Model of Product: Model JX-14
Name of Product: NC Processing Production Line of Angle Bar

OPERATION MANUAL

(Electric)

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1 BRIEF INTRODUCTION

With three NC axles the automatic NC Processing Production Line of Angle Bar (thereafter called abbreviated Line of Angle Bar) can complete automatically processing such as hole punch, character print and cutting off of angle bar.

Operation of the electric control system of the automatic NC Processing Production Line of Angle Bar has been described here while as for installation and adjustment of machinery and hydraulic system refer to another manual.

Warning: Production Line of Angle Bar is certain precision NC equipment on which any operation wrong may cause damage to machine or personnel hence it is necessary for you to read carefully this said manual before operation.

Main parameters of electric system the Production Line of Angle Bar:

main resources of electric power: 3_phase AC 380V plus or minus 10%, frequency 50Hz, total power about 60kW.

control electric resources: 2_phase AC 220V, capacity 800VA, DC 24V, capacity 4A.

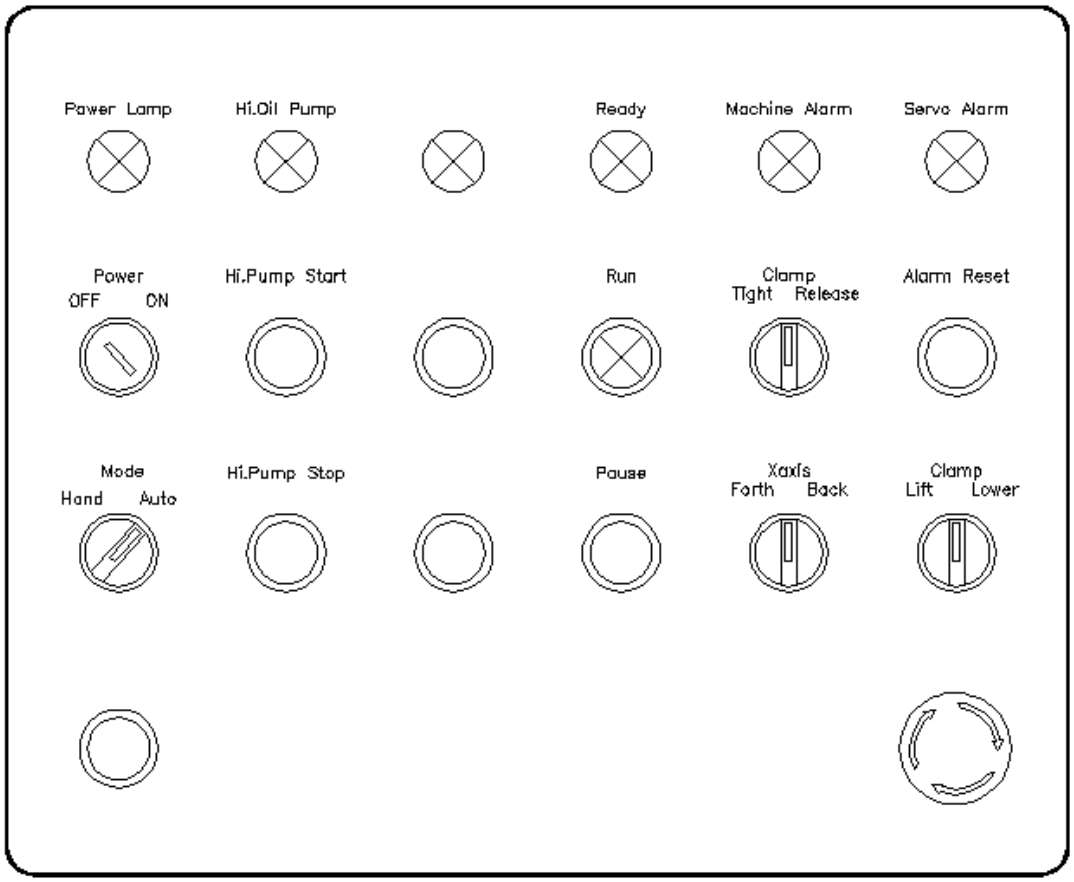
servo drivers resources: 3_phase AC 200 to 230V +/-10%, capacity 10kVA,

servo electric motor of feeding vehicle: 4.4kW, rated speed 1500rpm, with increment coder 4096P/R.

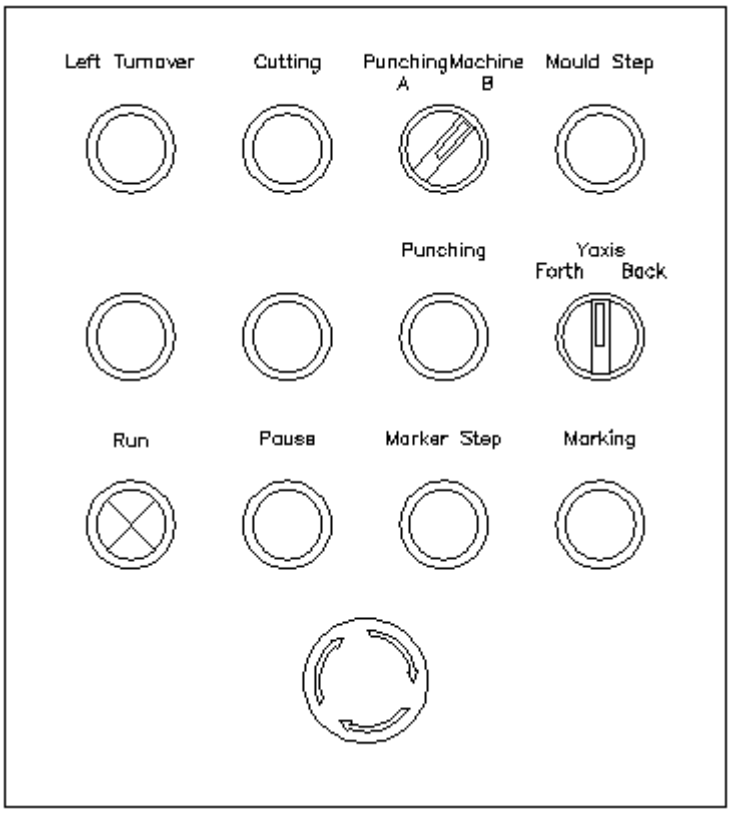
standard separation adjusting motor: 2.0 kW, rated speed 1500rpm, with increment coder 4096P/R or general braking motor: 1.5kW, speed 1000rpm

oil pump motor: rated speed 1470rpm, power 22kW

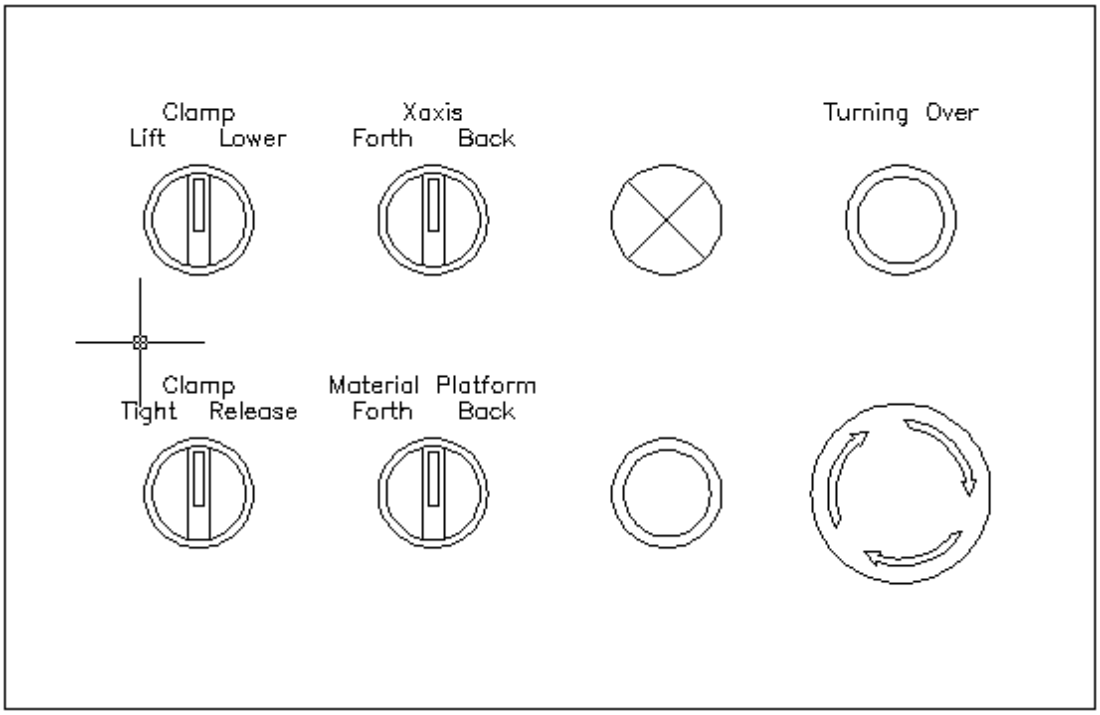
The electric control system of Line of Angle Bar consists mainly of electric cabinet, main console, the operational box of main machine and operational station for small vehicle. There mounted on the main console are the convenient control buttons in common use and indicating lights and the upper level computer which has been equipped with control software for Line of Angle Bar to complete normal control such as work-piece programming, blank layout, setting of machine parameters and others. As for layout of the main console refer to drawing I. The operational box of main machine has been equipped with operational buttons in common use for main machine of Line of Angle Bar to complete normal operation of the main machine and discharge mechanism, of which layout refer to drawing II. The operational station for small vehicle is concerned about normal operation of transfer vehicle and feeding support of which layout refer to drawing III.



(Drawing I- layout of main console)



(Drawing II- layout of the operational box of main machine)



(Drawing II- layout of operational station for small vehicle)

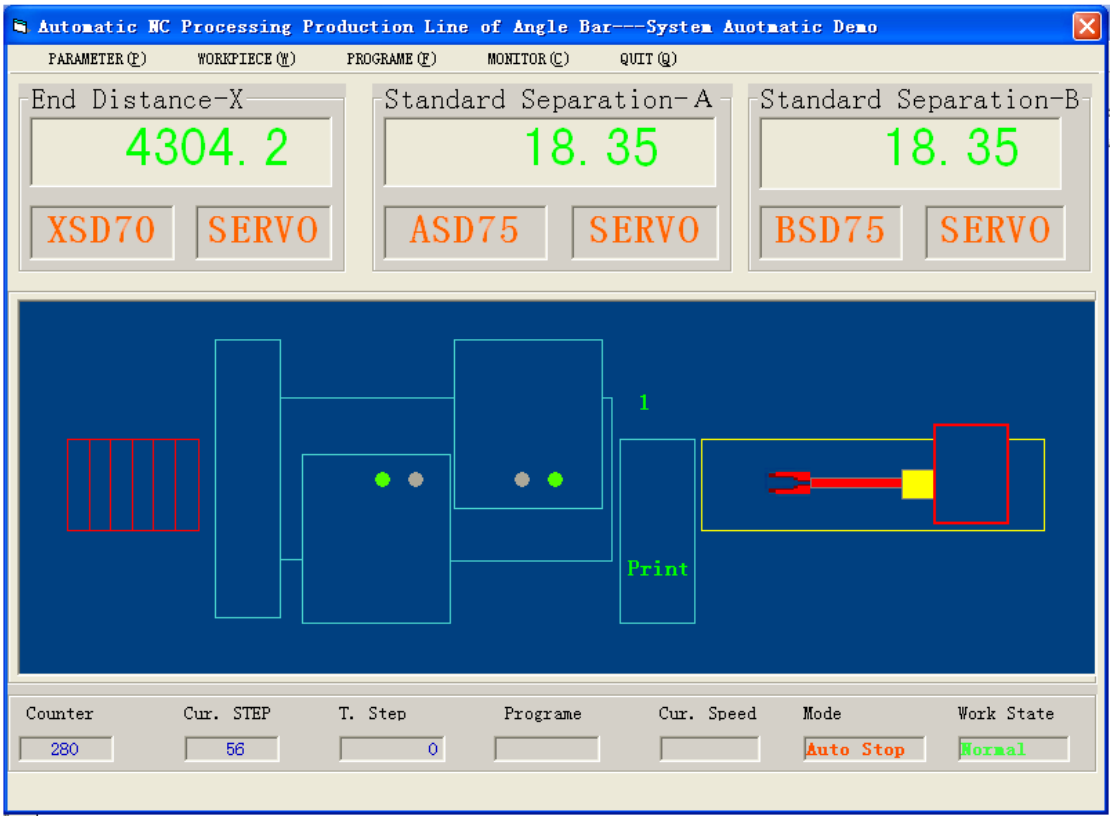
2 Start and selection of working mode

Preparation before start: inspect to assure no abnormal situation of the machine; lubricate each lubricating point; assure no obstacles on bar transfer way; open valve for compressed air; open cooling water of hydraulic station if necessary.

Start the machine: turn on general switch of electric resources in electric cabinet (The indicator will light of " electric resources " in the main console.) And the computer powered on will start automatically and display main window of control software of Line of Angle Bar. Turn on the key for " electric resources " on the main control console to connect to control electric resources. Start the oil pump motor and the Line of Angle Bar is in working state.

Selection of working mode: there are two modes i.e. for adjusting or for automation which are selected with buttons " working mode " on the main control console. In the mode of adjustment, machine can be operated manually for being used mainly in manual adjustment of the machine, of which operation in details refer to chapter 3. In the mode of automation the machine will run automatically according to blank layout program offered by the user to complete volume production of work piece. Operation in details refers to chapter 4.

Introduction of main picture of control software: the control software is indicated as follows in the graphics:



a. Main menu.

b. Display window of state of the three axis. If the axis is not back to the reference point, the present position will be displayed by dark green otherwise by bright green. Mistakes messages of this axis will be displayed below the window. The sign of ERR indicates the servo driving device of this axis is sending warning information while nothing in normal situation. The number of mistake indicates the number of breakdown of the positioning module of this axis while nothing in normal situation.

c. Preview of the machine. Correspondent action will be displayed whenever the machine has any action. The three indicators on the punching hole A and B indicates respectively the die state. The digit on print indicates the number of the present character plate.

d. Machine information including date, time, program name of the current blank layout and machine state and so on.

3 Operation in adjustment mode

In the mode of adjustment, machine can be operated manually for being used mainly in manual adjustment of the machine. Further more operations such as return to reference point, automatic length measuring and axis positioning have to be done in the mode of adjustment. Details are as follows:

3.1 Return to the reference point

Line of Angle Bar is an automatic production line with three NC axis. They are feeding vehicle (i.e. end distance, abbreviated as X axis), separation in A side (abbreviated as A axis) separation in B side (abbreviated as B axis). The X axis, taking the inside of the cutting edge as 0 point, is grown up backwards gradually with a stroke about 17m. The A and B axis, taking the surface of V_shape pad as 0 point, is grown up upwards gradually with a stroke about 170mm.

For purpose of precision positioning of the three axis of the machine, whenever machine is started operation of return to referrence point should be done first so as to enable the three axis to match the above mentioned coordinate system of the machine.

The following machine parameters should be used in operation of return to referrence point:

- position of referrence point
- speed of return to referrence point

These parameters should be set proper before return to referrence point can be done. As for parameters setting refer to chapter 6.

The operation of return to referrence point should be done in an upper level computer. Enter the main picture and select submenu " return to referrence point " under menu of " monitoring & control of machine " and the hint window will appear on the screen to give user a hint of selecting the axis that should return to referrence point. Push the keys of X, A or B can do while other key will let to exit.

After start of operation of return to referrence point, the servo motor move first in positive direction (coordinate value increase) with speed of return to referrence point, when switch of referrence point has been met, it will change its speed and continue to run with a lower speed till Z pulse of coder of position feedback has been found out. Then the system will set the current coordinate as " position of referrence point " which then change color to bright green and the operation finished.

The same method is for the operation of return to referrence point of the other two axis.

As mentioned above, when start of operation of return to referrence point, the servo motor move first in positive direction (coordinate value increase) so that the

position of axis before operation of return to referrence point should be in the front (beneath) of switch of referrence point and not just upper on switch of referrence point. Otherwise it will lead operation of return to referrence point to failure. Method mentioned in 3.2 or 3.3 can be used for operation of axis moving.

Warning: In case of without the operation of return to referrence point, the coordinate of the relating axis is not determined so that the soft limit parameter of this axis will not act as protection and damage of bumping into others may occur when this axis moves at this time.

Attention: When certain axis meets resistance hence with an overload, the servo driving device will automatically warn or breakdown of clamps being resistant (only for X axis). At this time for assurance of precision, the system will automatically clear up the sign of return to referrence point of the relating axis (the coordinate turn into dark) and renewing the operation of return to referrence point of the relating axis will be demanded. At this time inspection and clearing of breakdown should be done and then renew the operation of return to referrence point of this axis according to the above mentioned method before the work can be continued. Refer to 4.4 " breakdown disposal in automatic mode ".

3.2 Manual operation

When the adjusting modehas been selected the machine can be operated manually.

The button switch on operational box of main machine can be used to operate the main machine of Line of angle bar manually. The most used operations manual are as follows:

- Selection of hole punch machine:

Selection of A hole punch or B hole punch can be done by button of " Selection of hole punch ". Whenever done, the following operation such as " Standard separation adjustment ", " Selection of die of hole punch " and " hole punch " will be realize on the said hole punch unit.

- Standard separation adjustment:

Adjustment of the standard separation of the current selected hole punch unit can be manually done by button of " Standard separation forth & back ". Adjustment of speed can be modified with parameter of " speed of manual operation of A / B axis ". And Standard separation adjustment can also be done according to method of " axis positioning " described in 3.3.

- Selection of die of hole punch:

Every time when button of " Selection of die of hole punch " has been pushed,

the die of the current selected hole punch unit will change its station in sequence of 1 to 2 to 3 to 0 and in cycle.

- Hole punch

Pushing down and holding the button of " Hole punch ", the current selected hole punch unit will run its operation of hole punch and stop at once when button released.

- Cutting

Pushing down and holding the button of " Cutting ", the cutting machine will run its operation of cutting and stop at once when button released.

- Selection of character plate

Every time when button of " Selection of character plate " has been pushed, the character plate of the printer will change its station in sequence of 1 to 2 to 3 to 0 and in cycle.

- Printing

Pushing down and holding the button of " Printing ", the Printing machine will run its operation and stop when button released.

- Left turnover to discharge

Pushing down and holding this button, the discharge way will turnover to left and recover when button released.

- Right turnover to discharge

Pushing down and holding this button, the discharge way will turnover to right and recover when button released.

The button switch on main operational platform or operational station of small vehicle can be used for manual operation of material transfer vehicle and feeding support and the most used are as follows:

- Forth and back of small vehicle

Both main operational platform and operational station of small vehicle have been equipped with this button which can be used to move manually material transfer vehicle (X axis). The vehicle speed can be modified with parameter of " speed of manual operation of X axis ". And vehicle moving can also be done according to method of " axis positioning " described in 3.3.

- Tight clamping / release of clamps

Both main operational platform and operational station of small vehicle have been equipped with this button. And there is foot pedal switch. Using of this button or foot pedal can realize tight clamping / release of clamps.

● Lift / lowering of clamps

The clamps can lift only when both clamps have released and the position of vehicle is larger than " coordinate of length measuring switch ".

● Forth and back of material platform

To enable the motor of material platform to be forth and back so as to put a piece of angle bar into the upper material trough.

● Turnover of feeding support

To push down and hold this button will run the electric motor of feeding support to turnover to feed material while release of button will stop the motor.

Attention: In this operation the clamps should be lifted and assure nothing on material way.

3.3 Axis positioning

In addition to operation of axis moving mentioned in 3.2, command of " axis positioning " of the upper level computer can also be used for moving of axis and precision positioning. Enter the main picture and select command of " X axis positioning " under the menu of " monitor and control of machine ". The system will display the window of hint to give hint to user to type into position of X axis with mm as the unit for the new input absolute value of X axis (for instance, 7342.5) or value of relative position (with sign of @ as the beginning, for instance, @200 can move the X axis in direction of decrement of coordinate). With the key of enter, the X axis will automatically move forth or back to given position. In case of an input of position beyond the range of software limit parameter, the system will refuse to implement operation of positioning (refer to Chapter 6 " set the parameters ").

Positioning of A or B axis can be completed with the same method.

3.4 Automatic measuring of length

In preparation of blank layout file, the precision length of blank should be set, which can of course be determined with measuring manually. However, it will be not easy sometimes for an over long blank to be measured manually while using of function of " automatic measuring of length " offered by the system can do easily.

Before automatic measuring of length can be done, the user should prepare the blank ready and clamp tightly it with clamps and assure that the front end of the blank is not over the first switch of length measuring. Enter the main picture and select command of " automatic measuring of length " under the menu of " monitor and control of machine ". The system will display the window of hint to give hint to user

to be ready as mentioned above. Push the key of space to start length measuring. The X axis will move forth first with " speed of return to referrence point " and when reaching the first switch of length measuring, change its speed to slow one and not stop till reaching the second switch of length measuring and length measuring finished. The screen will then display the result of length measuring which will be at the same time kept in memory of system for being used in blank layout. (refer to 4.3.2)

Automatic measuring of length is realized based upon two photoelectric switches. Therefore, measuring accuracy will be influenced with such as dust on surface of switch, measuring speed, rust and bend of angle bar. For purpose of eliminating these influences for realization of precision measuring, semi - automatic measuring should be adopted as follows:

◇ Feed material and clamp tightly;

◇ Move the X axis to enable the front end of angle bar to reach near the length measuring switch (not necessary for an accurate position);

◇ Measure manually the distance between " basis " and the front end of angle bar of which the former can be random fixed location on the machine such as the side face of the printer or the end of the material way. The coordinate of the " basis " should be determined with machine parameter " basis coordinate ".

◇ Enter the picture of hint of length measuring, input directly and without a space the distance (mm) to be measured and the system will automatically calculate and display the length of blank and remember it inside the system for use in blank layout.

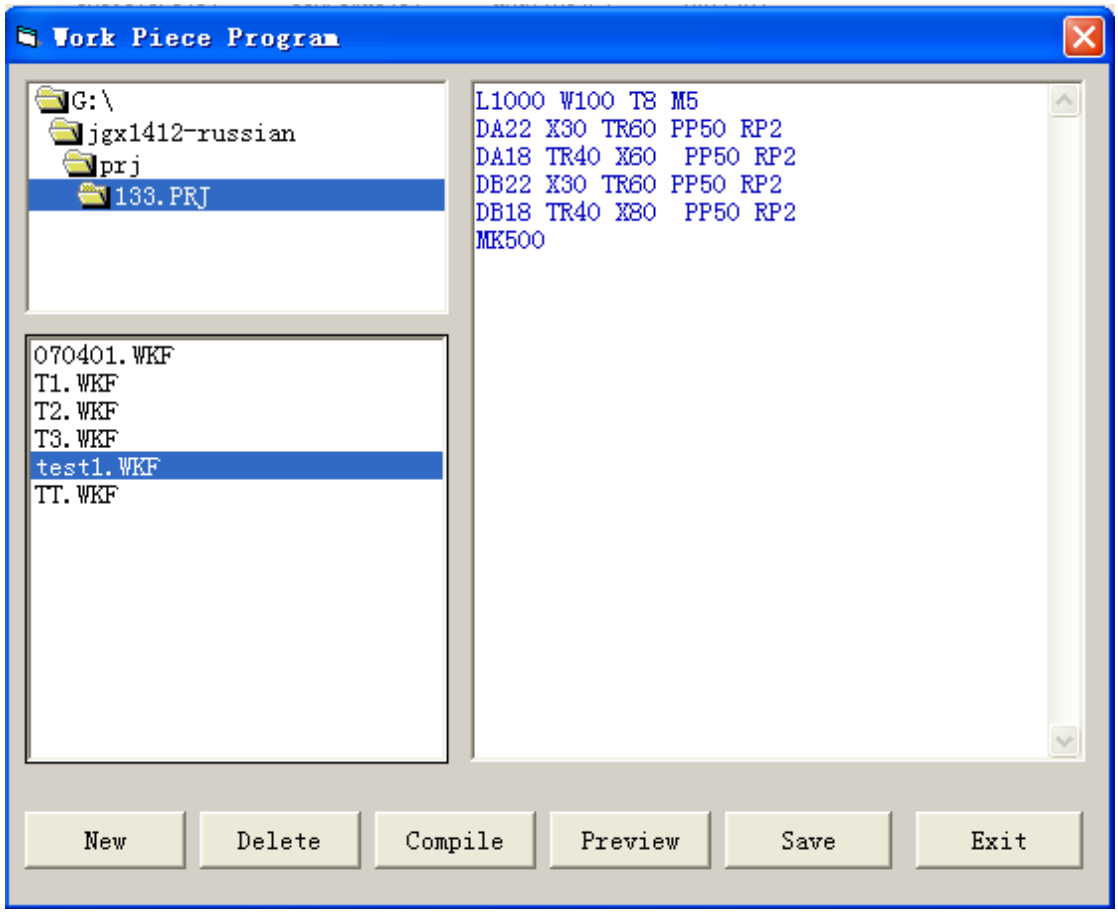
4 Operation in automatic mode

Under this mode, the user should program for work piece before blank layout. At last transfer the blank layout program down to PLC to start implementation. The system will automatically implement the blank layout program step by step to complete batch production of work piece. The following will describe these procedures in details.

4.1 Work-piece programming

This is to program according to drawings of work-piece programs which computer can accept. One work-piece program define one work piece. In a work-piece program the user should describe according to given format such as length, specifications, end distance among holes, standard separation and the position to print character of this said work piece.

4.1.1 Administering of work-piece program



The work-piece programs are kept in memory respectively in kinds and in a catalog of

tower of which one can store several work-piece programs. In main picture, select the menu of " work-piece programs " can implement some operation of management of the tower catalog and work-piece programs. When this menu has been selected, the system gives out a list window of work-piece programs as the graphics.

On the left of this window, tower type list has been given while all the work-piece programs under the current have been listed on the right. Changeover between the two lists is by keys of arrow leftwards or rightwards. The selected list title (" tower type " or " work-piece programs ") will be highlighted displayed.

When tower type list has been selected, one work-piece program can be determined by using keys of arrow upwards and downwards to move the cursor. Push and hold the key of ALT, then some operational commands for work-piece program will appear in the bottom of screen. The operation to work-piece program is relative complex which will be described in following chapters.

Addition to description: in fact, " tower type " is subdirectory in computer hard disk (kept in subdirectory C:\JGX\PRJ with postfix of .PRJ). the work-piece programs are some data files with postfix of .WKF kept in such subdirectory. Therefore, operation mentioned above about management of tower type and work-piece programs such as newly made tower type, copy, rename and delete can all be completed by commands of DOS or Windows operation system, of which details refer to relating computer information.

4.1.2 Make a new work-piece program

Select list of work-piece program in list window of work-piece program (refer to 4.1.1). To push keys NEW can newly make a work-piece program. The system will give hint to input name of new work-piece program. This name should be within 8 characters exclusive of specials such as space etc. Take care not to input any postfix for the system will add .WKF to name of new work-piece program automatically.

After a correct name of work-piece program has been input, the system will make a new work-piece program and enter automatically edit which will be described as follows.

4.1.3 Edit of work-piece program

Select list of work-piece program in list window of work-piece program (refer to 4.1.1),And then can edit work-piece program in right editing windows.

Edit of work-piece program is a total screen text editing program analog to Notepad in windows system, of which basic commands are as follows:

- the keys with arrow upwards, downwards, leftwards or rightwards: to move the cursors.

- key of DEL: to delete the character under the cursors.

- key of BACKSPACE: to delete the character before the cursors.

Using of these basic operation can make and modify work-piece program according to given format. One work-piece program consists of some basic commands plus necessary parameters. The basic commands are as follows:

- L-length
  To define length of work piece, for instance: L6692 indicates length of work piece is 6692mm.

- W-width
  To define width of work piece, for instance: W160 indicates width of work piece is 160mm.

- T-thickness
  To define thickness of work piece, for instance: T10 indicates a thickness of 10mm.

- M-material
  To define material of work piece. Attention: for purpose of easy disposal of program the material will be expressed by a number consisting of two digits and character is forbidden. So the user had to appoint a material name including character as a number consisting of two digits. For instance, M5 can express material Q235-A.

Attention: The above mentioned four instructions should be put in the beginning of work-piece program, which if appear after the following instructions then errors occur. However, it will be also of error when any of L, W, T or M has not been defined before the appearance of the following instructions. The following instructions are used to define hole punch or action of printing.

- X- end distance
  To stipulate value of end distance of hole punched. For instance: X300 indicates an end distance of 300mm.

- XX- relative end distance
  To give an end distance of hole punch relative to former value of end distance of hole For instance: XX 100 indicates an increment of end distance of hole punched relative to former value of end distance of hole.

- TR- standard separation
  To define the standard separation of hole punched. For instance: TR65.5 indicates a standard separation of 65.5mm. TR instruction can be omitted and the system then will default the standard separation as being used by former instruction.

- DA- die diameter
  To select die for hole A to be punched. For instance: DA will select die with diameter 22mm for hole A to be punched. DA instruction can be omitted and the system then will default the die as being used by former instruction.

- DB- die diameter
  To select die for hole B to be punched and stipulated to the same as DA instruction.
  Attention: The specific dimension of hole punch die and installing location will be determined by " die defining parameter " (refer to " parameters setting " in chapter 6). Before preparation of work-piece program, these parameters should be guaranteed to have been defined correctly and correct die diameters have been input when DA and DB instructions have been used for die selection. Hence guarantee of an automatic selection of correct die by the machine when hole punched. Otherwise not correct die may be selected for.

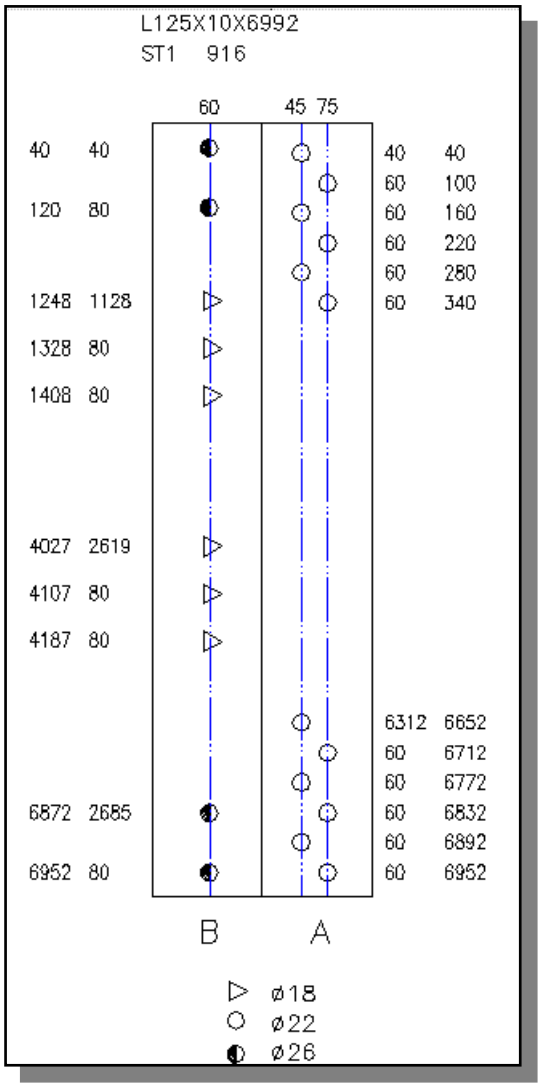
- PP- separation RP- number of amount
  To repeat the instruction for hole punch.

- MK- end distance for printing
  The printing instructions.

The following is a specific instance for description of programming of work-piece program. As for the work piece shown in the graphics the corresponding program is as follows:

L6992 W125 T10 M5
DA22 X40 TR45 PP120 RP3
X6652 PP120 RP3
X100 TR75 PP120 RP3
X6712 PP120 RP3

DB26 X40 TR60
XX80
X6872
XX80
DB18 X1248 PP80 RP3
X4027 PP80 RP3
MK500



Note:

- The line numbers, not needed to be input by the user, will be added by the system automatically, which have been being used only for display and not indicating the sequence of implementation of which the reality is always from large to small according to value of end distance of holes.

- For easy read of the program, random space and line without words can be done in program.

- In edit of work-piece program, you can push keys COMPILE at times to inspect or preview it. If mistakes found out, relating error messages will be displayed and the cursor will jump automatically to where errors occur. Otherwise, to list or preview the program can be done. As for operation of inspection, preview and error messages of work-piece program, refer to 4.1.4.

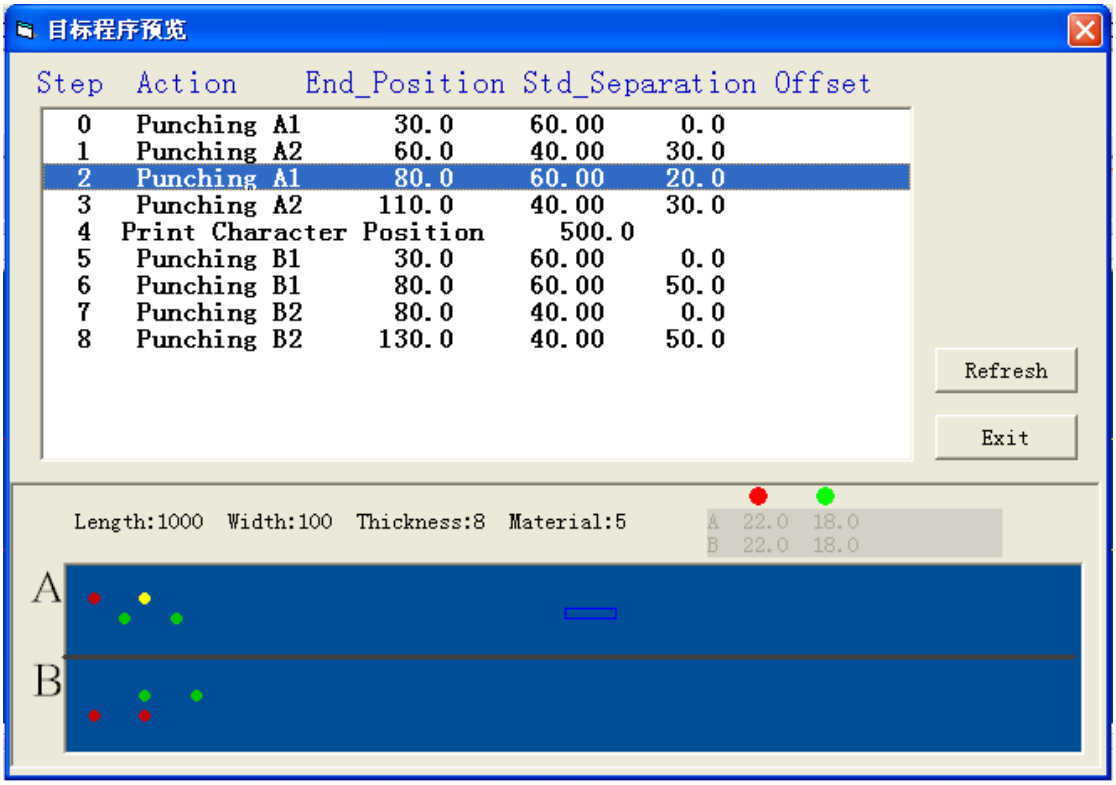
- Whenever keys SAVE to exit edit being pushed, the system will inspect the work-piece program in which if there is any mistake, please return to edit state to correct it otherwise it will cause mistake when being used in blank layout. (refer to 4.3 blank layout)

4.1.4 Inspection and preview of work-piece program

In picture of work-piece program administration, whenever a work-piece program has been selected, pushing keys of ALT-T can do inspection and preview of work-piece program. In edit of work-piece program, you can push keys ALT-T at times to inspect or preview it.

First the system will inspect work-piece program. If any mistakes found, relating error messages will then be displayed. The error messages of work-piece program are shown in table followed. When a program is correct, the system will give hint of " pushing key of P to preview, L to list ".

pushing key of P and system gives a window of preview of work-piece program (shown in the following graphics) to display work piece drawing. The system will display the holes to be punched with different diameter on sides of A and B with three colors of red, green and blue respectively. The specific dimension of die and installing position should be determined by " parameter to define die " (refer to chapter 6 " parameter setting ") and displayed on upper right corner of preview window. The position to be printed with characters will be shown as a rectangle on A side. On drawing of work piece, the system will display a cross cursor which can be moved by key of arrow up or down to select side of A or B and by key of arrow left or right to select hole. The end distance, standard separation and end distance deviation relative to the former hole of the selected hole will be displayed by the system on top of the preview window for easy verification with sample drawing. To exit from preview is by pushing key of ESC.



Error messages for work-piece program:

Error messages: Instruction steps over allowed
Description: instructions (hole punch and print) should not be over 200 steps in each work-piece program.

Error messages: not validated hole punch die
Description: Die selected by instructions DA, DB has not been defined. (refer to " parameters setting ")

Error messages: repeat in defining information
Description: Each instruction in each line of program should emerge only one time.

Error messages: impossible to identify
Description:

Error messages: RP instruction is demanded
Description: PP instruction should go with RP instruction.

Error messages: wrong number repeated
Description: Parameter of RP instruction should be larger than 2 and less than 30.

Error messages: define X before PP instruction can be used
Description: One should stipulate end distance by using X or XX instruction before PP instruction.

Error messages: repeat in defining MK instruction
Description: Only one print instruction should be allowed in one work-piece program.

Error messages: without value of X
Description: One should first stipulate end distance by using X or XX instruction in each line of instruction.

Error messages: without instruction of action
Description: undefined die (without instruction of DA and DB)

Error messages: without standard separation in instruction of hole punch
Description: undefined standard separation (without TR instruction)

Error messages: repeat in defining length
Description: L instruction can only be used one time at the beginning

Error messages: repeat in defining material and specifications
Description: Instructions as W, T and M can only be used one time at the beginning.

Error messages: undefined length or specifications
Description: One had to define length, width, thickness and material of work piece before instructions as hole punch or print.

Error messages: without content in a program
Description: a null program

Error messages: unreasonable numerical value
Description: Numerical value input has been beyond the range given.

Error messages: Mk instruction should occupy one single line.
Description:

Error messages: value of end distance over length
Description: Value of X or calculated value of X by instructions of XX, PP over length of work piece.

Error messages: wrong standard separation value
Description: standard separation value over parameter range

If no error in work-piece program found, push key of L to get a window listing the object program of work-piece program. In such a list, display is according to sequence from large to small end distance of hole to be punched or printed. Using of key of arrow up or down to scroll the window can explore the object program of which list is a method for an experienced operator to inspect correctness of a work-piece program.

4.1.5 To delete work-piece program

Pushing keys of DELETE can delete the selected work-piece program .

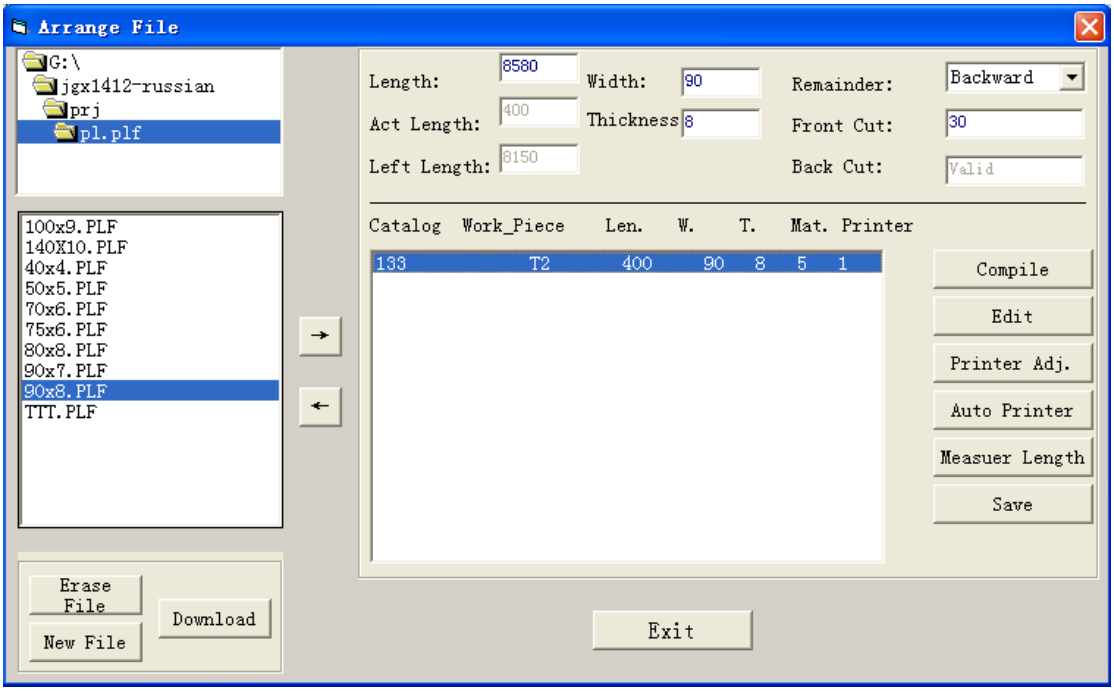
4.2 Work-piece program generated by software of laying off

Some software of laying off has function of generate work-piece program of Line of Angle Bar. Hence the user can omit programming procedure of work-piece program and directly copy with a disk the work-piece program generated by software of laying off to upper level computer of Line of Angle Bar for use. If a local net has been built among workshops and laying off room, it can be used for direct access of work-piece program generated by software of laying off.

The control system of this machine has the capability of direct transfer of work-piece program of Line of Angle Bar generated by software of laying off developed by Changzhi Electric Power Design Institute. Work-piece program

generated by this said system is XXX.DAT file, which when being in application, to be duplicated to certain tower type catalog (i.e. C:\JGX\PRJ\XXX.PRJ\ ). Then enter window of work piece administration to select this tower type catalog (notice that there are now not these .DAT files in list of work-piece program on the right). Push keys of ALT-T, all .DAT files in this tower type catalog will be transferred automatically to work-piece programs that can be used by the system. Warning: The transferred work-piece programs have the same name as the original though with a changed postfix of .WKF. Therefore if a .WKF file with a same name is in existence, it will be covered.

4.3 Blank layout



Blank layout means to arrange several work pieces properly upon a rather long blank of angle bar for reasonable use of material and higher productivity. Automatic process of Line of angle bar is to implement step by step the program generated by blank layout file.

Select " blank layout " on the main menu to get a window of blank layout as the above figure.

In window of blank layout list , all blank layout files and parameters such as length, width, thickness and material of blank have been listed. A blank layout file can be selected by using keys of arrow up and down to move the cursor. Push the key of ALT and on the bottom of the screen a hint of operational instructions will be given, such as newly make, edit, transfer down, change name, delete and so on, Details refer to description as follows.

4.3.1 New blank layout file

In window of blank layout list, push keys of ALT_N to make a new blank layout file. The system gives hint to input a new name for blank layout file. The name should be of characters less than eight and exclusive of special ones as space etc. Take care not to input postfix which should be .PLF added to the blank layout file by the system automatically.

After input of a correct name of blank layout file the system make a new one automatically and enter edit automatically. As for edit of blank layout file, refer to 4.3.2.

4.3.2 Edit of blank layout file

In window of blank layout list, select one,Then be able to edit and modify. In making a new one, state of edit of blank layout file will also be automatically entered. The edit picture of blank layout file is as the upper figure.

On the top of edit picture of blank layout file, display parameters as blank specification and layout manner while at the bottom, name of tower type catalog, work piece and length of each work-piece program in blank layout file.

🕮 To set specifications and blank layout manner

Whenever a blank layout file is to be newly made or modified, first, it should correctly set blank specifications and layout manner, including length, width and thickness of blank, excess metal to be front or rear set, length of front or rear crop which are all displayed parameters on the top of edit picture of blank layout file. Each parameter that the user can set has an command character in front of it. Push key of ALT and this character at the same time, these parameters can then be set. Specific description as follows:

- Set the length of blank. Input the length of blank with unit of mm. And push key of ALT-A can access the automatically measured length (refer to 3.4)
- Set the width of blank. Input the width of blank with unit of mm.
- Set the thickness of blank.
- Set excess metal to be prefix or backward or nocut
- When excess metal to be rear, set length of front crop; when excess metal to be front, this parameter is not validate. Attention: length of front crop includes " width of edge " so does length of front crop.
- When excess metal to be front, set length of rear crop; when excess metal to be rear, this parameter is not validate.

There also displayed on top of edit picture " real length " and " remainder length

" which are two parameters calculated automatically by the system and no need for user to set. And, the users need not to input blank material parameter which will be the 1st material datum accessed automatically.

🕮 To insert work piece

In edit windows push keys of → to insert a work-piece program into the current position. After pushing keys of →, a window of work-piece program administration will be given by the system. The operation is all the same as that " work-piece program administration " mentioned in 4.1.1 though this time work-piece program list only lists those work pieces that can meet conditions as follows:

- length of work piece is less than or equal to remainder length in blank layout file.
- width of work piece is equal to blank width of blank layout file.
- thickness of work piece is equal to blank thickness of blank layout file.

Please move the cursor to select a work-piece program under the tower type catalog, push key of enter to insert this work piece into blank layout file. Push key of ESC to finish insert operation.

Attention: Up to 20 work-piece programs can be inserted into a blank layout file though kind of work piece can't be excess to number of character plate of printer.

🕮 To repeat a work piece

In edit windows push keys of R to repeat the work-piece program in the current position of cursor. In a blank layout file, a work piece can be repeated several times though the total work pieces cannot be over 20.

🕮 To delete work piece

In edit windows push keys of ← to delete the work-piece program in the current position of cursor.

🕮 To edit work-piece program

In edit windows push keys of EDIT to edit the work-piece program in the current position of cursor, of which operation refer to 4.1.3.

🕮 To arrange character plate

In automatic mode, different work piece in blank layout file should be printed its own tower type name and work piece name, which can be done only by changing character plate.

There are two methods.

A. Manual. Add 1 in sequence to the number of character plate of work piece in

current position of cursor and return to 1 when reaching the number of amount of character plate, which should not use same character plate for different work piece otherwise with errors.

B. Automatic. In picture of edit push keys of AUTO PRINTER to enable the system to arrange character plate automatically. The system will assign a character plate number to different work piece character plate in blank layout file automatically. When kind of work piece is over character plate number of printer, error occurs.

🕮 To inspect blank layout file

In windows of edit, to push keys of COMPILE can inspect the current work-piece program. The system will inspect work pieces in blank layout file one by one and do blank layout. When error occurs in work-piece program, hint of " work-piece program with error < mistakes messages > " will be given; mistakes messages of work-piece program refer to 4.1.4. If error occurs in process of blank layout, hint of " blank layout file with error--< mistakes messages > " will be displayed. Mistakes messages of blank layout file refer to the following.

When having been inspected and without errors found, push L key to get a window listing objective program of blank layout file. This objective program is what should be transferred down to PLC for implementation. The key ESC make you return to edit of blank layout file.

Error message for blank layout file:

error message: null blank layout file
description: work piece has not been inserted into blank layout file.

error message: unable to find work-piece program
description: work-piece program in blank layout file can't be found, which might be damaged or deleted.

error message: length of blank not long enough
description:

error message: not meet the specifications
description: width and thickness of work piece should meet the specifications

error message: too many instructions
description: number of instructions in object program generated by blank layout file should not be over 600 steps.

error message: standard separation over limit
description: standard separation over limit upper and lower.

error message: not validated end distance in hole punch instruction
description:

error message: not validated end distance in print instruction
description:

error message: not validated end distance in cutting instruction
description: end distance in cutting instruction should be larger than parameter of " remainder in minimum open clamps ".

error message: different character plate for same work piece
description:

error message: not validated number of different character plate
description:

error message: same character plate for different work piece
description:

error message: different width and thickness of work piece
description: work piece with different specifications

🕮 Notice for blank layout

1. Width and thickness of work piece in blank layout file should be the same while with different material.

2. When rear remainder has been selected and length of remainder is zero, or when front remainder has been selected and parameter of rear crop is zero, cutting instruction will not be generated at last. Hence realization of function of " without cutting in rear end ".

3. When the clamps move to a position with 50mm near A1 die of hole punch , the latter will automatically withdraw back to prevent from being bumped with the clamps. Therefore, when function of " without cutting in rear end " is being used or when a too short rear remainder is, it will not complete the last hole punch on A side of rear of work piece. (This will be especially true for A2 and A3 die.) At this time, error message of " not validated end distance in hole punch instruction " will be displayed in inspection of blank layout. The same problem is also for B hole punch. The following method can be used as solution to the above mentioned problems.

- Change die, use die A1 or die B1 for hole punched in rear of work piece;
- Modify work-piece program to delete not validated hole punch in rear and punch manually.
- Add a welded angle bar to rear of blank.

📖 **To exit blank layout file edit**

When blank layout file has been edited, modified and inspected without errors to be found, push keys of SAVE to save edit state. And push keys of EXIT to exit this windows.

4.3.3 Transfer the blank layout file down

In blank layout file list window, select a file and push keys of DOWNLOAD to implement command of transfer down which means to send blank layout file stored in upper level computer via communication cables to PLC for being automatically implemented.

When this is going, the blank layout file will be first calculated, inspected by the system via the current parameters of the machine and then generate object program. (Therefore whenever any modification of some machine parameters would occur, the blank layout program should be newly transferred down. Refer to Chapter 6 " parameters setting ") If the blank layout file is with error, error message reported and transfer down will be stopped. Otherwise transfer down object program to PLC and reset the step number of start automatically, and renew output statistics table of work piece.

4.3.4 To delete the blank layout file

In blank layout file list window, select a file and pushing keys of ERASE FILE is able to delete this blank layout file.

Supplement of description: the blank layout file is .PLF file stored in catalog of C:\JGX\PRJ\PL.PLF. Therefore, commands of operation system the computer can be used to rename, delete and copy etc.

4.4 Automatic mode

After transfer down of a correct blank layout file, automatic mode can be started. Before this can be done, assure that the machine is ready for work and indicator lights. Conditions that machine is ready for work are as follows:

- Select automatic mode;
- Start HI.oil pumps
- Make compressed air ready.
- Feed material and clamp tightly with clamps.
- Cylinders of hole punch, cut, print and press are in upper station;
- Without breakdown of machine (security fence falling and clamps being stopped switch released);
- Without breakdown of servo (without warning from positioning module and servo driving device)

🕮 Select step number of start

When automatic mode is started, the program can be executed beginning at random step number. When breakdown occurs in the process of automatic mode and work stops in middle way, this function is especially important.

Select " object program / step number of start " under " machine monitoring and control "
in main menu and system lists out object program in the current PLC. Move the cursor to select the step for beginning. Push keys of ALT-S and system will set this step number as start one.

Whenever transfer down of blank layout program, the current step number will be reset automatically. So, If no selection of step number for start has been done, the system will execute the program from the its beginning.

🕮 Start automatic mode

When ready, push button of < start > on main operational platform to start automatic mode. At this time, indicator of " run " lights and the machine execute program step by step from the current step number. When cut command has been met and finish cut, program will stop automatically to wait for disposal of work piece cut or scrap by the operator. At the end of disposal, push again < start > and machine continue to do automatically. When all instructions have been executed , the conveying vehicle brings out rear remainder (feed to position of " front limit of X " plus 50mm. refer to 6.1 " parameters setting ") and then return back. When back to position of " length measuring switch ", the clamps lift and the conveying vehicle continues to withdraw till to " parking for feeding " and machine is now in state of temporary stop to wait for feeding. When feeding completes, push button of < run > on main console or operational box on machine for new cycle.

🕮 Temporary stop, recovery and stop of automatic mode

In process of automatic mode, in addition to automatic temporary stop in each cut, three buttons of < temporary stop / stop > on operation station can be at times pushed for temporary stop of automatic mode. After temporary stop, indicator of " run " repeats flash. In state of temporary stop, push button of < run > on main console or operational box on machine, machine continue to run automatically.
But if button of < temporary stop / stop > is pushed in state of temporary stop, automatic mode will then be stopped.

🕮 Disposal of breakdown in automatic mode

In process of automatic mode, if breakdown occurs in machine or servo, the indicators of " breakdown " or " servo breakdown " will light and work stops

automatically. At this time, based on method described in 5.3, inspect and eliminate breakdowns and then according to the above mentioned method " select step number for start " to select step number for start, continue your work.

Appendix B includes machine breakdown information and disposal methods.

5 Other operation

5.1 Output statistics

Select command of " output statistics " on the " machine monitoring and control " in main menu to list a table of work piece output, in which the work piece displayed with bright green is what is currently being processed one (work piece in blank layout program in current PLC)

Whenever a work piece has finished its being processed followed an automatic increment of 1 to output of relating work piece. the work piece displayed with dark green is what was previously being processed one.

In picture of output statistics, when pushing keys of ALT-S to renew outout statistics then the system will remove those displayed with dark green and being processed previously, and keep in memory only the current being processed ones to renew output statistics.

5.2 List of character plate

In transfer down blank layout file, the system will record automatically number of character plate used by each work piece in blank layout file. (refer to 4.3.2) For easy installing of head of character plate, character plate rank can be listed for comparison.

Select command of " character plate rank " on the " machine monitoring and control " in main menu, the system will give character plate rank in which the number of character plate to be used will display relating names of tower type catalog and work piece. According to hint to install head of character plate.

5.3 Inspection of breakdown

In process of work, if breakdown occurs in machine or servo, the indicators of " breakdown " or " servo breakdown " will light and relating indication also appear in main picture. At this time, use the function of breakdown inspection to inspect details in breakdown so as to eliminate it.

Select command of " breakdown inspection " on the " machine monitoring and control " in main menu, the system will give " type of breakdown ". Breakdown

messages can be divided into 10 types:

- breakdown in X axis positioning module
- breakdown in A axis positioning module
- breakdown in B axis positioning module
- warning in X axis positioning module
- warning in A axis positioning module
- warning in B axis positioning module
- breakdown in X axis servo unit
- breakdown in A axis servo unit
- breakdown in B axis servo unit
- breakdown in machine

Whenever breakdown occurs, the relating item displayed in red while those without breakdown in green. Move the cursor to item that breakdown occurs, push key of < enter > and details and disposal of such breakdown will be displayed by the system.

Generally when finish of breakdown disposal, push the button of " breakdown reset " to eliminate warning messages. At pushing this button of " breakdown reset ", action of all the three servo axis will be stopped, including manual action, return to reference point and general positioning. Therefore this button should not be pushed in normal work of machine.

When breakdown occurs in servo unit, the system will clear sign of return to reference point of relating axis and display of coordinate turns to dark. At this time, this axis had to renew its return to reference point before work can be continued.

Note: File of ERROR.TXT has defined the breakdown messages which refer please to **Appendix**.

5.4 Object program / starting position

Select item of " object program / starting position " on the " machine monitoring and control " in main menu, the system will give a window displaying the object program of the current machine.

When program is not in run, this window is " exploring object program " which can be done by use of cursor key to move the cursor. Push keys of ALT-S then the instruction in the position of current cursor will be set as " start position " and execute from this step when next time start.

When program is in run, this window is " monitoring object program ". At this time the cursor will not be controlled by the user but follows the currently executed step number.

5.5 PLC monitoring and control

In menu of PLC monitoring and control, monitoring and control of input and output points of PLC, special coils of PLC and special registers can be completed.

5.5.1 Monitoring and control of points of PLC input and output

When this menu is executed, the system will give out a window displaying state of input and output points of PLC. When PLC is in state of run, this window is " monitoring of input and output points of PLC "; while when PLC is in state of stop, this window is " control of input and output points of PLC ". At this time, the user can set 1 or 0 to input and output points of PLC by force. But one can't do in window of " monitoring ".

Refer to hint, the users can explore all input and output points by use of arrow key or PageUp and PageDown keys. Display sequence of input and output points can be selected and changed by use of key of F5, F6 and F7.

There is not cursor slip in window of " monitoring " while in window of " monitoring and control " there is a cursor slip. When the position, which the cursor is in, is an input point, the cursor slip is green. While the position, which the cursor is in, is an output point, the cursor slip is red and at this time when key 1 is pushed, this output is set 1 and 0 for 0.

Warning: When set output of PLC by force or clear, the relating executing elements will act. The user should do carefully to prevent from dangers!

5.5.2 Monitoring and control of PLC special circuit and registers

To execute these two menus can monitor some special relays (M) or special registers (D) in PLC so as to help with finding causes of errors which occur in PLC. As for description of special relay and register in details, refer to Manual of PLC Programming.

6 Parameters setting

All kinds of parameters are needed in work of Line of Angle Bar, which can all be set in an upper level computer. Select item of " Parameters setting " on main menu then enter it. For sake of security, correct cryptogram should be input before entering Parameters setting. Only input of correct cryptogram can allow setting of relating parameters.

Warning: Machine parameters are most important to work of Line of Angle Bar. If parameters set wrong, abnormal work may be caused even breakdown or danger occur. So when parameters set, one should be careful.

Some parameters are used to control work-piece program or blank layout program, for instance, each coordinate parameter, define die, which when having been modified, the transfer down of blank layout program should be renewed.

Draw_down menu is for parameter set. The following will describe meaning of machine parameters in each menu.

6.1 Machine parameters

- width of edge of cutter: to define width of edge of cutter (mm). This is used in blank layout. In each cutting position, length given by this parameter should be removed. Therefore, if this parameter does not meet the real width of edge of cutter, it will lead length error in work piece. (When parameter is larger than a real one, the work piece will be longer and shorter for shorter.)
- coordinate of punch die A1
- coordinate of punch die A2
- coordinate of punch die A3
- coordinate of punch die B1
- coordinate of punch die B2
- coordinate of punch die B3

The above 6 parameters define the distance (mm) between the centre of relating hole punch die and inside of edge of cutter, which also used in blank layout and lead to deviation of end distance of hole punched when set wrong.

- coordinate of printer: define the distance (mm) between the printer and inside of edge of cutter, which can be used for adjustment of deviation of end distance of printing.
- coordinate of length measuring switch: define the distance (mm) between the length measuring switch and inside of edge of cutter, which will lead error in

length measuring when set wrong.

- coordinate of basis for measuring: define X coordinate of " measuring basis " for semi-automatic length measuring. (refer to 3.4)
- deviation of standard separation of punch die A1
- deviation of standard separation of punch die A2
- deviation of standard separation of punch die A3
- deviation of standard separation of punch die B1
- deviation of standard separation of punch die B2
- deviation of standard separation of punch die B3

The above 6 parameters define the deviation of standard separation of relating punch die (mm), which used in blank layout. When deviation of standard separation of hole punched occurs, these parameters can used in adjustment.

- number of character plate: stipulate the number of character plate of printer, used in arrangement of character plate in blank layout. Refer to 4.3.2.
- parking position for feeding vehicle: Whenever a blank layout programme has executed to the end, material conveying vehicle (X axis) will withdraw automatically to a position given by this parameter to wait for feeding again. Refer to 4.4.

6.2 Define of hole punch die

- diameter of punch die A1
- diameter of punch die A2
- diameter of punch die A3
- diameter of punch die B1
- diameter of punch die B2
- diameter of punch die B3

The above 6 parameters define the diameter of relating punch die (mm), used in programming of work piece.

Hint: For easy use, when diameter of punch die defined, integer can only be input so as to be simple selection of die by instruction of DA and DB in work-piece programming. For instance, 22 can be used instead of 21.5.

6.3 X axis parameters

- position of reference point: define coordinate of reference point in X axis, which should be proper adjusted based upon machine, otherwise all positioning in X axis will be with deviation.
- front end limit by software

- rear end limit by software

These two parameters stipulate in X axis front and rear end limit by software, which should be set based upon machine. When X axis is moving over the limit, warning given except for manual move.

- minimum remainder length in clamps open: in blank layout, go error when end distance in cutting instruction less than this parameter.
- acceleration time (ms)
- deceleration time (ms)

These two parameters stipulate the slope time of acceleration and deceleration in X axis positioning. If too small the value set, shock will occur when X axis moves and may lead departure of clamps caused by too large deceleration when slow down. If too long set, positioning time will increase. General 500 to 1000 set. As for large angle bar, reasonable increment of such time will be all right.

- accuracy: define accuracy of X axis, which should be proper set. If too small, then too long time for positioning; if too large, the end distance may be over. General 0.3mm.

6.4 AB axis parameters

- position of reference point in A axis
- position of reference point in B axis

These two define coordinate of reference point in A axis and B axis respectively, which should be set correctly based upon machine.

- minimum permitted standard separation
- maximum permitted standard separation

These two parameters stipulate in A and B axis front and rear end limit by software. When A and B axis move over the limit, warning given except for manual move.

- acceleration time (ms)
- deceleration time (ms)

These two parameters stipulate the time of acceleration and deceleration in A and B axis. General 300 to 800.

- accuracy: define accuracy of A and B axis, which should be proper set. If too small, then too long time for positioning; if too large, the standard separation may be over. General 0.2mm.

6.5 Speed parameters

- limiter of X axis speed (m/min): define the maximum permitted speed of X axis. range: less than 50 m/min.(Note: at the same time, servo driving device parameter should be correctly set Cn-03>2.45*Vmax, otherwise, warning of following deviation will be given.)

- positioning speed of X axis (m/min): which is used in automatic positioning speed of X axis.
- manual moving speed of X axis (m/min): which is used in manual moving X axis and length automatic measuring.
- speed of X axis return to reference point of (m/min): which is used in X axis return to reference point, crawl speed has been fixed in 2m/min.
- limiter of A and B axis speed (m/min): define the maximum permitted speed of A and B axis. range: less than 12 m/min.(Note: at the same time, servo driving device parameter should be correctly set Cn-03>20*Vmax, otherwise, warning of following deviation will be given.)
- positioning speed of A and B axis (m/min): which is used in automatic positioning speed of A and B axis.
- manual moving speed of A and B axis (m/min): which is used in manual moving A and B axis.
- speed of A and B axis return to reference point of (m/min): which is used in A and B axis return to reference point, crawl speed has been fixed in 2m/min.

6.6 Saving and loading of parameters

Select this in " parameter setting " menu, push key of ALT-S can save all parameters to file in path C:\JGX\DATAS\PARAFILE.PAR; push key of ALT-L can load parameters from the file.

7 Maintenance and repair

- Inspect regularly wire and cable in machine to find if any released, disconnected or damaged.
- Inspect regularly each switch on the machine to find if any loosened or switch bump lump released, disconnected or if a proper induced distance for approaching switch.
- Inspect regularly and clean the dust-proof cover of the computer.
- Backup regularly data files to prevent from data being lost.
- Take care when floppy disk is to be in use for copy of data to prevent from being contaminated computer virus. Use regularly virus killing software in your computer.
- When breakdown, it should be strict to abide by the rules to inspect and dispose and it is forbidden to modify electric circuit or computer software at will. When breakdown occurs that is difficult for user to deal with, record please, in details, the state of breakdown and contact us just in time.

Appendix: Information of Breakdown

The following are main content of define file of breakdown messages of Line of Angle Bar. In this file breakdown number less than 1000 indicate breakdown in positioning module; breakdown number from 1000 to 1999 indicate warning from positioning module; breakdown number 2000 indicate breakdown in servo unit; breakdown number larger than 2000 indicate breakdown in machine.

:70 when start, servo ready signal OFF
:71 when start, outside STOP signal ON
:72 when start, upper limit switch OFF
:73 when start, lower limit switch OFF
:74 when start of return to reference point, reference point switch ON

:90 when BUSY, servo ready signal OFF
:91 when BUSY, upper limit switch OFF
:92 when BUSY, lower limit switch OFF
:93 when return to reference point, outside STOP signal ON

:1001 lower limit parameter error
:1002 electric gear CMX parameter error
:1003 electric gear parameter CDV error
:1010 speed limiter parameter error
:1011 acceleration time parameter error
:1012 deceleration time parameter error
:1013 dead zone parameter error
:1014 positioning manner parameter error
:1020 return to reference point speed parameter error
:1021 crawl speed parameter error
:1022 reference point switch ON run distance parameter error
:1030 positioning instruction address error
:1031 in V/P mode, positioning instruction address error
:1032 positioning instruction speed error
:1040 control modify zone speed change data error
:1041 control modify zone manual speed error
:1060 attempt to write fixed parameter in Y2D on
:1061 attempt to write data to write-forbidden address
:1062 write one byte to double byte address
:1080 when start, PLC ready signal (Y2D) and AD70 ready signal (X11) OFF
:1081 when star BUSY signal ON
:1082 when star outside STOP signal ON
:1083 when star, current coordinate over limit. inspect plz limit parameter. return to

reference point or not?
:1084 attempt to execute operation of return to reference point when signal of completing return to reference point ON
:1085 in V/P mode, attempt to renew start after completing positioning or under P mode
:1086 in V/P mode, attempt to start positioning by Y21
:1087 current coordinate changed over limit
:1100 current value over limit range
:1102 when return to reference point, outside STOP signal ON
:1103 when return to reference point, PLC ready signal (Y2D) OFF
:1104 speed calculated by electric gear parameter over 1000kHz
:1105 when BUSY, PLC ready signal (Y2D) OFF
:1110 when BUSY, attempt to change current coordinate
:1111 when return to reference point, attempt to change speed
:1112 in positioning deceleration, attempt to change speed
:1113 in manual positioning when JOG signal OFF, attempt to change speed
:1114 attempt to clear deviation counter

:2000
----------plz read out warning code of this axis with operation device.---------- comparison with following warning list, plz inspect and eliminate breakdown-----
A.02 parameter verification and error
A.04 parameter over range given
A.10 power transistor current over
A.30 abnormal regenerative circuit
A.31 position deviation pulse over parameter Cn-1E
A.40 abnormal voltage in main circuit
A.51 rotary speed of motor over detecting level
A.71 much over rated torque to run seconds to dozens seconds (too heavy load)
A.72 too low load, i.e. over rated torque to run continuous
A.A1 overheated radiator of servo unit
A.B1 CPU of servo unit can't detect instruction input
A.C1 servo motor (coder) out of control
A.C2 abnormal phase of 3_phase A, B, Z of coder
A.C3 disconnection in A or B phase of coder
A.C9 discommunication in coder and servo drive
A.F1 power line open phase
A.F3 power failure over a phase in electric supply
A.99 display normal action state

:2001
exchange of die of A hole punch over time. i.e. A hole punch did not complete selection of die within given time based upon programme. Causes maybe as follows:
1. not adequate air pressure

2. no action in electromagnetic valve, (damaged or wrong connection)
3. die position detecting switch of die support does not send signal
4. pad lump blocked in its sliding support and can't exchange station

:2003
punch of A hole over time. i.e. after instruction of hole punch has been sent out, not complete punch of hole within given time. Causes maybe as follows:
1. no action in electromagnetic valve of A hole punch, (damaged or wrong connection)
2. high pressure pump not open or high pressure too low
3. lower pressure pump not open
4. no signal sent from stroke switch of lower limit of A hole punch

:2004
breakdown of stroke switch of upper and lower limit of A hole punch. Causes maybe as follows:
1. damaged or loosened upper limit switch, and related induced lump can't induce it.
2. damaged or loosened lower limit switch, and related induced lump can't induce it.
3. loosened or lost induced lump of upper and lower limit

:2011
exchange of die of B hole punch over time. i.e. B hole punch did not complete exchange of die within given time based upon programme instruction. Causes maybe as follows:
1. not adequate air pressure
2. no action in electromagnetic valve, (damaged or wrong connection)
3. die position detecting switch of die support does not send signal
4. pad lump blocked in its sliding support and can't exchange station

:2013
Warning for punch of B hole over time. i.e. after instruction of hole punch has been sent out, not complete punch of hole within given time. Causes maybe as follows:
1. no action in electromagnetic valve of B hole punch, (damaged or wrong connection)
2. high pressure pump not open or high pressure too low
3. lower pressure pump not open
4. no signal sent from stroke switch of lower limit of B hole punch

:2014
breakdown of stroke switch of upper and lower limit of B hole punch. Causes of warning maybe as follows:
1. damaged or loosened upper limit switch, and related induced lump can't induce it.
2. damaged or loosened lower limit switch, and related induced lump can't induce it.
3. loosened or lost induced lump of upper and lower limit

:2015
breakdown of stroke switch of upper limit of main cylinder of printing. Causes of warning may be as follows:
1. damaged or loosened upper limit switch, and related induced lump can't induce it.
2. loosened or lost induced lump of upper limit

:2016
breakdown of stroke switch of upper and lower limit of cutting. Causes of warning maybe as follows:
1. damaged or loosened upper limit switch, and related induced lump can't induce it.
2. damaged or loosened lower limit switch, and related induced lump can't induce it.
3. loosened or lost induced lump of upper and lower limit

:2020
pressing breakdown. when pressing instruction has been sent, no signal of pressing completed being detected. causes may be as follows:
1. no action in electromagnetic valve of material pressing, (damaged electromagnetic valve or wrong connection)
2. can't press to the end for being blocked
3. no signal from detecting switch (damaged switch or related induced lump can't do)

:2021
too low pressure of lower pressure system
when program started, pressure of lower pressure system changes drastically or not reach the given pressure frequently, warning sent. causes may be as follows:
1. not start of lower pressure pump;
2. too low the overflow valve adjusted that can't reach the given value;
3. damaged pressure relay;
4. other causes of enabling the lower pressure system not to establish pressure

:2022
printer can't reach rear position.
when program is in run, printer can't be back to rear and this warning sent. Causes may be:
1. no signal from rear switch (damaged switch or related induced lump can't do)
2. no action in electromagnetic valve of withdrawing, (damaged electromagnetic valve or wrong connection)
3. the lower pressure is too low to push printer

:2023
character plate of printer can't reach its position.
when printer is in work, character plate of printer hasn't been selected according to requirements of program and this warning sent. Causes may be as follows:

1. damaged detecting switch of character plate position or not correct position of induced lump
2. cylinder of 4-station or 2-station be blocked
3. no action of electromagnetic valve of cylinder of 4-station or 2-station (damaged valve or wrong connection);
4. pressure of lower pressure system is too low.

:2024
breakdown of detecting switch of clamps lifting.
when clamps lift instruction sent, signal of clamps lift instruction hasn't been detected and warning sent. Causes may be as follows:
1. no action in electromagnetic valve of clamps lift, (damaged electromagnetic valve or wrong connection)
2. without air pressure or too low;
3. damaged detected switch or disconnection.

:2025
emergency stop switch being pushed

:2026
lift of protection fence

:2027
clamps being resistant

:9999
sorry, no details in this breakdown.