HS-3/R AUTOMATIC TOOL CHANGER SPECIFICATIONS

Tool Storage Capacity	38
Maximum Tool Length (referenced from gage line)	600 mm (23.6 in)
Maximum Tool Diameter	250 mm (9.8 in)
Maximum Tool Diameter with Adjacent Tool Pockets Filled	125 mm (4.9 in)
Maximum Tool Weight	36 kg (79.4 lb)
Maximum Tool Moment (referenced from gage line)	300 kg-cm (260 lbf-in)
Tool Pot Chain Pitch	130 mm (5.12 in)
Tool Taper	CAT50
Pull Stud Type	MAS P50T 45º
Hydraulic Pressure	50 kgf/cm2 (711 lbf/in2)
Hydraulic Flow-rate	30 l/min (8 gal/min)

INITIAL SET-UP PROCEDURE

THIS SECTION ASSUMES THE MORI TOOL CHANGER ANCHORS HAVE BEEN INSTALLED IN THE SHOP FLOOR AND THAT THE HORIZONTAL MILL HAS BEEN PROPERLY LEVELED AND ANCHORED. DO NOT ATTACH THE MORI TOOL CHANGER TO THE BASE OF THE MILLING MACHINE PRIOR TO LEVELING THE MACHINE. IF NECESSARY REFER TO THE HS-3/R OPERATORS MANUAL FOR INSTRUCTIONS ON HOW TO INSTALL THE TOOL CHANGER ANCHORS.

1. Temporarily block the tool changer up on its base plate and install the six leveling blocks on the bottom of the base plate, Figure 1.

2. Verify that the four main leveling screws (the large hollow screws located at all four corners) and the four intermediate leveling screws (the hex head bolts located on each of the four sides of the base plate) are adjusted so that they are flush with the bottom of the tool changer’s base plate, Figure 1.

3. Lift the tool changer with the arm mechanism facing towards the front of the HS-3/R. Move the tool changer over the top of the pre-installed anchor bolts and lower it such that the hollow leveling screws slide over the anchor bolts.

4. An alignment bracket is used to provide the initial “rough” alignment of the tool changer to the horizontal mill. Attach the alignment bracket to the base of the tool changer using three M16 X 60mm metric socket head cap screws (Haas P/N 40-0039), Figure 2. **Install, but do not tighten the screws at this time.** In addition, it may be necessary to move the tool changer’s base plate a small amount to bring the alignment bracket into its proper position.

5. Place a bubble level on the tool changer’s base and using the four main leveling screws (the large 60mm hex screws located in the corners of the base plate) bring the tool changer base plate into level. During this leveling procedure, verify that the height of the slots on the vertical face of the alignment bracket are at the same elevation as the threaded holes in the pad located on the side of the milling machine’s base, Figure 2. If necessary, re-adjust the leveling screws to bring the alignment bracket to the proper elevation.

6. When the tool changer is level and the four slotted holes in the alignment bracket are lined up with the threaded holes in the pad, attach the alignment bracket to the base of the mill using four 3/8-16 x 1¼ socket head cap screws. Finish attaching the bracket by tightening the three M16 cap screws.

7. Next, thread the four intermediate leveling bolts (the four bolts with 30mm hex heads located near the center of each side of the base plate) down until they just touch the leveling blocks. Further tighten the bolts approximately another 1/8 turn past this point to insure these screws are each sharing some portions of the load.

8. Complete the base plate installation by installing the nuts and washers onto the threaded ends of the tool changer anchor bolts and tightening to 230 ft-lb. Note that these are metric threads and nuts.

9. Remove the two yellow shipping brackets located on the tool changer’s arm assembly, Figure 3.

10. Install the tool changer guard around the tool changer and make the following electrical connections:

a) Connect the remote control box cable to the tool changer junction box.

b) Route and connect the cables from the tool changer junction box to the connectors located on the side of the machine’s control box.

INSTALLING THE HYDRAULIC POWER UNIT

HYDRAULIC POWER UNIT SPECIFICATIONS

MAXIMUM PRESSURE	1000 PSI
MAXIMUM FLOWRATE @ 1800 RPM	10.5 GPM
RESERVOIR VOLUME	20 GAL.
PRESSURE HOSE (Haas P/N 52-0008)	½ JICF X ½ JICF X 84” L
RETURN HOSE (Haas P/N 52-0000)	½ JICF X ½ JICF X 90” L

INITIAL SET-UP OF HYDRAULIC POWER UNIT

1. Check the level of the hydraulic fluid in the reservoir by inspecting the sight gage located on the side of the reservoir. If necessary, add hydraulic fluid (DTE 25) to the reservoir until the level reaches the top of the sight gage.

2. Connect the pressure and return hoses from the hydraulic power unit (HPU) to the tool changer. The pressure hose connects the pump outlet to the middle port on the tool changer manifold; the return hose connects the bottom port on the tool changer manifold to the filter inlet on the hydraulic power unit, Figure 4. **NOTE: IF THE HPU IS TO BE OPERATED FOR THE FIRST TIME, SKIP TO STEP 7 FOR INITIAL ADJUSTMENT OF THE HYDRAULIC SYSTEM’S PRESSURE AND FLOW SETTINGS.**

3. Connect the supply air-line (1/4” plastic hose) from the machine’s air-lube panel to the upper fitting on the tool changer manifold.

4. Connect the power cord from the hydraulic power unit’s motor to the power connection located on the side of the milling machine’s control box.

5. Check the rotation direction of the hydraulic power unit’s motor using the following procedure:

a) Remove the orange inspection from the bell housing located between the motor and the hydraulic pump, Figure 5.

b) Power-up the HS-3/R but **DO NOT CLEAR THE ALARMS UNTIL THE NEXT STEP**.

c) With an observer watching the coupling inside the inspection window, push the <**RESET**> button on the keypad and immediately push the <**E-STOP**> button. This will jog the motor on the hydraulic power unit.

d) Note the rotational direction of the power unit’s motor and compare with the directional arrow located on the front of the hydraulic pump’s casing.

e) If the rotation matches the rotation of the directional arrow the machine is correctly wired. If the rotation does not match then the phasing of the machine’s power must be changed by reversing any two of the incoming three wires of the machine’s power wiring.

f) If it was necessary to re-wire the machine, re-check and verify that the motor is rotating in the correct direction.

6. When it has been verified that the motor is rotating in the correct direction, turn the hydraulic power unit on by powering-up the machine and clearing the alarms. **NOTE: THE HYDRAULIC POWER UNIT OPERATES ANY TIME THE MACHINE IS POWERED-UP AND THE ALARMS ARE CLEARED.**

7. When the pump is to be operated for the first time, the discharge side of the pump should be in a no-load state. This is accomplished by connecting the pump's discharge (pressure) hose directly to the inlet of the return filter connection.

The motor should be started and stopped 5 to 6 times to bleed any air from inside the pump. After verifying that the pump is discharging oil by feeling the discharge hose or cracking one of the hose's fittings, the pump should be operated for at least 10 minutes without any load to remove any remaining air in the circuit.

8. To adjust the hydraulic system's flowrate perform the following steps:

a) The flowrate is adjusted with the hydraulic power unit operating in a no-load state.

b) Install a hydraulic service flowmeter rated for 1 to 15 gpm in-line with the hose connecting the pump discharge to the filter inlet of the hydraulic power unit, Figure 6.

c) Power-up the hydraulic power unit and adjust the pump's discharge flowrate by turning the flow adjustment screw (the horizontally oriented screw with lock-nut), Figure 7, clockwise to decrease the flowrate and counter-clockwise to increase the flowrate. The correct flowrate for operation of the ATC 38 tool changer is 8 gpm. Note that it may be necessary to first adjust the pump's "open system" discharge pressure to achieve 8 gpm. This is done by adjusting the vertically oriented screw. Approximately 300 to 375 psi will be the maximum achievable pressure when in the "open system" operating mode.

9. After the flowrate has been adjusted, reconnect the hydraulic hoses as described in Step 2.

10. Power-up the machine and check the pressure gage on the HPU to verify that the system pressure is in the range of 700 to 750 psi. This is the "blocked system" pressure.

If necessary this pressure can be adjusted by turning the pressure adjusting screw (the vertically oriented screw with lock-nut), Figure 7, on the pump in a clockwise direction to increase pressure and counter-clockwise to decrease pressure.

11. The tool changer is now fully connected and ready for alignment.

NOTE: FINAL ALIGNMENT OF THE TOOL CHANGER TO THE MACHINE'S SPINDLE MUST BE PERFORMED BEFORE THE TOOL CHANGER CAN BE USED TO CHANGE TOOLS.

TOOL CHANGER OPERATION

The ATC 38 tool changer is a hydraulically powered unit that operates in a sequential manner. That is, each of four arm functions must fully complete its motion before the next function is allowed to begin. For example, the arm must complete its slide-left function before the arm is allowed to perform its push-out function. In operation the system verifies that the arm or other component has made it to its desired final position before it will allow the next function to begin.

Table 1., SEQUENCE OF ATC OPERATION, provides a step-by-step “snap-shot” of each sequence of the tool changer’s automatic operation beginning with the tool changer in its HOME position. This automatic sequence must also be used for manual operation of the tool changer.

OVERVIEW: TOOL CHANGER RECOVERY

The tool changer recovery mode is used to manually move the tool changer’s arm and carriage into either its HOME position (describe below) or into its alignment position. The tool changer has a total of 13 separate functions that can be operated from the control panel or the remote control box located on the tool changer’s cage guard. The tool changer recovery mode (accessed through the use of the <**TOOL CHANGE RESTORE**> button on the keypad) provides direct access to 10 of the tool changer’s functions. There are 8 functions that can be controlled from the first tool changer recovery screen. These are listed on the **TOOL CHANGER RECOVERY** screen and are controlled by using the cursor buttons. These functions are:

TABLE 1. SEQUENCE OF ATC OPERATION

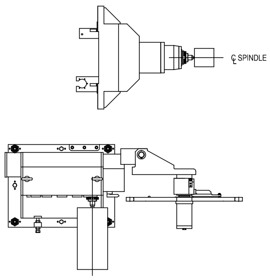
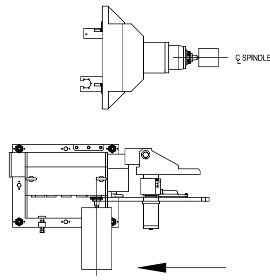
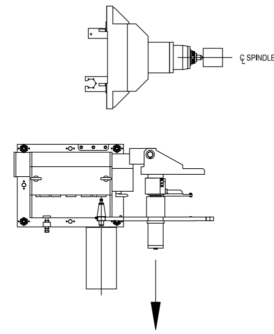
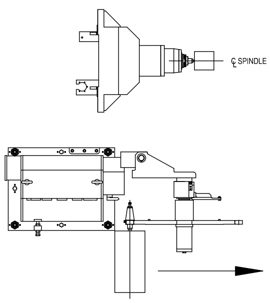
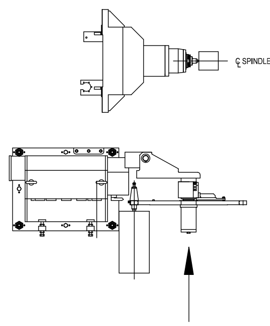
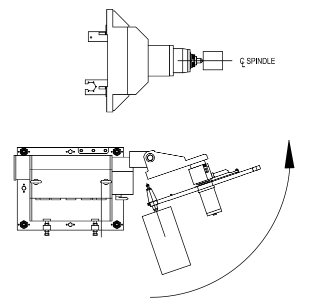
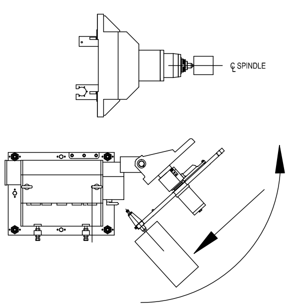
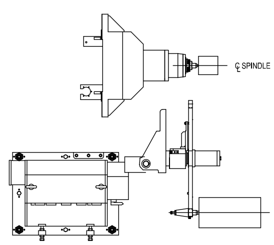
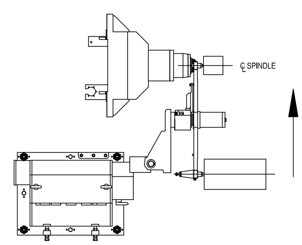
 1. START AT INITIAL/ HOME POSITION	 2. SLIDE LEFT	 3. ARM OUT
 4. SLIDE RIGHT	 5. ARM IN	 6. SWING TO SPINDLE
 7. SWING TO SPINDLE W/ SLIDE LEFT	 8. SWING TO SPINDLE COMPLETE	 9. SLIDE TO SPINDLE

TABLE 1. SEQUENCE OF ATC OPERATION

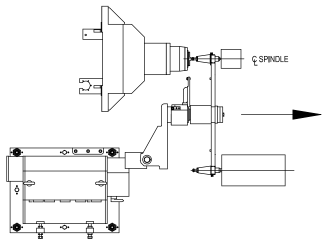
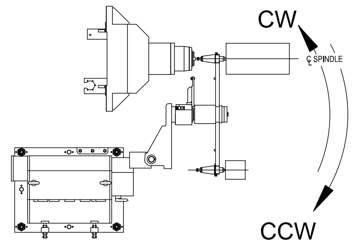
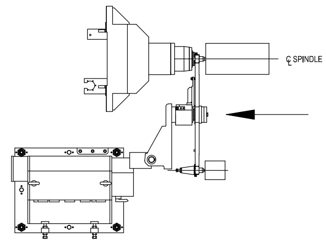
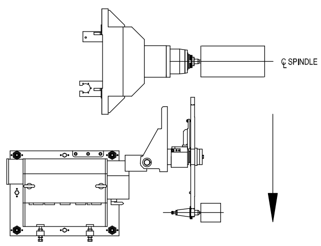
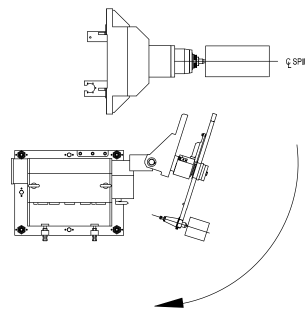
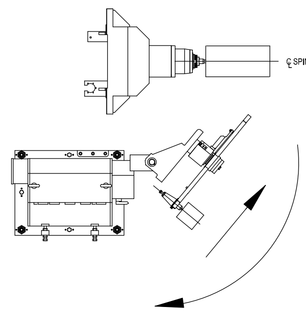
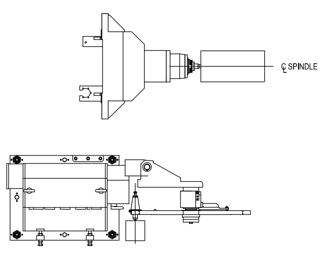
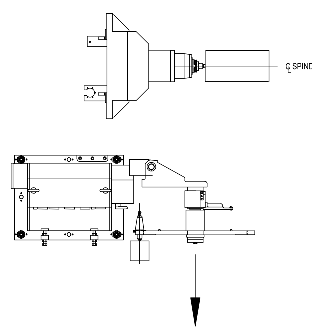
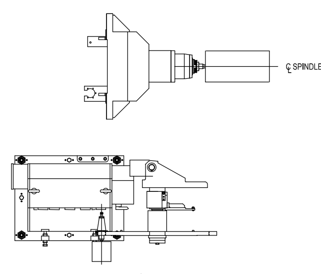
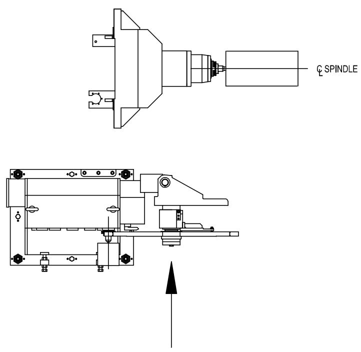
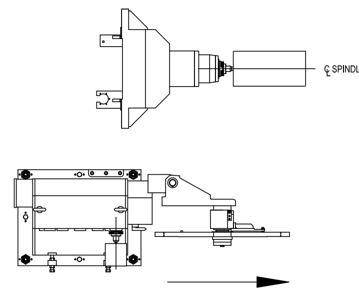
 10. ARM OUT	 11. ARM ROTATE CW OR CCW	 12. ARM IN
 13. SLIDE LEFT	 14. SWING TO MAGAZINE	 15. SWING TO MAGAZINE W/ SLIDE RIGHT
 16. SWING TO MAGAZINE COMPLETE	 17. ARM OUT	 18. SLIDE LEFT

TABLE 1. SEQUENCE OF ATC OPERATION



19. ARM IN



20. SLIDE RIGHT TO INITIAL/ HOME POSITION

TABLE 2
MANUAL TOOL CHANGER OPERATION
FROM THE CONTROL PANEL

FUNCTION NO.	BUTTON NAME/CONTROL KEY	OPERATION
1	HOME BUTTON <HOME>	SWING ARM TOWARDS SPINDLE
2	PAGE DOWN <PAGE DOWN>	SWING ARM TOWARDS MAGAZINE
3	UP ARROW <^>	PULL ARM IN
4	DOWN ARROW <V>	PUSH ARM OUT
5	END BUTTON <END>	ROTATE ARM COUNTER-CLOCKWISE *
6	PAGE UP BUTTON <PAGE UP>	ROTATE ARM CLOCKWISE *
7	LEFT ARROW <<>	SLIDE ARM TO LEFT *
8	RIGHT ARROW <>>	SLIDE ARM TO RIGHT *

***:** As viewed from the magazine side of the tool changer.

In addition, as the tool changer recovery screens are paged through, the tool changer door can be opened and closed (functions 9 and 10). When required the tool changer recovery sequence will state that the door must be opened or closed using the “O” or “C” buttons on the alpha keypad.

TABLE 3 MANUAL TOOL CHANGER OPERATION FROM THE CONTROL PANEL		
FUNCTION NO.	**CONTROL KEY**	**OPERATION**
9	**<O>**	**OPENS TOOL CHANGER DOOR**
10	**<C>**	**CLOSES TOOL CHANGER DOOR**

The final three functions are accessed from the remote control box located on the tool changer's cage guard:

TABLE 4 MANUAL TOOL CHANGER OPERATION REMOTE CONTROL PANEL, TOOL CHANGER CAGE GUARD		
FUNCTION NO.	**CONTROL ELEMENT**	**OPERATION**
11	**FOOT SWITCH**	**PUSHES TOOL OUT OF TOOL POCKET**
12	**ROTATE CCW BUTTON**	**ROTATES THE MAGAZINE COUNTER-CLOCKWISE**
13	**ROTATE CW BUTTON**	**ROTATES THE MAGAZINE CLOCKWISE**

TOOL CHANGER ALIGNMENT PROCEDURE

1. To begin the alignment procedure of the tool changer perform the following steps:

a) Press **<POWER ON>** button.

b) Go to the **PARAMETERS** screen and set **Parameters #211** (Y-axis) and **#64** (Z-axis) to zero.

c) Press **<ZERO RETURN>** and **<AUTO ALL AXIS>** buttons.

d) Press **<MDI>** button then press **<ORIENT SPINDLE>** button.

e) Press **<TOOL CHANGER RESTORE>** button.

At this point the machine will ask the operator to verify the locations of any tools and the status of the tool changer door. When the conditions asked for on the screen are met press **<Y>,** this will simultaneously open the tool changer door and to move the next screen.

This screen gives a warning that tools may fall during the following process. The operator is asked to press **<Y>** to continue the process.

The new screen states:

PRESS A TO ATTEMPT AUTO RECOVERY

PRESS M TO GO TO MANUAL RECOVERY

Press **<M>** to go into manual recovery mode.

The next screen states:

A= Arm

M= Magazine

O= Open Door

C= Close Door

Press **<M>** on the keypad to home the tool changer magazine. After the magazine has reached its home position press **<A>** to go to the control screen for the tool changer's arm functions.

The next screen states:

Hydraulic tool changer bump arm

Using arrow keys attempt to move the arm into its home position

Pressing the cursor keys described in Table 2 will move the tool changer's arm and carriage.

NOTE: THE TOOL CHANGER'S ARM AND CARRIAGE ASSEMBLY WILL "JERK" AND "SHAKE" WHEN IT IS OPERATED MANUALLY BY USING THE CONTROL PANEL KEYS. BECAUSE THE MOTION IS SOMEWHAT ERRATIC, THE SAFETY OF PERSONNEL AND EQUIPMENT SHOULD BE TAKEN INTO CONSIDERATION WHEN OPERATING IN THIS MODE.

!!!SAFETY WARNING!!!

WHEN OPERATED IN THE MANUAL MODE IT IS POSSIBLE TO MOVE THE TOOL CHANGER'S ARM AND CARRIAGE INTO A POSITION THAT MAY DAMAGE THE TOOL CHANGER AND/OR THE HORIZONTAL MILL. BEFORE MANUALLY OPERATING THE TOOL CHANGER THE MACHINE OPERATOR MUST FULLY UNDERSTAND THE MOTION OF THE TOOL CHANGER'S ARM AND CARRIAGE DURING A NORMAL TOOL CHANGE CYCLE.

MOST IMPORTANTLY DO NOT ATTEMPT TO SWING THE TOOL CHANGER ARM TOWARDS THE SPINDLE UNLESS THE PHRASE "ARM HOME" IS DISPLAYED ON THE TC RECOVER SCREEN.

2. The next step in the alignment procedure is to move the tool changer's arm to its **HOME** position by using the cursor buttons described in Table 2. The **HOME** position is defined as:

a) The arm is **fully rotated** towards the magazine, using the **<PAGE DOWN >** button.

b) The arm is **fully pulled in**, using the **<^>** up arrow button.

c) The arm is rotated **fully clockwise** or **fully counter-clockwise**, using the **<END>** button or the **<PAGE UP>** button until the arm is in a horizontal position.

d) The arm is moved **fully to the right**, using the **<>>** right arrow button.

When the tool changer arm has been moved into its **HOME** position the control panel screen will display a highlighted line that states **ARM HOME**. Prior to reaching the **HOME** position the display screen will be blank in this area. As a check, when the arm is in the **HOME** position, the cam follower located on the bottom of the slide mechanism will be in-line with the cam slot on the guide plate.

By using the cursor keys and the messages displayed on the **TOOL RECOVERY** screen, move the tool changer's arm into its **HOME** position. The tool changer's arm and carriage must be moved to their **full limit** of travel to achieve the **HOME** position. Even when it appears that the full limit of travel has been reached, push the button several more times to ensure that, in fact, the full limit of travel has been reached.

3. A three-piece alignment tool is available as an aid for aligning the tool changer's arm to the machine's spindle, Figure 8. Using the <**TOOL RELEASE**> button install the taper section of the alignment tool, Figure 9, into the machine's spindle. Next, insert the flanged end of the alignment tool, Figure 10, into the gripper claws of the arm.

4. Before performing this step, verify that the spindle and column are at their zero limits of Y and Z-travel.

Press the <**HOME**> button to swing the tool changer arm into the machine enclosure. After the arm has rotated fully into the enclosure push the <**>**> (right arrow) button to slide the arm towards the center of the machine.

With the arm in this position, place a level on its top edge and verify that the arm is level. If it is not level re-adjust the leveling bolts on the base of the tool changer to bring the arm into level.

5. Handle-jog the spindle to bring the centerline of the bore of the tapered section of the alignment tool into rough alignment with the centerline of the bore of the flanged section of the alignment tool in the gripper claws. Move the column in the Z-axis direction to create a 0.005" gap between the faces of the two halves of the alignment tool. If the two faces are not parallel, use the leveling screws on the base of the tool changer to bring the faces into a parallel condition.

6. To perform the final portion of the alignment procedure it is necessary to loosen the six clamp bolts that join the tool changer to its base plate and use the adjusting bolts located on the sides of the base plate to move the tool changer in the +/- X-axis direction. Using the +/- X-axis direction adjusting bolts and the Y-axis handle jog move the tool changer and the spindle to align the bores in the two halves of the alignment tool such that the alignment dowel can slide through both bores, Figure 11. Note that the alignment dowel has a small and a large diameter section. This is to enable a "course adjustment" and then a "fine adjustment" to be made.

7. Tighten the six clamp bolts on the tool changer base and verify that the alignment dowel still slides through the bores in the alignment tool halves.

SETTING THE TOOL CHANGE POSITION PARAMETERS

8. Without moving the tool changer arm, spindle or column from the position achieved in Step 7, do the following:

a) Go to the **SETTINGS/GRAPH** display screen by pressing the <**SETNG/GRAPH**> button.

b) Go to Setting **#7**, **PARAMETER LOCK** and change it to **OFF** by pressing <**>**> (right arrow) button and then press the <**WRITE/ENTER**> button to save it in memory.

c) Go to the **ALARMS** display screen by pressing the <**ALARM/MESGS**> button. Type in **DEBUG** from the keypad and press the <**WRITE/ENTER>** button.

d) Move to the **POSITION** display screen by pressing the <**POSIT**> button. Press the <**PAGE UP**> button to move to the **POS-RAW DAT** screen.

e) Record the values shown in the **ACTUAL** column for the position of the Y and Z-axes.

f) Go back to the **ALARMS** screen, type in **DEBUG** and press the <**WRITE/ENTER>** button to exit the **DEBUG** mode.

g) Press the <**E-STOP**> button to allow parameters to be changed.

h) Go to the **PARAMETERS** display screen by pressing the <**PARAM/DGNOS**> button. Go to Parameter **#211, Y Tool Change Offset,** on the **"Y PARAM B"** screen. Enter the number (with the correct sign) recorded from the **POS-RAW DAT** screen for the Y-axis and press the **WRITE/ENTER** button.

NOTE: THESE PARAMETER NUMBERS ARE ENTERED WITHOUT A DECIMAL POINT AND MUST BE THE SAME SIGN AS THAT GIVEN ON THE POS-RAW DAT SCREEN. FOR EXAMPLE –0.7094 WOULD BE ENTERED AS –7094 AND –278.8854 WOULD BE ENTERED AS –2788854.

i) Go to Parameter **#64, Z Tool Change Offset,** on the **"Z PARAM B"** screen. Enter the number (with the correct sign) recorded from the **POS-RAW DAT** screen for the Z-axis and press the **WRITE/ENTER** button.

NOTE: ENTERING A VALUE OTHER THAN ZERO FOR PARAMETER #64 CREATES A NEW "ZERO" POSITION FOR THE MACHINE'S Z-AXIS WHICH IS FORWARD OF THE ZERO LIMIT FOR THE MACHINE. THUS, WHEN PROGRAMMING THE POSITION OF THE Z-AXIS IT IS POSSIBLE TO USE BOTH POSITIVE AND NEGATIVE VALUES FOR THE Z-AXIS POSITION.

j) Because of the new "ZERO" position for the machine the value **for Parameter #34, Z –axis Maximum Travel** must be adjusted to reflect the new "ZERO" position. To calculate the new value use the following formula: (**Parameter #33**) x (Z –axis travel distance) – (**Parameter #64**) = (**Parameter #34**), where:

(**Parameter #33**) is Z-axis encoder steps per unit (unit = 1 inch)

(Z-axis travel distance) is the machine's total Z-axis travel in inches (60 in.)

(**Parameter #64**) is the Z Tool Change Offset value in encoder steps

(**Parameter #34**) is the Z-axis Maximum Travel in encoder steps

Example: (138718 steps/inch) x (60 inches) – (1052517 steps) = 7270563 steps
Go to the **“Z PARAM B”** screen and enter this number for **Parameter #34**.

k) Remove the **E-STOP** condition by pulling out the <**E-STOP**> button and press the <**RESET**> button twice to return to normal machine operation.

l) Push the <**TOOL CHANGE RESTORE**> button and gain access to manual control of the tool changer.

m) Using the tool change recovery cursor buttons, move the tool changer carriage out of the machine enclosure to its home position and remove the alignment tool from the spindle and the tool changer arm.

n) Complete the Tool Change Restore operation to close the tool changer door.

o) **POWER OFF** and then **POWER ON** the machine. Press the <**RESET**> button twice to clear any alarm messages and then verify that parameters **#211**, **#64** and **#34** retain the correct offset values.

p) Push the <**ATC FWD**> button and visually verify that the tool changer is functioning properly and that the tool changer arm correctly positions itself for a tool change.

q) Install a tool in the spindle and perform a live tool change. Inspect the entire sequence of operations for the tool changer and verify that the tool changes are being made in a smooth and safe manner.

ADJUSTING THE OPERATING SPEED OF THE ATC 38 HYDRAULIC TOOL CHANGER

The speed of the various functions on the ATC 38 tool changer can be adjusted. In general, the goal of adjusting the tool changer speed is to achieve a high operational speed (or low tool-to-tool change time) that does not cause undo deflection or vibration of the tool changer. In addition, consistency of motion must also be considered, that is, it is best to equalize the speed of reciprocal functions (rotate clockwise and counter-clockwise, slide left and slide right, etc.) to produce a consistent flow of motion as the tool changer operates.

> **NOTE: IT IS POSSIBLE TO CAUSE DAMAGE TO THE TOOL CHANGER IF THE SPEEDS ARE TOO HIGH. APPROACH THE ADJUSTMENT OF THE TOOL CHANGER’S SPEED WITH CAUTION.**

1. The speed of the following nine functions on the ATC 38 tool changer can be adjusted:

I) Carousel speed

II) Carriage swing speed, toward carousel

III) Carriage swing speed, toward spindle

IV) Carriage slide speed, left direction

V) Carriage slide speed, right direction

VI) Arm speed, push-out

VII) Arm speed, pull-in

VIII) Arm rotation speed, clockwise

IX) Arm rotation speed, counter-clockwise

The Carousel speed and the Arm's pull-in/push-out speed are directly controlled by the flowrate of the hydraulic pump. Thus, increasing the flowrate will increase the speed of these functions and conversely decreasing the flowrate will decrease their speed. The speed of the other six functions are controlled by flow control valves located on the tool changer's valve manifold, Figure 12.

2. If it is necessary to adjust the speed of a function controlled by a valve perform the following:

a) Locate the valve that controls the function.

b) Loosen the lock-nut on the appropriate flow control valve.

c) Turn the flow control adjustment screw counter-clockwise to increase flow (increase speed), or turn the adjusting screw clockwise to decrease flow (speed**). NOTE: MAKE ADJUSTMENTS IN ¼ TURN INCREMENTS AS SMALL ADJUSTMENTS CAN CAUSE LARGE CHANGES IN SPEED.**

d) After completing the adjustment, tighten the adjustment screw lock-nut.

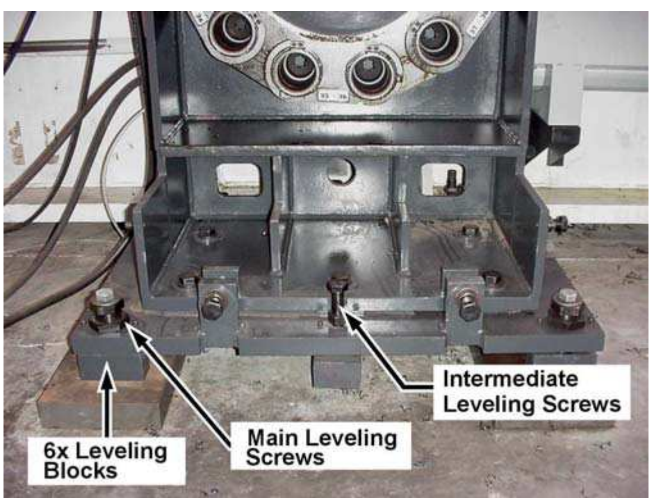


Figure 1

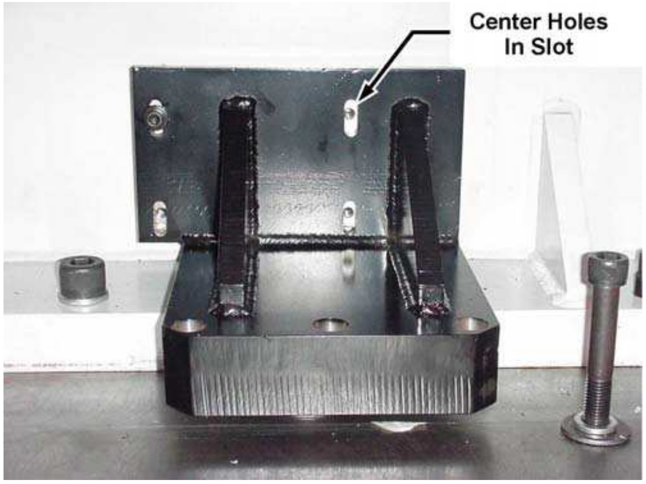


Figure 2a

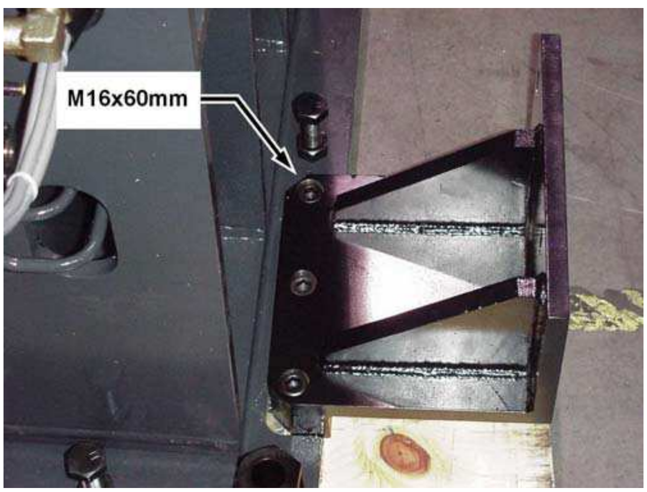


Figure 2b

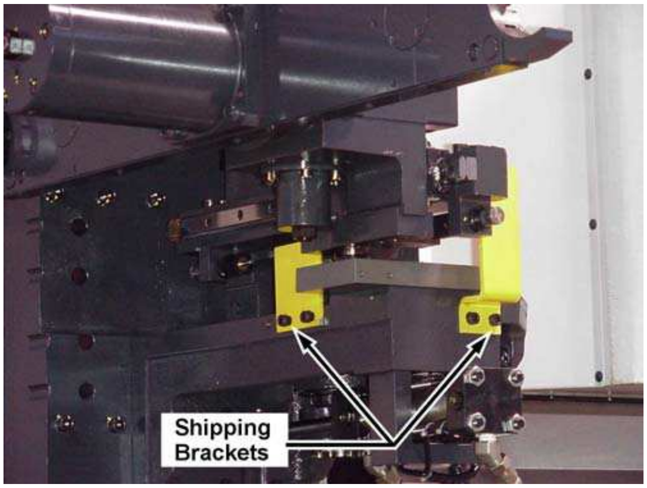


Figure 3

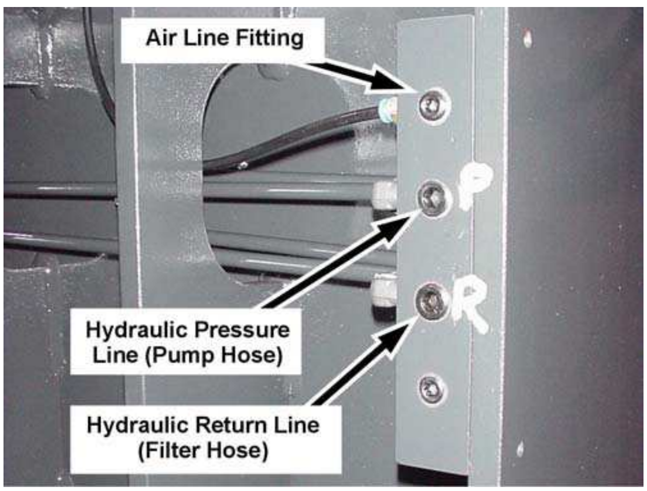


Figure 4

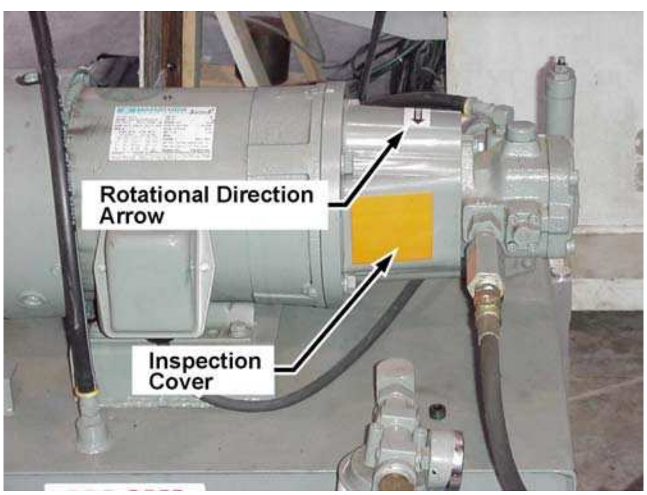


Figure 5

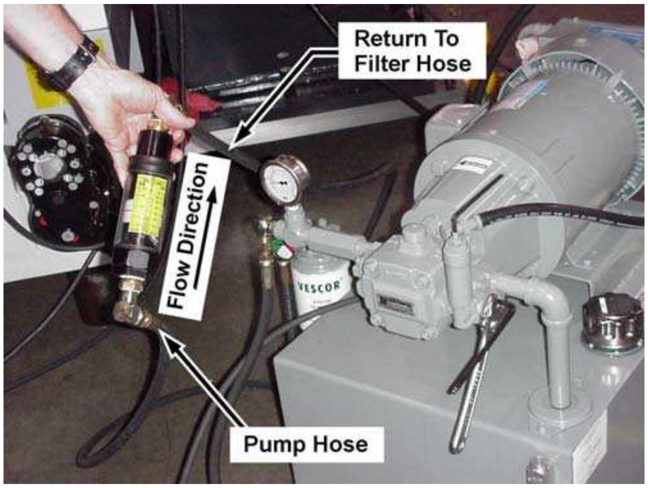


Figure 6

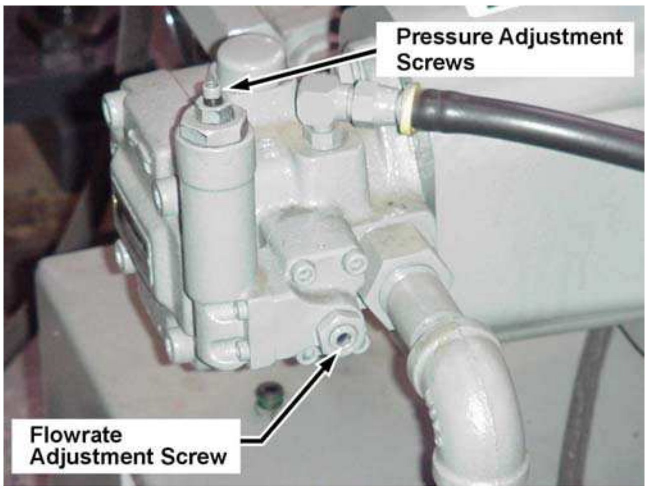


Figure 7

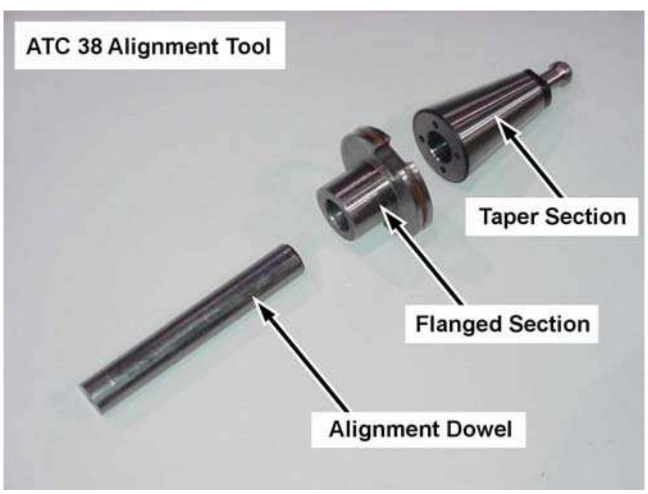


Figure 8

Figure 9

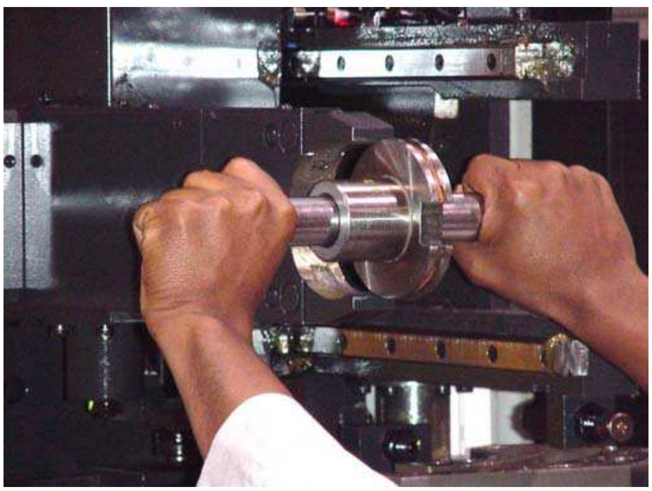


Figure 10

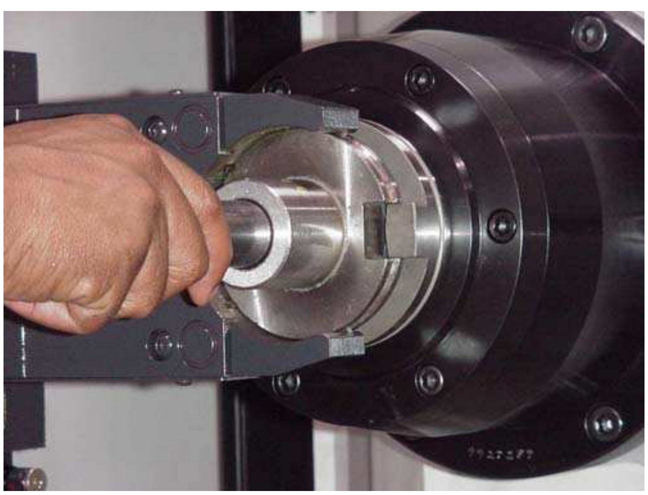


Figure 11

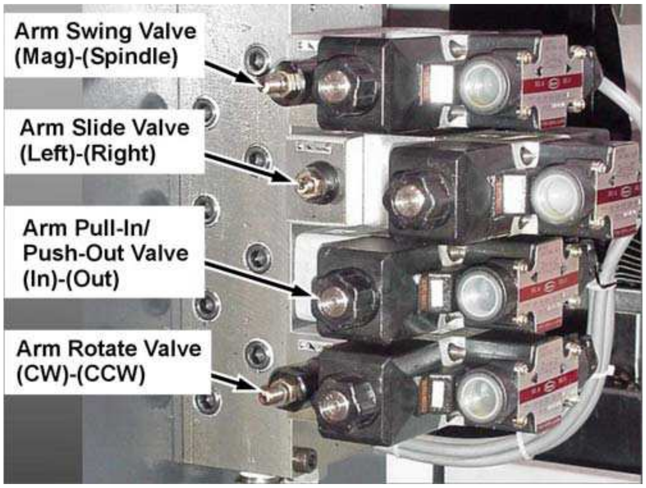

Arm Swing Valve
(Mag)-(Spindle)
Arm Slide Valve
(Left)-(Right)
Arm Pull-In/
Push-Out Valve
(In)-(Out)
Arm Rotate Valve
(CW)-(CCW)

Figure 12

Maintenance Manual

Of

ATC 38/50#

For ***Haas Automation, Inc***

Mori Machinery Corporation

Okayama-Japan

INDEX

Attached Drawings

1. ATC assembly 38	1M2098A
1. Magazine assembly 38	1M2163A
① Main drive assembly	1M2016A
② Tension assembly 38	2M0248A
③ Tool release assembly 38	2M0425A
④ Base assembly 38	1M2017A
⑤ Cover assembly 38	1M2025A
2. Changer assembly	1M2164A
① Arm assembly	1M2097A2
3. Valve assembly	1M2102A

Spare parts list

1 Outline of the machine

This machine is "ATC equipment" made for the purpose of changing spindle tools automatically.
This machine consists of magazine unit of which maximum capacity of tools are 38 tools (Tool dia. under 125mm) and ATC changer unit, and is actuated by hydraulic system.
ATC magazine is Link chain system and contributes to shortening time for indexing tools by adopting clockwise and counterclockwise indexing function.
ATC arm is double arm type and contributes to the short tool change time as it grips the next tool from ATC magazine while machining.

2 Specification

2-1 Specification of tools

60 Tool

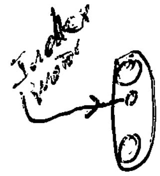
- Tool storage capacity : 38 Tools
- Tool shank : CAT50#
- Pull stud : MAS P50T-1 (45)
- Max. Tool diameter : 125 mm (with adjacent tools) 245 with adjacent
  : 250 mm (without adjacent tools)
- Max. Tool length : 600 mm
- Max. Tool weight : 36.0 kg 80lbs 300 total
  : 15.0 kg (Average tool weight)
- Max. Tool moment : 300 kg cm

2-2 Specification of machine

- Max. Tool capacity : 38 tools (On condition tool dia. is under 125 mm)
- Tool pot chain pitch : 130 mm
- Tool selection : Clockwise and counterclockwise is possible.
- Drive system

: ATC changer unit	: Hydraulic	(77kg/cm2)
: Magazine	: Hydraulic	(77kg/cm2)
: Tool pusher (Manual)	: Air	(4kg/cm2) 7Kg.
		min. max

15kg max for cylinder



38 T

3 Details of ATC

3-1 Magazine

Hollow-pin type tool pot chain makes rotation by hydraulic motor (index motor) equipped with positioning function. Reduction gear ratio is 1/12 when using drive sprocket (T12). (Motor shaft 1 rotation / 1 pot)
As this tool pot's pitch is 130mm and guarded by polymeric resin, under no dispensing oil condition, smooth movement is possible.

3-2 Manual tool change of magazine

Pushing the pull stud from magazine side of the tool pot by air-cylinder does the function of tool pullout from the tool pot. Pull out the tool supporting with your hands on the tool, as the tool is pushed out with the movement of air-cylinder actuated by footswitch. Also the tool should be inserted into the tool pot confirming the direction of the tool key.

HAAS & Ball SS 455

3-3 ATC changer unit

Hydraulic unit drives ATC changer unit. As the movement of ATC changer unit is on the linear guide, smooth movement is possible. The movement is actuated by hydraulic motor and rack and pinion. At the end of the linear guide, this unit has shock absorbers which function not only shock absorbing but also as a mechanical stopper.
Arm rotation is 180-degrees with rack movement by hydraulic cylinder. IN/OUT of arm is also actuated by hydraulic cylinder, and each cylinder's type is stated on the Electric parts list. Stroke adjustment except arm-out end position is possible by outside mechanical-stopper. This mechanical-stopper is indicated on **DWG 1.** Please refer to the **DWG 1** while the alignment work is being done.

- **Caution:**

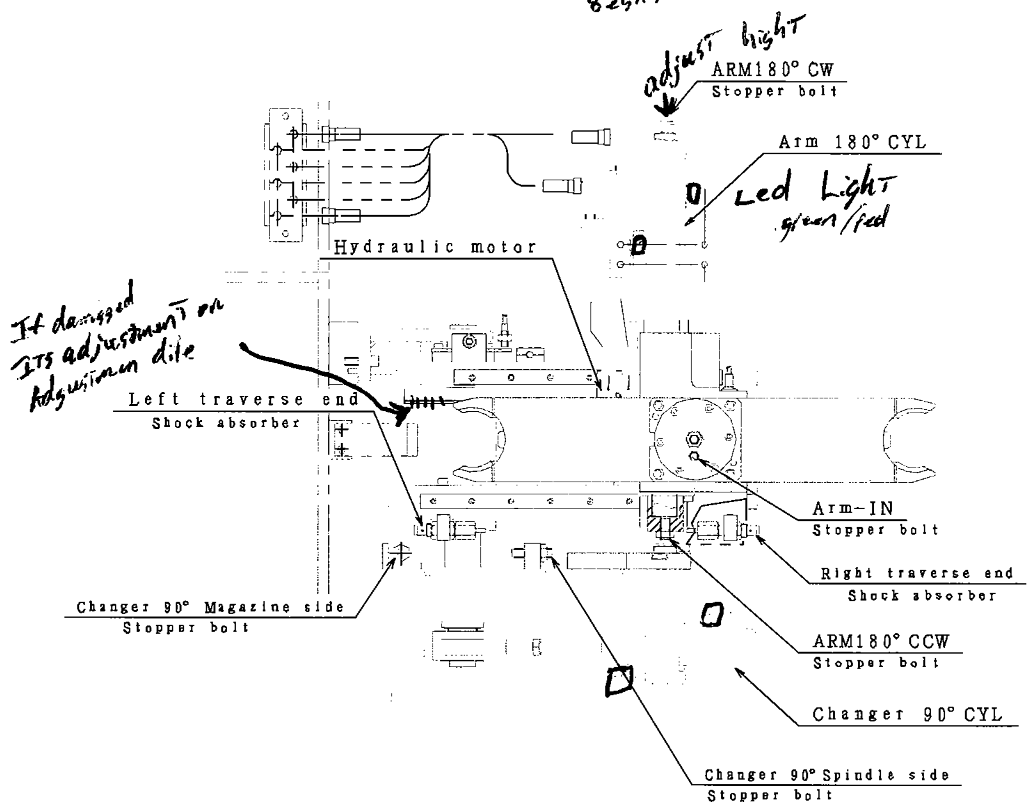
  The 180-degree rotation cannot be done while arm is IN due to the interference between dogs for mechanical-lock cancellation and arm.
  The 180-degree rotation should be done under the condition of arm-OUT when changer is at the tool changing location with spindle.
  Furthermore keep the following conditions.

  Changer 90-degree rotation is made from:
  MG side to spindle side: Changer must be at the right traverse end.
  Spindle side to MG side: Changer must be at the left traverse end.

DWG. 1. Location of ATC Mechanical-Stopper

4 sensor lead switch leads

8 sensor



3-4 ATC Arm

The grippers of the arm have both mechanical lock function and hydraulic Lock function. Mechanical lock function is cancelled if the lock pin at the reverse side of the arm is pushed. As hydraulic lock is using hydraulic of arm-OUT, the lock functions at a time of movement of arm-OUT and is cancelled at a time of movement of arm-IN.
Refer to agenda "4-2", when needed, which explains the clearance and the way of adjustment between the arm and the dog for mechanical-lock cancellation.

- **Caution:**

  As explained above, hydraulic lock is cancelled only at the movement of arm-IN.

  In case solenoid valve is at the neutral position, hydraulic lock cannot be cancelled.

4 Alignment

4-1 Alignment work of ATC arm and Spindle

Alignment work of ATC arm and Spindle should be done as follows.

: Y, Z-axis direction is done at the spindle side.

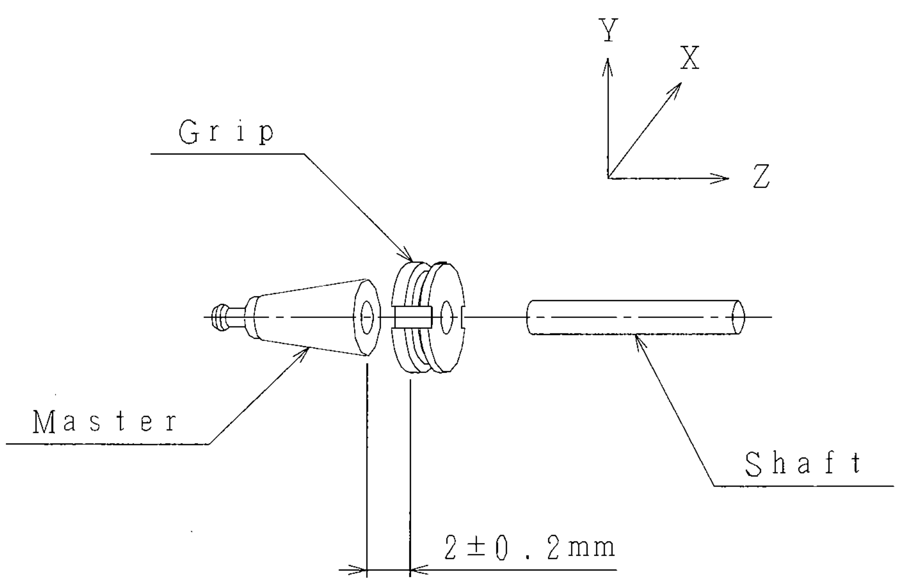
: X-axis direction is with the movement of ATC magazine.

Parallel adjustment of X-Y axis plane and ATC arm (parallel between spindle nose and arm) should be done at ATC side. Alignment allowance and its way of alignment are indicated on **Chart 1.**

Chart 1. Alignment allowance and its way

	Allowance	**Way**
X direction	±0. 1	ATC body movement
Y **direction**	±0. 1	Spindle Y-axis
Z **direction**	2±0. 1	Spindle Z-axis

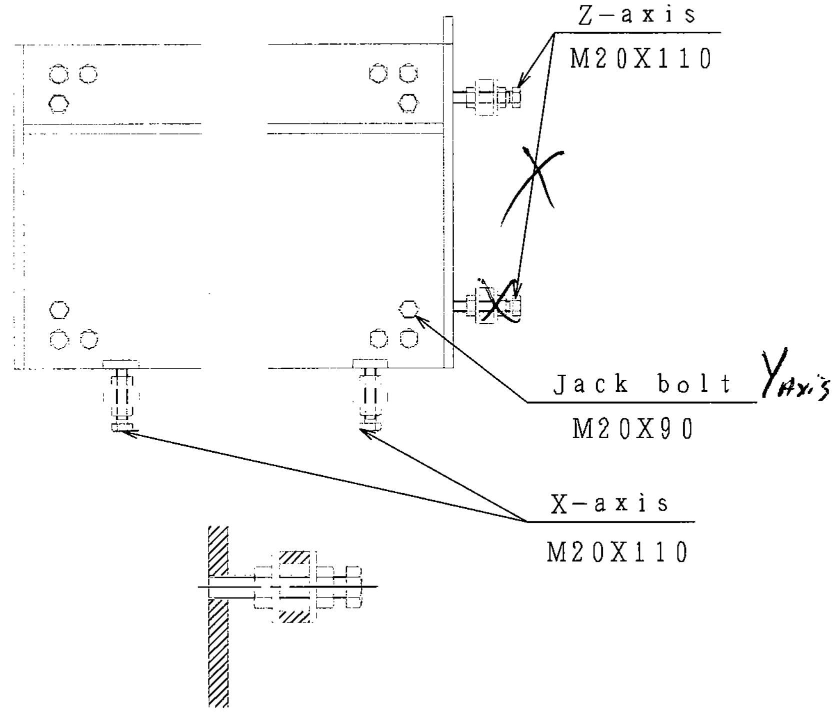
DWG. 2. Alignment of Magazine



Haas 0.6 mm

Movement of ATC body is done by jack bolt for adjustment of magazine up down and right-left indicated on **DWG 3.**Alignment of pot and arm has already been adjusted when the machine is delivered to HAAS AUTOMATION Inc, no need to re-alignment.

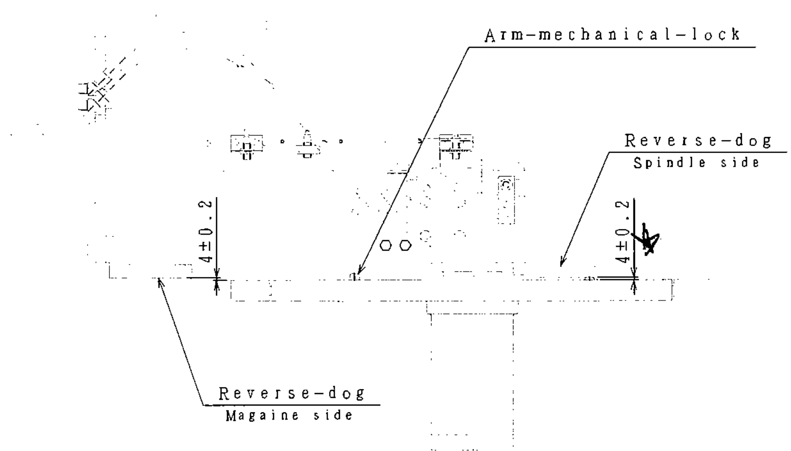
DWG. 3. Alignments



4-2 Adjustment of dog for cancellation of arm mechanical-lock.

The clearance between dog for arm-mechanical-lock and arm is indicated on **DWG 4.**
The dog adjustment has already been done when the machine is delivered to HAAS AUTOMATION Inc.
But in case you adjusted stopper-bolt for the adjustment of arm-IN end (Re-alignment of clearance between magazine gauge line and arm), re-alignment shall be necessary.
In case clearance is small, you need to grind the reverse side of dog and in case clearance is large, insert the shim beneath the dog.

DWG. 4 Clearance between dog for arm-mechanical-lock and arm



5 Speed adjustment

Magazine drive, ATC arm-IN/OUT and tool pushing cylinder are oil-flow fixed type actuators and their speeds cannot be adjusted. Other movements' speeds are adjustable as there are flow control valves in the hydraulic circuit. Refer to the valve assembly (attached **DWG 1M2102A**).
Cylinder cushions of changer 90 and 180-degree rotation are possible to be adjusted from outside.

less than
Slide < 90° ROTATE
1.0 sec. 1.4 sec.

6 Maintenance

6-1 Check

(1) Magazine

- No unusual sound shall be heard from the magazine drive.
- No dust or cutting chips in the tool pot.
- No cutting chip and other contamination at the tool pot guide area.

(2) ATC arm

- Smooth movement of arm mechanical-lock pin Stays in gripper broke
- Smooth movement of arm grippers
- Grippers of the arm do not have any damage

(3) ATC changer unit

- No noise while sliding
- Smooth movement of arm180 degree rotation
- Smooth movement of arm in/out
- Smooth movement of changer 90 degree rotation

Movement confirmation of each actuator shall be done by lead switch and proximity switch. Keep dust and/or oil away from the switches.
Lead switch, proximity switch, hydraulic cylinder and etc. are listed in "Electric parts list".

6-2 Lubrication

Refer to the following lubrication parts **chart 2** and lubricate the oil to the parts of ATC according to the list. Be sure to confirm that the machine is stopped when you dispense oil.

Please refer to the lubrication parts listed also in the attached drawings.

Chart 2. Lubrication

Chain lub 4-6 month

6 month shaft

Lubrication part	Lubricate way	Quantity	Term
Magazine drive gear	General grease lubricate	Proper quantity	6 months each
Arm shaft IN/OUT	Molybdenum grease lubricate	Proper quantity	6 months each
Tool pot	General grease lubricate	Proper quantity	6 months each
Rack for changer slide	General grease lubricate	Proper quantity	6 months each
Linear guide for changer slide	General grease lubricate	Proper quantity	1 year each

6-3 Tool pot chain tension

Tool pot chain tension should be checked regularly.

Although the tension of tool pot chain is adjusted at the shipment, after long years operation stretch of the chain, noise, trouble of the guide etc may arise and the alignment between arm and tool pot may get out of order.

- Please be careful that too tight tension of the tool pot chain shall cause abnormal wear.

  Instruction of chain tension adjustment is as follow. Please refer to the attached drawing no. **2M0248A**

Tension is located at lower/left area of the magazine (manual tool change side).
Loosen the 4 paces of #8 bolt with hole 12 x 50 from the front of the magazine.
By doing this #7 plate shall be movable. Then loosen the #13 hexagon nut, tighten the #12 hexagon bolt, move the plate, and adjust the tension of the tool pot chain.
After the adjustment, please tighten the hexagon nut and 4 paces of bolt with hole.
Tensioning will not change the indexed pot location, but please check the alignment between manual tool pushing cylinder and tool pot.

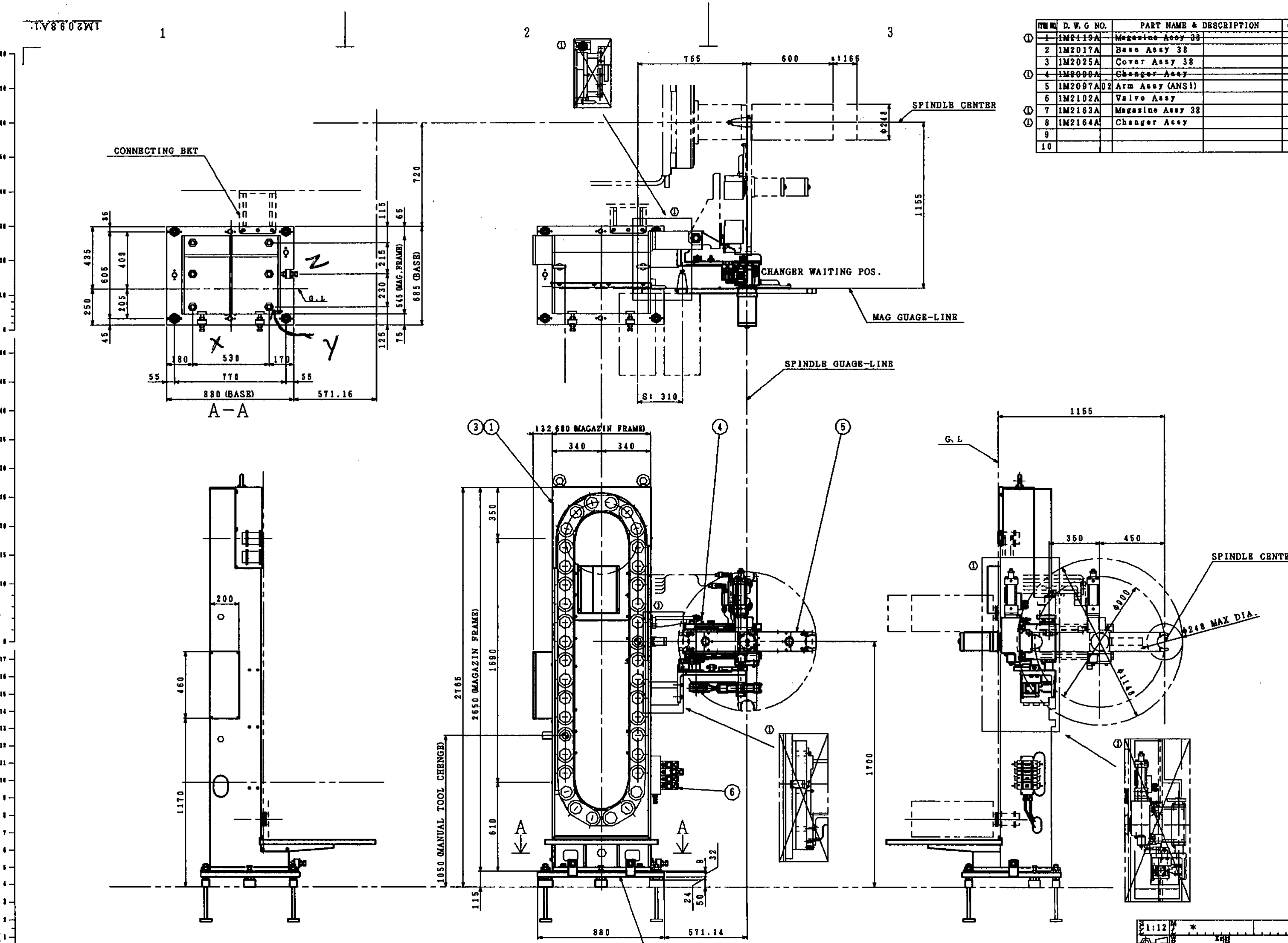
6-4 Parts list

In the attached parts list, following information is provided.

- Name of the parts
- Manufacturer of the parts

Prenames	DWG No	Parts name	Description	Number	Maker	Note
Magazine assembly		Proximity switch	E2E-X7E1	1	OMRON	
Main drive assembly		Proximity switch	E2E-X2E1	2	OMRON	
	L5179491	Index motor	EIS-170-2PC-1MAO-HB	1	NOP	
Tool release assembly		SOL. Operated valve	VFS1120-1DZ-01-F	1	SMC	
		Read switch	A73HL	1	SMC	
Arm assembly	1M2097A02	Arm assembly		1	MORI	Sub assembly
	GY08617	Claw ANSI		2	MORI	
	GY08618	Claw ANSI		2	MORI	
		Bush	LFB1412	4	OILES	
Changer assembly		Proximity switch	E2E-X2E1	5	OMRON	
		HYD. Motor	OMM-32-B-C	1	SUMITOMO	
		Shock absorber	W-A2M20N016SD	2	TAIYO	
		Stopper nut	SN-A2M20	2	TAIYO	
		Cam follower	NATR15XLL	1	NTN	
	3L00089	Shaft		1	MORI	
		External retaining ring	15	1		
		Read switch	AX-115	6	TAIYO	
		H-Hose	N177-06-750-1005=1005	1	YOKOHAMA	
		H-Hose	N177-06-695-1005=1005	1	YOKOHAMA	
		H-Hose	N177-06-685-1005=1005	1	YOKOHAMA	
		H-Hose	N177-06-720-1005=1005	1	YOKOHAMA	
		H-Hose	N177-06-715-1005=1005	1	YOKOHAMA	
		H-Hose	N177-06-670-1005=1005	1	YOKOHAMA	
		H-Hose	N177-06-450-1005=1005	1	YOKOHAMA	
		H-Hose	N177-06-625-1005=1005	1	YOKOHAMA	
Valve assembly		SOL. Operated valve	HD1-3W-BGA-025A-WYA3	3	TOYOOKI	
			HD1-3W-AEB-025A-WYA3	1	TOYOOKI	

ITEM NO.	D. W. G NO.		PART NAME & DESCRIPTION		QUALITY	WEIGHT	G_1	G_2	G_3	G_4	
~~1~~	~~1M2119A~~		~~Magazine Assy 38~~				1				
2	1M2017A		Base Assy 38				1				
3	1M2025A		Cover Assy 38				1				
~~4~~	~~1M2099A~~		~~Changer Assy~~				1				
5	1M2097A	02	Arm Assy (ANSI)				1				
6	1M2102A		Valve Assy				1				
7	1M2163A		Magazine Assy 38				1				
8	1M2164A		Changer Assy				1				
9											
10											



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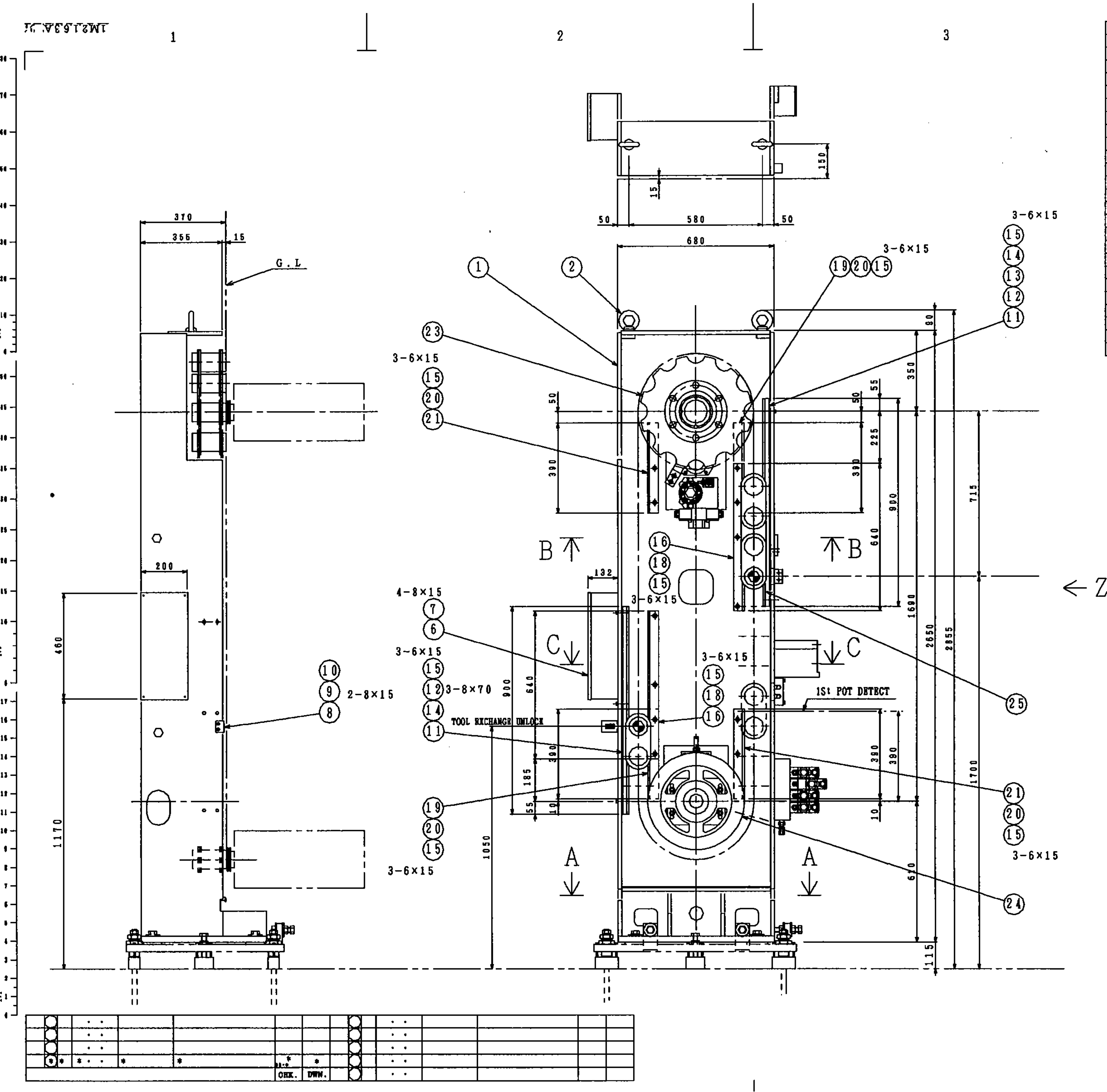
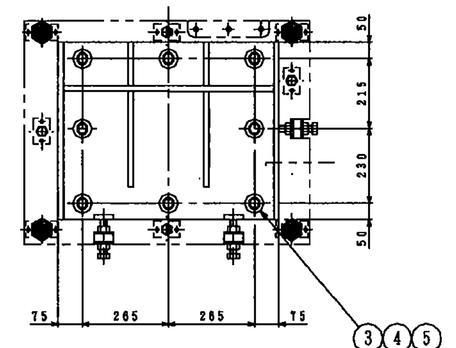
CHECK-by	
MORI-MACHINERY-CORPORATION	1M2098A 1



No.	DWG. No.	PARTS NAME	TYPE	MATERIAL	WT.	QTY	DESCRIP
1	0M00147	Magazine Frame			712	1	
2		Eye Screw	24			2	
3		Hex Bolt	20×70			8	
4		Hex Nut	20			8	
5	Y700008	Washer			0.12	8	
6	2M02741	Terminal Box			4.5	1	
7		Socket Head Capscrew	8×15			4	
8	4M049462	Name Plate Stay			0.06	1	
9		Socket Head Capscrew	8×15			2	
10	4M012451	Name Plate				1	
11	3M02708	Guide 14			2.9	4	
12		Socket Head Capscrew	8×70			2	
13		Socket Head Capscrew	8×25			10	
14	3M02728	Guide Rail 14			0.16	4	
15		Flat Head Screw	6×15			52	
16	3M027052	Guide 2			3.5	4	
17		Socket Head Capscrew	12×90			6	
18	3M02733	Guide Rail 2			0.11	4	
19	4M042933	Guide 3			2.2	2	
20	4M04337	Guide Rail 3			0.07	4	
21	RY84802	Guide			2.2	2	
22		Socket Head Capscrew	12×35			4	
23	1M2016A	Magazine Assy			100	1	
24	2M0248A	Tension Assy			40	1	
25	1M2020A	TPC Assy			130	1	



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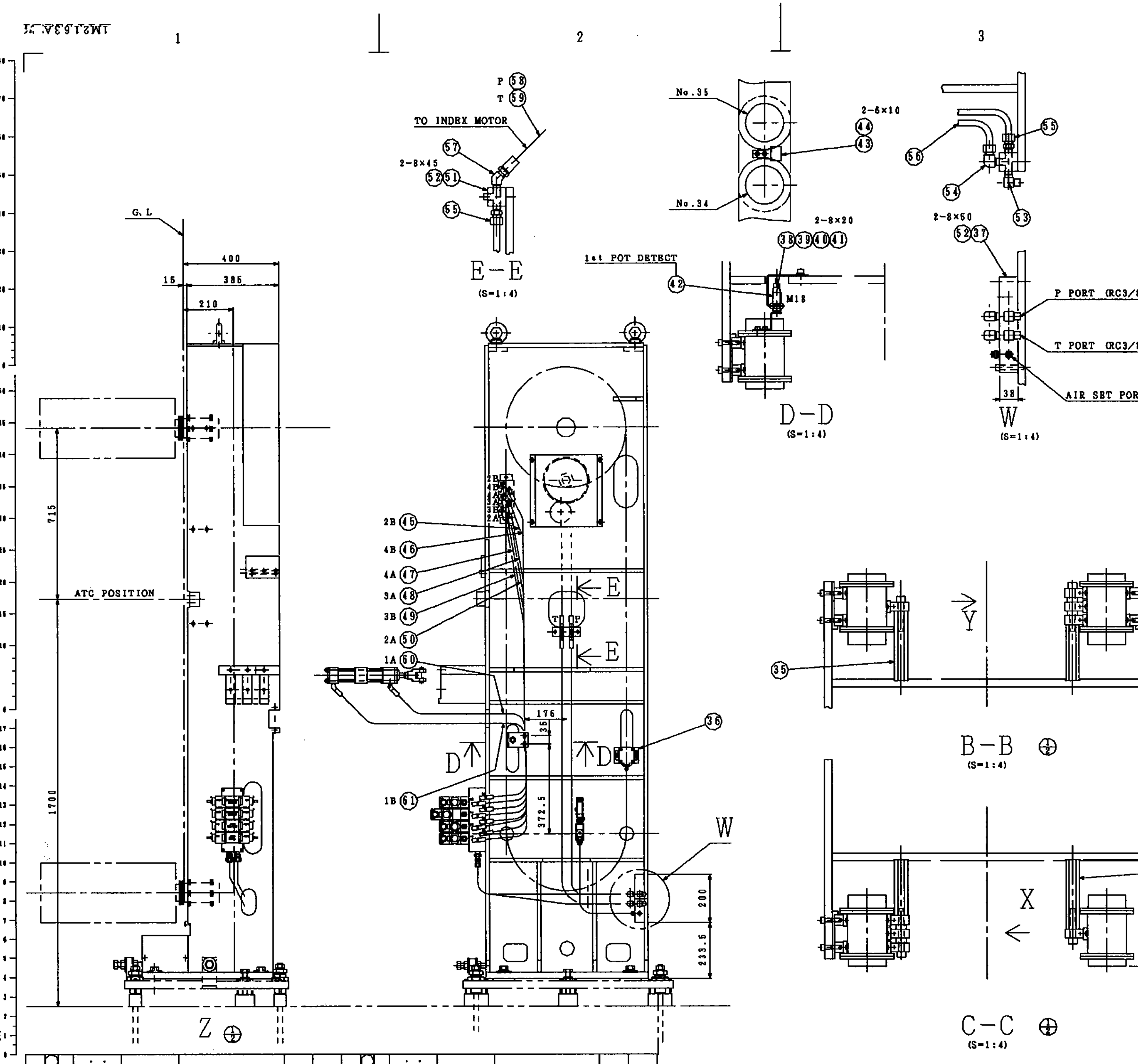
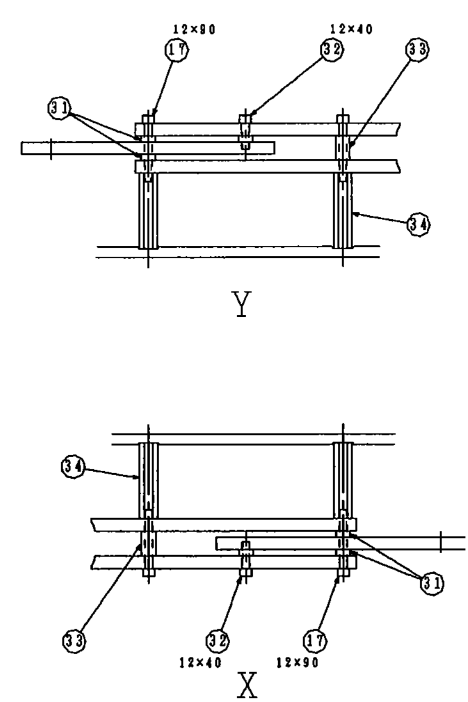


No.	DWG. No.	PARTS NAME	TYPE	MATERIAL	WT.	QTY	DESCRIP
31	4M04305	Collar			0.02	6	
32		Socket Head Capscrew	12×40			2	
33	4M04306	Collar			0.07	4	
34	4M043034	Screw 2			0.56	6	
35	4M063031	Screw			0.45	4	
36	2M0425A	Tool Release Assy				1	
37	4M04752	Block			2.1	1	
38	4M09125	LS Stay			***	1	
39		Socket Head Capscrew	8×20			2	
40		Washer	8			2	
41		Spring Washer	8			2	
42		Proximity Switch	E2E-X5E1			1	
43	RY781311	Dog			0.05	1	
44		Socket Head Capscrew	6×10			2	
45		H-HOSE N176-06-	1610 1005=1005			1	
46		H-HOSE N176-06-	1655 1005=1005			1	
47		H-HOSE N176-06-	1600 1005=1005			1	
48		H-HOSE N176-06-	1505 1005=1005			1	
49		H-HOSE N176-06-	1565 1005=1005			1	
50		H-HOSE N176-06-	1430 1005=1005			1	
51	Y300008	Block			1.1	1	
52		Socket Head Capscrew	8×50			4	
53		Fitting For Hose	1034-06			2	
54		Bite Type Pipe Fitting	KLN10-030E			2	
55		Bite Type Pipe Fitting	KCT10-030E			4	
56		Steel Tube	Φ10			2	
57		Fitting For Hose	1036-06			2	
58		H-HOSE N176-06-	530 1005=1005			1	
59		H-HOSE N176-06-	560 1005=1005			1	
60		H-HOSE N176-06-	1400 1005=1005			1	
61		H-HOSE N176-06-	1500 1005=1005			1	



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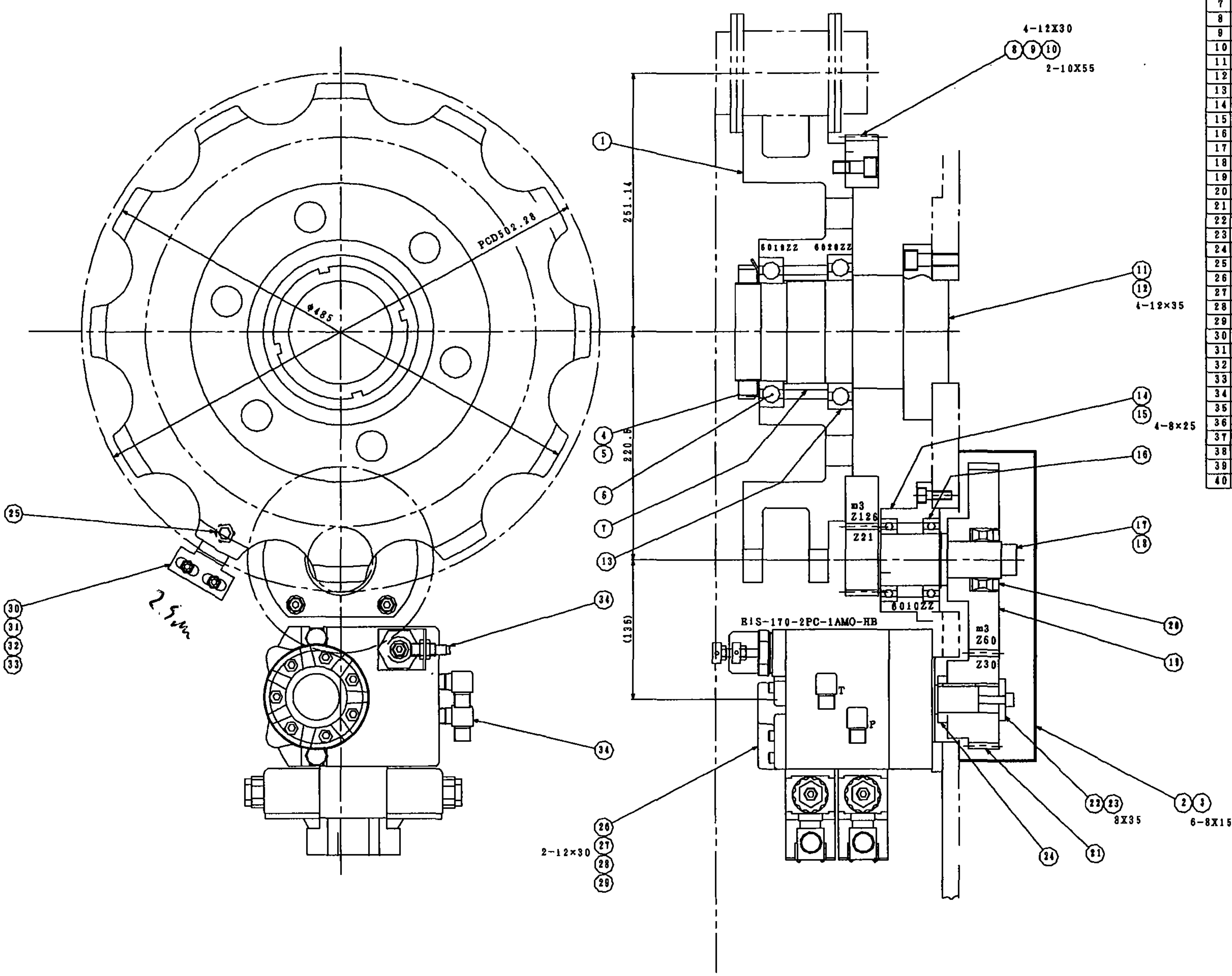
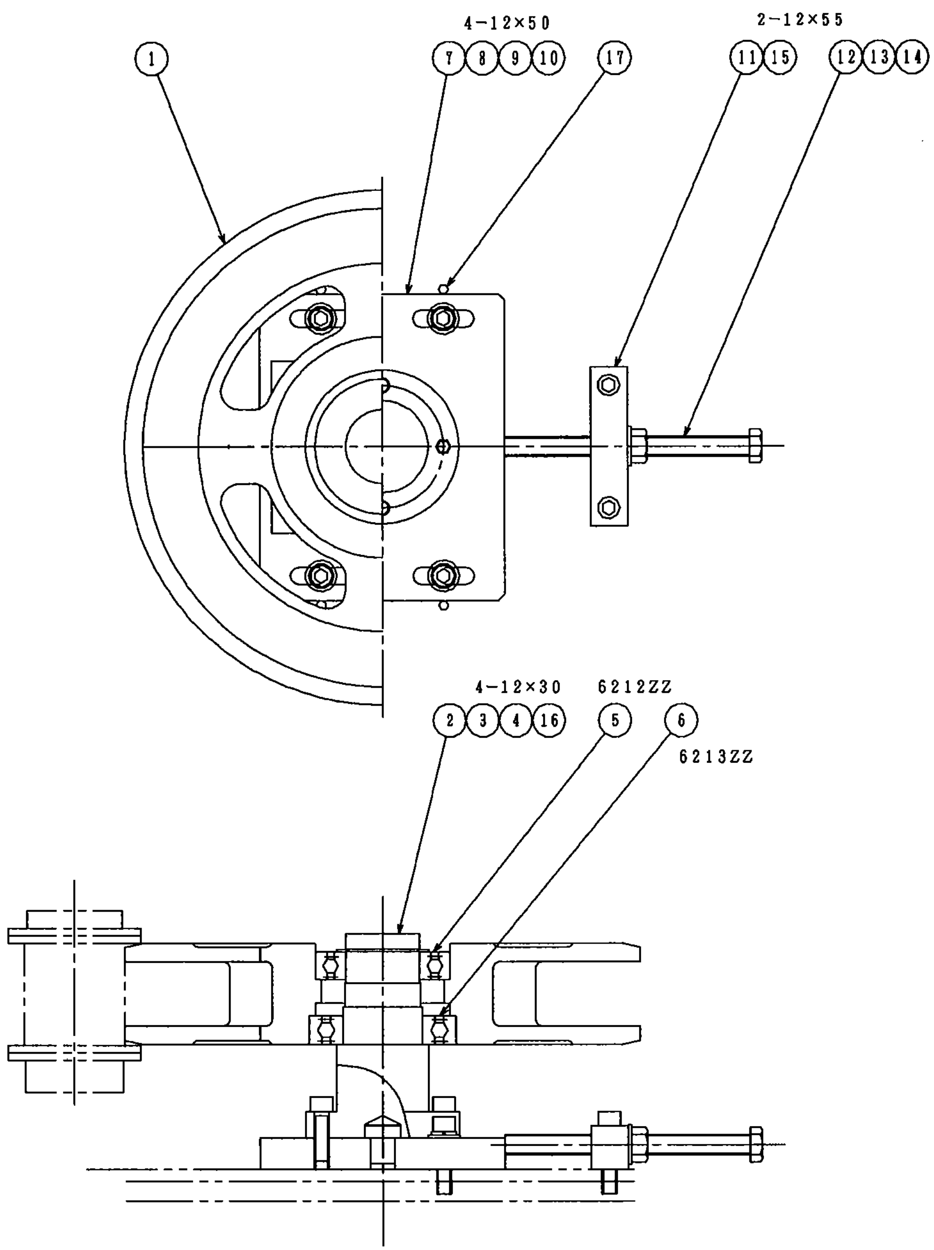


ITEM NO.	D.W.G NO.		PART NAME & DESCRIPTION		QUALITY	WEIGHT	Q1	Q2	Q3	Q4	PO
1	3M02713	2	Sprocket				1				
2	KY69503	1	Cover				1				
3			Socket Head Capscrew	8X15			6				
4			Bearing Nut	AN19			1				
5			Bearing Washer	AW19			1				
6			Bearing	6019ZZ			1				
7	4M04340	1	Spacer				1				
8	3M02714	1	Gear 126				1				
9			Socket Head Capscrew	12X30			4				
10			ST DWL Pin	10X55			2				
11	3M03723		Shaft				1				
12			Socket Head Capscrew	12X35			6				
13			Bearing	6020ZZ			1				
14	4M05791		Bearing Case				1				
15			Socket Head Capscrew	8X25			4				
16			Bearing	6010ZZ			2				
17	3M02815	1	Shaft Gear 21				1				
18			Retaining Ring	50			1				
19	4M04414	1	Gear 60				1				
20			Power Lock	PL35X060			1				
21	4M04415		Gear 30				1				
22	YT00004		Washer				1				
23			Socket Head Capscrew	8X35			1				
24	4M04419		Collar				1				
25			Proximity Switch	E2E-X5E1			1				
26	L517849	1	Index Motor				1				
27			Socket Head Capscrew	12X30			2				
28			Washer	12			2				
29			Spring Washer	12			2				
30	4M08481		Pot Count Stay				1				
31			Socket Head Capscrew	6X15			2				
32			Washer	6			2				
33			Spring Washer	6			2				
34			Proximity Switch	E2E-X2E1			1				
35			Fitting For Hose	1033-06			2				
36											
37											
38											
39											
40											

Note
type:ATC38

SCALE 1:2	*
100 Kg	
DRAWN-by 1-AUG-'88 MANDAI	TITLE MAIN DRIVE ASS
CHECK-by	HAAS ATC38
MORI-MACHINERY-CORPORATION	1M2016A

1M2016A



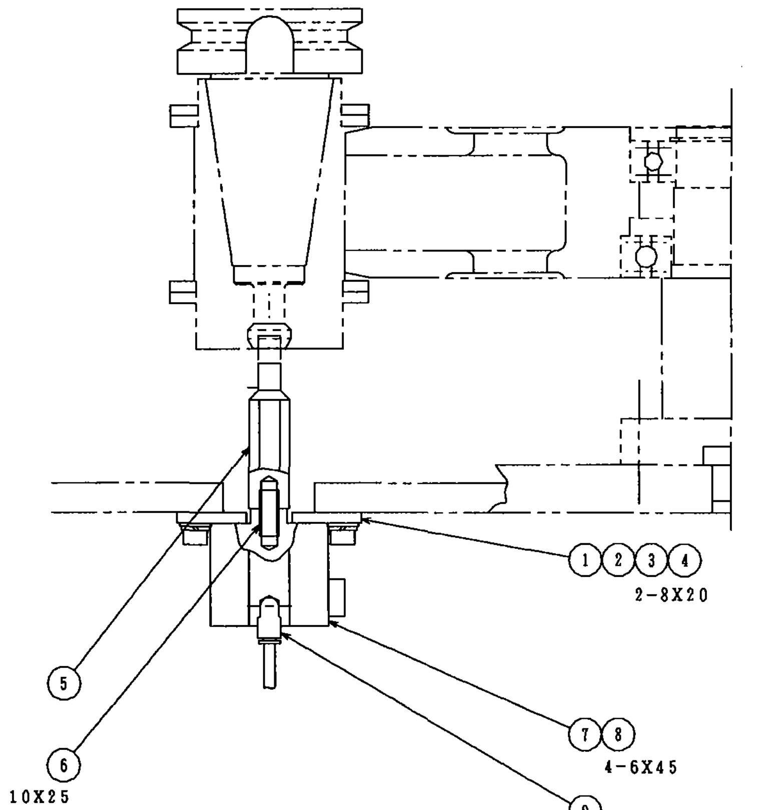
ITEM NO.	D. W. G NO.		PART NAME & DESCRIPTION		QUALITY	WEIGHT	G1	G2	G3	G4	PG
1	3M02710	1	Corner Roller			22.5	1				
2	4M06083		Shaft			6.2	1				
3			Socket Head Capscrew	12x40			4				
4			Retaining Ring	60			1				
5			Bearing	6212ZZ			1				
6			Bearing	6213ZZ			1				
7	3M04125		Plate			9.25	1				
8			Socket Head Capscrew	12x50			4				
9			Spring Washer	12			4				
10			Washer	12			4				
11	4M04262	1	Block			1.35	1				
12			Hex Bolt	16x200 S200			1				
13			Hex Nut	16			3				
14			Washer	16			3				
15			Socket Head Capscrew	12x55			2				
16	4M04422		Pin			0.1	1				
17			Spring Pin	8x40			4				
18											
19											
20											

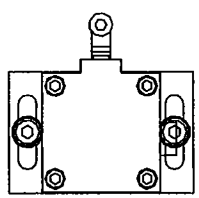
SCL 1:3	MTL
WET 40 Kg	HRM / RMK / *
DRAWN-by 10·JUL·'96 OGURA	TITLE TENSION ASSY 38
CHECK-by	M-M38
MORI-MACHINERY-CORPORATION	2M0248A

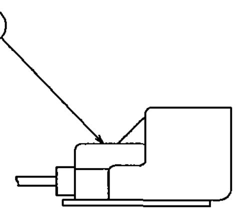
APPROVER DRAWN

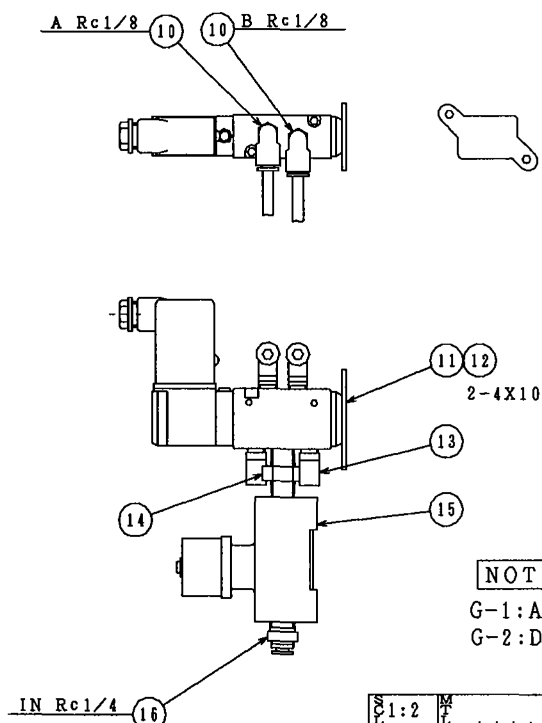
2M0245A

ITEM NO.	D.W.G NO.	PART NAME & DESCRIPTION		QUALITY	WEIGHT	G1	G2	G3	G4	PG
1	4M05747	Plate			0.24	1	1			
2		Socket Head Capscrew	8x20			2	2			
3		Spring Washer	8			2	2			
4		Washer	8			2	2			
5	4M05751	Rod			0.15	1	1			
6		Set Bolt	10x25			1	1			
7		Air Cylinder	CDQ2B50-15D-A73HLS		0.4	1	1			
8		Socket Head Capscrew	6x45			4	4			
9		Joint	KQL06-02S			2	2			
10		Joint	KQL06-01S			2	2			
11		Sol.Operated directional valve	VFS1120-1DZ-01-F		0.18	1				
12		Socket Head Capscrew	4x10			2	2			
13		Silenser	AN103-01			2	2			
14		Nipple	SRN02-010J			1	1			
15		Speed Controller	AS4000-02		0.22	1	1			
16		Joint	KQH06-02S			1	1			
17		Foot Switch	OFL-VG-SM2.K		1.7	1	1			
18		Sol.Operated directional valve	VFS1120-5DZ-01-F		0.18		1			
19										
20										

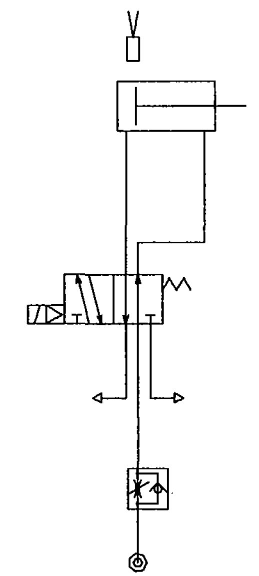








NOTE
G-1:AC100V
G-2:DC24V

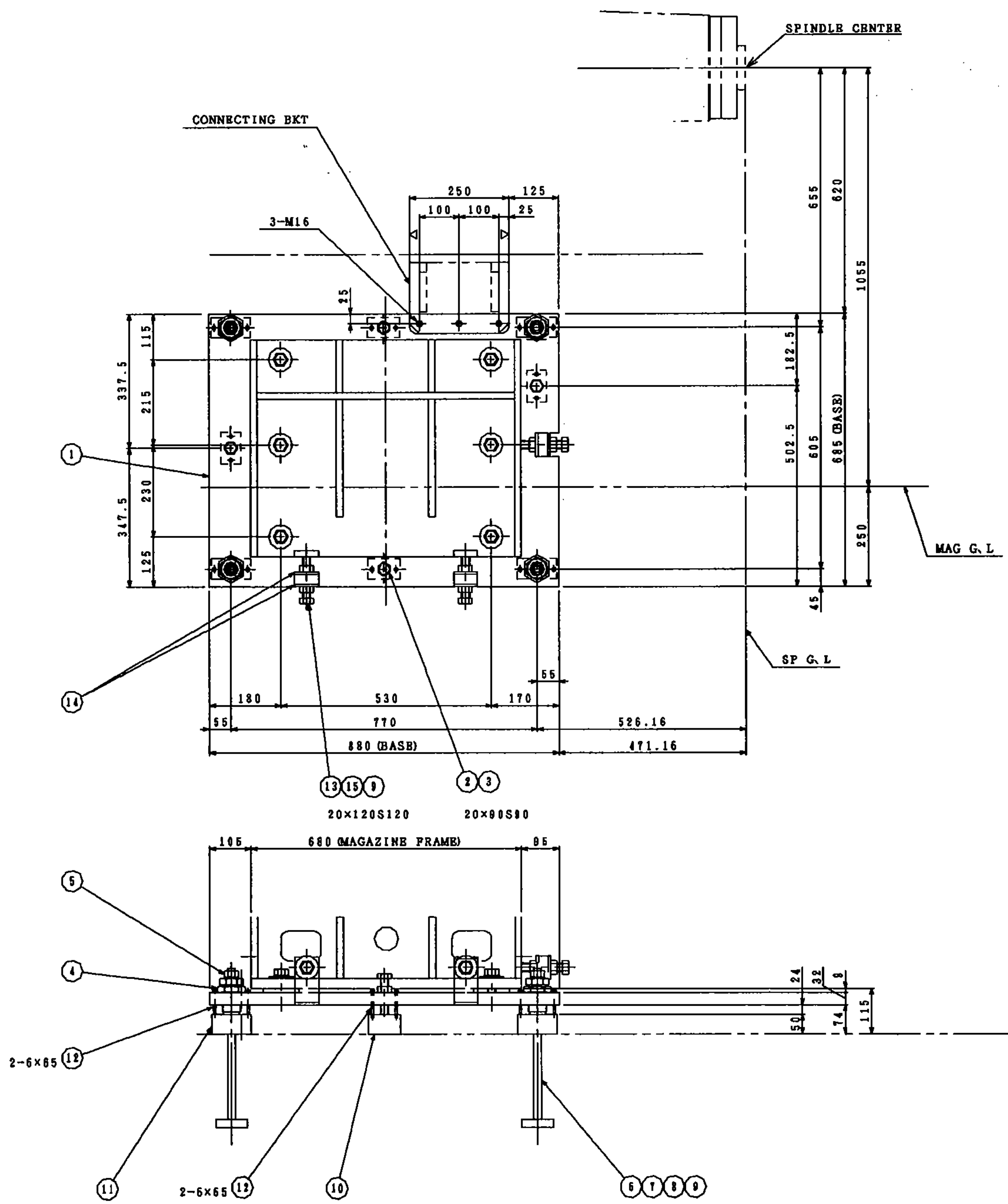


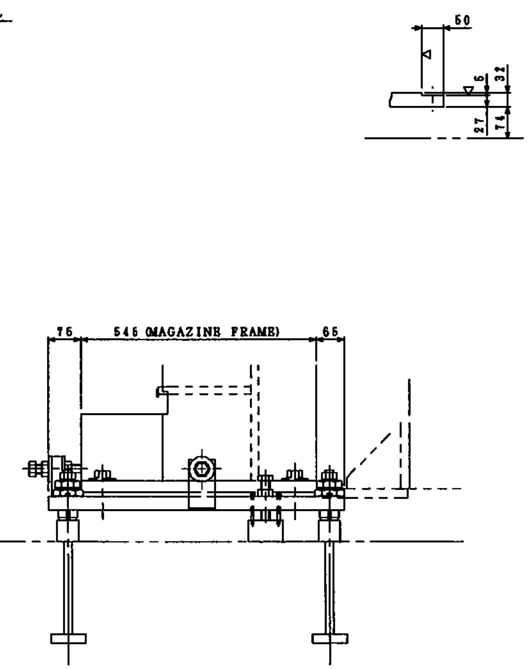
TOOL RELEASE ASSY

SCL 1:2	MTL		REG
	WET 5 Kg	RMK	*
DRAWN-by 10-APR-'96 MANDAI	TITLE TOOL RELEASE ASSY 38		
CHECK-by	M-M (MAS)		
MORI-MACHINERY-CORPORATION	2M0425A		

APPROVER DRAWN

ITEM NO.	D. W. G NO.	PART NAME & DESCRIPTION		QUALITY	WEIGHT	G1	G2	G3	G4	FO
1	1M01913	Base 38			135	1				
2		Hex Bolt	20x90 S90			4				
3		Hex Nut	20			4				
4	4M05111	Jack Bolt			0.8	4				
5	4M05110	Nut			0.8	4				
6	4M01558	Foundation Bolt			1.2	4				
7		Hex Nut	20			4				
8		Spring Washer	20			4				
9		Washer	20			10				
10	4M07960	Matting Plate			1	4				
11	4M08480	Matting Plate			2	4				
12		Socket Head Capscwew	6x65			16				
13		Hex Bolt	20x120 S120			3				
14	YT00008	Washer			0.1	6				
15		Hex Nut	3-20			6				
16										
17										
18										
19										
20										





1:6

160 Kg

DRAWN-by 11·JUN·'98 MANDAI

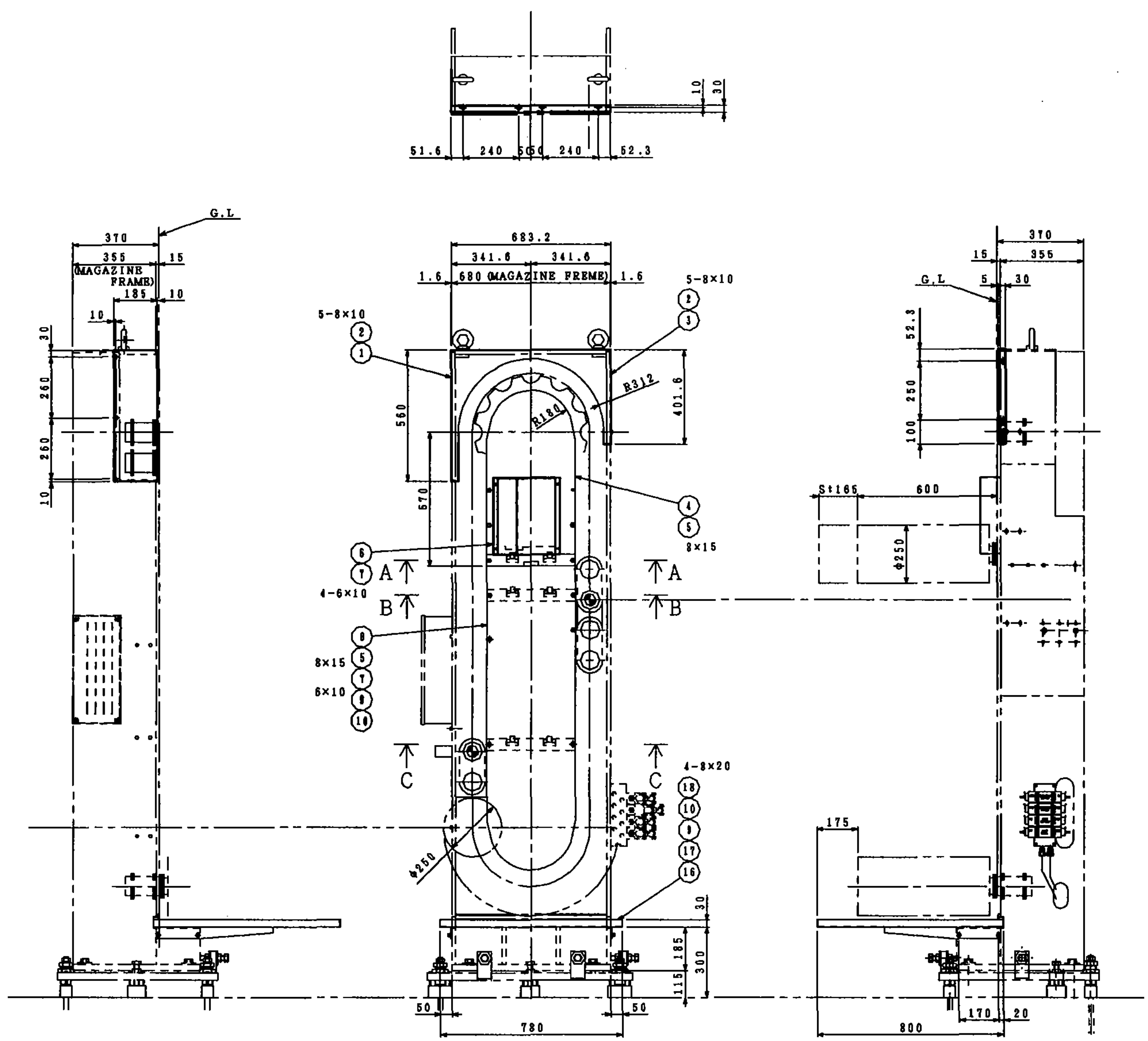
CHECK-by

TITLE BASE ASSY 38

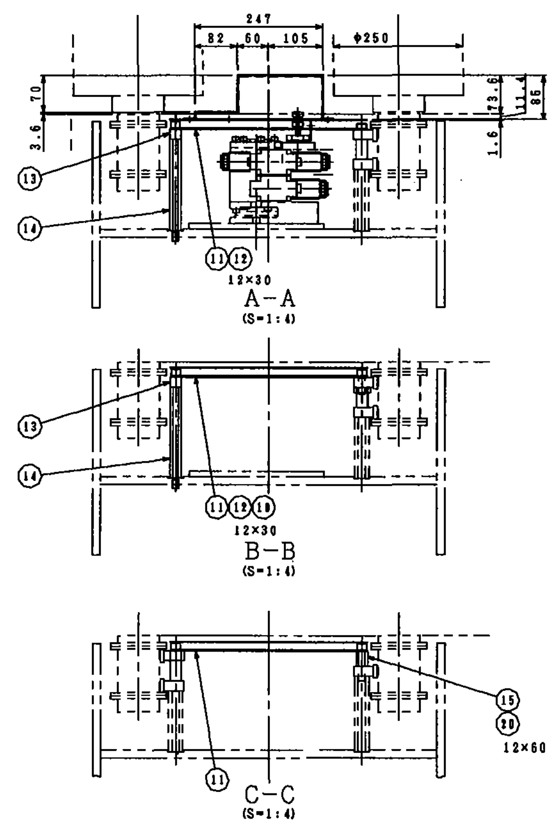
ATC 38

MORI-MACHINERY-CORPORATION 1M2017A

1 2 3



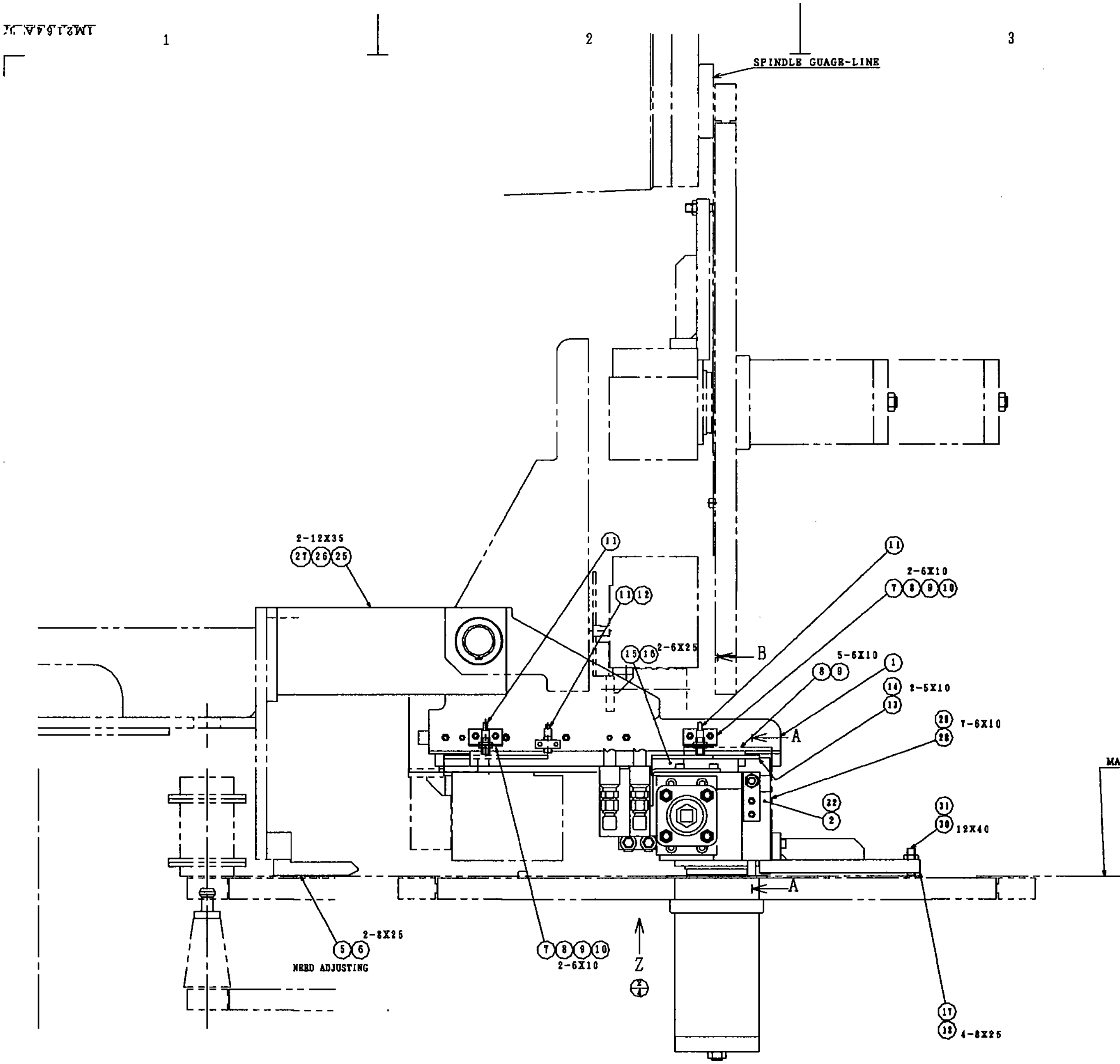
ITEM NO.	D.W.G NO.		PART NAME & DESCRIPTION		QUALITY	WEIGHT	Q1	Q2	Q3	Q4	PO
1	3M03996	1	Cover			2.0	1				
2			Botton Head Bolt	8x10			9				
3	4M04091	3	Cover			1.2	1				
4	KY69535	1	Cover				1				
5			Botton Head Bolt	8x15			2				
6	RY78112		Cover				1				
7			Botton Head Bolt	6x10			5				
8	3M06739		Cover			6.3	1				
9			Washer	8			5				
10			Spring Washer	8			5				
11	4M04510	1	Plate 4			0.38	3				
12			Socket Head Capscrew	12x30			3				
13	4M06238		Collar 19			0.04	1				
14	4M04309	1	Bolt			0.4	1				
15	4M06239		Collar 28.5			0.06	1				
16	2M02454		Oil Pan 38			10.6	1				
17			Socket Head Capscrew	8x20			4				
18			Plug	3/4B			1				
19			Hex Nut	12			1				
20			Socket Head Capscrew	12x60			1				
21											
22											
23											
24											
25											

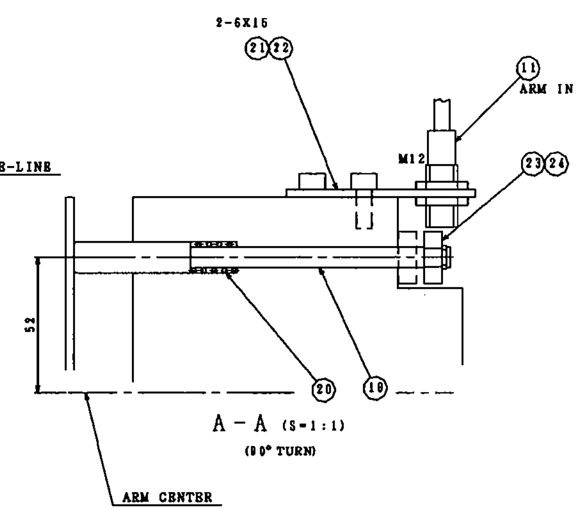


1:10
17
DRAWN-by 14·JUL·'98
MANDAI
CHECK-by
TITLE
COVER ASSY
HAAS ATC38
MORI-MACHINERY-CORPORATION
1M2025A

APPROVED DRAWN

ITEM NO.	D. W. G NO.		PART NAME & DESCRIPTION		QUALITY	WEIGHT	Q1	Q2	Q3	Q4	FO
1	BY01906	3	Swivel Base				1				
2	BY07046	3	Changer Body				1				
3											
4											
5	4M06869		Dog			0.8	1				
6			Socket Head Capscrew	8X25			2				
7	3L00063		LS Stay				2				
8			Socket Head Capscrew	6X15			4				
9			Washer	6			4				
10			Spring Washer	6			4				
11			Proximity Switch				4				
12			Attachmennt				1				
13	RY78159		Plate				1				
14			Countersunk Head Screw	5X10			2				
15	RY47298		Dog				1				
16			Socket Head Capscrew	6X25			2				
17	3M07148	1	Bracket			2.9	1				
18			Socket Head Capscrew	8X25			4				
19	S345593	2	Pin			0.07	1				
20	S382989		Spring				1				
21	S345594	3	LS Stand			0.04	1				
22			Socket Head Capscrew	6X15			2				
23	S345595	1	Dog			0.01	1				
24			'E' Circrip	6			1				
25	4M07483		Bracket				1				
26			Socket Head Capscrew	12X35			2				
27			Spring Pin	8X40			2				
28	2M02722	3	Cover				1				
29			Socket Head Capscrew	6X10			3				
30			Set Screw	12X40			1				
31			Nut	3-12			1				
32	3M07149	1	Changer Body Machining Dwg.				1				
33											
34											
35											
36											
37											
38											
39											
40											





A - A (S=1:1)
(90° TURN)

APPROVED DRAWN

1:3

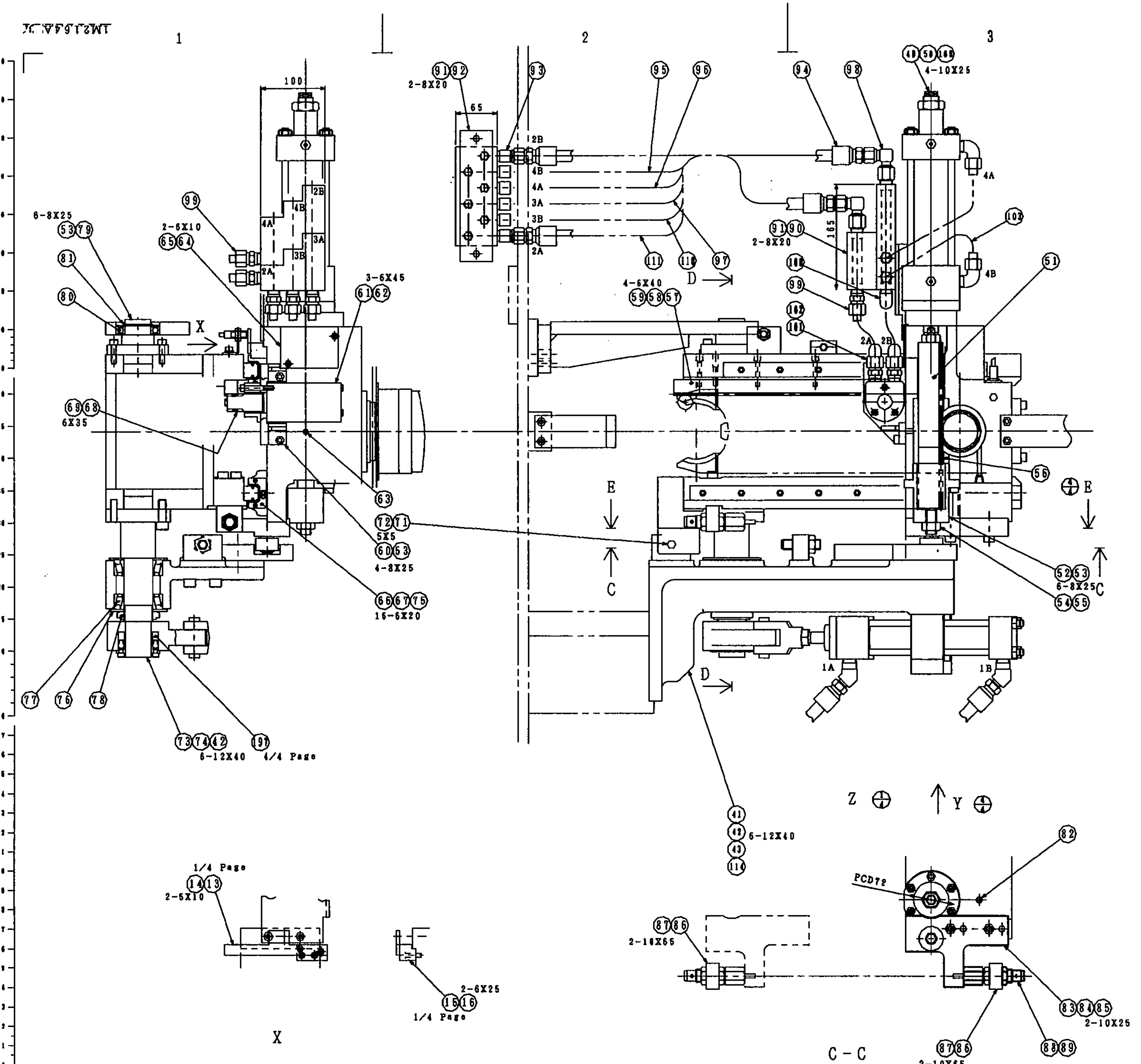
DRAWN-by 12-May-'99 M. MANDAI

CHECK-by

TITLE CHANGER ASSY

HAAS ATC

MORI-MACHINERY-CORPORATION 1M2164A



ITEM NO.	D. W. G NO.		PART NAME & DESCRIPTION		QUALITY	WEIGHT	Q1	Q2	Q3	Q4	PO
41	EY01907	6	Under Bracket				1				
42			Socket Head Capscrew	12X40			12				
43			Parallel Pin	10X40			5				
44											
45											
46											
47											
48											
49	3M07151	1	Hyd. Cylinder				1				
50			Socket Head Capscrew	10X25			4				
51	3L00068	1	Rack				1				
52	L395294	2	End Housing				1				
53			Socket Head Capscrew	8X25			16				
54	Y200001		Stopper Bolt				1				
55			Hex Nut	3-16			1				
56	S446908		Bush				1				
57	KY55920	1	Rack				1				
58			Socket Head Capscrew	6X40			4				
59			Taper Pin	6X30			2				
60	2L00026	3	Motor Bracket				1				
61			Hyd. Motor OMM-	32B-B *YUKEN			1				
62			Socket Head Capscrew	6X45			3				
63			Set Screw	8X15			1				
64	4M08956		Cover				1				
65			Pan Head Screw	6X10			2				
66	KY55921		Linear Guide				1				
67			Socket Head Capscrew	6X20			16				
68	3L00060	1	Gear 12				1				
69			Hex Screw	6X35			1				
70											
71	3L00073		Stopper Piece				2				
72			Set Screw	5X5			2				
73	KY69613	1	Shaft				1				
74			Parallel Pin	10X35			1				
75			Bush	LFB-2825			1				
76	3L00076		Cover				2				
77			Bearing	33009JR*KOYO			2				
78			"U" Nut	M45X1.5*FUJI			1				
79	RY78120	2	Shaft				1				
80			Bearing	6008ZZ			1				
81			Retaining Ring	40			1				
82			Socket Plug	Rc1/8			1				
83	RY47297	2	Stopper Block				1				
84			Socket Head Capscrew	10X25			2				
85			Spring Pin	10X20			2				
86	3L00223		Block				2				
87			Socket Head Capscrew	10X65			4				
88			Mini. Softener W-A	2M20N016SD*TAIYO			2				
89			Stopper Nut	SN-A2M20*TAIYO			2				
90	3M01088	3	Connector				1				
91			Socket Head Capscrew	8X20			4				
92	RY74200		Block				1				
93			Hose Joint	1036-04-06			6				
94			HOSE N177-06-	750 1005=1005			1				
95			HOSE N177-06-	6[illegible]5 1005=1005			1				
96			HOSE N177-06-	685 1005=1005			1				
97			HOSE N177-06-	720 1005=1005			1				
98			Swivel Joint	SK-34-9			6				
99			Tube Fitting	KCT10-030E			5				
100			Tube Fitting	KLN10-030E			1				
101			Tube Fitting	KHB10-030E			2				
102			Tube Fitting	KLA10-000E			2				
103			Steel Tube	10X1.5			1				
104											
105											
106											
107											
108											
109	4M08955	2	CYL Plate			1.2	1				
110			HOSE N177-06-	715 1005=1005			1				
111			HOSE N177-06-	670 1005=1005			1				
112							1				
113							1				
114	3M07145	1	Under Bracket Machining Dwg				1				

SCALE 1:3

DRAWN-by 12-May-'99 M. MANDAI

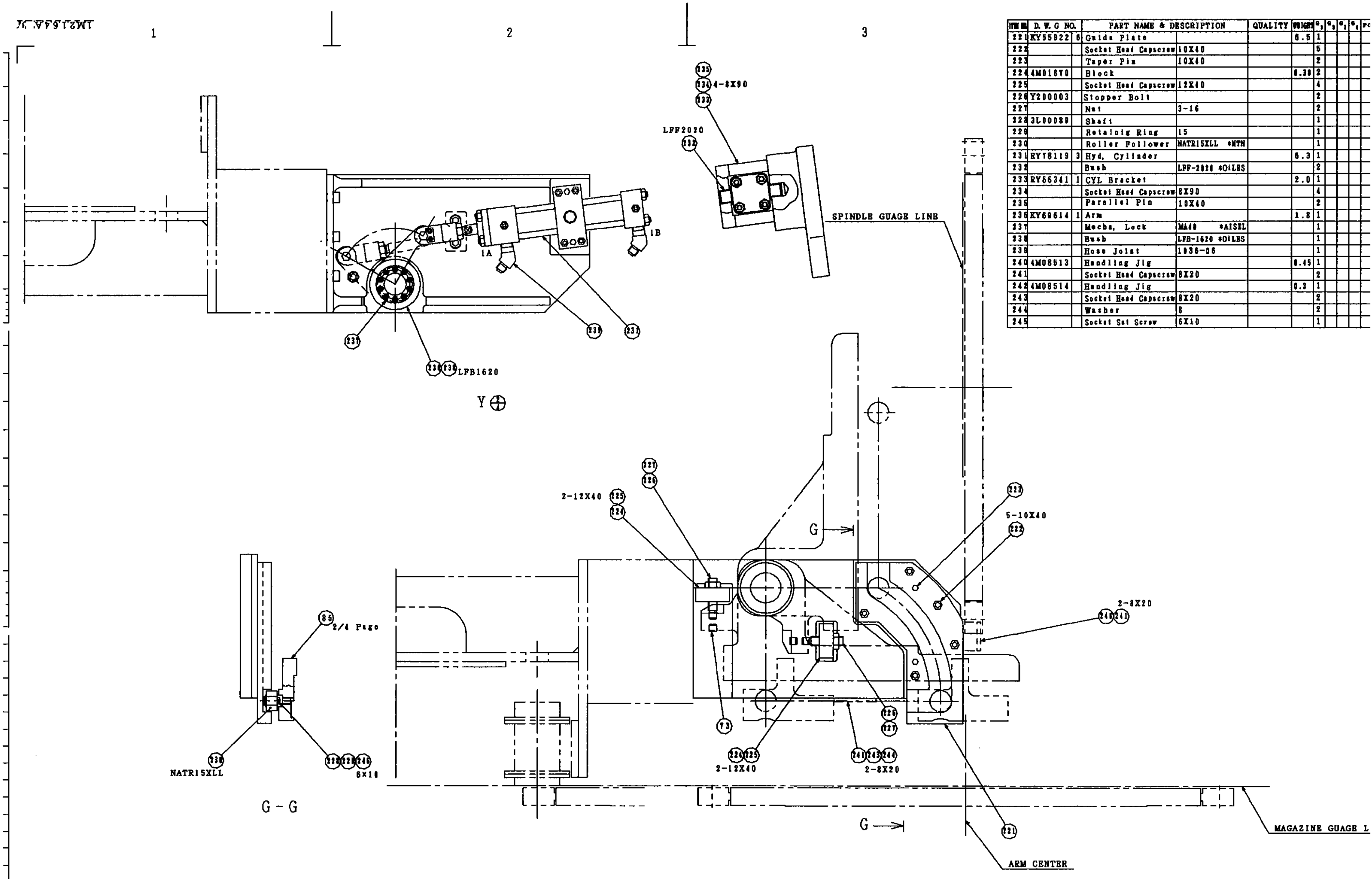
CHECK-by

TITLE CHANGER ASSY

HAAS ATC

MORI-MACHINERY-CORPORATION

1M2164A



ITEM NO.	D. W. G NO.		PART NAME & DESCRIPTION		QUALITY	WEIGHT	Q1	Q2	Q3	Q4	PC
221	KY55922	6	Guide Plate			6.5	1				
222			Socket Head Capscrew	10X40			5				
223			Taper Pin	10X40			2				
224	4M01870		Block			0.38	2				
225			Socket Head Capscrew	12X40			4				
226	Y200003		Stopper Bolt				2				
227			Nut	3-16			2				
228	3L00080		Shaft				1				
229			Retainig Ring	15			1				
230			Roller Follower	NATR15XLL *NTN			1				
231	RY78119	3	Hyd. Cylinder			6.3	1				
232			Bush	LFF-2020 *OILES			2				
233	RY66341	1	CYL Bracket			2.0	1				
234			Socket Head Capscrew	8X90			4				
235			Parallel Pin	10X40			2				
236	KY69614	1	Arm			1.8	1				
237			Mecha. Lock	MA40 *AISEL			1				
238			Bush	LFB-1620 *OILES			1				
239			Hose Joint	1036-06			1				
240	4M08513		Handling Jig			0.45	1				
241			Socket Head Capscrew	8X20			2				
242	4M08514		Handling Jig			0.3	1				
243			Socket Head Capscrew	8X20			2				
244			Washer	8			2				
245			Socket Set Screw	6X10			1				

1:3

DRAWN-by 1-May-'99 M. MANDAI

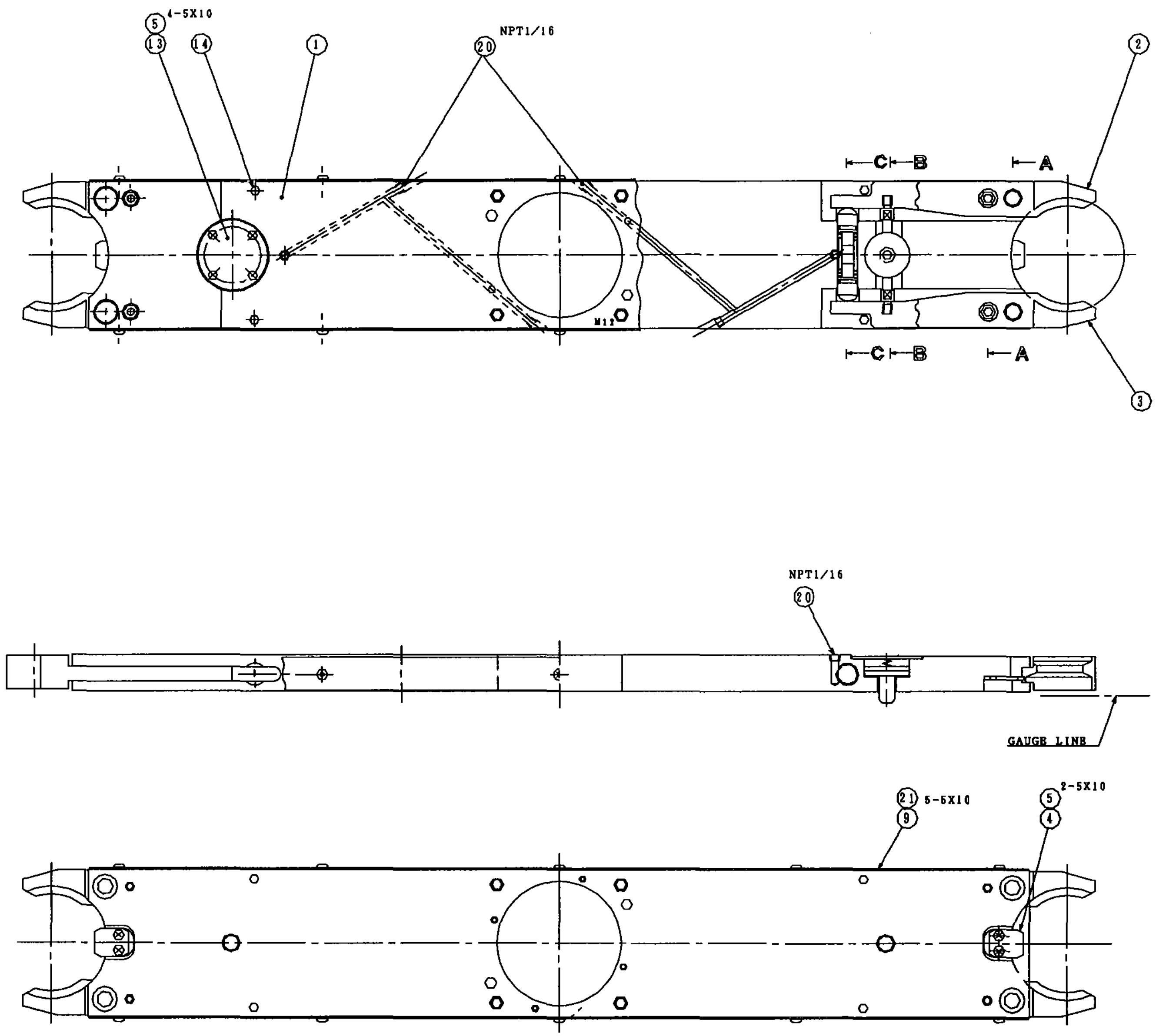
CHECK-by

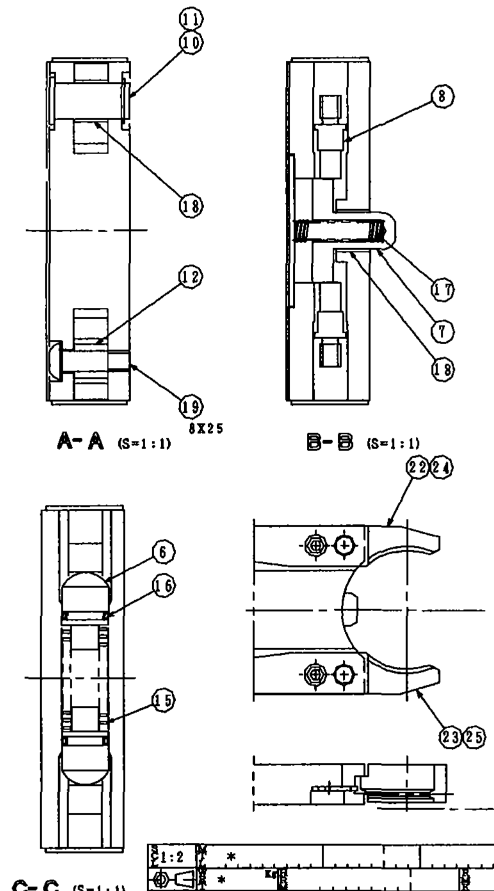
TITLE CHANGER ASSY HAAS ATC

MORI-MACHINERY-CORPORATION 1M2164A

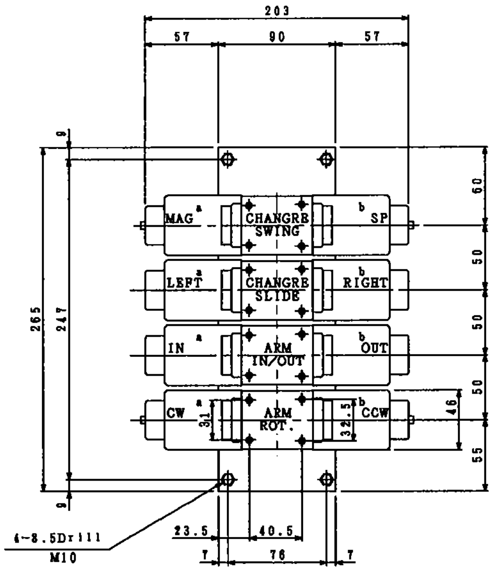
APPROVED DRAWN

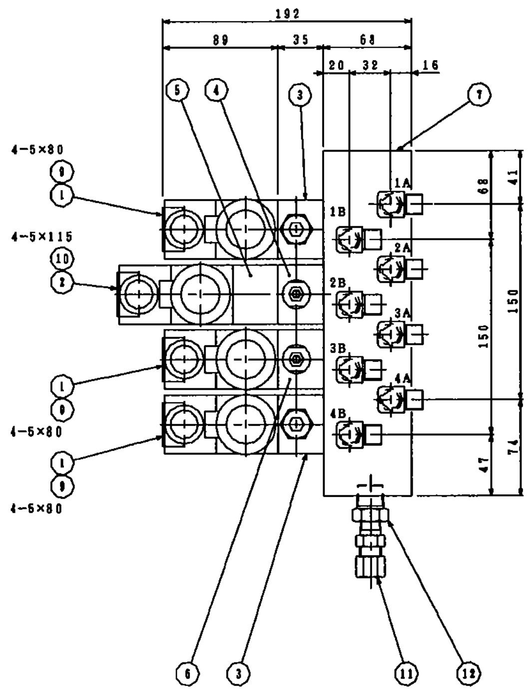
ITEM NO.	D. W. G NO.		PART NAME & DESCRIPTION		QUALITY	WEIGHT	G1	G1	G3	G4	G6
1	1M01970		Arm Body			23.5	1				
2	GY05867	3	Claw BT			0.7	2				
3	GY05871	3	Claw BT			0.7	2				
4	RY30002	2	Key			0.01	2				
5			Countersunk Head Screw	5×10			12				
6	RY32043	5	Piston			0.05	4				
7	RY30005		Lock pin			0.09	2				
8	RY30006	2	Pin			0.01	4				
9	4M08946		Cover			0.3	2				
10	RY30008	2	Pin			0.06	4				
11			Circrip	14			4				
12	RY30010	1	Spaser			0.01	4				
13	RY30004	1	Cover			0.07	2				
14			Spring Pin	8×30			4				
15			Spring	TR17×45			2				
16			'O' RING	P14			4				
17			Spring	LR8×40			2				
18			Bush	LFB1412			6				
19			Socket Button Head Screw	8×25			4				
20			Socket Plug	NPT1/16			6				
21			Socket Button Head Screw	5×10			10				
22	GY08617	1	Claw ANSi			0.7	2				
23	GY08618	1	Claw ANSi			0.7	2				
24	GY08615	1	Claw DiN			0.7	2				
25	GY08616	1	Claw DiN			0.7	2				



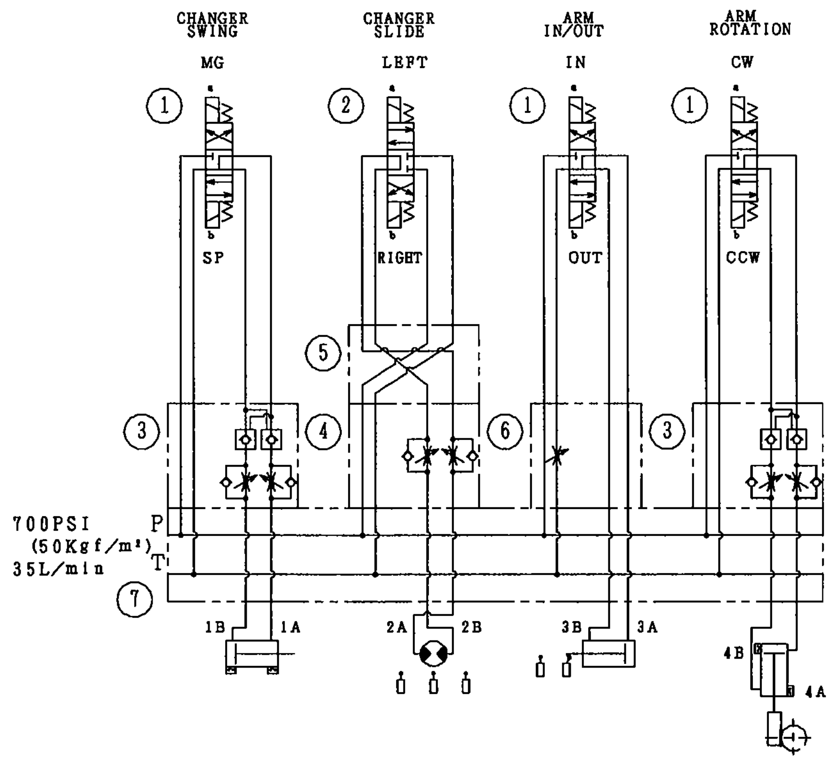


SCALE	1:2
DRAWN-by 26-DEC-'99	MANDAI
CHECK-by	
TITLE	ARM ASSY HAAS ATC
MORI-MACHINERY-CORPORATION	1M2097A

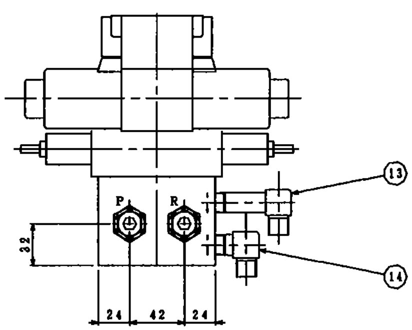




ITEM NO.	D. W. G NO.		PART NAME & DESCRIPTION		QUALITY	WEIGHT	G_1	G_2	G_3	G_4
1			Sol.Operated Directional Valve	HD1-3W-BGA-025A-WTA3			3			
2			Sol.Operated Directional Valve	HD1-3W-ARB-025A-WTA2			1			
3			Compound Valve	HKF3H-W-Y2-40K-025B			2			
4			Throttle Valve	HF3H-W-40K-025B			1			
5	3M01491		Block				1			
6			Throttle Valve	HF3H-P-40K-025B			1			
7			Blto Kits	HMD-4-024-03TY2			1			
8										
9			Socket Head Capscrew	HKS-NA-5x80			12			
10			Socket Head Capscrew	5x120			4			
11			Joint	KCT10-030E			2			
12			Bushing	SBU04-030J			2			
13			Hose Joint	9034-06			4			
14			Hose Joint	1034-06			4			
15										



HYDRAULIC CIRCUIT



1:2			
DRAWN-by 13-JAN-'91 MANDAI	TITLE		
CHECK-by	VALVE ASSY		
	HAAS ATC		
MORI-MACHINERY-CORPORATION	1M2102A		

2000-04-22
Mori Machinery Corporation
NORIAKI YASUHARA

1:Changer swing (MG<->SP 90)

Changer assembly (1M2164A-4/4)

Part No.231 Hyd, Cylinder

-1)Cushion adjustment

The end of Magazine	->	Rod side
Spindle side	->	Head side

-2)Speed adjustment

Valbe assembly (1M2102A)

It is done with the flow control valve under the valve for the changer swing.

2:Changer slide (Right<->Left)

Changer assembly (1M2164A-2/4)

Part No.61 Hyd, Motor

-1)Cushion adjustment

It is done with the shock absorber of the partial number 95.

-2)Speed adjustment

Valbe assembly (1M2102A)

It is done with the flow control valve under the valve for the changer slide.

3:Arm rotation (180CW-CCW)

Changer assembly (1M2164A-2/4)

The hydraulic cylinder of the partial number 57.

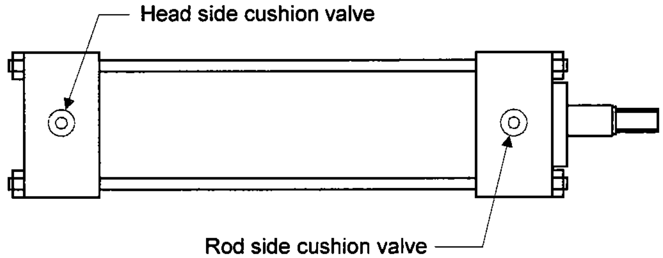
-1)Cushion adjustment

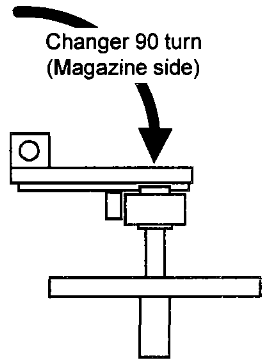
CW side	->	Head side
CCW side	->	Rod side

-2)Speed adjustment

Valbe assembly (1M2102A)

It is done with the flow control valve under the valve for the arm rotation.

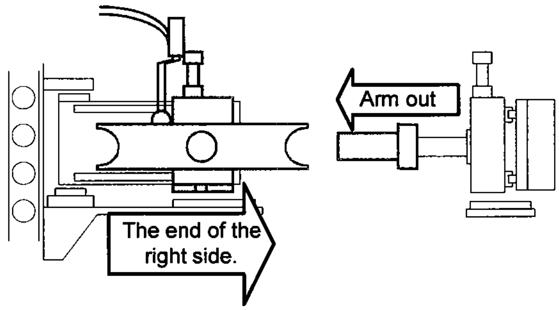


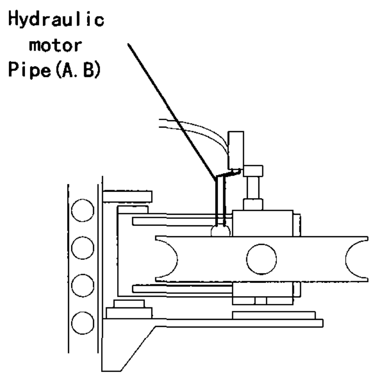


1: Interrupt a power supply after you surely carry out the next movement by the ATC operation.

-1)The end of the right side.
-2)Changer 90 turn. (Magazine side)
-3)Arm out.

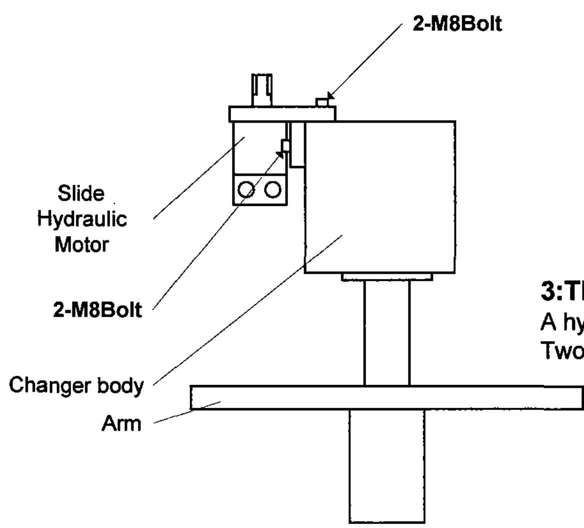
*Turn off a power supply under the above condition.





2:Hydraulic pressure off

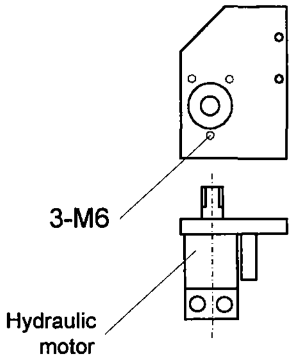
Two pipes which lay a pipe in the hydraulic motor for the changer slide are removed.



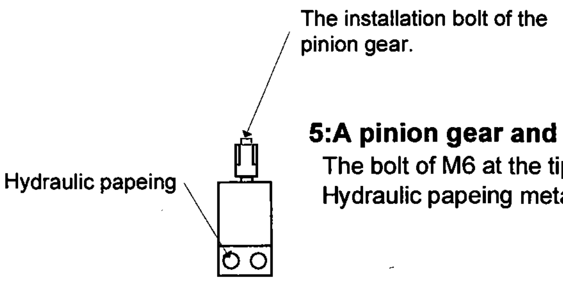
3:The removal of the hydraulic motor

A hydraulic motor bracket installation bolt 2-M8 is removed. Two places.

The condition which a changer unit from the top



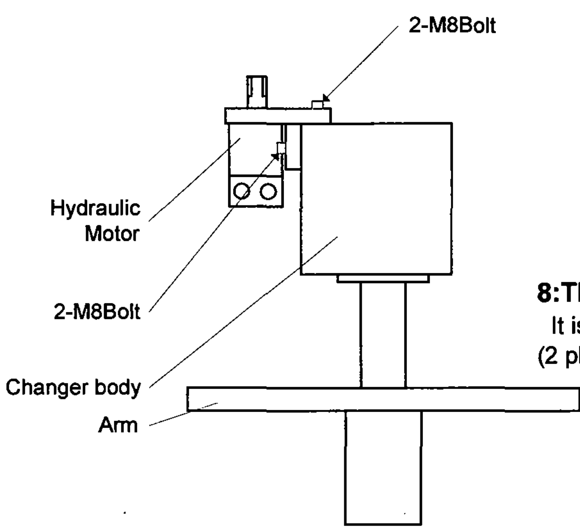
4:A hydraulic motor is removed from the motor bracket.
The installation bolt 3-M6 flat head bolt of the hydraulic motor and the bracket is removed.



5:A pinion gear and papeing metal fittings are removed.
The bolt of M6 at the tip of the hydraulic motor shaft is loosened, and a gear is removed.
Hydraulic papeing metal fittings (two) are removed.

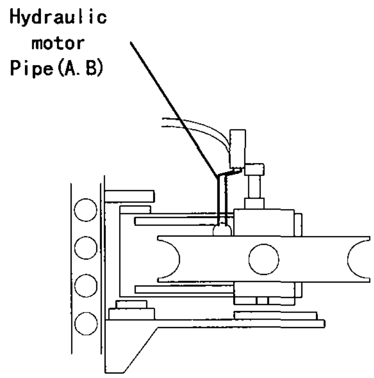
6:A pinion gear and papeing metal fittings are installed in the new hydraulic motor.
A gear is inserted in the tip of the hydraulic motor shaft, and the bolt of M6 is wrung.
Hydraulic papeing metal fittings (two) are fastened.

7:A hydraulic motor is installed in the bracket.
A hydraulic motor is installed in the bracket with the installation bolt 3-M6 flat head bolt.



8:The installation of the hydraulic motor
It is installed with the hydraulic motor bracket installation bolt 2-M8.
(2 places)

The condition which a changer unit from the top

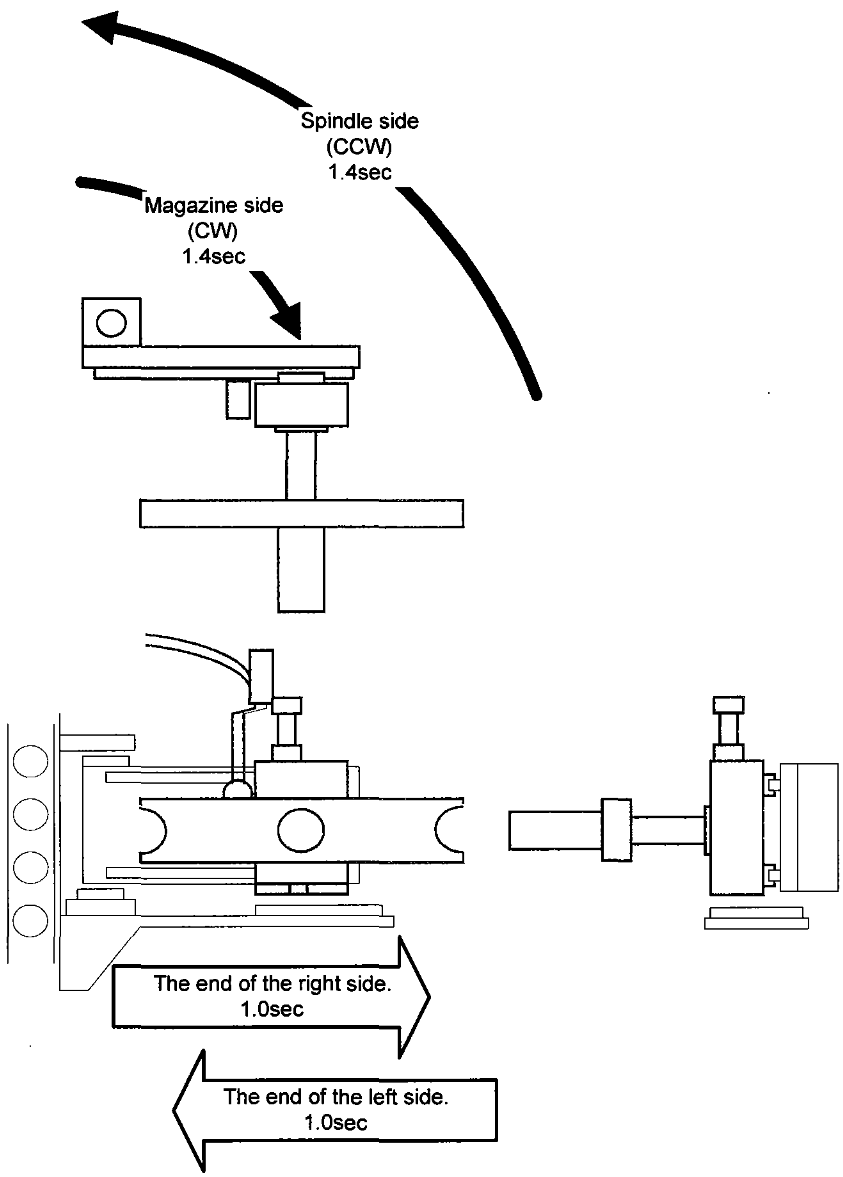


piping
9:A papeing to the hydraulic motor

Two papeings are installed in the hydraulic motor for the changer slide.

Attention:

Be sure to confirm whether you can set a papeing smoothly again if a hydraulic papeing doesn't hold a hydraulic motor.



Do the speed adjustment of each movement, and do movement confirmation by the M06 MDI operation.

Changer cam follower exchange process document

1:It turn at 90 by the changer turn on the magazine side, and the power supply is cut off.

2:It is made the condition that a papeing to the hydraulic motor for the changer slide is loosened and that a changer is pushed by hand and which can be moved.

3:A changer is pushed by hand in the right direction, and stopped in the magazine end front.

4:A cam follower can be removed at the same time by removing the bracket installed under the changer body, too.
A bracket removes 3-M10 screw.

5:The cam follower shaft which breaks in the bracket is removed first.

6:A looseness stop does with the M6 set screw in the cam follower shaft from the side.

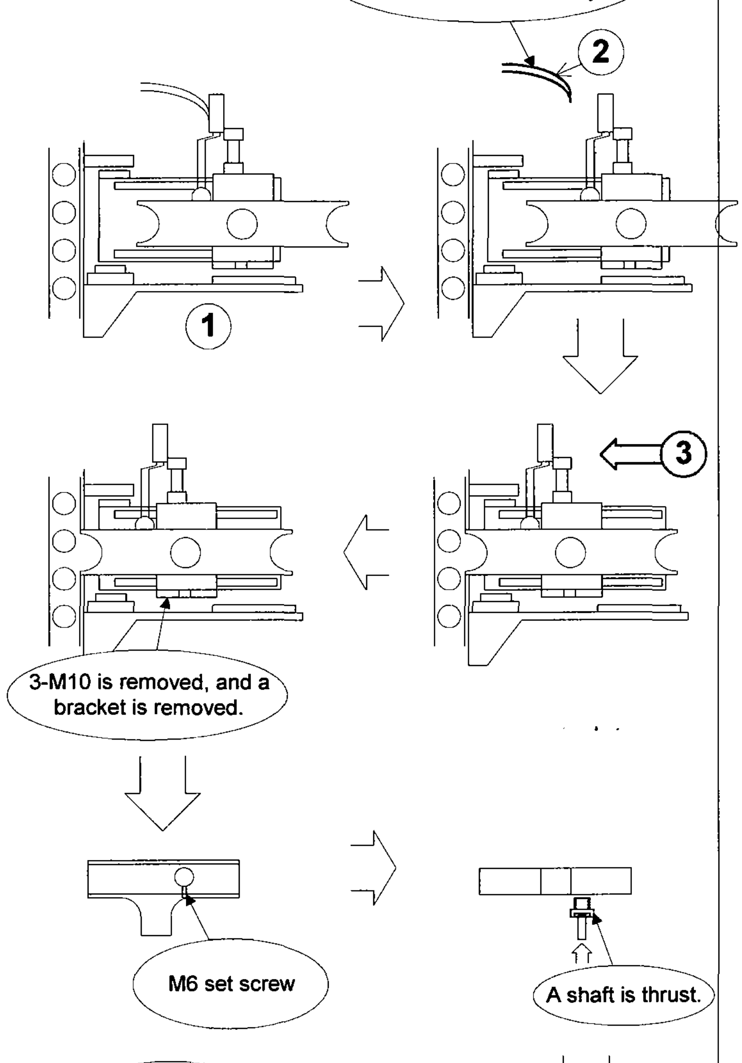
7:If a shaft comes off, only a new shaft is thrust.
Thrust it by using the wrench to the end.

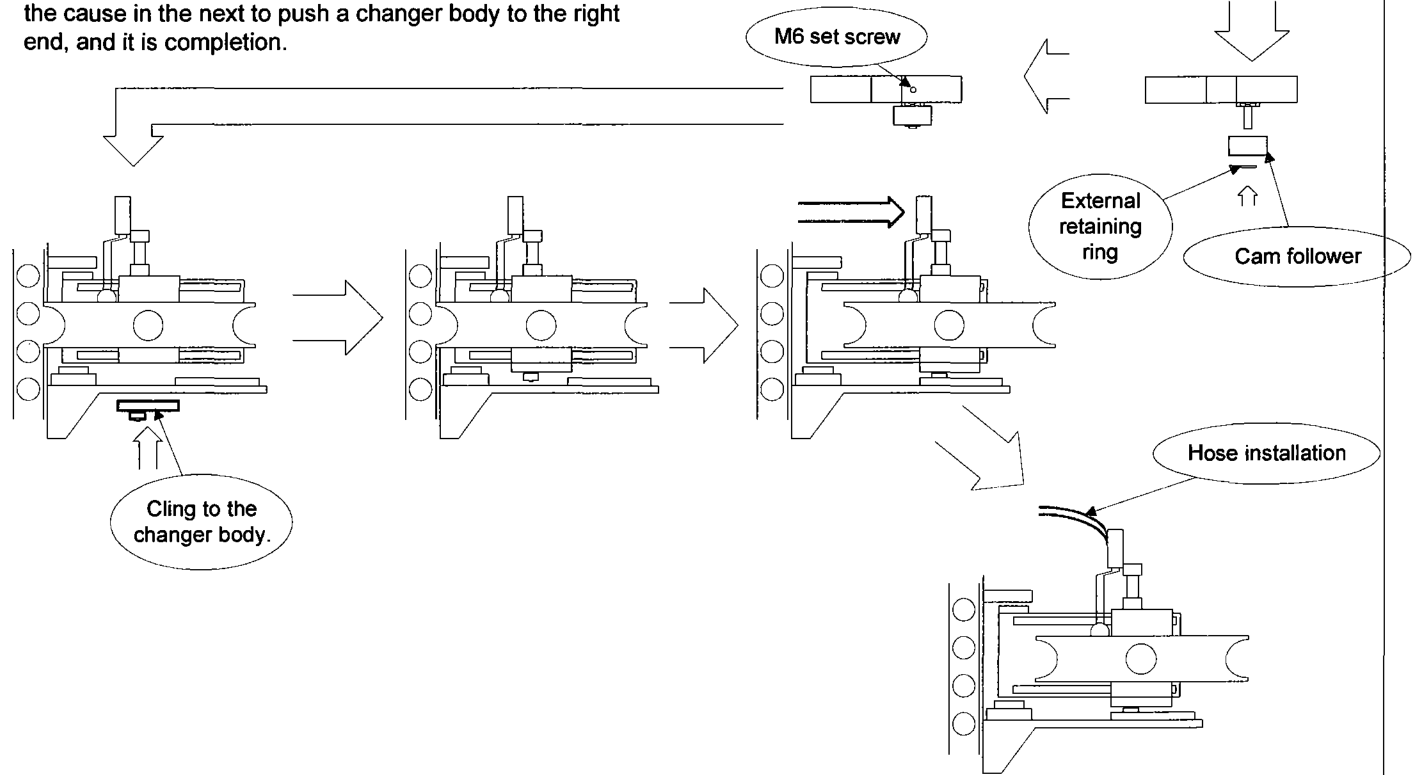
8:A looseness stop is done with the M6 set screw from the side.
Use it if there is a screw lock (bond).
Put a hollow on the cam follower shaft a little in the drill of 4mm, and then do a M6 set screw when there is no bond.

9:A cam follower is inserted into the shaft, and fixed with the external retaining ring.

10:A bracket is assembled under the changer body.

11:If work is completed, a hydraulic papeing is returned to the cause in the next to push a changer body to the right end, and it is completion.





The adjustment process of the ATC changer cam follower

1:It confirms whether a cam follower is in the center of the groove under the condition on the changer 90 turn magazine side.

2:When a guide hits a cam follower, a stopper bolt at the end of 90 turn magazine is adjusted and adjusted in the center of the guide.

3:A turn spindle side is adjusted at 90 with the process which is the same as the item 1-2, too.

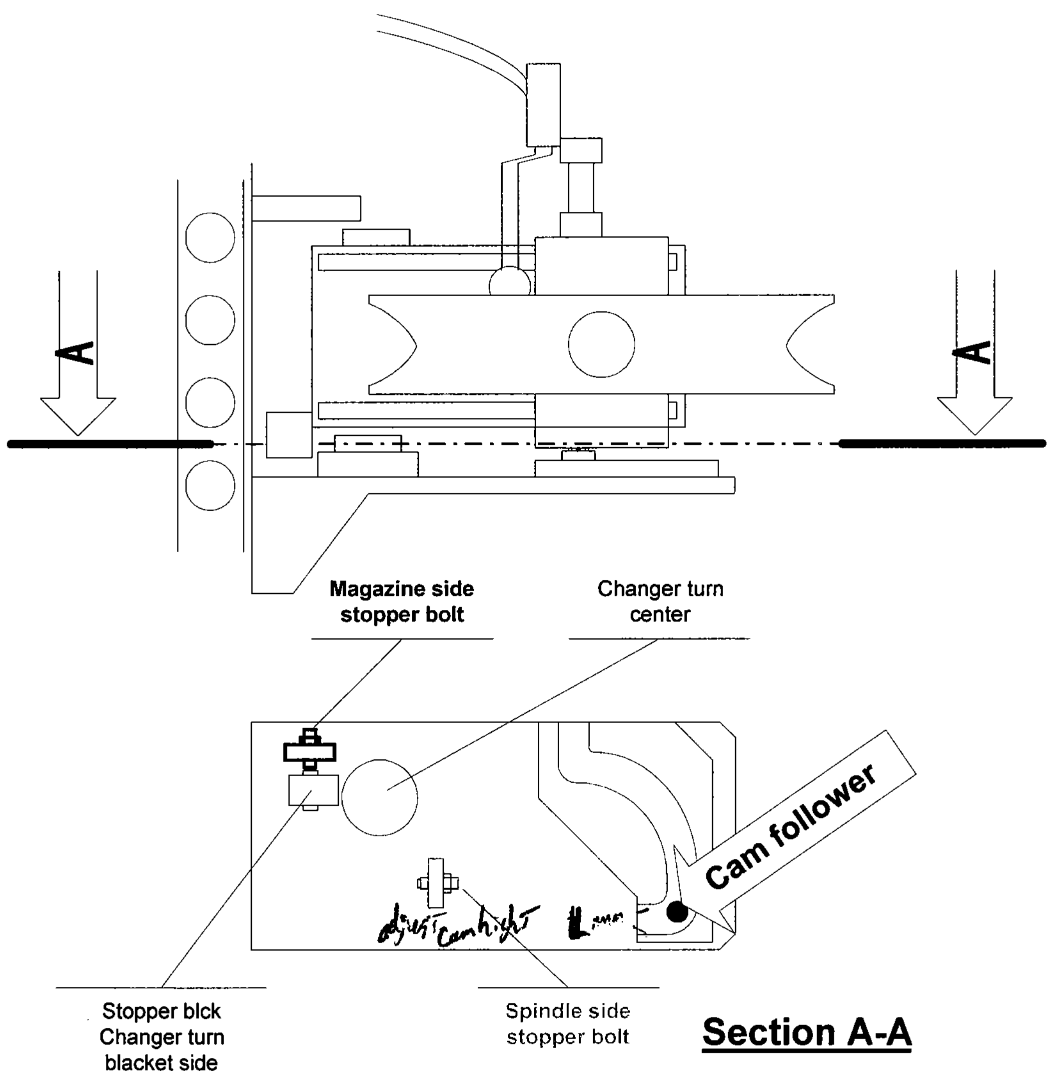
4:90 turn movement is repeated by the manual operation, and a shock at each stroke end is confirmed.

5:It is adjusted with the cushion of the cylinder if a changer unit seems to bound in the turn direction at the stroke end.

6:It is adjusted with doing speed adjustment with the flow control valve of the cylinder hydraulic circuit and keeping a balance when bound can't be absorbed only with the cylinder cushion.

slide	:1.0sec(right,left)
90turn	:1.4sec(Magazine side, spindle side)

7:By the automatic operation, confirmation
Confirmation is done under the condition which makes one side (magazine side) of the arm have the tool of the maximum weight.



Section A-A

Shock absorber adjustment point document

2000/05/02
Mori Machinery Corporation
NORIAKI YASUHARA

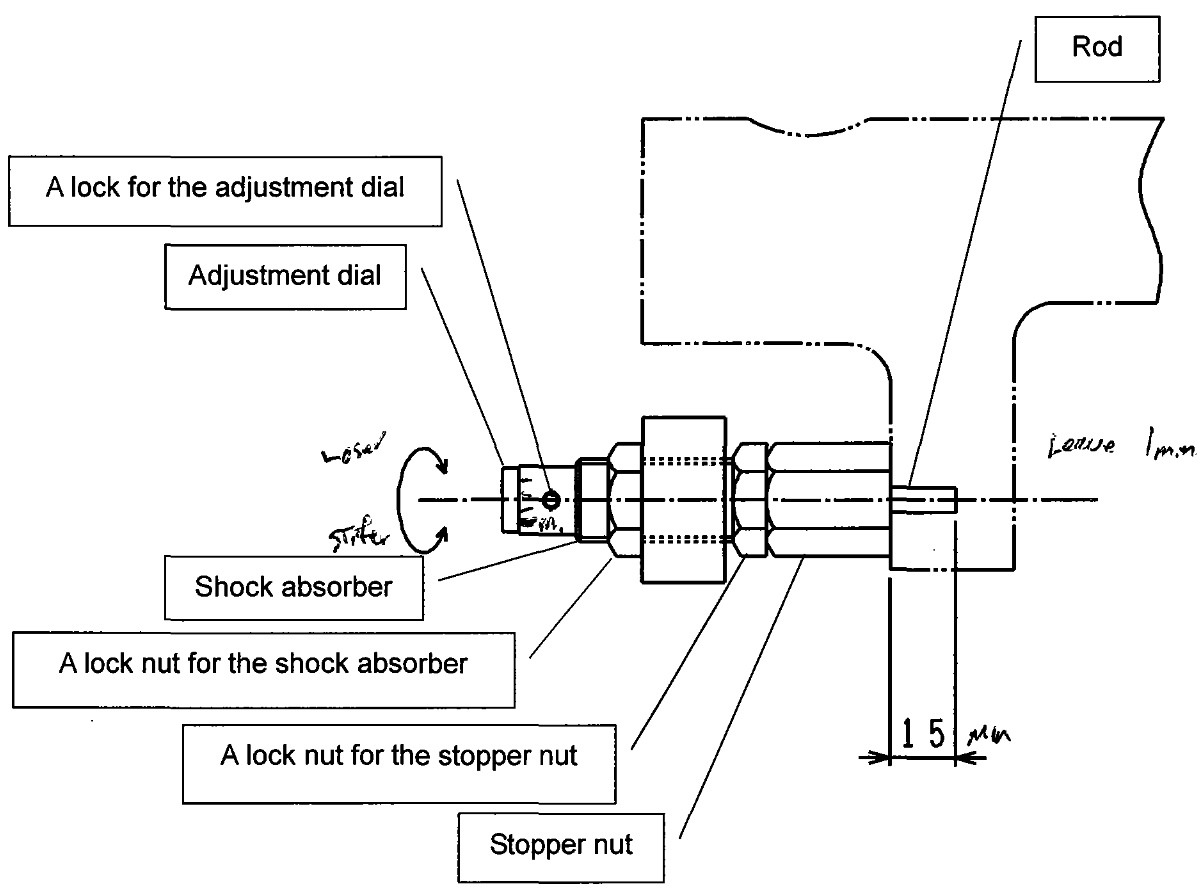
This shock absorber can't be used as a stopper at the rod stroke end.
Set it up by the following point.

1. Set it on the position of 15mm from the tip of the rod, and the end face of the stopper nut is to lock a shock absorber with the lock nut under the free condition.

2. Set up an absorption energy adjustment knob in the position of 強, and tighten a lock screw on the side of the shock absorber, and lock.

3. Turn an absorber itself, and adjust position adjustment at the end of the changer slide, and fix it with the lock nut.

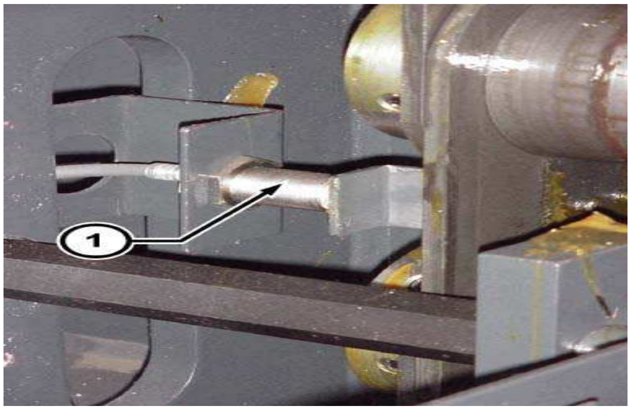
<u>Attention: It can't be adjusted with the stopper nut.</u>



HS-3/R ATC 38 HYDRAULIC TOOL CHANGER SPARE PARTS

The HS-3/R horizontal milling machine is available with an optional 38 pocket tool changer supplied by the Mori Machine company (OPTION No.: SMTC50-H3, tool changer P/N: 30-0458, MORI 1M01964 (ATC 38)). This document lists the HAAS part numbers for the spare parts available for this tool changer and provides the physical location of these spare parts on the tool changer.

ASSEMBLY NAME	ITEM NO.	PART NAME	HAAS PART NO.
MAGAZINE ASSEMBLY	1	PROXIMITY SWITCH (TOOL POCKET NO.1 DETECT, POT COUNT)	93-0171
MAIN DRIVE ASSEMBLY	2	PROXIMITY SWITCH (INDEX LOCK PIN, ARM SLIDE LEFT/RIGHT/CENTER, ARM IN/OUT)	93-0172
	3	INDEX MOTOR, HYDRAULIC	93-0173
	35	SOLENOID OPERATED VALVE	93-0702
	36	SOLENOID OPERATED VALVE	93-0703
TOOL RELEASE ASSEMBLY	4	SOLENOID OPERATED VALVE	93-0174
	5	REED SWITCH, TOOL RELEASE CYLINDER	93-0175
ARM ASSEMBLY	6	ARM ASSEMBLY	93-0176
	7	GRIPPER CLAW “A”, ANSI	93-0177
	8	GRIPPER CLAW “B”, ANSI	93-0178
	9	LOCK PIN, GRIPPER CLAW	93-0179
	10	BUSHING, GRIPPER CLAW PIVOT PIN	93-0180
TOOL CHANGER SWING ASSEMBLY	11	SLIDE MOTOR, HYDRAULIC	93-0181
	12	SHOCK ABSORBER	93-0182
	13	STOPPER NUT, SHOCK ABSORBER	93-0183
	14	ROLLER FOLLOWER	93-0184
	15	SHAFT, ROLLER FOLLOWER	93-0185
	16	RETAINING RING, ROLLER FOLLOWER SHAFT, 14mm	93-0186
	17	REED SWITCH (ARM ROT. CW/CCW, SWING ARM MAG./SPIN.)	93-0187
	18	HYDRAULIC HOSE, MOTOR, SLIDE RIGHT	93-0188
	19	HYDRAULIC HOSE, ARM IN	93-0189
	20	HYDRAULIC HOSE, ARM OUT	93-0190
	21	HYDRAULIC HOSE, ARM ROTATE CCW	93-0191
	22	HYDRAULIC HOSE, ARM ROTATE CW	93-0192
	23	HYDRAULIC HOSE, MOTOR, SLIDE LEFT	93-0193
	24	HYDRAULIC HOSE, ROTATE CYL., ROD END, 450mm	93-0194
	25	HYDRAULIC HOSE, ROTATE CYL., CAP END, 625mm	93-0195
HYDRAULIC VALVE ASSEMBLY	26	SOLENOID OPERATED VALVE, ARM SWING, IN/OUT, ROTATE	93-0196
	27	SOLENOID VALVE, CHANGER ARM SLIDE	93-0197
	28	SOLENOID, CHANGER ARM VALVES	93-0198
HYDRAULIC POWER UNIT	29	HYDRAULIC PUMP	93-0155
	30	AIR-OIL COOLER	93-0156
	31	DRIVE MOTOR	93-0157
	32	RETURN FILTER	93-0158
	33	HYDRAULIC HOSE, PRESSURE	52-0008
	34	HYDRAULIC HOSE, RETURN	52-0000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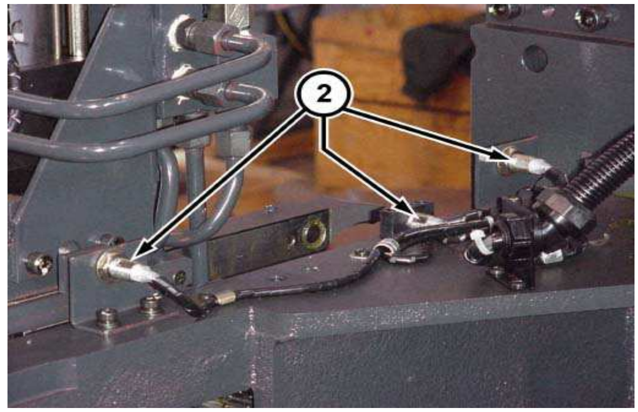
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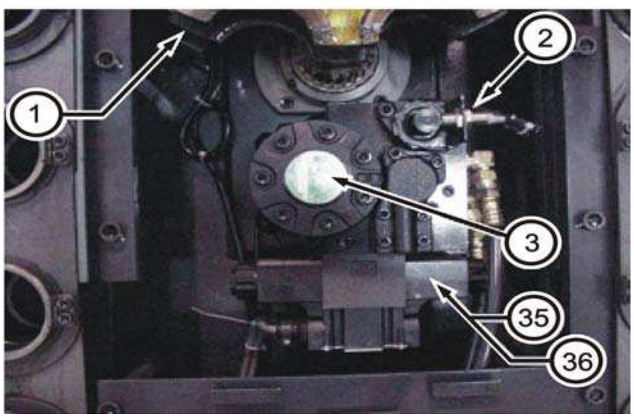
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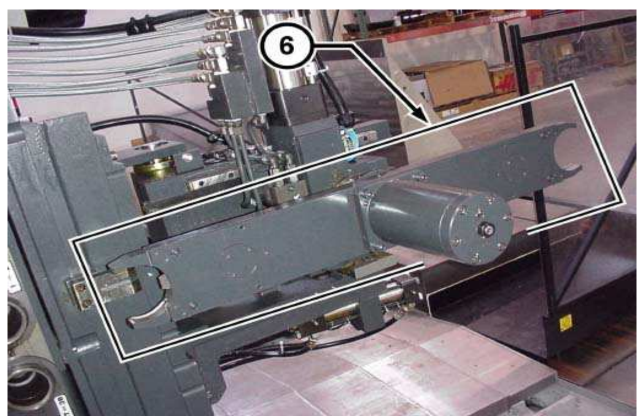
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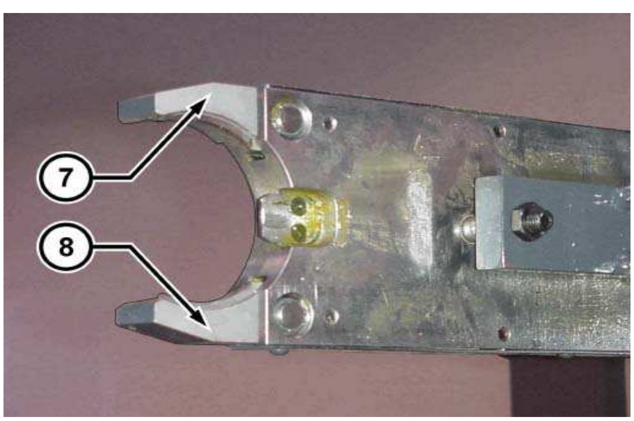
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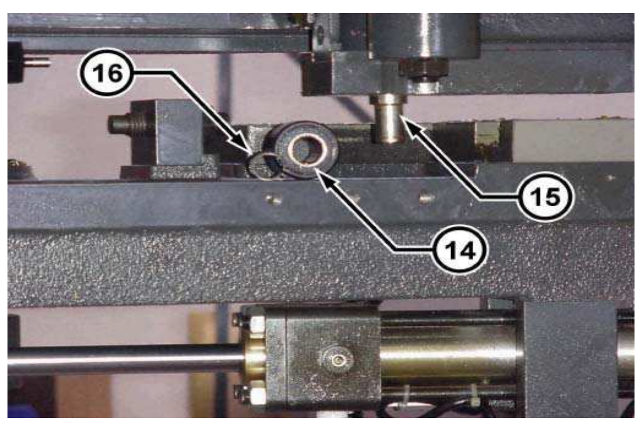
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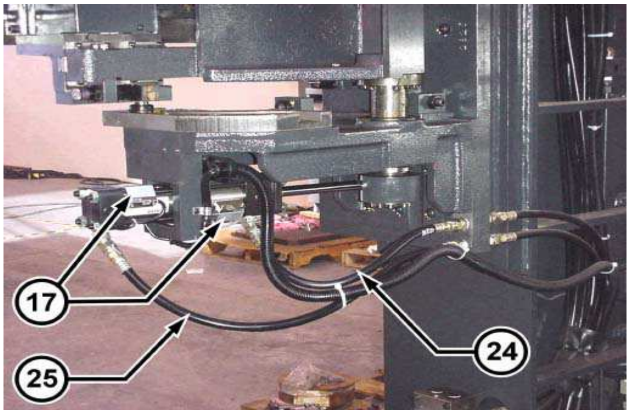
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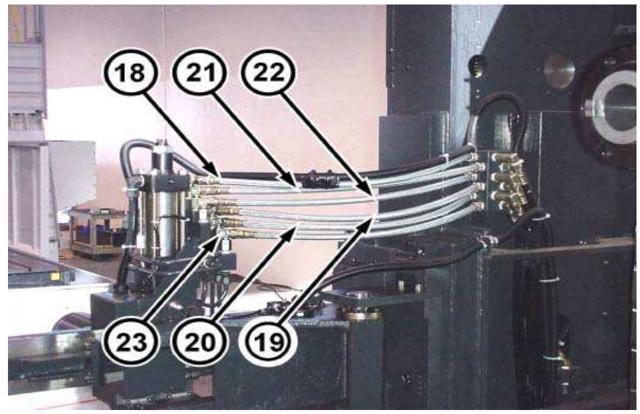
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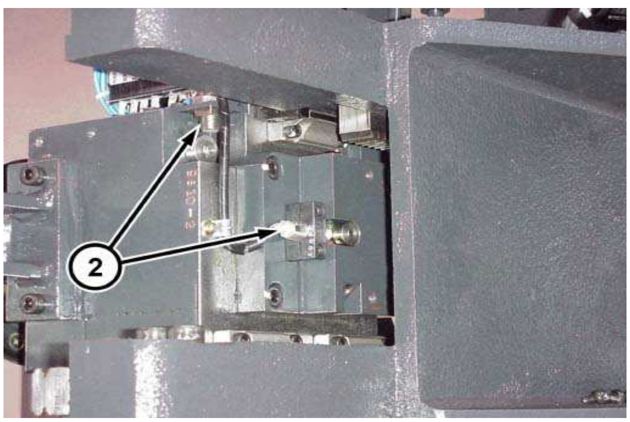
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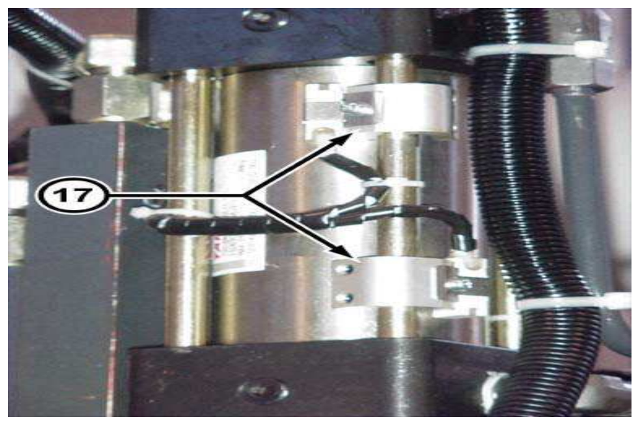
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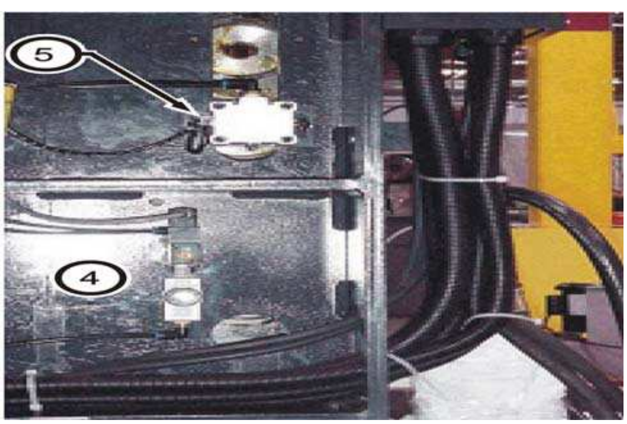
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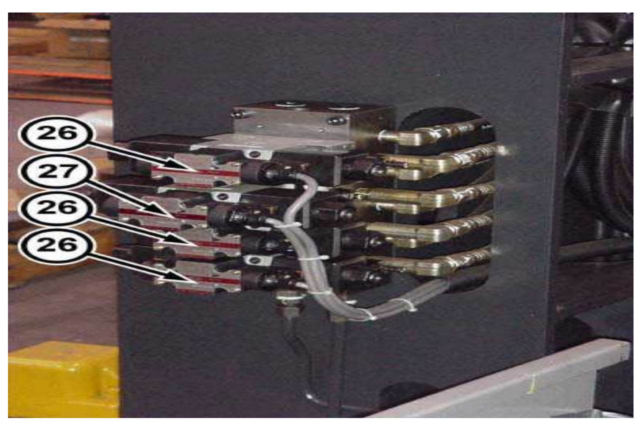
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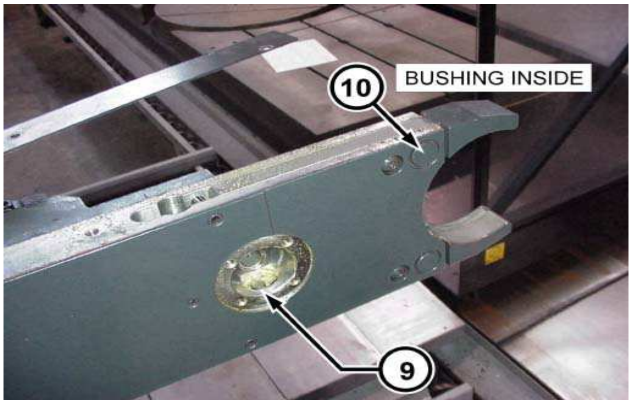
BUSHING INSIDE
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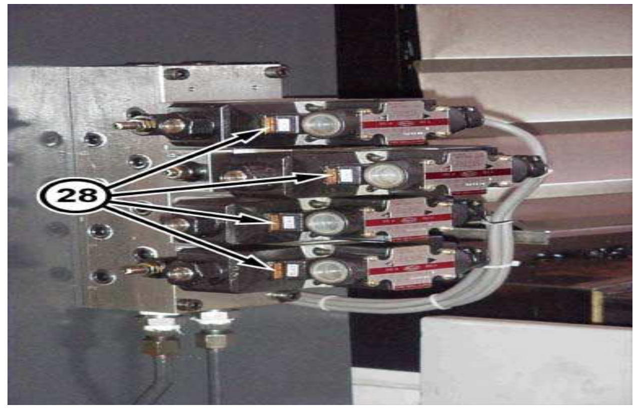
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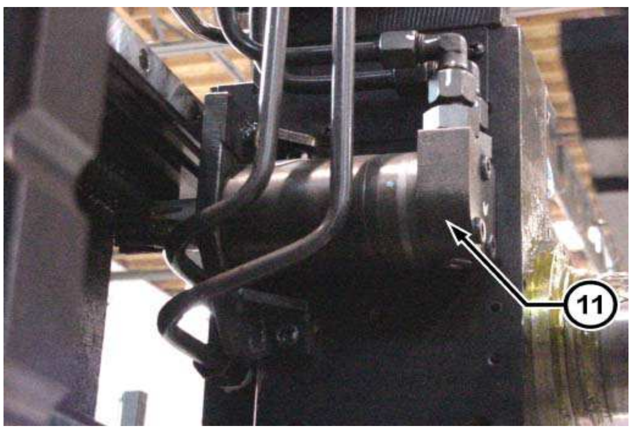
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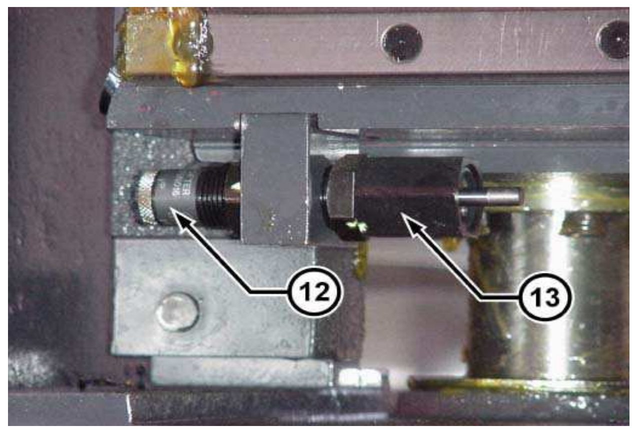
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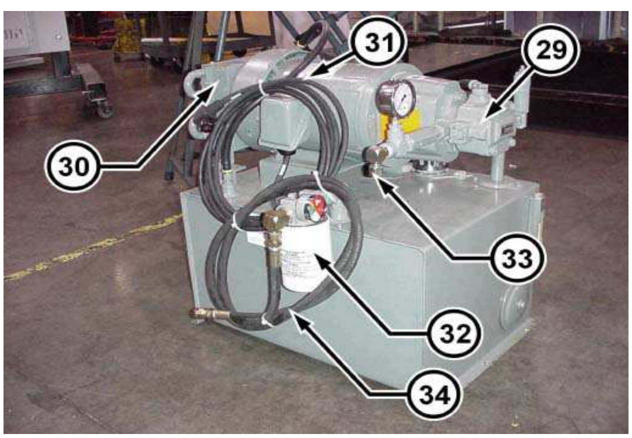
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