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 460 VAC ±10%, 50/60 Hz, with a load capacity of over 18 kVA (over 15 kVA 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 three terminal connections if the flywheel rotates in the wrong direction.
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.

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  Table & caniage 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 bail 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.
Safety functions

The following functions ensure the safe operation of the press:

**Punching protection**
The shear plate in the 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 the workclamps is disabled during an automatic press operation except when the press is stopped by the program or optional stop command.

**X-gauge block protection**
The press cannot be started if the X-gauge 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 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 the turret index pins is not inserted or if the striker is not positioned over the 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 the 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 if the 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.
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.

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Subcontrol panel "A"  10
Subcontrol panel "B"  11
**Electrical** control unit  12
Other switches & interfaces  73
Displays  14
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**
- T/POS  ACTUAL POSITION display.
- L/SET  SETTING display.

**CURSOR keys**
- T/PRGRM  The PROGRAM display.
- L/ALARM  The ALARM/MESSAGE display.
- ←/COMND  The MDI 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. The hydraulic motor will not stop. (Not applicable to PEGA KING.)

**OIL PRESSURE (r)**  Lights when the operating hydraulic pressure has been reduced and the press is stopped. The hydraulic motor and the hydraulic motor are stopped. (Not applicable to PEGA KING.)

**OIL TEMPERATURE (r)**  Lights when the hydraulic oil temperature has risen abnormally and the press is stopped.

**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 'B' 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 reconf. 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.)

- X, - 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.)

<table>
<thead>
<tr>
<th>FEEDRATES</th>
<th>MEMORY, TAPE, MDI modes*</th>
<th>MANUAL mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>F1 key</td>
<td>50.0 m/min (1968 ipm)</td>
<td>20.0 m/min (787 ipm)</td>
</tr>
<tr>
<td>F2 key</td>
<td>37.5 m/min (1476 ipm)</td>
<td>14.0 m/min (551 ipm)</td>
</tr>
<tr>
<td>F3 key</td>
<td>25.0 m/min (984 ipm)</td>
<td>10.0 m/min (393 ipm)</td>
</tr>
<tr>
<td>F4 key</td>
<td>125 m/min (492 ipm)</td>
<td>5.2 m/min (204 ipm)</td>
</tr>
</tbody>
</table>

* Feedrates for PEGAS 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)
PART II: CONTROLS

INDEX SPEEDS

<table>
<thead>
<tr>
<th></th>
<th>Thick turret</th>
<th>Thin turret</th>
<th>All device</th>
</tr>
</thead>
<tbody>
<tr>
<td>F1 &amp; F2 keys</td>
<td>30 rpm</td>
<td>40 rpm</td>
<td>60 rpm</td>
</tr>
<tr>
<td>F3 &amp; F4 keys</td>
<td>15 rpm</td>
<td>20 rpm</td>
<td>30 rpm</td>
</tr>
</tbody>
</table>

The turret index speed in the MANUAL mode (3 or 4 to 12 rpm) is determined by the TURRET SPEED switch on the subcontrol panel 'B'. 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 'B' is pressed, which has the same function as this button.

RELEASE button

Used to release the overrun caused for the X or Y axis in combination with the jog keys.

EDIT PROTECT switch

Protects the program in the 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 the ON position unless the 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 that 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: Performed.
MDI: Performed.
MEMORY/TAPE: Not applicable.
INCHING: Performed.
CYCLE: Not applicable.

EMERGENCY STOP button

Stops the press operation instantly when pressed — the button will then be locked. Turn the 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 s&control 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 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
Operator 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
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.

IN and OUT lights
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 Other Switches). 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 below) and stop to index the nearest turret station in the rotating direction when the button is released.

TURRET ON = and <= buttons
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.

TURRET SPEED selector 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.)

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**

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 turned 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
- The hydraulic motor can be operated when this switch is turned to ON. Keep the switch turned to ON normally. (Not applicable to PEGAKING.)
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 closes 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 OFF 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**

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  MOI 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 \( U / S E T \) key together with the **FUNC** key. It can be changed to a subdisplay (STATE ON 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 \( T / P R G R M \) 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 \( T / P O S \) 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 \( \leftrightarrow / C O M M D \) 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 \( J / A L A R M \) 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.

<table>
<thead>
<tr>
<th>PRESS MODEL</th>
<th>AXIS</th>
<th>METRIC SPEC.</th>
<th>INCH SPEC.</th>
</tr>
</thead>
<tbody>
<tr>
<td>PEGA 30 40 50</td>
<td>X</td>
<td>1270.00 mm</td>
<td>50.000'</td>
</tr>
<tr>
<td></td>
<td>Y</td>
<td>1000.00 mm</td>
<td>39.370'</td>
</tr>
<tr>
<td>PEGA 30 40 50 KING</td>
<td>X</td>
<td>1270.00 mm</td>
<td>50.000'</td>
</tr>
<tr>
<td></td>
<td>Y</td>
<td>1000.00 mm</td>
<td>39.370'</td>
</tr>
<tr>
<td>PEGA 30 50 72</td>
<td>X</td>
<td>1830.00 mm</td>
<td>72.000'</td>
</tr>
<tr>
<td></td>
<td>Y</td>
<td>1270.00 mm</td>
<td>50.000'</td>
</tr>
<tr>
<td>PEGA 30 60 72</td>
<td>X</td>
<td>1830.00 mm</td>
<td>72.000'</td>
</tr>
<tr>
<td></td>
<td>Y</td>
<td>1525.00 mm</td>
<td>50.000'</td>
</tr>
<tr>
<td>COMA5050 72</td>
<td>X</td>
<td>1830.00 mm</td>
<td>72.000'</td>
</tr>
<tr>
<td></td>
<td>Y</td>
<td>1270.00 mm</td>
<td>50.000'</td>
</tr>
<tr>
<td>COMA506072</td>
<td>X</td>
<td>1830.00 mm</td>
<td>72.000'</td>
</tr>
<tr>
<td></td>
<td>Y</td>
<td>1525.00 mm</td>
<td>50.000'</td>
</tr>
<tr>
<td>COMA5080 80</td>
<td>X</td>
<td>2000.00 mm</td>
<td>78.740'</td>
</tr>
<tr>
<td></td>
<td>Y</td>
<td>2040.00 mm</td>
<td>80.315'</td>
</tr>
</tbody>
</table>
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.

Preparing for operation 18
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TAPE mode operation 23
MDI mode operation 24
Operation stops 25
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 LSX 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.
### PART III: PUNCHING OPERATION

#### SETTING (SET DATA) display

<table>
<thead>
<tr>
<th>Setting</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SHEET COUNT</td>
<td>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 <strong>ACTUAL POSITION</strong> display. Key-in <code>P</code> and <code>0</code> (zero) to reset the count to zero (or a number to set) and then press the <strong>INPUT</strong> key.</td>
</tr>
<tr>
<td>POWER ON HRS</td>
<td>An accumulated period of time in which the <strong>CNC</strong> has been turned on can be counted up to 99,999,999 hours, 59 minutes and 59 seconds and displayed here and on the <strong>ACTUAL POSITION</strong> display. Key-in <code>P</code> and <code>0</code> to reset the count to zero (or a number to set) and then press the <strong>INPUT</strong> key for each item.</td>
</tr>
<tr>
<td>MIN</td>
<td></td>
</tr>
<tr>
<td>SEC</td>
<td></td>
</tr>
<tr>
<td>CYCLE ON HRS</td>
<td>An accumulated period of time in which the press is operated automatically can be counted up to 99,999,999 hours, 59 minutes and 59 seconds and displayed here and on the <strong>ACTUAL POSITION</strong> display. Key-in <code>P</code> and <code>0</code> to reset the count to zero (or a number to set) and then press the <strong>INPUT</strong> key for each item.</td>
</tr>
<tr>
<td>MIN</td>
<td></td>
</tr>
<tr>
<td>SEC</td>
<td></td>
</tr>
<tr>
<td>TOTAL HITS</td>
<td>An accumulated number of hits can be counted up to 99999999 and displayed here and on the <strong>ACTUAL POSITION</strong> display. Key-in <code>P</code> and <code>0</code> to reset the count to zero (or a number to set) and then press the <strong>INPUT</strong> key.</td>
</tr>
<tr>
<td>MULTIPLE PART</td>
<td>Entry is made automatically according to the status of the three <strong>MULTI-PART MODE</strong> keys. <code>0</code> (NONE) is entered if a multiple-part punching program is not involved and the <strong>LEDs</strong> on the three keys are not lighted.</td>
</tr>
<tr>
<td>MACRO DATA</td>
<td>Give preference either for erasing or not erasing the macroprograms in the memory when resetting or shutting down the system. Key-in <code>P</code> and <code>0</code> (for erasing) or <code>1</code> (for not erasing) and then press the <strong>INPUT</strong> key.</td>
</tr>
<tr>
<td>BENDING OFS</td>
<td>Enter an offset value that is equivalent to coefficient &quot;D&quot; entered with a G94 command in the program by taking into account the successive bending of the punched worksheet. Key-in <code>P</code> and the offset value, which is 160 if the coefficient is 1.6, and then press the <strong>INPUT</strong> key.</td>
</tr>
<tr>
<td>PROGRAM UNIT</td>
<td>Give preference for the unit to enter numerical data. Key-in <code>P</code> and <code>0</code> (<strong>mattimeters</strong>) or <code>1</code> (<strong>inches</strong>) and then press the <strong>INPUT</strong> key.</td>
</tr>
</tbody>
</table>

---
**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.
PART III: PUNCHING OPERATION

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 MEMORY 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 CURSORT/PRGRM 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 "0" 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 MODE, 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.

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 dear 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 overtravelled.
Change to the MANUAL mode and then press the OT RELEASE button together with the jog button that will retract the overtravelled 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 INCH NG. 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.
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 "0" (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 0 1000 CR G92 X . . . . . . . . . G50 CR . . . . . . CR 0 2000 . . . . . . . . G50 CR %
```

Program no. program Space end-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 “0” (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 NEWPROG-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 **CURSOR†/PRGM** 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.

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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 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/cm²
- Gauge G2 (clutch & brake cooling pressure): Below 1.5 kg/cm²
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 workdamps: 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.)
Weekly maintenance

Inspect and maintain the equipment once every week in addition to the daily maintenance 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:

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.

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

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:

<table>
<thead>
<tr>
<th>PART</th>
<th>FREQUENCY</th>
<th>LUB</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Motor upper bracket (grease fitting)</td>
<td>Monthly</td>
<td>C</td>
</tr>
<tr>
<td>2 Motor lower bracket (grease fitting)</td>
<td>Monthly</td>
<td>C</td>
</tr>
<tr>
<td>3 Turret drive gearbox (reservoir)</td>
<td>Monthly</td>
<td>C</td>
</tr>
<tr>
<td>4 Lower turret disk bearings (grease fitting)</td>
<td>Monthly</td>
<td>C</td>
</tr>
<tr>
<td>5 Upper turret disk bearings (grease fitting)</td>
<td>Monthly</td>
<td>C</td>
</tr>
<tr>
<td>6 Striker (grease fitting)</td>
<td>Monthly</td>
<td>C</td>
</tr>
<tr>
<td>7 Y-axis bearings (grease fitting)</td>
<td>Monthly</td>
<td>B</td>
</tr>
<tr>
<td>8 Y-axis ball nut (grease fitting)</td>
<td>Monthly</td>
<td>B</td>
</tr>
<tr>
<td>9 Y-axis drive gearbox (reservoir)</td>
<td>Monthly</td>
<td>B</td>
</tr>
<tr>
<td>10 Sub-guide upper cam follower (grease fitting)</td>
<td>Monthly</td>
<td>B</td>
</tr>
<tr>
<td>11 Sub-guide lower cam follower (grease fitting)</td>
<td>Monthly</td>
<td>B</td>
</tr>
<tr>
<td>12 Pulley bearings (grease fitting)</td>
<td>Monthly</td>
<td>B</td>
</tr>
<tr>
<td>13 Clamp (grease fitting)</td>
<td>Monthly</td>
<td>B</td>
</tr>
<tr>
<td>14 X-axis bearings (grease fitting)</td>
<td>Monthly</td>
<td>B</td>
</tr>
<tr>
<td>15 X-axis ball nut (grease fitting)</td>
<td>Monthly</td>
<td>B</td>
</tr>
<tr>
<td>16 X-axis bearings (grease fitting)</td>
<td>Replenish*</td>
<td>E</td>
</tr>
<tr>
<td>17 Automatic lubrication pump (grease fitting)</td>
<td>Weekly</td>
<td>D</td>
</tr>
<tr>
<td>18 X-axis guide bars (grease fitting)</td>
<td>Weekly</td>
<td>D</td>
</tr>
<tr>
<td>19 Y-axis guide bars (grease fitting)</td>
<td>Daily</td>
<td>A</td>
</tr>
<tr>
<td>20 Punches (oiler)</td>
<td>Replenish***</td>
<td>A</td>
</tr>
<tr>
<td>21 Air system lubricator (oiler)</td>
<td>Quarterly</td>
<td>A</td>
</tr>
<tr>
<td>22 Turret drive chains (oiler)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
PART V: MAINTENANCE

COMA MODELS

[Diagram of mechanical components with numbered parts]
CNC TURRET PUNCH PRESS

PEGA models

PART
1. Turret drive gears (grease fitting)
2. Tensioner lower bearings (grease fitting)*
3. Lower turret disk bearings (grease fitting)*
4. Upper turret disk bearings (grease fitting)*
5. Tensioner upper bearings (grease fitting)*
6. T-axis gearbox (reservoir)
7. Striker (grease fitting)
8. Y-axis bearings (grease fitting)
9. Y-axis ball nut (grease fitting)
10. Y-axis drive gearbox (reservoir)
11. X-axis bearings (grease fitting)
12. X-axis ball nut (grease fitting)
13. X-axis bearings (grease fitting)
14. Automatic grease pump (reservoir)
15. Clamp (oiler)
16. X-axis guide bars (grease fitting)
17. Y-axis guide bars (grease fitting)
18. Punches (oiler)
19. Air system lubricator (oiler)
20. Turret drive chains (oiler)

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

FREQUENCY LUB
Monthly B
Monthly B
Monthly B
Monthly B
Quarterly A
Monthly B
Monthly C
Monthly B
Quarterly A
Monthly C
Monthly B
Monthly B
Monthly B
Replenish*
Daily A
weekly C
weekly C
Daily A
Replenish** A
Quarterly A

(*) See page 34.
(**) See page 35.

Auto-index device (optional)

PART
1. Bearings (grease fitting)
2. Bearings (grease fitting)
3. Gearbox (reservoir)

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

FREQUENCY LUB
Monthly B
Monthly B
Quarterly A
PART V: MAINTENANCE

PEGA MODELS

CENTRAL LUBRICATION BLOCK

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.

2. 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-l 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, dismounted 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 lever-controlled 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 after 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 M14 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 end)
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

<table>
<thead>
<tr>
<th>Alarm</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>000</td>
<td>Parameter requires turning the CNC off and then on again.</td>
</tr>
<tr>
<td>001</td>
<td>TH error. Illegal number of holes for a character are punched in tape.</td>
</tr>
<tr>
<td>002</td>
<td>TV error. Illegal number of characters are punched in tape (detected when TV check is effective).</td>
</tr>
<tr>
<td>003</td>
<td>Illegal number of digits are entered in data.</td>
</tr>
<tr>
<td>004</td>
<td>Block begins with number, minus sign or decimal point instead of address character.</td>
</tr>
<tr>
<td>005</td>
<td>Address character is followed by another address character or EOB.</td>
</tr>
<tr>
<td>006</td>
<td>Illegal minus sign is entered or two minus signs are entered in one data word.</td>
</tr>
<tr>
<td>007</td>
<td>Illegal decimal point is entered or two or more decimal points are entered in one data word.</td>
</tr>
<tr>
<td>009</td>
<td>Illegal characters are entered.</td>
</tr>
<tr>
<td>010</td>
<td>Illegal G-code command is entered.</td>
</tr>
<tr>
<td>011</td>
<td>Feedrate is not specified or not suitable.</td>
</tr>
<tr>
<td>017</td>
<td>Travel is commanded for non-equipped auto-index device (C-axis).</td>
</tr>
<tr>
<td>023</td>
<td>Zero is entered in R-data for arc.</td>
</tr>
<tr>
<td>029</td>
<td>Offset value exceed 6 digits.</td>
</tr>
<tr>
<td>030</td>
<td>D-number for tool-diameter compensation is invalid.</td>
</tr>
<tr>
<td>031</td>
<td>P-data is too large or not specified for G10 or custom macro.</td>
</tr>
<tr>
<td>032</td>
<td>R-data is too large for G10 or custom macro.</td>
</tr>
<tr>
<td>033</td>
<td>Intersection cannot be calculated for tool-diameter compensation.</td>
</tr>
<tr>
<td>034</td>
<td>Start-up or cancellation has been attempted during execution of G02/G03 for tool-diameter compensation.</td>
</tr>
<tr>
<td>035</td>
<td>Automatic repositioning, punching pattern, or multiple-part punching has been commanded during execution of tool compensation C.</td>
</tr>
<tr>
<td>038</td>
<td>Arc radius is zero at its start or end and tool-dia., compensation may result excessive cutting.</td>
</tr>
<tr>
<td>041</td>
<td>Excessive cutting may be caused by tool-diameter compensation.</td>
</tr>
<tr>
<td>048</td>
<td>Travel is commanded without zero-returning axes after turning power on or emergency stop.</td>
</tr>
<tr>
<td>050</td>
<td>X-data is not entered to G10 command.</td>
</tr>
<tr>
<td>051</td>
<td>I, J, P, Q or Fdata is not entered, or I-data is zero, in G59 block.</td>
</tr>
<tr>
<td>052</td>
<td>I, J, K, P or Fdata is not entered, or I-data is zero, in G58 block.</td>
</tr>
<tr>
<td>053</td>
<td>Non-existing rack number is entered for SCHEDULE mode operation.</td>
</tr>
<tr>
<td>054</td>
<td>I or Q data is negative in G18 block.</td>
</tr>
<tr>
<td>059</td>
<td>Specified program number is not found (external program number search 'A').</td>
</tr>
<tr>
<td>060</td>
<td>Specified sequence number is not found.</td>
</tr>
</tbody>
</table>
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.
090 Zero-return cannot be executed properly because no signal has been received from pulsecoder.
091 Zero-return cannot be executed properly because pulse-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 SORT 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.
125 Error in format of expression.
126 "n" in DOn is not 1/sm3.
127 CNC commands are mixed with macro commands.
128 "n" in GOTOn is not 0/sm999.
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 K-data is entered to GO1 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 GO1, GO2 or GO3.
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.
145 G25 or G27 is commanded during execution of GO2 or GO3.
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 G26 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 P-data is zero or negative, or I, J, K or P-data is not entered to G36 or G37 command.
154 P-data is zero, I-data is less than 1.5 times P-data, or I, J or P-data is not entered to G66
command.
155 P- or Q-data 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 Q-data 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 D-data is zero
or negative, or I, J, K, P or Q-data is not entered to G78 command.
159 Q-data is zero, negative, smaller than D-data, or larger than I-data, Q-data is zero or
negative, or I, J, P or Q-data 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 Y-data is beyond stored stroke limit 1 in minus direction.
170 Editing is attempted with program with number from 8000 to 9999.
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.
195 G75 is commanded although P-data is zero to G98 command, or G76 is commanded although
K-data is zero in G98 block.
196 Q-data in G76 block is not 1 or 3 although P-data is zero in G98 block, or Q-data in G75 block
is not 1 or 2 although K-data is zero in G98 block.
197 Q- or W-data is not entered to G73 command. Q-data is not correct.
198 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.
215  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.
222  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.
225  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 (PRDY) has not been turned off although position control
     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.
412  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.
415  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 in 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.
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### APPENDIX 3

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### CNC-to-PMC relays (control panel)

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