH "K" (No slug rectangular cutout)

The G66 command can be used to punch out a square or rectangular cutout with no slug left by inserting a **K** command within the **G66** line. The "**K**" command would be used to describe the height of the required cutout.

FORMAT: G66 I---J---P---Q---K---T---C

- I:** X axis length of window from origin point. Positive only.
- J:** Angle from 0 degrees, positive only CCW from 0 degrees.
- P:** Tool length, positive or negative, (dimension in I direction).
- Q:** Tool width, positive or negative (dimension in **K** direction).
- K:** Y axis **width** of window from origin point. Positive only.
- T:** Tool station number.
- c:** If auto index is used: tool angle input.

Normally the I dimension will be the longer dimension of the cutout.

Notes:

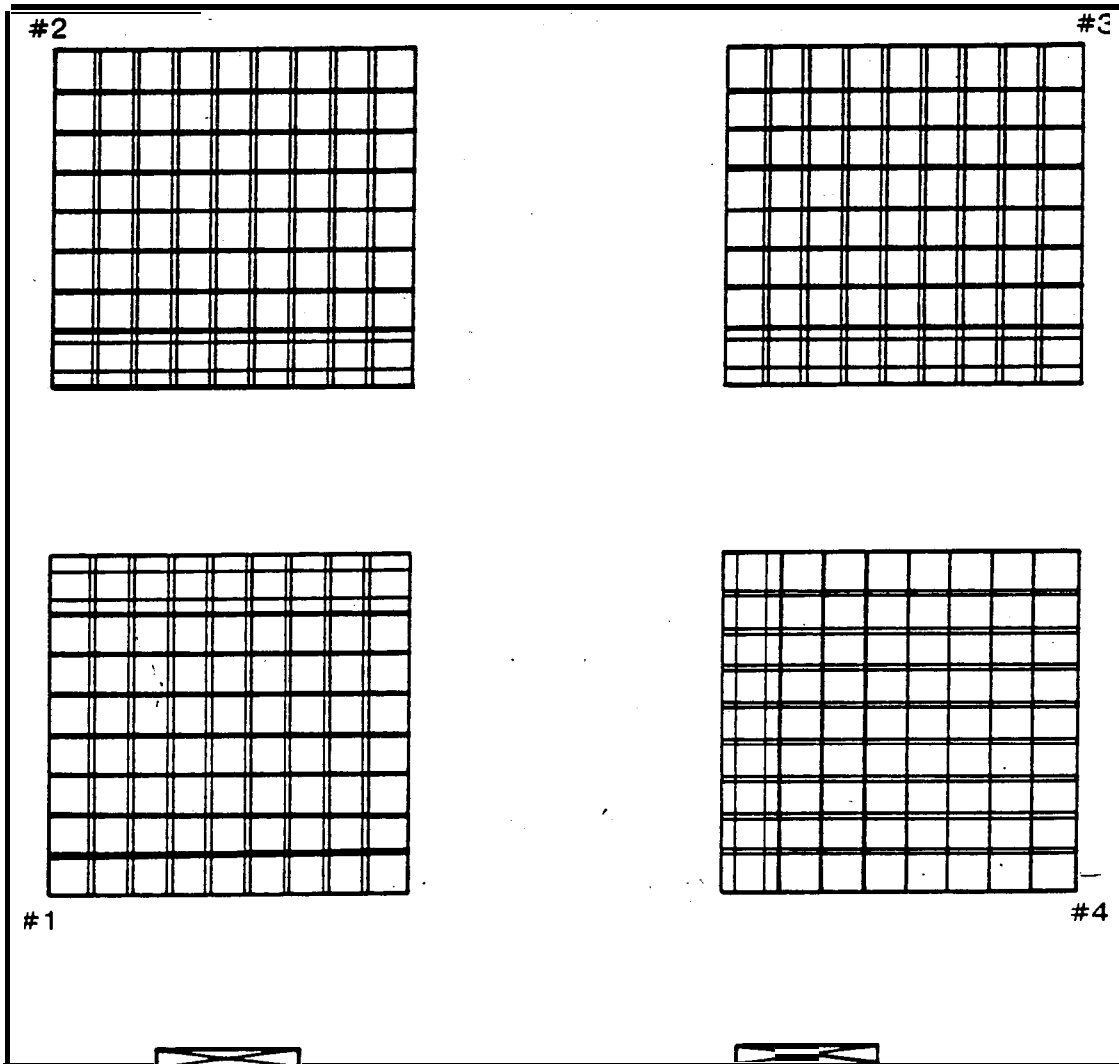
1. This function is applicable only to machines with 6M Fanuc controls that use 931, Version 10 software or higher. The software version may be found by powering down the control, turn on control and look at the CRT screen. A number next to the work version will appear. That is the control software version. All versions of **M31** controls are capable of this command.
2. 200B and 3000C controls do not have provisions for this function.
3. G66 processes a window and leaves no scrap, proper tool overlap is provided by the command, when "**K**" is used.
4. The value of "I" must be at least 1.5 times the value of "**P**".
5. The value of "**K**" must be at least 1.5 times the value of "Q".
6. When it is desired to process a shear-proof slot; "**K**" should be omitted.
7. A square or rectangle punch may be used, however, square punches are recommended for better tool life.
8. Small punches should not be used when processing large windows, excessive punching time results.
9. The sign of "**P**" determines the offset direction: i.e., positive offsets the punch to the left of the "I" length for pattern origin, negative offsets the pattern to the right.
10. The sign of "**P**" and "**Q**" must be the same.



EXAMPLE NO. 2

G66 with **K**
SHEET SIZE 25000/20000
CLAMP (1) 5000
(2) 18000

G92x39.37Y39.37
Pattern Origin: #1 G72X1.Y4
G66I8.J0P1.K8.T223
#2 G72X1.Y24.
G66I8.J0P-1.K8.
#3 G72X24.Y24.
G66I8.J180.P1.K8.
#4 G72X24.Y4.
G66I8.J90.P1.K8.
G50
END



G68 NIBBLING ARC (NBL-A)

G68I (Radius) **J** (Starting Angle?) **K** (Moving Angle \pm) **P** (Punch Dia. Offset \pm) **Q** (Pitch) **T** XXX

Allows nibbling along an arc or a circle by specifying, in order, radius of arc or circle: **I**, starting angle: **J**, Moving angle: **K**, punch diameter offset: **P**, nibbling pitch: **Q**. Pattern origin coordinate 'must first be given in G72 block.

I: Radius of circle: Positive value only

J: Starting angle: \pm to the X axis

Counterclockwise: positive

Clockwise: negative

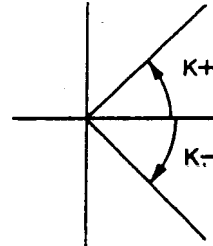
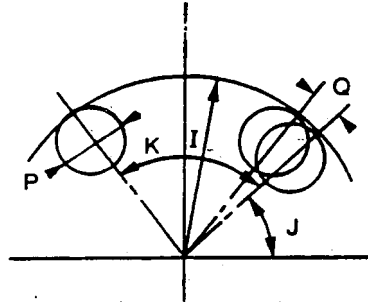
K: Moving angle:

Counterclockwise: positive

Clockwise: negative

P: Punch diameter offset: \pm . Take positive value when nibbling outside the circle and negative value when inside the circle.

Q: Pitch: Positive value only.

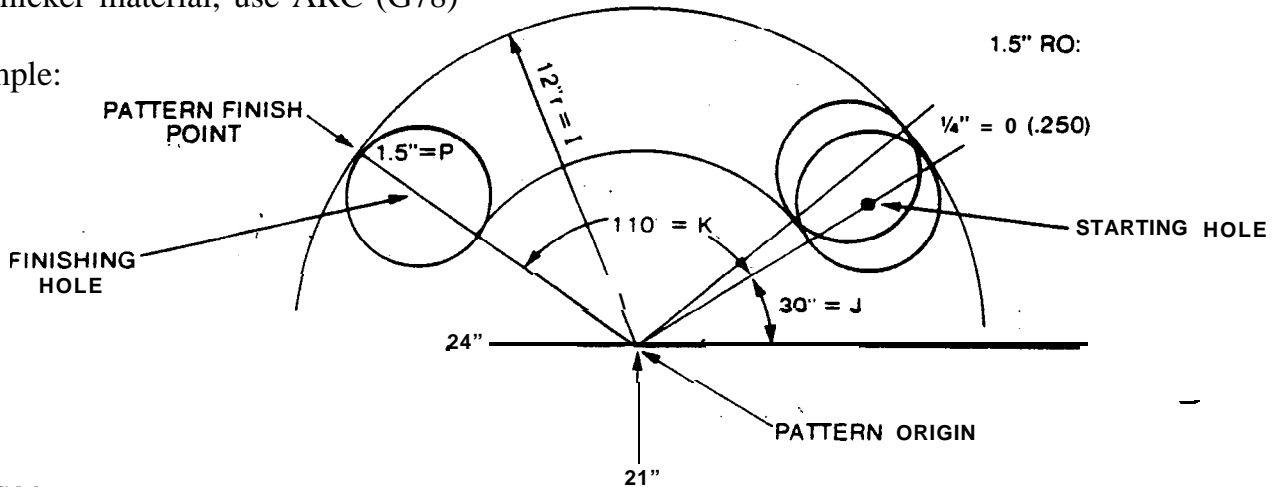


Value "Q" should be less than .200 OCTO, .315 PEGA/VELA, .250 PEGA KING, .470 COMA, .188 ARIES, and larger than material thickness.

Note: Maximum material thickness for nibbling: Sheet metal: .125

For thicker material, use ARC (G78)

Example:



G72G90X24000Y21000

G68I12000J3000K11000P-1.500Q250T210

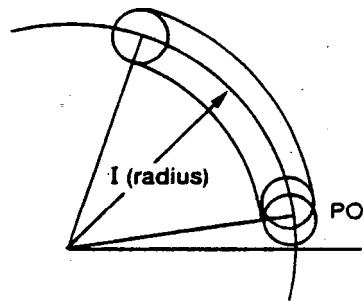
When a hole at the pattern origin (24", 21") is made, neglect G72 and give T210 in the same block.



G68 NIBBLING ARC (NBL - A) (Continued)

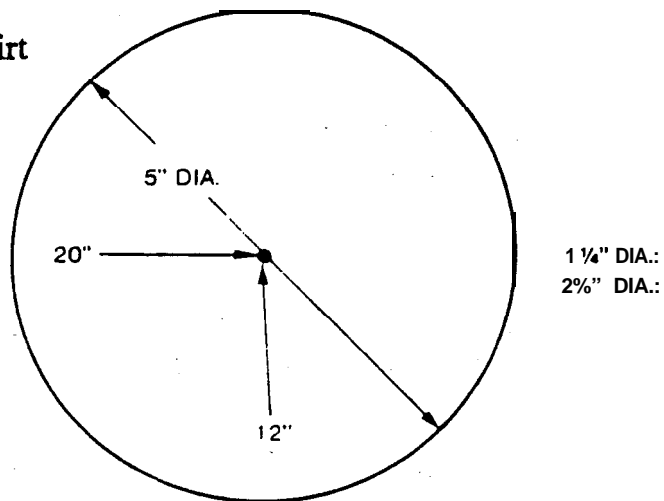
When punch diameter (P) is zero, punching is executed on the arc of the circle with radius (I).

Example:

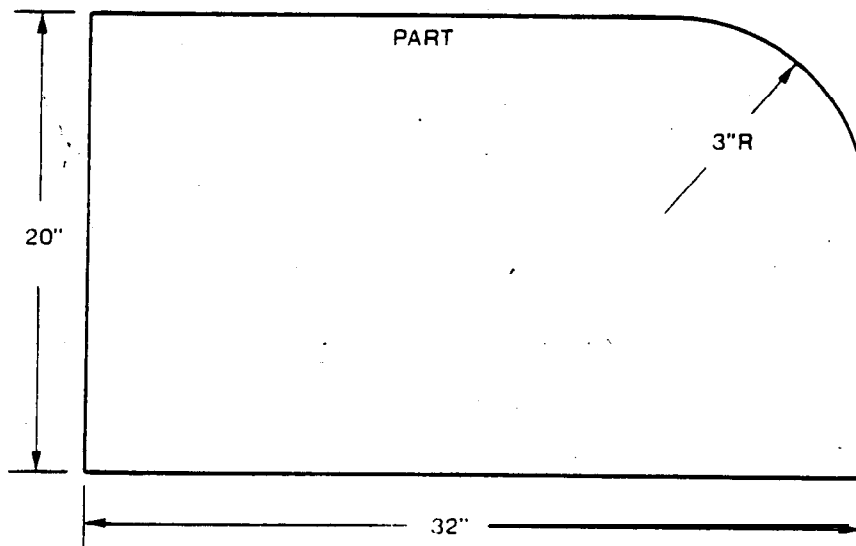


In the event a punching slug remains inside during large-hole punching, give J (angle \pm) of the first punching point 90 degrees or 45 degrees and command MOO or MO1 to make slug removal easy.

Problem: Punch hole first
then slug



Problem: Program the arc by means of NBL-A



G78 PUNCHING ARC (FOR .125 MATERIAL and UP)

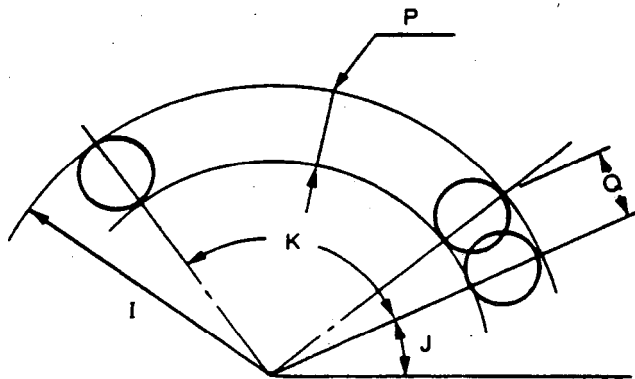
G78I (Radius) **J** (Starting **Angle** \pm) **K** (Moving Angle \pm) **P** (Punch Dia. Offset \pm) **Q** (Pitch)
D (Material Thickness)

A function for punching along an arc or complete circle by specifying, in order, radius: I, starting angle: J, moving angle: **K**, punch diameter: P, punching pitch: Q, and material thickness: D.

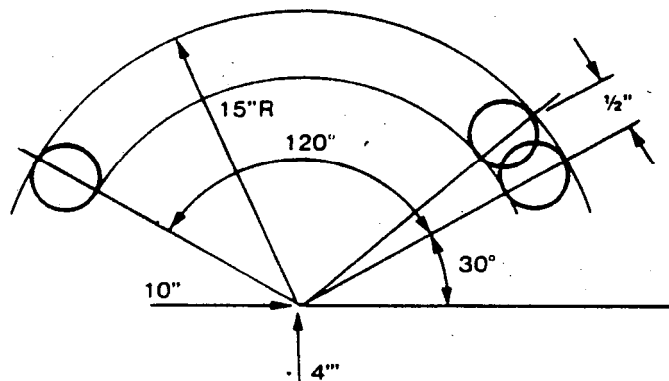
A pattern origin coordinate must first be given in a G72 block.

- I: Radius of circle: Positive value only
- J: Starting angle: \pm to the X axis
 Counterclockwise: positive
 Clockwise: negative
- K: Moving angle:
 Counterclockwise: positive
 Clockwise: negative
- P: Punch diameter **offset**: \pm , Take positive value when punching the outside of the circle and negative value when inside the circle.
- Q: Pitch: Positive value only (must be greater than D)
- D: **Material thickness**

The Symbols:



Example:



PUNCH: 3/4" DTA.
 MATERIAL: 1/8"

G90G72X10000Y4000
 G78I15000J3000K12000P-750Q500D125T304



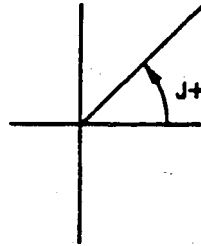
G69 NIBBLING LINE (NBL - L)

G69 I (Length) J (Angle*) P (Punch Dia. Offset) Q (Pitch) T...

Allows nibbling along a line at an angle to the X axis by specifying, in order, length: I, angle: J, punch diameter: P, pitch: Q.

Pattern origin coordinate must first be **given** in G72 block.

- I: **Length** from the starting point (punch center to punch center) to the finishing point of a straight line.
- J: Angle: +
Counterclockwise: positive only
- P: Punch diameter: \pm
- Q: Pitch: Positive value only



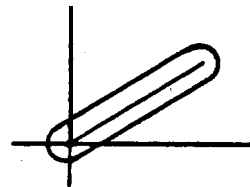
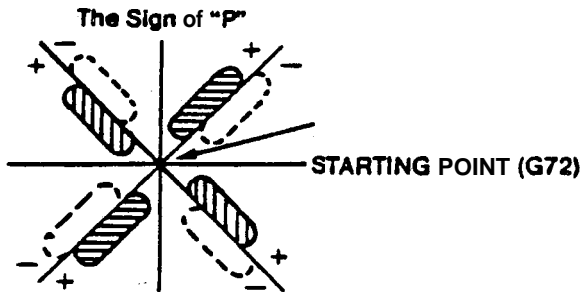
Value "Q" should be less than .200 OCTO .315 PEGA/VELA/PEGA KING .250 470 COMA and larger than material thickness.

Note: Maximum material thickness for nibbling.

Sheet metal: .125

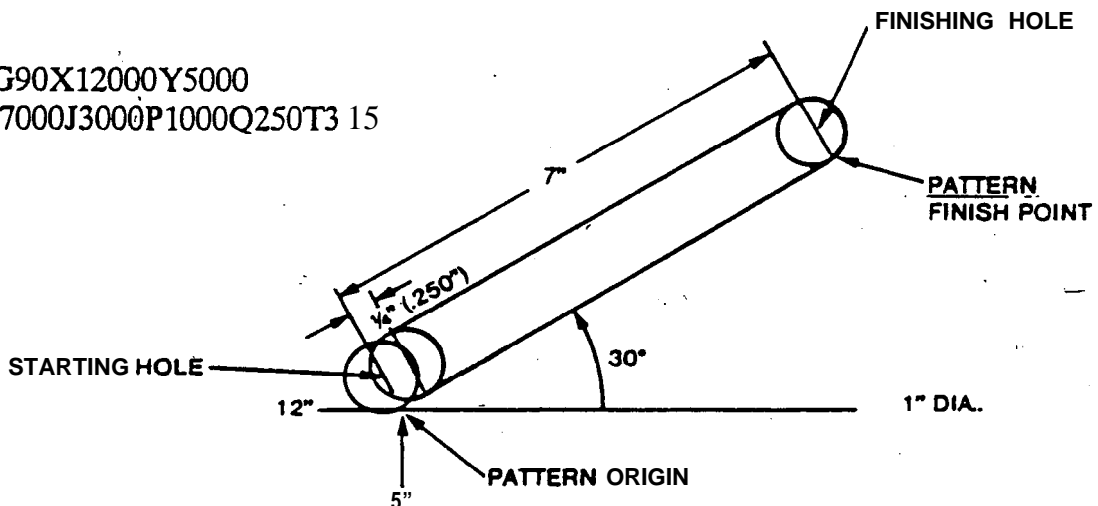
For thicker material, use G79

If P = 0, the starting hole center coincides with the pattern origin.



Example:

G72G90X12000Y5000
G69I7000J3000P1000Q250T3 15

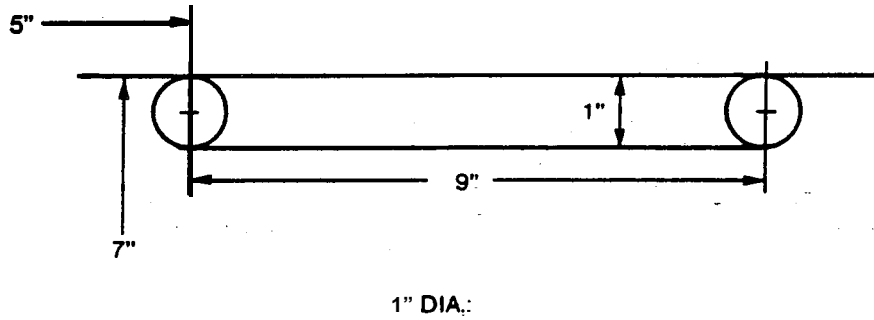


If G72 is neglected, the pattern origin (12", 5") is also punched.

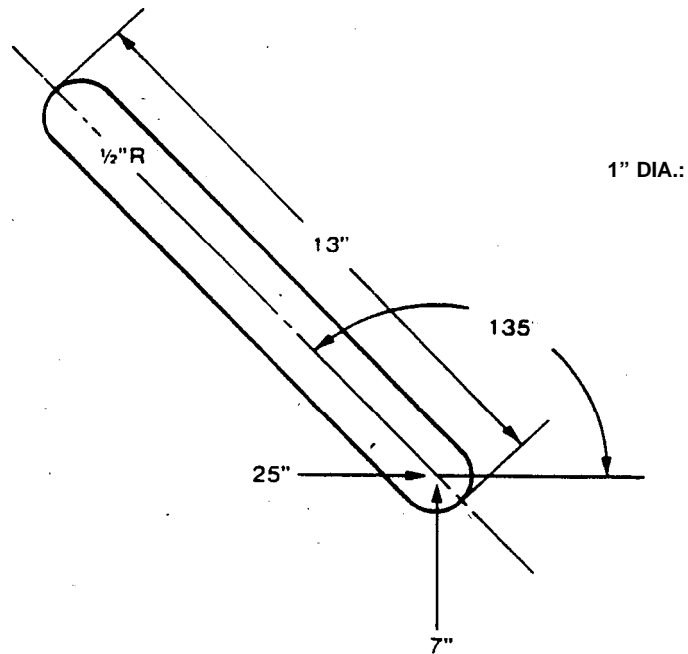


G69 NIBBLING LINE (NBL - L) (Continued)

Problem:



Problem:

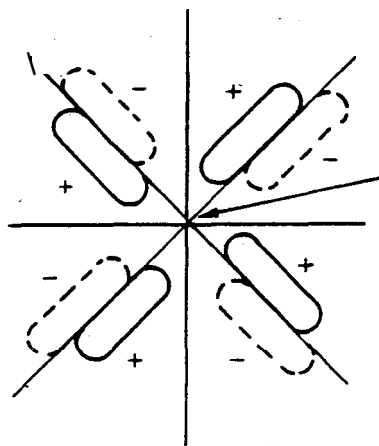
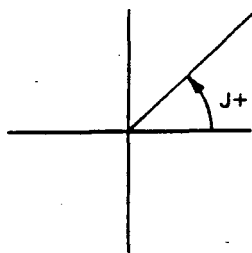


G79 PUNCHING LINE (FOR .125 MATERIAL UP)

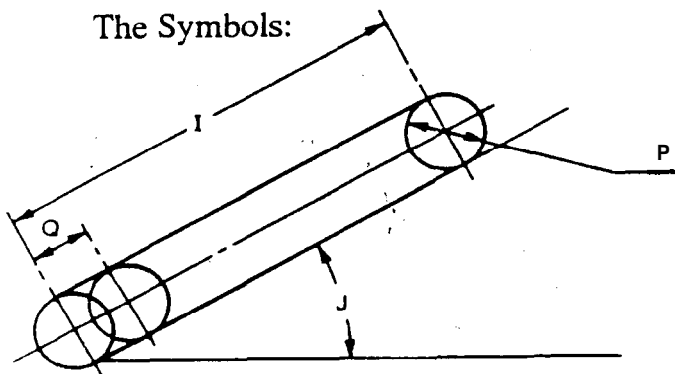
G79 I (Length) J (Angle +) P (Punch dia. offset \pm) Q (Pitch) D (Material Thickness)

A function for punching holes along a line at an angle to the X axis by specifying in order; length I, angle J, punch diameter offset P, pitch Q, and material thickness D.

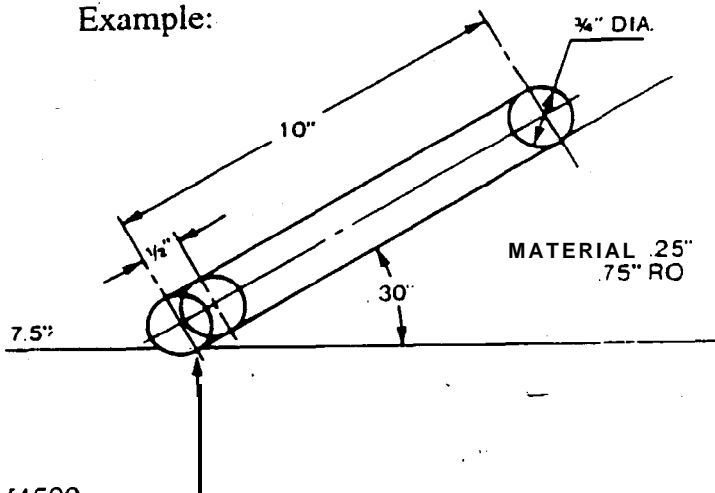
- I: Length from the starting point (punch center) to the finishing point of a straight line.
- J: **Angle +** : Angle to **the X axis** is **positive** if **counterclockwise** only.
- P: Punch diameter \pm : A positive punch diameter will allow punching on the counterclockwise side of the angle.
- Q: Pitch: The distance between punch centers. Note: A program error will occur if the pitch has a smaller value than the material thickness.
- D: **Material thickness**



The Symbols:



Example:

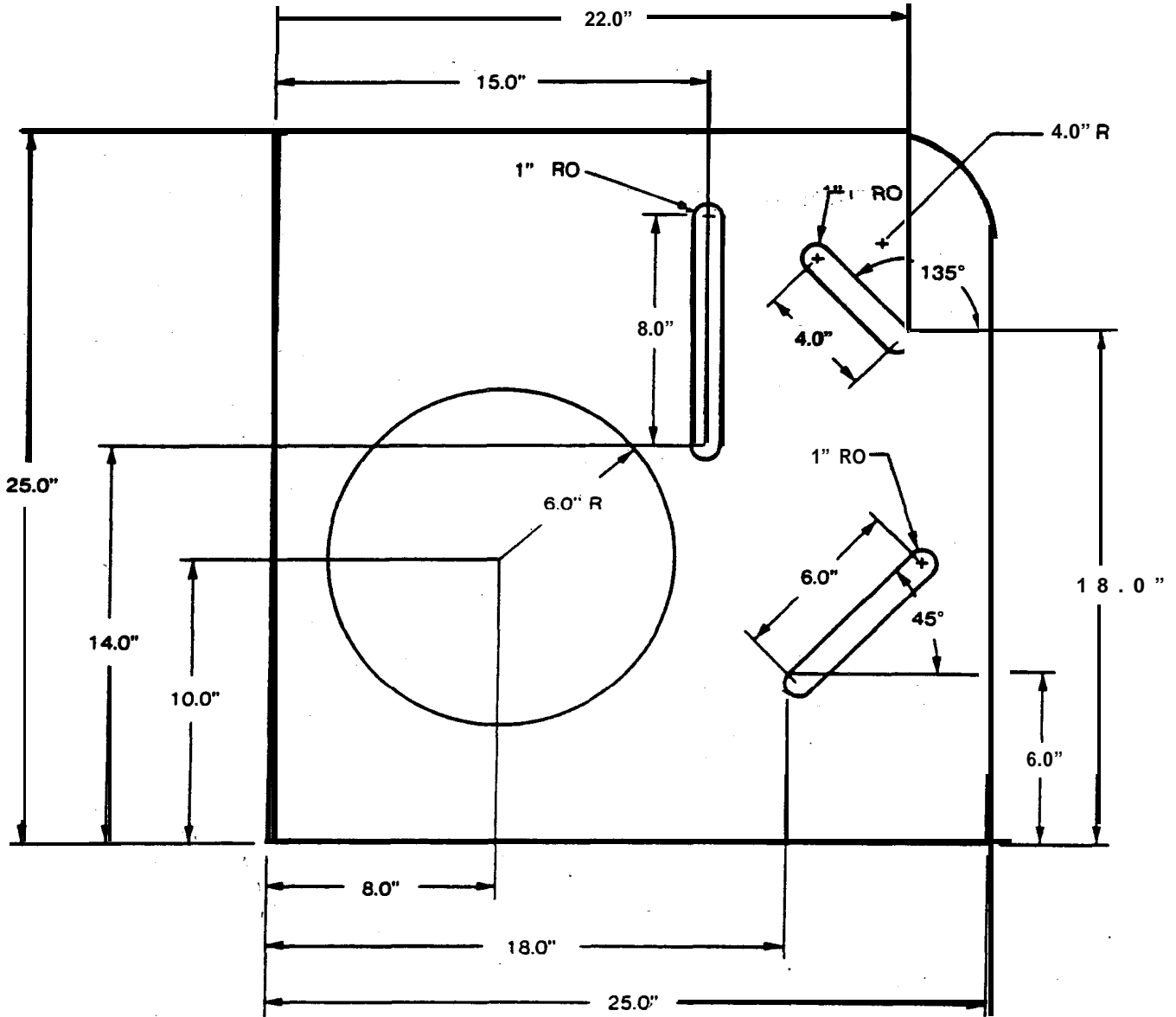


Program: G90G72X7500Y4500
G79I10000J3000P750Q500D250T306



PROGRAM NO. 7

1" RO
2" RO



PATTERN MEMORY AND PATTERN RECALL

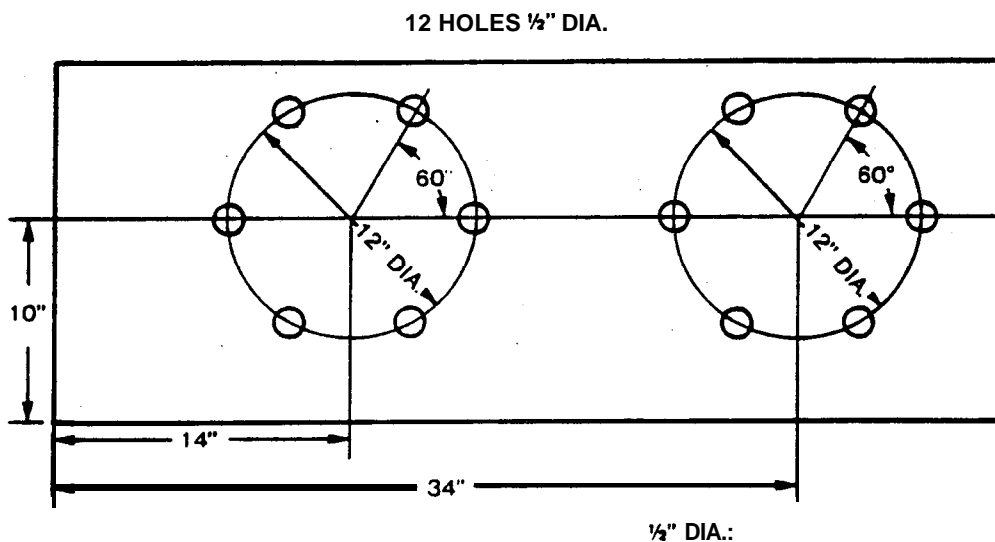
A# Pattern Memory Store

B# Pattern Recall

In case a pattern instructed by G26 (BHC), G28 (LAA), G29 (ARC), G36 (GRD-X), G37 (GRD-Y), G66 (SHP), G67 (SQR), G68 (NBL-A) or G69 (NBL-L) occurs repeatedly, the pattern memory can be used by having a numeral following "A" and by recalling the pattern, **whenever** necessary, by using the same numeral following "B".

Note: Use numerals 1 to 5.

Example:



G72G90X14000Y 10000
A1G25I6000JOK6T203 (Pattern memory)
G72X34000
B1 (Pattern recall)

"A#" and "B#" are used for pattern only.

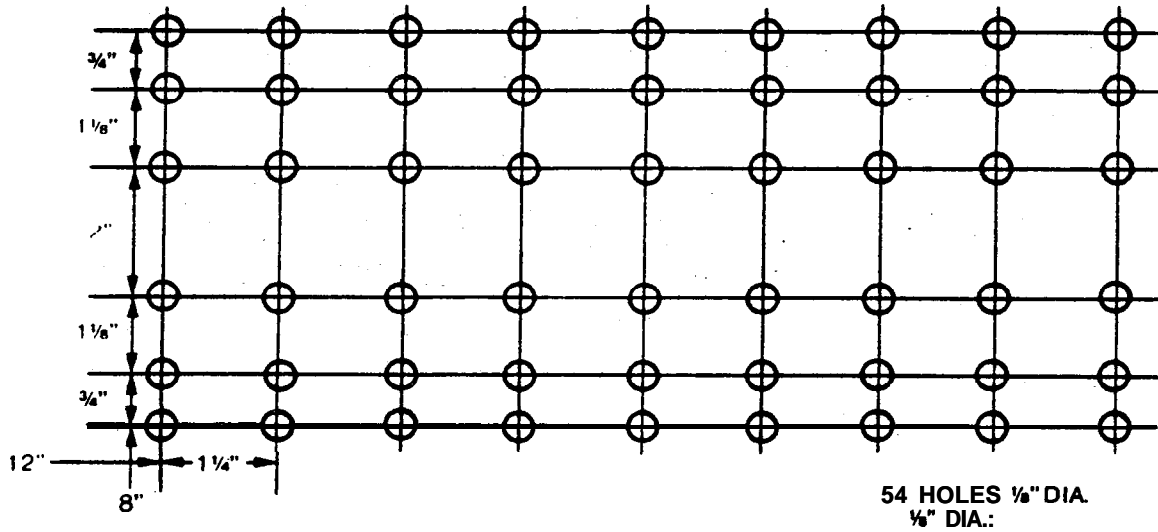
"A#" should always be given before pattern to store command block, "B#" must be a single block by itself.

Never use the same numeral for different types of pattern; if the same numeral is given, the previous pattern is erased.



PATTERN MEMORY AND PATTERN RECALL (Continued)

1. Problem: Make a program by A, B and LAA.
2. Problem: Make a program using two grid patterns and A, B.



AUTO-INDEX PROGRAMMING

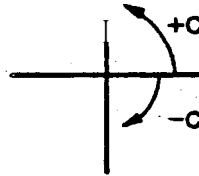
The Auto-Index program is used to control the angular orientation of punches and dies in punch presses equipped with the Auto-Index device.

X ___ Y ___ T000 C±

Auto-Index punching is performed after the **X**, **Y**, **T** and **C** axis have been positioned. In the **C** axis instruction, the value and sign of **C** determines the angle of the punch and die **with respect to the X axis**.

T: Auto-Index station number

C: Tool angle ± Counterclockwise positive (+)
Clockwise negative (-)



The angular input must be in the absolute angular value, referenced to the X axis. The minimum angular input is 0.01 degrees.

When Auto-Index instructions are **used within** pattern instructions, the Auto-Index tool angle will be automatically compensated in the tangential direction with the progress of hole punching.

When Auto-Index instructions are used within the following instructions, the Auto-Index instructions will be ignored and machine operation will continue: G92, G93, G72, G27, G98, G75, G76, G04, U, V, and W.

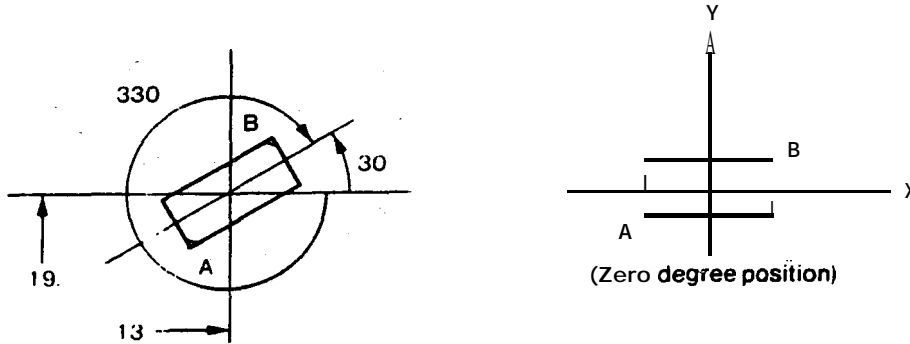
For stations other than Auto-Index stations, attempting to use a C axis instruction will cause a program error.

When a program block with instructions to use a different station follows the Auto-Index punching instructions, the C axis will be returned to its zero degree position after the punching operation at the Auto-Index station is finished, the next station will then be selected.

G90X50.Y15.T256C45,00
X35.Y20.T201

Punching operation at Auto-Index station
T201 is selected after C axis has returned to
its zero degree position.

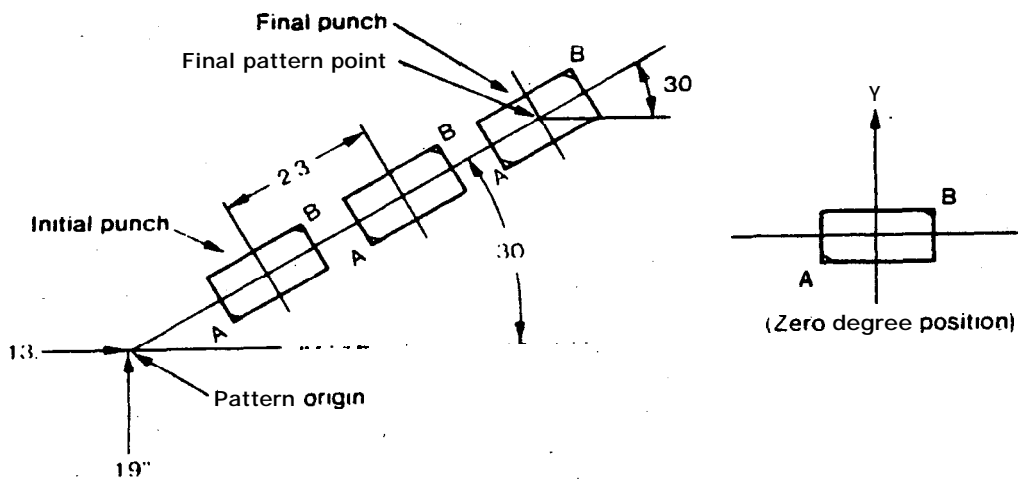
AUTO-INDEX PROGRAMMING (Continued)



G90X13.Y19.T000C30.00 (or C-330.00)

Auto-Index punching will be performed after the **X**, **Y**, **T** and **C** axes have been positioned. The punch and the die will be positioned 30 degrees (or - 330 degrees) with respect to the X axis.

PROGRAM EXAMPLE (G28 - LINE AT ANGLE)



G72G90X13.Y19.
G28I2.3J30.00K3T000C30.00 (or C - 330.00)

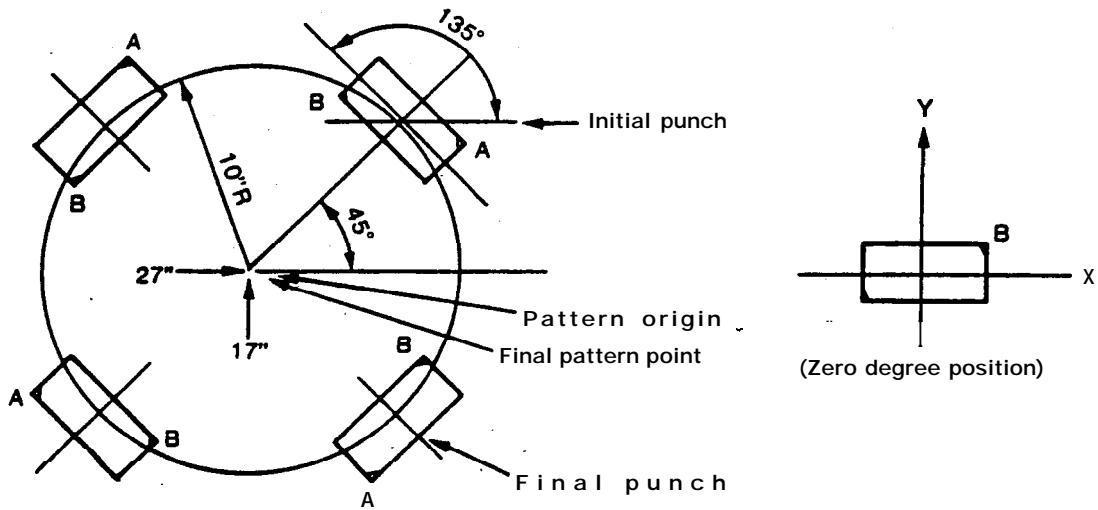
The punch and the die will be positioned 30 degrees (-330 degrees) with respect to the X axis and the Auto-Index punching **will** be performed according to the **G28** pattern instruction.

If the pattern origin (**X13.Y19.**) is to be punched also, omit "**G72**" and move "**T000C30.00**" to the end of the upper instruction block.

C90X13.Y19.T000C30.00
G28I2.3J30.00K3



G26 - BOLT HOLE CIRCLE WITH AUTO-INDEX



G72G90X27.Y17.
 G26I10.J45.00K4T000C135.00 (or C-225.00)

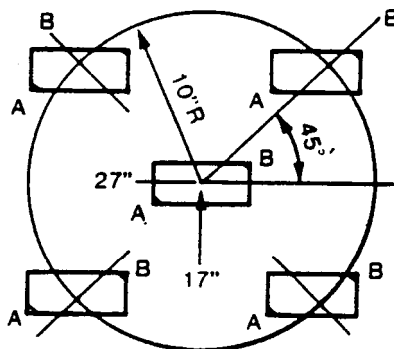
The first punching will be performed with the tool angle position 135 degrees (-225 degrees) with respect to the X axis and all subsequent **punchings** will be performed with the tool angle automatically compensated in the tangential direction.

If the pattern origin (X27.Y17.) is to be punched also, omit "G72" and enter T000 C ±θ" in the upper instruction block.

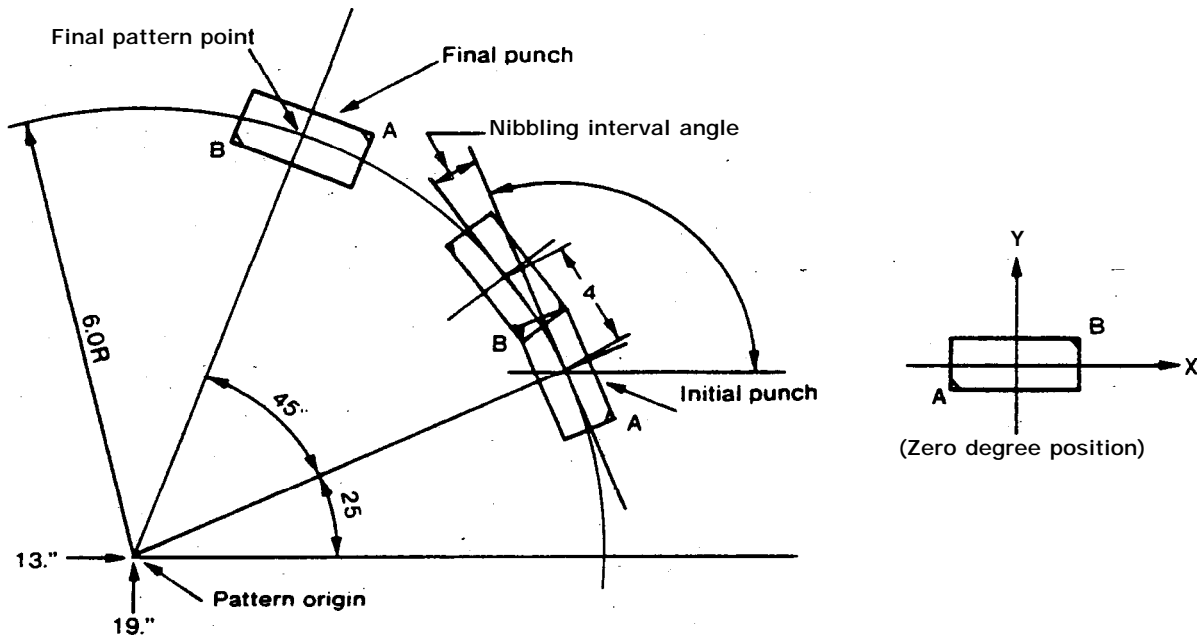
G90X17.Y17. T000 C ± θ
 G26I10.J45.00K4 C135.00

If there is no C axis instruction or 0 degrees is called out in the pattern instruction block, the pattern punching will be performed without compensation of the tool angle.

G90X27.Y17.T000C0
 G26I10.J45.00K4 ,



G68 - NIBBLING ARC WITH AUTO-INDEX



G72G90X13.Y19.

G68I6.J25.00K45.00P0Q.200T000C115.00 (or C-245.00)

The tool angle is positioned 115 degrees (-245 degrees) with respect to the X axis and it will be automatically compensated. Keep tangential direction with the progress of hole nibbling.

If the pattern origin (X13.Y19.) is to be punched also, omit "G72" and enter "T000 C±θ" in the upper instruction block.

G90X13.Y19.T000C±0

G68I6.J25.00K45.00P0Q.200C115.00

If the nibbling interval or nibbling interval angle exceeds the following values, a program error will occur.

Maximum nibbling pitch: 470 (COMA), 315 (VELA II), .250 (PEGA KING), .200 (OCTO).

Maximum nibbling interval angle: 12 degrees (COMA), 8 degrees (VELA II, PEGA), 4 degrees (PEGA KING), 12 degrees (OCTO)

- Note:
1. If an alarm condition arises (i.e. Alarm #148) you will need to shorten the "Q" pitch. i.e. .200 to a .100
 2. Formula-for C command is $J + 90 \text{ degrees} = C$ (J starting angle plus 90 degrees equals C command). i.e. $J = 25. + 90 \text{ degrees} = C115$



EXAMPLE NO. 3

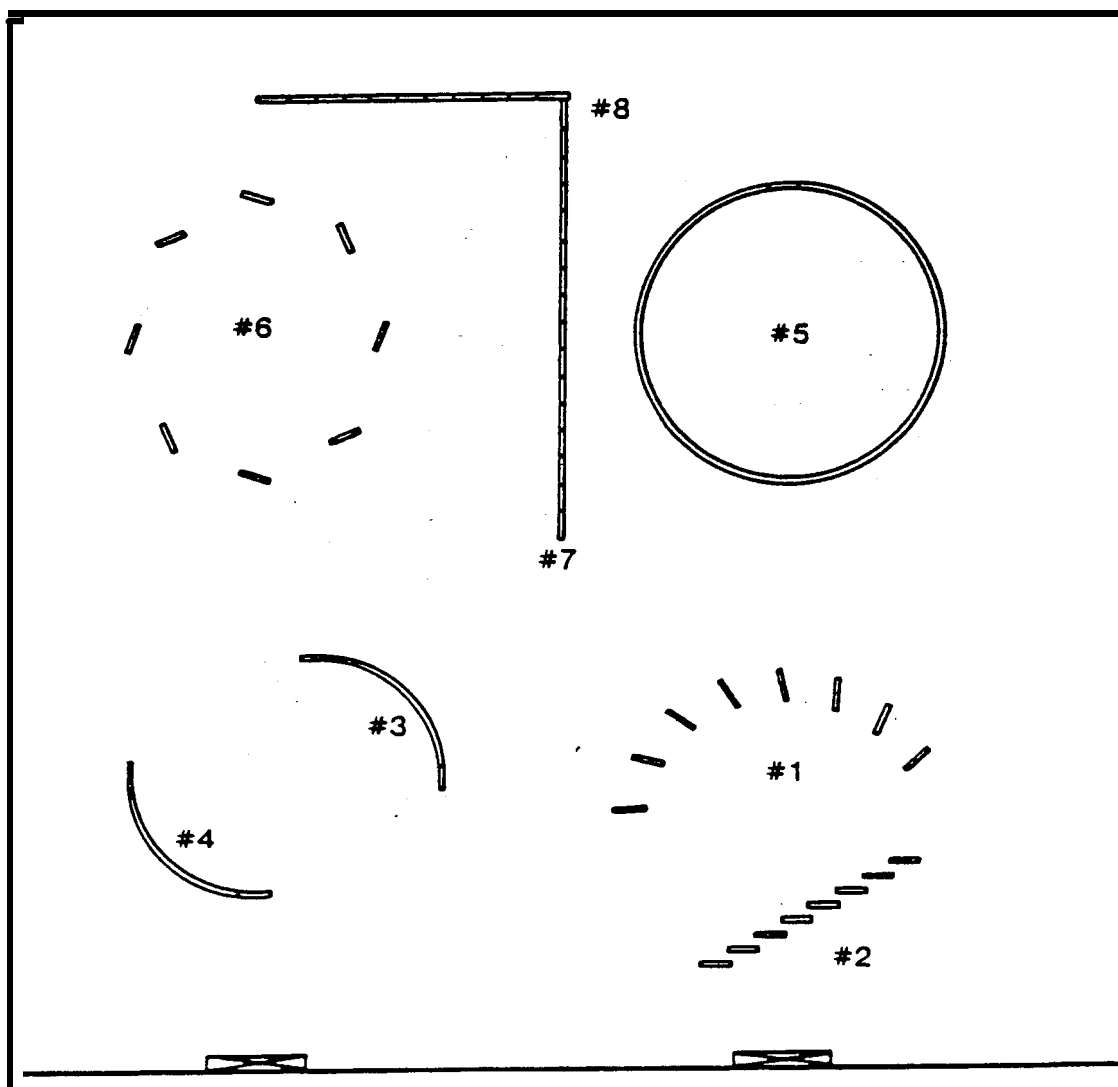
* SHEET SIZE 36000* 36000

* CLAMP (1) 8000
(2) 25000

T220 - 1" x .25"

- 01122
(Pega 357 with Auto-Index)
(Sta. 220 Auto-Index)
(58 Sta. Turret)
G92X72. Y50.
- #1 G72X25. Y8.
G29I5.J30.P20.K8T220C45.
- #2 G72X22. Y3.
G28I1.J30.K8CO.
- #3 G90G72X10. Y10.
G68I4.J0K90.P0Q.1C90.

- #4 G72X8. Y10.
G68I4.J180.K90.P0Q.1C90.
- #5 G72X25. Y25.
G68I5.J90.K360.P0Q.2C180.
M00
- #6 G72X8. Y25.
G26I4.J45.K8C115.
- #7 G72X18. Y18.
G66I15.J90.P1.Q.25C90.
- #8 G66I10.J180.P-1.Q-25C0
G50
END



TONNAGE CHART

APPROXIMATE PRESSURE REQUIRED FOR PUNCHING																				
ROUND HOLES IN MILD STEEL																				
HOLE DIAM.		1/8	3/16	1/4	3/8	1/2	5/8	3/4	7/8	1	1 1/4	1 1/2	1 3/4	2	2 1/2	3	3 1/2	4	4 1/2	
		125	1875	250	375	500	625	750	875	1000	1250	1500	1750	2000	2500	3000	3500	4000	4500	
METAL THICK GAUGE INCHES		PRESSURE IN TONS																		
#28	0.15	1	2	3	5	6	7	9	10	12	15	18	21	24	29	35	41	47	53	
X 26	.018	2	3	4	5	7	9	11	12	14	18	21	25	28	33	38	44	50	56	
x24	.024	2	4	5	7	9	12	14	17	19	24	28	33	38	44	50	56	62	68	
x 2 2	.030	3	4	6	9	12	15	18	21	24	29	35	41	47	54	61	68	75	82	
x20	.036	4	5	7	11	14	18	21	25	28	35	42	49	57	65	74	83	92	101	
#18	.048	5	7	9	14	19	24	28	33	38	47	57	66	75	85	95	105	115	125	
#16	.060	6	9	12	18	24	31	35	41	47	59	71	82	94	107	120	134	148	162	
x14	.075	7	11	15	22	29	37	44	52	59	74	88	103	118	134	150	166	182	198	
#12	105	1.0	1.5	2.1	3.1	4.1	5.2	6.2	7.2	8.2	10.3	12.4	14.4	16.5	20.6	24.7	28.9	32.9	37	
#11	120	1.2	1.8	2.4	3.5	4.7	5.9	7.1	8.2	9.4	11.8	14.1	16.5	18.8	23.6	28.6	33.0	37.7	42	
#10	135	1.3	2.0	2.7	4.0	5.3	6.6	8.0	9.3	10.6	13.3	15.9	18.6	21.2	26.5	31.8	37.1	42.4	48	
5132	157	-	2.3	3.1	2.3	46	62	77	92	108	123	154	18.5	21.7	24.7	30.8	37.0	43.2	49.3	56
3/16	-	188	2.8	37	55	74	92	111	12.9	14.8	18.5	22.1	25.8	29.5	36.9	44.3	51.7	59.1	66	
1/4	250	-	4.9	74	9.8	12.3	14.7	17.2	19.6	24.5	29.5	34.4	39.3	49.1	58.9	68.7	78.5	88.3	98.1	
5/16	313	-	-	92	12.3	15.4	104	215	24.6	30.7	36.9	43.0	49.2	61.5	73.0	86.0	98.3	111	124	
3/8	375	-	-	110	14.7	18.4	22.1	258	29.5	36.8	44.2	51.5	58.9	73.6	80.4	103.1	117.8	133	148	
1/2	500	-	-	19.6	24.5	29.5	35.0	39.3	49.1	58.9	68.7	78.5	90.2	117.8	137.4	157.1	177	197	217	

TONNAGE CHART

APPROXIMATE PRESSURE REQUIRED FOR PUNCHING																			
SQUARE HOLE IN MILD STEEL																			
"A" DIM.		1/4	3/4	1	1 1/2	1 3/4	2	2 1/4	2 1/2	2 3/4	3	3 3/4	4	4 1/2	4 3/4	5	5 1/2	6	6 1/2
		25	50	75	100	125	150	175	200	225	250	275	300	325	350	375	400	425	450
METAL THICK GAUGE INCHES		PRESSURE IN TONS																	
#28	0.15	4	8	11	15	23	23	26	30	34	38	41	45	49	53	56	60	64	68
#26	.018	5	9	18	18	27	32	48	41	45	50	72	78	84	90	96	102	108	114
#24	.024	6	12	24	30	36	42	54	60	66	72	78	84	90	96	102	108	114	120
x22	.030	8	15	23	30	38	45	53	60	68	75	83	90	98	105	113	120	128	135
#20	.036	9	18	27	36	45	54	63	72	81	90	99	108	117	126	135	144	153	162
#18	.048	12	24	36	48	60	72	84	96	108	120	132	144	156	168	180	192	204	216
#16	.060	15	30	45	60	75	90	105	120	135	150	165	180	195	210	225	240	255	270
#14	.075	19	38	56	75	94	113	131	150	169	188	206	225	244	263	281	300	319	338
#12	105	26	53	19	105	131	158	184	210	236	263	289	315	341	368	394	420	446	473
#11	120	30	60	90	120	150	180	210	240	270	300	330	360	390	420	450	480	510	540
#10	135	34	68	101	135	169	203	236	270	304	338	371	405	439	473	506	540	574	608
5/32	157	39	78	117	156	195	234	273	311	352	391	430	469	508	547	586	625	664	703
3/16	188	47	94	141	190	234	281	328	375	422	469	516	563	609	656	703	750	797	844
1/4	250	63	13	188	250	313	375	438	500	563	625	688	750	813	875	938	1000	1063	1125
5/16	313	16	234	313	391	469	547	625	703	781	859	938	1017	1096	1175	1254	1333	1412	1491
3/8	375	19	281	375	469	563	656	750	844	938	1032	1126	1220	1314	1408	1502	1596	1690	1784
7/16	438	22	326	438	541	656	766	875	984	1091	1200	1311	1422	1533	1644	1755	1866	1977	2088
1/2	500	25	375	500	625	750	875	1000	1125	1250	1375	1500	1625	1750	1875	2000	2125	2250	2375



25 ton/in² = 35.16 kg/mm²



WEIGHT OF THE SHEET MILD STEEL (w = 0.283 lbs/inch³)



	#20	#18	#16	x14	#12	#10	3/16	1/4
12" x 12"	1.47 lb	1.96 lb	2.44 lb	3.05 lb	4.27 lb	6.49 lb	7.66 lb	10.20 lb
12- x24-	2.93	3.90	4.88	8.10	a.54	10.98	15.30	20.40
24" x 24"	5.86	7.80	9.76	12.19	17.07	21.96	34.61	40.81
24" x 36"	0.79	11.70	14.64	18.29	25.61	32.93	45.91	61.21
24" x 48"	11.72	15.61	19.52	24.39	34.15	43.91	61.21	81.62
36" x 36"	13.19	17.56	21.96	27.44	38.42	49.40	68.87	91.82
36" x 48"	17.58	23.41	29.28	36.68	51.22	65.67	91.82	122.43
36" x 60"	21.98	29.26	36.61	46.73	64.03	62.33	114.78	153.04
48" x 48"	23.44	31.21	39.05	48.78	68.30	87.62	122.43	163.24
48" x 60"	29.30	39.01	48.81	60.97	86.37	109.78	153.04	204.05
48" x 72"	35.16	46.62	56.57	73.16	102.45	131.73	183.64	244.86



**MULTIPLE
PARTS
PUNCHING**

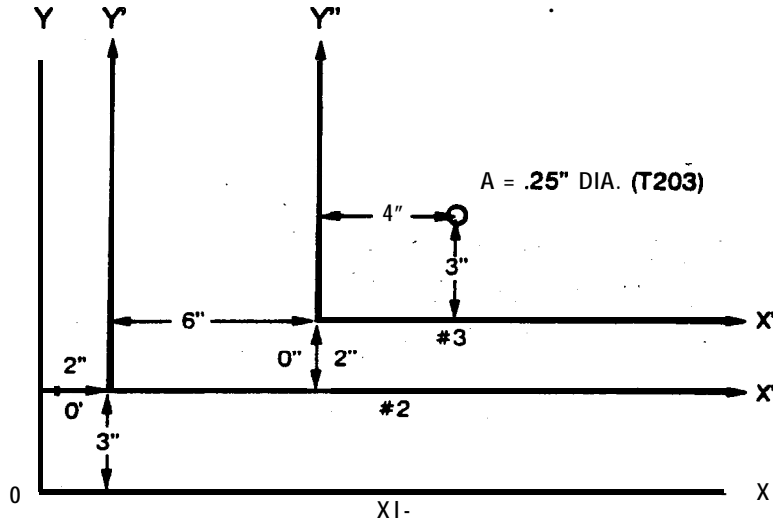
SECTION III

G93 OFFSET (OFS)

G90G93X___ Y___
G91G93X___ Y___

Establishes the origin of local coordinate system.

Example:



#1 X and Y coordinate system: Basic coordinate system (global coordinate system)

#2 X' and Y' coordinate system: local coordinate system

#3 X'' and Y'' coordinate system: local coordinate system

Designation of X' and Y' coordinate system (conversion to a coordinate system with 0' as origin).

G90G93X2000Y3000

Designation of X'' and Y'' coordinate system (conversion to a coordinate system with 0'' as origin from 0').

G90G93X8000Y5000 or G91G93X6000Y2000

Example of designation of point A

1. G90X12000Y8000T203
2. G90G93X2000Y3000 - (0' point).
X10000Y5000T203
3. G90G93X2000Y3000 - (0' point)
G91G93X6000Y2000 - (0'' point)
X4000Y3000T203

G93 OFFSET (OFS) (Continued)

Method of returning a local coordinate system to a global coordinate system:

G90G93X0Y0

G93 is for establishing a coordinate system. It is not for positioning or punching.

Instructions other than **G90** or **G91** or **N**, **X**, **Y** must not be given in the same block with **G93**; e.g., do not instruct **T** or **M**.

Example:

G90G93X2000Y4000T210

Program error

Basic form of a program using **G93**

G92X50000Y50000 (in the case of NCT 5.5.7: **G92X72000Y50000**)

G90G93X__ Y__
x__ Y__
G50

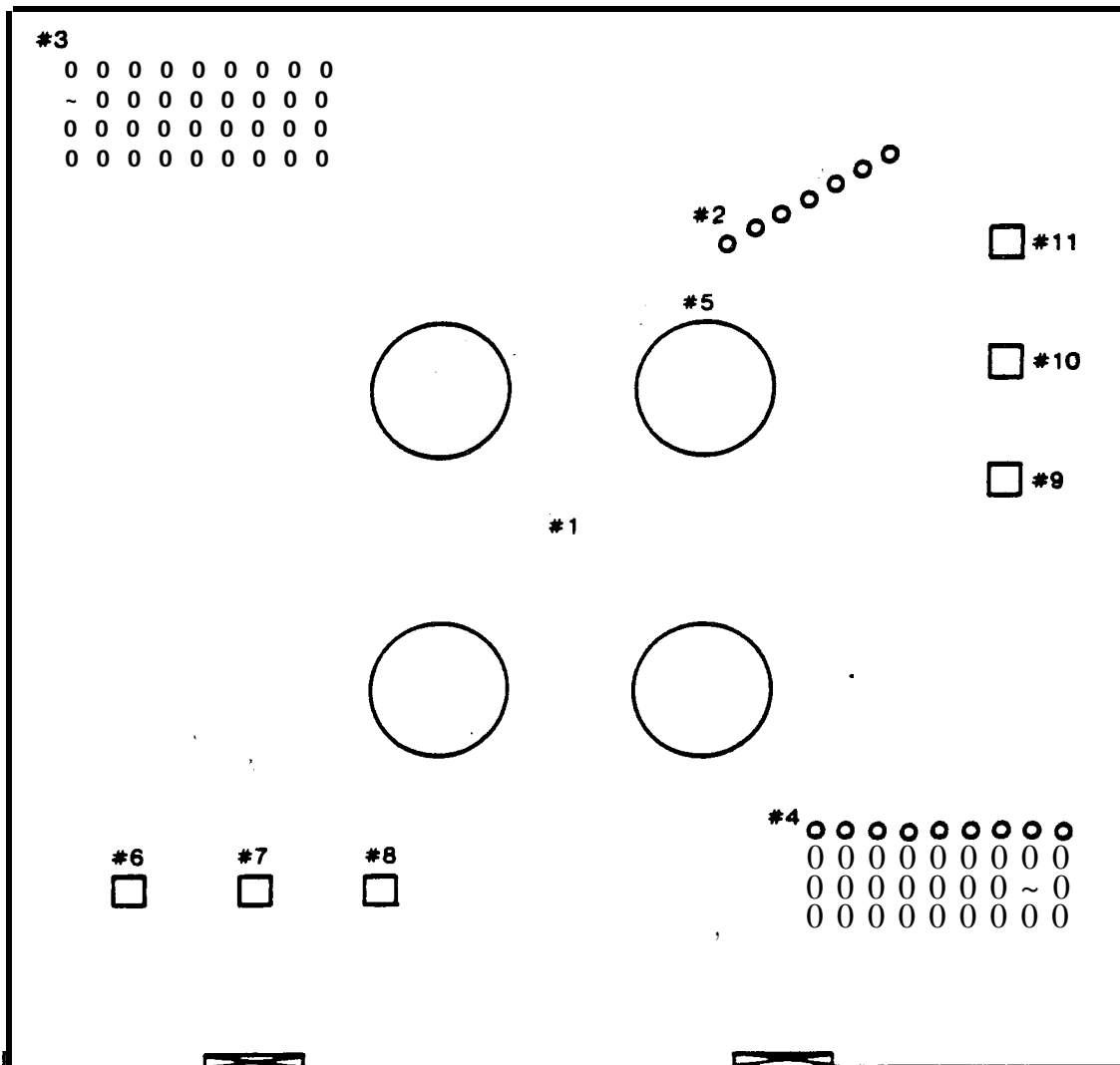


EXAMPLE NO. 4

Sheet Size
 36000/36000
 Clamp (1) 8000
 (2) 25000

00008
 (56 Sta. Pega)
 G93 Offset Center of Sheet:
 (.500 RO)
 (4.5 RO)
 (1. SQ.)
 G92X39.37Y39.37
 #1 G90G93X18.Y18.
 X5.Y10.T108
 #2 G28I1.J30.K6
 X-16.Y16.
 #3 A1G36I1.P8J-1.K3

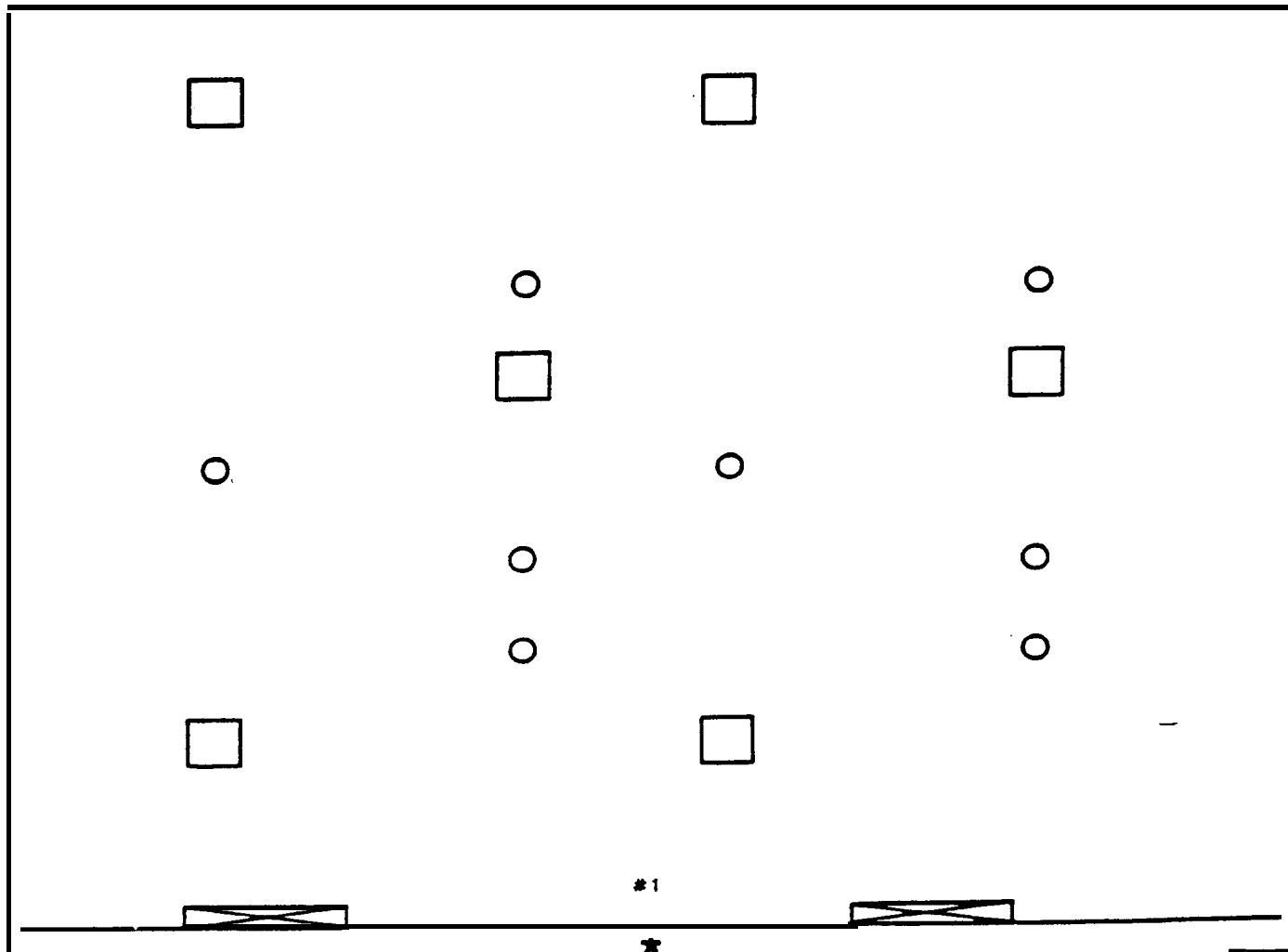
X8.Y-10.
 #4 B1
 G72X0Y0
 #5 G26I6.J45.K4T201
 #6 X-14.Y-12.T264
 #7 x-10.
 #8 X-6.
 #9 X14.Y2.
 #10 Y6.
 #11 Y10.
 G50
 END



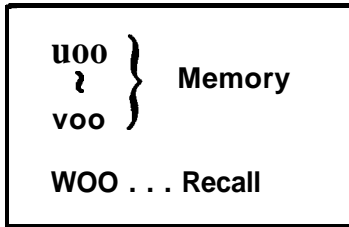
EXAMPLE NO. 5

Sheet Size
25000/20000
Clamp (1) 5000
(2) 18000

00002
(56 Sta. **Pega**)
(G93 Offset)
(.5 RO)
(1. **SQ.**)
G92X39.37Y39.37
U1
G90X10. Y14. T205
Y8.
Y6.
X4. Y10.
X4. Y4. T223
Y18.
X10. Y12.
V1
#1 G93X10. Y0
W1
G50
END



MACRO FUNCTION



Macro Storing

Using the macro function, the contents of multiple blocks of data can be stored within the memory of NC as a single macro data and **can** be recalled whenever required. To store multiple blocks of data, enter the address letter **"U" along with a two digit numeral from "01 to 99"**. As a single block' preceding the **multiple blocks** enter the address letter **"V"** using the same two digit numeral as used for the address letter "U" as a **single** block.

The two-digit numeral following "U" or "V" is called-the "macro number." This macro number comes in the following three types:

- 01 - 59: The block **of data** between "U" and "V" are stored while they are simultaneously being executed, when parameter 435 equals zero.
- 60 - 89:** The blocks of data between "U" and "V" are only stored into the memory.
- 90 - 99: Storing of multiple macros is accomplished.

Macro Recalling

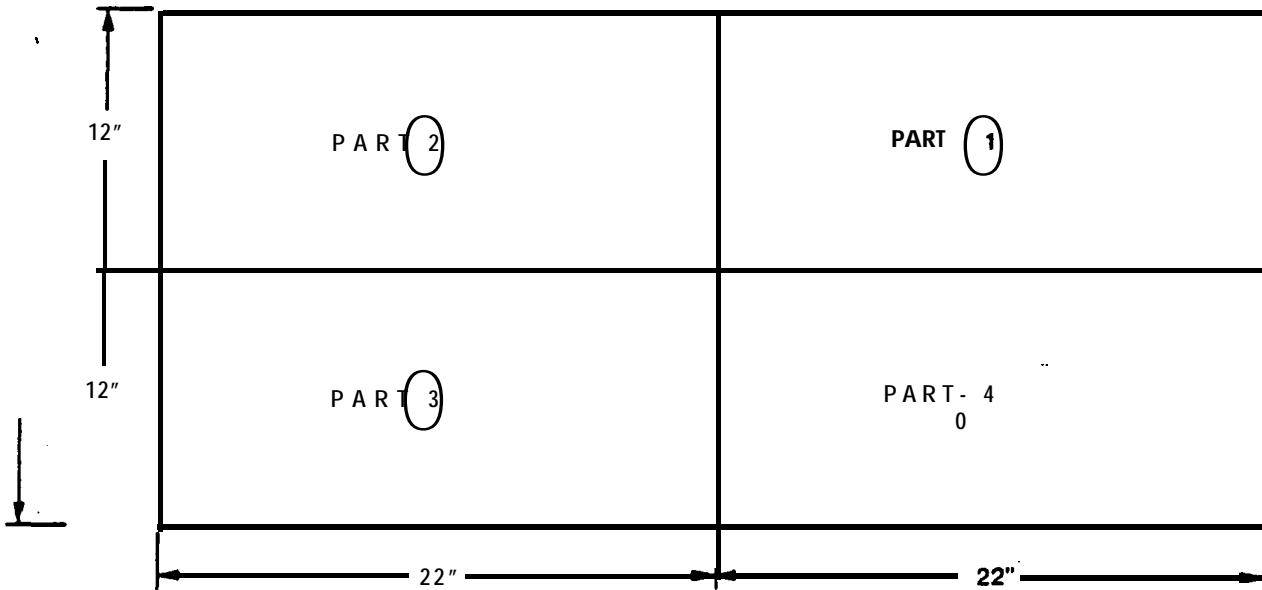
The multiple blocks of data which were stored by "U" and "V" can be recalled by the address letter "W" with the same numeral that was used at "U" and "V".

Example:

G92X50.Y50. U1		
G90X4.Y6.T356 A1G28I.75J45.K3 X9.Y3. B1		Memorized While Punching
V1 U60		
X3.25Y7.T148 Y6.33 X9.Y3.875		Stored. No Punching Until Recall
V60 G93X12.Y0~Offset		
W1 W60		Recall & Punch Same As Above
G50		



MACRO FUNCTION (Continued)



G92X500U0Y50000
 G90G93X22000Y12000
 U1
 G90X___Y___T203

X---Y-----	} Program	Part (1)
X---Y-----		
X---Y-----		
x---Y-----		
X---Y-----		

V1

G90G93X0 - Offset	Part (0)
W1- Program Recall	Part (2)
G90G93Y0	Part (3)
W1	Part (4)
G90G93X22000	Part (0)
W1	Part (4)

u2
 G90X1___Y___0 6

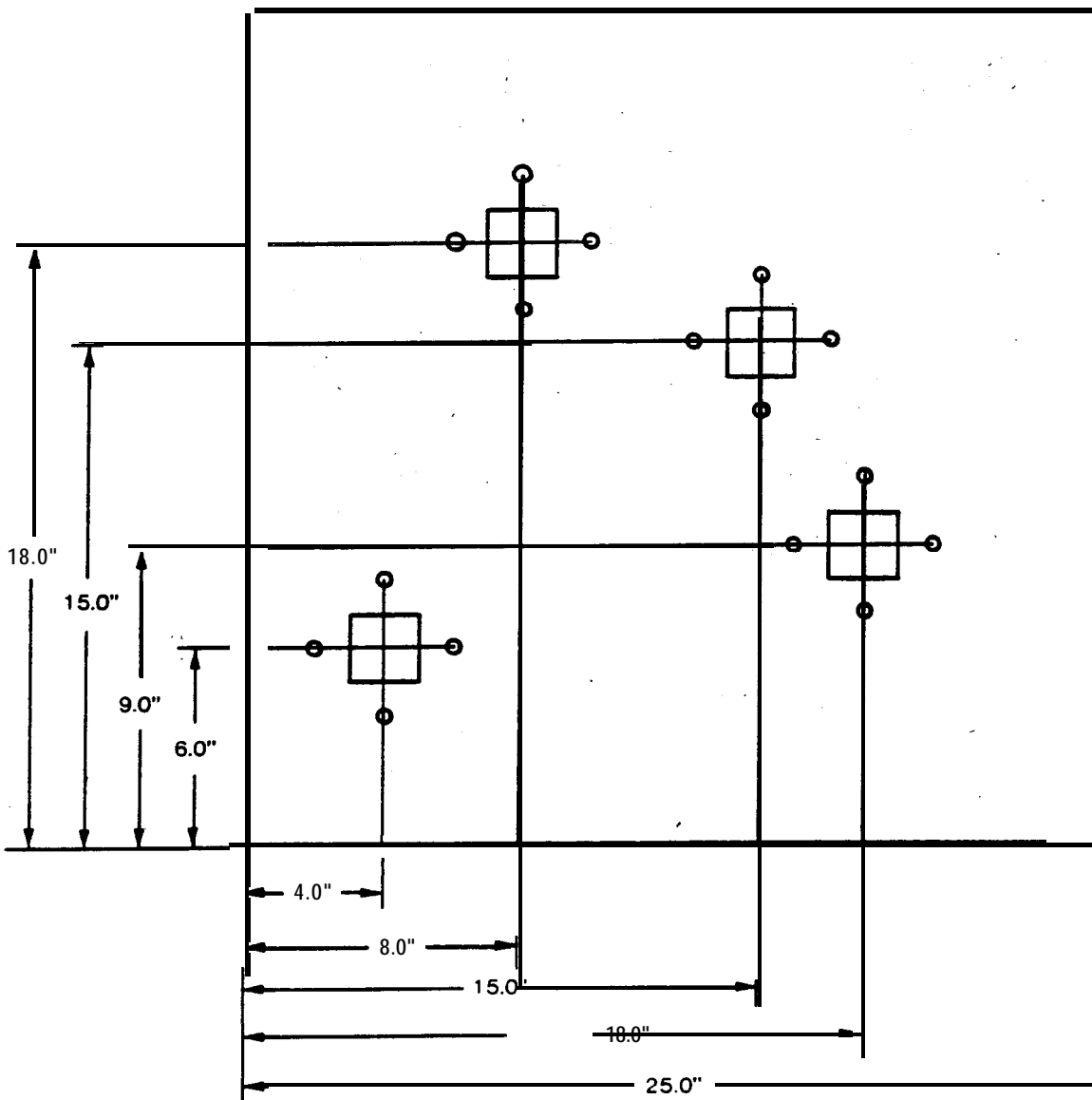
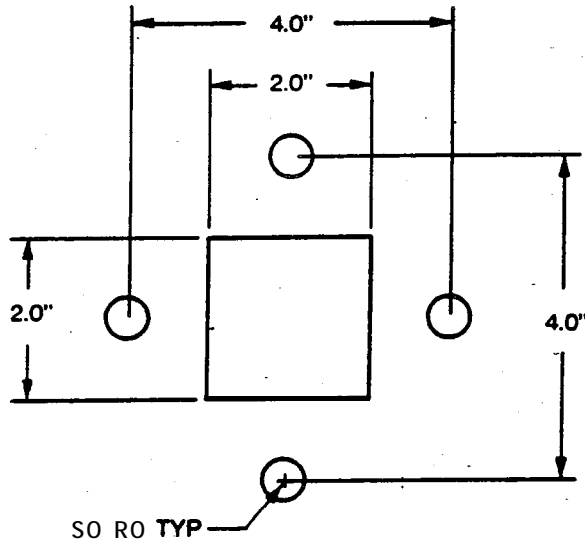
-----	} Part (4)
-m-----a-	
-m-a-----w-	
m-----B-----	
-w-e-----a--	

V2
 G90G93X0
 w2 Part (3)
 G90G93Y1200
 w2 Part (2)
 G90G93X22000
 w2 Part (1)
 G50



PROGRAM NO. 9

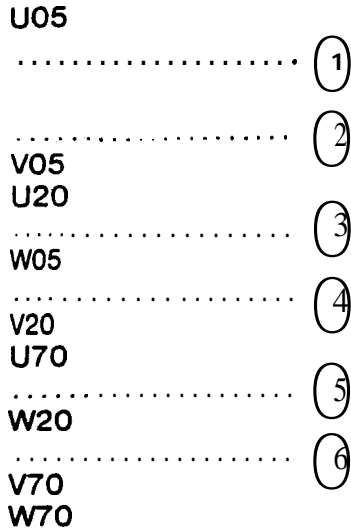
2. SQ.
.5 RO



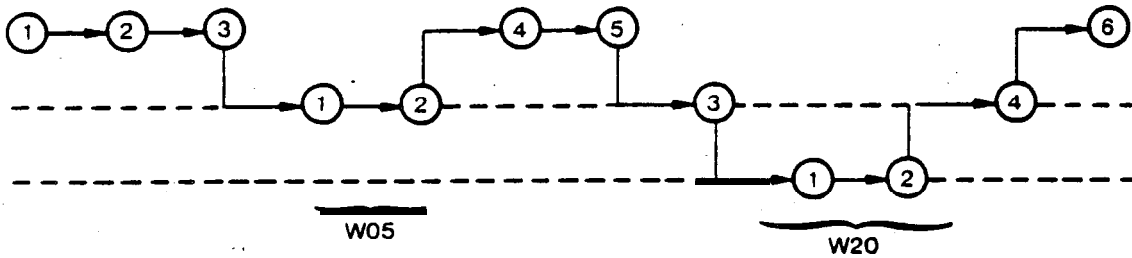
MULTIPLE RECALLING OF MACRO

The data stored as macro data can be recalled and the recalled data can be stored and recalled again.

Example:



In the above example, the execution is carried out in the following manner.



This multiple recalling is possible up to three deep.

MEMORY CAPACITY FOR MACRO (Macro numbers 01 to 89)

The maximum memory capacity for macro is 2660 characters. One character equals:

- One letter (G, X, Y, T, M, etc.) or
- One numeral (1, 2, 3, 0) or
- One symbol (CR, I, F, -, /, etc.)

The delete, space, and other codes, which are ignored by the NC, are not considered characters.



STORING AND RECALLING OF MULTIPLE MACROS

Multiple macros can be stored and recalled by using the ~~macro numbers 90 to 99~~. These macro numbers are only capable of defining a group of **multiple macros as one macro**. They are unable to store execution instructions.

Example:

```
U90
U01
....
V01
U10
....
V10
U15
....
v15
G90X22.Y 18.T201 ← This block is not stored, but is executed.
U02
....
vo2
V90
....
....
W01
W10
W15
W02
}
W90=
```

All stored between U90 and V90.

The maximum number of macros stored by each of the macro numbers 90 to 99 is 15.



PARAMETER SETTING DATA

Run Time Display

```

SETTING DATA 01 :   00099 NO099

X MIRROR IMAGE =0 (0:OFF 1:ON)
Y MIRROR IMAGE =0 (0: OFF 1:ON)
C MIRROR IMAGE =0 (0:OFF 1:ON)
TV CHECK       =0 (0:OFF 1 :ON)
PUNCH CODE     = 0 (0:EIA 1:150)
INPUT UNIT     = 0 (0:MM 1:INCH)
INPUT DEVICE 1 =0 (0:TAPE 1:RMT)
INPUTDEVICE 2 = 0 (1:RS232C)

RUNNING TIME   0005H 0 2 M 06S

O              LSK   ABS
    
```

Run Time Setting Macro Memory Setting'

```

SETTING DATA 02 : 00099 NO099

.NO.      DATA NO.      DATA
0057      5              0155      0
0058      2              0158      0
0059      8              0157      0
0087      0              0158      0
0088      0 0319 101 00001
0141      50             0340      0
0151      0              0341      0
0152      0 0435
0154      0              0539      0

LSK   ABS
    
```

Tool Stroke Display And Setting

```

SETTING DATA 03 :   00099 NO099

NO.      DATA NO.      DATA
0917     220 0927      0
0918     0 0928        0
0919     0 0929        0
0928     122 0930      0
0921     0 0931        0
0922     950 0932      0
0923     0 0933        0
0924     0 0934        18
0925     0 0935        3
0926     3 0938        0

LSK   ABS
    
```

Setting Procedure

1. Push the **SET** button.
2. Push PAGE- button or to display the page required.
3. Push CURSOR button or to move the cursor under the parameter to be altered.
4. Turn the MODE switch (42) to MDI and turn the PROG PROTECT switch (46) OFF.
5. Press ADDRESS key **P** and enter the required setting with the DATA keys.
6. Push the **INPUT** button.



MULTIPLE PART PARAMETERS

Setting of parameters (on the control operators console)

- 0: When set at zero, it is an indication that G75 and G76 will not be used. All macro numbers 1 to 59 will be executed while simultaneously being stored in macro memory.
- 1: When set at one, trial punching of the lower left hand part is performed. **This** is useful for checking one part in a G98 multiple part program to save time and material.
- 2: When set at two, the worksheet is processed in multiple part format, but the lower left hand part is omitted. This will complete the sheet started by the trial punching.
- 3: When set at three, multiple part programs execute normally. This setting is used for production running.

NOTE: When using G98 to produce multiple parts, parameter #435 must not be set at zero or an alarm condition will result.

MULTIPLE PART PUNCHING G98

G98 X...Y...I...J...P...K...

X = Reference point for lower left hand part in X axis

Y = Reference point for lower left hand part in Y axis

I = Distance between parts in X direction (add slotting tool)

J = Distance between parts in Y direction (add slotting tool)

P = Number of parts in the X axis - excluding the bottom left part

K = Number of parts in the Y axis - excluding the bottom left part

Example 1. **G98X1000Y3000I8000J5000P3K2**

0 = **X**, Y reference point

Notes:

- 1. This command establishes the reference points for the multiple part **processing and** performs no punching.
- 2. When microjoint, shake-a-part processing is desired, it is necessary to add the width of the slotting tool to the **I and J** values. See examples for clarity.

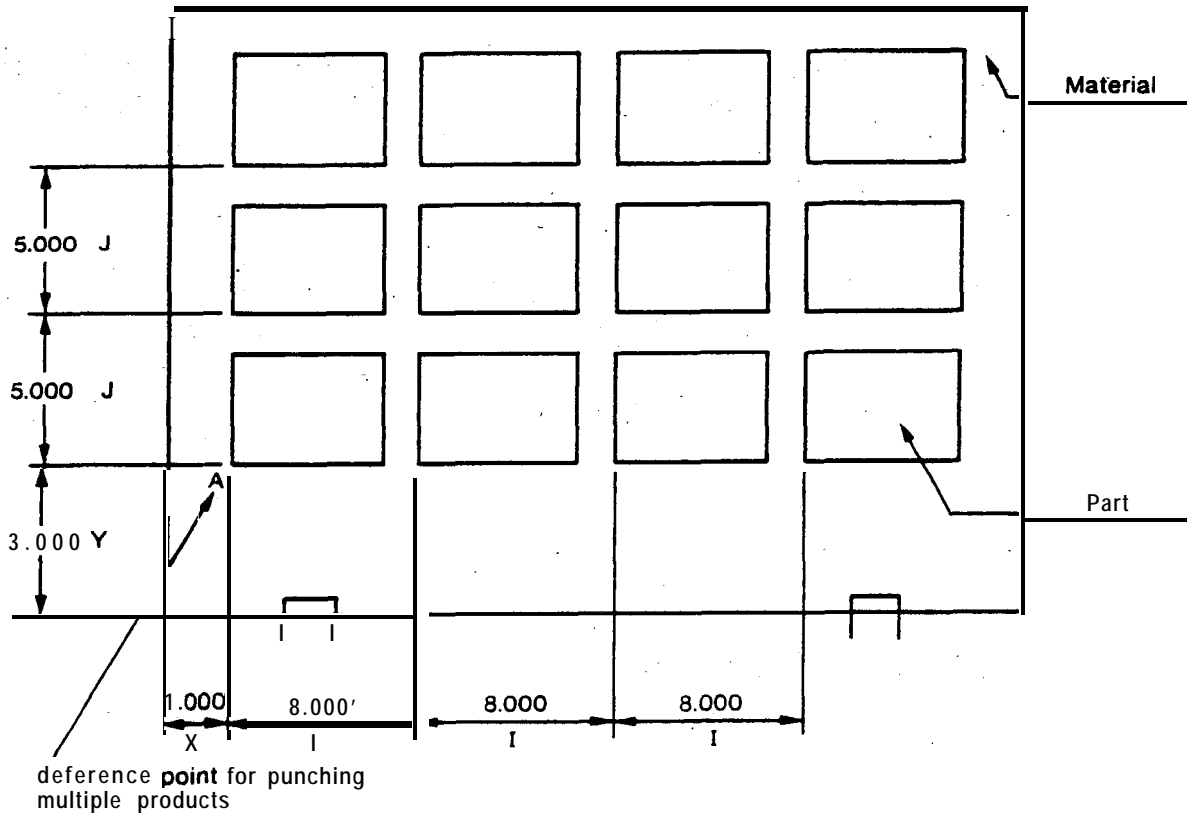


G98 LAYOUT FOR PUNCHING MULTIPLE PRODUCTS

Format: G98 X Y I J P..K

- X = Set up new "0" point (starting point) in the "X" axis.
- Y = Set up new "0" point (starting point) in the "Y" axis.
- I = Pitch between parts in "X" axis (including slotting tool)
- J = Pitch between parts in "Y" axis (including slotting tool)
- P = Number of spaces between parts in "X" axis.
- K = Number of spaces between parts "Y" axis.

Example 1.



In the above example, assume that X = 1 inch, Y = 3 inch, I = 8 inch, J = 5 inch.
For this procedure-the program is:

G98X1000Y3000I8000J5000P3K2

Notes:

1. The reference point for punching multiple products must be located in lower left corner of the product, located at the lower left portion of the material.
2. The values of I, J, P, and K, as specified by G98, must be either zero or positive values.



MULTIPLE PART PROGRAMMING TECHNIQUES

Introduction:

We have seen in previous sections of this manual how more than one part may be fabricated on a sheet by using **U# - V#** MACROS to store program information and using G93 for moving the zero reference **point** to other locations. While this eliminates the need to write out the part program over and over; we must still specify an offset (G93) and macro **call (W)** for each tool used, times the number of **parts on** the sheet,

The G98 Multiple Part Set-Up Command gives us a way to tell the Fanuc Control how **to find** the zero reference point of each part on the sheet using only one block of information. Then the original part program can be repeated, one tool at a time, over the entire sheet, starting at any of the four corners of the sheet.

The three basic steps to creating a Multiple Part program are as follows:

1. Set up the G98 layout. To do this, three things are needed:
 - A. The part size in the X direction.
 - B. The part size in the Y direction.
 - C. The sheet size that the part is on.
2. Program the original part.
(one tool at a time in each U# - V# pair).
3. Punch all the parts located by the G98 statement. This is done by telling the machine three things:
 - A. Which way to punch (**G75** or G76)
 - B. What to punch (W#)
 - C. Where to Start (**Q#**)

All three components will be on one line as information, i.e. **G75W1Q4**.



SHAKE-A-PART PROGRAM METHOD

Ten Steps For Programming Microjoint Parts

1. Set up for multiple parts (G98)
2. Program the original part (one tool at a time, with each tool in a separate macro, U# - V#)
3. Punch all parts (according to the G98 layout, using G75 and/or G76)
4. Set up for slotting in one direction (G98 assuming the slot is the part),
5. Program the slot (U# - V#)
6. Punch the slot (according to the new G98 layout using G75 or G76)
7. Set up for slotting in the other direction (G98 assuming the other slot is the part)
8. Program the other slot (U# - V#)
9. Punch the slots (according to the last G98 layout, using G75 or G76)
10. End of program (G50)

You have processed an entire shake-a-part sheet. Following these ten steps will make programming micro-joint parts much easier.



EXECUTION OF PUNCHING

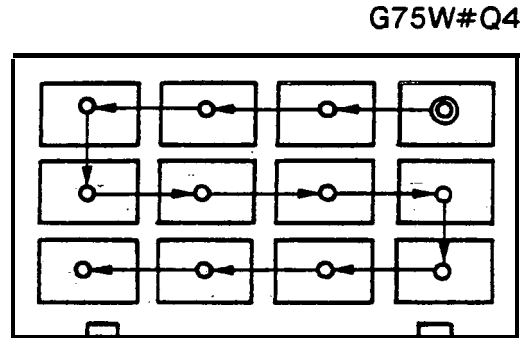
G75 or **G76**
Specifies Direction of
P u n c h i n g

W#
Recalls **U#** & **V#**
in Program

Q#
Specifies the Quadrant to
Start Punching

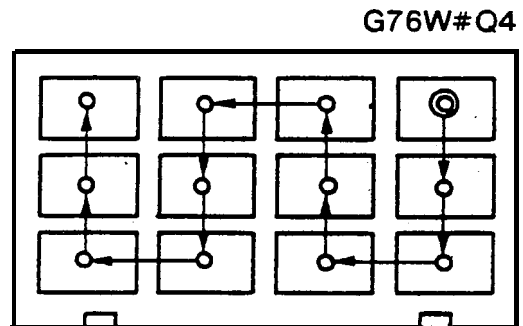
G75 . . . Execution of horizontal Grid ("X" Axis)

The contents of the part program placed between **U#** and **V#**, which correspond to the No. of **W#**, are executed in the order shown in the figure at the right.



G76 . . . Execution of vertical Grid ("Y")

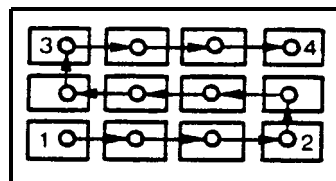
Execution is accomplished as shown at right.



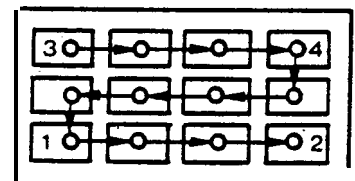
Q# . . . Specification of the starting point.

This specifies the quadrant of the punching layout from which the punching operation will begin by **G75** and **G76**.

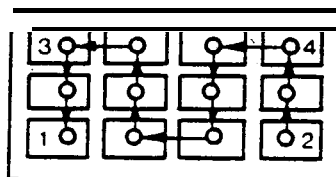
- Q1** . . . Lower left quadrant
- Q2** . . . Lower right quadrant
- Q3** . . . Upper left quadrant
- Q4** . . . Upper right quadrant



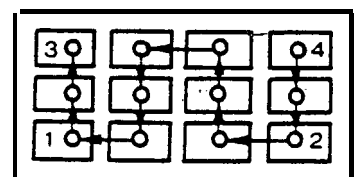
G75W#Q1



G75W#Q3



G76W#Q2



G76W#Q4



EXECUTION OF- PUNCHING (Continued)

G75 - Execution of Punching In Grid X Direction.

G76 - Execution of Punching In Grid Y Direction.

Format: (**G75** or **G76**) **W# Q#**

W is **the macro** number to be executed.

Q is the starting comer **1, 2, 3,** or 4.

G75 - The program information between U# and V# is **performed starting** at the part located in the comer of the sheet specified- by Q. Punching is performed in a manner similar to X grid.

G76 - The program information between U# and V# is performed starting at the part located in the comer of the sheet specified by **Q**. Punching is performed in a manner similar to Y grid.

Q# - This specifies the sheet corner where punching will begin when using **G75** or **G76** with **G98** format.

Q1 - lower left hand corner

Q2 - lower right hand comer

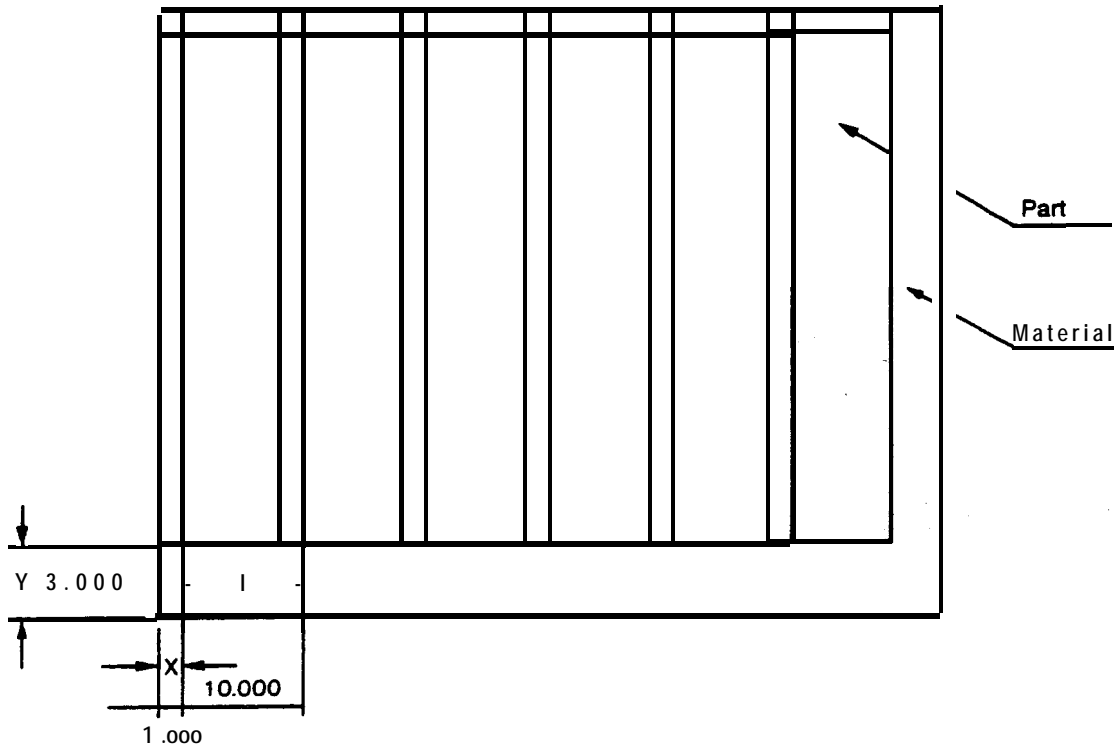
Q3 - uppper left hand comer

Q4 - upper right hand comer



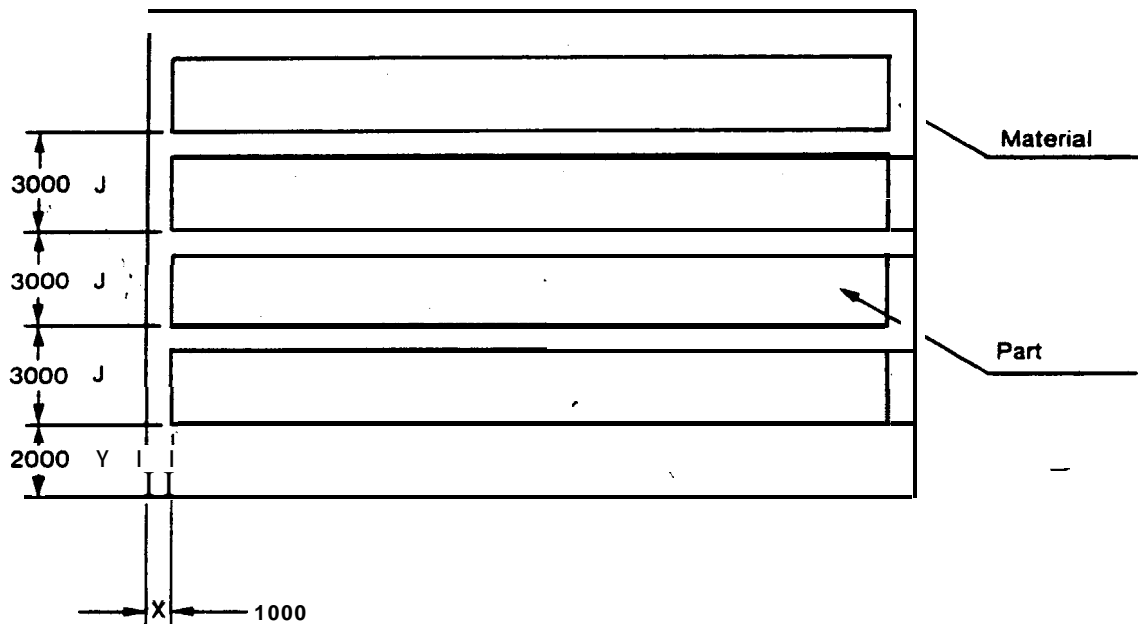
EXECUTION OF PUNCHING (Continued)

This shows the punching of products in the X-axis direction only.



If $X = 1$ inch, $Y = 3$ inch and $I = 10$ inch in the above figure the program is:
G98X1000Y3000I10000P5J0K0

This shows the punching of parts only in the Y-axis direction.



If $X = 1000$, $Y = 2$ inch, $J = 3$ inch the program is: **G98X1000Y2000I0P0J3000K3**



EXECUTION OF PUNCHING (Continued)

When punching multiple products in a single horizontal row:

G . . . only **G75** can be used.

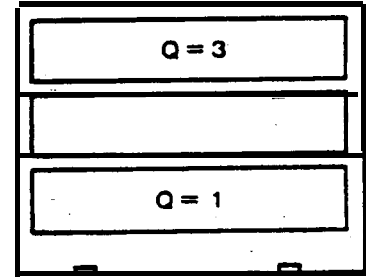
Q . . . only 1 or 2 can be used.



When punching multiple products in a single **vertical** row:

G . . . only **G76** can be used.

Q . . . only 1 or 3 can be used.



The **only** "Q" that can be used with either G75 or G76 is "Q1" when punching a single row of parts.

Combination method of G75, G76 and Q1 to Q4

1. Either G75 or G76 must be selected in order that the distance of movement be minimized.
2. If the-processing of a program between a pair of U and V starts from the upper right corner (Q4) and ends at the upper left corner, the next processing between the next pair of U and V should start at the upper left corner, (Q3), in order to guarantee efficient movement.
3. When cutting the outside edge in the process of punching multiple products, it is desirable to start the punching at the upper portion of the sheet and move lower in sequence. For this procedure, enter the command of:

G75W#Q4 or Q3

U90 to U99

If the starting point specified by Q is **unchnged** and either G75 or G76 is to be used alone, it is possible to **represent** multiple sets of U# and V# by a single U# and V#. The macro number for this function is 90 to 99

Setting of Multiple Part Punching Program

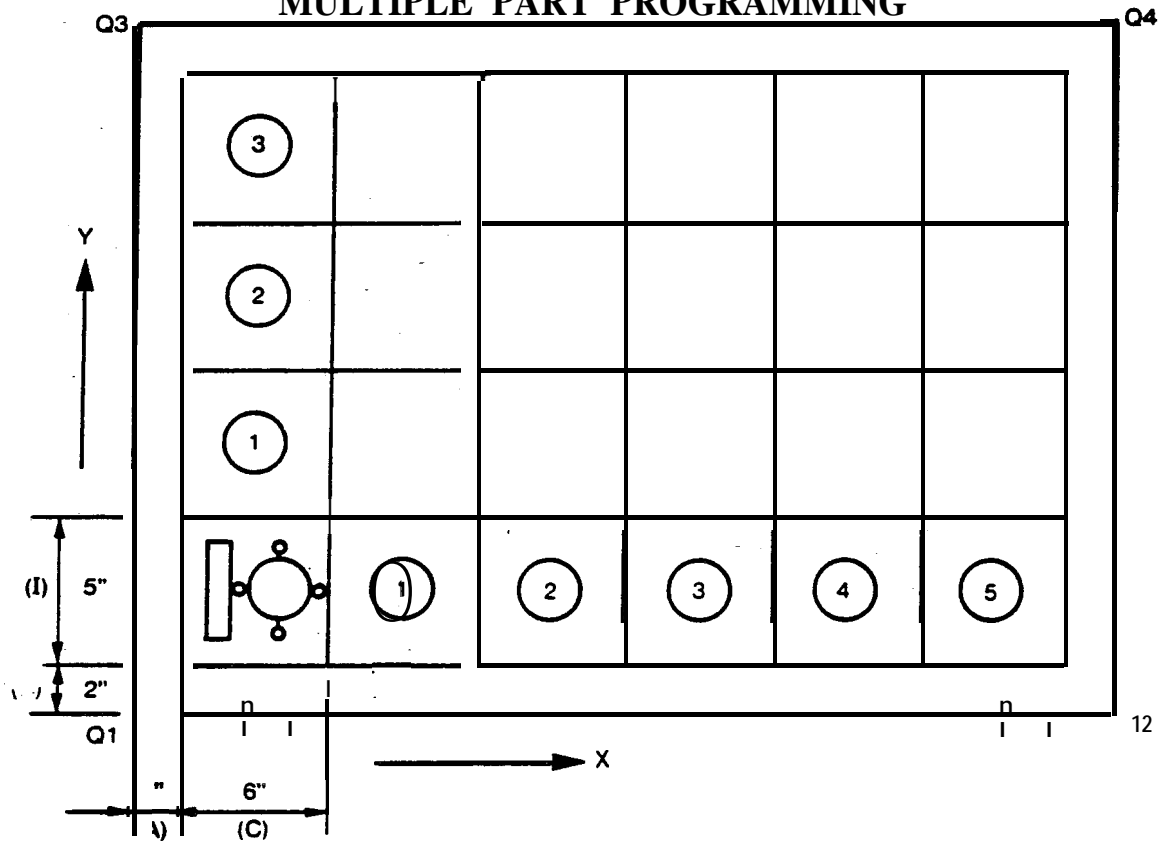
Parameter #435 (Setting Data Page #02)

- 0: Programs which do not use software for multiple part punching (does not use G98).
- 1: Trial punching (Punches all of Part in corner Q1).
 - 2: Remaining punch work after trial punching (all parts except the one in corner Q1).
 - 3: Entire punch work of multiple part punching.

Note: When G98 is used perimeter 435 must be 1, 2 or 3.



MULTIPLE PART PROGRAMMING



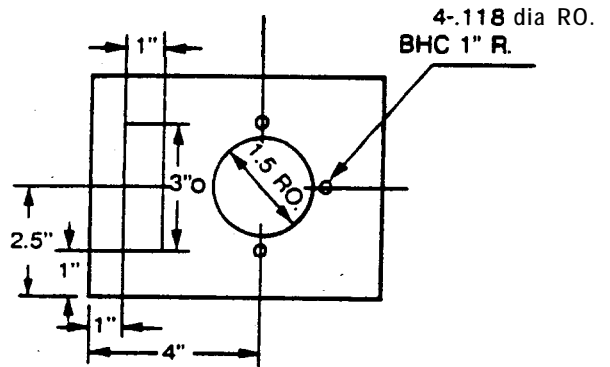
G92X50000Y50000
 G98X1000Y2000I6000J5000P5K3
 (A) (B) (C) (D)

U1
 G72X4000Y2500
 G26I1000J9000K4T205 (.118 dia.)
 V1

u 2
 G72X1000Y1000.
 G66I3000J9000P-1000T3 12

v 2
 u 3
 X4000Y2500T228 (1.500 dia.)

v 3
 G75W1Q4
 G75W2Q2
 G75W3Q4
 G50

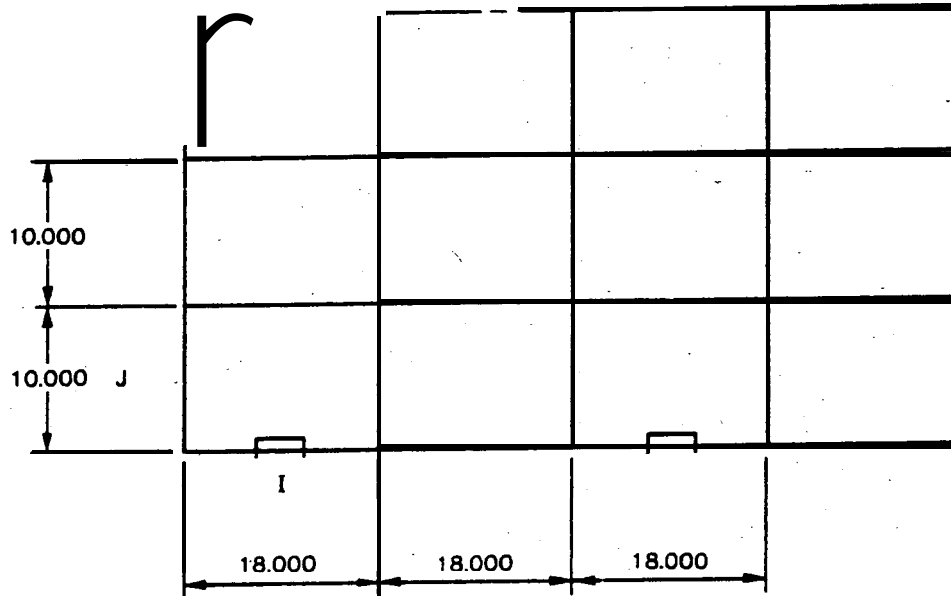


1. U1-V1 Memory of T205
2. U2-V2 Memory of T312
3. U3-V3 Memory of T228
4. G75W1Q4 All punching of 1
5. G75W2Q2 All punching of 2
6. G75W3Q4 All punching of 3-



MULTIPLE PART PROGRAMMING (Continued)

This is an example where there is neither a cutting area between parts nor a clamping area and trimming is not performed.



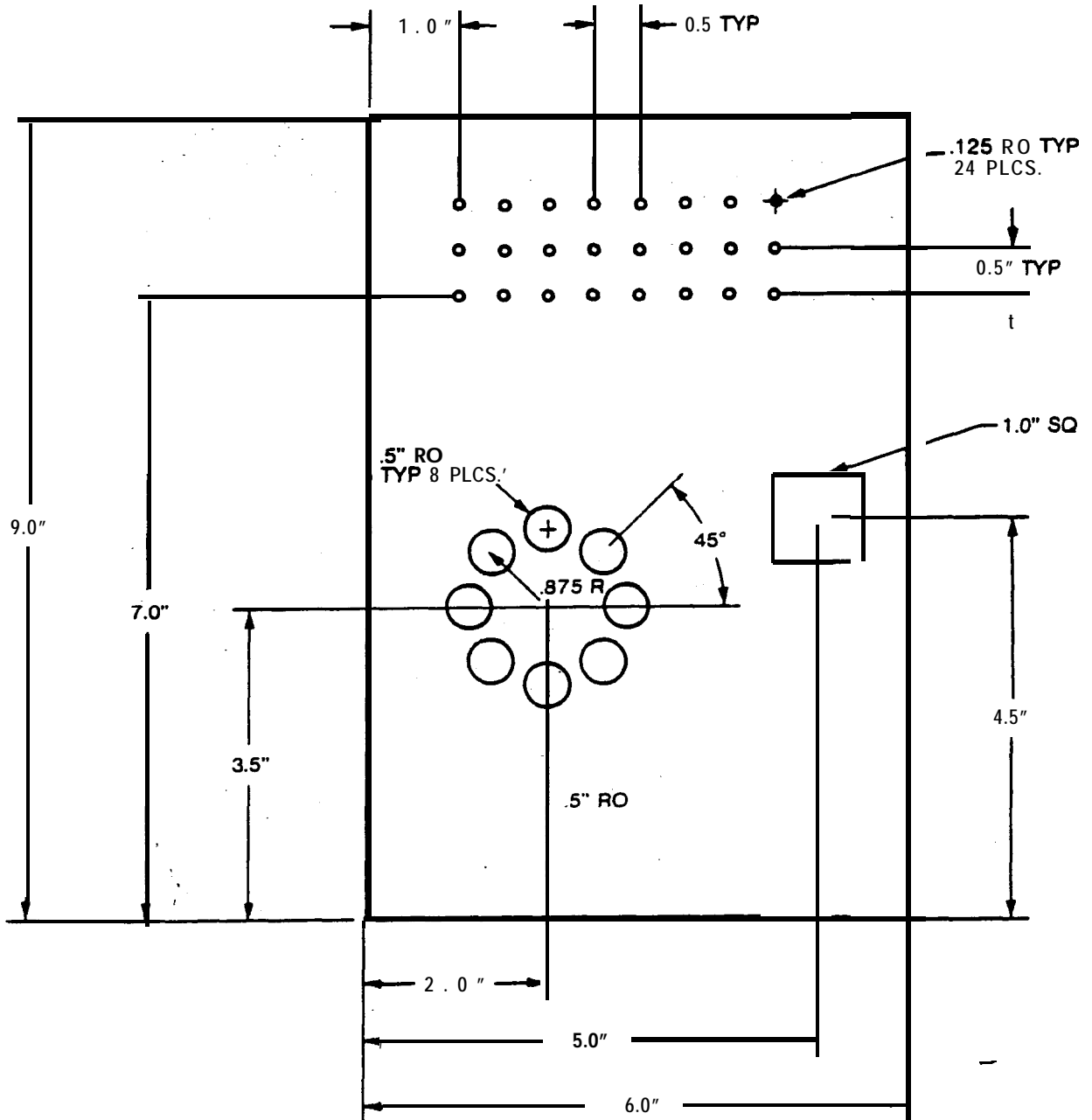
If I (length of part along X axis) = 18 inches and Y (length of part along Y axis) = 10 inches, the program is:

G98X0Y0I18000J10000P3K2

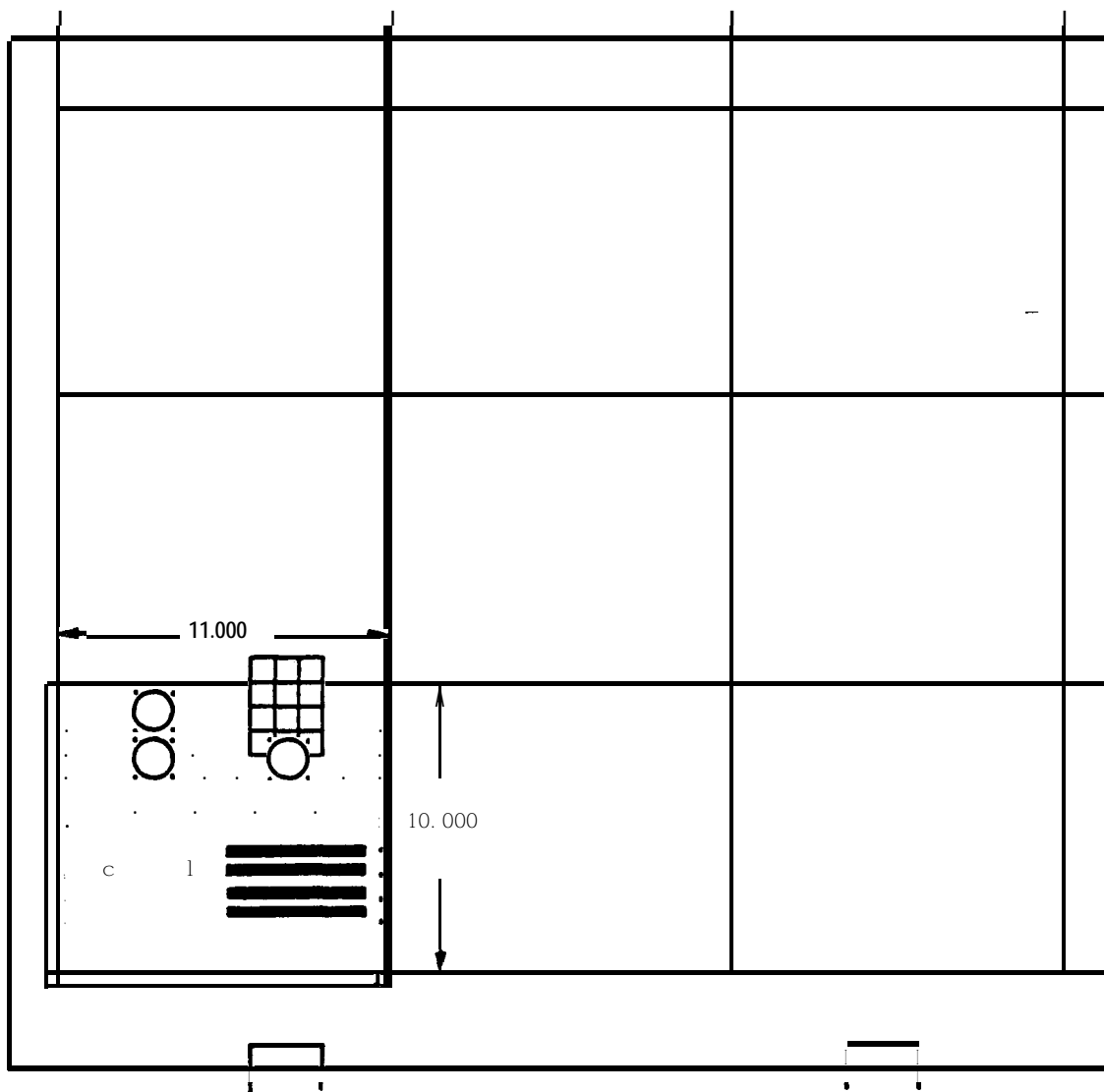


PROGRAM NO. 10

Sheet Size 36" X 36"
1.0 SQ. 0 Deg.
.5 RO.
.125 Ro.



SAMPLE MULTIPLE SHAKE-A-PART



SHEET SIZE: 36000, 36000
 CLAMP POS.: 10000, 25000

<u>Tool</u>	<u>Shape</u>	<u>Size</u>	<u>Angle</u>
T310	RO	141	0
T303	SQ	8 7 5	0
T207	RO	1500	0
T229	SQ	3000	0
T306	OB	250 x 125	90
T243	RE	3000 x 250	90
T215	RE	3000 x 250	0
END			



SAMPLE MULTIPLE SHAKE-A-PART (Continued)

G92X39370Y39370
G98X1000Y3000I11250J10250P2K2
U1
X250Y1000T310
G37I10500P1J1000K8
G72X2500Y6000
A1G26I1000J4500K4
G72X2500Y8200
B1
G72X8500Y8200
B1
G72X8500Y6000
B1
V1
u 2
X4500Y5500T303
G36I1000P2J1000K3
u 3
X2500Y6000T207
G37I6000P1J2200K1
v 3
U4
X2500Y2500T229
v 4
U5
M I 2
X5000Y1000T306
A1G28I200J0K24
M I 3
M I 2
X9800Y1500
A2G28I200J18000K24
M I 3
M I 2
X5000Y3000
81
M I 3
M I 2
X9800Y3500
B2
MI3
V5
G75W1Q4
G75W2Q1
G75W3Q4
G75W4Q1
G75W5Q4
G98X1000Y3000I11250J10250P3K2
U10
G72X0Y0
G66I10000J90000P30000Q250D-10T243

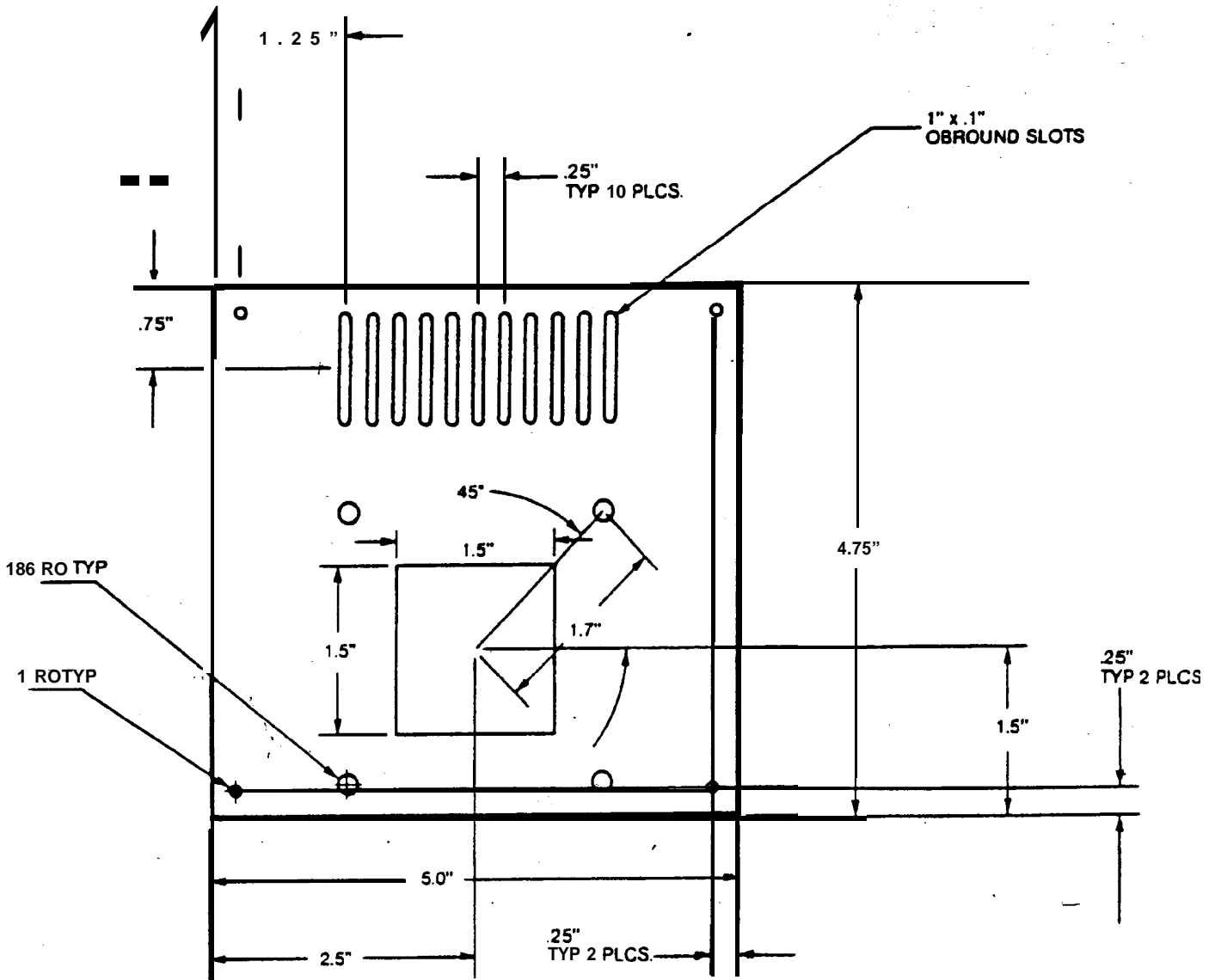


PROGRAM NO. 11

1. Do the problem in the sequence listed below.

- | | |
|------------------------------|----------------------------------|
| A. 1." X .100" obround slots | 1. X .100 OB keyed 90 degrees |
| B. .100 round holes | .100 RO. |
| C. .186 round holes | .186 RO. |
| D. 1.500 square hole | 1.5 SQ. keyed 0 degrees |
| E. Vertical slotting | 3.00 X .250 RE. keyed 90 degrees |
| F. Horizontal slotting | 3.25 X .250 RE. keyed.0 degrees |

2. The material is 18.0" in the X direction and 20.0" in the Y direction.

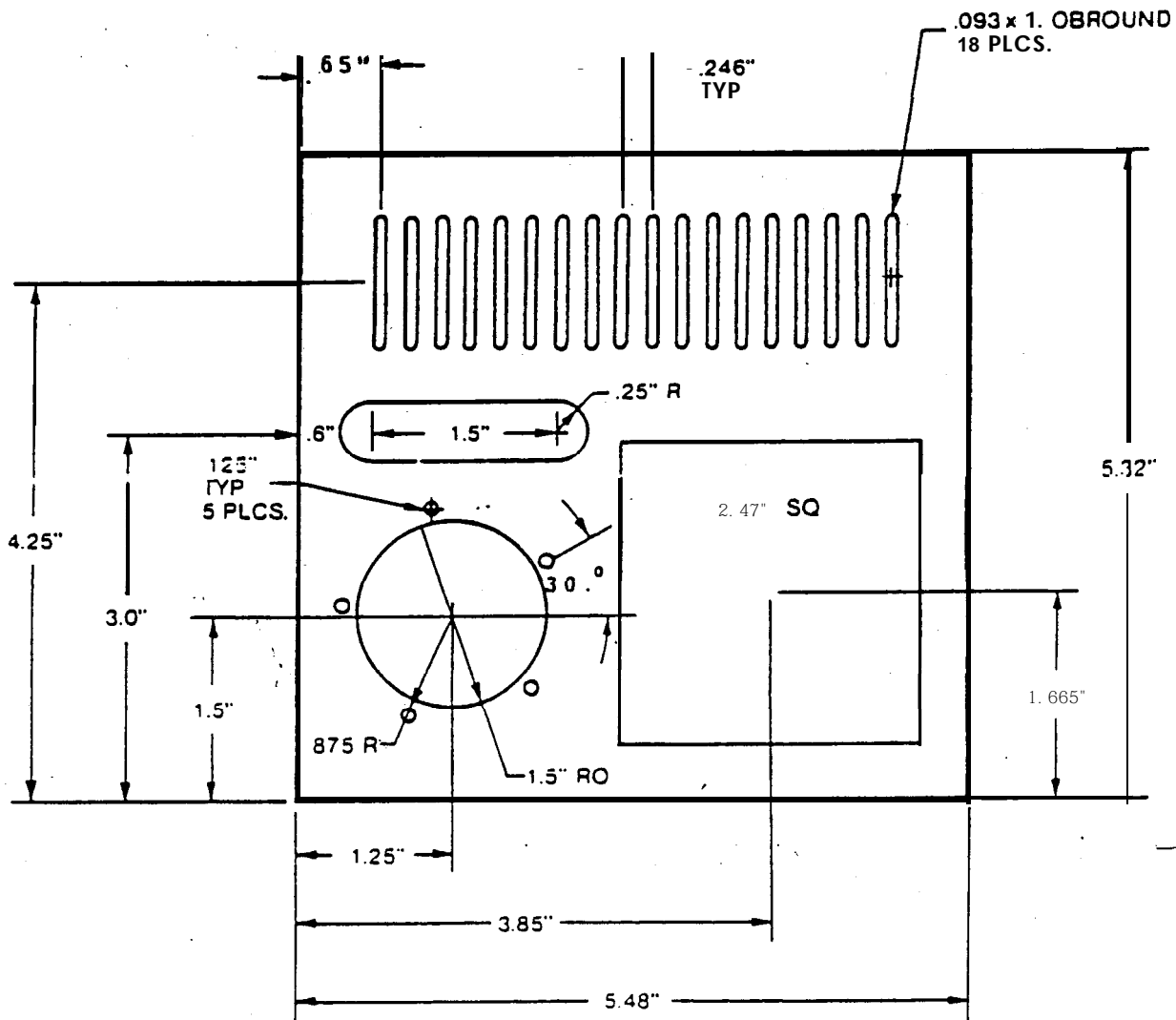


PROGRAM NO. 13

Program the pictured part as a shaker part. The sheet size is 36,000 x 36,000 mild steel. Use the tools in the order shown below. Use G92X39.37Y39.37 (**Pega 56 Sta.**)

TOOL LIST

- | | |
|---------------------------------------------------|-------------------------------------|
| 1) 1.500 Dia. | 1-207 1.5 RO. |
| 2) .125 Dia. | 1-306.125 RO. |
| 3) 2.470 X 2.470 Square at 0 degrees | T215 2.47 SQ. at 0 degrees |
| 4) .093 X 1.000 Obround at 90 degrees | T303 .093 X 1 at 90 degrees |
| 5) .500 Dia. | T205 .5 RO. |
| 6) .250 X 3.000 Rect. at 90 degrees | T243 .250 X 3. at 90 degrees |
| 7) .250 X 3.000 Rect. at 0 degrees | T229 .250 X 3. at 0 degrees |



**ADDITIONAL
PROGRAMMING
& OPERATIONAL
FEATURES**

SECTION IV

CONTROL CAPABILITIES

CONTROL TYPE	PUNCH TYPE	SERVO TYPE	G98	#MACROS
GN200	LYLA	20H	NO	5
200A	COMA	20H	NO	25
(This control does not have stripping miss and has Ram Head Discharge)				
200B	COMA	20H	NO	25
200B (567 Ser# C67064 and later (557 Ser# C57080 and later (555 Ser# C55023 and later)	COMA	10L	YES	25
3000C	PEGA	10L	YES	5
3000c	VELA II	20H	NO	5
3000c (Ser# 180 and later)	VELA II	10L	YES	5

This information is from service archives and **could** be subject to modification by control software. The final test should be made on each individual machine.



SUBPROGRAMS

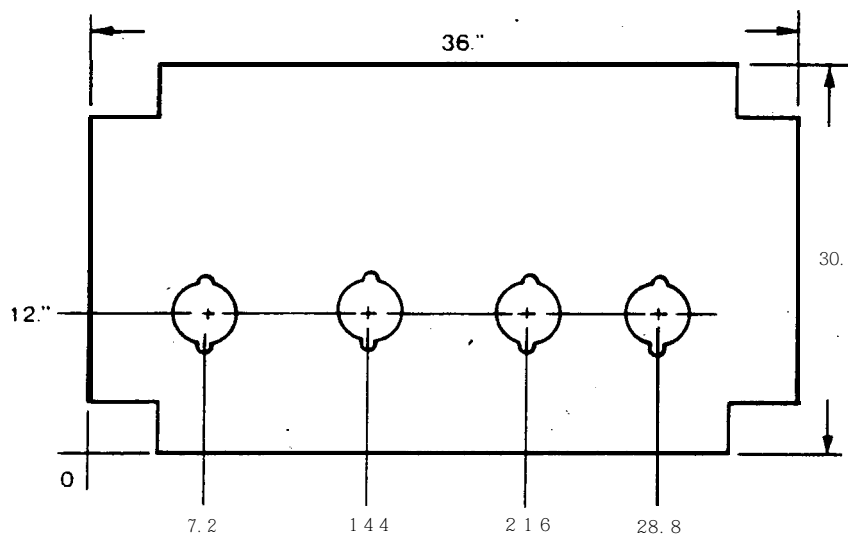
When programs contain patterns repeated frequently, they can be stored in advance in the memory as subprograms.

Subprogram format:

1. Store the subprogram with a program number, i.e.: 01234
2. Write the program (remember that offsets (**G93**) can be used to locate the subprogram. No G92 statement is required when using subprograms).
3. End the subprogram with M97.
4. Recall the subprogram with M96 P1234 (subprogram number must correspond with the number stored).

Example:

Subprogram	Program
07846	06666
X0Y0T114(1.R0)	G92X50.Y50.
X0Y.5T309(.5X250@90 deg.)	G93X7.2Y 12.
Y-.5	M96P7846
M97	G93X14.4
	M96P7846
	G93X21.6
	M96P7846
	G93X0Y0
	X1.Y1.T215
	G36I34.P1J28.K1
	G50

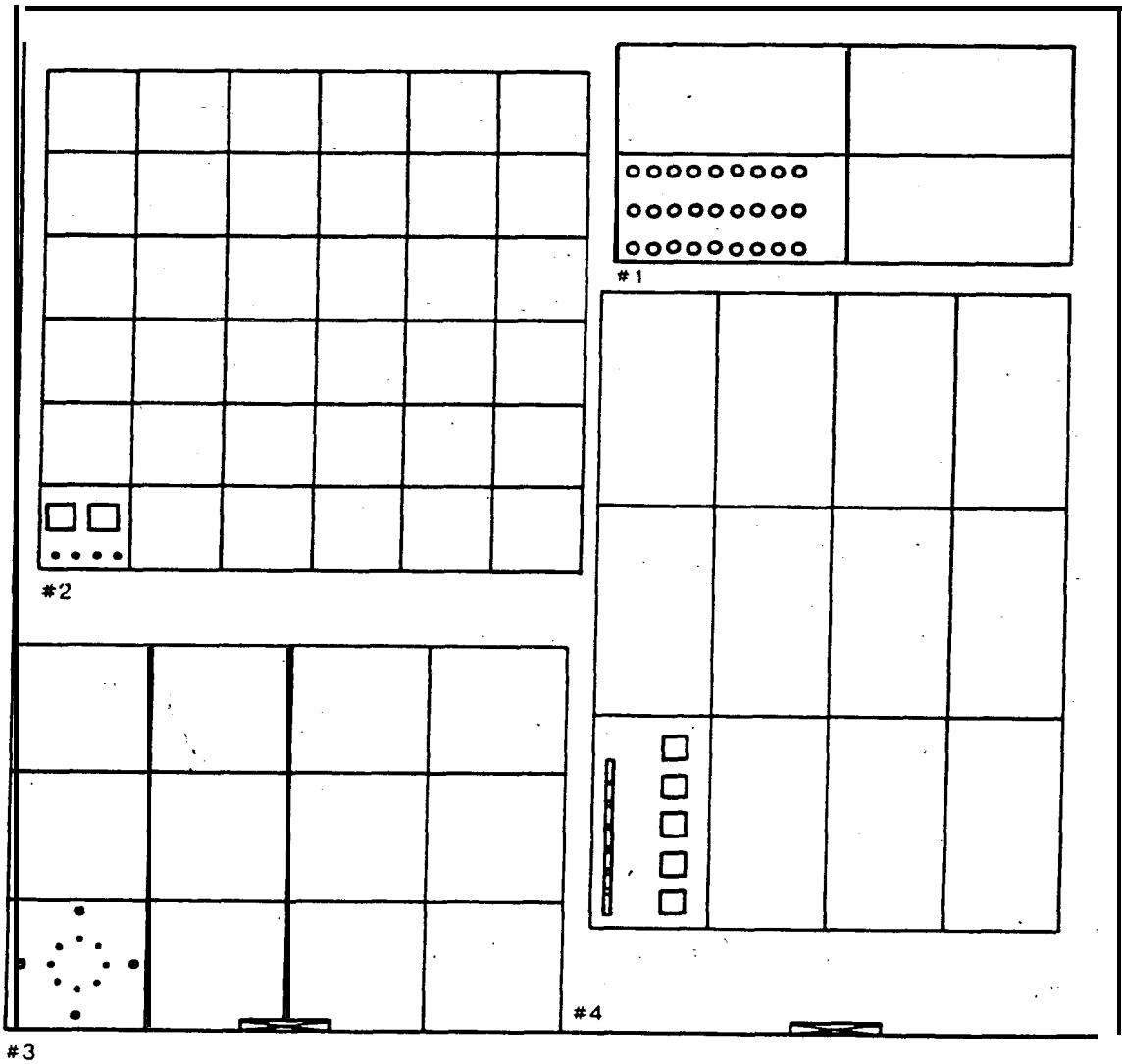


EXAMPLE NO. 6

4-G98'S USED AS SUBPROGRAMS
 SHEET SIZE 40000* 40000
 CLAMP (1) 10000
 (2) 30000

03337
 G92x39.37Y39.37
#1 G93X23.Y29.
 M96P3336
#2 G93X1.Y18.
 M96P3335
#3 G93X0Y0
 M96P3332
#4 G93X20.Y0
 M96P3334
 G50
 END

NESTING WITH SUBPROGRAMS



TURNING ON G73 MIRROR IMAGE

1. Open **front** panel of control, the panel with the CRT. Find the main "PC" board. Locate the large board toward the bottom of the control. The components will face you. **Find** the small **two** (2) position switch in the lower left corner of the board and set on the "enable" position.
2. **Set** the mode switch to MDI.
3. Turn the program protect key to "off".
4. Press the **param** key.. -Make sure you are 'on the parameter **page**, not PC parameter page. If PC parameter appears on the CRT, press the parameter button once.
5. **Press** N 303. Press input. The cursor should now appear beneath parameter **#303** on the **CRT**.

7 6 5 4 3 2 1 0 < bit number

6. You will see: 303 00000001
If your display **is different**, record what is present.
7. We wish to change only bit six to a one, leaving all else the same. **In** the case above, type **P01000001** and press input. **If** your data was different, type it back in changing bit six to a one.
8. Turn the parameter enable switch to disable.
9. Turn control "OFF" and "ON" then reorigin; mirror image (G73) will now be active.

Example:

Originally:	3 0 3 00000001
After change:	303 01000001



G73 MIRROR IMAGE

(G73 X . . . Y . . . Q . . . W . . .)

When the patterns of holes to be punched are symmetrical, they can easily be programmed by using this instruction and the macro function.

X: Distance from a **specified** pattern reference-point "O" to the symmetrical pattern reference point along the "X" axis.

Y: Distance from the same specified pattern reference point "O" to the symmetrical pattern reference point along the "Y" axis.

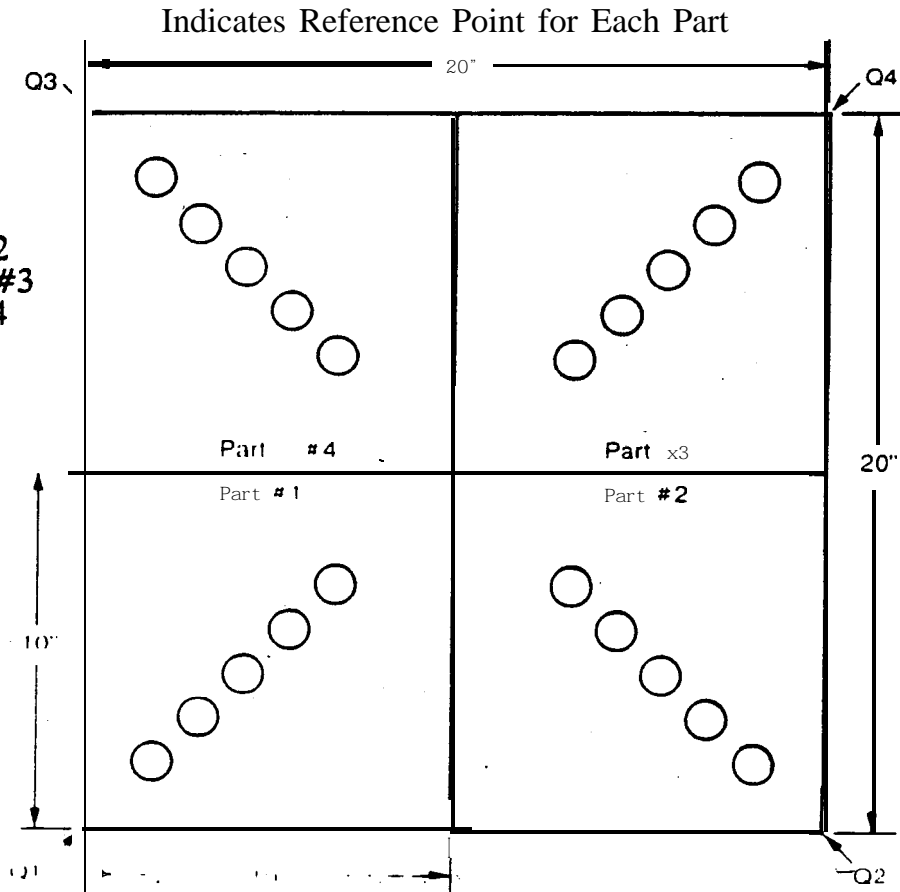
Q: **Specification** of the starting point.

- Q1 = Lower Left Comer
- Q2 = Lower Right Comer
- Q3 = Upper Left Comer
- Q4 = Upper Right Comer

W: Macro number storing the specified pattern.

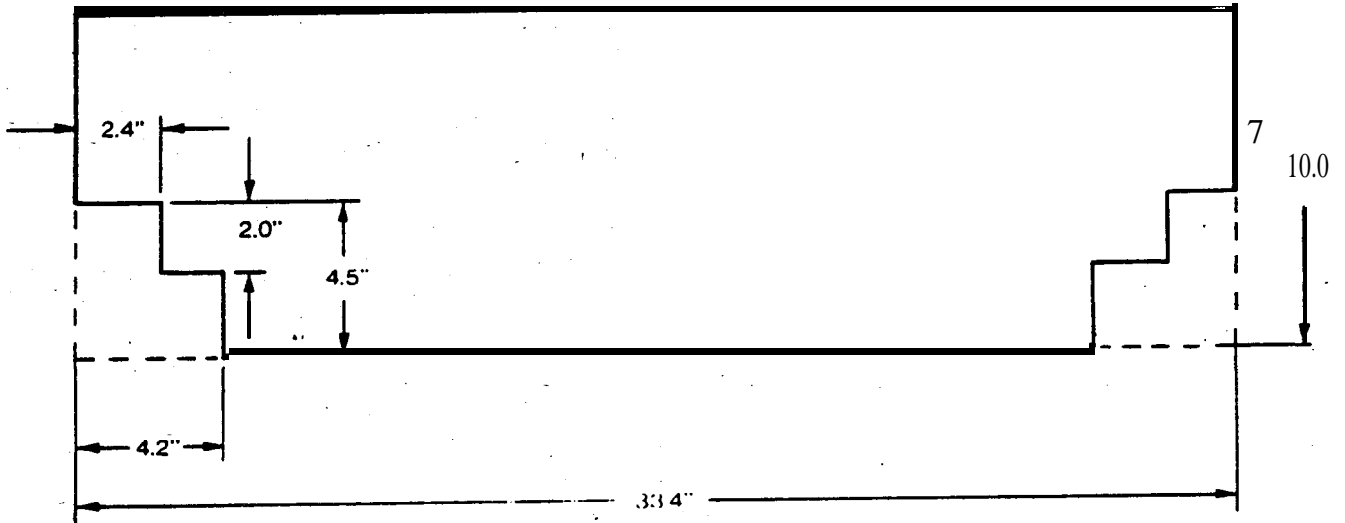
Example: ,

```
G92X50.Y50.
U1
G90X2.Y3.T356
G28I1.75J45.K4
V1
G73X20.Y0Q2W1 + Part #2
G73X20.Y20.Q4W1 + Part #3
G73X0Y20.Q3W1 + Part #4
G50
```



PROGRAM NO. 14

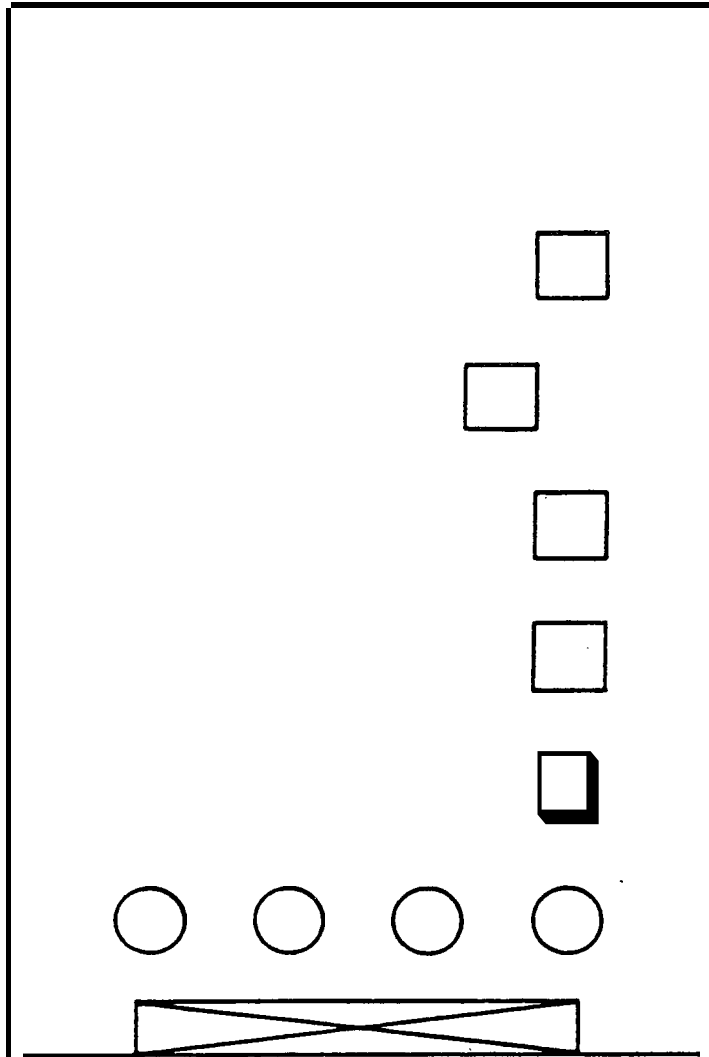
1. Use mirror image to complete this problem.
2. Program the left hand comer notching, then use G73 to do the right comer.
3. **Use** tool station **306** for turrets and tool station 1 for Octos.
4. Use a $1/2$ " square punch.
5. Leave no scrap;



EXAMPLE NO. 7

ORIGINAL PART
SHEET SIZE 5000* 8000
CLAMP (1) 2500
(2) 0

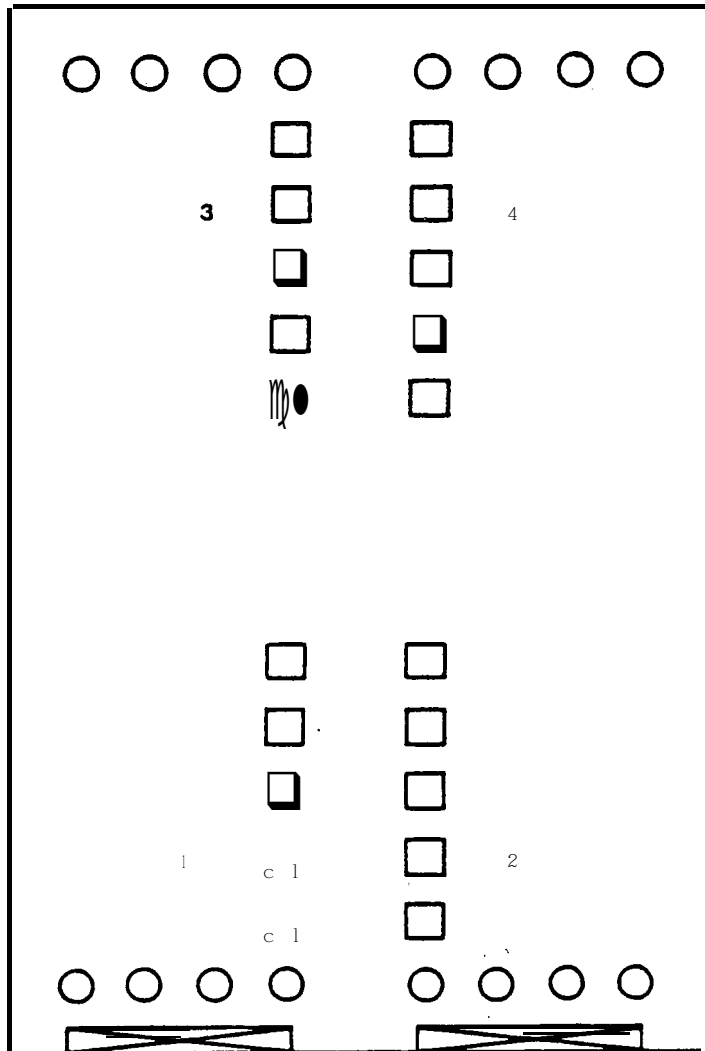
10
20 G92X39.37Y39.37
30 G90X4.Y2.T317
40 G28I1.J90.K4
50 X1.Y1.T310
60 G28I1.J0K3
70 G50
9999 END



EXAMPLE NO. 7A

G73 ALL 4 CORNERS
 SHEETSIZE 10000* 16000
 CLAMP (1) 2500
 (2) 7500

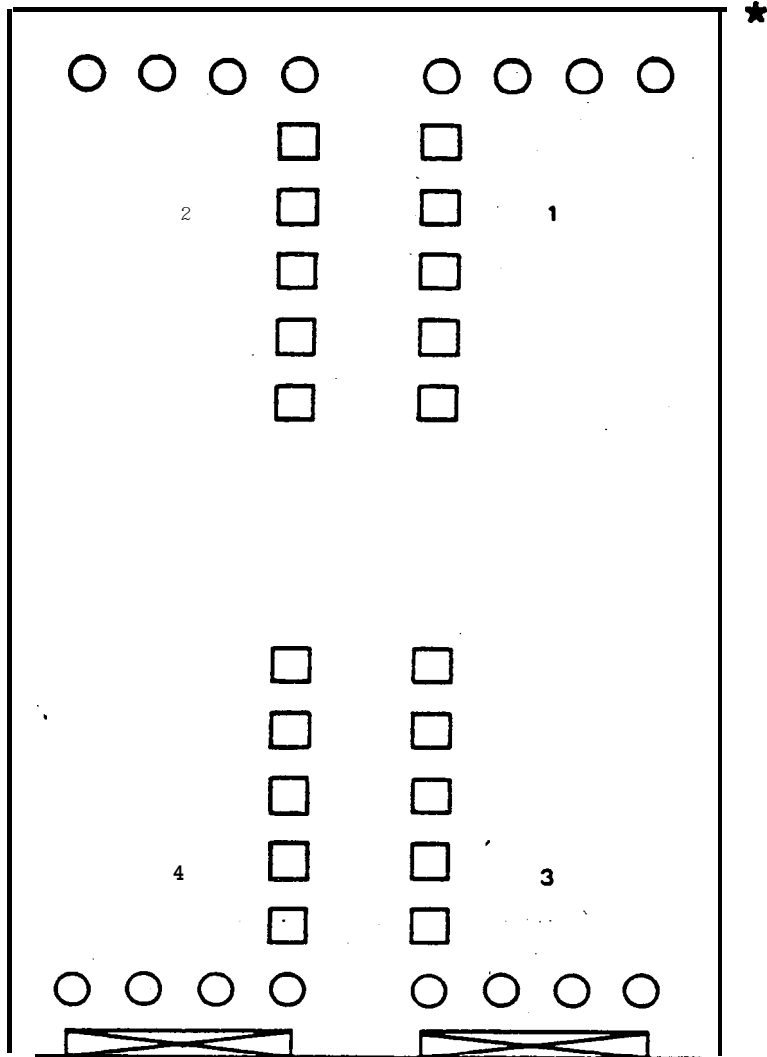
10
 20 G92X39.37Y39.37
 30 U1
 40 G90X4.Y2.T317
 50 G28I1.J90.K4
 60 X1.Y1.T310
 70 G28I1.J0K3
 80 V1
 90 G73X10.Y0W1Q2
 100 G73X10.Y16.W1Q4 --
 110 G73X0Y16.W1Q3
 120 G50
 9999 END



EXAMPLE NO. 7B

G93 OFFSET UPPER RIGHT AND G73
 SHEET SIZE 10000/16000
CLAMP (1) 2500
 (2) 7500

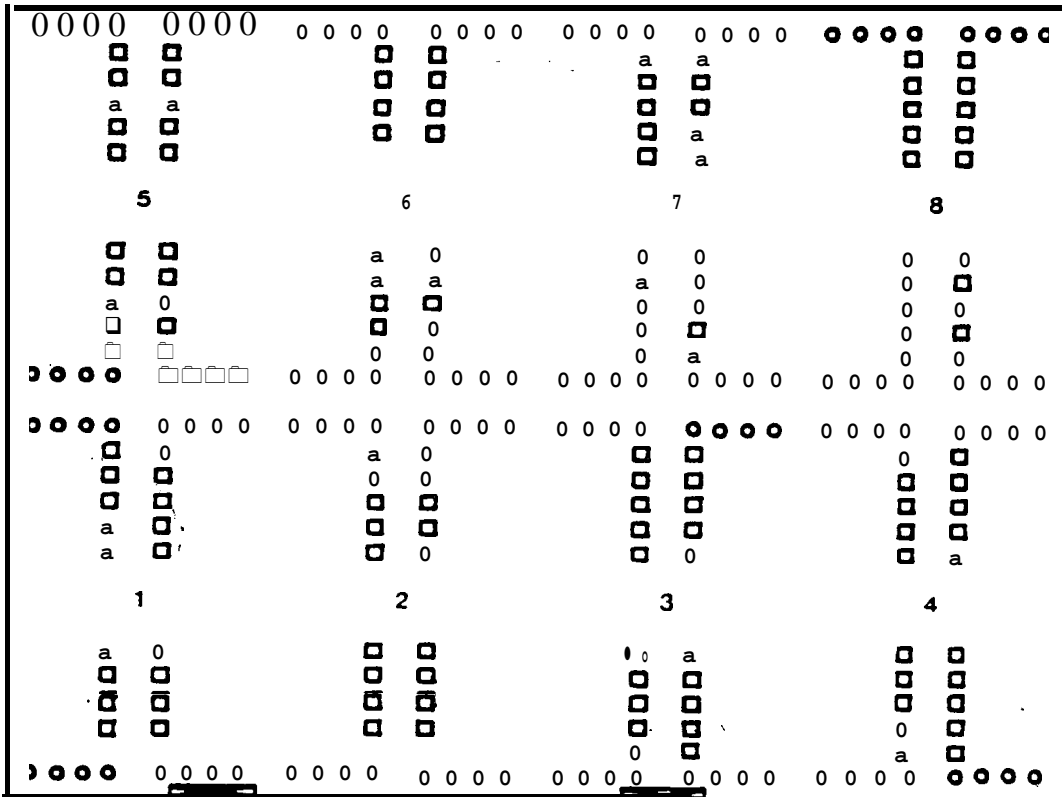
G92X39.37Y39.37
 G93X10.Y16.
 U1
 G90X-4.Y-2.T317
 G28I1.J270.K4
 X-1.Y-1.T310
 G28I1.J180.K3
 V1
 G73X-10. . . . Y0W1Q2
 G73X-10.Y-16.W1Q4
 G73X0Y-16.W1Q3
 G50
 END



EXAMPLE NO. 7C

G73 WITH G93 OVER ENTIRE SHEET
 SHEET SIZE 40000/32000
 CLAMP (1) 8000
 (2) 25000

01113
 G92x39.37Y39.37
 G90G93X0Y0
 M96P1212
 G93X10.Y0
 M96P1212
 G93X20.Y0
 M96P1212
 G93X30.Y0
 M96P1212
 G93X0Y16.
 M96P1212
 G93X10.Y16.
 M96P1212
 G93X20.Y16.
 M96P1212
 G93X30.Y16.
 M96P1212
 G50
 END



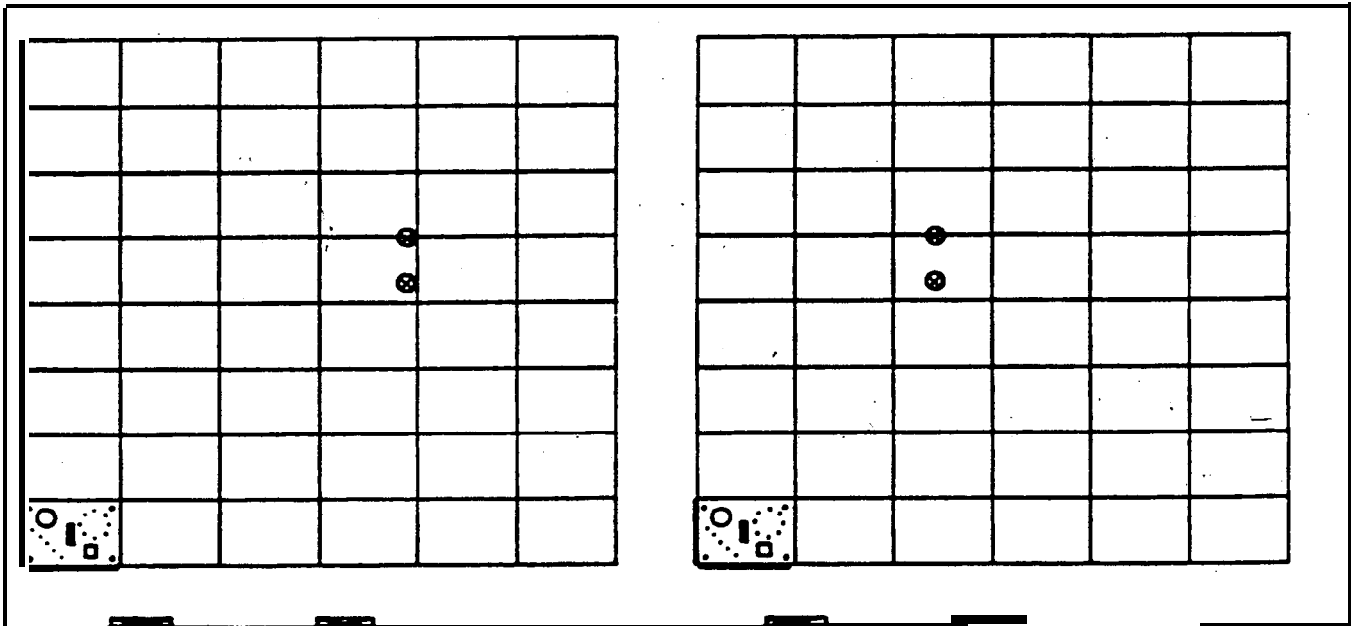
EXAMPLE NO. 8

G98 WITH REPOSITION
 SHEET SIZE 80000/40000
 CLAMP (1) 8000
 (2) 20000

O0009
 (G98 with Reposition)
 (T221 .25RO)
 (T205 .187 RO)
 (T317 .375 Sq. Keyed 0)
 (T207 1.375 RO)
 (T356 .75 Sq. Keyed 0)
 (T209 .156 RO)
 (T243 2.X.25 RE Keyed 90.)
 (T215 3.X.25 RE Keyed 0)
 G92x39.37Y39.37
 #1 G98X1.Y4.I5.875J4.25P5K7
 U1
 G90X5.25Y3.625T221
 G36I-4.875P1J-3.25K1
 V1
 U2
 G72X2.75Y.1
 G28I.612J135.K5T205
 v2
 u3
 G72X3.Y1.4
 G66I1.25J90.P.375T317
 V3
 U4

X1.406Y2.94T207
 V4
 U5
 X4Y.875T356
 V5
 U6
 G72X4.3Y2.6
 G26I.875J45.K8T209
 V6
 G76W1Q4
 G76W2Q3
 G76W3Q4
 G76W4Q3
 G76W5Q4
 G76W6Q3
 #2 G98X1.Y4.I5.875J4.25P6K7
 U10
 G72X0Y0
 G66I4.J90.P2.Q.25D-10T243
 V10
 G76W10Q4
 #3 G98X1.Y4.5.875J4.25P5K8
 U20
 G72X0Y0
 G66I5.625J0P-3.Q-.25D-10T215

V20
 G75W20Q1
 #4 G98X0Y0I0J0P0K0
 G70X39.5Y25.
 G27X39.
 #5 G98X41.Y4.I5.875J4.25P5K7
 G76W1Q4
 G76W2Q3
 G76W3Q4
 G76W4Q3
 G76W5Q4
 G76W6Q3
 #6 G98X41.Y4.I5.875J4.25P6K7
 G76W10Q4
 #7 G98X41.Y4.I5.875J4.25P5K8
 G75W20Q1
 #8 G98X0Y0I0J0P0K0
 G70X39.5Y22.
 G27X-39.
 G50
 END

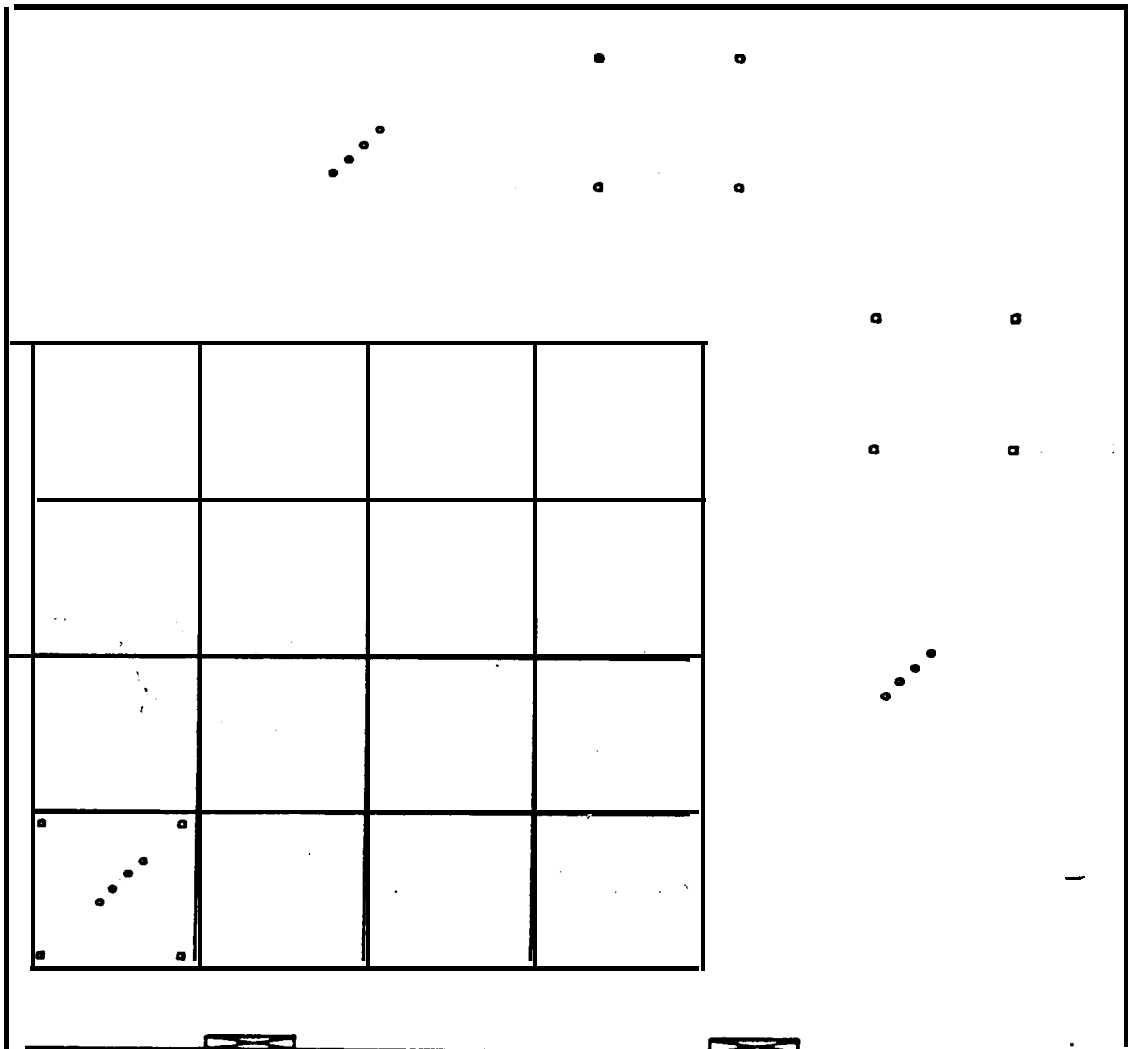


EXAMPLE NO. 9

G92X39370Y39370
G98X1.Y3I6J6P3K3
U1
G72X2.Y2.
A1G28I.75J45.K4T170
V1
U2
X.5Y.5T132
A2G36I5.P1J5.K1
V2
G75W1Q4
G75W2Q2
G72G90X30.Y10.
B1
G72X10.Y30.
B1
X20.Y30.T132

B2
X30.Y20.
B2
G50
END

SHEET SIZE 40000/40000
CLAMP(1)9000
(2) 27000

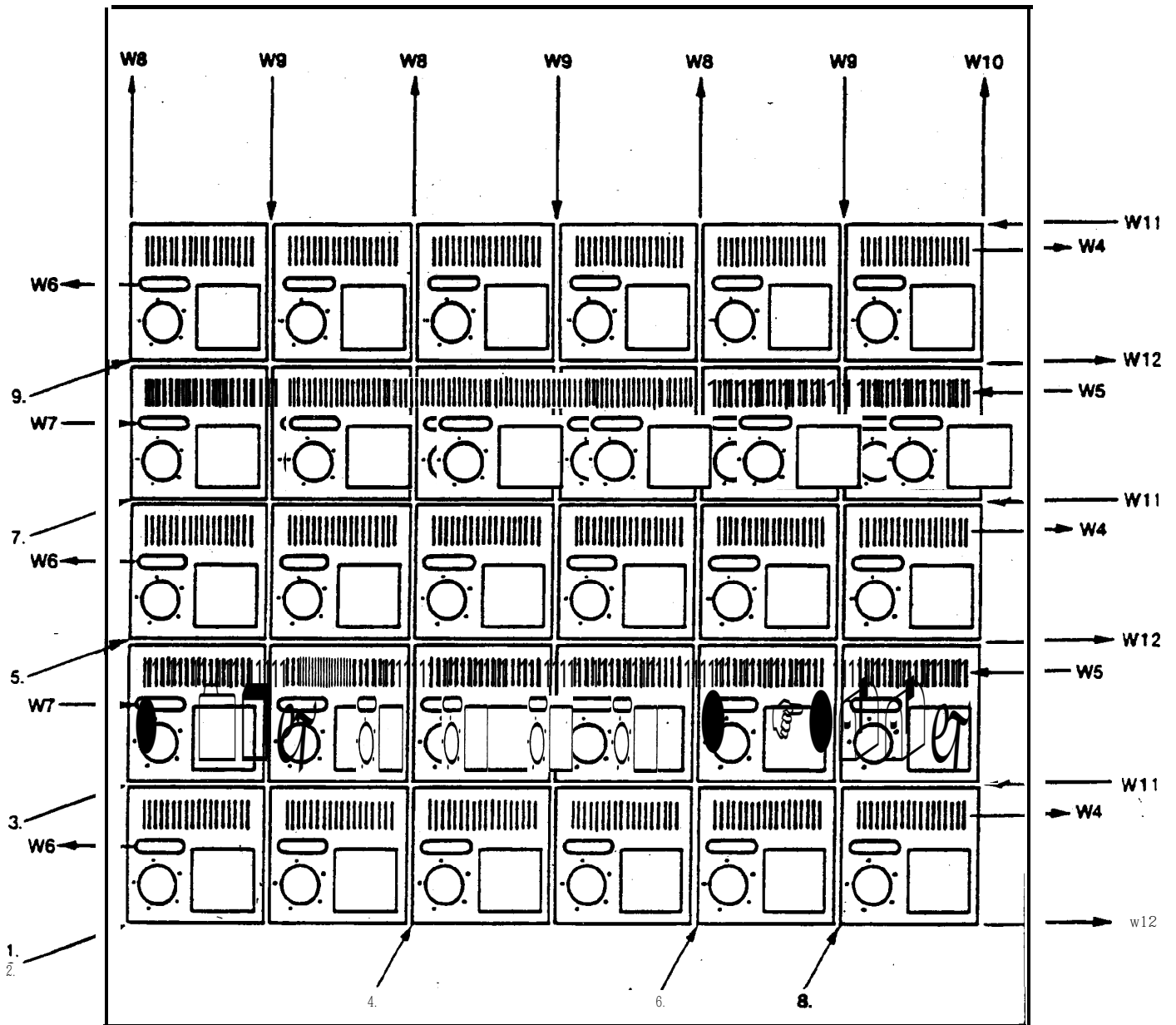


EXAMPLE NO. 10

- G92X39.37Y39.37
1. G98X750Y4000I5730J5570P5K4
U1
X1.25Y 1.5T235
V1
U2
G72G90X1.25Y1.5
G26I875J3000K5T338
v2
U3
X3850Y1685T215
V3
G75W1Q4
G75W2Q1
G75W3Q4
 1. G98X750Y4000I5730J0P5K0
U4
M12
X650Y4250T317
G28I246J0K17
M 1 3
V4
G75W4Q1
 3. G98X750Y9570I5730J0P5K0
U5
M12
X4832Y4250
G28I-246J0K17
M13
V5
G75W5Q2
 5. G98X750Y15140I5730J0P5K0
G75W4Q1
 7. G98X750Y20710I5730J0P5K0
G75W5Q2
 9. G98X750Y26.28I5730J0P5K0
G75W4Q1
U6
G72G90X2.1Y3.
G69I-1.5J0P0Q.150T209
V6
G75W6Q2
 7. G98X750Y20.71I5730J0P5K0
U7
G72G90X600Y3.
G69I1500J0P0Q150
V7
G75W7Q1
 5. G98X750Y15.14I5730J0P5K0
- G75W6Q2
3. G98X750Y9570I5730J0P5K0
G75W7Q1
 1. G98X750Y4I5730J0P5K0
G75W6Q2
 2. G98X750Y4IQJ5570P0K4
U8
G72X0Y0
G66I5320J90.P3.Q.25D-01 OT229
V8
G76W8Q1
U9
G72G90X5480Y5320
G66I5320J-90.P3000Q250D-010
V9
G76W9Q3
 4. G98X12.21Y4.I0J5570P0K4
G76W8Q1
G76W9Q3
 6. G98X23.67Y4.I0J5570P0K4
G76W8Q1
G76W9Q3
 8. G98X29.4Y4.I0J5570P0K4
U10
G72X5480Y0
G66I5320J90.P-3.Q-250D-010
V10
G76W10Q1
 9. G98X750Y26.28I5730J0P5K0
U11
G72G90X5480Y5320
G66I5480J18000P-3.Q-.25T201
V11
G75W1 IQ2
U12
G72X0Y0
G66I5480J0P-3.Q-.25
V12
G75W12Q1
 5. G98X750Y 15.14I5730J0P5K0
G75W1 IQ2
G75W12Q1
 1. G98X750Y4.I5730J0P5K0
G75W1 IQ2
G75W12Q1
G50



EXAMPLE NO. 10A



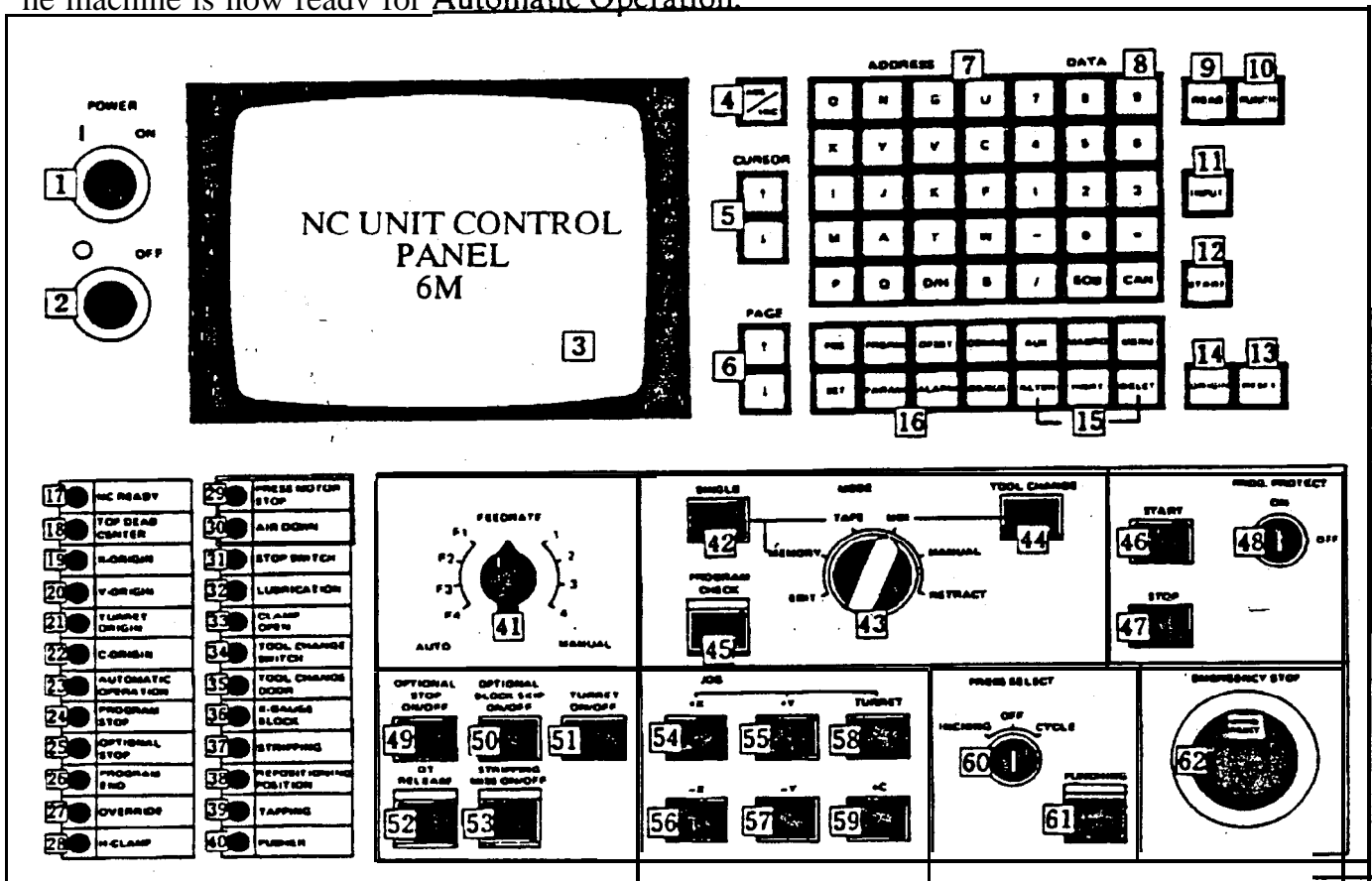
PREPARATION FOR MACHINE OPERATION (6M)

1. Turn on power (circuit breaker).
2. Push power on button.
3. Origin X, Y, T, and C axis.
 - A. Turn mode switch to manual.
 - B. Push jog buttons -X -Y move table about 8" in both X and Y directions.

If you push the wrong buttons and put the machine into an overtravel condition, follow these steps to remove overtravel alarm.

- a. Turn mode switch to manual.
 - b. Push and hold in OT release button on control panel (use b, only if **not-ready**-light is on).
 - c. Push jog buttons either plus or minus to move table off limit switches.
 - d. Once table is moved, push reset button on control.
 - e. Continue with origin procedures.
- C. Turn mode switch to retract.
 - D. Push jog buttons +X +Y until both X & Y axis stop at their origins and the originlights (19 & 20) on the control come on.
 - E. Push the turret button and hold until the turret origin light (21) comes on the control.
 - F. With Auto-Index machines push the +C button and hold until the C-origin light (22) come on.

he machine is now ready for Automatic Operation.



RETURN MACHINE TO TOP DEAD CENTER

1. Turn **Mode** switch to manual.
2. Turn **Index Pin Toggle** switch (73) to the "IN" position. This toggle switch is located on the sub control panel "B".
3. Push **Punching** button (55) until the top dead center light comes on. This light is number 19 on the control panel.

Setting parameter 435 for multiple part punching.

- 1 Push the **SET** button on control panel.
2. Push page button or to select page #2.
3. Turn the mode switch (42) to MDI.
4. Push cursor button or to move cursor under number 435.
5. Turn program protect switch (46) to off.
6. Press address key **P**
7. Press the data keys as needed:
 - 0 = Programs which do not use software for multiple part punching.
 - 1 = Trial punching (bottom left part)
 - 2 = Post-trial punching (finish the sheet except the bottom left part)
 - 3 = Full punching (production punching fill sheet)
8. Push **INPUT** key.

CALLING ALL PROGRAMS STORED IN MEMORY

1. Turn **program protect** switch OK.
2. Turn mode switch to **edit**, then push the **Pro&am** button.
3. Press the **Can** (cancel) key and **Origin** button in that order.

All the programs stored in memory will be displayed on the CRT screen.

The number of characters remaining in memory will be displayed at the bottom left of the CRT screen.

Now that you know that program numbers are stored in control memory, use the following procedure for recalling one program at a time.



RECALLING SINGLE PROGRAMS OUT OF MEMORY

1. **Turn the Mode** switch to **Memory**.
2. Push the **Program** button.
3. Press address **key 0**, then enter the program number to be found. Push cursor **Down** button. The **first** page of the searched program will appear on the CRT screen.

Since you now have the program on the CRT screen, you may want to search for the word needed.

WORD SEARCH METHOD

Example search for **T201**

1. Turn mode switch to **“EDIT”**.
2. Press address **key T** and data keys **2, 0, 1** in that order.
3. Push cursor button **down** to start search.


Upon **completion** of search, the cursor will appear under the T of **T201**.

ENTERING PROGRAMS MANUALLY INTO MEMORY FROM THE CONTROL PANEL

1. Turn the Program Protect switch to **“OFF”**.
2. Turn the Mode switch to **edit**.
3. Push the **Program** button.
4. Press the address **key 0**, then enter the program number to be registered. Press the **Insert button**.
5. Push EOB(end of block) button, then **insert** button. The display on the CRT screen will appear in the upper left of the screen.
6. Now you can enter the program to be stored in memory.

After word search, word insertion, or editing, the cursor should be returned to program start position (top of program) before machine operation. Use the following procedures.

Method 1

1. Turn **Mode** switch (42) to memory.
2. Push **Cursor button**  The cursor will return to the beginning of the program.

Method 2

1. Turn **Mode** switch (42) to edit.
2. Push the **Reset** button. The cursor will return to the beginning of the program.
3. Turn **Mode switch** to memory for automatic operation.







LOADING TAPE INTO MEMORY

1. Turn mode switch to **Edit**.
2. Turn program protect switch to Off.
3. Load program tape into tape reader.
4. Push **Program** button.
5. Enter a program number if the tape has no program number or when the existing program number is to be changed. To enter a program number, press the address key "0" and enter the program number (it is not necessary to push the **Input** button).
6. Push **the Read** button. The program **tape** will be read by the tape reader, then **Edit** will be displayed in the lower right corner of the CRT screen,.
7. The beginning of the program will be displayed on the CRT screen.

MDI OPERATION (MANUAL DATA INPUT)

To input one instruction block through the NC panel and execute, proceed as follows:

1. Turn mode switch (42) to **MDI**.
2. Push the function button **Comnd**.
3. Select the page titled **Next Block/MDI** on the CRT screen by pushing the page button  or .
4. Push the **ABS/inc** button to display ABS in the lower right corner of the CRT screen.
Example: To punch a hole at X10.Y10.T201
5. Press the X, 1, 0, and  keys and input button in that order. Press Y, 1, 0, and  keys and **Input** button. Now press the T, 2, 0, 1 keys and input.

Note: If any incorrect data is entered before pushing the **Input** button, press the **Can** key and re-enter all data. If incorrect data is discovered after the input button has been pushed, begin at step 5 and re-enter all data again.

6. After completion push start button for **positioning**.
7. Now push punching button to punch hole.
8. To bring machine home enter G50, push **input** and start buttons.



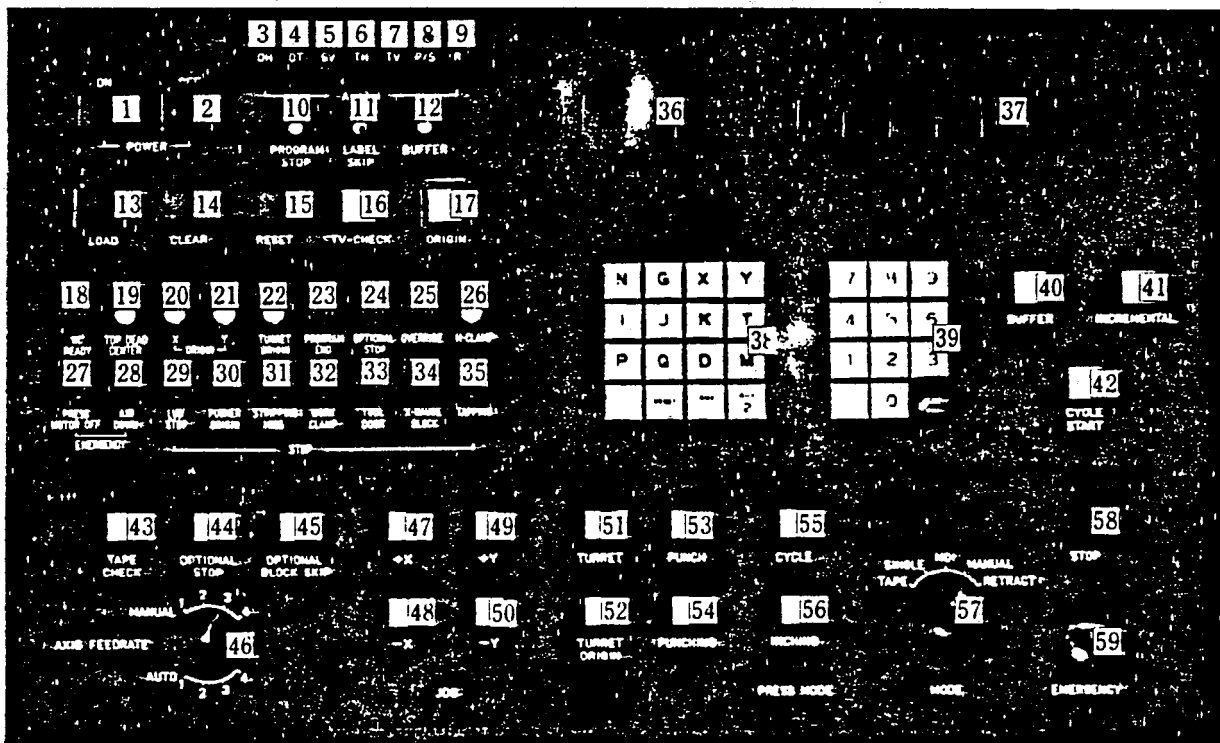
AUTO INDEX REORIGIN

In some emergency situations the auto index could be left in other than 0 deg. position. If this occurs it will be necessary to origin the auto index before the turret. This is the sequence to follow:

1. Turn SELECT switch to retract mode.
2. Hold in AUTO INDEX origin button until turret error message appears.
3. Hit emergency stop button on 6M control.
4. Pull out emergency stop button on 6M control.
5. Origin X & Y axis.
6. Origin turret.
7. Reorigin auto index.

Punch is now ready for normal operation.

SETTING MULTIPLE PART



CONSOLE PANEL - 200 B

Mode select to MDI
 Turn buffer on.
 Push AUX 2 button.
 Push "X" button
 Push 0, 1, 2 or 3.
 Mode select to tape.

Push STAR-I'.

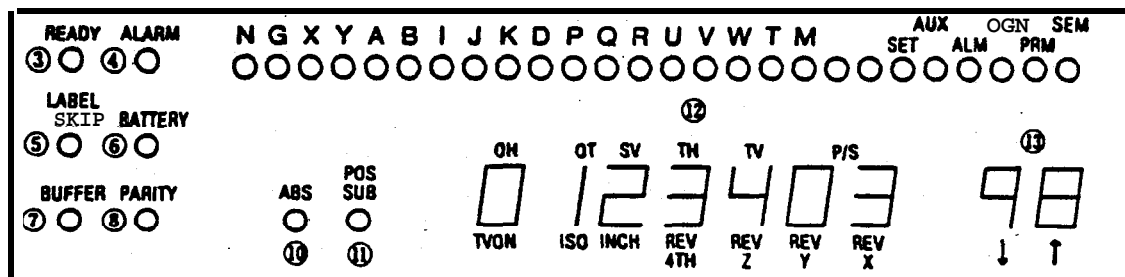
- Trial punching.
- 1 :: When performing processing on material left after trial punching.
- 3 ... Full punching.



SETTING MULTIPLE PART(Continued)



CONTROL PANEL - 300oc



Mode selector to "MDI"
Address light under "SEM"

Type in "98" above number keys.
Depress input key.

Type in 01, 02, or 03 on the data keys.
Depress input key.

Mode selector to "TAPE"
Depress start.

01.....When performing trial punching.

02.... When performing processing on material left after completion of trial punching.

03.....When performing full punching.



ARIES
QUICK
REFERENCE

S E C T I O N V

ARIES

Set Buttons

The set portion of the control only has two pages in it. The first page has seven components.

1. The number of sheets processed.
2. Power on is the actual time the machine is turned on.
3. **Running** time is the actual running time of your sheets. The clock starts when the table leaves the limit switch and runs until the table returns home and shuts off the clock.
4. Decimal Point Input. Here we have two options to choose from:

- A. 0: When set at zero the machine will look at all your inch dimensions and assume a whole number (i.e. 10 is read as 10000 or 10.). Angles will be read as complete degrees (i.e. 90 is 9000 or 90.). So, in this zero mode the machine adds three places for your inch dimensions and two places for your angles.

Caution: In' this mode you must use a decimal point for fractions of an inch and from minutes of a degree (i.e. **.250** for a quarter-inch and for 30 minutes) after the conversion it would be **written .5** or 50.

If you just put X250 without the decimal point the machine **will** give you an X-axis over travel alarm because the machine **will** try to move to two-hundred and fifty inches away.

- B. 1: In this mode the machine **will** carry out three places for all inch dimensions and two places for all angles when you leave off the decimal point,

i.e. twenty inches (20") is read **.020** not 20.
i.e. ninety degrees is read **.90** not 90.

5. Inch/Metric: Here you can choose to program with either inch or metric dimensions.
6. Punch Code: EIA or ISO
7. Macro delete.,

This completes the first page. Now, push the button titled "Next **Page.**" On the second page we have a hit counter for every tool in our turret and a total hit counter for all the tools combined.

Note: To set or reset any of the components on these two pages, do the following:

Push the **MDI** button.

Move your cursor with any of the four arrow keys to whatever you want to change. Once you have moved your cursor to where you need it. Push the data keys for the number required:

Push the input button to complete the change.



MDI Operation

1. Push the **MDI button** (the light will come on).
2. Push the address keys or data keys as needed, i.e. **G70X14.Y10**.

We would push **G, 7, 0, X, 1, 4, ., Y, 1.0., and** push input.

3. Now push start for positioning.

Note: If the Decimal Point Input, in the set **page**, is set to zero you can leave off the decimal point. The machine will look at the **X14** and **Y10** as whole numbers.

Caution: If you want to move to a fractional dimension (i.e. **1/2"**) you must use the decimal point (i.e. **.5**). If you don't, the machine will look at it as five-thousand (5000) **inches** and that is a definite over-travel problem.

Machine Origin

1. Turn circuit breaker switch to "ON". This switch is located at the bottom left side of the control.
2. Push the green power On button.

At this point wait for the NC ready and the top dead center lights to come on. Then the not ready on the CRT screen will go off.

3. Push the retract button (the light should come on).
4. Push the plus X (+X) and plus Y (+Y) buttons.

There is no need to hold in these buttons, just push them and let go.

After this procedure is complete the green lights in the X and Y buttons will come on.

5. Push the turret button (no need to hold it) .

When turret is. at "Origin", the Auto-Index will automatically origin.

Now the turret **green** light will come on and the "Origin" light will come on. Now you are ready for automatic operation.

G70 Punch ,Off

To set a new machine origin in the Y-direction for processing narrow sheets (i.e. 36" long by 10" wide) proceed as follows:

1. Push **Edit** button.
2. Push **Search** button.

This will display all the programs stored in memory.

3. At this time key in the program name to be used for the program (i.e. Test G70) and push the



G70 PUNCH OFF (Continued)

Input key to register that program name in memory.

Note: A program name must begin with an alphabet character and can be composed of up to 8 alphanumeric characters.

Warning: Do not begin your program with a numeric character because it will not transfer storage from character memory to disc.

Now we are ready to type in our program.
Type it in just like our example.

Type: **G70Y10.;** (End of Block) and insert.
G92X50.Y10.; (EOBO and insert)
G90X10.Y8.T6; and insert
G50; and insert

4. Push “**Auto**” button.

5. Push “Start” button.

The machine will move up to **Y10.** and then move to the hole position at **X10.Y8.** and punch a hole with T6. When it reads the G50 the machine will return to **X50.Y10.** which is now our new load and unload position.

When you no longer need the **Y10.** load position, we can return to the original load position of **X50.Y39.37** two different ways.

A. Push **MDI** button

1) Push- **G50.**

2) Push Input.

3) Push Start.

This will return your table to home origin and establish this position as **origin** again.

B. Push the Manual button.

1) Push **-X** and **-Y** buttons just for a second.

2) Push the “Retract” button.

3) Push **+X** and **+Y** buttons.

This method will also return you to the original home origin..

Return Machine to Top Dead Center

1. Push the manual button (the light will come on).

2. Turn the Press Select Key to inching.

3. Push the Index Pin button (located at the bottom right of control). This will illuminate the amber index pin light at the bottom left of the control.



RETURN MACHINE TO TOP DEAD CENTER (Continued)

4. Press the Punch button until the top dead center light comes on. When the light comes on, stop - you are now at top dead center.

Entering Programs Manually into Memory

1. Press the Program Protect key to unlight its led if it is lit.
2. Press the **Edit** button.
3. Press the **Search** button.

This will display all the programs stored in memory.

4. Now key in the program name to be stored, i.e. Prog1 and press the **"Input"** button to register that program name in memory.

Note: You can store programs with either alphabet keys or numeric keys up to to eight characters, i.e. prog1 or **1prog**.

Once you have typed the program name and pushed Input, the screen will go blank and your program name will appear at the top of the CRT screen. We are now ready to type in the program data.

There are two ways to enter program data:

- A. By using the alphabet and numeric keys only, i.e. push **G92X50.Y39.37**; insert in that order. Then finish the program using the same method.
- B. By using the G-code keys, i.e. push the **"Pattern Shift"** button and then the G92 button. A Prompt will appear above the displayed G-code. You fill in the blanks as needed.

50. input

39.37 input

and insert.

Note: In this mode it is not necessary to push EOB (End of Block) at the end of each line before you push insert.

Now finish typing in your program data using this same method.

5. Push Auto button.

Push Start when ready to run the program.



Programs Store in Memory

1. Push Auto Button.

2. Push the Search Button.

This will give you a list of all programs that exist in the controls memory.

3. Move the cursor to the required program or type in the program name.

4. Now push **Input**.

The program will now appear on the CRT screen.

5. Push Start to run the **program**.

Search -Function

With **your** program on the screen you may want to search out some part of the program for editing purposes.

1. Push the Edit Button.

For our example we will search for a dimension of Y25. in the middle of the program.

2. Push Y, **2, 5, .,** in that order. You will see **Y25.** at the bottom left of the **CRT** screen.

3. Push the cursor **down arrow (↓)** to start the search.

Note: Do **not** push the search button. If you do, it **will** change your screen to list all the programs stored in memory.

The cursor is now under the **Y25.** in the program. Now that we are here let's change the Y25. to Y22.

A. Push the Y, **2, 2, .,** in that order. Y22. will appear at the bottom left of the screen.

B. Push the **"Alter"** button to make the change.

If this is-all **you** need to change in this program, push the **Auto** button. This will do two things.

1) Set the machine for automatic operation.

2) Move the cursor to the beginning of the program.

4. If you are ready to run the program just push Start.



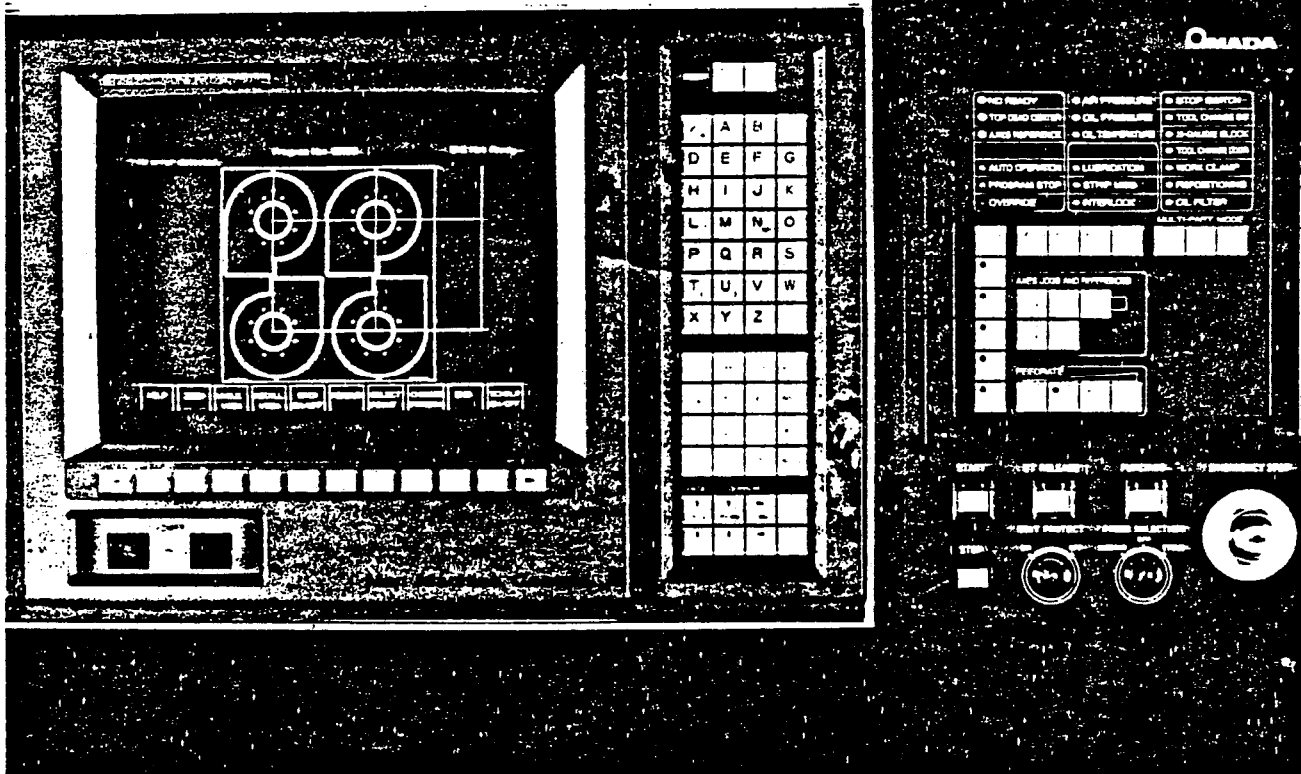
Q4PC
QUICK
REFERENCE

SECTION VI

PREPARATION FOR MACHINE OPERATION (Amadan 04P Control)

1. Turn on Power (circuit breaker).
2. Push Power On button.
 Wait until the TDC and the NC ready light have come on.
3. Push the Ref Zero button (the light must be on).
4. Now push the plus **X**, plus Y and turret buttons in that order,
5. Confirm that the lights on each of these jog buttons are (X, Y and turret).
6. At this time the "axes reference" light **located** under the TDC light.
7. The machine is now ready for automatic operation.

AMADAN-04P-C



OVER TRAVEL CONDITION

There are two types of over travel conditions. First there is a soft over travel. The CRT screen will show a X + SOT for example. This means you only need to push +) or (-) X button to move the machine off the limit switch. Then push the reset button to clear the alarm.

The second is an over travel that will need a little more work to clear the problem. The CRT will show Emergency and a No. 14 Emergency/Reset. Follow these steps to clear this condition:



1. Push and hold the **OT** release button until the “**Not Ready**” at the bottom of the CRT screen goes off.
2. Still holding the **OT** button in with your other hand push the (-) X or (-) Y buttons to move the table off the limit switches.
3. Push Reset.
4. Push the **Ref Zero** button (make sure the-light is on).
5. Push plus (+) **X**, plus (+) Y and the turret buttons in that order.

Now you should have no alarms and the Axes Reference light should be on.

The machine is now ready for automatic operation.

RETURN MACHINE TO-TOP DEAD CENTER

1. Push **the Manual** button.
2. Turn **the** press selection key to “**Inching**”.
3. On sub control panel B (next to the tool door) push the **toggle** switch to the “**In**” position.
4. **Now** push **the punching** button until the IDC light comes on.

ENTERING PROGRAMS MANUALLY INTO MEMORY (Using Program Directory)

1. Push **Edit**.
2. Turn **Edit Protect** key.to off.
3. Push and hold **the Func** (function) button.
4. Still holding **the Func** button in, push the **Prgm** (Program) button.
5. Push **Directory** button.
6. Type in the program ID number **1111** (you can use 0001 to 7999).
7. Push the “**New Program**” button.
8. Push **Insert**.
9. Push **EOB**.
10. Push **Insert**.

Doing steps 9 and 10 will separate the ID numbers from the program data.

Type in the program.

NOTE: Finish each line of the program with EOB button then push insert before going to the next line.



ENTERING PROGRAMS MANUALLY INTO MEMORY (Using the Program Display)

1. Push **Edit**.

2. Turn **Edit Protect** key to off.
3. Push and hold **the Func** button.
4. Still holding in **the Func** button, push the **Prgrm** button.
5. Push the address letter 0 and the **ID** number, i.e. 2222. (You can **use numbers** 0001 to 7999).
6. Push **Insert..**
7. Push **EOB**.
8. Push **Insert**.

Steps 7 and 8 will separate the ID number from the program data.

9. Now type the program using the **EOB** button at the end of each line of information and before pushing insert.

CALLING ALL PROGRAMS STORED ON MEMORY

1. Push **Edit**.

2. Push and hold the **Func** button.
3. Holding in the **Func** button, push the **Program** button. You will see either the last program run on the machine or the list of all programs in memory.

If the last program is on the screen, push "**Directory**" button at the bottom of the screen.

The screen will now list all program **ID** numbers in memory.

NOTE: At the bottom right of the screen you will see the number of programs remaining for storage and the number of characters available in memory.

LOADING TAPE INTO MEMORY

We have two ways to load a tape into memory.

- I.
 1. Push **Edit** button (the light should be on).
 2. Turn the **Edit Protect** key to off.
 3. Push and hold the **Func** button.
 4. Holding the **Func** button push the **program** button (↑).
 5. Push the **Directory** button at the bottom of the screen.



6. Load the tape into tape reader.

NOTE: The tape gear holes should be toward you as you load it into the reader. The tape progresses from right to left

7. **Flip** the tape reader switch to "**Auto**".

8. **Type** in the **ID** number, i.e. 3456. Type in **ID** number only if the **tape** has no number or the number needs to be changed.. You can use numbers from 0001 to 7999.

9. Push the Read button at the bottom of the CRT screen.

After the tape is read, the first page of the program will appear on the CRT screen.

- II.
1. Push the **Memory** button (the light should be on).
 2. Turn the **Edit Protect** key to off.
 3. Push and hold the **Func** button.
 4. Holding the **Func** button, push the **Prgrm** button (↑).
 5. Push the **Program** button at the bottom left of your CRT screen.
 6. Load the tape into the tape reader (see note above).
 7. Flip the tape reader switch to "**Auto**".
 8. Type in ID number (i.e. **01234**), only if needed.

NOTE: In the memory mode you must type in the Zero before the ID number.

9. Push the Read button at the bottom of the CRT screen.

MDI OPERATION (Manual Data Input)

To input one instruction block through the NC panel and execute, proceed as follows:

1. Push the **MDI** button (the light should be on).
2. Push the Comnd button while holding in the **Func** button. We want the page titled next block MDI. **You** only have two pages to choose from.
3. Push the Pos button (↑) or set button (↓) to change pages.
4. Type in data needed. For our example, we will type in **XIO**. Input **Y20**. Input T220 input.
5. Push the Start button for positioning only.
6. Push the **Punching** button to punch a hole if that is all you need.
7. Type in **G50** Input.
8. The Start button will now bring the machine home.



RECALLING SINGLE PROGRAMS OUT OF MEMORY

1. Push the **Memory** button (the light should be on).
2. Holding in **the Func** button, push the program button.
3. Push the **Program** button at the bottom of the CRT screen.
4. Type in the ID number, i.e. 4567. **In** this mode there is no need to type in the Zero.
5. Push the **Alarm** button. This is the cursor down button.

The first page of the program will be on the CRT.

WORD SEARCH METHOD

Let us search for the **G28** statement in our program.

1. Push the **Edit** button (the light should be on)..
2. Turn the **Edit Protect** key to off.
3. Type in the **data** for the search, i.e. **G28**.
4. Push the **Alarm** button to start the search.

The cursor will now be under the **G28** statement in our program.

Now that we are at the **G28**, change it to G29.

5. Push the **G29** button.
6. Now push the **Alter** button.

The change is complete.

To run the program we need the cursor at the top of the program, follow these steps:

1. Push the **Memory** button.
2. Push the **Prgrm** button.

The cursor is now at the top of our program.

