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USERGUIDE

MNL-00075

HCR - 100S
HCR - 100G

⚠ **WARNING - Reliance on this Manual Could Result in Severe Bodily Injury or Death!**

This manual is out-of-date and is provided only for its technical information, data and capacities. Portions of this manual detailing procedures or precautions in the operation, inspection, maintenance and repair of the product forming the subject matter of this manual may be inadequate, inaccurate, and/or incomplete and cannot be used, followed, or relied upon. Contact Conair at info@conairgroup.com or 1-800-654-6661 for more current information, warnings, and materials about more recent product manuals containing warnings, information, precautions, and procedures that may be more adequate than those contained in this out-of-date manual.

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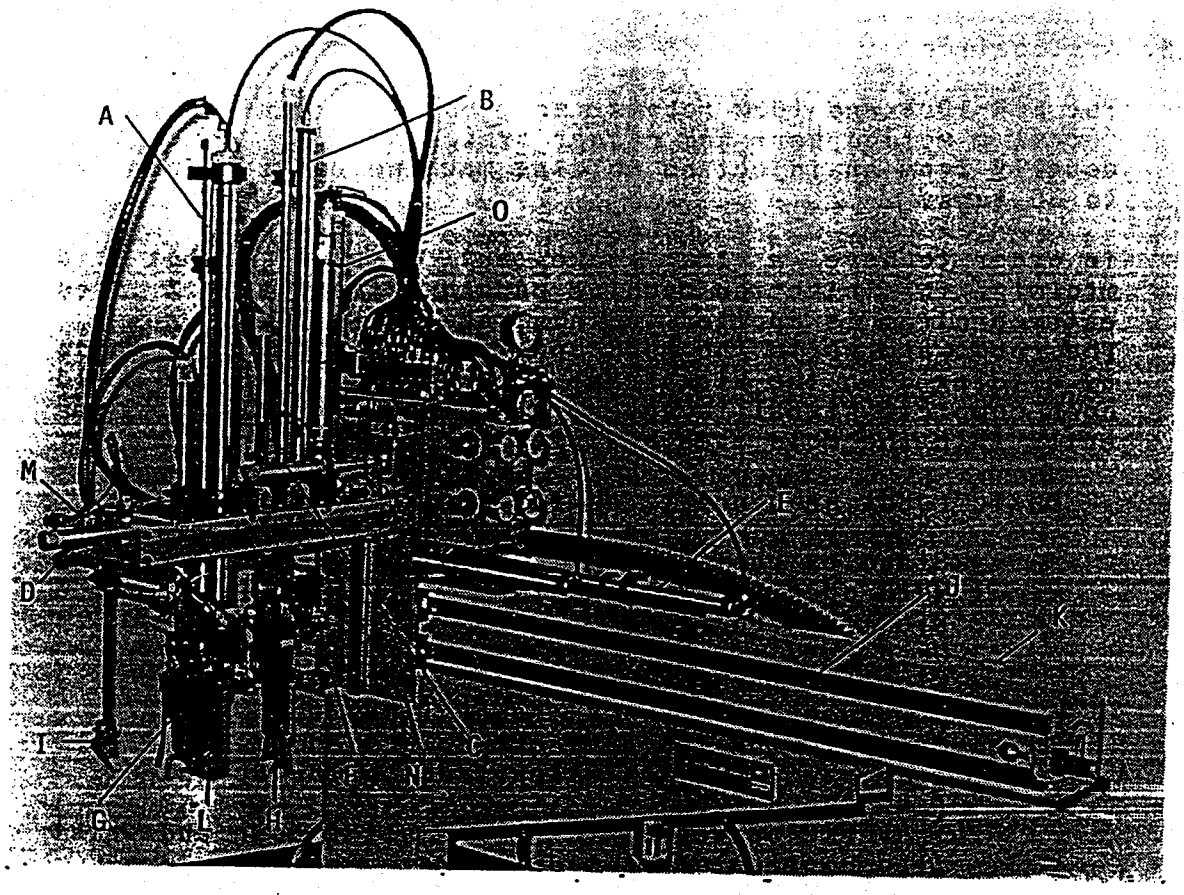
A
B
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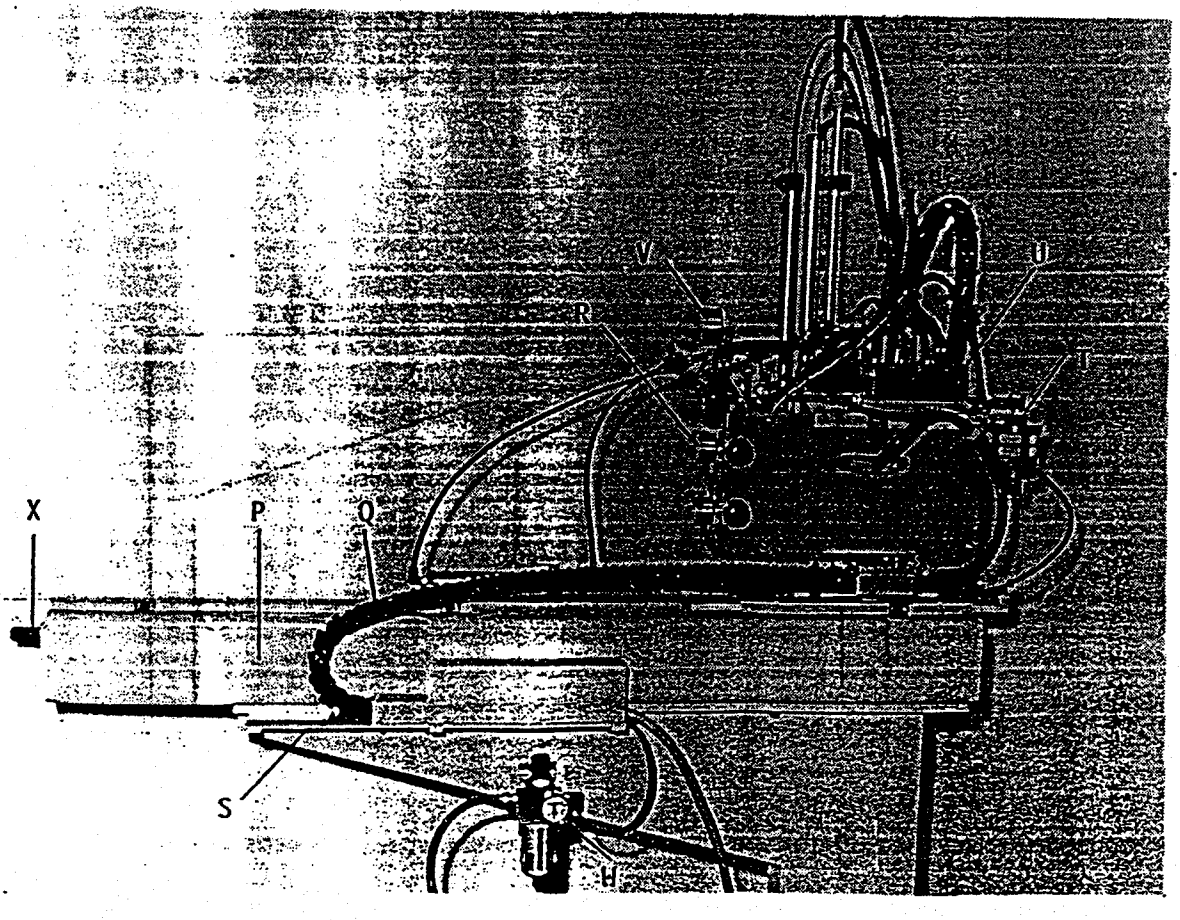

V
R
X
P
Q
S

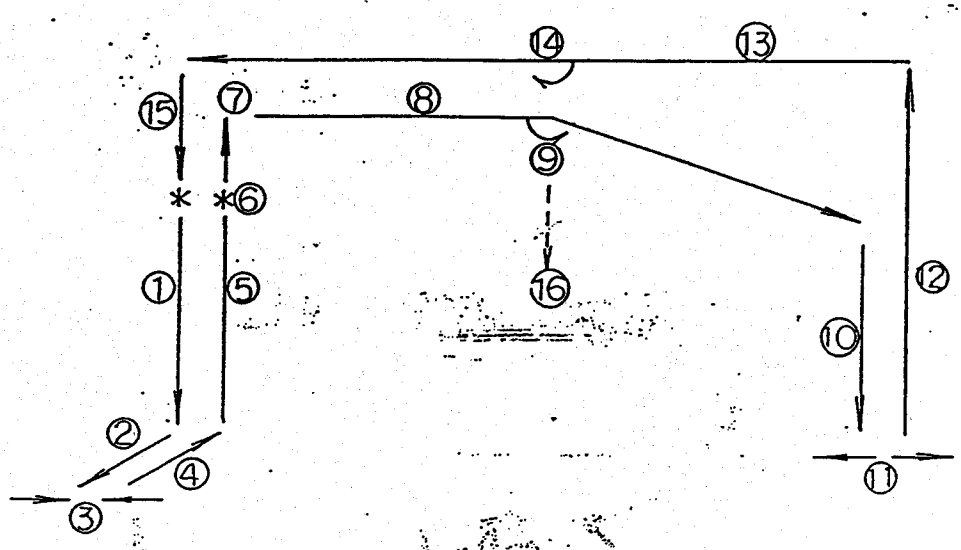
2. Application

The HCR-100S and 100G robots are used to automatically remove a molded part and runner system at the same time usually from an injection molding machine ranging from 40 to 80 tons.

In order to have a fast take out time of robot (to minimize the injection machine pausing time),arm 2 step entry protram is applied to this robot.
The robot arm waits the mold opening just ablve the molds by sliding down the kick frame in advance. When the mold open complete signal is geven to robot controller, arms enter into the mold area and take out molded parts.

Basic robot sequence is as follows ;

* Stand by position
1 Mold open - arm descends
2 Kick forward
3 Grip
4 Kick backward
5 Arm ascends and kick frame slides up
6 mold closing start at arm upward end
7 Traverse outward at kick frame slide up end
8 Traverse outward
9 Traverse outward, kick frame slide down and wrist flip horizontal at midway traverse.
10 Arm descends
11 Release parts
12 Arm ascends and kick frame slides up
13 Traverse inward
14 Traverse inward and wrist return vertical at midway traverse
15 Kick frame slides down
16 Sprue release
* Stand by position



3. Optional Items

The following optional items are availvable when ordering the robot.

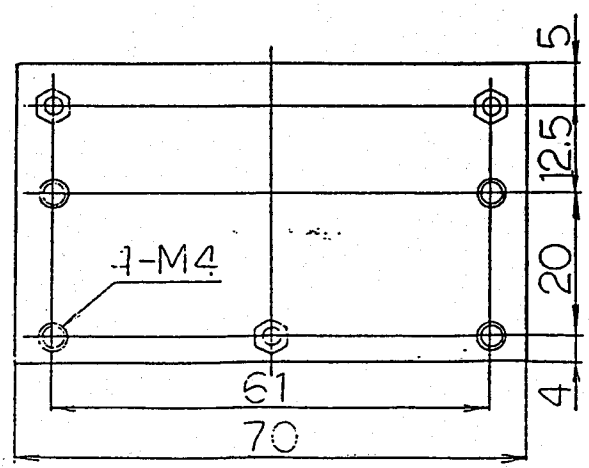
1. Vacuum suction system kit with air ejector
2. Sprue gripping circuit on E.O.A.T.
3. Nipper circuit on E.O.A.T.
4. Nipper circuit on E.O.A.T. with primary and secondary pressure
5. Signal output for synchronous motion of conveyor
6. Alarm light
7. Change of take-out direction of main arm
8. Special color to order

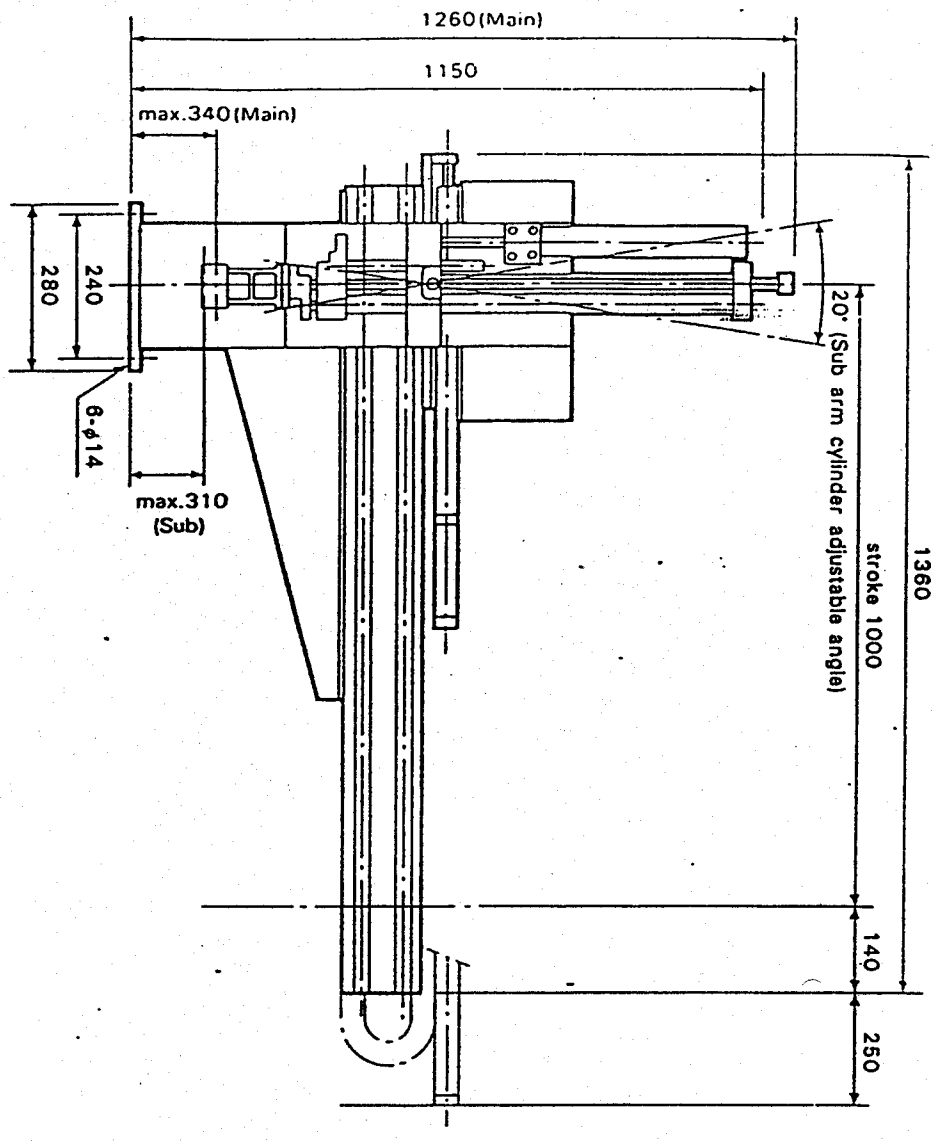
B. SPECIFICATIONS AND DIMENSIONS

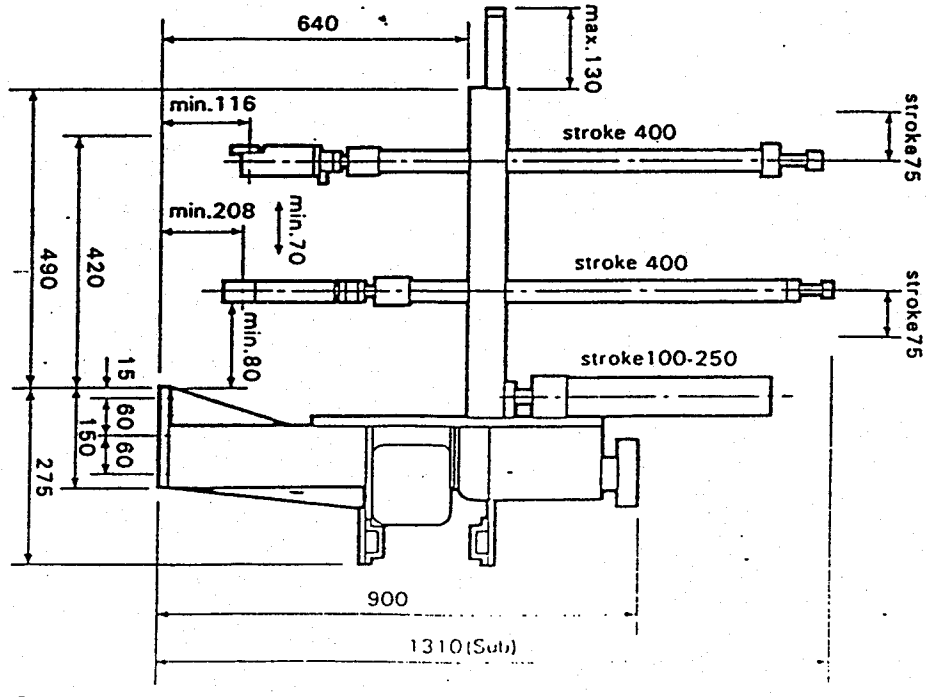
Model	HCR-100S	HCR-100G
Dimensions (mm) Height	1260	1310
Width	1360	1360
Depth	765	765
Cylinder stroke (mm) Slide	100-250	100-250
Main arm	400	400
Sub arm	-	550
Main kick	0-75	0-75
Sub kick	-	0-75
Traverse	1000	1000
Wrist (C)	90°	90°
Max.Payload (g) (incl.E.O.A.T.)	2000	2000
Working Air Pressure range	5.0 to 7.0 kg/cm^2	
Max. allowable Air Pressure	8.5 kg/cm^2	
Min. Take out Time (sec.)	0.9	0.9
Min. Cycle Time (sec.)	7.0	7.0
Air Consumption (Nℓ/cycle)	22.0	25.0
Power supply	100/110/200/220/240 VAC 50/60 Hz	
Controller	Programmable controller	PC-HIID PC-II

Dimensions for the end of arm tooling (E.O.A.T.) mounting plate on main arm end.

Refer following dimensions when making the E.O.A.T.




1260(Main)
1150
max.340(Main)
280
240
6-φ14
max.310
(Sub)
20° (Sub arm cylinder adjustable angle)
stroke 1000
1360
140
250


640
max.130
min.116
stroke 400
stroke75
min.208
min.70
490
420
stroke 400
stroke75
min.80
15
stroke100-250
60
60
150
275
900
1310(Sub)

C. FUNCTIONS AND ADJUSTMENT

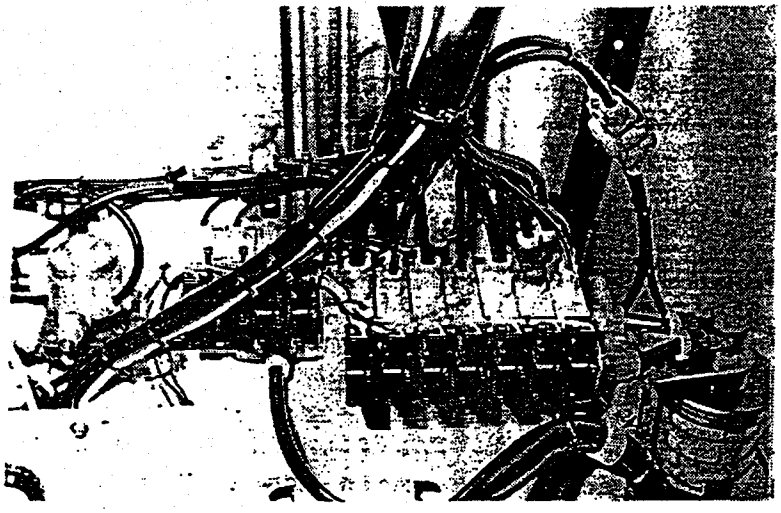
1. Air solenoid valves

The solenoid valves which actuate the cylinders, vacuum generator and nippers are mounted on the machine as shown in the photo given in next page. For the functional details of each solenoid valve, see the seal attached under each solenoid valve.

Solenoid valves and functions

Solenoid valve	SOL No.	Function	Model
A	7 & 8	Wrist flip (Horizontal/Vertical)	180-4E2
B	1 & 2	Traverse cylinder (Outward/Inward)	180-4E2
C	3	Main arm cylinder (Ascent/Descent)	180-4E1
D	4	Main arm kick cylinder (Forward/Backward)	180-4E1
E	9	Sub arm cylinder (Ascent/Descent)	180-4E1
F	10	Sub arm kick cylinder (Forward/Backward)	180-4E1
G	OPT-1	Slide cylinder (up/down)	180-4E1
H	11	Sub arm sprue grip	180-E1
I	6	Vacuum (Option)	180-E1
J	5	Main arm grip	180-E1
K	14	Main arm sprue grip(Option)	180-E1

When manually operating the robot, select the manual mode and operate the pushbuttons on the control box. When operating the robot using the manual push pins of the solenoid valves, check the robot conditions and full opening of molds, because the solenoid valve is operated and the pneumatic circuit is changed irrespective of the conditions of other solenoid valves and injection molding machne, i.e., the safety interlocks will be made ineffective. All the solenoid valves used on robot are 24V DC rating.



Solenoid valves A to L, from right to left, are shown in the photo.

2. Function of Each Cylinder

(a). Main arm cylinder

The main arm cylinder vertically moves the end of arm tooling at the arm end, which accommodates grippers or vacuum or other components to remove a molded part from the injection molding machine.

(b). Main arm kick cylinder

The main arm approaches to the mold and after gripping the molded parts, strip off the parts from the mold.

(c). Sub arm cylinder

The sub arm cylinder vertically moves the fingers at the arm end, which grips the runner system when the main arm cylinder removes a molded parts from the three plate molds.

(d). Sub arm kick cylinder

The sub arm approaches to the mold and pick up the sprue runner system, then strip off the runner system from three plate mold.

(e). Wrist flip cylinder

The wrist flip cylinder positions the end of arm tooling mounted at the end of the main arm to the horizontal or vertical position.

(f). Traverse cylinder

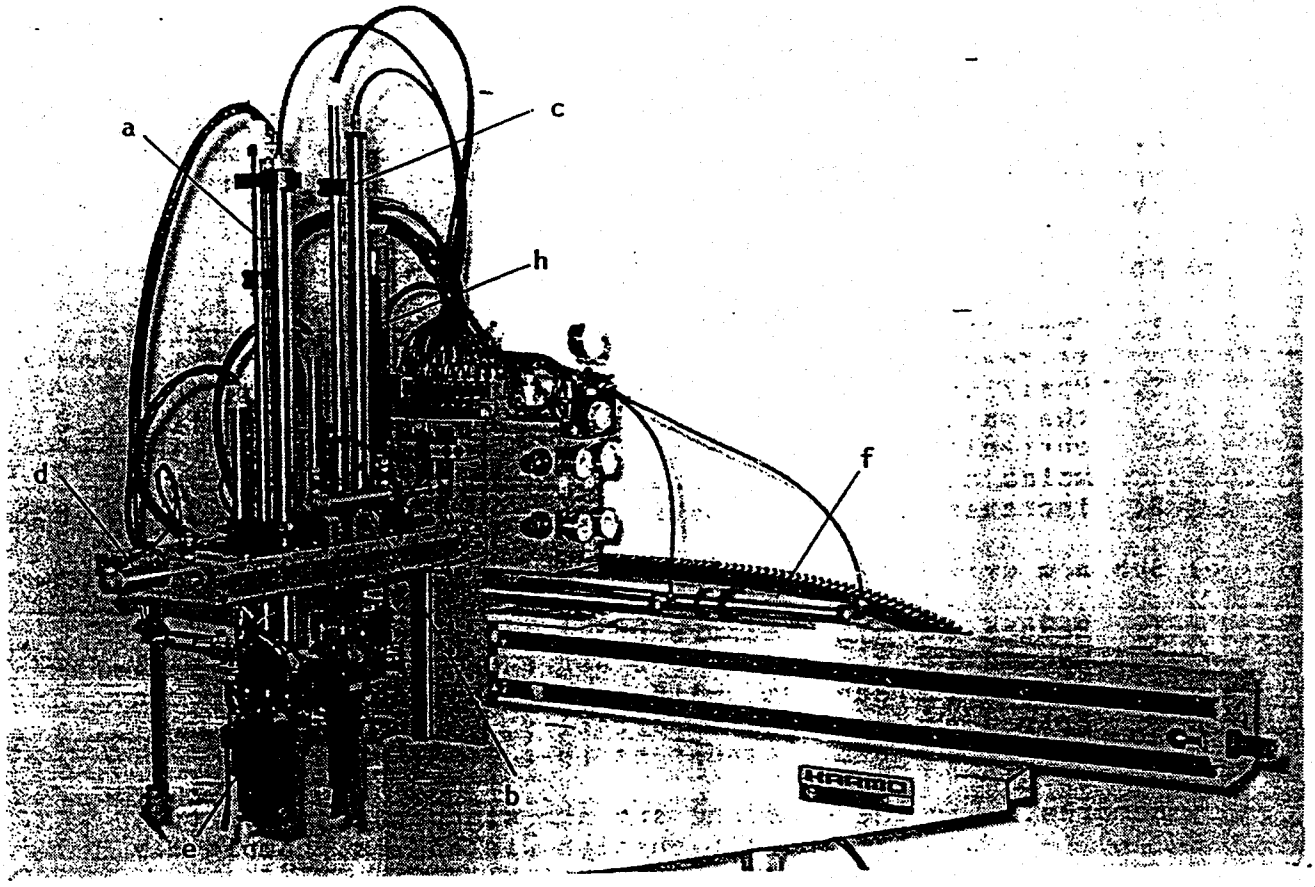
The traverse cylinder moves the kick frame to remove a molded part and runner system out of the injection machine. Shock absorbers are provided at both traverse ends to absorb the shock generated when the traverse cylinder stops.

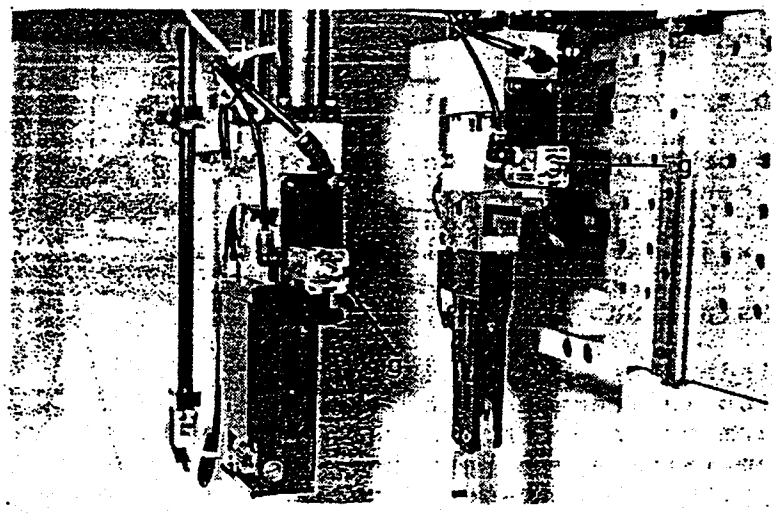
(g). Main and Sub arm cylinder safety lock cylinder

For the both of Main arm and Sub arm, safety lock cylinders are provided, preventing the arms from dropping if the pneumatic pressure suddenly decreases, the pneumatic hose is disconnected from the compressor.

(h). Slide cylinder

Kick frame is slid down by this cylinder in order to wait the mold open of injection machine at just above the mold. Shock absorbers are provided at both up and down ends to absorb the shock.


a
c
h
d
f
b
e



3. Cylinder Stroke adjustment

Adjust the stroke of each cylinder in the following manner.

a) Slide cylinder

Possible to adjust the slide cylinder stroke in a range of 100 - 250 mm . Rough stroke change is done by moving bracket A to position X or Z, and precise adjustment is available by moving shock absorber up and down.

b) Main arm cylinder

1. Open the molds, then reduce the air pressure until it reaches 0 kg/cm^2.
2. Position main arm by using main stopper B so that the main arm cylinder moves the end of arm tooling correctly to a molded part to be removed from the molds at the descent end position.
3. Increase the air pressure to 5.0 to 7.0 kg/cm^2.

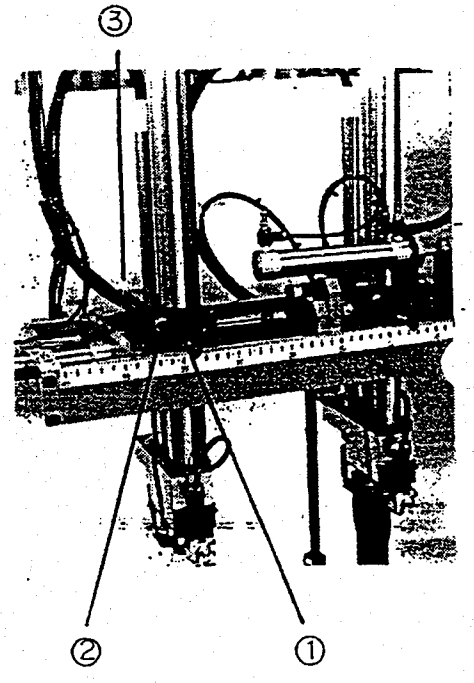
c) Sub arm cylinder

1. Reduce the air pressure until it reaches 0 kg/cm^2.
2. Loosen sub arm cylinder stopper C.
3. Extend the sub arm cylinder so that the fingers can grip a runner sysstem correctly.
4. Secure sub arm cylinder stopper C.

Remarks; Fix the main and sub arm stopper at a position so that the air cushion piston is completely pressed as shown in sketch.

Adjustment of arm gripper height

Available to adjust the up/down position (gripper height) of arms.Loosen the screws 1 & 2, then, a little bit loosen 3. After adjust the positions, tightn 3 screws.

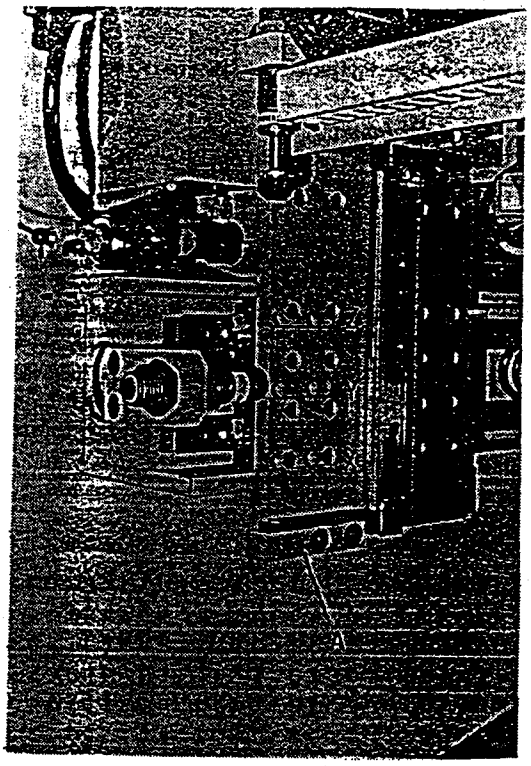


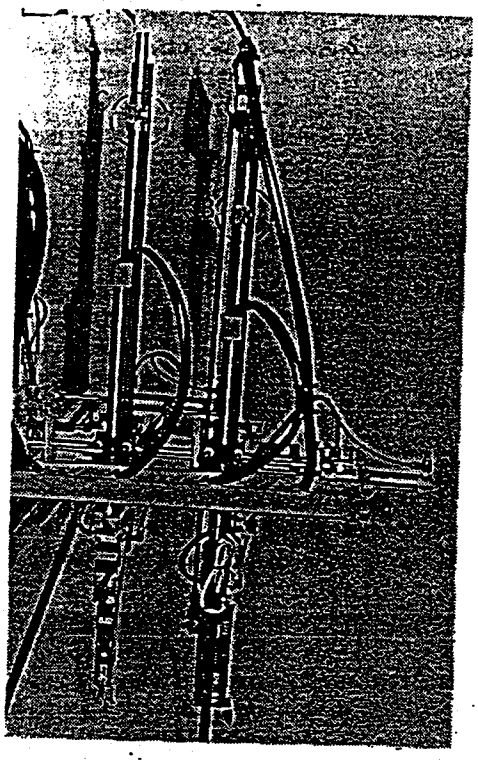
Adjustment of sub arm gripper position

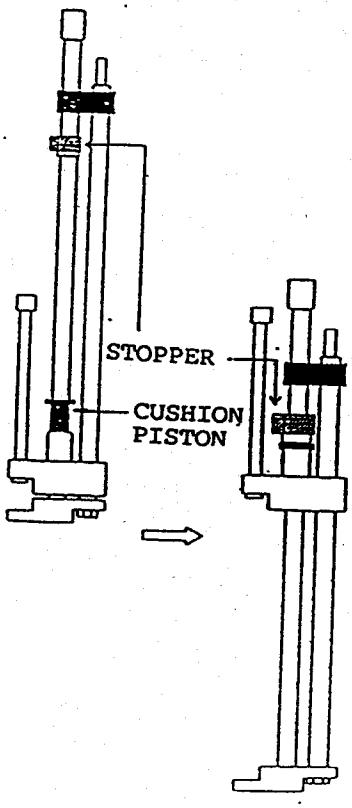
When the sprue to be gripped is not located on the nozzle center line, available to adjust the gripper position by loosening the screw D . Slide adjustable range is 50mm.

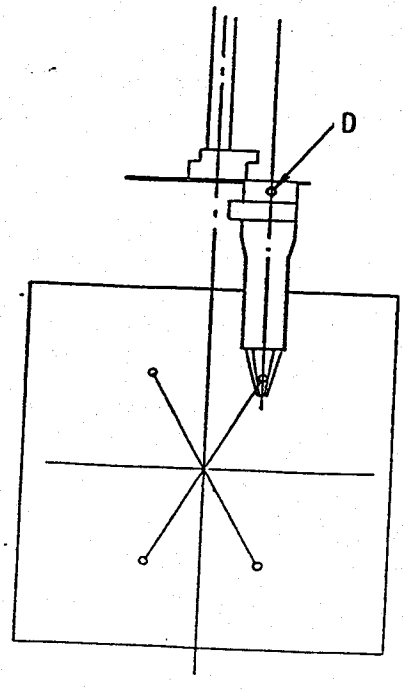
Construction of Main & Sub Arm Cylinder

The main arm cylinder was designed into an unique construction to reduce the take-out time. The main arm cylinder incorporats the air cushion system,(air shock absorber) to absorb shocks which occur when cylinder reaches the upward end and downward end.






STOPPER
CUSHION
PISTON


D

d) Main arm kick cylinder

1. Open the molds, then reduce the air pressure until it reaches 0 kg/cm^2.
2. Open the molds, then roughly adjust the backward end of the main arm kick cylinder using main kick stopper E.
3. Loosen the screw F. Roughly adjust the forward end position of the main arm by moving the main kick cylinder.
4. Increase the air pressure to 5.0 - 7.0 kg/cm^2.
5. Press the MANUAL OPERATION ARM DESCENT button to extend the main arm cylinder then finaly adjust the backward end position of the main arm adjusting main kick stopper E.
6. Extend the kick cylinder, then finely adjust the forward end position of the main arm moving shock absorber G.

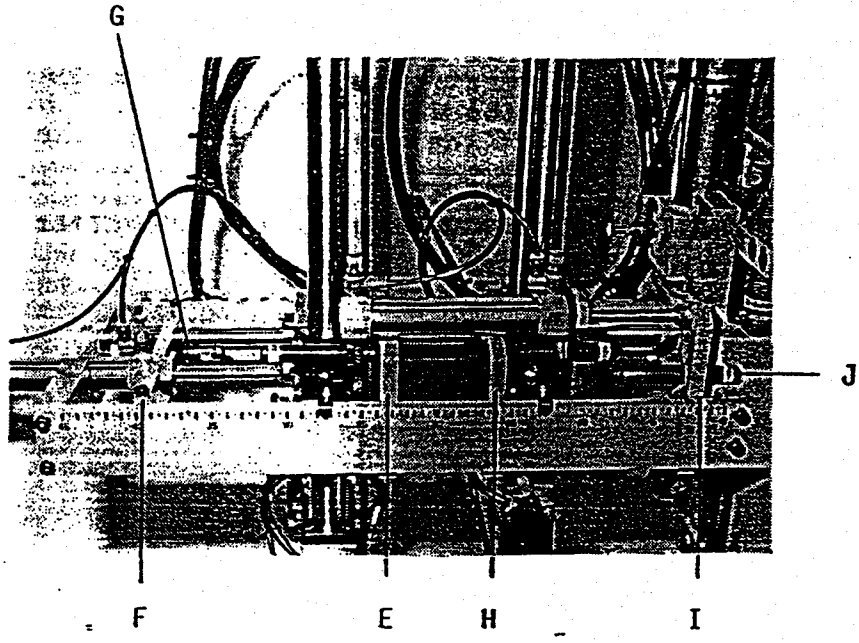
e) Sub arm kick cylinder

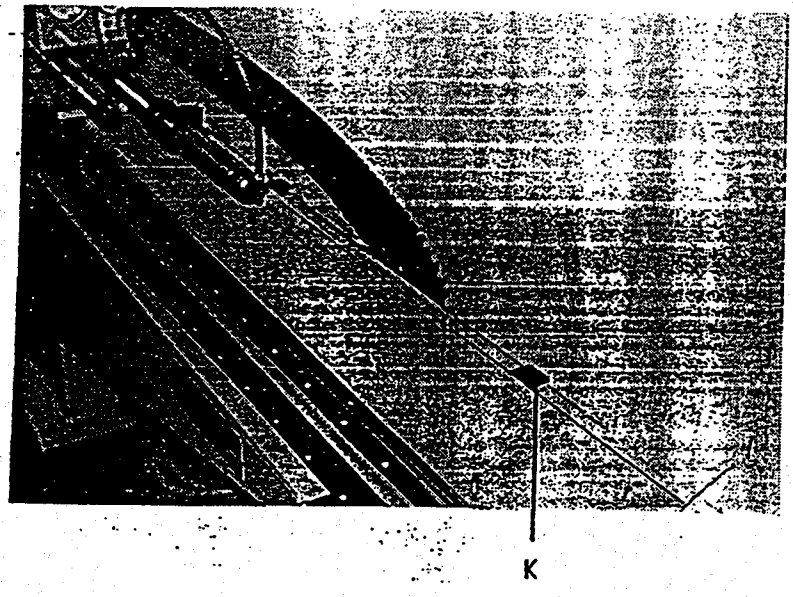
1. Reduce the air pressure until it reaches 0 kg/cm^2.
2. Extend the sub arm cylinder to the downward end position so that the fingers reach the level where they can grip a runner system correctly, then extend the sub arm kick cylinder to the desired position.
3. Move the sub arm kick stopper H so that it touches to the sub arm cylinder mounting bracket (bearing bracket) and fix it.
4. Loosen the screw I. Roughly adjust the forward end position of the sub arm by moving the sub kick cylinder.
5. Finely adjust backward end position of sub arm by moving the sub kick stopper H.
6. Finely adjust forward end position of sub arm by moving shock absorber J.

** In order to absorb the shock that occured at kick forward and backward end, shock absorbers are provided for both of Main and Sub arm.

f) Traverse cylinder

Adjustment of both end positions can be done by moving shock absorber. When the position is changed, move the actuator for LS-1 and LS-2 so that the switches are actuated correctly at both traverse ends.
Sprue releasing position and kick frame down position can be adjusted by moving the actuator K.


G
J
F
E
H
I

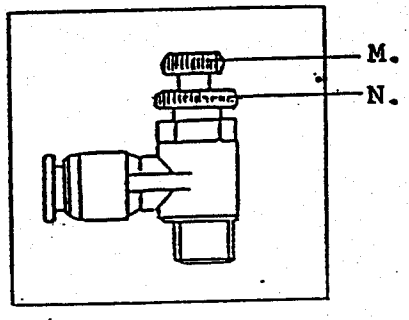

K

4. Cylinder speed adjustment

The operation speed of each cylinder can be changed by adjusting the speed controllers provided at both ends of each cylinder. The speed controller controls the flow rate of air discharged from the cylinder.

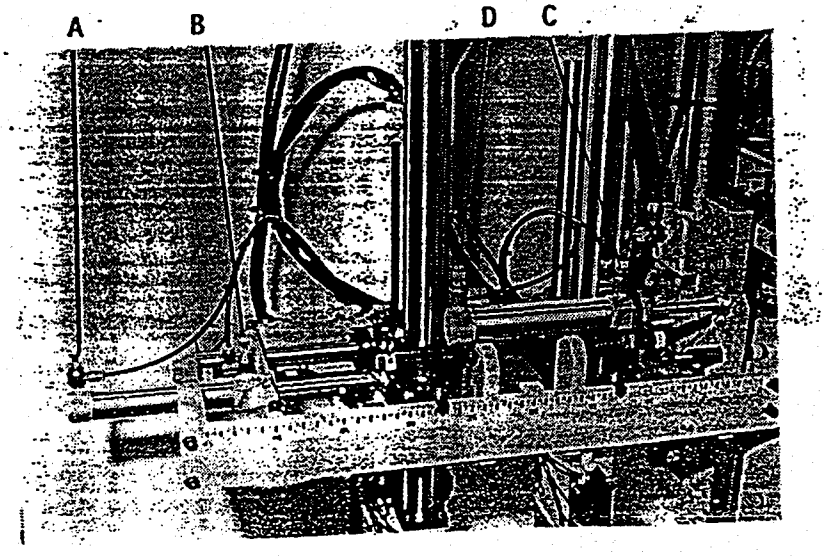
As needle (M) is tightened with lock nut (N) loosened, flow rate of air discharged from the cylinder decreases, thereby reducing the cylinder operation speed. On the contrary, as needle (M) is loosened, the flow rate of air discharged from the cylinder increases, thereby increasing the cylinder operation speed.

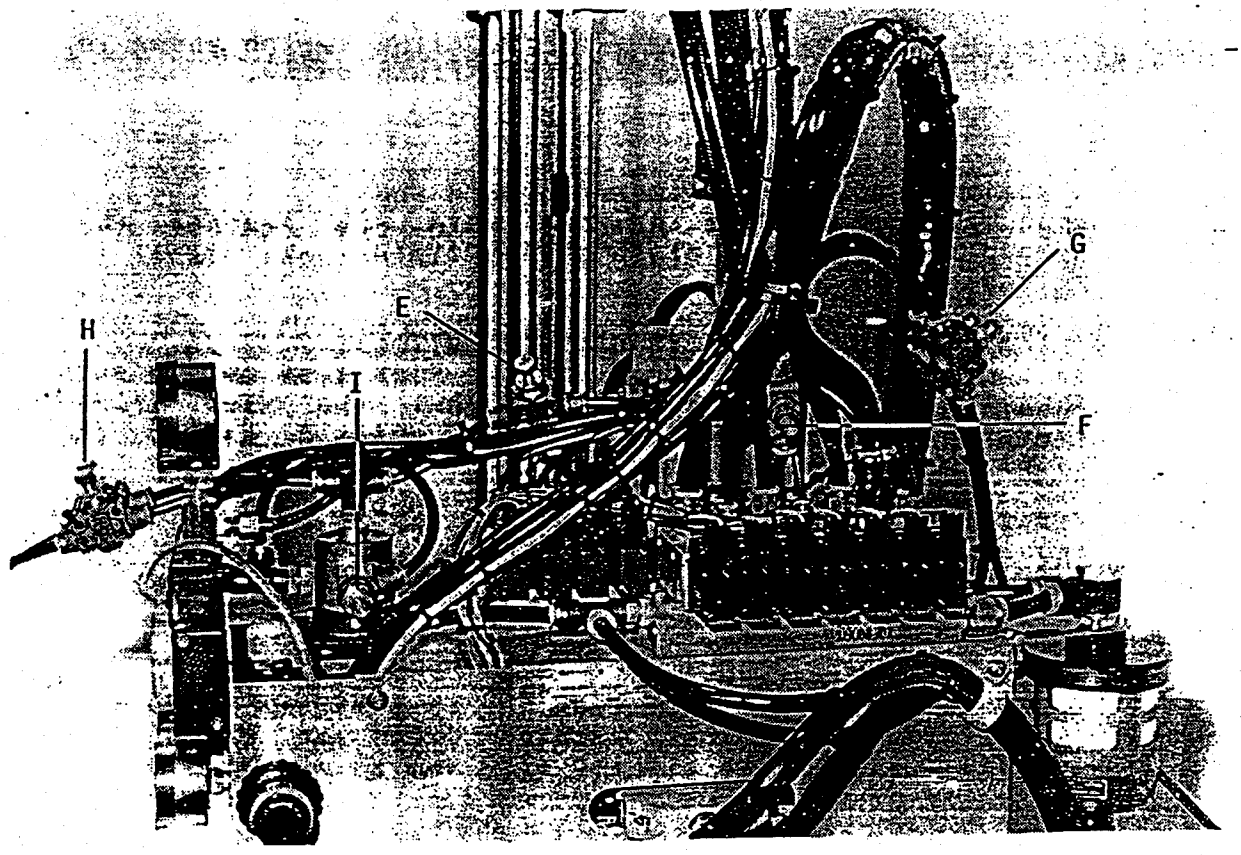
Secure needle (M) by tightening lock nut (N) after adjusting the cylinder operation speed to the desired value.



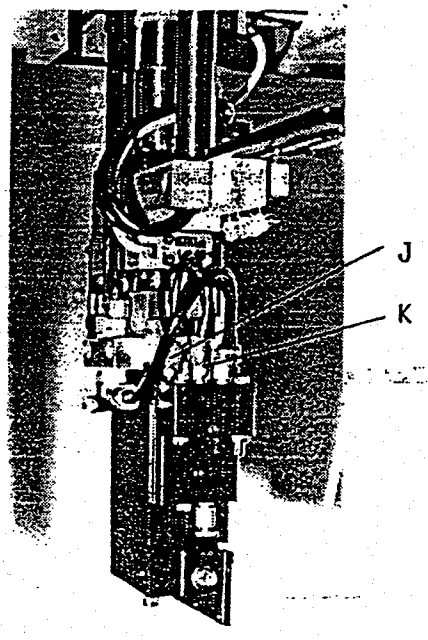
M: Needle N: Lock nut

A Main arm kick forward
B Main arm kick backward
C Sub arm kick forward
D Sub arm kick backward





E Main arm descent
F Sub arm descent
G Traverse outward
H Traverse inward
I Main arm second descent
J Wrist flip horizontal
K Wrist return vertical



D. PROXIMITY SWITCHES

The proximity switches and magnetic induction switch shown in following photos have the functions described below.

LS-3* (Proximity switch): Main arm upward end
When the LS-3 detects that the main arm reaches the upward end, the mold close safety (interlock) signal is released.

LS-3-2 (LS-OPT1)(Magnetic induction switch): Kick fram upward end
When the LS-3 and LS-3-2 detects that the kick frame reaches the upward end, traverse outward signal is issued.

LS-7* (Proximity switch): Sub arm upward end
When the LS-7 detects that the sub arm creaches the upward end, the mold close safety (interlock) signal is released.

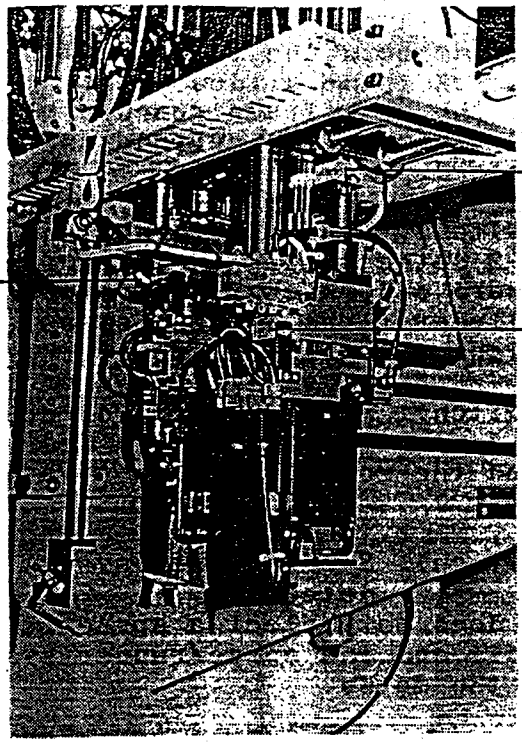
* If one of the output signals from the LS-7 and LS-3 are not issued, the injection molding machine does not close the molds, beacause the output signals from the LS-7 and LS-3 are ANDed with each other.

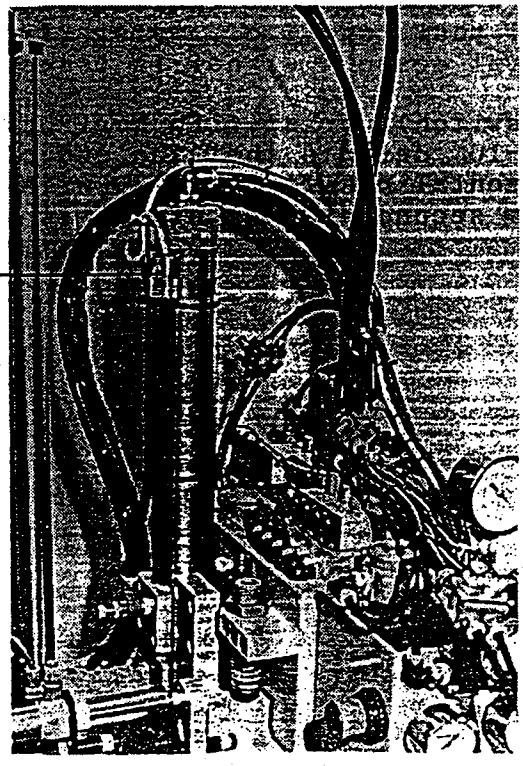
LS-11 (Proximity switch): Main arm downward end
When the LS-11 detects that the main arm cylinder reaches the downward end at the end of the main arm cylinder first descent operation, the main arm kick cylinder approach signal is issued.

** Following switches are used on HCR series robot.

Proximity switch : OMRON Type TL-N5ME1
TL-Q5MC1

Magnetic induction switch :
KOGANEI Type CS-3B


LS–11
LS–7
LS–3


LS–3–2

LS-1 (Proximity switch): Midway traverse and traverse outward end

When the LS-1 detects the traverse midway position (actuator), kick frame slides down. And when the LS-1 detects that the kick frame reaches the traverse outward end, the main arm cylinder second descent signal is issued.

LS-2 (Proximity switch): Traverse inward end

When the LS-2 detects that the kick frame reaches the traverse inward end, kick frame slides down and the main arm cylinder first descent signal is issued when mold open signal is given to robot.

LS-4 (Proximity switch): Molded part pick-up failure detector

If the LS-4 does not detect a molded part, the LS-4 stays off and the molded part is regarded as being in the molds.

LS-5 (Proximity switch): Sprue runner system pickup failure detector

If the LS-5 does not detect a sprue/runner system, the LS-5 stays off and the sprue/runner system is regarded as being in the molds.

LS-6 (Proximity switch): Main arm kick backward end

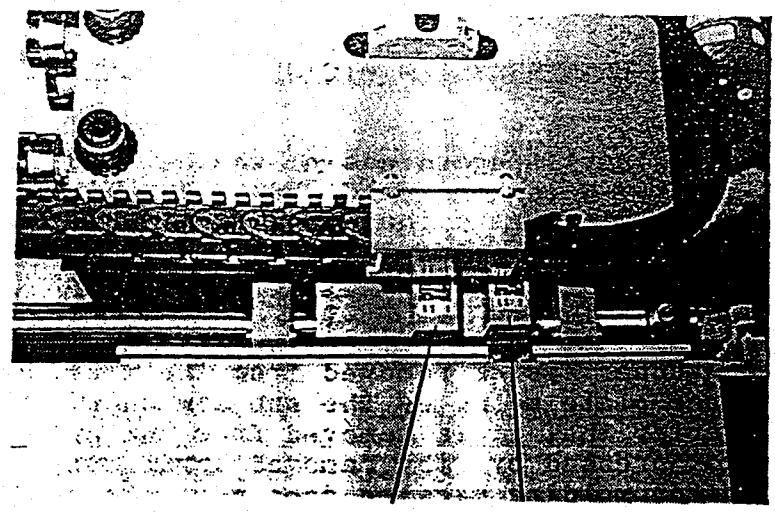
When the LS-6 detects that the main arm reaches the backward end, the main arm cylinder and slide cylinder start the ascent operation.

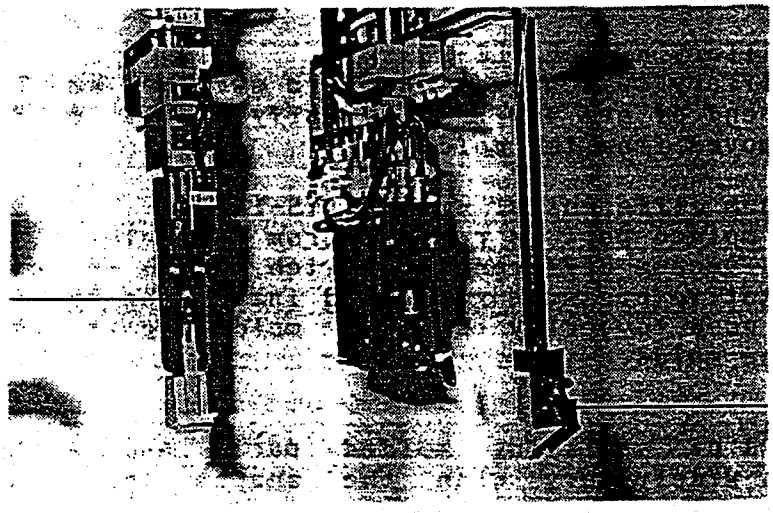
LS-8 (Proximity switch): Wrist flip vertical end

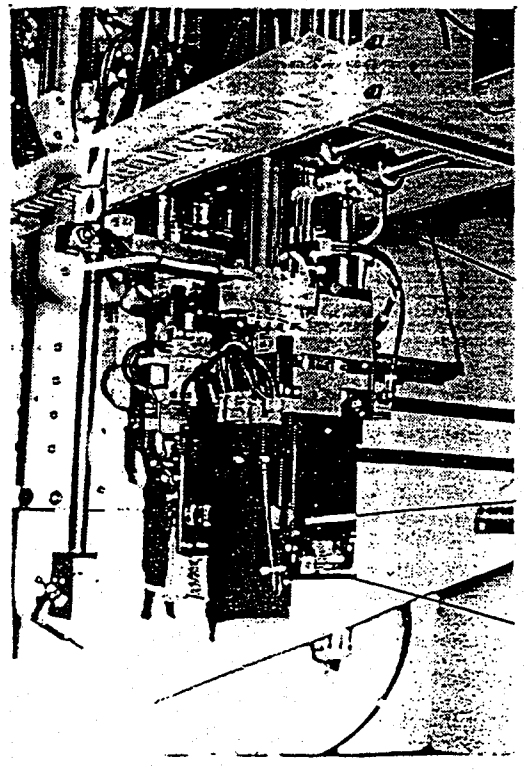
When the LS-8 detects that the end of arm tooling is in the vertical position, i.e., wrist flip vertical, the main arm first descent signal is issued.

LS-10 (Proximity switch): Wrist flip horizontal end

When the LS-10 detects that the end of arm tooling is in the horizontal position, i.e., wrist flip horizontal, the main arm second descent signal is issued.


LS–1
LS–2


LS–5
LS–4


LS–6
LS–8
LS–10

E. MOLDED PARTS AND RUNNER SYSTEM PICKUP VERIFICATION

(1) By LS-4
When a molded part, regardless of whether a single-cavity or multi-cavity molds are used, has a durable side gate, it is possible to verify that the molded poart is removed from the molds by pressing the LS-4 with the molded part of runner system.

(2) By LS-5
The sprue runner system removed from the stationary mold of the three-plate molds by the sub arm should press the LS-5 to verify that it is removed from the molds. If the LS-5 is not pressed by the removed sprue runner system, the injection molding machine does not close the molds even though all the other conditions for the mold close operation are satisfied.

(3) By auxiliary switch (LS-14)
An auxiliary switch such as micro switches may be mounted on the end of arm tooling to verify that a molded parts are removed from the molds.

(4) By vacuum differential switch (VS-1)
When a molded part is removed from the molds by suction pads, a vacuum differential switch, which is activated by the negative pressure generated inside the suction pads, may be used to verify that the molded part is removed from the molds.

(5) Others
The ways of verifying molded parts and sprue runner systems widely vary with the shapes and quantity of molded parts. There are some molded parts which are difficult to verify with limit switches or vacuum switches. In such a case, a photo sensor or the like may be used to verify that a molded part and runner system are removed from the molds. Further, the number of molded parts may be counted using a photo sensor and counter.

* For nonstandard verifying methods, consult our sales representatives.

F. VAUUM GENERATOR

1. Specifications

Model	: KEA-60M
Nozzle hole dia.	: 1.5 mm
Max.vacuum pressure	: 650 mmHg or more
Max. flow rate of vacuum	: 55 ℓ/min or more
Compressed air consumption	: 100 ℓ/min or less
Compressed air pressure	: 5 kg/cm^2
Flued	: Air
Operating temperature	: 0 to 50°C (Free from condensation)
Oil supply	: Not necessary
Working pressure range	: 0 to 6 kg/cm^2
Filter rating	: 30 μ

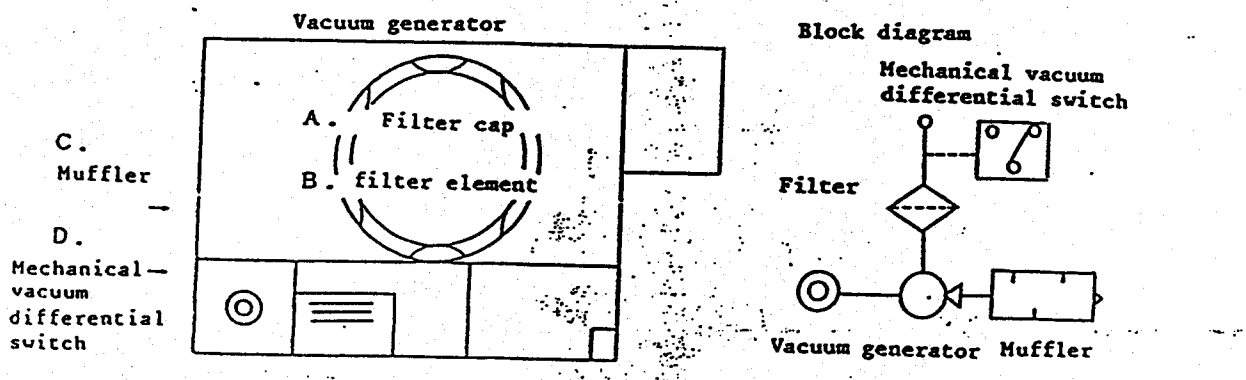
2. Maintenance

a. Filter element
Periodically blow oily particles and foreign matter off the filter element to prevent it from being clogged.

b. Filter cap
Clean the filter cap without using an organic solvent.

c. Muffler
Periodically blow or remove oily particles and foreigh matter passing through the filter element from the sound absorbing material to prevent the vacuum gaenerator performance from deteriorating.

d. Vacuum differential switch
A mechanical vecuum differential switch is used for the vecuum generator.



Calculation of lifting capacity created by the vacuum generator

$$W = \frac{P \times C}{760} \times F$$

Where, W=Lifting capacity (kg), P=Vacuum power (mmHg)
C=Suction pad area (cm^2)
F=Safety factor : 1/4 (when lifting a molded part horizontally)
: 1/8 (when lifting a molded part vertically)

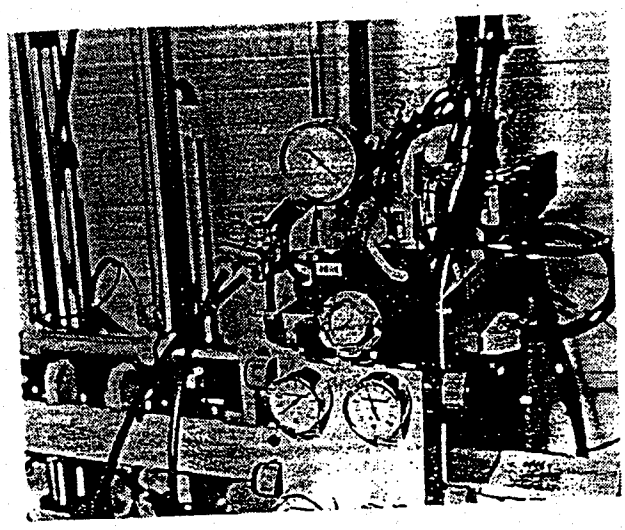
Note that the suction pad lifting capacity veries according to the surface texture of molded parts.

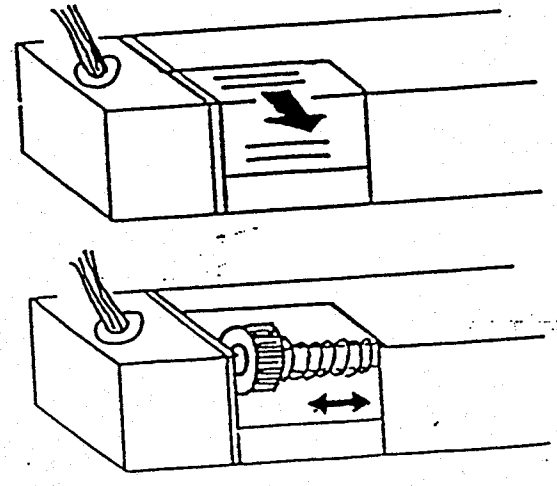
3. Vacuum differential switch specifications

Vacuum range	: 200 to 600 mmHg
Differential pressure	: 60 to 120 mmHg
Contacts (color of leads)	: Normally open contact and common lines (black & white)
Working pressure range	: 2 to 6 kg/cm^2
Electrical rating	: 125 VAC / 5A or 250 VAC / 3A

4. Vacuum adjustment

a. Remove the cover by pulling it in the arrow direction.
b. Increase (or decrease) the degree of vacuum by rotating the brass control nut closkwise (or counterclockwise).





G. SILENCER/EXHAUST CLEANER

1. Functions

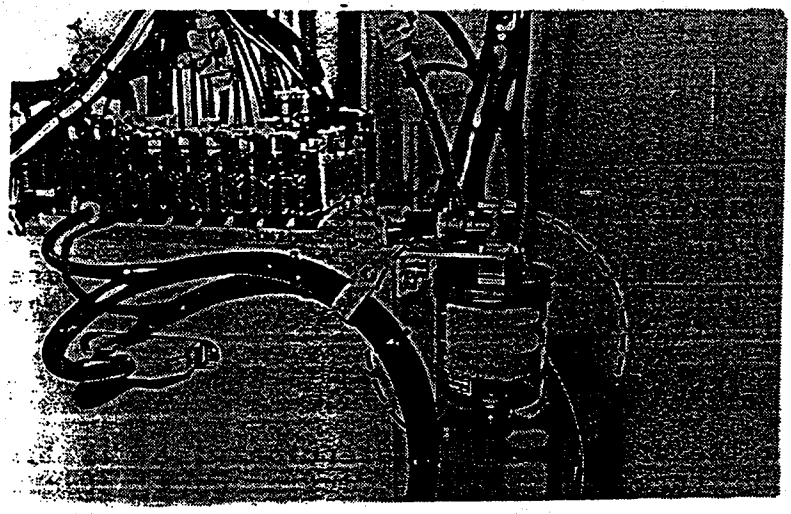
The exhaust cleaner has two functions as a silencer and oil separator which separates oil particle from oil mist. The exhaust cleaner is attached to the exhaust port of the solenoid valves to maintain better working conditions.

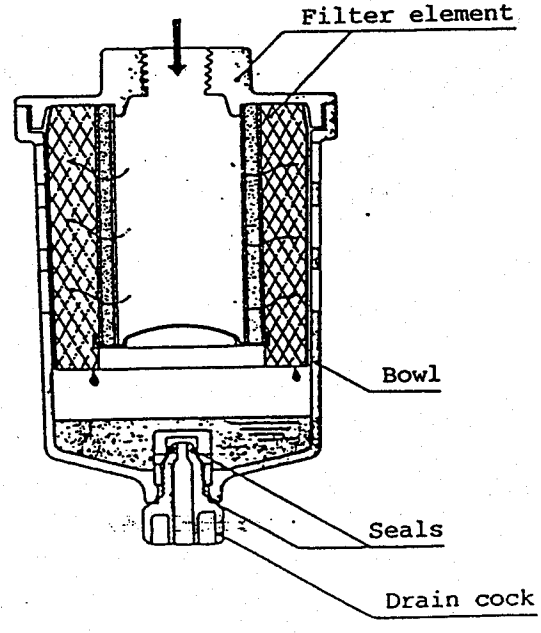
2. Specifications

Items	Model EF-300
Connection aperture (PT)	3/8
Max. filtering flow rate (Nℓ/min)	300
Filtering capacity (μm)	0.3
Silencer efficiency (dB)	35 or more
Oil separation efficiency (%)	99.9 or more
Weight (kg)	0.22

3. Cleaning exhaust cleaner

a. Rotate the drain cock counterclockwise to discharge oil. Be sure to rotate the drain cock clockwise as far as it goes after discharging drain.
b. When cleaning the exhaust cleaner, rotate the drain cock counterclockwise, then rotate the oil case counterclockwise to remove the oil case from the exhaust cleaner.
c. Wash the oil case with neutral detergent. Never use organic solvent such as thinner, alcohol, etc. because thy erode the oil case.
d. Be sure to completely wipe water from the oil case by using soft cloth or dry the oil case after washing it.
e. Attach the oil case reversing the above procedures in (a).




Filter element
Bowl
Seals
Drain cock

H. F-R UNIT

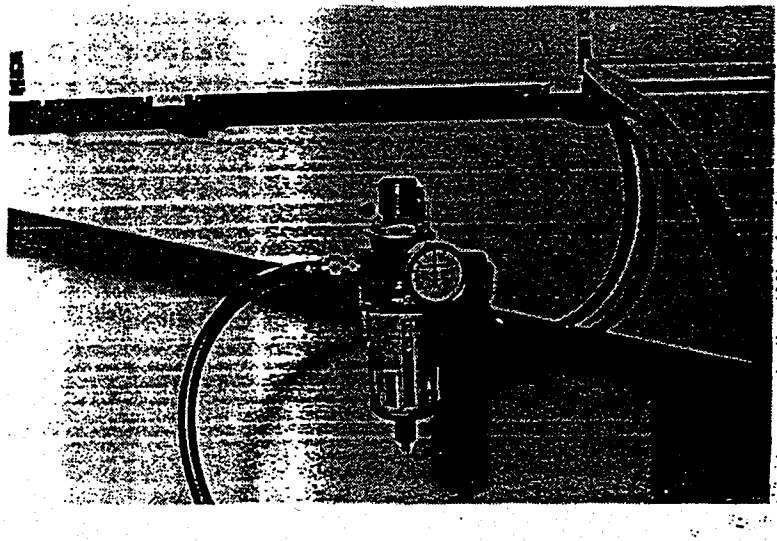
- Oilless cylinders are standardized on the HCR series robot. It is not necessary to supply lublicating oil to these robots.

1. Drain maintenance

   Auto drain system is applied to this F-R unit. Drainage is discharged automatically when its level comes up to the certain level. Also possible to discharge the drainage manually with rotating drain cock. **CHECK THE LEVEL ONCE A DAY.**

2. Pressure control

   a. The primary air pressure to supply to F.R. unit should be less than 8.5 kg/cm^2 and the secondary working pressure should be 5.0 to 7.0 kg/cm^2.
   b. Clockwise rotation of the control knob permits the secondary pressure to increase and anti-clockwise rotation to decrease.
   c. Push down the adjusting knob after air pressure adjustment.



I. OTHERS

1. Traverse linear bearing

The kick frame, guided by the LM-guide attached to the traverse beam, travels along the traverse rail.

LM guide (Linear bearing for traverse beam and kick frame up/down)

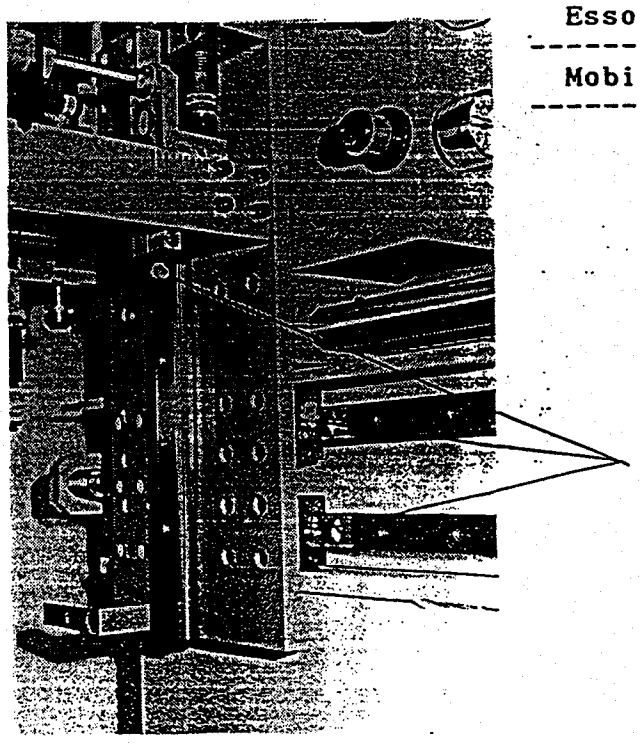
Since the slide unit of the LM-guide includes steel balls, the LS guide can be installed without misalignment and deformation which cannot be eliminated in ordinary slideways. This allows high-precision linear motion and excellent rigidity even for a load which lifts the kick frame from the traverse block.

Supply lithium soap grease to the LM guide through grease nipple after every 100 km of travel (usually once a month).

Recommended grease

It is recommended to use the following grease or equivalent for the HARMO robot and the sliding part (LM-guide cylinder tube inside, cylinder piston, etc.) respectivery.

Manufacturer	Lithium grease
Shell	Alvanis grease 1,2,3
Esso	Beacon 2,3,Q2
Mobil	Mobilux 2



2. Pressure regulators

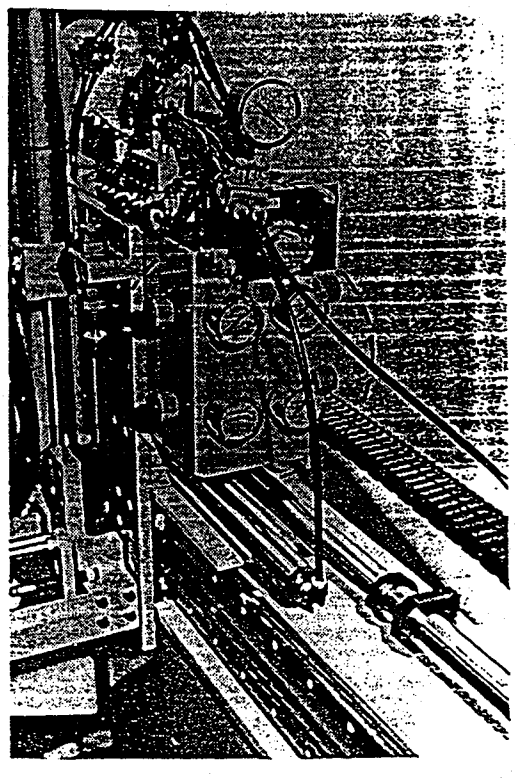
The HCR series robot is equipped with an air pressure regulator for the main arm grip as standard and air pressure regulators for vacuum generator, air nippers and a main arm sprue grip as option. This allows the pressure of the compressed air supplied to the above devices to be independentry adjusted to the desired level.

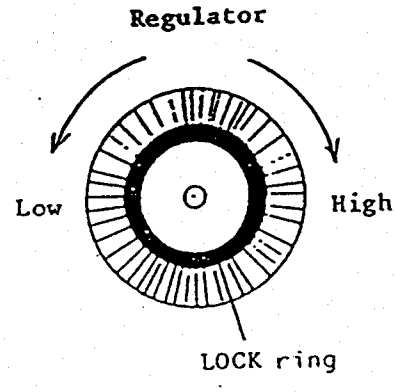
As the knob of the air pressure regulator is rotated clockwise, the pressure of the compressed air supplied to the corresponding solenoid valve increases.

Note that the degree of vacuum cannot be increases by rotating the knob of the air pressure regulator for the vacuum after the degree of vacuum has reached a cirtain level.

Adjust the pressure of the air supplied to the main arm grip to a sufficient level for chucking an omlded part. Being careful not to damage or deform the molded part by large gripper chucking force due to too much air pressure.

After the air pressure has been adjusted, lock the knob of the air pressure regulator by pushing the red lock ring.





3. Connecting and disconnecting of air tube

a. Connecting

Push the tube into the joint.

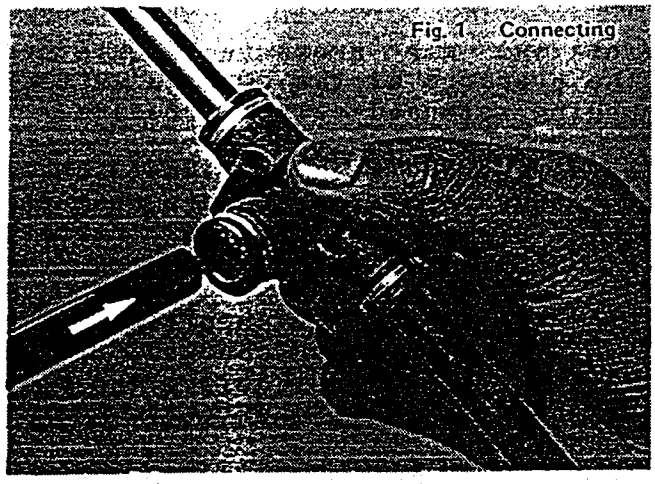


Fig. 1 Connecting

b. Disconnecting

Push the releasing bush in.
Pull out the tube with the bush pushed in.

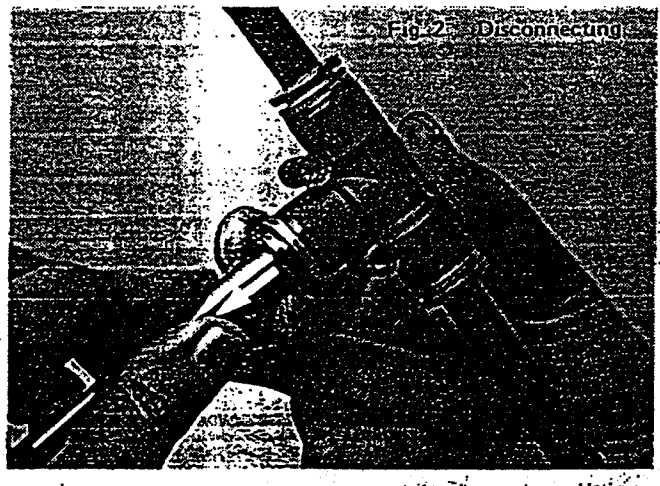
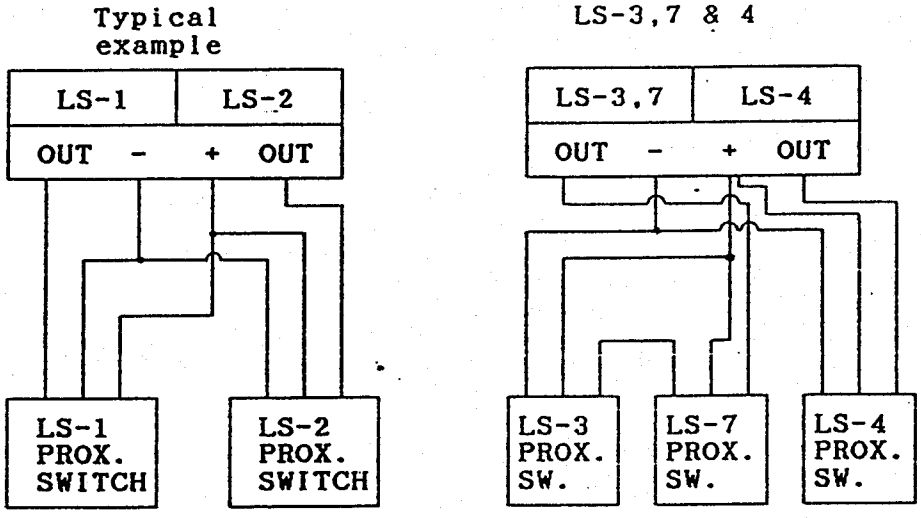
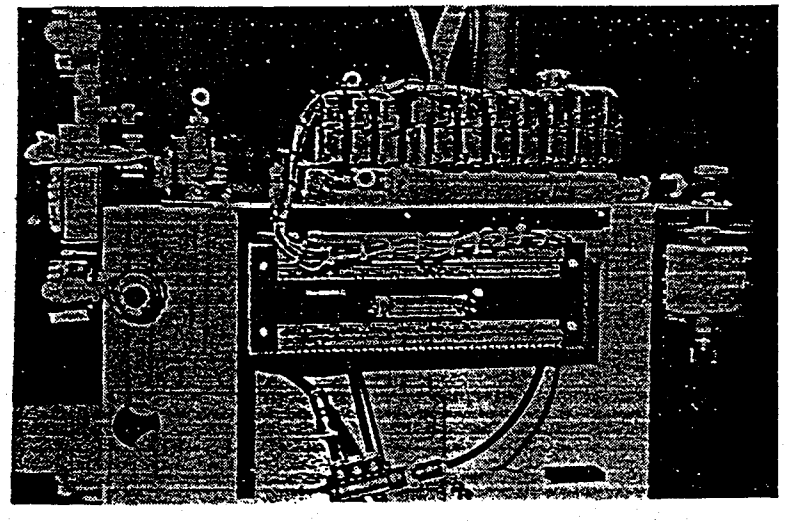


Fig. 2 Disconnecting

4. Cable connection of Proximity switch and Limit switch

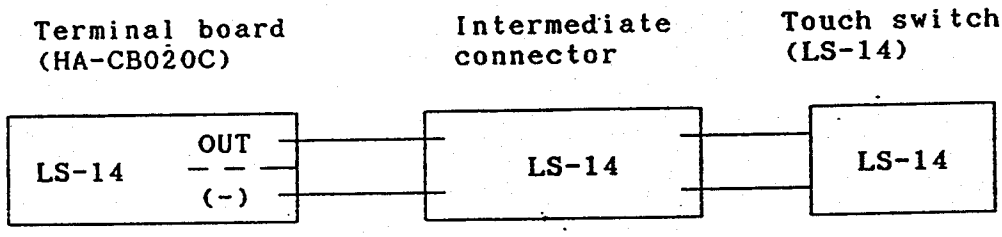
Cables from proximity and limit switches are connected to printed circuit board (HA-CB020C) equipped below air solenoid valves as shown below.

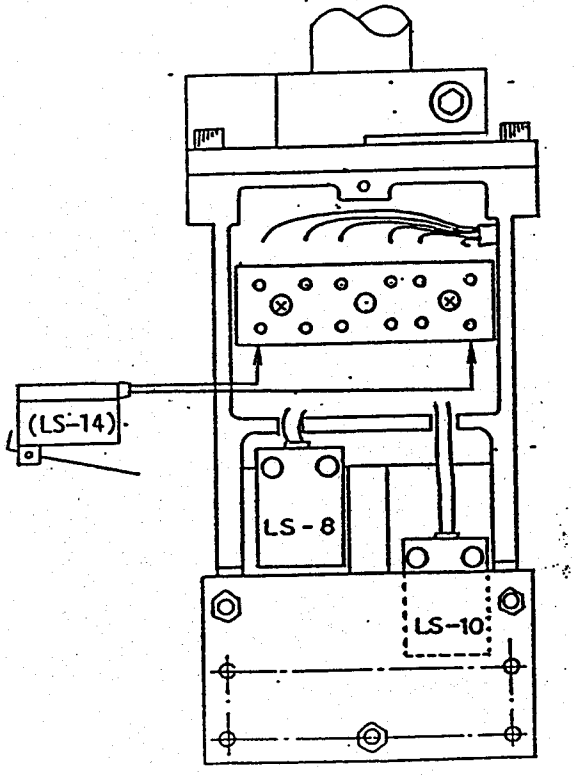




5. Intermediate connector for limit switches

The intermediate connector for limit switches (LS-14) is attached on the wrist flip unit as shown in the sketch. When the touch switch (LS-14) is attached on the end of arm tooling, connect wires from the switch to the intermediate connector (LS-14).

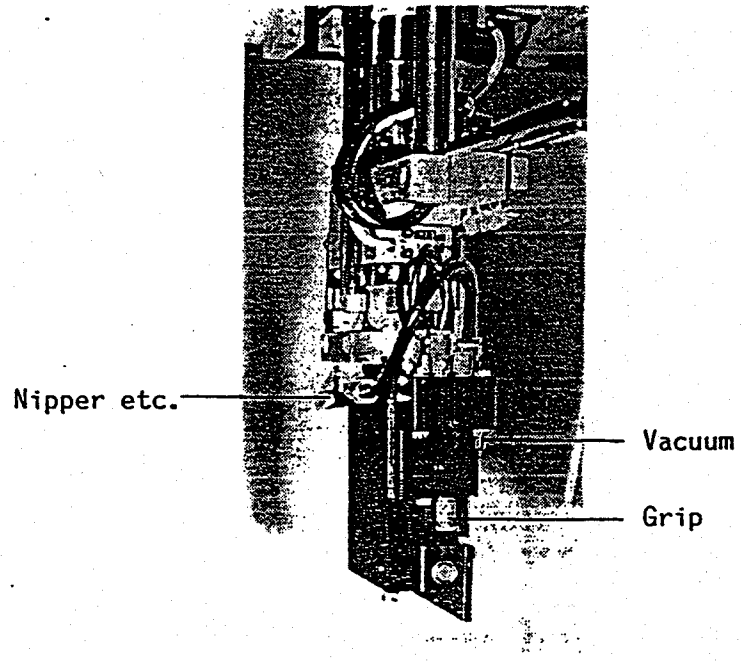




6. Air connection to actuators on E.O.A.T.

Quick fittings for connecting with actuators (mini cylinders,vacuum pads, nippers and other actuators) on end of arm tooling (E.O.A.T.) are provided on arm end.

Assignment of each fittings are as follows:



J. SEQUENCE CONTROLLER, TYPE PC-HIID

1. Concept

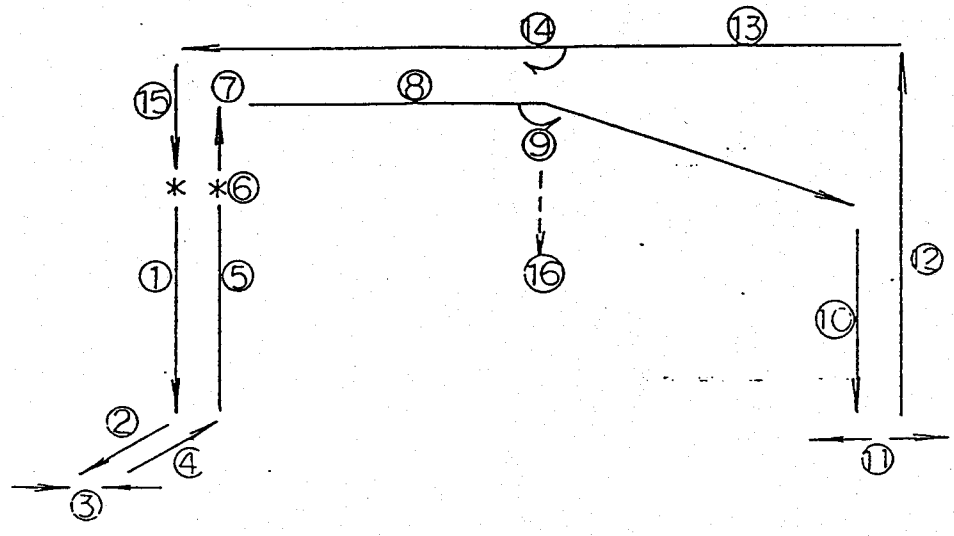
The HARMO programmable controller PC-HIID is equipped with a sequencer PM-911C. Input and Output circuits are operated at 24V DC. Since the input and output signal is indicated on the each LED, troubleshooting is very easy. Timer adjustment is also easy by using digital timers.

Arm 2 step entry program

In order to have a fast take out time of robot (to minimize the injection machine pausing time),arm 2 step entry protram is applied to this controller.
The robot arm waits the mold opening just ablve the molds by sliding down the kick frame in advance. When the mold open complete signal is geven to robot controller, arms enter into the mold area and take out molded parts.

Basic robot sequence is as follows ;

* Stand by position
1 Mold open - arm descends
2 Kick forward
3 Grip
4 Kick backward
5 Arm ascends and kick frame slides up
6 mold closing start at arm upward end
7 Traverse outward at kick frame slide up end
8 Traverse outward
9 Traverse outward, kick frame slide down and wrist flip horizontal at midway traverse.
10 Arm descends
11 Release parts
12 Arm ascends and kick frame slides up
13 Traverse inward
14 Traverse inward and wrist return vertical at midway traverse
15 Kick frame slides down
16 Sprue release
* Stand by position



2. External switches (See External view)

1) POWER (SW-0) : Power ON / OFF switch

2) ROBOT ON/OFF (KSW-1)

a) OFF : Stop all movement for auto and manual operation except the followings;

1. Mold close/open interlock signal

Mold close and open on the injection machine is availavle only in the position of main arm cylinder upward end or traverse outward end.

2. Injection machine cycle start signal
(mold closing start signal)

Injection machine cycle start signal keeps ON during mold open complete signal is ON.

3. Ejector timing control signal

Hydlaulic knock out ejector interlock to injection machine is released during mold open complete signal is ON.

b) ON : Turn "ON" when operate robot

3) START (PSW-1) : Automatic operation switch

ROBOT ON/OFF switch (KSW-1) must be at "ON" position when press this button. Alarm buzzer will sound if ROBOT ON/OFF switch is not turned to "ON" or the robot is not at home position when press START switch. In such case, press STOP switch and turn ROBOT ON/OFF switch to "ON" and/or set the robot to home position.

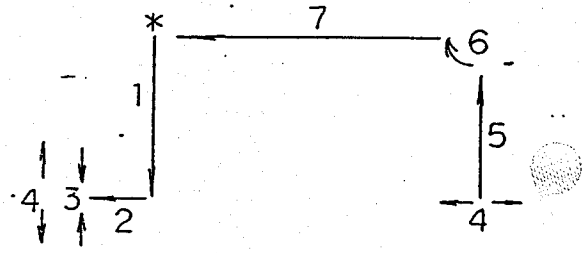
4) STOP (PSW-2) : Automatic operation stop switch

Main arm cylinder and kick cylinder returns to their home position (except traverse motion).

5) MANUAL 1 (PSW-3), 2 (PSW-4) : Manual operation switch

This switch is available only when ROBOT ON/OFF switch is "ON" position and mold open signa is valid.
The following motions are available step by step whenever push the each button.

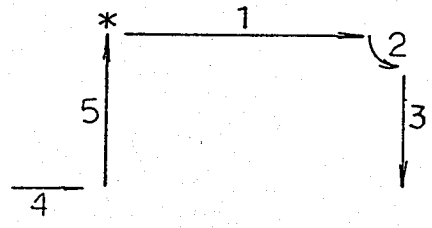
a) Manual 1 (PSW-3)



* Home position
1 Main arm first descent and kick frame down
2 Kick forward
3 Grip
4 Release
5 Main arm second ascent and kick frame up
6 Wrist return vertical
7 Traverse inward to home position

In the mold area, it is available to grip and release repeatedly by pressing this button.

b) Manual 2 (PSW-4)



* Home position
1 Traverse outward
2 Wrist flip horizontal
3 Main arm-second descent and kick frame down
4 Kick backward
5 Main arm first ascent and kick frame up

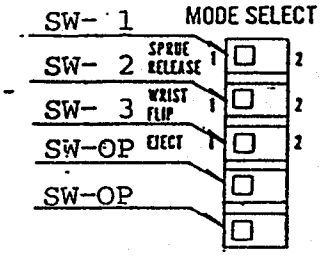
6) RESET (PSW-5) : Reset switch

In case that molded parts and/or sprue runner system are not recognized by part verification switch or vacuumm differencial switch, the alarm comes on when CYCLE MONITOR timer (T-8) elapses. Press this button after checking no molded parts and/or sprue runner system in the mold area. Then injection machine will start mold closing and the robot starts swing out motion.
In case that molded parts and/or sprue runner system is dropped between the home position and *midway position on the traverse beam, parts verification gets OFF, then, mold closing of injection machine is interrupted in order to prevent the molds from damaged and robot stops at traverse outward end position.. In such case, by pressing this switch, robot and injection machine operation will be continued.

* midway position on traverse beam
This position can be changed easily by moving an actuator for LS-1 put on the traverse beam.

7) MODE SELECT (SW-1, SW-2, SW-3, SW-OP)

Availavle to select several motion sequence by these switches. Mode change during auto operation is not valid. Set these swithes when the robot is under manual operation mode.



a) SPRUE RELEASE 1/2 (SW-1)

Sprue/runner system releasing timing can be selected by this switch.

1 : Sprue/runner system is released at the midway traverse during traverse outward motion.

2 : Sprue/runner system is released at the midway traverse during traverse inward motion.

Remarks ; Function of this switch correspondes to the conditon of CYL.SELECT switch (RSW-2) as follows.

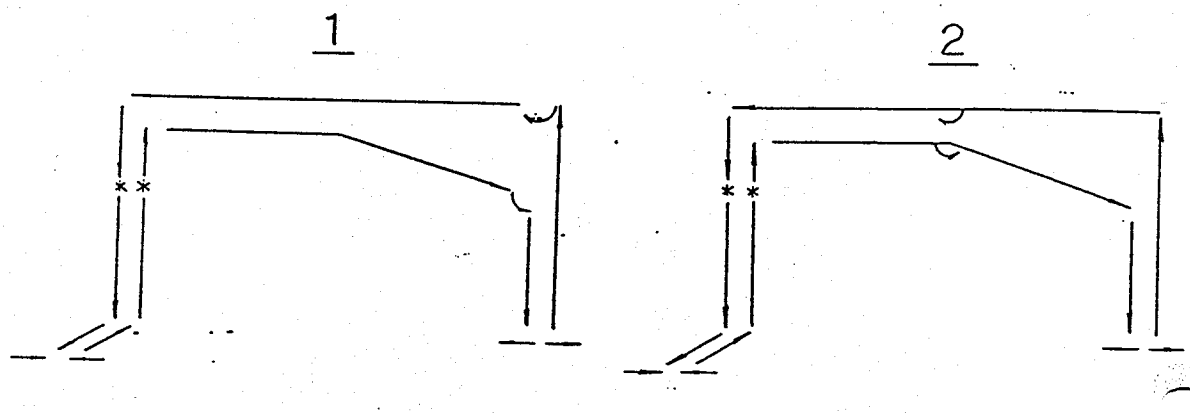
* When the CYL. SELECT switch is set to MAIN or MAIN & SUB, releasing timing of sprue/runner system taken out by main arm can be controlled by this switch. In such case, sprue/runner system taken out by sub arm is released during the traverse outward motion (fixed).
* When the CYL. SELECTOR switch is set to SUB,
  1 : Sprue/runner system is released at the midway traverse during traverse outward motion.
  2 : Sprue/runner system is released at the traverse outward end position.

b) WRIST FLIP 1/2 (SW-2)

Wrist flip timing of the end of arm tooling can be selected by this switch.

1 : Wrist flip horizontal at traverse outward end position, and wrist return vertical after second ascent, then traverse inward to home position.

2 : Wrist flip horizontal at midway traverse during traverse outward motion, and wrist return vertical at midway traverse during traverse inward motion.



c) EJECT 1/2 (SW-3)

Start timing of T-1 (EJECT timer) can be selected by this switch.

1 : T-1 starts counting at the same time of arm first descent.

2 : T-1 starts counting at the same time of kick forward.

d) SW-OP : For option

8) EMERGENCY STOP (PB-1)

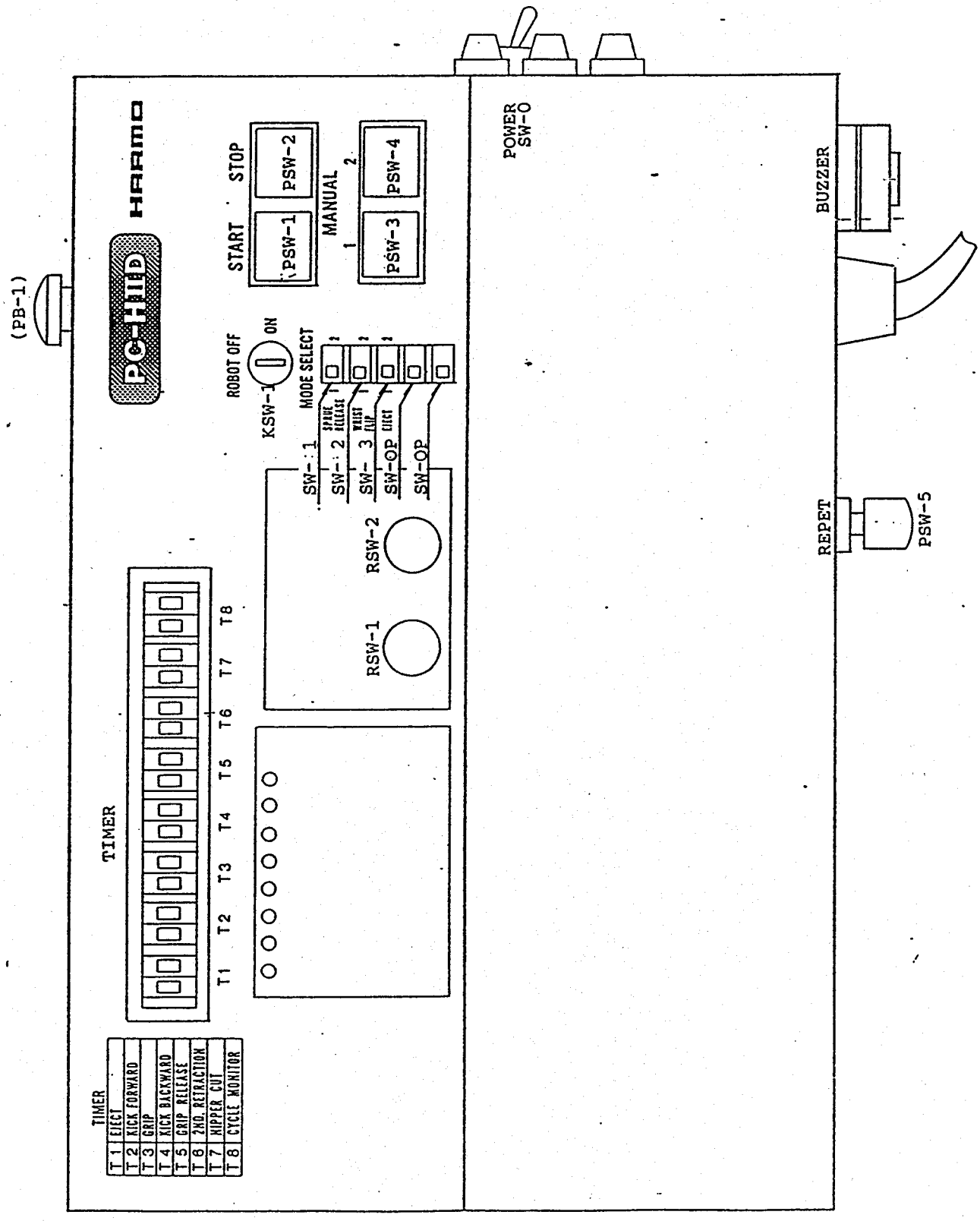
a) When press the button during auto operation, all power source for solenoid valves are shut off. To cancel this mode, pull up the button, then, the robot become manual operation mode.

b) When press the button during manual operation, all power source for solenoild valves are shut off and manual sequence is cleared.

Mold close/open interlock signal, injection machine cycle start (mold closing start) signal, and ejector timing control signal are all shut off, when press the button.

To release this mode, pull up the button.

EXTERNAL VIEW



3. Internal switch

1) PARTS VERIFICATION (RSW-1)

Parts and/or sprue runner system verification method can be selected by this selector switch.

LS-4 .... Part verification is done by Ls-4 proximity switch

VS-1 .... Parts verification is done by vacuum differencial switch (VS-1) when vacuun ejector kit is used.

AUX. .... The auxiliary switch equipped on the end of arm tooling verify the parts and/or sprue runner system.

VS-1 & AUX. .... Parts and/or sprue runner system is verified by vacuum differencial switch and auxiliary switch.

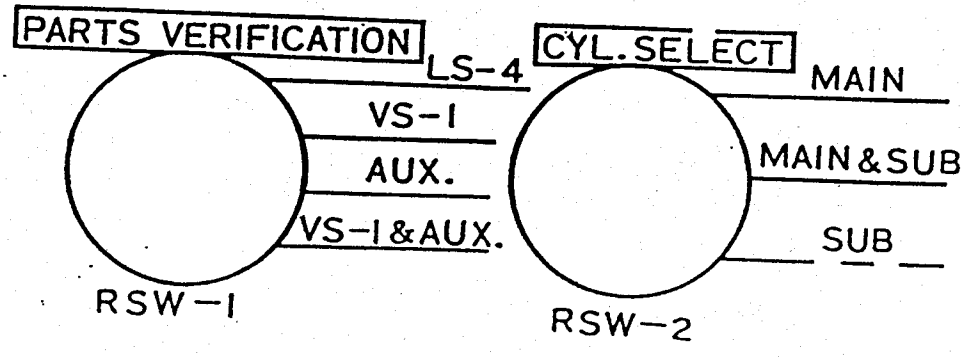
2) CYL. SELECT (RSW-2)

Arms can be selected by this switch.

MAIN .... Only main arm is used (for 2 plate molds).

MAIN & SUB .... Main and sub arms are used for 3 plate molds.

SUB .... Only sub arm is used to take out sprue/runner system.

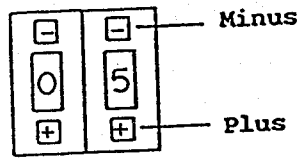


4. TIMERS

Adjust timers in order to get fast and smooth robot motion.

Digital timers (T-1 to T-8)

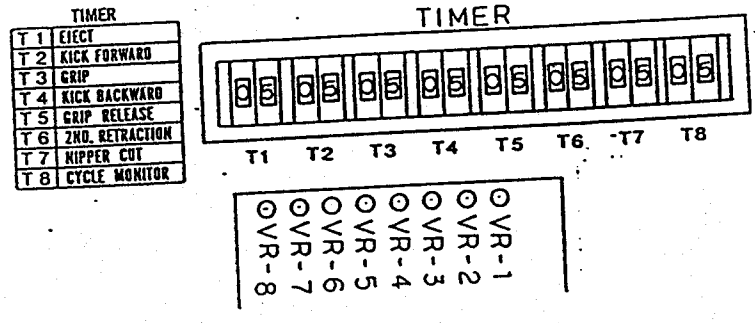
It can set up 0.1 second each for the range of 0.1 to 9.9 seconds.



Set each delay time by pressing small push button on digital timers.

Analog timers (VR-1 to VR-8)

It can set by attached screw driver.
These timers are provided as extra timers. It is necessary to modify the program stored in the ROM IC if these timers are needed to use.



a) EJECT (T-1)

Hydlaulic ejection timing of injection machine is controlled by this timer. Start timing of this timer can be selected by MODE SELECTOR switch (SW-3 : EJECT 1/2). When T-1 elapses, eject interlock is released.

b) KICK FORWARD (T-2)

This timer starts counting at the same time of arm kick forward. When T-2 elapses, gripper approaches (kick forward) to the molded part and/or sprue runner system.

c) GRIP (T-3)

This timer starts counting at the same time of kick forward motion. When T-3 elapses, finger grips the molded part and/or sprue runner system.

d) KICK BACKWARD (T-4)

This timer starts counting at the same time of grip. And when T-4 elapses, gripper strips off the molded parts and/or sprue runner system.

e) GRIP RELEASE (T-5)

This timer starts counting when the T-7 elapses. When T-5 elapses, robot releases molded part.

f) 2ND RETRACTION (T-6)

This timer starts counting at the same time of grip release. When T-6 elapses, main arm retracts.

g) NIPPER CUT (T-7)

This timer starts counting when the main arm reaches to 2nd. descent end. When T-7 elapses, nippers equipped on the end of arm tooling are actuated. Nipper blades open at the same time of 2nd. ascent. Set this timer to 0 (zero) second when nipper circuit is not used.

h) CYCLE MONITOR (T-8)

1 cycle time of robot is divided into following 3 steps. This timer checks each time and alarm if it elapses.

1st. step	1	Home position
	2	1st. descent
	3	kick forward
	4	Grip
	5	Kick backward
	6	1st. ascent
	7	verify parts
2nd. step	8	Traverse outward
	9	Traverse outward end
3rd. step	10	Wrist flip horizontal
	11	2nd. descent
	12	Release
	13	2nd. ascent
	14	Wrist return vertical
	15	Traverse inward to home

5. LED DISPLAY

LEDs on PCB-E005H

a) MOLD OPEN (L-1)

Light when mold open complete signal is given to robot.

b) OPEN·CLOSE SAFETY (L-2)

Light when mold open and close interlock signal are released.

c) MOLD CLOSE (L-3)

Light then mold closing start signal is given to injection machine.

d) EJECTOR (L-4)

Light when eject interlock signal is released.

e) HOME POSITION (L-5)

Light when robot is at the following condition.
* Main (and sub)arm is at upward end position (LS-3 & 7 : ON & LS-11 : OFF)
* Traverse inward end position (LS-2 : ON & LS-1 : OFF)
* Wrist flip vertical position (LS-8 : ON & LS-10 : OFF)
* Kick backward end position (LS-6 : ON)
* Part verification switch and RESET switch are OFF

f) OUTWARD END (L-6)

Light when traverse outward end limit switch (LS-1) is ON.

g) INWARD END (L-7)

Light when traverse inward end limit switch (LS-2) is ON.

h) ARM UPWARD END (L-8)

Light when main (and sub) arm upward end limit switch (LS-3 & 7) are ON.

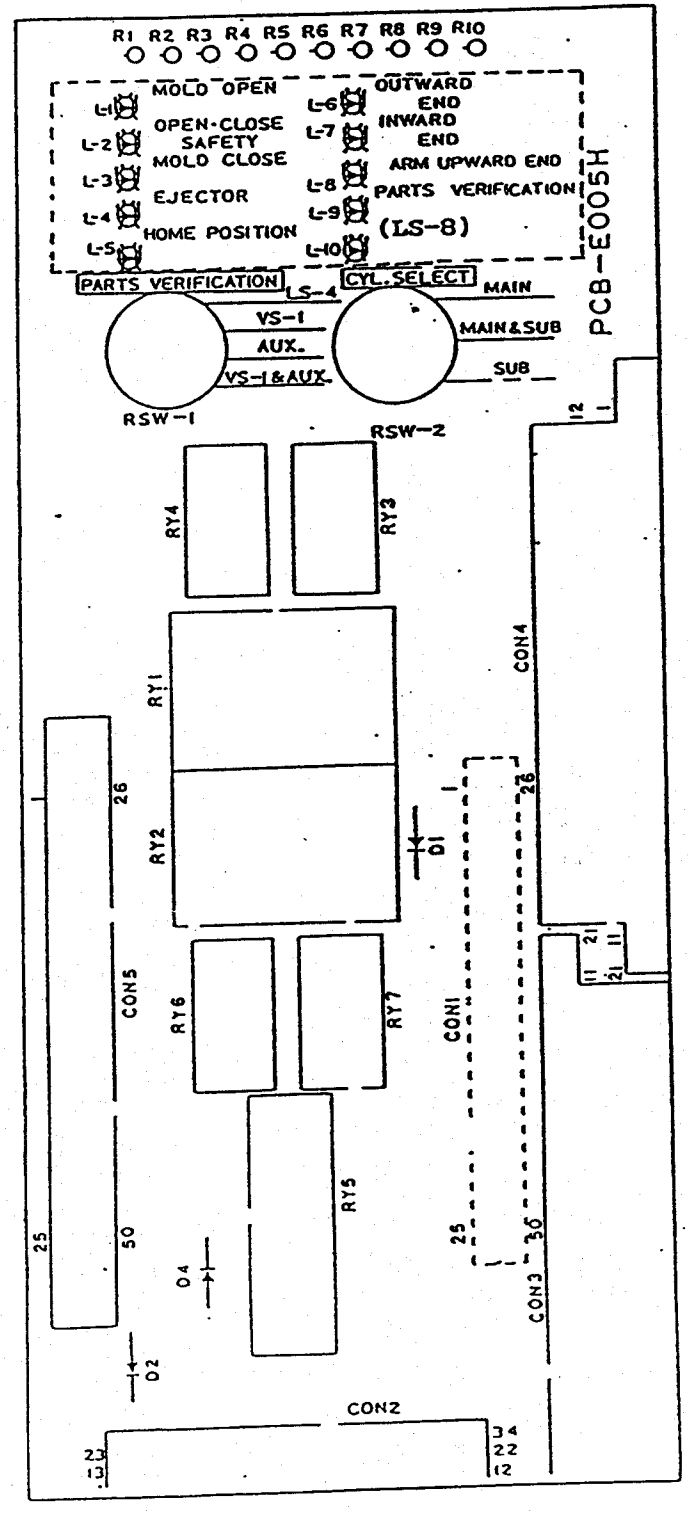
i) PART VERIFICATION (L-9)

Light when part verification switch or reset switch is ON.

j) (LS-8) (L-10)

Light when the end of arm tooling vertical end switch (LS-8) is ON.

LED DISPLAY


R1 R2 R3 R4 R5 R6 R7 R8 R9 R10
L-1 MOLD OPEN
L-2 OPEN-CLOSE SAFETY
L-3 MOLD CLOSE
L-4 EJECTOR
L-5 HOME POSITION
L-6 OUTWARD END
L-7 INWARD END
L-8 ARM UPWARD END
L-9 PARTS VERIFICATION
L-10 (LS-8)
PCB-E005H
PARTS VERIFICATION
LS-4
VS-1
AUX.
VS-1&AUX.
RSW-1
CYL. SELECT
MAIN
MAIN&SUB
SUB
RSW-2
RY4
RY3
RY1
RY2
RY6
RY7
RY5
D1
D2
D4
CON1
CON2
CON3
CON4
CON5

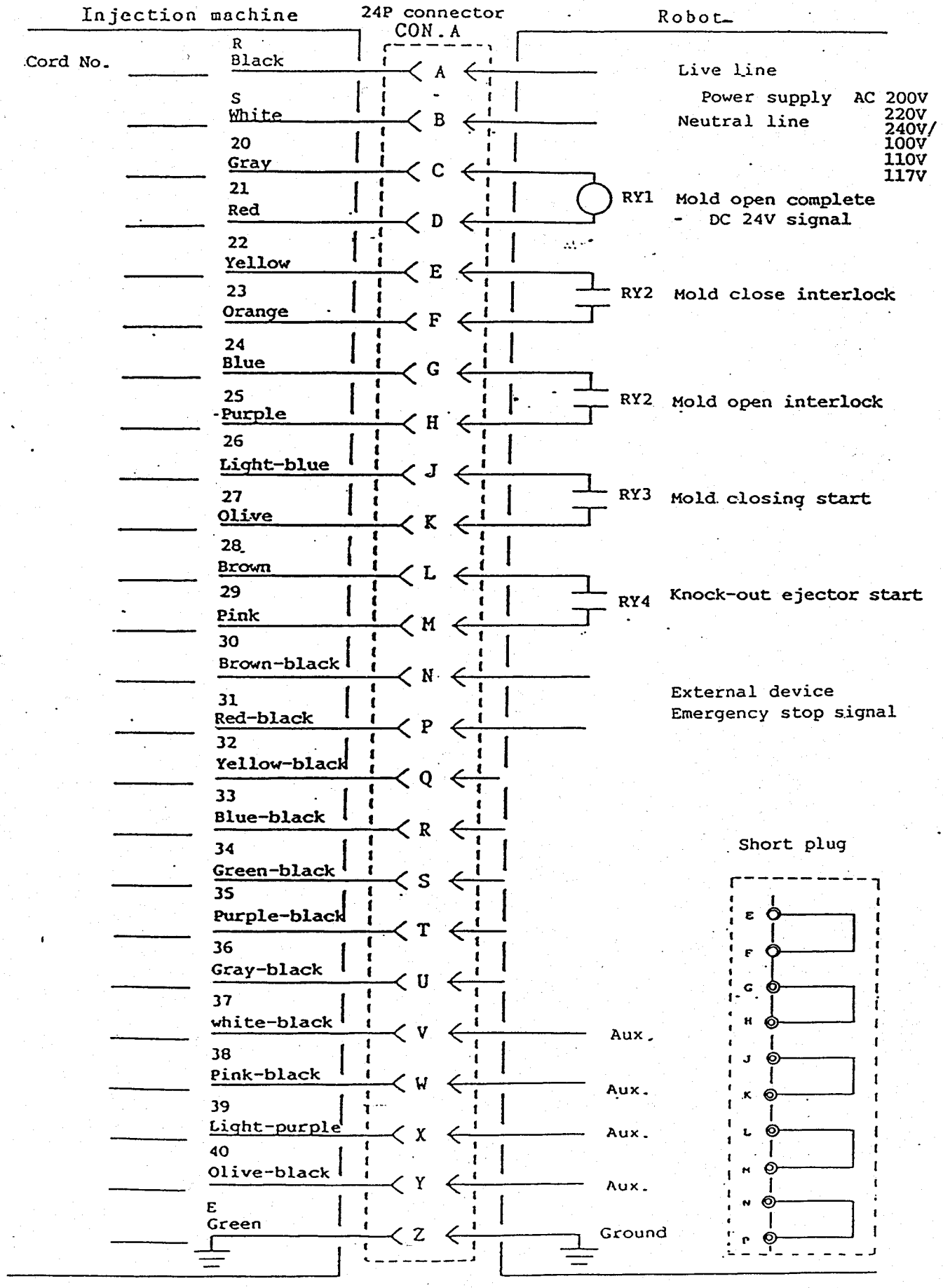
LEDs on sequence controller PM-911C

POWER	Light when power is ON.	
CPU	Light when "Sequence error". Shut off all output signal from sequencer.	
Y00 - HOME PSTN/ALARM .	Home position and alarm	
Y01 - MOLD SAFETY	Mold open/close safety interlock	(RY2 & 3)
Y02 - EJECTOR FWD	Ejector forward signal	(RY4)
Y03 - MAIN CYL. SOL. ..	Main arm extend	(SOL-3)
Y04 - TRAVERSE OUT SOL.	Traverse outward	(SOL-1)
Y05 - TRAVERSE IN SOL..	Traverse inward	(SOL-2)
Y06 - KICK CYL. SOL. ..	Kick forward	(SOL-4)
Y07 - GRIP SOL.	Grip, vacuum	(SOL-5 & 6)
X00 - MOLD OPEN	Mold open completion signal	(RY-1)
X01 - ROBOT OFF	Without robot operation	(KSW-1)
X02 - AUTO START	Auto operation start	(PSW-1)
X03 - MANUAL 1	Manual operation 1	(PSW-3)
X04 - MANUAL 2	Manual operation 2	(PSW-4)
X05 - MODE SELECT 1 ...	Sprue release 2	(SW-1)
X06 - MODE SELECT 2 ...	Wrist flip 2	(SW-2)
X07 - MODE SELECT 3 ...	Eject 2	(SW-3)
X08 - LS-1	Traverse outward end limit	(LS-1)
X09 - LS-2	Traverse inward end limit	(LS-2)
X0A - LS-3	Arm upward end limit	(LS-3 & 7)
X0B - LS-4,VS,AUX.	Part verification (LS-4,vacuum switch,Aux. switch)	

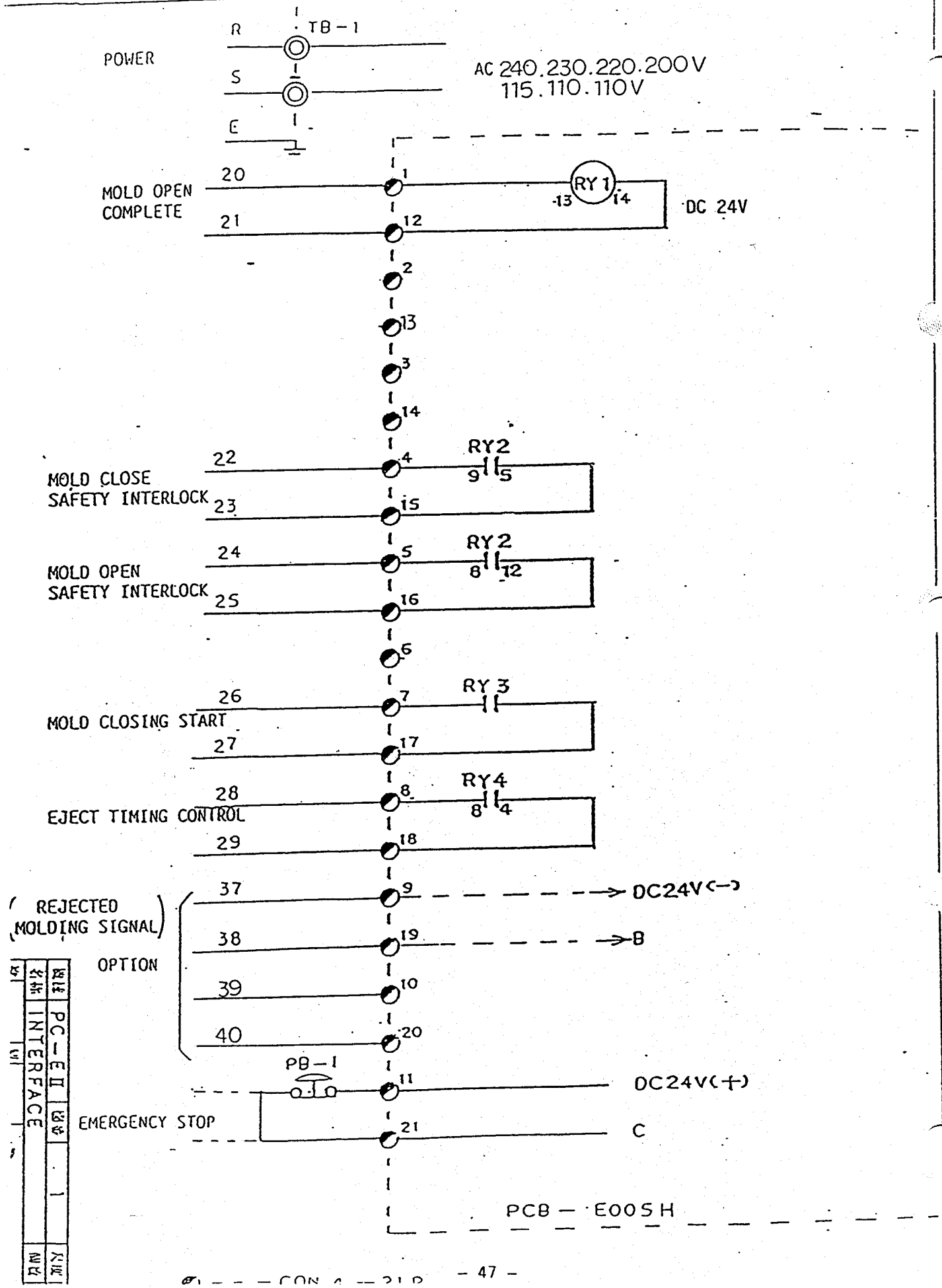
LEDs on PCB-E006A

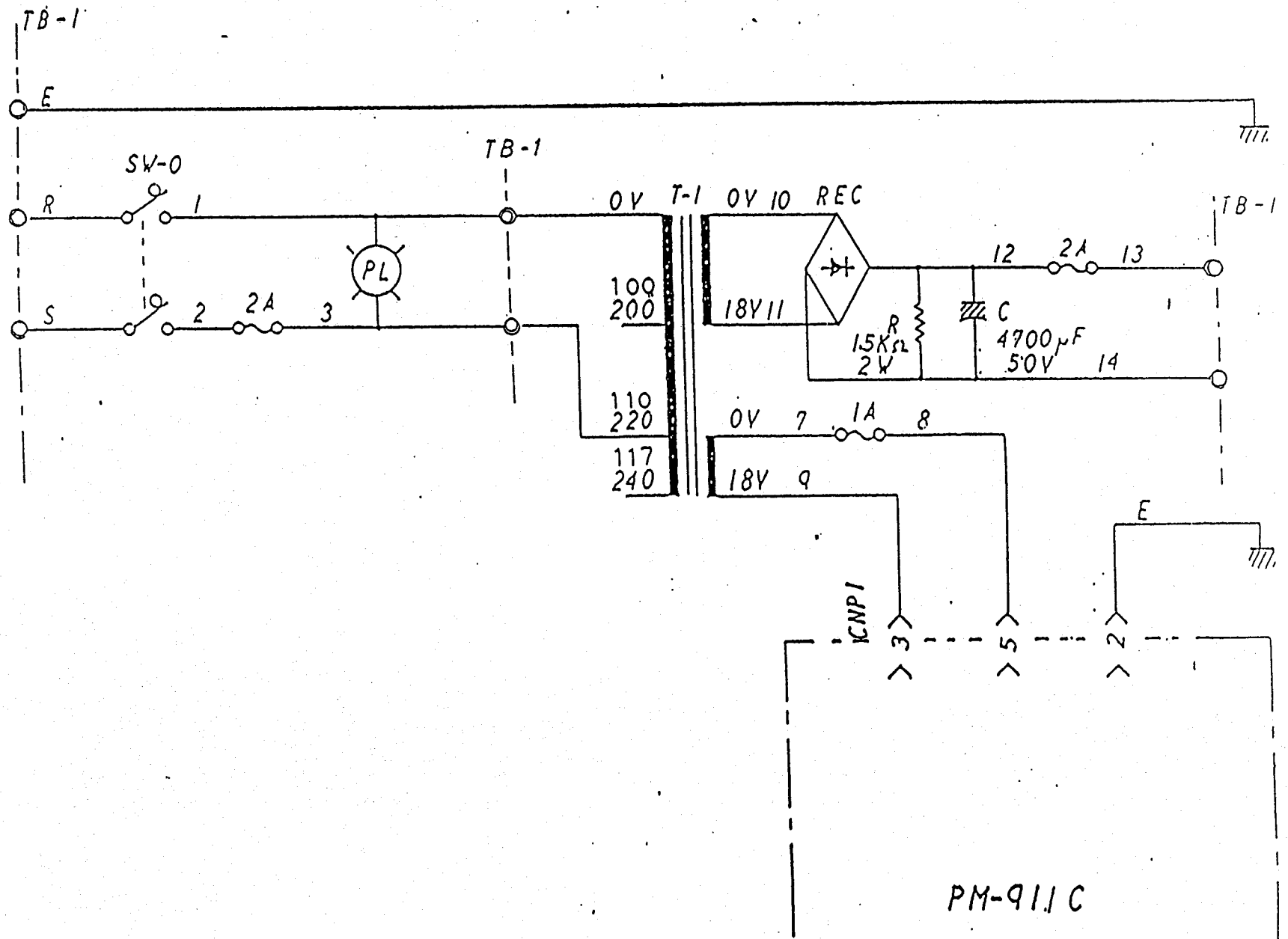
Y08 - WRIST FLIP HOR. ..	Wrist flip horizontal	(SOL-7)
Y09 - WRIST FLIP VER. ..	Wrist flip vertical	(SOL-8)
Y0A - MAIN SPRUE GRIP ..	Main arm sprue grip	(SOL-14)
Y0B - SUB ARM DESCENT ..	Sub arm descent	(SOL-9)
Y0C - SUB SPRUE GRIP ...	Sub arm sprue grip	(SOL-11)
Y0D - SUB KICK FORWARD .	Sub arm kick forward	(SOL-10)
Y0E - STAND BY ABV MOLD	First entry cyl.	(SOL-OPT1)
Y0F - NIPPER CUT	Nipper	(SOL-13)
X0C - CYL. SELECT 1	Main,Main & Sub,Sub	(RSW-2)
X0D - CYL. SELECT 2	ditto	
X0E - LS-5	Sub arm sprue verification	(LS-5)
X0F - LS-11	Main arm downward end limit	(LS-11)
X10 - LS-OPT 1	First entry cyl. upward end limit	(LS-OPT1)
X11 - LS-6	Main arm kick backward end limit	(LS-6)
X12 - LS-10	Wrist flip hori. end limit	(LS-10)
X13 - LS-8	Wrist flip vert. end limit	(LS-8)

K. CONNECTION BETWEEN ROBOT AND INJECTION MACHINE

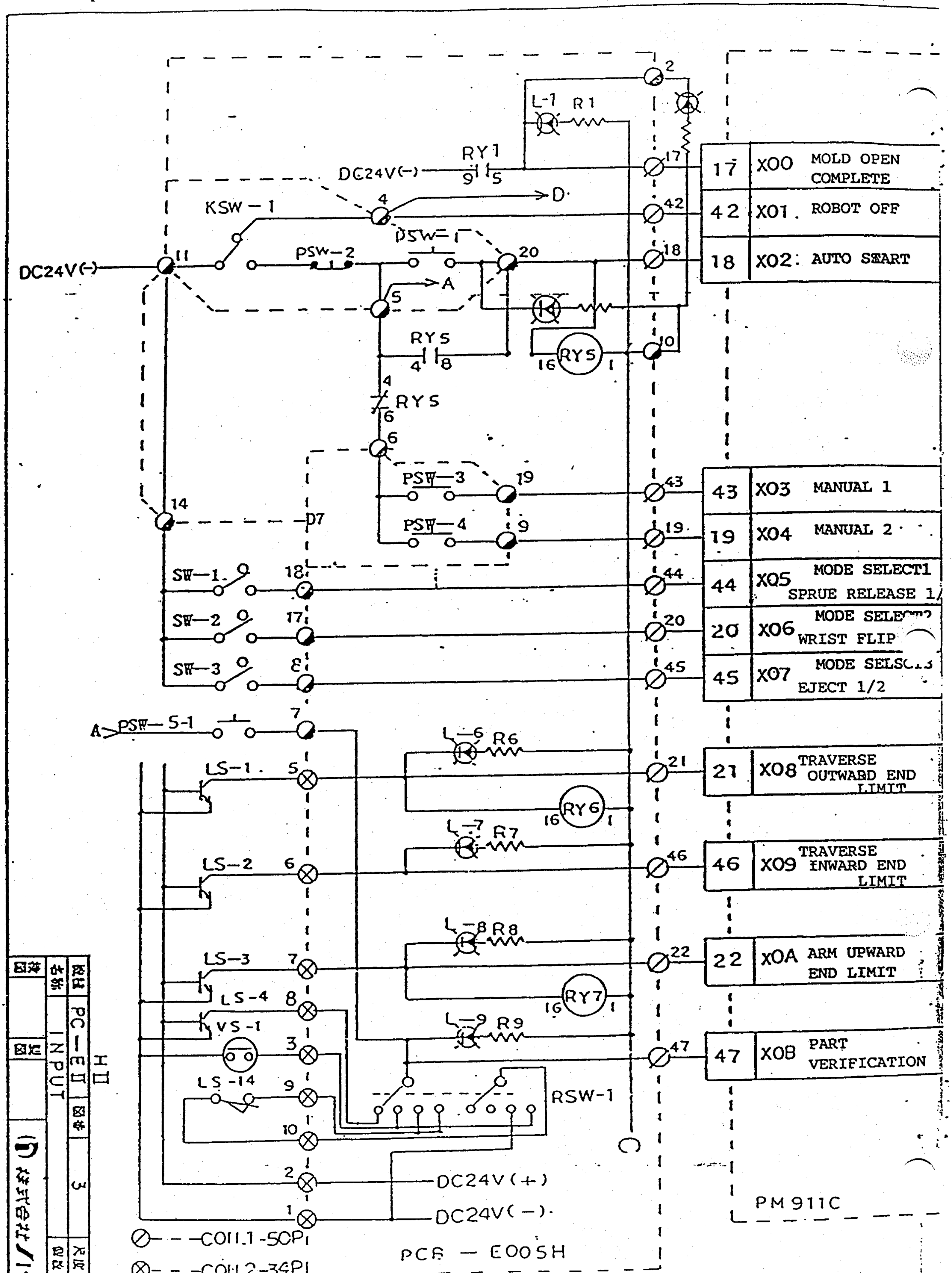


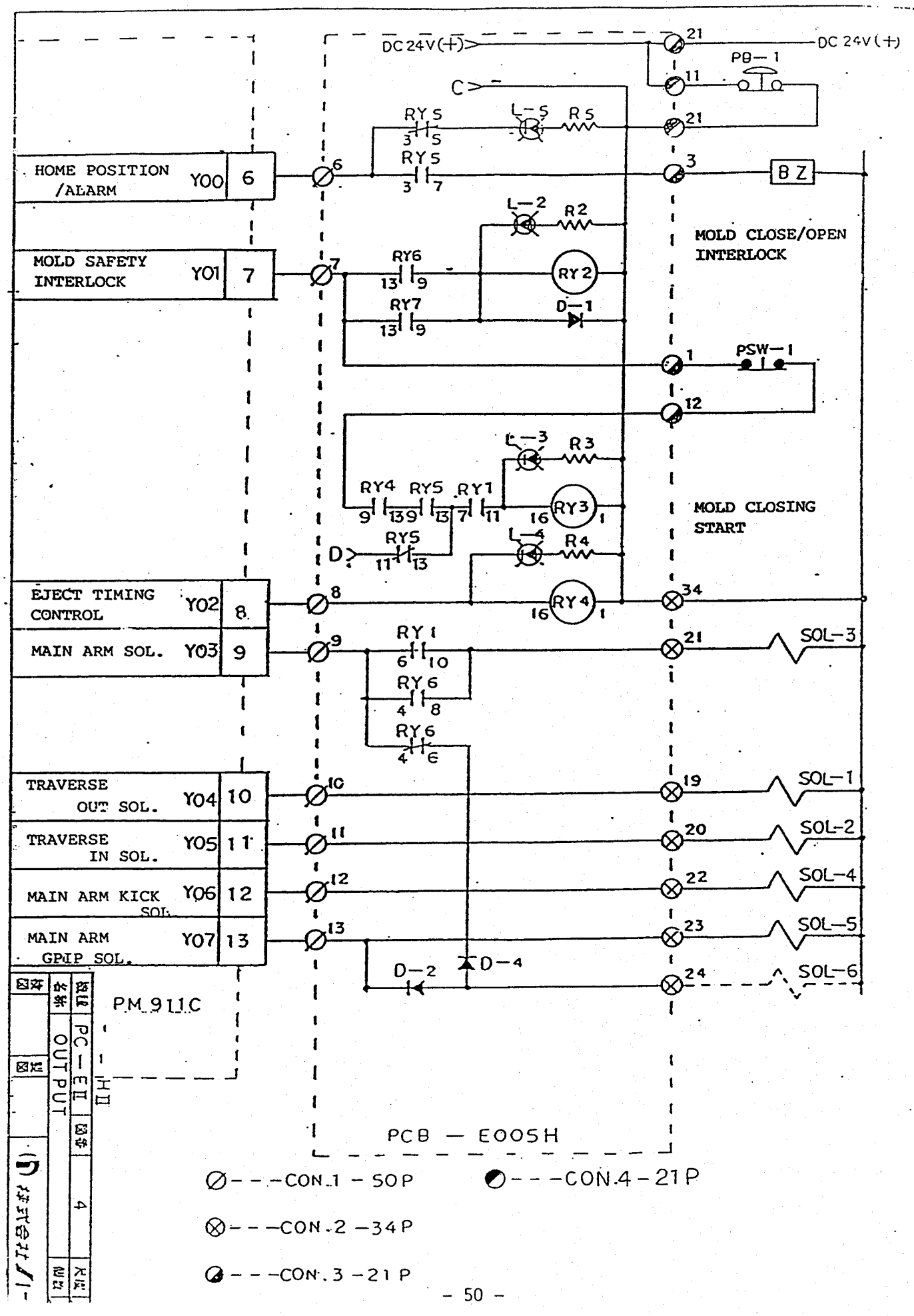
L. WIRING DIAGRAM FOR PC-HIID CONTROLLER

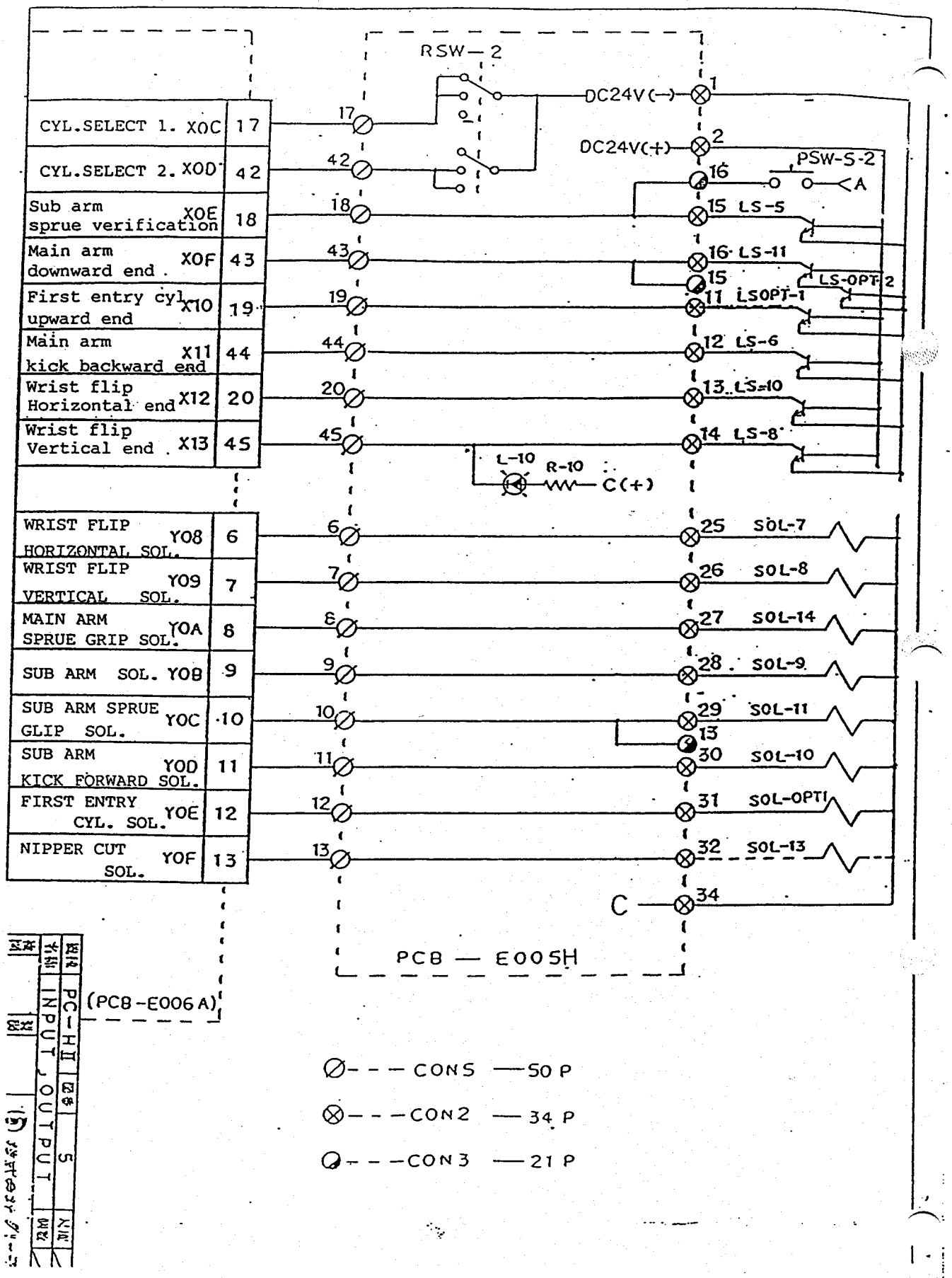


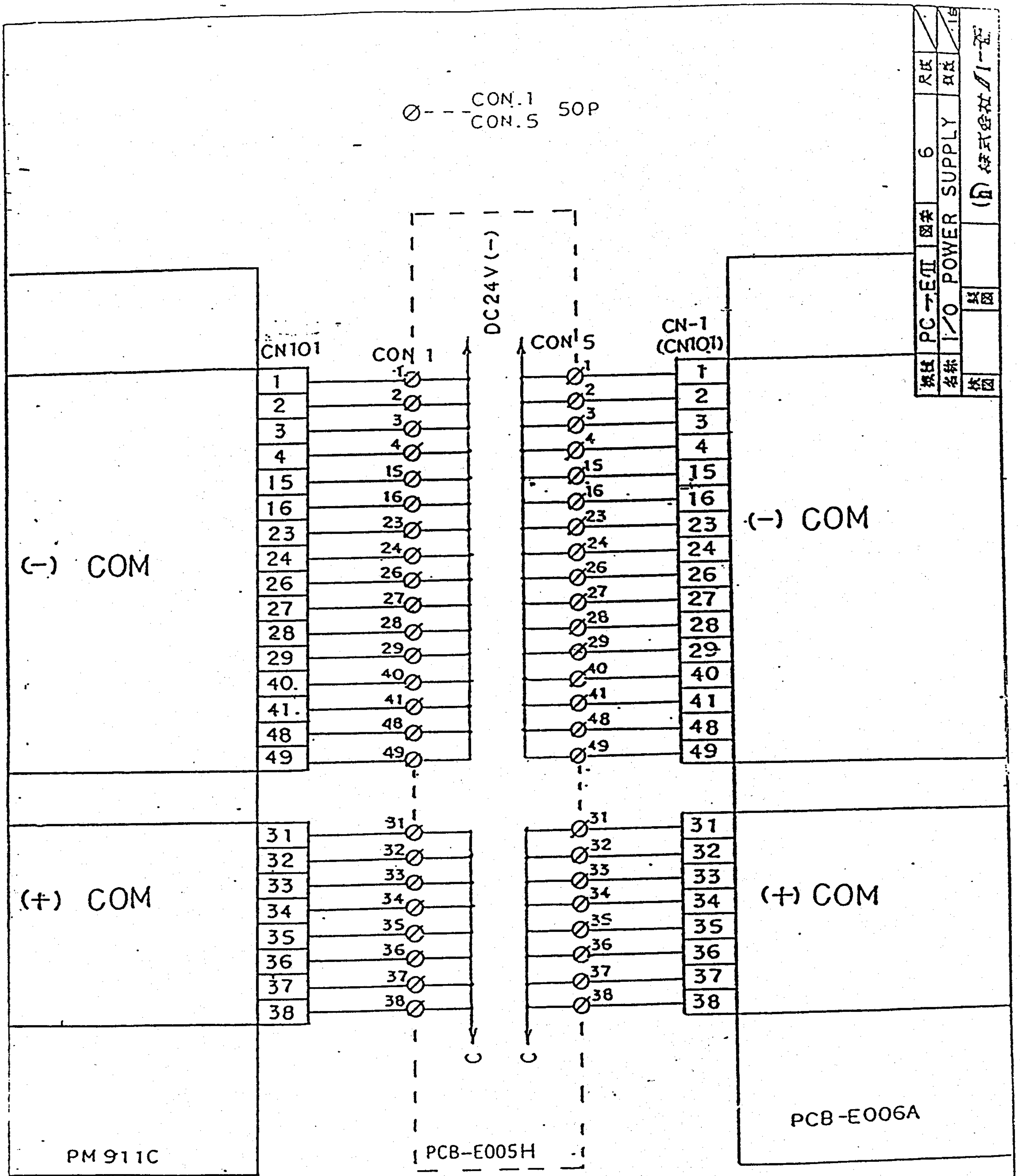


機種	PC-E□	図番	2	尺度	
名称	POWER SUPPLY			図数	1枚
設		製			


DC24V(−)
RY1
L-1
R1
KSW − 1
PSW−2
PSW−1
RY5
PSW−3
PSW−4
SW−1
SW−2
SW−3
PSW−5-1
LS−1
LS−2
LS−3
LS−4
VS-1
LS-14
L−6
R6
RY6
L−7
R7
L−8
R8
RY7
L−9
R9
RSW-1
DC24V(+)
DC24V(−)
COM.1-50P
COM.2-34P
PCB − E005H
PM911C
17 X00 MOLD OPEN COMPLETE
42 X01 ROBOT OFF
18 X02 AUTO START
43 X03 MANUAL 1
19 X04 MANUAL 2
44 X05 MODE SELECT1 SPRUE RELEASE 1/
20 X06 WRIST FLIP
45 X07 EJECT 1/2
21 X08 TRAVERSE OUTWARD END LIMIT
46 X09 TRAVERSE INWARD END LIMIT
22 X0A ARM UPWARD END LIMIT
47 X0B PART VERIFICATION
PC−EII
INPUT
HII


DC 24V(+)
DC 24V(+)
PB-1
C
RY5
L-5
R5
HOME POSITION /ALARM
Y00
6
RY5
BZ
L-2
R2
MOLD CLOSE/OPEN INTERLOCK
MOLD SAFETY INTERLOCK
Y01
7
RY6
RY2
RY7
D-1
PSW-1
L-3
R3
RY4
RY5
RY1
RY3
MOLD CLOSING START
D
L-4
R4
EJECT TIMING CONTROL
Y02
8
RY4
MAIN ARM SOL.
Y03
9
RY1
RY6
SOL-3
TRAVERSE OUT SOL.
Y04
10
SOL-1
TRAVERSE IN SOL.
Y05
11
SOL-2
MAIN ARM KICK SOL.
Y06
12
SOL-4
MAIN ARM GRIP SOL.
Y07
13
SOL-5
D-2
D-4
SOL-6
PM 911C
PCB - E005H
⊘---CON.1 - 50P
◐---CON.4 - 21P
⊗---CON.2 - 34P
◔---CON.3 - 21P


RSW—2
DC24V(—)
DC24V(+)
PSW-S-2
A
CYL.SELECT 1. X0C
CYL.SELECT 2. X0D
Sub arm sprue verification X0E
Main arm downward end. X0F
First entry cyl upward end X10
Main arm kick backward end X11
Wrist flip Horizontal end X12
Wrist flip Vertical end. X13
LS-5
LS-11
LS-OPT-2
LSOPT-1
LS-6
LS-10
LS-8
L-10
R-10
C(+)
WRIST FLIP HORIZONTAL SOL. Y08
WRIST FLIP VERTICAL SOL. Y09
MAIN ARM SPRUE GRIP SOL. Y0A
SUB ARM SOL. Y0B
SUB ARM SPRUE GLIP SOL. Y0C
SUB ARM KICK FORWARD SOL. Y0D
FIRST ENTRY CYL. SOL. Y0E
NIPPER CUT SOL. Y0F
SOL-7
SOL-8
SOL-14
SOL-9
SOL-11
SOL-10
SOL-OPT
SOL-13
C
PCB — E005H
(PCB-E006A)
CON5 —50P
CON2 —34P
CON3 —21P


∅---CON.1 CON.5 50P
DC24V(−)
CN101
CON 1
CON 5
CN-1 (CN101)
1 2 3 4 15 16 23 24 26 27 28 29 40 41 48 49
31 32 33 34 35 36 37 38
(−) COM
(+) COM
C
C
PM911C
PCB-E005H
PCB-E006A
PC-E/II
I/O POWER SUPPLY
6

Cable connection between robot and controller

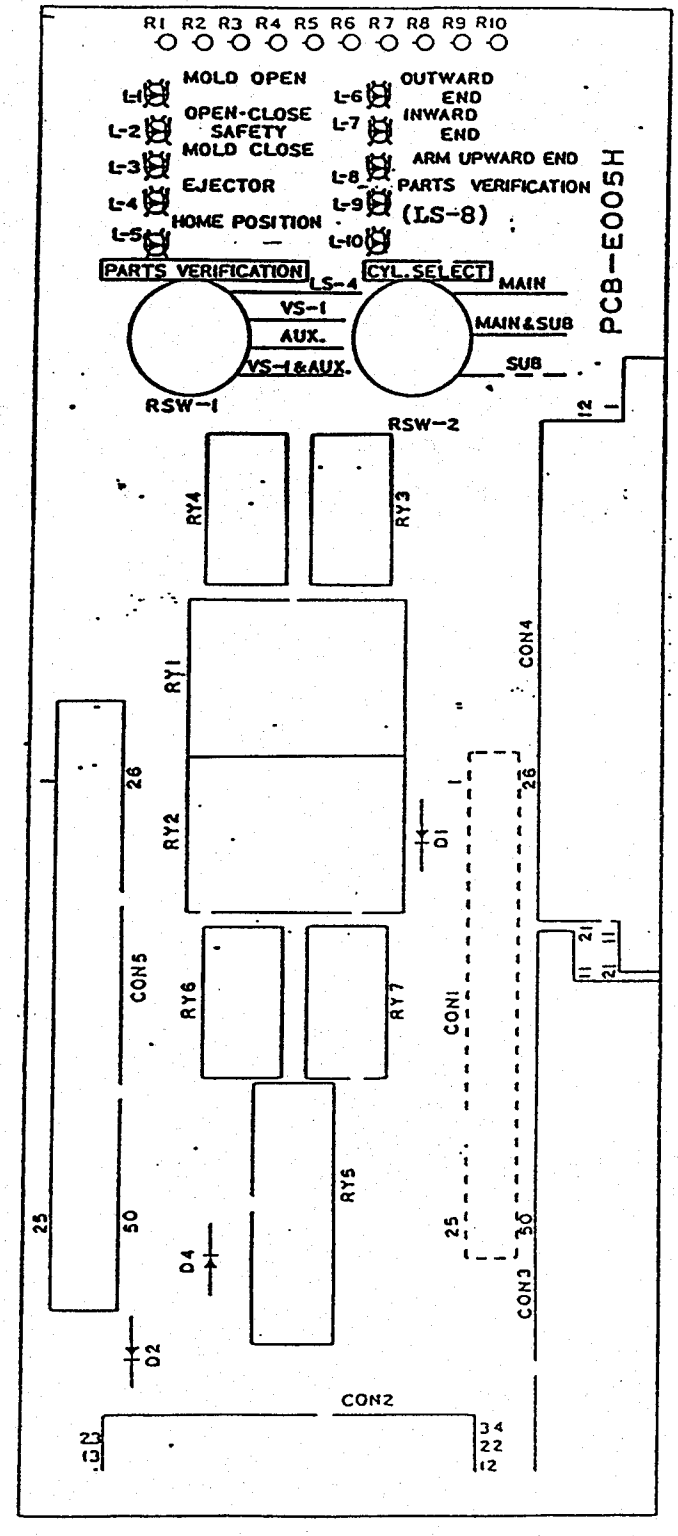
ROBOT CONTROLLER PC-HIID		MR-34	40 core cable	21P CON. INPUT	45 core cable	MR-50	ROBOT HACBO20C
DC.24V	(-)	1	BLACK	1	BLUE	1	(-)COM
DC.24V	(+)	2	WHITE	2	BROWN	33	(+)COM
VACUUM VERIFICATION	X0B	3	GRAY	16	BROWN-YELLOW	36	VS-1
		4	ORANGE-BLACK	20	RED-ORANGE	40	LS OPT4
TRAVERSE OUTWARD END LIMIT	X08	5	LIGHT PURPLE	3	RED	2	LS-1
TRAVERSE INWARD END LIMIT	X09	6	YELLOW	4	BLACK	3	LS-2
ARM.UPWARD END LIMIT	X0A	7	ORANGE	5	YELLOW	4	LS-3,7
PART VERIFICATION	X0B	8	BLUE	6	WHITE	5	LS-4
AUX.SWITCH	X0B	9	PURPLE	15	BROWN-RED	35	LS-14
AUX.SWITCH	COM	10	LIGHT BLUE	21	RED-GRAY	41	LS-14 COM
FIRST ENTRY CYL UPWARD END	X10	11	YELLOW-GREEN	17	BROWN-GRAY	37	LS OPT1
MAIN ARM.KICK BACKWARD END	X11	12	BROWN	8	BLUE-BLACK	7	LS-6
WRIST FLIP HORIZONTAL END	X12	13	PINK	11	BLUE-ORANGE	19	LS-10
WRIST FLIP VERTICAL END	X13	14	BROWN-BLACK	9	BLUE-RED	8	LS-8
SUB ARM.SPRUE VERIFICATION	X0E	15	LIGHT BLUE-BLACK	7	BLUE-WHITE	6	LS-5
MAIN ARM DOWNWARD END	X0F	16	LIGHT PURPLE-BLACK	12	BLUE-GRAY	20	LS-11
		17	BLACK-SILVER	18	RED-WHITE	38	LS OPT2
		18	RED-SILVER	19	RED-BLACK	39	LS OPT3
				10	BLUE-YELLOW	9	LS-9
				13	BROWN-WHITE	21	LS-12
				14	BROWN-BLACK	34	LS-13

				OUTPUT			
TRAVERSE OUT SOL.	Y04	19	RED-BLACK	10	YELLOW-RED	30	SOL-1
TRAVERSE IN SOL.	Y05	20	YELLOW-BLACK	11	YELLOW-ORANGE	31	SOL-2
MAIN ARM SOL.	Y03	21	BLUE-BLACK	3	BLUE-YELLOW	10	SOL-3
MAIN ARM KICK SOL.	Y06	22	GREEN-BLACK	4	BLUE-ORANGE	11	SOL-4
MAIN ARM GRIP SOL.	Y07	23	PURPLE-BLACK	5	BLUE-GRAY	12	SOL-5
MAIN ARM VACUUM SOL.	Y07	24	GRAY-BLACK	6	BROWN-WHITE	13	SOL-6
WRIST FLIP HORIZONTAL SOL.	Y08	25	WHITE-BLACK	7	BROWN-BLACK	14	SOL-7
WRIST FLIP VERTICAL SOL.	Y09	26	PINK-BLACK	8	BROWN-RED	15	SOL-8
MAIN ARM SPRUE GRIP SOL.	Y0A	27	YELLOW GREEN-BLACK	9	BROWN-YELLOW	16	SOL-14
SUB ARM SOL.	Y0B	28	GREEN	13	BROWN-WHITE2	42	SOL-9
SUB ARM SPRUE GRIP SOL.	Y0C	29	GREEN-SILVER	15	BLACK-WHITE2	44	SOL-11
SUB ARM KICK FORWARD SOL.	Y0D	30	YELLOW-SILVER	14	RED-WHITE2	43	SOL-10
FIRST ENTRY CYL. SOL.	Y0E	31	BROWN-SILVER	17	BLUE-BLACK2	46	SOL OPT1
NIPPER CUT SOL.	Y0F	32	BLUE-SILVER	16	YELLOW-BLACK2	45	SOL-13
		33	PURPLE-SILVER	18	BROWN-BLACK2	47	SOL OPT2
DC.24V	(+)	34	RED	1	BROWN-GRAY	17	(+)COM
				2	RED-WHITE	18	(+)COM
				12	BLUE-GRAY	32	SOL-12
				19	RED-BLACK2	48	SOL OPT3
				20	WHITE-BLACK2	49	SOL OPT4
				21	RED-GRAY	21	PL

N. PC-HIID INTERFACE BOARD

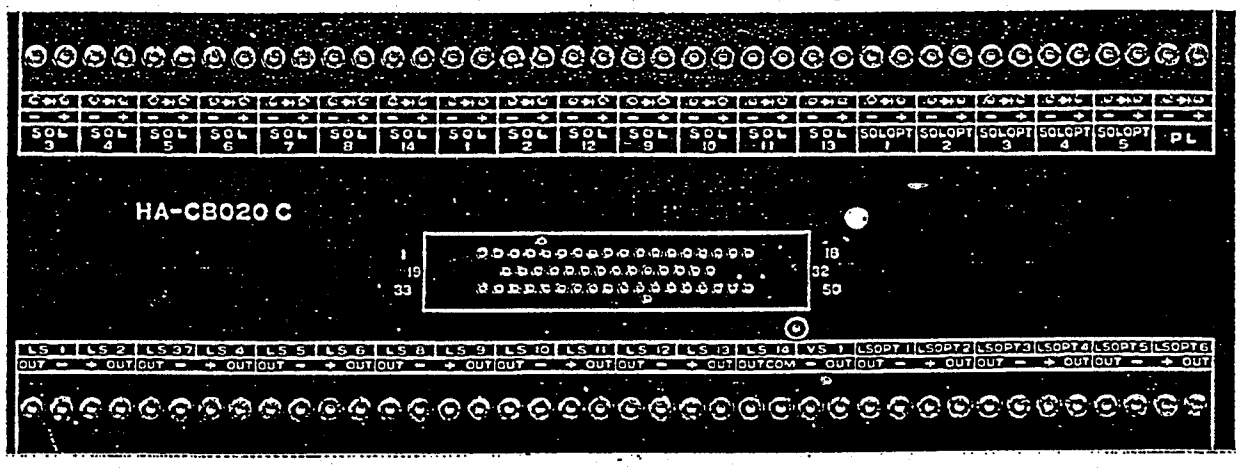
RY-1 : MOLD OPEN COMPLETE RELAY (OMRON MY-2 DC24V)
RY-2 : MOLD OPEN/CLOSE SAFETY INTERLOCK RELAY (MATSUSHITA AG2044)
RY-3 : MOLD CLOSING START RELAY (MATSUSHITA AG2024)
RY-4 : EJECT INTERLOCK RELAY (MATSUSHITA AG2024)
RY-5 : AUTO OPERATION RELAY (MATSUSHITA AG2044)
RY-6 : SWING OUTWARD END RELAY (MATSUSHITA AG2024)
RY-7 : ARM UPWARD END RELAY (MATSUSHITA AG2024)

CON1 : I/O CABLE CONNECTOR FOR PM911C BOARD
CON2 : I/O CABLE CONNECTOR FOR ROBOT
CON3 : I/O CABLE CONNECTOR FOR EXTERNAL SWITCHES
CON4 : CONNECTOR FOR INTERFACE CABLE FOR PRESS
CON5 : I/O CABLE CONNECTOR FOR ADDITIONAL BOARD PM911E



O. PCB HA-CB020C ON THE ROBOT BODY

Cables for solenoid valves and switches are connected to the PCB HA-CB020C. This PCB is located under the solenoid valves on main body of HCR series robot.

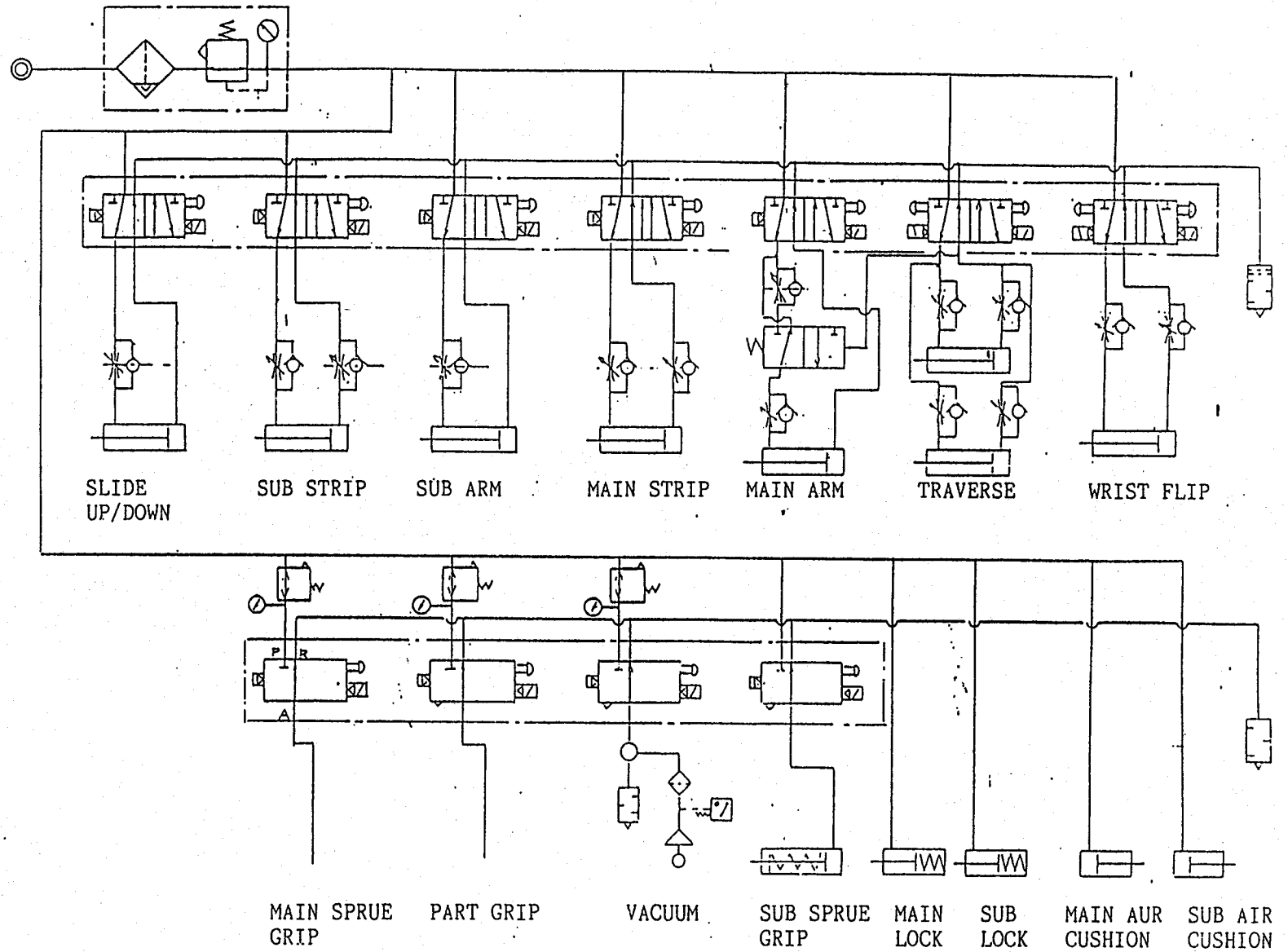


Assignment for each SOL. and LS is as follows;

Output
- SOL- 1 ... Traverse ourward solenoid valve
- SOL- 2 ... Traverse inward solenoid valve
- SOL- 3 ... Main arm cylinder solenoid valve
- SOL- 4 ... Main kick cylinder solenoid valve
- SOL- 5 ... Main grip solenoid valve
- SOL- 6 ... Vacuum solenoid valve
- SOL- 7 ... Wrist flip horizontal solenoid valve
- SOL- 8 ... Wrist flip vertical solenoid valve
- SOL- 9 ... Sub arm cylinder solenoid valve
- SOL-10 ... Sub kick cylinder solenoid valve
- SOL-11 ... Sub arm, sprue grip solenoid valve
- SOL-12 ... Not used for HCR robot
- SOL-13 ... Nipper cut solenoid valve
- SOL-14 ... Main arm sprue grip solenoid valve
- SOL-OPT1 . First entry cylinder solenoid valve
- SOL-OPT2 - 5 ... Not used for HCR robot
- PL ..... Alarm light

Input
- LS- 1 ... Traverse outward end proximity switch
- LS- 2 ... Traverse inward end proximity switch
- LS- 3 ... Main arm upward end proximity switch
- LS- 4 ... Main arm, part verification switch
- LS- 5 ... Sub arm sprue verification switch
- LS- 6 ... Main arm kick backward end proximity switch
- LS- 7 ... Sub arm upward end proximity switch
- LS- 8 ... Wrist flip vertical end proximity switch
- LS- 9 ... Not used for HCR robot
- LS-10 ... Wrist flip horizontal end proximity switch
- LS-11 ... Main arm downward end proximity switch
- LS-12 ... Not used for HCR robot
- LS-13 ... Not used for HCR robot
- LS-14 ... Auxiliary parts verification switch
- VS- 1 ... Vacuum differencial switch
- LS-OPT1 . First entry cylinder upward end proximity switch
- LS-OPT2 - 6 ... Not used for HCR robot

AIR SCHEMATIC FOR HARMO ROBOT MODEL HCR-100G



We're Here to Help

Conair has made the largest investment in customer support in the plastics industry. Our service experts are available to help with any problem you might have installing and operating your equipment. Your Conair sales representative also can help analyze the nature of your problem, assuring that it did not result from misapplication or improper use.

How to Contact Customer Service

To contact Customer Service personnel, call:

From outside the United States, call: 814-437-6861

You can commission Conair service personnel to provide on-site service by contacting the Customer Service Department. Standard rates include an on-site hourly rate, with a one-day minimum plus expenses.

Before You Call ...

If you do have a problem, please complete the following checklist before calling Conair:

- ❒ Make sure you have all model, serial and parts list numbers for your particular equipment. Service personnel will need this information to assist you.
- ❒ Make sure power is supplied to the equipment.
- ❒ Make sure that all connectors and wires within and between loading control and related components have been installed correctly.
- ❒ Check the troubleshooting guide of this manual for a solution.
- ❒ Thoroughly examine the instruction manual(s) for associated equipment, especially controls. Each manual may have its own troubleshooting guide to help you.
- ❒ Check that the equipment has been operated as described in this manual.
- ❒ Check accompanying schematic drawings for information on special considerations.

Additional manuals and prints for your Conair equipment may be ordered through the Customer Service or Parts Departments for a nominal fee.

EQUIPMENT GUARANTEE

Conair guarantees the machinery and equipment on this order, for a period as defined in the quotation from date of shipment, against defects in material and workmanship under the normal use and service for which it was recommended (except for parts that are typically replaced after normal usage, such as filters, liner plates, etc.). Conair's guarantee is limited to replacing, at our option, the part or parts determined by us to be defective after examination. The customer assumes the cost of transportation of the part or parts to and from the factory.

PERFORMANCE WARRANTY

Conair warrants that this equipment will perform at or above the ratings stated in specific quotations covering the equipment or as detailed in engineering specifications, provided the equipment is applied, installed, operated and maintained in the recommended manner as outlined in our quotation or specifications.

Should performance not meet warranted levels, Conair at its discretion will exercise one of the following options:

- Inspect the equipment and perform alterations or adjustments to satisfy performance claims. (Charges for such inspections and corrections will be waived unless failure to meet warranty is due to misapplication, improper installation, poor maintenance practices or improper operation.)
- Replace the original equipment with other Conair equipment that will meet original performance claims at no extra cost to the customer.
- Refund the invoiced cost to the customer. Credit is subject to prior notice by the customer at which time a Return Goods Authorization Number (RGA) will be issued by Conair's Service Department. Returned equipment must be well crated and in proper operating condition, including all parts. Returns must be prepaid.

Purchaser must notify Conair in writing of any claim and provide a customer receipt and other evidence that a claim is being made.

WARRANTY LIMITATIONS

Except for the Equipment Guarantee and Performance Warranty stated above, Conair disclaims all other warranties with respect to the equipment, express or implied, arising by operation of law, course of dealing, usage of trade or otherwise, including but not limited to the implied warranties of merchantability and fitness for a particular purpose.