

CNC TURRET PUNCH PRESS

AMADAN 04PC

OPERATOR'S MANUAL

November 1988

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PREFACE

This manual describes the **equipment**, controls, operation, and maintenance of the CNC Turret Punch Press. Be sure to read it carefully before operating the press or providing maintenance for it in order to obtain a thorough knowledge of proper and safe procedures.

NOTE: For the description of programming and tooling for the press, refer to their respective manuals.

Operator's Manual
CNC Turret Punch Press

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Safety precautions

Observe the following safety precautions when you install, operate, **or** provide maintenance for the press. Although the press is incorporated with various devices that ensure safe operations, it is operated automatically at very high speeds and can be dangerous unless it is operated in the proper manner with the utmost caution.

- * *Have a qualified electrician carry out all electrical work.*
- * *Do not modify the control circuit or machine parts.*
- * *Inspect the press before starting the day's work.*
- * *Make it a rule to have a single qualified operator control the press.*
- * *Never operate the press with the safety devices removed.*
- * *Never wear a necktie, a muffler, or loose clothing during an operation.*
- * *Clear the area around the press table — particularly behind the press — of people and obstacles before starting the press.*
- * *Stay away from the press especially when starting it and during an automatic operation. The table and the carriage operate at fast speeds in both operating directions when the worksheet is positioned for punching.*
- * *Also stay away from the press when working with an oversized worksheet or automatic repositioning is involved. The worksheet may be projected abruptly from the front or rear of the press.*
- * *Take the necessary precautionary steps whenever work must be done on the turret or the table for a tooling change or scrap removal.*
- * *Turn off the main power switch before inspecting or servicing the press unless power is absolutely necessary.*

Installation of the press

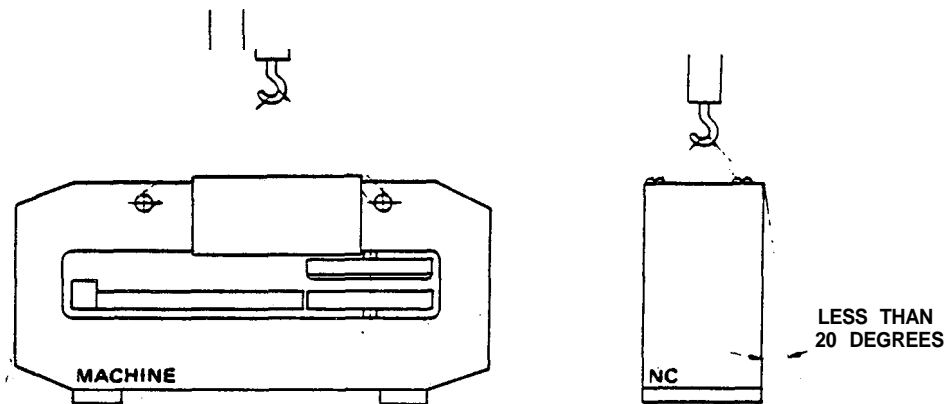
The press should be installed according to the instructions described below and by following the instructions of the **AMADA** engineer.

Location and foundation

Reserve ample space around the press, the **CNC unit**, and an air compressor to permit easy operation, maintenance, work handling, and tool storage. Provide a firm, **level** concrete floor for the installation of the press according to the foundation plan provided by **AMADA**. Install the CNC unit at least 2 to 3 meters (7 to 10 feet) away from any nearby equipment that produces electrical noise (such as a welder, drill, or sander). Take necessary measures to isolate the press and the **CNC** unit from any nearby equipment that produces vibration or dust. *See page vi, Air Connections, for the installation of the air compressor.*

Lifting

To lift the press by a crane, attach wire ropes to the four ribs located on the upper frame of the press. To lift the **CNC** unit by a crane, attach wire ropes to the four hooks located on the top of the cabinet. Lift the press or the **CNC** unit **slowly** while balancing it carefully and protecting it from impacts when lowering it onto the floor.



Cleaning

CAUTION

Never use a scraper or solvents that may damage the coated surfaces of the press.

Remove the rust preventive from the surfaces of the press by using cleaning oil and then apply machine oil to the parts from which the preventive has been removed.

Air connections

The press requires a supply of clean and dry compressed air at a rate of more than 80 **liters/min** (2.8 **ft³/min**) and an operating pressure of 5 **kg/cm²** (70 psi). Install an air compressor as **close** to the press as possible — within a distance of 5 m (**16 ft**) — and connect them by using an air hose or pipe with a minimum inside diameter of **1/4"**.

NOTE: **PEGA KING** requires an air supply of 2000 **liters/min** (71 **ft³/min**), an operating pressure of 5.7 **kg/cm²** (80 psi), and an **air hose or** pipe with a minimum inside diameter of **3/4"**.

If the inside diameter of the air hose or pipe is smaller or the piping distance is longer than those required, **the** pressure will be reduced. If the piping distance exceeds 5 m (**16 ft**), use an air hose or pipe with an inside diameter of over **3/8"** (except **PEGA KING**).

Electrical connections

WARNING *Carry out all electrical work by a qualified electrician in order to prevent accidents or damage.*

The required voltage for a **3-phase** power supply is 230,400, or **460VAC ±10%**, **50/60Hz, with** a load capacity of over 18kVA (over **15kVA** for **PEGA KING**). , Connect the power cable to the input and ground terminals for the circuit breaker inside the electrical control unit of the **CNC** cabinet.

Confirm that the connection has been made properly by turning on the power and inspecting the rotational direction of the flywheel, which can be viewed by uncovering the rear of the press. The flywheel should rotate in the direction indicated by the arrow on the flywheel. Interchange any two of the the three terminal connections if the flywheel rotates in the wrong direction.

PART1

MAIN COMPONENTS

The main components of the CNC Turret Punch Press as well as its **safety** functions are described in this part. See **Appendix 1 for the description of accessories.**

Main components 2

Table & cariage 3

Punching mechanism 3

Safety functions 4

Main components

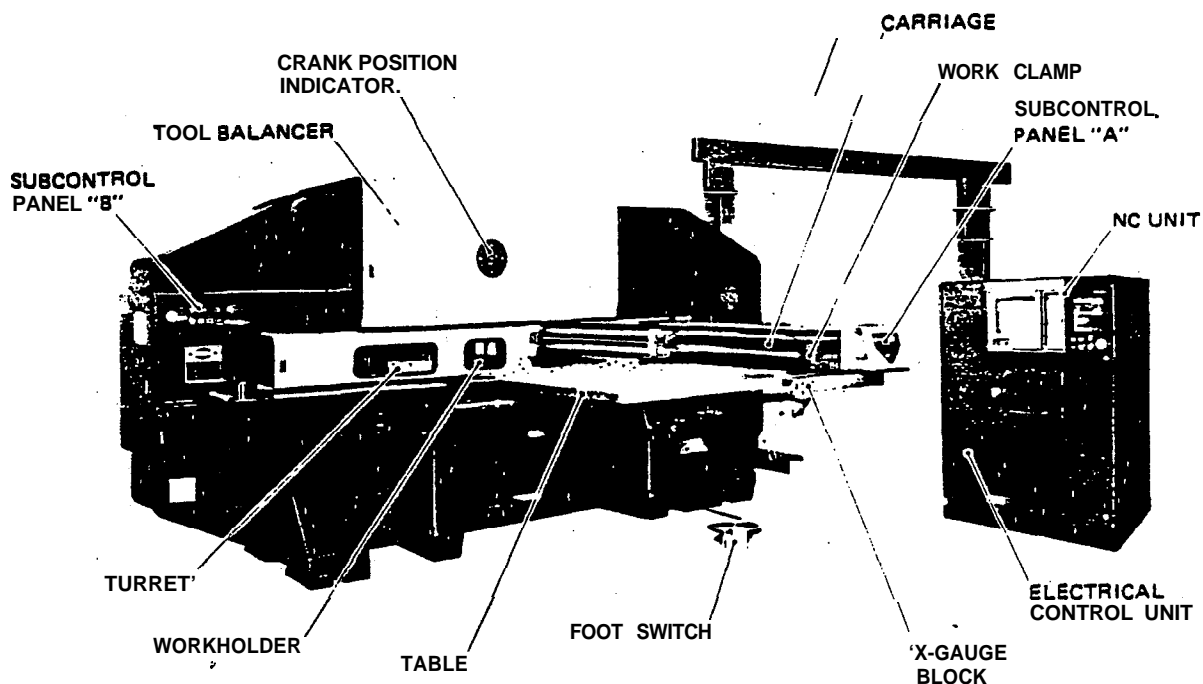


Table & carriage .

The **TABLE** is divided into three sections. The center section is stationary and the two side sections are driven by an AC servomotor to travel along the Y-axis. Large free-motion ball bearings are placed on the surfaces of the three table sections to ensure the smooth movement of the worksheet. There is a work chute close to the turret in the center section, through which small work or scrap pieces can be dropped down **from the table** (optional for **PEGA** models, see **Appendix 1**, Accessories).

The **CARRIAGE** is **installed** inside a housing mounted on the movable side sections of the table. The **carriage** is driven by an AC servomotor along the X-axis inside the housing. **The housing** moves in the Y-axis direction when the side sections of the table are driven.

There are normally two **WORKCLAMPS** mounted on the carriage. Their positions on the carriage can be adjusted according to the size of the worksheet. They are opened and closed by operating the foot switch.

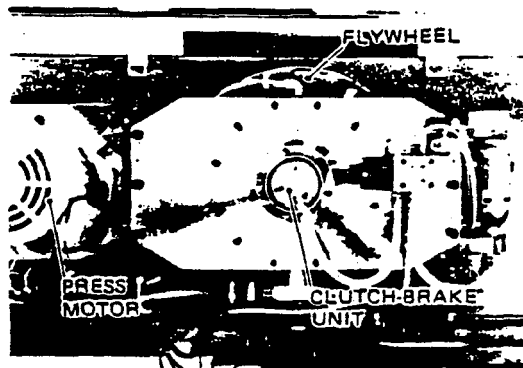
The **X-GAUGE BLOCK** determines the x-axis origin when positioning the worksheet in combination with the workclamps. The x-gauge block can be raised above the table and stowed under the table by operating its lever. The machine cannot be started when the x-gauge block is raised.

There are **two WORKHOLDERS** installed in front of the turret over the center section of the table. They hold the worksheet temporarily when the worksheet must be **reclamped** by the **workclamps** during an automatic worksheet-repositioning.

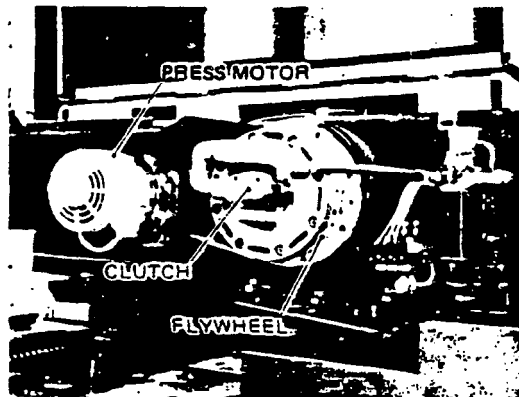
Punching mechanism

The **PRESS MOTOR** drives the flywheel, the flywheel torque is transmitted to the crank via the hydraulic clutch-brake unit, and the rotating force of the crank drives the striker to hit the punch. (**PEGA KING** is equipped with pneumatically operated clutch **and** brake.)

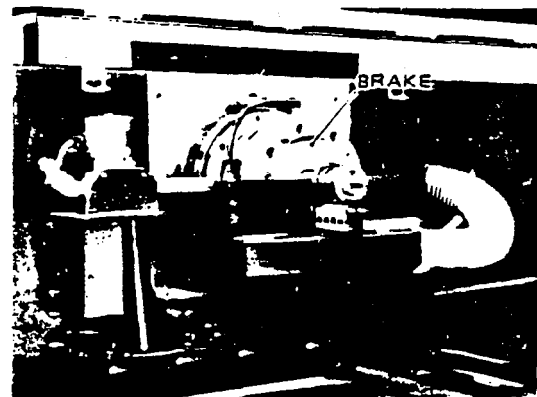
The **TURRET** is composed of **3-track** upper and lower disks, which are driven by an **AC** servomotor. The turret will be rotated in either direction whichever it is faster to index the required turret **station** to the punching position. The pneumatically operated index pins **will** lock the turret disks automatically, when the turret has been indexed.



(EXCEPT PEGA KING)



(PEGA KING ONLY)



(PEGAKING ONLY)

Safety functions

The following functions ensure the safe operation of the press:

Punching-protection

The shear plate in **me** striker will break to protect the punching mechanism from being damaged if an **overload** is exerted on it during punching. The press will stop if the crank has **not** stopped at its top dead center during a punching operation.

Servo-system protection

The press will stop if an abnormality is detected in the **servo-system**, such as an overloaded **servomotor**.

Workclamp protection

The press **will** stop temporarily if a workclamp enters an area in which it may **be** punched and damaged. The **unclamping** of **me** workclamps is disabled during an automatic press operation — except when the press **is stopped** by **me** program or optional stop command.

X-gauge block protection

The press cannot **be** started if **me** Xgauge block has **not** been lowered and stowed after the positioning of the **worksheet**. The press will stop immediately if the block is raised erroneously **during** an operation.

Table/carriage overtravel precheck

An **alarm** **will** be caused if any data that can cause an overtravel are detected. The detection is made automatically by the CNC in **me** TAPE, **MDI**, or MEMORY mode prior to their execution.

Table/carriage overtravel detection

The press will stop if the table or the carriage has overtraveled.

Turret index pin & striker position detection

Punching will not be performed if any of **me** turret index pins is not inserted or if the striker is **not positioned** over **me** proper turret track.

Stripping detection

The press will stop if the worksheet has not been stripped of the punch or if the stripping is **delayed**.

Tool-change safety

A switch is provided to stop the press motor and lock the table and the carriage to ensure **safety** during a tool-change operation. The press will also stop if any of **the** tool-change doors has not been closed or is **opened** erroneously **during a** punching operation.

Control cabinet door interlock

The CNC **will** be turned off if **me** main control cabinet is opened.

Air pressure detection

The press will stop if the air pressure has been reduced **below** the normal operating pressure.

Hydraulic pressure detection

The press **will** stop if the oil pressure has been reduced below the normal operating pressure or **me** oil temperature has risen abnormally.

Safety mats (optional)

Several mats can be placed around the press **and** the press can be stopped by **stepping on any** of them.

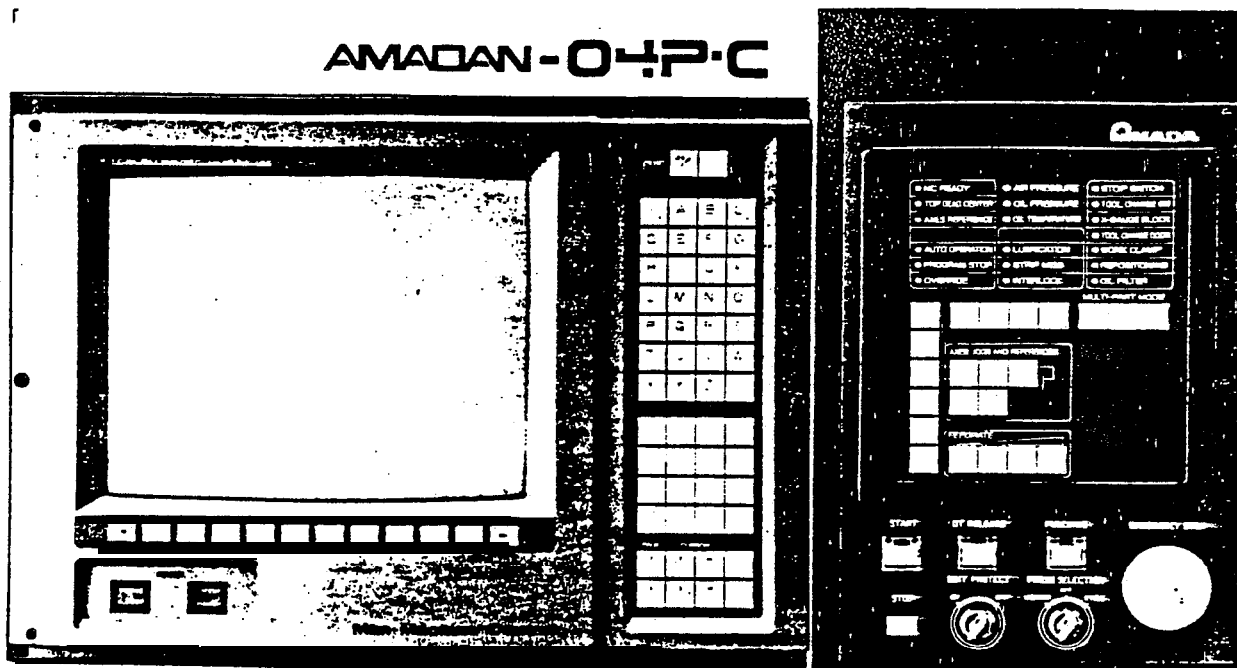
PART II

CONTROLS

The functions of the switches, etc. found on the press are described in *this part. See Appendix for the description of the controls for the tool balancer.*

Main control panel	6
Subcontrol panel "A"	10
Subcontrol panel "8"	11
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Main control panel



Function keys

The 10 function keys, which are located below the screen, are defined and identified for their currently available functions at the bottom of the screen. When there is no definition for a function key, the key is disabled.

MMC/CNC key

This key selects the **CNC** or **MMC** operation mode. The **MMC** operation mode is used for the programming of the source program for punching operations (*refer to the AMADAN-04P-C PROGRAMMING SYSTEM manual for details*).

RESET key

This key is used to reset alarms, select the label skip function, clear entered data, etc. Do not press the key during a press operation — doing so will stop the press and erase the block of data which are currently in use.

PAGE, CURSOR keys /Display selection keys

The PAGE and CURSOR keys are used to change displayed pages and move the cursor. They are **also** used to select displays (shown in *parentheses*, see *Displays for description*) by pressing the FUNC key in combination:

PAGE keys

↑/POS ACTUAL POSITION display.
↓/SET SETTING display.

CURSOR keys

↑/PRGRM The PROGRAM display. ←/COMND The MDI display.
↓/ALARM The ALARM/MESSAGE display. →/AUX Not used.

Indicator lights.

The indicator lights will be **lighted** in green (g), amber (a) or red (r) to indicate the condition of the press according to the current status or the cause of a stop.

NC READY (g)	Lights when the CNC is ready for operation. Blinks while the clutch solenoid is being energized (not applicable to PEGA KING).
TOP DEAD CENTER (g)	Lights when the crankshaft is stopped at the top dead center.
AXES REFERENCE (g)	Lights when all the axes have been returned to their origins in the REF ZERO mode. An automatic operation cannot be performed when unlighted.
AUTO OPERATION (a)	Lights during an automatic operation.
PROGRAM STOP (a)	Lights when the press is stopped when a program stop (M00) or an optional stop (M01) has been commanded.
OVERRIDE (a)	Lights when the press is stopped for the confirmation of an interference between a workclamp and a punch when the override detecting function is in effect.
AIR PRESSURE (r)	Lights when the operating air pressure has been reduced and the press is stopped.
OIL PRESSURE (r)	Lights when the operating hydraulic pressure has been reduced and the press is stopped — the hydraulic motor will not stop. (Not applicable to PEGA KING.)
OIL TEMPERATURE (r)	Lights when the hydraulic oil temperature has risen abnormally and the press and the hydraulic motor are stopped. (Not applicable to PEGA KING.)
LUBRICATION (r)	Lights when an abnormality has been caused in the automatic lubrication system and the press is stopped.
STRIP MISS (r)	Lights when a stripping failure has been caused and the press is stopped.
INTERLOCK (r)	Lights when an interlock alarm has been caused. The alarm will be identified by a message on the screen (see page 54).
STOP SWITCH (r)	Lights when the STOP button on the subcontrol panel 'A' or '8' has been pressed and the press is stopped.
TOOL CHANGE SW (r)	Lights when the TOOL CHANGE switch is turned to ON.
X-GAUGE BLOCK (r)	Lights when the X-gauge block is raised.
TOOL CHANGE DOOR (r)	Lights when a tool change door is opened.
WORK CLAMP (r)	Lights when a workclamp is opened except when the workclamps are opened to refamp the worksheet for repositioning.
REPOSITIONING (r)	Lights when the press is stopped for the confirmation of an interference between a workclamp and a workholder when the worksheet repositioning detecting function is in effect.
OIL FILTER (a)	Lights when the hydraulic line filter is loaded. (Not applicable to PEGA KING.)

MODE keys

The LED on each key will be lighted when the key has been pressed and selected. The primary **function** of the-mode selected by each key is as follows:

REF ZERO	Permits the manual zero-return of axes by using jog keys (see below).
MEMORY	Permits execution of the program in the CNC memory, etc.
TAPE	Permits execution of the program on tape, etc.
MDI	Permits Mock-by-block programming and execution, etc.
MANUAL	Permits manual table and carriage feed, turret rotation, etc.
EDIT	Permits program registration and editing, direct programming, etc.

Program control keys

The LED on each key will be lighted when the key has been pressed and **selected**.

SINGLE	Permits the single-block operation.
TEST	Permits program check without operating the press.
OPT STOP	Permits the optional-stop operation.
BLOCK SKIP	Permits the block-skip operation.

AXESJOGSAND REFERENCE keys

These keys have different functions in the **REF ZERO** mode and the **MANUAL** mode. The -X key and the **-Y** key are not effective in the **REF ZERO** mode and the **TURRET** key is not effective in the **MANUAL** mode. Their functions in the two modes are as follows:

+X, +Y, TURRET	Returns the corresponding axes to their origins when pressed in the REF ZERO mode. The LED on each key will be lighted when the axis has been zero-returned. (Both the turret and the auto-index device will be zero-returned by the TURRET key.)
tx. -X, +Y, -Y	Feeds the X or Y axis in-the indicated direction when each of these keys is pressed in the MANUAL mode.

FEEDRATE keys

These keys set the automatic and manual feedrates for the **X** and **Y** axes as well as the automatic indexing speeds for the turret and the auto-index device. The LED on each key will be lighted when the key has been pressed and selected. (The key that was pressed last before **turning** off the power remains to be in effect when the power is turned on.)

X Y FEEDRATES	MEMORY, TAPE, MDI modes'	MANUAL mode
F1 key	50.0 m/min (1968 ipm)	20.0 m/min (787 ipm)
F2 key	37.5 m/min (1476 ipm)	14.0 m/min (551 ipm)
F3 key	25.0 m/min (984 ipm)	10.0 m/min (393 ipm)
F4 key	125 m/min (492 ipm)	5.2 m/min (204 ipm)

* Feedrates for **PEGA KING** in these modes are as follows:

F1: 80 m/min (3150 ipm), **F2: 60 m/min** (2362 ipm), **F3: 40 m/min** (1575 ipm), **F4: 20 m/min** (787 ipm)

INDEX SPEEDS	Thick turret	Thin turret	AI device
F1 and F2 keys	30 rpm	40 rpm	60 rpm
F3 and F4 keys	15 rpm	20 rpm	30 rpm

The turret index speed in the MANUAL mode (3 or 12 rpm) is determined by the TURRET SPEED switch on the **subcontrol** panel '8'. The auto-index device cannot be operated in the MANUAL mode.

MULTI-PART MODE keys

These keys select punching methods for a multi-part punching program. The LED on each key **will** be lighted when the key has been pressed and selected. When **the** operation does not involve any multi-part punching program, the **LEDS** on these keys must not be lighted.

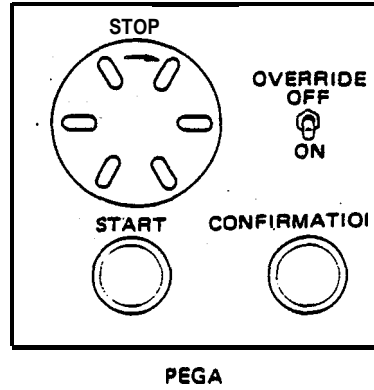
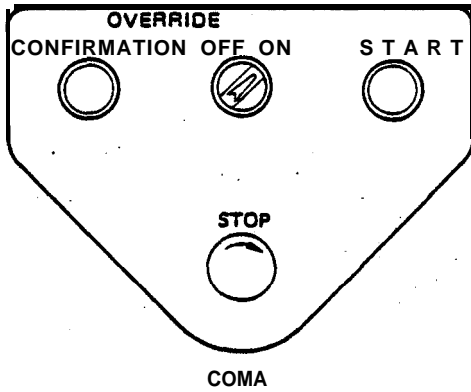
- FIRST Permits to punch only the first pan that is used as the basis.
- OTHERS Permits to punch **the** remaining parts after the FIRST function is completed.
- ALL Permits to punch all the pans.

Switches

- START button Starts operation when pressed and lighted in the MEMORY, **MDI** or TAPE mode. The button will **also** be lighted when the START button on subcontrol panel **"A"** or **"B"** is pressed, **which** has the same function as this button.
- STOP button Stops operation when pressed and lighted. The button will also be lighted when the STOP button on subcontrol panel 'A' or '8' is pressed, which has the same function as this button.
- Of RELEASE **button** Used to release the overravel caused for the X or Y axis in combination **with** me jog keys.
- EDIT PROTECT switch Protects the program in me CNC memory from being overwritten or erased when turned to ON by using the key. **The** switch will be locked in position when **the** key is removed. Keep **the** switch in me ON position unless me program must be edited.
- PUNCHING button Used to perform punching according to the setting on the PRESS SELECTION switch (see below) in the MDI or MANUAL mode — provided mat the INDEX PIN IN light on **subcontrol** panel **"B"** (see page 11) is lighted.
- PRESS SELECTION** switch Selects **the** mode of punching. The switch will be locked in **position when the** key is removed. Punching will not be performed when the switch is turned to OFF. A punch can be operated in an inching manner when turned to INCHING and one punching **cycle** can be performed when turned to CYCLE — both by pressing the PUNCHING button. The relations between these switch settings and the press operation modes are as follows:

	MANUAL	MDI	MEMORY/TAPE
INCHING	Performed.	Performed.	Not applicable.
CYCLE	Not applicable.	Performed.	Performed.
- EMERGENCY STOP button Stops the press operation instantly when pressed — the button will then be locked. **Turn** me button clockwise to unlock it and normalize the condition before starting another operation (the interrupted operation cannot be **resumed**).

Subcontrol panel "A"



OVERRIDE
CONFIRMATION button

When the press operation has been interrupted due to a suspected **work-clamp override**, the operation can be resumed by pressing this button after confirming that the **workclamps** will not be punched. The OVERRIDE CONFIRMATION button on subcontrol panel "B" has the same function.

OVERRIDE
ON/OFF switch

Selects the **workclamp** detecting function for override (interference with a punch) and worksheet-repositioning (interference with the workholders) when turned to ON. The function is effective at **all** times in the TAPE mode regardless of the setting of this switch.

START button

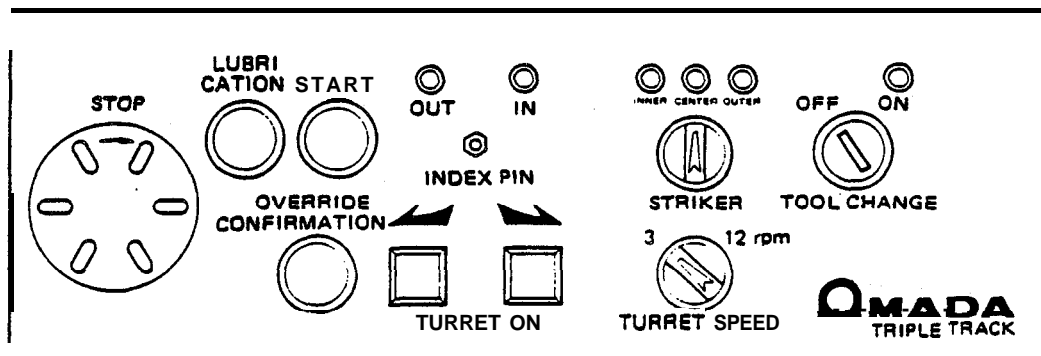
Starts **operation** when pressed in the MEMORY, MDI or TAPE mode. The START buttons on the main control panel and subcontrol panel "B" have the same function as this button.

STOP button

Stops operation when pressed — the button will then be locked and the STOP button on the main control panel will be lighted. This button can be unlocked by turning it clockwise. The STOP button on subcontrol panel "B" has the same function as this button.

NOTE: When the optional pneumatic X-gauge block and workpusher (refer to *Appendix 1, Accessories*) are equipped, their control switches will be installed on this panel.

Subcontrol panel 'B'



START button	Starts operation when pressed in the MEMORY, MDI or TAPE mode. The button functions the same as the START buttons on the main control panel and subcontrol panel 'A'.
STOP button	Stops operation when pressed — the button will then be locked and the STOP button on the main control panel will be lighted. This button can be unlocked by turning it clockwise. The button functions the same as the STOP button on subcontrol panel 'A'.
LUBRICATION button	Operates the automatic lubricator to apply grease to the punching mechanism when pressed.
OVERRIDE CONFIRMATION button	Functions the same as the OVERRIDE CONFIRMATION button on subcontrol panel 'A'.
INDEX PIN switch IN and OUT lights	This switch is only effective in the MANUAL mode. The turret index pins will be inserted in the turret disks when the switch is turned to the right and the IN light will be lighted. The pins will be withdrawn when the switch is turned to the left and the OUT light will be lighted. Keep the OUT light lighted normally.
TURRET ON ⇒ and ⇐ buttons	These buttons are only effective in the MANUAL mode. The turret index pins must be out of the turret disks when using these buttons. The turret will rotate in the counterclockwise direction when the ⇒ button is pressed together with the TURRET JOG ON button behind the tool change door (see <i>Other Switches</i>). The ⇐ button will turn the turret in the clockwise direction. The turret will rotate at the speed selected by the TURRET SPEED selector switch (see <i>below</i>) and stop to index the nearest turret station in the rotating direction when the button is released.
TURRET SPEED selector switch	This switch is effective only in the MANUAL mode. Turn the switch to the '3' or '12' position to rotate the turret at a speed of 3 or 12 rpm respectively.

CNC TURRET PUNCH PRESS

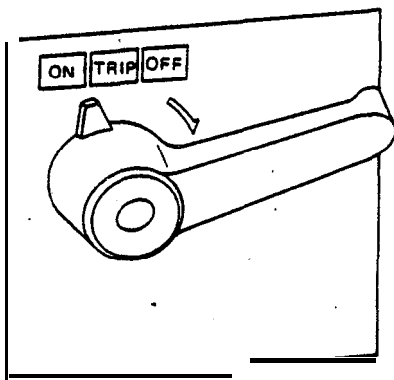
TOOL CHANGE
ON/OFF switch

When the switch is turned to ON by using the key, the press motor will **be stopped and the X and Y axes will be locked. The turret can then be rotated safely in the MANUAL mode.** Never turn this switch to ON **during** operation in the modes other than MANUAL (This switch is located on the front panel of the CNC console on some models.)

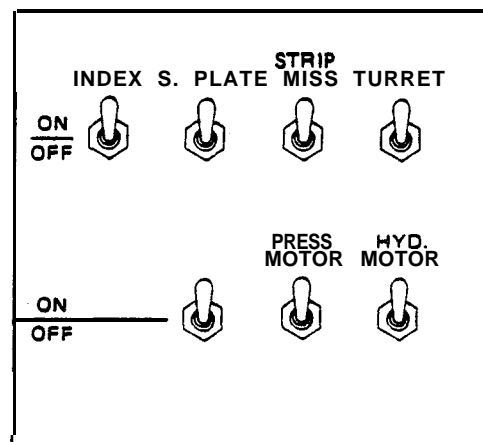
STRIKER switch
INNER, CENTER
and OUTER lights

This switch is only effective in the MANUAL mode. The striker can be shifted to one of the three turret tracks by turning the switch and lighting **the** required track position light. Keep the switch turned to the CENTER position normally.

Electrical control unit



[INSIDE OF UNIT]



Circuit breaker switch

Turns the circuit breaker on and off for the press and the CNC. The switch will be turned to OFF automatically when an overcurrent is supplied.

INDEX switch

The optional auto-index device can be operated when this switch is turned to ON.

S. PLATE switch

The **optional** support plate, is raised when this switch is turned to ON.

STRIP MISS switch

The stripping failure detection device can be operated when this switch is turned to ON. Keep the switch turned to ON normally.

TURRET switch

The turret can be rotated when this switch is turned to ON. Keep the switch tuned to ON normally.

PRESS MOTOR **switch**

The press motor can be operated when this switch is turned to ON. Keep the switch turned to ON normally.

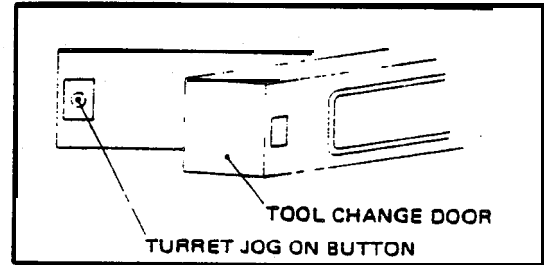
HYD. MOTOR switch

Thehydraulic motor can be operated when this **switch** is turned to ON. Keep the switch turned to ON normally. (Not applicable to **PEGA KING**.)

Other switches & interfaces

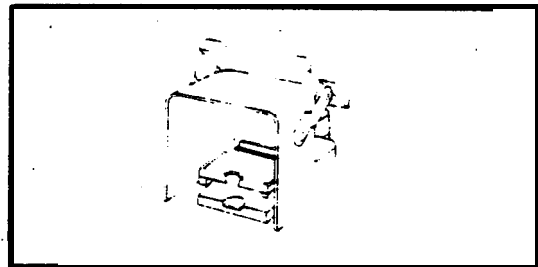
TURRET JOG ON button

This button is located behind the tool change door and rotates the turret **when** pressed in **combination** with one of the TURRET ON buttons on subcontrol panel "B" in the MANUAL mode.



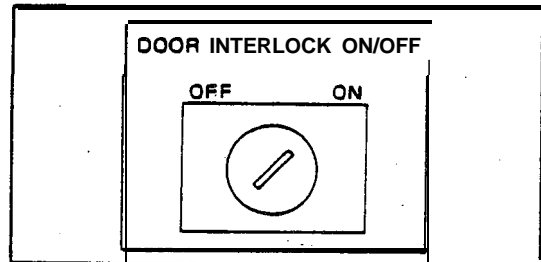
Foot switch unit

This switch opens or doses the **work-clamps** when the **pedal** is depressed. **During** an automatic press operation, the switch is **effective** only when a program stop command is in effect.



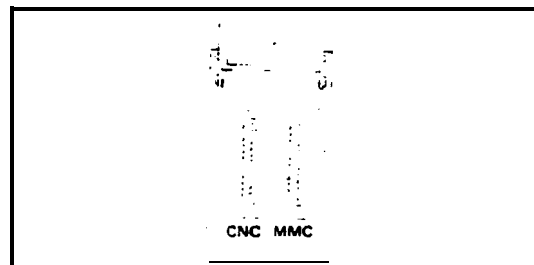
DOOR INTERLOCK ON/OFF switch

The power for the CNC will be turned off if the CNC cabinet is opened when this switch is turned to ON. Keep this switch turned to **ON** normally.



Interfaces for tape puncher/reader

A tape **puncher/reader** with an **EIA-RS232C** interface can be connected to one of these two interfaces on the CNC. Use the left interface for the input/output of an **NC program** and the **right one** for the input/output of a source program (edited in MMC).



Connector configuration

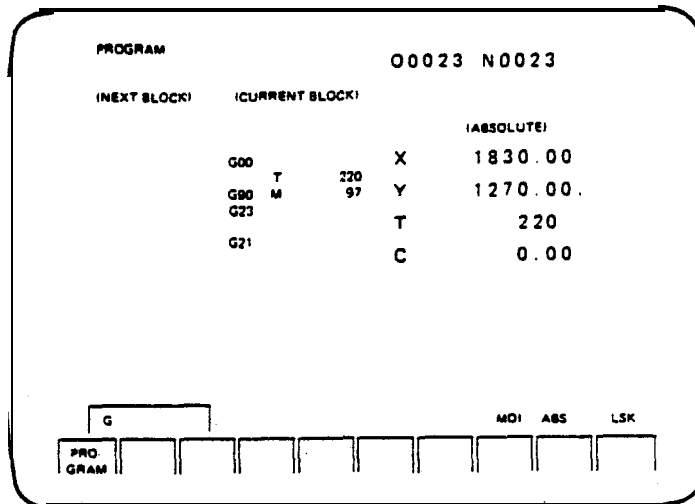
1	2	3	4	5	6	7	8	9	10	11	12	13
FG	SD	RD	CS	DR	SG	CD						
	14	15	16	17	18	19	20	21	22	23	24	25
							ER					+24N

(DB-25)

For the description of the control switches for the tool balancer, refer to Appendix 1, Accessories.

Displays

A number of displays can be shown on the CRT screen selectively by pressing a required PAGE and CURSOR key together with the **FUNC** key. Some of these displays can be changed to related displays by pressing a function key that is defined for such display when **available**. See *next page for the description of the displays and Part III, Punching Operation, and Part IV, Program*, for their *applications*.



In the lower right section of these displays, the current status of the CNC is indicated by code words. The displayed code words and their **meaning** are as follows:

NOT READY	System is not ready for operation.
LSK	Label skip function is effective.
BUF	Block of data has been read but not executed. The Mock can be erased by resetting in any mode other than MDI .
ABS	Entry of absolute data is selected for MDI .
INC	Entry of incremental data is selected for MDI .
MCRM	MACRO data are being read when. this code word appears and blinks.
A L M	Alarm has been caused when this code word appears and blinks.
SRCH	Sequence number is being searched when this code word appears and blinks.
READ	Tape is being read when this code word appears and blinks.
ZRN	REF ZERO mode is in effect.
MEM	MEMORY mode is in effect.
TAPE	TAPE mode is in effect..
MDI	MDI mode is in effect
JOG	MANUAL mode is in effect.
EDIT	EDIT mode is in effect

The **SETTING** display

The **SETTING (SET DATA)** display is used to set parameters, etc. It is displayed by pressing the **↓/SET** key together with the **FUNC** key. It **can be** changed to a subdisplay (**STATION PUNCH NO.**, **JOB SCHEDULE***, **TOOL OFFSET***, **TOOL LIFE***, or **MACRO VAR****) by pressing the corresponding function key. Refer to *Part III, Punching Operation, for details*.

* **Optional** for all models.

** **Optional** for **PEGA** models.

The **PROGRAM** display

The **PROGRAM** display shows the program in the CNC memory and the current **axial** positions. It is displayed by pressing the **↑/PRGRM** key together with the **FUNC** key and can be changed to the PROGRAM DIRECTORY display, which shows the numbers and comments for the programs stored in the CNC memory as well as the remaining capacity of the memory, by pressing the DIRECTORY-defined function key.

The **ACTUAL POSITION** display

The **ACTUAL POSITION** display **shows the** current positions **of** the axes (program and machine coordinate systems), the remaining amount of travel, a number of punched worksheets, an accumulated period of time in which the **CNC** has been turned on, an accumulated period of time in which the press has been turned on, and an accumulated number of hits made by all punches. It is displayed by pressing the **↑/POS** key together with the **FUNC** key.

The **MDI** display

The **MDI** display is used to enter and execute data in the **MDI** mode. **It is** displayed by pressing the **←/COMND** key together with the **FUNC** key. It can be changed to the **MDI (TOOL CHANGE)** display by pressing the TOOL CHANGE-defined **function** key.

The **ALARM/MESSAGE** display

The **ALARM/MESSAGE** display is used to identify the cause of an alarm. It is displayed **by pressing** the **↓/ALARM** key together with the **FUNC** key. If the display is changed to another after it has been displayed once, it **can be** redisplayed by pressing the **ALARM-defined** function key. It **can be** changed to the **DIAGNOSIS (I/O)**, **PARAMETER**, or **PARAMETER (DIGITAL SERVO)** display by pressing the **DIAGNOSIS-**, **PARAMETER-**, or **SERVO PARAM-defined** function key respectively (these displays are used only for the maintenance of the system).

Zero-position coordinates

The displayed zero-position coordinates for the x- and Y-axis origins are not identical **among the** CNC Turret Punch Press models according to their different machine specifications. The coordinates shown in parentheses in the following table are those displayed when the parameter for the **program data** unit is set for inches or millimeters.

<u>PRESS MODEL</u>	<u>AXIS</u>	<u>METRIC SPEC.</u>	<u>INCH SPEC.</u>
PEGA 30 40 50	X	1270.00 mm (50.000")	50.000' (1270.00 mm)
	Y	1000.00 mm (39.370')	39.370' (1000.00 mm)
PEGA 30 40 50 KING	X	1270.00 mm (50.000")	50.000' (1270.00 mm)
	Y	1000.00 mm (39.378')	39.370' (1000.00 mm)
PEGA 30 50 72	X	1830.00 mm (72.047')	72.000' (1828.00 mm)
	Y	1270.00 mm (50.000.)	50.000' (1270.00 mm)
PEGA 30 60 72	X	1830.00 mm (72.047')	72.000' (1828.00 mm)
	Y	1525.00 mm (60.039')	60.000' (1524.00 mm)
COMA5050 72	X	1830.00 mm (72.047')	72.000' (1828.00 mm)
	Y	1270.00 mm (50.000.)	50.000' (1270.00 mm)
COMA506072	X	1830.00 mm (72.047')	72.000' (1828.00 mm)
	Y	1525.00 mm (60.039")	60.000' (1524.00 mm)
COMA5080 80	X	2000.00 mm (78.740')	78.740' (2000.00 mm)
	Y	2040.00 mm (80.315')	80.315' (2040.00 mm)

PART III

PUNCHING OPERATION

The procedure for operating the press for punching is described in this part. For the description of punching programs, refer to Part IV, Program.

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Preparing for operation

Prepare and operate the press in the manner described below after inspecting it for the day's operation (**Part V, Maintenance**) and by observing the safety precautions (page iv).

- 1 **Confirm** that the switches inside the electrical control unit are turned on.
- 2 Turn the circuit breaker switch on the electrical control unit to ON.
- 3 Press the **POWER ON** button on the main control panel.
- 4 **Confirm that the NC READY and TOP DEAD CENTER** lights are lighted and **all** other lights are not lighted on the main control panel.
NOTE: The NC READY light will blink until the clutch solenoid valves are energized if the room temperature is low. While the light is blinking, only a program check operation can be performed. The press motor and the hydraulic motor will be started when the NC READY light stops blinking and is lighted (except for PEGA KING).
- 5 **Confirm** that the codes LSK and **ABS** are displayed in the lower right section of the screen.
- 6 Press the **REF ZERO** key to light its LED. Then press the jog keys in the order of **+X, +Y and TURRET** to return the axes to their origins. If the TURRET key is pressed first, the other keys will **not** become effective until the turret and the optional auto-index device are returned to their origins..
- 7 **Confirm** that the LED on each jog key and the AXES REFERENCE light are lighted. The LED on the TURRET key first blinks when either the turret or the auto-index device is returned to its origin and then lights when both have been returned to their origins.
- 8 Set parameters for data processing, etc. as described in the following section.

Parameter setting

- 1 Press the **MDI** key to light its LED.
- 2 Turn the EDIT PROTECT switch to **OFF**.
- 3 **Press the FUNC key and the PAGE↓/SET key** together to show the SETTING display, which **can** be changed to **another SETTING** display by pressing the function key defined for the required display. The display can be changed to **another page**, if any, by using the PAGE keys.
- 4 Move the cursor to the required item and enter data as described below. Those items which concern optional equipment or functions are not applicable unless the equipment or functions are incorporated in the press or the **CNC**.
NOTE: Keyed-in data can be corrected by erasing characters with the CAN key and reentering data if the INPUT key has not been pressed. If the INPUT key has already been pressed for the entry, overwrite the data by keying-in correct data.

SETTING (SET DATA) display

- SHEET COUNT** = An accumulated number of punched worksheets can be counted up to **99,999,999** (except for punching in **MDI** mode) and displayed here and on the **ACTUAL POSITION** display. Key-in **P** and **0** (zero) to reset the count to zero (or a number to set) and then press the **INPUT** key.
- POWER ON HRS** = An accumulated period of time in which the **CNC** has been **turned** on can be counted up to **99,999,999** hours,
MIN = 59 minutes and 59 seconds and displayed here and on the **ACTUAL POSITION** display. Key-in **P** and **0** to reset the count to zero (or a number to set) and then press the **INPUT** key for each item.
SEC =
- CYCLE ON HRS** = An accumulated period of time in which the press is
MIN = operated automatically can be counted up to **99,999,999**
SEC = hours, 59 minutes and 59 seconds and displayed here and on the **ACTUAL POSITION** display. Key-in **P** and **0** to reset the count to zero (or a number to set) and then press the **INPUT** key for each item.
- TOTAL HITS** = An accumulated number of hits can be counted up to 99999,999 and displayed here and on the **ACTUAL POSITION** display. Key-in **P** and **0** to reset the count to zero (or a number to set) and then press the **INPUT** key.
- MULTIPLE PART** = Entry is made automatically according to the status of the three **MULTI-PART MODE** keys. **0** (**NONE**) is entered if a multiple-part punching program is not involved and the **LEDs** on the three keys are not lighted.
- MACRO DATA** = Give preference either for erasing or not erasing the macroprograms in the memory when resetting or shutting down the system. Key-in **P** and **0** (for erasing) or **1** (for not erasing) and then press the **INPUT** key.
- BENDING OFS** = Enter an offset value that is equivalent to coefficient "**D**" entered with a **G94** command in the program by taking into account the successive bending of the punched worksheet. Key-in **P** and the offset value, which is 160 if the coefficient is 1.6, and then press the **INPUT** key.
- PROGRAM UNIT** = Give preference for the unit to enter numerical data. Key-in **P** and **0** (**millimeters**) or **1** (**inches**) and then press the **INPUT** key.

- PUNCH CODE** = Give preference for the code used to output data to a tape puncher. Key-in **P** and **0 (ISO)** or **1 (EIA)** and then press **the INPUT** key.
- PUNCH PROG NO.** = Give preference either for punching or not punching the program number in tape. Key-in **P** and **0** (for punching) or **1** (for not punching) and then press the **INPUT** key.
- INPUT DEVICE** = Select an input device from the displayed list, key-in **P** and the number for the selected device and then press **the INPUT** key.
- OUTPUT DEVICE** = Select an output device from the displayed list, key-in **P** and the number for the selected device and then press **the INPUT** key.
- PARAMETER SET** = This item appears on the second page of the **SET DATA** display and used only for the maintenance purpose. Do not change the setting.

SETTING (STATION PUNCH NO.) display

An accumulated number of hits made by the punch in each turret station can be counted up to **99,999,999** and displayed. Move the cursor to the required turret station number, key-in **P** and **0** to reset the count to zero (or a number to set) and then press the **INPUT** key.

SETTING (JOB SCHEDULE) display (optional)

Move the cursor to the required job number and enter data as follows:

- 1 Key-in **P** and the number for the program to be used and press the **INPUT** key.
- 2 Key-in **Q** and a number of worksheets to be punched and press the **INPUT** key.
- 3 Key-in **R** and the number for the storage rack in which the worksheets are stored and press the **INPUT** key.

A number of punched worksheets (**DONE**) and a number of remaining worksheets (**REMAIN**) are shown in the lower right section of the screen.

SETTING (TOOL OFFSET) display (optional)

Move the cursor to the required tool number, key-in **P** and the offset value for the tool center path, and then press the **INPUT** key.

SETTING (TOOL LIFE) display (optional)

When a punch has been used exceeding the specified maximum number of hits and requires regrinding, the color of the displayed tool number will change to yellow.

Move the cursor to the required tool number, key-in **Q** and the maximum number of hits for the punch, and then press the **INPUT** key. If the actual **number of** hits must be changed, **key-in P** and the number of hits, and then press the **INPUT** key.

SETTING (MACRO VAR) display (optional for **PEGA** models)

The numerical data which are assigned to the variables will be displayed during the execution of a macroprogram.

Tooling

*Refer to the **TOOLING** manual and the **AMADAN-04P-C PROGRAMMING SYSTEM** manual for the description of tooling and tool registration.*

Punching operation

A punching operation can be performed by using a registered NC program in the **MEMDRY** mode, by reading an NC program from tape in **the TAPE** mode, or by entering and executing data block by block in the **MDI** mode. See the following sections for the description of operations in these three modes. Refer **to Part IV, Program, for the description of the direct programming and program management.**

MEMORY mode operation

A punching operation in the **MEMORY** mode can be performed in the manner described below when the press has been prepared and the program is registered in the CNC memory:

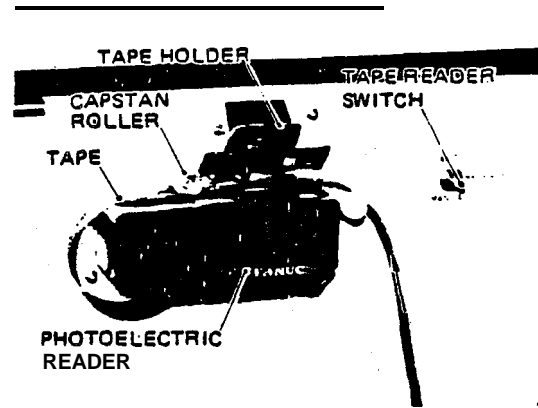
- 1 Press the **MEMORY** key to light its **LED**.
- 2 Press the **FUNC** key and the **CURSOR1/PRGM** key together to show the **PROGRAM display**.
- 3 Specify the program number to display the program. Confirm that the cursor is at the address character "**O**" of the displayed program number. (If the cursor is somewhere else in the program, the program will be-executed from where the cursor is.)
- 4 Open the **workclamps** by operating the foot switch — the **WORK CLAMP** light should then be lighted.
- 5 Place the worksheet on the table:
- 6 Raise the x-gauge block — the **X-GAUGE BLOCK** light should then be lighted.
- 7 Push the worksheet against the workclamps and the x-gauge block.
- 8 Close the workclamps to clamp the worksheet by operating the foot switch and then lower the x-gauge block — both the **WORK CLAMP** light and the **X-GAUGE BLOCK** light should then be unlighted.
- 9 Inspect the conditions of indicator lights (no red indicator lights should be lighted) and switch settings* and take necessary steps to correct the conditions as required.
 - * **OPT STOP, , BLOCK SKIP, TEST, SINGLE, FEEDRATE, MULTI-PART MODE, PRESS SELECTION.**
- 10 Press a **START** button to execute the program — the **AUTO OPERATION** light should then be lighted. The cursor on the display will shift to the program block which is being executed as the operation progresses.
- 11 The **AUTO OPERATION** light will be unlighted when the program has been executed. The **X** and **Y** axes will then be zero-returned and the **LEDs** on the **+x** and **+y** jog keys will be lighted. The cursor will then be returned to the start of the program.



TAP33 mode operation

A punching operation in the **TAPE** mode can be performed in the manner described below when the press has been prepared.

- 1 Press the **TAPE** key to light its **LED**.
- 2 Load the program tape in the tape reader and turn the reader switch to **AUTO**.
- 3 Open the workclamps by operating the foot switch — the **WORK CLAMP** light should then be lighted.
- 4 Place the worksheet on the table.
- 5 Raise the x-gauge block — the **X-GAUGE BLOCK** light should then be lighted.
- 6 Push the worksheet against the workclamps and the x-gauge block.
- 7 Close the workclamps to clamp the worksheet by operating the foot switch and then lower the x-gauge block -both the **WORK CLAMP** light and the **X-GAUGE BLOCK** light should then be unlighted.
- 8 Inspect the conditions of indicator lights (no red indicator lights should be lighted) and switch settings' and take necessary steps to correct the conditions as required.
 - * **OPT STOP, BLOCK SKIP, TEST, SINGLE, FEEDRATE, MULTI-PART MDE, PRESS SELECTION.**
- 9 Press a **START** button to read and execute the program — the **AUTO OPERATION** light should then be lighted.
- 10 The **AUTO OPERATION** light will be unlighted when the program has been executed. The **X** and **Y** axes will then be zero-returned and the **LEDs** on the **+X** and **+Y** jog keys will be lighted.



MDI mode operation

A punching operation in the **MDI** mode can be performed in the manner described below when the press has been prepared.

- 1 Press the **MDI key** to light its LED.
- 2 Press the **FUNC** key and the **CURSOR←/COMND** key together to show the **MDI** display.
- 3 Open the workclamps by operating the foot switch — the **WORK CLAMP** light should then be lighted.
- 4 Place the worksheet on the table.
- 5 Raise the X-gauge block — the **J-GAUGE BLOCK** light should then be lighted.
- 6 Push the worksheet against the workclamps and the x-gauge block.
- 7 Close the workclamps to clamp the worksheet by operating the foot switch and then lower the X-gauge block -both the **WORK CLAMP** light and the **X-GAUGE BLOCK** light should then be unlighted.
- 8 Inspect the conditions of indicator lights (no red indicator lights should be lighted) and switch *settings* and take necessary steps to correct the conditions as required.
 - **SINGLE, FEEDRATE, PRESS SELECTION.**
- 9 Press the **ABS-defined** function key to specify the entry of absolute data if the code "ABS" is not displayed in the lower right section of the screen.
- 10 Enter data by keying-in the address character and numerical data and then pressing the **INPUT** key..

NOTE: Keyed-in data **can be** corrected by erasing characters with the **CAN** key and reentering data if the **INPUT** key has not been pressed. If the **INPUT** key has already been pressed for the entry, **overwrite** the data by keying-in correct data. Press the **RESET** key to clear the entered data.

Press the **SINGLE** key to light its LED if a punching pattern has been used for the **entry of** data. Unless the single block function is selected, the block will be executed only for positioning without punching and the press will be stopped at the last commanded position.
- 11 Press a **START** button — the **AUTO OPERATION** light should then be lighted — to position the worksheet and index the turret. The press will then stop temporarily except for a nibbling pattern, in which case punching will be performed successively following the positioning and turret indexing.
- 12 Press the **PUNCHING** button to perform punching. In the case of a pattern punching, it is necessary to press the **PUNCHING** button every time the press stops temporarily after positioning the worksheet and indexing the turret for the next hole in the pattern.

Positioning the turret for tool-changing

A turret station can be positioned to change its tool in the **MDI** mode. Press the **TOOL CHANGE-defined** function key to show the **MDI (TOOL CHANGE)** display. Key-in **T** and the number for the **turret station**, press the **INPUT** key, and then press a **START** button. The specified turret station will be indexed to the tool-changing position and the press will then stop.

Operation stops

The press will stop and the execution of the program will be interrupted if any of the conditions listed below is effected. The cause for the stop can be identified by the corresponding indicator light or lights, which are lighted or unlighted according to the cause, or by an alarm number displayed on the screen (*see Appendix 2, Alarm Numbers*).

Some interrupted operations cannot be resumed -the axes must be zero-returned and the program must be re-executed from its beginning. Other interrupted operations can be resumed after confirming or normalizing the condition and the program can be executed from the point where it has been interrupted.

STOP button has been pressed.

When the purpose for the stop has been served, the operation can be resumed. If the pressed **STOP** button is locked, unlock it before pressing a **START** button to resume the operation.

EMERGENCY STOP button has been pressed.

When the purpose for the stop has been served, unlock the button, confirm that the **NC READY** light is lighted and the **OIL PRESSURE** light is unlighted, return the axes to their origins, and restart operation from the beginning.

M00 or M01 has been commanded.

A program stop command (**M00**) or an optional stop command (**M01**) in the program has been read and executed. Press a **START** button to resume the operation.

Single-block execution has been completed.

The execution of one block in the program, which has been selected by the **SINGLE** key, has been completed. Press a **START** button to resume the operation.

Tool-change door has been opened erroneously.

close the opened tool-change door and press a **START** button to resume the operation.

Workclamps have been opened erroneously.

Close the workclamps and press a **START** button to resume the operation.

Stripping failure has been caused.

Confirm the condition or remove the cause and press a **START** button to resume the operation.

Workclamps are suspected of interference with punch.

When the workclamp override detection function is in effect, the entry of the workclamps in their dead zone will cause the press to stop. If there is no danger of punching the workclamps, the operation **can be** resumed by pressing the **OVERRIDE CONFIRMATION** button. If there **is a** danger of punching the workclamps, press the **RESET** key, return the axes to their origins, change the positions of the workclamps (or modify the program), and then restart operation.

Workclamps are suspected of interference with workholders.

When the worksheet repositioning detection function is in effect, the entry of the workclamps in the working area of the workholders will cause the press to stop. If there is no danger of **their** interference, the operation can be resumed by pressing a **START** button. If there is a danger of their interference, press the **RESET** key, return the axes to their origins, modify the program, and then restart operation.

Table or carriage has overtraveled.

change to the **MANUAL** mode and then press the **OT RELEASE** button together with the jog button that will retract the overtraveled axis until the **NC READY** light is lighted. Then press the **RESET** key, change to the **REF ZERO** mode, return the axes to their origins, modify the program as required, and then restart operation.

Malfunction has been detected in automatic lubrication system.

Press the **LUBRICATION** button and press a **START** button to resume the operation.

Malfunction has been detected in servo-system.

Remove the cause, return the axes to their origins, and restart operation.

Operating air pressure has been reduced.

Normalize the condition, return the axes to their origins, and restart operation.

Operating oil pressure has been reduced.

Normalize the condition, return the axes to their origins, and restart operation.

Oil temperature is abnormally high.

Normalize the condition, return the axes to their origins, and restart operation.

Crank is not stopped at top dead center.

When the crank has not returned to its top dead center position and the TOP DEAD CENTER light is unlighted, return the crank to the top dead center in the following manner:

Turn the power off by pressing the **POWER OFF** button and then turn it on again by pressing the **POWER ON** button. Change to the **MANUAL** mode, turn the **INDEX PIN** switch to **IN**, and turn the **PRESS SELECTION** switch to **INCHING**. Then repeat pressing the **PUNCHING** button intermittently until the **TOP DEAD CENTER** light is lighted.

NOTE: An emergency stop will be effected if the **MEMORY** or **TAPE** mode is selected when the **TOP DEAD CENTER** light is not lighted.

PART IV

PROGRAM

The registration of an NC program in the CNC memory, the direct programming in the **EDIT** mode, and the procedures for program editing and management are described in this part

Program registration 28

Direct programming 29

Saving program in tape 30

Program search 30

Program deletion 30

Program check 31

Program editing 32

Program registration

The NC program for a punching operation must be registered in the CNC memory before it can be applied to perform the operation. The program can be an NC program that has been converted from a source program and transferred from **AMADAN-04P-C***, or an NC program read in **from** tape, or an NC program programmed directly on the **CNC****.

* Refer to the **AMADAN-04P-C Programming System manual**.

... See page 29, *Direct Programming*.

Registering program from tape

Read and register the NC program from tape in the following manner:

- 1 **Select** the MEMORY or EDIT mode and turn the EDIT PROTECT switch to OFF.
- 2 Show the PROGRAM display. **Change** to the PROGRAM DIRECTORY display, if necessary, by pressing the DIRECTORY-defined function key.
- 3 If the program in tape is not numbered or the program number must be changed, enter address character **"O"** (not required on the PROGRAM DIRECTORY display) and then the number (0001 to 7999).
- 4 Load the program tape in the tape reader and turn the reader switch to AUTO.
- 5 Press the READ-defined function key to read the tape. The program will be loaded and registered in the CNC memory.
- 6 The contents of the registered program will be displayed when the PROGRAM display is active. The number for the registered program will be displayed when the **PROGRAM DIRECTORY** display is active and the program **can be** displayed by pressing the PROGRAM-defined function key.

If the tape contains another NC program and it must also be registered in the CNC memory, enter the program number and press the READ-defined function key after the preceding registration process has been completed.

If the tape contains a number of programs and they must all be registered in the CNC memory, enter **-9999** as the program number — provided that the tape is in the format shown below ending with the end-of-record code (**%**):

CR **O** 1000 CR **G92X** **G50** CR CR **O** 2000 G50 CR **%**

Program no.

pan program

Space

&d-of-record

Adding a program in tape to the program in the memory

Select the **MEMORY** or **EDIT** mode, turn the **EDIT PROTECT** switch to OFF, show the **PROGRAM** display, and then display the contents of the program in the memory. Load the tape in the tape reader and turn the reader switch to **AUTO**. Press the **CAN** key and then the **READ-defined** function key.

Direct programming

An NC program can be composed directly on the CNC and registered in the memory in the following manner:

- 1** Select the **EDIT** mode, turn the **EDIT PROTECT** switch to OFF, and show the **PROGRAM** display or the **PROGRAM DIRECTORY** display.
- 2** Enter address "O" (not required on the **PROGRAM DIRECTORY** display) and the number for the program (1 to 7999).
- 3** Press the **INSRT** key if the **PROGRAM** display is active. Or press the **NEW PROG-**defined function key if the **PROGRAM DIRECTORY** display is active.
- 4** Enter data for the first block of the program. Up to 40 characters can be entered in one line. Change the line when the block has more characters but a word cannot be divided between two lines. Any erroneously entered characters can be erased by using the **CAN** key.
- 5** Press the **INSRT** key to input the block if the entered data are correct.
- 6** Enter data for the next block and press the **INSRT** key. Enter data for the remaining blocks in the same manner.
- 7** Press the **RESET** key or the **PROG TOP-defined** function key to return the cursor to the top of the program to end the session.

The completed program is registered in the **CNC** memory and its status is the same as any other NC programs that are registered in the memory.

PROGRAM STORAGE CAPACITY

The currently available capacity in the CNC memory for the registration of NC programs can be confirmed on the **PROGRAM DIRECTORY** display. The capacity is shown in the lower right section of the display indicating the number of programs that can be registered as well as a total number of characters that can be used.

Saving program in tape

The **NC** programs in the **CNC** memory can be saved in tape in the manner described below by connecting the optional tape puncher to the **CNC** and setting related parameters prior to its use. See *page 18, Preparing for Operation, for details and page 13 for the description of the interface.*

Select the **EDIT** mode, **show the PROGRAM DIRECTORY** display, set a blank **tape** in the puncher and prepare it for punching, key in **address "0"** and the program number (-9999 if all the programs in the memory are to be output), and then press the **PUNCH**-defined function key. Punching can be stopped by pressing the **RESET** key.

Program search

An **NC** program in the **CNC** memory can be searched for and can be displayed in the following manner:

Select the EDIT or MEMORY mode and show the PROGRAM or PROGRAM DIRECTORY display. Key-in address **"0"** and the program number, and **press the CURSOR↓/ALARM key when the PROGRAM display is active.** If the **PROGRAM DIRECTORY** display is active, key-in the program number and then press the **SEARCH-defined** function key (the program number will then be displayed).

The contents of the programs in the memory can also be displayed and changed for one program after another each time address **"0"** is keyed in and the **CURSOR↓/ALARM key is pressed on the PROGRAM display in the EDIT mode, or address "0" is keyed in and the CAN key and then the CURSOR↓/ALARM key are pressed in the MEMORY mode.**

Program deletion

The **NC** program or programs in the **CNC** memory can be deleted in the following manner:

Select the EDIT mode, turn the EDIT PROTECT switch to OFF, and show the PROGRAM or PROGRAM DIRECTORY display. Key-in address **"0"** (not required on the **PROGRAM DIRECTORY display**) and the program number, and **press the DELETE-defined function key.** To delete all the programs in the **CNC** memory, key-in -9999 for the program number.

Program check

The NC program in the CNC memory or tape can be checked for format errors and for axial positions prior to the execution of the program without operating the press in the following manner:

- 1 Confirm that the **AXES REFERENCE** light and the **LEDs** on the **+X, +Y** and **TURRET** keys are lighted. Take necessary steps if they are not lighted.
- 2 Select the **MEMORY** mode if the program is in the CNC memory or the **TAPE** mode if the program is in tape.
- 3 Press the **FUNC** key and the **CURSORT/PRGRM** key together to show the **PROGRAM** display.
- 4 Display the program and place the cursor at the beginning of the program. If the program is in tape, load the tape in the tape reader, turn the reader switch to **AUTO**.
- 5 Press the **TEST** key to light its **LED**.
- 6 Press the **SINGLE** key to light its **LED** when checking the program block by block. Press the **FUNC** key and the **PAGE↑/POS** key together if the current position display is required during the program check.
- 7 Press the **START** button to start the check. The **AUTO OPERATION** light should be lighted at this time. (The check can be stopped by pressing the **STOP** button or the **RESET** key.)
- 8 The check will be interrupted if an error has been found and the error will be identified by the corresponding error number on the display (*see Appendix 2, Alarm Numbers*). If the error must be corrected, press the **RESET** key and then the **TEST** key, change to the **EDIT** mode, and correct the error (*see Program Editing*). The interrupted check cannot be resumed and the program must be checked again from the beginning by repeating the steps described above. If an error has been found in the program tape, it must be remade.
- 9 When the check has been completed, the **AUTO OPERATION** light will be unlighted. Press the **TEST** key to unlight its **LED** and then change to the **MANUAL** mode.
- 10 Press the **-X** key and the **-Y** key to shift each of the axes at least 200 mm (8") away from the origin in the minus direction.
- 11 Press the **REF ZERO** key to light its **LED** and then press the **+X** key and the **+Y** key to zero-return the axes, lighting the **LEDs** on these keys and the **AXES REFERENCE** light.

Program editing

First, select the **EDIT** mode, turn **the** EDIT PROTECT switch to OFF, and display the NC program which must be corrected or modified.

Then place the cursor at the **start** of the word that must be corrected or modified by using the CURSOR and PAGE keys. Or search for the word by keying-in its address character (or the whole word) and pressing the **CURSOR↓** key. The search will be made toward the end of the program from the current cursor position and **then** the cursor will be placed at the first address character or word that has been found. (The cursor can be returned to the start of the program by pressing the PROGRAM TOP-defined **function** key or the **RESET** key.)

Modifying a word

With the cursor placed under the address **character** of the word that is to be modified, key in the address and data required for the modified word and press the ALTER key. Modification can be made for one word at a time. If there is a series of words that must be modified in the **same** block, they may be deleted (see below) first and the words can be entered in one operation (up to 40 characters can be entered at a time). If there are other words **that** must be added in the same block following the **cursor-**specified word, enter the words successively and then press the ALTER key.

Inserting a word or a block

Place the cursor under the address character of the word after which a new word must be inserted, enter the new word (or words), and then press the **INSRT** key. To insert a new block, place the cursor under the **EOB** code (;) of the block after which a new block must be inserted, enter the new block (or blocks), and then press the **INSRT** key.

Deleting a word or a block

Place the cursor under the address character **of** the word which must be deleted and then **press** the **DELET** key to delete the word. To delete an entire block, place the cursor under the address character of the first word in the block, press the **EOB** key to enter the **EOB** code, and then press the **DELET** key to delete the block. To delete a number of successive blocks, place the cursor under the address character of the first word in the first block, enter the sequence number for the last block, and then press the **DELET** key to delete the specified blocks.

PART V

MAINTENANCE

The inspection and maintenance procedures for the press are described in this part.

Daily maintenance	34
Weekly maintenance	36
Monthly maintenance	36
Quarterly maintenance	37
Annual maintenance	37
CNC air filter	37
Lubrication	36
Hydraulic system	42
Striker shear plate	43

Daily maintenance

Inspect and maintain the equipment before starting the day's operation as well as when the operation is interrupted.

CLEANING THE PRESS

Clean the side table-section guide bars, carriage guide bars, turret disks (especially underneath the lower disk), turret index pins and holes, and other parts as required. Inspect these parts as well while cleaning.

LUBRICATION

Lubricate the parts listed in the lubrication chart (see *Lubrication*).

AUTOMATIC LUBRICATOR

Press the **LUBRICATION** button to apply grease to the crank, connecting rods, and ram guide before starting the day's operation. Inspect the level of grease in the reservoir and replenish the grease as required through the nipple (see *Lubrication*) — be sure to keep air out when filling.

TOOLS

Inspect every punch and die for damage, wear and its mounted condition and take necessary measures as required, and oil the punch surface.

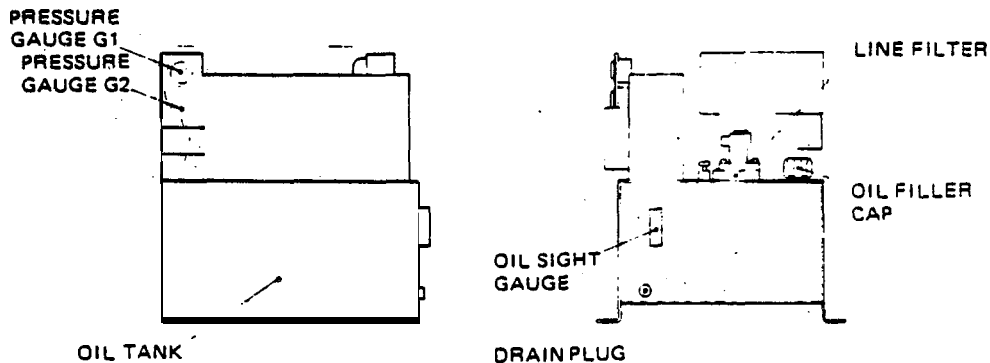
HYDRAULIC SYSTEM

Check the oil level in the tank, which should be higher than a $\frac{1}{3}$ level on the sight gauge when the hydraulic motor is being operated. See page 42, *Hydraulic System*.

Inspect oil pressure gauges G1 and G2 and provide the following proper operating pressures:

Gauge G1 (clutch & brake operating pressure): 60 kg/cm^2

Gauge G2 (clutch & brake cooling pressure): Below 1.5 kg/cm^2



TAPE READER

Clean the surfaces of the light source, photo cell, tapeholder, and tape path by using soft cloth impregnated with alcohol.

AIR SYSTEM

Check the oil level in the air system lubricator and replenish the oil (see *Lubrication*). The rate of oil application can be adjusted with the adjustment screw at the top of the lubricator (one drop per five in-out operations of the turret index pins, or one drop per **15** to 20 up-down operations of the ram **for PEGA KING**). Drain the accumulated water in the filter housings on the press and the air compressor.

Inspect and provide operating pressures as follows:

System: **5.0 kg/cm²** (5.7 kg/cm² for **PEGA KING**)

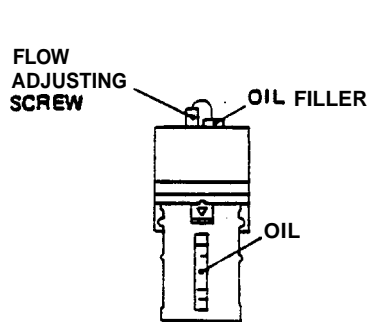
Pneumatic **workclamps**: 5.0 kg/cm²

Hydraulic workdamps (optional): 4.0 kg/cm²

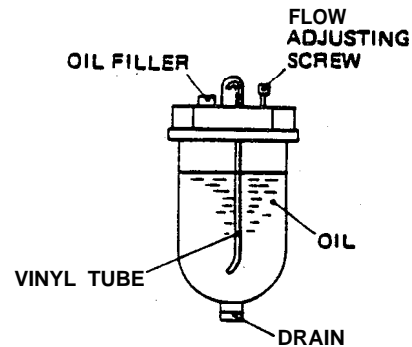
Turret index pins: 5.0 kg/cm²

Auto-index device **clamp** (optional): 5.0 kg/cm²

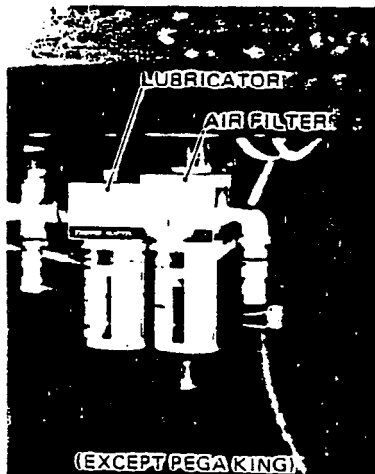
Brake (PEGA KING): 5.0 kg/cm² (Remove the press top cover to expose the pressure gauge.)



[EXCEPT PEGA KING]



[PEGA KING ONLY]



[EXCEPT PEGA KING]



REGULATOR (INDEX PIN/AUTO-INDEX CLAMP)



[PEGA KING ONLY]

Weekly maintenance

Inspect and maintain the equipment once every week in addition to the daily **main-**
nance operation.

LUBRICATION

Lubricate the parts listed in the lubrication chart (see *Lubrication*).

TAPE READER

Clean the capstan roller, guide roller, pinch **roller**, etc. by using soft cloth impregnated with alcohol.

Monthly maintenance

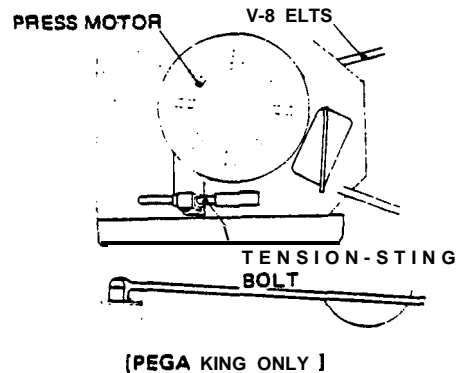
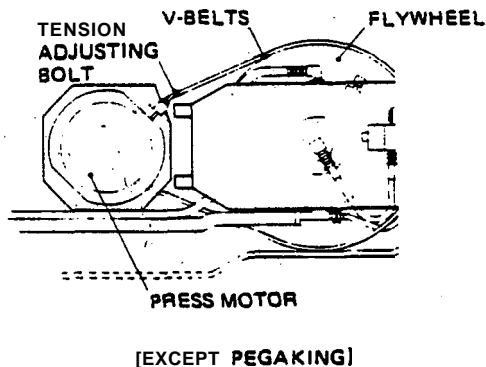
Inspect and maintain the equipment once every month in addition to the daily and weekly maintenance operations.

LUBRICATION

Lubricate the parts listed in the lubrication chart (see *Lubrication*). Inspect the oil levels in the drive gearboxes for the v-axis, the turret, and the auto-index device (optional) and replenish as required.

FLYWHEEL BELTS

Inspect and provide the proper belt tension by means of the adjustment bolts on the press motor unit. The belt should be depressed about 9 mm (**1/3"**) in the middle of the span between the flywheel and the press motor when it is depressed with a force of 1.9 to 2.0 kg (4.2 to 4.4 lb). Also inspect the belts for **wear and** cracks and change them as required.



OTHERS

Inspect the cables, hoses, pipes, terminals, and their connections and confirm that there are no damage, loose fittings, or -leakage.

Quarterly maintenance

Inspect and maintain the equipment once every three months in addition to the daily, weekly and monthly maintenance operations.

LUBRICATION

Lubricate the parts listed in the lubrication chart (see *Lubrication*).

HYDRAULIC OIL CHANGE

Change the hydraulic oil and the line filter after the initial 3 months of operation and once every year thereafter, or once every 2000 hours shown on the **POWER On** record on the **SETTING** display (see page 19), whichever comes first. See page 42, *Hydraulic System*, for the procedure.

Annual maintenance

Inspect and maintain the equipment once every year in addition to the daily, weekly, monthly and **quarterly** maintenance operations.

HYDRAULIC OIL CHANGE

Change the hydraulic oil and the line filter. See page 42, *Hydraulic System*, for the procedure.

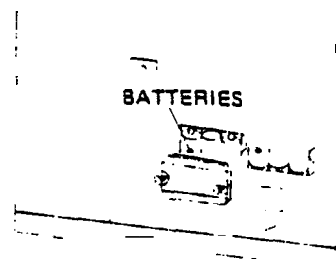
CHANGING DRY CELLS FOR CNC MEMORY

Three 1.5V alkaline manganese cells (**AM1**) are used to retain all the data stored in the **CNC** memory when the **AC** power is switched off. The data in the memory will be lost if the cells are completely consumed. Be sure to change the cells once every year or earlier. The alarm code "**BAT**" appears in yellow in the lower right section of the screen when the **CNC** is turned on if the capacity of the cells has been reduced to a level that requires replacement. Change the cells in the following manner:

CAUTION

The data in the memory will be lost if the cells are removed when the CNC is turned off.

- 1 First be sure to turn on the **CNC**.
- 2 Remove the cover from the battery compartment on the front of the **CNC** by loosening the two screws.
- 3 Remove the old cells and load the new cells with their poles properly placed according to the indications in the compartment.
- 4 Replace the cover and tighten the screws.



CNC air filter

There is an air filter on the back of the **CNC** cabinet, where air is taken in for ventilation. Detach the filter by removing the two screws whenever it has gathered dust. Blow away the accumulated dust from the back of the filter or tap the filter lightly to shake off the dust. **Wash** it with neutral detergent if necessary, rinse it well in water, and dry it in the shade.

Lubrication

Lubricate the parts, replenish the grease or oil, and change the oil as follows:

COMA models

Identification of recommended lubricants

- A:** MOBIL DTE Oil **Light**, SHELL **Tellus** Oil **C32**
- B:** MOBIL **Mobilux** EP-1, SHELL **Alvania** EP-1
- C:** MOBIL **Motilux** 2, SHELL **Alvania** 2
- D:** MOBIL **Mobilux** **EP-0**, SHELL **Alvania** **EP-R0**

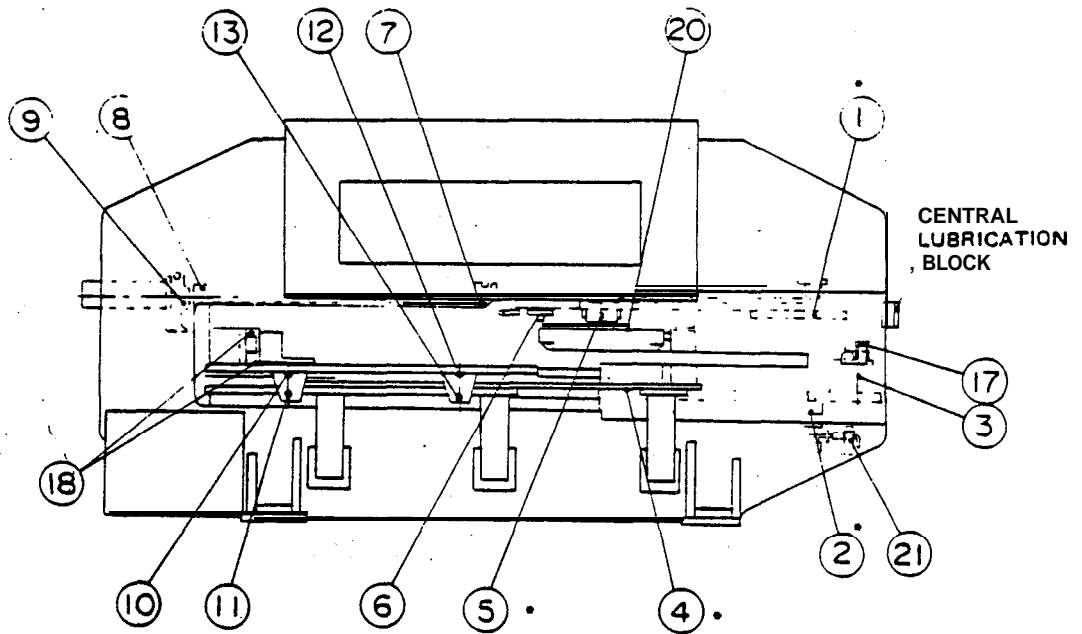
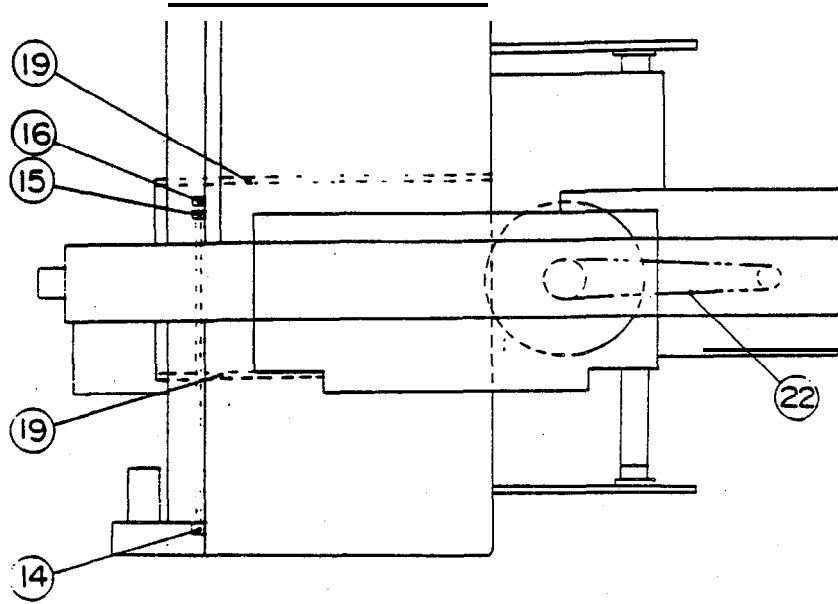
<u>PART</u>	<u>FREQUENCY</u>	<u>LUB</u>
1 Motor upper bracket (grease fitting')	Monthly	C
2 Motor lower bracket (grease fitting')	Monthly	C
3 Turret drive gearbox (reservoir)	Quarterly	A
4 Lower turret disk bearings (grease fitting')	Monthly	C
5 Upper turret disk bearings (grease fitting')	Monthly	C
6 Striker (grease fitting)	Monthly	B
7 Y-axis bearings (grease fitting)	Monthly	B
8 Y-axis ball nut (grease fitting)	Monthly	B
9 Y-axis drive gearbox (reservoir)	Quarterly	A
10 Sub-guide upper cam follower (grease fitting)	Monthly	B
11 Sub-guide lower cam follower (grease fitting)	Monthly	B
12 Pulley bearings (grease fitting)	Monthly	B
13 Clamp (grease fitting)	Monthly	B
14 X-axis bearings (grease fitting)	Monthly	B
15 X-axis ball nut (grease fitting)	Monthly	B
1 6 X-axis bearings (grease fitting)	Monthly	B
17 Automatic lubrication pump (grease fitting)	Replenish"	D
18 X-axis guide bars (grease fitting)	Weekly	D
19 Y-axis guide bars (grease fitting)	Weekly	D
20 Punches (oiler)	Daily	A
21 Air sytem lubricator (oiler).	Replenish***	A
22 Turret drive chains (oiler)	Quarterly	A

* On central lubrication block.

** See page 34.

*** See page 35.

COMA MODELS



PEGA models

Identification recommended lubricants

- A: MOBIL DTE Oil Light, SHELL **Tellus** Oil C32
- B: MOBIL **Mobilux** 2, SHELL Alvania 2
- C: MOBIL Mobilux **EP-0**, SHELL Alvania **EP-RO**

PART

<u>PART</u>	<u>FREQUENCY</u>	<u>LUB</u>
1 Turret drive gears (grease fitting)	Monthly	B
2 Tensioner lower bearings (grease fitting)*	Monthly	B
3 Lower turret disk bearings (grease fitting)'	Monthly	B
4 Upper turret disk bearings (grease fitting)'	Monthly	B
5 Tensioner upper bearings (grease fitting)*	Monthly	B
6 T-axis gearbox (reservoir)	Quarterly	A
7 Striker (grease fitting)	Monthly	B
8 Y-axis bearings (grease fitting)	Monthly	C
9 Y-axis ball nut (grease fitting)	Monthly	B
10 Y-axis drive gearbox (reservoir)	Quarterly	A
11 X-axis bearings (grease fitting)	Monthly	C
12 X-axis ball nut (grease fitting)	Monthly	B
13 X-axis bearings (grease fitting)	Monthly	C
14 Automatic grease pump (reservoir)	Replenish"	C
15 Clamp (oiler)	Daily	A
16 X-axis guide bars (grease fitting)	weekly	C
17 Y-axis guide bars (grease fitting)	weekly	C
16 Punches (oiler)	Daily	A
19 Air system lubricator (oiler)	Replenish"	A
20 Turret drive chains (oiler)	Quarterly	A

- . On central lubrication block.
- ** See page 34.
- . * See page 35.

Auto-index device (optional)

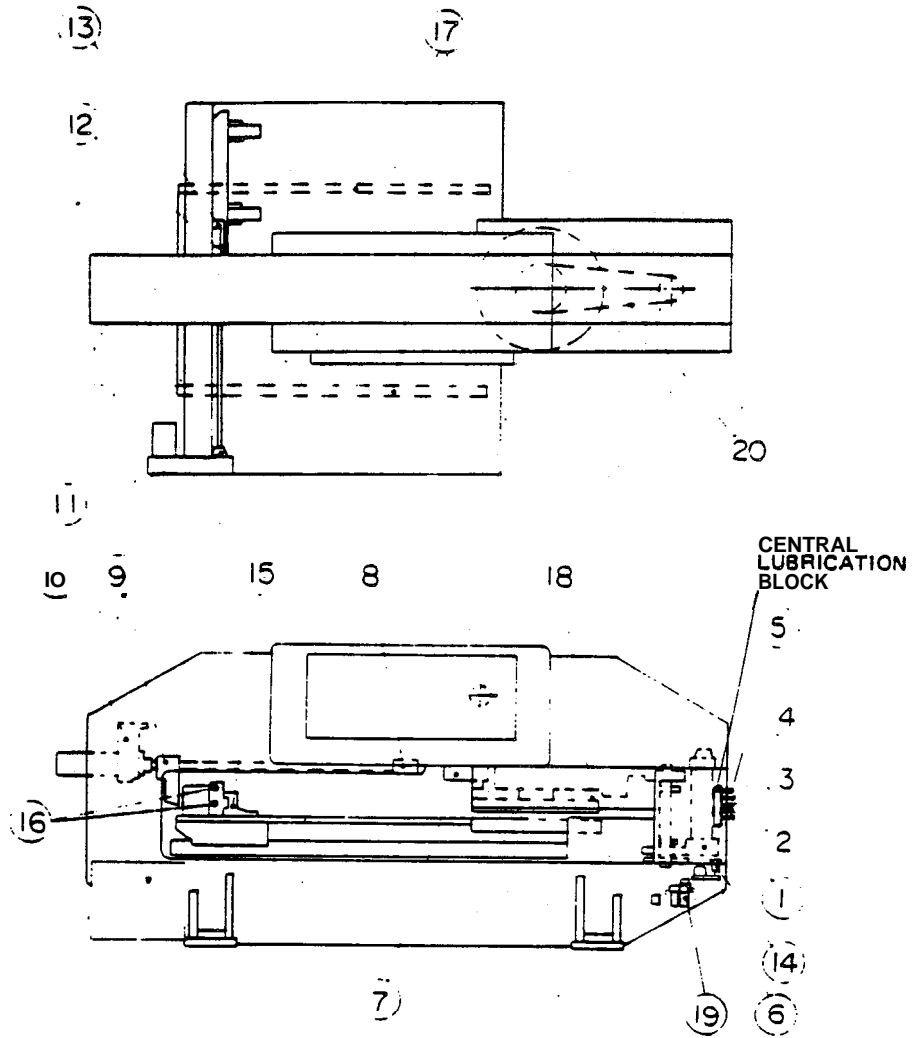
Identification o recommended lubricants

- A: **MOBIL** DTE Oil Light, SHELL **Tellus** Oil C32
- B: MOBIL Mobilux **EP-0**, SHELL Alvania EP-RO

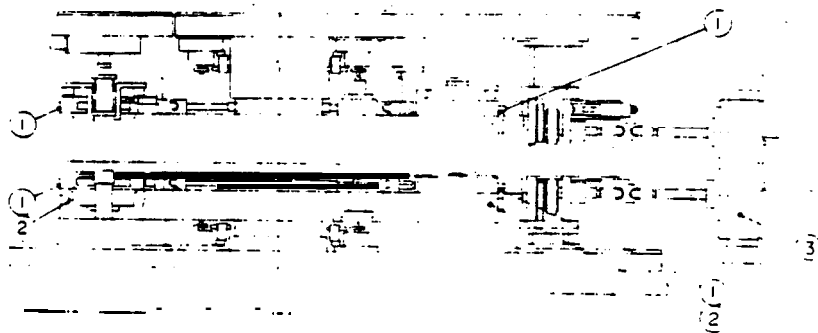
PART

<u>PART</u>	<u>FREQUENCY</u>	<u>LUB</u>
1 Bearings (grease fitting)	Monthly	B
2 Bearings (grease fitting)	Monthly	B
3 Gearbox (reservoir)	Quarterly	A

PEGA MODELS



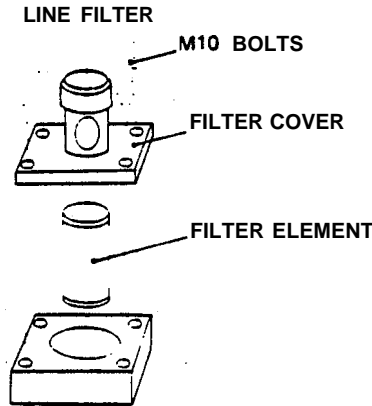
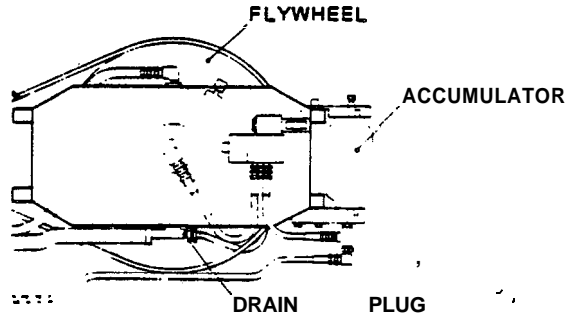
AUTO-INDEX DEVICE



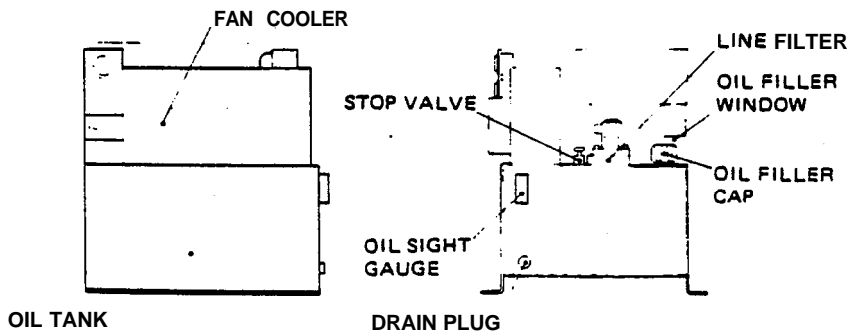
Hydraulic system

Change the hydraulic oil and the line filter in the manner described below after the initial 3 months of operation and once every year thereafter, or once every 2000 hours shown on **the POWER ON** record on the **SETTING** display (see page 19), whichever comes first.

- 1 Turn the circuit breaker switch to OFF. Wait until the hydraulic motor and the cooling fans stop completely.
 - a Remove the cover from the hydraulic unit and then the oil filler cap.
- 3 Open the stop valve and then remove the drain plug from the oil tank to drain the oil.
- 4 Remove the drain plug from the clutch-brake housing to drain the oil remained in the reservoir.
- 5 Remove the cover from the line filter housing, remove the old filter, set the new filter, and replace the cover.
- 6 Replace the drain plugs and close the stop valve.
- 7 Fill the tank with new oil* until the level rises above the $\frac{2}{3}$ level on the sight gauge. The tank has a capacity of 60 liters (15.9 US gal).
 - **AMADA** A-I 10, **MOBIL** OTE Oil 25, or **SHELL Tellus** Oil 46
- 8 Replace the filler cap and the unit cover.

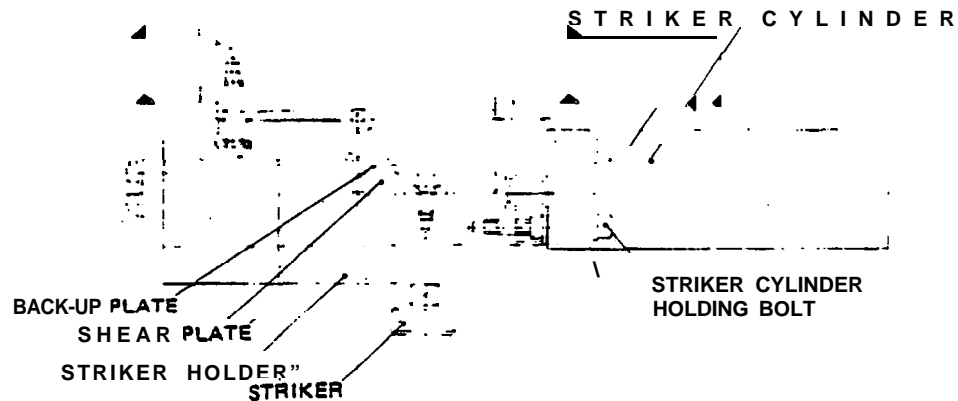


When only the **line** filter must be changed, uncover the hydraulic unit, uncover the filter housing, change the filter, and then replace the covers,



Striker shear plate

Change the striker shear plate in the manner described below if it has been sheared due to an overload.



- 1 Place an empty turret station below the striker, or dismount the punch positioned below the striker, to provide room for the changing of the shear plate.
- 2 Select the **MANUAL** mode.
- 3 Turn the **INDEX PIN** switch to the right to insert the index pins into the turret.
- 4 Turn the **PRESS SELECTION** switch to **INCHING**.
- 5 Move the crank to its bottom dead center position by pressing the **PUNCHING** button.
- 6 Turn off the press, the **CNC**, and the air supply.
- 7 Detach the air connector from the striker cylinder.
- 8 Remove the four holding bolts and then dismount the cylinder and the striker holder.
- 9 Detach the striker from the striker holder by loosening the striker-holding bolt.
- 10 Remove the broken shear plate together with the **backup** plate.
- 11 Change the shear plate and replace the striker together with the shear plate and the backup plate.
- 12 Mount the striker holder and the cylinder. Apply grease to the cylinder at this time and then attach the air connector to the cylinder.
- 13 Turn on the press, the **CNC**, and the air supply.
- 14 Return the crank to the top dead center. Replace any, dismantled punch.

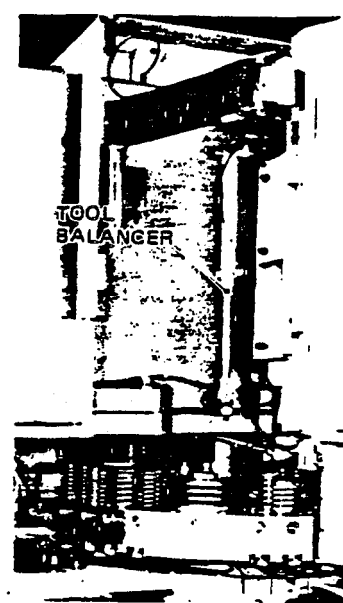
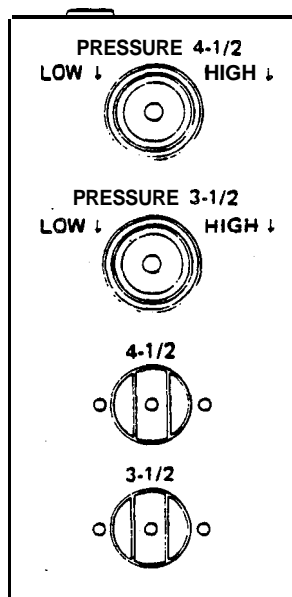
APPENDIX 1: Accessories

Tool balancer (optional for PEGA models except PEGA KING)

The tool balancer supports the **weight of** a heavy punch during its mounting and dismounting. Its control box is exposed by opening the upper turret cover. Turn off the two switches, screw the balancer tip into the threaded hole in the punch, turn on the appropriate switch to hold the punch, mount or dismount the punch (adjust the balancer force by the knob if necessary), turn off the switch, and then detach the balancer from the punch.

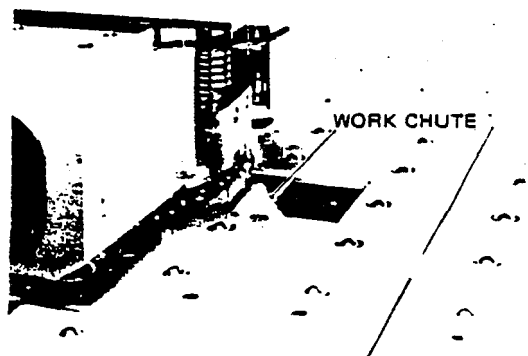
The **PRESSURE 4-1/2 knob** adjusts the force of the balancer when mounting or **dismounting** a punch with a diameter of up to **4-1/2"**. The **PRESSURE 3-1/2 knob** is used when **handling a punch with a diameter of up to 3-1/2"**. Pull out the flange for the knob and then **turn the knob clockwise to increase the force of counterclockwise to decrease it. Push down the flange to lock the knob.**

The **4-1/2 switch** turns on the balancer when handling a punch with a diameter of up to **4-1/2"**. The **3-1/2 switch** is used when handling a punch with a diameter of up to **3-1/2"**. push in the **switch** and then **turn it to the left to turn the balancer on or to the right to turn it off.**



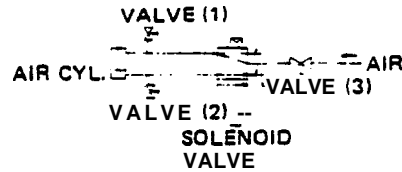
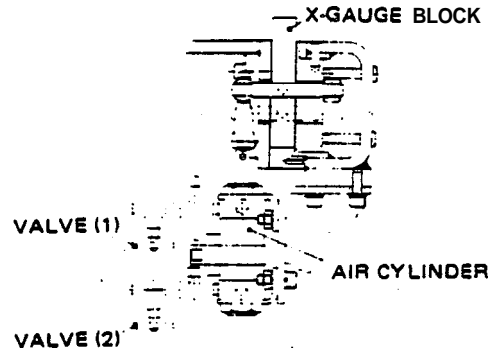
Work chute (optional for PEGA models)

The work chute is a trap door located close to the turret in the center section of the table. **Small workpieces or scrap** — smaller than 200 x 200 mm (7.8 x 7.8") — can be dropped from the table through the door, which can be opened by an M80 command and closed by an **M81** command.



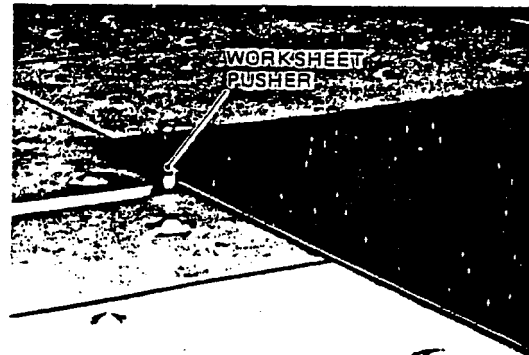
Air-operated X-gauge block (optional)

The standard levercontrolled x-gauge block can be replaced with this pneumatic model, which can be controlled by an additional switch provided on subcontrol panel "A". Its air cylinder **can also** be operated by opening valves 1 and 2 (see figure) and then closing valve 3.



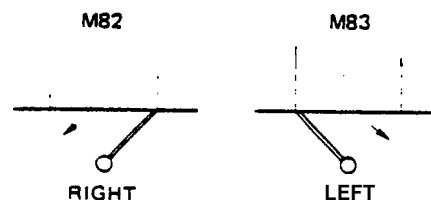
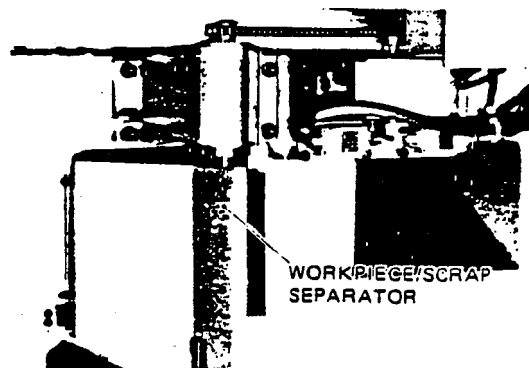
Worksheet pusher (optional)

The worksheet pusher assists the positioning of a heavy worksheet in the workclamps by pushing the worksheet into the opened workclamps. Its control switch is provided on subcontrol panel "A" when this device is equipped. The press cannot be started unless the worksheet pusher is fully retracted.



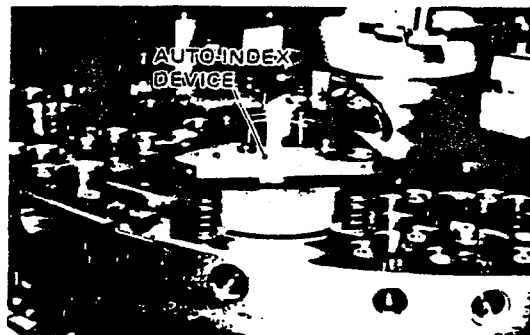
Workpiece/scrap separator (optional)

Punched-out workpieces or scrap pieces can be ejected separately from the press by this device. The separator can be swung to the right by an M82 command and to the left by an M83 command. The separator will swing to the left position automatically when the CNC is turned on, the RESET button is pressed, or an emergency stop has been effected.



Auto-index device (optional)

The auto-index device permits to index a multi-sided punch (1 -1/4"-dia.), which is mounted in the device, in an automatic operation. Two auto-index devices can be mounted on a turret. *Refer to the separate programming and tooling manuals for details.*



Hydraulic workclamps (optional)

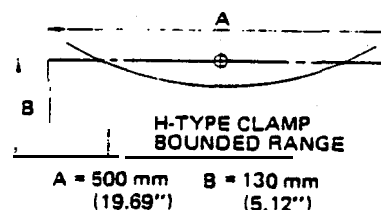
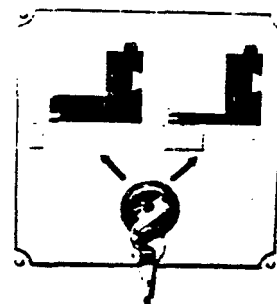
These hydraulic workclamps can clamp a thick or heavy worksheet with a clamping force that is greater than that of the standard pneumatic workclamps. There are two types of hydraulic workclamps: L-type with a clamping force of approx. 315 kg (695 lb) and H-type with a clamping force of approx. 900 kg (1984 lb).

The damp selection switch, which is provided on the electrical control cabinet when the H-type workclamps are equipped, must be set according to their type — the right position is for the L-type and the left position is for the H-type. This will alter the workclamp dead zone and the feedrate to F3 (if set at F1, F2 or F3) or F4 (if set at F4) automatically.

The H-type workclamps cannot enter between the upper and lower turret disks. An emergency stop will be caused if one of the H-type workclamps enters a bounded range (see figure).

CAUTION

Damage may be caused if the selection switch is not set properly.



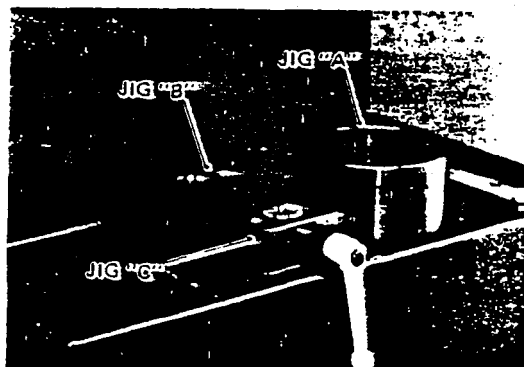
Punch assembling jigs (optional)

A set of three jigs can be used to disassemble and reassemble punches.

Jig "A": Applied to punches of types C (2"), D (3-1/2"), E (4-W) and F (6") for their disassembly/reassembly.

Jig "B": Applied to shaped punches of types A (1/2") and B (1-W) for their disassembly/reassembly and height adjustment.

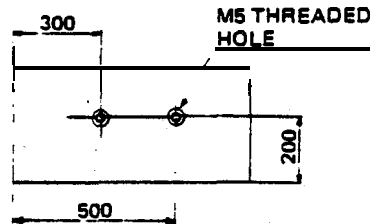
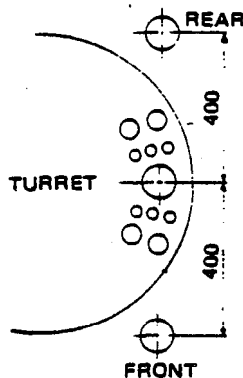
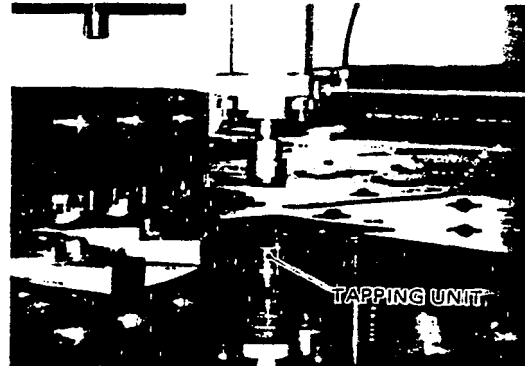
Jig "C": Applied to round punches of types A and B for their disassembly/reassembly and height adjustment.



Tapping unit (optional)

The tapping unit permits thread-cutting to a depth of 3 to 6 mm (**0.12 to 0.24"**) in a punched hole in the worksheet. The unit can be **installed** 400 mm (**15.7"**) forward or backward away from the punching center. The punched hole must be aligned with this position for tapping.

The unit mounted in the front can be started by an M1 5 command. The unit mounted in the rear can be started by an M1 4 command. Both can be stopped by an M1 7 command.



AN EXAMPLE OF TAPPING PROGRAM:

G92 X1830. Y1270.

G90 X500. Y200. T203 (punching 1st hole)

X300. (punching 2nd hole)

M1 5 (tapping start)

X500. Y200. (tapping 1st hole)

X300. (tapping 2nd hole)

M1 7 (tapping gnd)

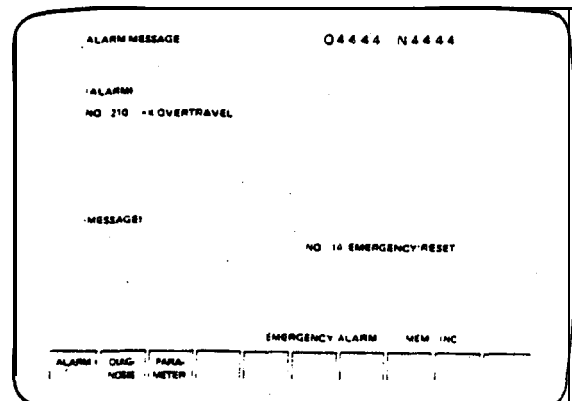
G50

Support plate (optional)

The support plate protects **the underside** of the worksheet from being damaged by dies when the worksheet is moved. The support plate is installed inside the center hole of the lower turret **disk and can** be controlled by **S. PLATE** switch in the electrical control cabinet.

APPENDIX 2: Alarm numbers

When the press has been stopped due to an alarm, the code "ALM" blinks on the screen and a number (some with brief identification) will be displayed automatically to indicate the cause of the alarm. Alarm numbers are listed below with the description of their causes.



PROGRAM-RELATED ALARMS

- 000 Parameter requires turning the CNC off and then on again.
- 001 **TH** error. Illegal number of **holes** for a character are punched in tape.
- 002 **TV** error. Illegal number of characters are punched in **tape** (detected when **TV** check is effective).
- 003 **Illegal** number of digits are entered in **data**.
- 004 **Block** begins with number, minus sign or decimal point instead of address character.
- 005 Address character is followed by another address character or **EOB**.
- 006 Illegal minus sign is entered or **two** minus signs are entered in one data word.
- 007 Illegal decimal point **is** entered or two or more decimal points are entered in one data word.
- 009 **Illegal** characters are entered.
- 010 Illegal **G-code** command is entered.
- 011 **Feedrate** is **not** specified or not suitable.
- 017 Travel is commanded for non-equipped auto-index device (C-axis).
- 023 Zero is entered in R-data for arc.
- 029 Offset value exceed **6** digits.
- 030 D-number for tool-diameter compensation is invalid.
- 031 **P-data** is too large or not specified for **G10** or custom macro.
- 032 **R-data** is too large for **G10** or custom **macro**.
- 033 Intersection cannot be **calculated** for tool-diameter compensation.
- 034 **Start-up** or cancellation has been attempted during execution of **G02/G03** for tool-diameter compensation.
- 035 Automatic **repositioning**, punching pattern, or multiple-part punching has **been** commanded during execution of **tool** compensation C.
- 038 Arc radius is **zero** at its start or end and **tool-dia.** compensation may result excessive cutting.
- 041 Excessive cutting may **be** caused by tool-diameter compensation.
- 048 Travel is commanded without zero-returning axes after turning power on or emergency stop.
- 050 **X-data** is not entered to **G10** command.
- 051 **I, J, P, Q** or Fdata is not entered, or I-data is **zero**, in **G59** block.
- 052 **I, J, K, P** or Fdata is not entered, or **I-data** is **zero**, in **G58** block.
- 053 Non-existing rack number is entered for SCHEDULE mode operation.
- 054 **I** or **Q** data is negative in G18 block.
- 059 Specified **program** number is not found (external program number search 'A').
- 060 Specified sequence **number** is not found.

- 070 **Remaining** memory **capacity** is insufficient.
- 071 Address searched for is not found.
- 072 Number of registered programs has exceeded 191.
- 073 Entered program number is already used
- 074 **Illegal** program number (other than 1 to 9999) is entered.
- 075 Program number and sequence number are missing from first block.
- 077** More than three levels of subprograms (five levels for custom macros) are called.
- 079 Contents of program in memory and in tape do not agree (program verification).
- 085** Data cannot be input from tape because number of bits or baud rate disagrees.
- 086 Data cannot be input or output due to abnormality in transmission or **IO** device.
- 087 Data **with** more than 10 characters has been read following DC3 stop code.
- 0 9 0 Zero-return cannot be executed properly because no signal has been received from pulsecoder.
- 091 Zero-return cannot be executed **properly** because puke-coder signal and reference counter have **not** been **synchronized**.
- 100 '1' is entered to PARAMETER SET that must be **"0"**. Change and reset.
- 101 Power has been turned off during editing. **Turn** power on while pressing DELET and RESET keys together to **clear** memory area.
- 110** Absolute **value** of data in fixed-point representation exceeds allowable range.
- 111 **Exponent** of data in floating-point representation exceeds allowable range.
- 112 Divisor is zero.
- 114** **Error** in format other than that of expression.
- 115** Specified variable is not defined.
- 116 Left side of assignment statement contains variable that inhibits assignment.
- 118 **More than five** sets of parentheses are used.
- 119 Argument in **SQRT** is negative, or argument in **BCD** is negative, or **value** other than 0 to 9 **is contained**.
- 122 More than four levels of macros are called.
- 123 **Macro** control command is used in TAPE mode.
- 124 DO and END statements **are not** used **correctly**.
- 12s Error in format of expression.
- 126 **"n"** in **DO n** is not 1 **≤ n ≤ 3**.
- 127 **CNC commands** are mixed with **macro** commands.
- 128 **"n"** in **GOTO n** is not 0 **≤ n ≤ 9999**.
- 129 Illegal address is used in **defining** argument.
- 130 Error in **larger** segment of program read from **external** device.
- 131 More **than five** alarms have been **caused** in external device.
- 132 No **corresponding** alarm number is found for external alarm.
- 133 Error in smaller segment of program. read from **external** device.
- 135** I or J-data exceeds **workclamp** range or improper Kdata is entered to G05 command.
- 142 P, K or Q-data is not entered to **G94** command (OFS-II).
- 143 **T-** or **C-code** command is given during execution of **G01**, G02 or G03.
- 144 T- or M-code command or G04, G70, G25 or G27 is given during nibbling. Or T-code command is in G72, G93, **G75** or G76 block.
- 14s **G25** or G27 is commanded during execution of G02 or G03.

- 146 **Invalid T-code command is given.**
- 147 X or Y-axis increment for nibbling is too large.
- 148 C-axis increment for nibbling entered to **G68** command exceeds limit.
- 149 **Q-data** is zero or negative. P or **Q-data** is not entered, or **J-data** is larger than distance from **start** to end for **G22** command.
- 150 I-data is **zero** or negative, K-data is zero, or I, J or **K-data** is not entered to G26 command.
- 151 **K-data** is zero or negative, or I, J or **K-data** is not entered to **G28** command.
- 152 I- or K-data is zero or negative, or I, J, K or P-data is not entered to G29 command.
- 153 K- or Pdata is **zero** or negative, or I, J, K or Pdata is not entered to G36 or G37 command.
- 154 Pdata is zero, I-data is less than 1.5 times Pdata. or I, J or **P-data** is not entered to **G66** command.
- 155 P- or Qdata is zero or negative, I- or J-data is less than 3 times P- or **Q-data**, or I, J, K, P, **Q** or **R-data** is not entered in G67 block.
- 156 Qdata is **zero** or negative or exceeds limit, or I-data is zero or negative, or I, J, K, P, **Q** or **R**-data is not entered to **G68** command.
- 157 Q-data is zero or negative or exceeds limit or I, J, P or **Q-data** is not entered to G69 command.
- 158 Q-data is **zero**, negative, smaller than D-data, or larger than arc length, I- or Ddata is **zero** or **negative**, or I, J, K, P or Q-data is **not entered** to G78 command.
- 159 Qdata is zero, negative, smaller than D-data, or larger than **I-data**, Ddata is zero or negative, or I, J, P or Qdata is not entered to G79 command.
- 160 **X-data** is beyond stored stroke limit 1 in plus direction.
- 161 X-data is beyond stored stroke limit 1 in minus **direction**.
- 162 **Y-data** is beyond stored stroke limit 1 in plus direction.
- 163 Ydata is beyond stored stroke limit 1 in **minus direction**.
- 170 Editing is attempted with program with number from 8000 to 9999.
- 104 Number other than **1 to 5** is specified as pattern memory/recall number.
- 185 **Another** macro-saving is attempted during macro-saving, **V-code** command is given although **U-code** is not input, or U- and V-macro numbers do not agree.
- 186 **Illegal** macro number is entered.
- 187 Macro-saving is attempted exceeding memory capacity.
- 188 Non-stored macro is **called**.
- 189 More **than** three levels of macros are caked, or saving of more than **15** macros is attempted for numbers from 90 to 99.
- 190 **Q-** or **W-data** is not entered to G75 or G76 command.
- 191 **Incorrect Q-data** is entered to **G75** or G76 command.
- 192 Non-stored macro is caked in G75 or G76 block.
- 193 G75 or **G76** is commanded although **zero** is entered for no multi-part punching.
- 194 G75 or G76 is commanded during macro-saving.
- 196 G75 is commanded although Pdata is zero to **G98** command, or G76 is commanded although Kdata is **zero** in G98 block.
- 197 **Q-data** in G76 block is not **1** or 3 although Pdata is zero in **G98** block, or Qdata in **G75** block is not 1 or 2 although **K-data** is zero in **G98** block.
- 198 **Q-** or **W-data** is not entered to G73 command. or Qdata is not correct.
- 199 Non-stored macro is caked in G73 block.

OVERTRAVEL ALARMS

- 210 +X-axis stroke limit **switch** has been actuated.
- 211 **-X-axis** stroke limit switch has been actuated.
- 212 X-axis has entered in area restricted by stored stroke limit 1 in plus direction.
- 213 X-axis has entered in area **restricted** by stored stroke limit 1 in minus direction.
- 214 **X-axis** has entered in area restricted by stored stroke limit 2 in **plus direction**.
- 21s **X-axis** has entered in area restricted by stored stroke limit 2 in minus direction.
- 220 **+Y-axis** stroke limit switch has **been** actuated.
- 221 **-Y-axis** stroke limit switch has been actuated.
- 2 2 2 **Y-axis** has entered in area **restricted** by stored stroke limit 1 in plus direction.
- 223 Y-axis has entered in area restricted by stored stroke limit 1 in minus direction.
- 224 **Y-axis** has entered in area restricted by stored stroke limit 2 in plus direction.
- 22s **Y-axis** has entered in **area.restricted** by stored stroke **limit** 2 in minus direction.
- 240 **+C-axis stroke limit switch** has been actuated.
- 241 -C-axis **stroke limit** switch has been actuated.

SERVO-SYSTEM ALARMS

- 400 Overload has been detected on X- or Y-axis.
- 401 **Velocity** control READY **signal (VRDY)** for X- or Y-axis has been turned off.
- 402 Overload **has been** detected on **T-** or C-axis.
- 403** Velocity control READY signal (**VRDY**) for **T-** or C-axis has been turned off.
- 404 Velocity control READY **signal (VRDY)** has not been turned off although position control READY **signal (PRDY)** has been turned off. Or, **VRDY** has been turned on although **PRDY** **has not been turned on when power is turned on.**
- 405** Abnormality has been detected in **servosystem** or **CNC** **during** zero-return, resulting possible zero-return failure.
- 410 **X-axis** positional **deviation** after stopping has exceeded preset limit.
- 411 X-axis positional deviation during travel has exceeded preset limit.
- 413 X-axis **positional** deviation has exceeded **±32767**. Or, D-A converter speed command is outside of range from **+8191** to -8192. (Mostly caused by erroneous parameter setting.)
- 414 **Error** has been detected in X-axis digital **servosystem**.
- 41s **Speed greater** than 511875 **units/second** has been instructed for X-axis. (Caused by **erroneous** CMR parameter setting.)
- 416 **Abnormality** (broken wire) has been detected iii pulsecoder for X-axis.
- 417 **Error has** been detected in parameter setting for X-axis digital **servosystem**.
- 420 Y-axis position has deviated far beyond preset limit when stopped.
- 421 Y-axis position has deviated far beyond preset limit during travel.
- 423 Y-axis positional deviation has exceeded 32767 in plus or minus direction. Or, D-A converter **speed** command is outside of range from **+8191** to -8192. (Mostly caused by erroneous parameter setting.)
- 424 Error has been detected in Y-axis digital servosystem.
- 425** Detection speed greater than 511875 **units/second** has been instructed for Y-axis. (Caused by erroneous CMR setting.)
- 426 **Abnormality** (broken wire) has been detected in pulsecoder for Y-axis.
- 427 **Error** has been detected in parameter setting for Y-axis digital servosystem.

2118	7	6	5	4	3	2	1	0
	MP4	MP2	MP1	EV16	FV8	EV4	EV2	FV1
2119	7	6	5	4	3	2	1	0
	KEY	EDT	MEM	T	D	J	H	S
2120	7	6	5	4	3	2	1	0
	EFS	MNS						
2121	7	6	5	4	3	2	1	0
				WN16	WN8	WN4	WN2	WN1
2122	7	6	5	4	3	2	1	0
			SPC	SPB	SPA			SST0
2123	7	6	5	4	3	2	1	0
	-MITC	-MITT	-MITY	-MITX	+MITC	+MITT	+MITY	+MITX
2128	7	6	5	4	3	2	1	0
		ENBKY	BDT9	BDT8	MLP2	MLP1	NCRS	PCRE
2129	7	6	5	4	3	2	1	0
	4NG	SNP			AIT5		MRD	PCAM
2130	7	6	5	4	3	2	1	0
	ED7	ED6	ED5	ED4	ED3	ED2	ED1	ED0
2131	7	6	5	4	3	2	1	0
	ED15	ED14	ED13	ED12	ED11	ED10	ED9	ED8
2132	7	6	5	4	3	2	1	0
	EST8	EA6	EA5	EA4	EA3	EA2	EA1	EA0
2133	7	6	5	4	3	2	1	0
	R08I	R07I	R06I	R05I	R04I	R03I	R02I	R01I
2134	7	6	5	4	3	2	1	0
	SIND	SSIN	SGN		R12I	R11I	R10I	R09I
2135	7	6	5	4	3	2	1	0
	BDT7		BDT6		BDT5	BDT4	BDT3	BDT2
2136	7	6	5	4	3	2	1	0
	UI7	UI6	UI5	UI4	UI3	UI2	UI1	UI0
2137	7	6	5	4	3	2	1	0
	UI15	UI14	UI13	UI12	UI11	UI10	UI9	UI8
2138	7	6	5	4	3	2	1	0
	T128	T124	T122	T121	T118	T114	T112	T111

APPENDIX 3

2139	7	6	5	4	3	2	1	0
	T148	T144	T142	T141	T138	T134	T132	T131
2140	7	6	5	4	3	2	1	0
	MS07	MS06	MS05	MS04	MS03	MS02	MS01	MS00
2141	7	6	5	4	3	2	1	0
	MS15	MS14	MS13	MS12	MS11	MS10	MS09	MS08

CNC-to-PMC relays

2148	7	6	5	4	3	2	1	0
	OP	SA	STL	SPL	ZPC	ZPT	ZPY	ZPX
2149	7	6	5	4	3	2	1	0
	MA	TIF	SC2	SC1	SPRI	RWD	AST	AI
2150	7	6	5	4	3	2	1	0
	NBLE	DPE	DST	BAL	TE	SF	EF	ME
2151	7	6	5	4	3	2	1	0
	M28	M24	M22	M21	M18	M14	M12	M11
2152	7	6	5	4	3	2	1	0
	ESC	EST	ESY	ESX	MCC	MCT	MCY	MCX
2153	7	6	5	4	3	2	1	0
	M00	M01	M02	M30	PER	PF	NBL	DEF
2154	7	6	5	4	3	2	1	0
	S28	S24	S22	S21	S18	s14	S12MDG	S12LWG
2155	7	6	5	4	3	2	1	0
	T28	T24	T22	T21	T18	T14	T12	T11
2158	7	6	5	4	3	2	1	0
	EREND				ESEND			ENB
2159	7	6	5	4	3	2	1	0
	T48	T44	T42	T41	T38	T34	T32	T31
2160	7	6	5	4	3	2	1	0
	M48	M44	M42	M41	M38	M34	M32	M31
2162	7	6	5	4	3	2	1	0
	S48	s44	S42	s41	S38	s34	S32	s31

2163	7	6	5	4	3	2	1	0
	RP3C	RP3T	RP3Y	RP3X	RP2C	RP2T	RP2Y	RP2X
2164	7	6	5	4	3	2	1	0
	UO7	UO6	UO5	uo4	uo3	uo2	uo1	UO0
2165	7	6	5	4	3	2	1	0
	UO15	UO14	UO13	uo12	uo11	UO10	UO9	UO8
2166	7	6	5	4	3	2	1	0
		NCRE	CNVS	PCRS				
2174	7	6	5	4	3	2	1	0
	R08	R07	R06	R05	R04	R03	R02	R01
2175	7	6	5	4	3	2	1	0
					R12	R11	R10	R09
2176	7	6	5	4	3	2	1	0
	PN07	QN06	PN05	PN04	PN03	QN02	PN01	QN00
2177	7	6	5	4	3	2	1	0
	PN15	QN14	PN13	PN12	PN11	PN10	PN09	PN08
2176	7	6	5	4	3	2	1	0
	PN23	PN22	PN21	PN20	PN19	PN18	QN17	PN16
2179	7	6	5	4	3	2	1	0
	PN31	QN30	PN29	PN26	QN27	PN26	QN25	QN24
2180	7	6	5	4	3	2	1	0
							PRGDPL	INHKY

PMC-to-CNC relays (control panel)

2242

7	6	5	4	3	2	1	0
PF3	PF4	PEDT	PMAN	PMDI	PTAP	PMEM	PZER
F3 PL	F4 PL	Edit PL	Manual PL	MDI PL	Tape PL	Memory PL	Ref-zero PL

2243

7	6	5	4	3	2	1	0
PF2					PZR		OSBK
F2 PL					X-origin PL		Single PL

2244

7	6	5	4	3	2	1	0
		PZRT	PZRY			POPS	PMLK
		Turret origin PL	Y-origin PL			opt stop PL	Test PL

2245

7	6	5	4	3	2	1	0
PORD		PF1					QBDT
Override PL		FI PL					Block skip PL

2246

7	6	5	4	3	2	1	0
PM00		POP					QTEST
Program stop PL		Auto op. PL					Multipart first PL

2247

7	6	5	4	3	2	1	0
PRDY	PZR	OSM	PIT			PALL	PRAL
NC ready PL	Axes-ret PL	Strip miss PL P	Interlock L			Multipart all PL	Multipart others PL

2246

7	6	5	4	3	2	1	0
		PBNA		PHDTH	PHDPS	QPAN	PHDFL
		Lub alarm PL		Oil temp alarm PL	Oil pressure alarm PL	Air pressure alarm PL	Oil filter alarm QL

2249

7	6	5	4	3	2	1	0
		PREP	PWC	PTC	PLP	QWTC	PSW
		Reposition confirm PL	Workcfamp open PL	Tool change door PL	X-gauge block PL	Tool change switch PL	Stop button PL

CNC-to-PMC relays (control panel)

2292	7	6	5	4	3	2	1	0
	W3	W4	WEDT	WMAN	WMDI	WTAP	WMEM	WZER
	F3 key	F4 key	Edit key	Manual key	MDI key	Tape key	Memory key	Ref-zero. key
2293	7	6	5	4	3	2	1	0
	W2				W-X	W+X		WSBK
	F2 key				-X key	+X key		Single key
2294	7	6	5	4	3	2	1	0
		W-Y	W+T	W+Y			WOPS	WMLK
		-Y key	Turret origin key	+Y key			Optional stop key	Test key
2295	7	6	5	4	3	2	1	0
			W1					WBDT
			F1 key					Block skip key
2296	7	6	5	4	3	2	1	0
								WTEST
								Multipart first key
2297	7	6	5	4	3	2	1	0
							WALL	WRAL
							Multipart an key	Multipart others key