

OPERATION AND MAINTENANCE MANUAL FOR

CINCINNATI

RETROFIT SEQUENCE CONTROLLER AND DC-DRIVE FEEDER

CINCINNATI

CINCINNATI INCORPORATED
CINCINNATI, OHIO 45211

ELECTRONIC CONSOLE OPERATION

FEEDER

REMOTE MAGNETIC PUSHBUTTON STATION

1. MANUAL - AUTO

In "MANUAL" the "EXTEND" and "RETRACT" buttons are active and the press cannot be cycled. In the "AUTO" position the feeder motion is determined by the settings on functions 25 thru 29 and the Main Feeder control switch.

2. RETRACT BUTTON

When depressed the feeder will move away from the die in slow speed until it reaches its maximum limit (6" on 66 and 110 ton, 8" on 220 ton and 12" on 550 and 825 ton).

3. EXTEND BUTTON

When depressed the feeder will move toward the die in slow speed until it is centered over the die (0").

MAIN CONTROL CONSOLE

1. RETRACT-ON-DELAY

In the "RETRACT" position the feeder will retract to its maximum limit and will stay retracted throughout the entire stroke of the press.

In the "ON" position the feeder will retract to the clear position (Function #25, "TO" display) during the dwell period set on Function #26. The feeder will extend over the die throughout the remaining portion of the stroke. In the "DELAY" position the feeder will stop at the delay position (Function #28, "TO" display) and remain there until the degree setting of Function #29 "FROM" display is reached, at which time it will continue to move over the die.

2. SHAKER SWITCH

In the "ON" position the feeder will move back and forth or "shake" when the feeder is over the die. The shake time is dependent on the speed of the press, but can be extended by using cycle delay #1. The feeder will shake for a maximum of two seconds regardless of the time setting of the cycle delay.

MACHINE MONITOR FAULT NUMBERS

The MONITOR is a two digit numerical display for the purpose of indicating various machine faults. The numbers from 1 to 49 have been reserved for machine faults, many of which can be corrected by the operator. Numbers from 50 to 99 are reserved for control faults which would normally require experienced maintenance personnel to correct the problem. Most of the faults can be reset by pushing the "RESET" button after the fault has been corrected. The "RESET" button has no effect on a BAD BRAKE (No. 1) or MEMORY BOARD (Nos. 54, 55, 56 and 57) faults.

OPERATOR CORRECTED FAULTS

MON. NO.	DESCRIPTION	CORRECTIVE ACTION
1.	BAD BRAKE: Press stopping time has exceeded the preset time period (see Function #26).	Turn power OFF, have Maintenance adjust brake or change linings as necessary. Turn power ON.
2.	POOR BRAKE: Press stopping time has exceeded the preset time period (to within 10% of BAD BRAKE time). (See Function #25).	Immediately notify Maintenance to correct problem before BAD BRAKE (No. 1) occurs. Pushing "RESET" button will allow continued operation, but number 2 will stay on monitor to indicate brake should be fixed. Brake over-heating due to both cycle delays used near maximum speed will cause this fault.
3.	MOTION DETECTOR: Encoder is not rotating as main shaft rotates.	- Check for loose coupling between rotary encoder and main shaft - Check for extremely sluggish brake clutch valve - Recheck position display with actual position of press. If they do not match, rotate encoder until readout is correct and tighten coupling. Push "RESET" button
7.	FEEDER POSITION: When a 7 appears there will also be a number from 31 to 37 which describes exactly what the feeder fault is.	See indicated feeder fault (No. 31 to 37) for corrective action
31.	Feeder motion when no command for motion.	CHECK FOR: - Servo drive malfunction - Digital to analog board malfunction
32.	No feeder motion when command for motion.	- Servo drive malfunction - Digital to analog board malfunction - Loose wire to input of servo from digital to analog board - Feeder stuck or jammed - Loose encoder coupling
33.	Feeder not at clear position during feeder check dwell.	Wrong settings on sequence control
34.	Feed shoe never reached over die proximity switch.	- Faulty proximity switch - Retract command too early (before feeder reached die)

MON. NO.	DESCRIPTION	CORRECTIVE ACTION
35.	Feeder retract limit switch stuck in ON position.	. Bad limit switch or input board. (Use Function #32 to check) . Encoder on feeder not properly adjusted
36.	Feed shoe stayed over die.	. Faulty proximity switch . Broken linkage
37.	Feeder linkage pin not present.	. Bad proximity switch or input board. (Use Function #32 to check) . Linkage pin fell out

Once a fault is signaled, corrective action must be taken. After the fault is corrected, always push the "RESET" button and continue in operation.

In addition to the above faults with a specific indicator, there are occasions when the press will stop for no apparent reason. There will be no indication of a fault on the monitor yet the machine will not run. In these cases look for:

1. Sequence controller in "PROGRAM" mode.
2. Feeder in "MANUAL" mode.
3. Faulty control unit - call maintenance.

MAINTENANCE CORRECTED FAULTS

MON. NO.	DESCRIPTION	CORRECTIVE ACTION
0.	Output board failure, or short circuit.	The output failure indicator light, located on the lower middle part of each output board (15, 16, 17) will be lit. Press the "RESET" button and observe the lights. The light on the failed board will remain lit. Turn power off. Replace the failed board, then turn the power back on. If the problem still exists, then each wire to the faulty output board must be checked for a short circuit.
51.	Brake blower failure.	Check blower motor and flow switch.
53.	Clutch or brake valve failure.	Push reset button located on faulty valve, push MONITOR RESET button. If problem still exists, replace faulty valve.
54.	R.A.M. memory board failure or battery failure.	Turn power on, load <u>ALL</u> (1 thru 24) functions (even those not used), turn power off then on. If problem still exists, turn power off, replace R.A.M. board and repeat step 2.

MON. NO.	DESCRIPTION	CORRECTIVE ACTION
55.	P.R.O.M. Board 1 failure.	Turn power off, then turn power back on. If failure still exists, replace faulty board after turning power off.
56.	P.R.O.M. Board 2 failure.	Same as 55.
57.	P.R.O.M. Board 3 failure.	Same as 55.
58.	P.I.A. Board 1 failure.	Push "RESET" button. If problem remains, replace faulty board after turning power off.
59.	P.I.A. Board 2 failure.	Same as 58.
99.	5V Micro Supply failure or 110VAC loss.	If the fault is the 5V Micro Supply the P.S. fault light (lower LED) on the voltage monitor board will be lit. Check the supply (3 PWRS) with a meter or oscilloscope at the supply terminals. The voltage level should be 5.1V + .1V or - .3V with not more than 5mv of ripple as measured on the scope. The voltage adjust on the supply can be used to adjust the level to 5.1V. Turn the main disconnect off and back on to reset the fault. If the voltage adjust does not bring the level into specs or if the ripple is too great, it may be necessary to replace the supply. Turn the main disconnect off, replace the supply, turn the main disconnect on and set the new supply to 5.1V If the fault is 110VAC loss the line fault light (upper LED) may or may not be lit. If the light is not lit (momentary loss of AC line) turn main disconnect off and back on to clear fault. If the light is on, find the source of the 110V loss and repair

USING THE SEQUENCE CONTROL BOARD

GENERAL

The Sequence Control gives the operator or set-up person a method to quickly change various machine functions via keyboard input and L.E.D. display. It also gives maintenance personnel a monitor of brake deterioration by displaying press stopping time and a monitor for checking input and output status without the use of a meter.

Currently numbers "1" thru "24" are used by the customer to be assigned to functions that require frequent operator adjustment.

Numbers "25" thru "29" are assigned to functions controlling the DC-Drive feeder.

Numbers "30" and "31" are assigned to the Poor and Bad Brake time settings respectively.

Number "32" is used for Input/Output testing.

The "FROM" and "TO" data entries for functions "1" thru "29" are in degrees of crankshaft rotation (0° to 359°) with the exception of functions "25" and "28", which are in inches (.0 to 12.0) of feeder position away from "over the die" position.

"FNC" FUNCTION NUMBER

The "FNC" and the "ENT" (Enter) keys are used to enter a new function number for the purpose of retrieving the data in the FROM and TO locations or in preparation for entering new data into these locations. When the "FNC" key is pressed, all previous commands are aborted and the FUNCTION, FROM and TO displays go blank. Any number of digits may be pressed after the "FNC" key has been pressed, but only the last two digits will be recognized when the "ENT" key is pressed. As each number is entered, it will begin to flash until the "ENT" key is pressed. (In the examples that follow, the flashing numbers are underlined.) If an attempt is made to enter a number that has not been assigned a function (33 thru 99), the function display will go blank and a new number must be entered.

Example:		<u>FUNCTION</u>	<u>FROM</u>	<u>TO</u>
Current Display =		16	230	350
Press: "FNC" =				
1 =		<u>1</u>		
9 =		<u>19</u>		
"ENT" =		19	130	240

"FRM" FROM

After a function has been entered, the FROM data can be changed using the "FRM" and "ENT" keys. When the "FRM" key is pressed the FROM display will go blank. Any number of digits may now be pressed but only the last three digits are accepted as legitimate data when the "ENT" key is pressed. If an attempt is made to enter a number greater than 359, the number will not be entered and the display will go blank until a new number is entered.

Examples:		<u>FUNCTION</u>	<u>FROM</u>	<u>TO</u>
Current Display =		16	230	350
1. Press: "FRM" =		16		350
5 =		16	<u>5</u>	350
"ENT" =		16	5	350
NOTE: 230 has been changed to 5.				
2. Press: "FRM" =		16		350
1 =		16	<u>1</u>	350
2 =		16	<u>12</u>	350
3 =		16	<u>123</u>	350
4 =		16	<u>234</u>	350
"ENT" =		16	234	350

NOTE: Only the last three digits were entered so 5 has been changed to 234.

3. Press: "FRM" =	16		350
4 =	16	<u>4</u>	350
1 =	16	<u>41</u>	350
2 =	16	<u>412</u>	350
"ENT" =	16		350

NOTE: The number is greater than 359 so it was cleared and not entered.

"TO" TO

The "TO" key is used to change the TO data. Operation of the "TO" key is identical to that of the "FRM" key.

Example:		<u>FUNCTION</u>	<u>FROM</u>	<u>TO</u>
Current Display =		16	230	350
Press: "TO" =		16	230	
3 =		16	230	<u>3</u>
4 =		16	230	<u>34</u>
0 =		16	230	<u>340</u>
"ENT" =		16	230	340

NOTE: 350 has been changed to 340.

"INC" SEQUENCE

The "INC" key is similar to the "FNC" key. When the "INC" key is pressed the function number will increment and the next sequential FROM and TO locations will appear. Pressing the "INC" key will also abort any previous commands.

Example:		<u>FUNCTION</u>	<u>FROM</u>	<u>TO</u>
Current Display =		16	230	350
Press: "INC" =		17	60	90
Press: "INC" =		18	180	270

"T-S" SPECIAL COMMAND KEY

The "T/S" key is a dual purpose key and its function is dependent upon the position of the RUN - PROGRAM selector switch.

In the RUN mode the "T/S" key controls the POSITION/STROKES-PER-MINUTE display. If the "T/S" key is pressed in the RUN mode the display will read out in STROKES PER MINUTE and when it is pressed again the display will read out the crankshaft position in degrees (0° - 359°).

If the "T/S" key is pressed in the PROGRAM mode, the data in the FUNCTION, FROM and TO display is transferred to the upper "Transfer" display. Thus the transfer display acts as a scratch pad so that two different functions can be observed at the same time. (To clear the transfer display press "FNC" followed immediately by "T/S".)

RUN-PROGRAM, KEYLOCK SELECTOR SWITCH

When this selector is in the PROGRAM position, all of the afore mentioned operations are available to the operator. The compacting press will not be permitted to cycle when the switch is in the PROGRAM position.

If the switch is in the RUN position, the "FRM", "TO" and "ENT" keys are disabled so that "Position" changes cannot be made while the machine is running.

MISCELLANEOUS FUNCTIONS

Functions "25" and "28" are feeder position settings in inches (0 - 12.0). The "FROM" display shows the actual feeder position and the "TO" display shows the desired feeder position. There are two methods for changing the desired position. The first method is to change it by using the "TO" key as explained earlier in this section. A simpler way is to move the feeder using the manual buttons to the desired position. Then simply press the "ENT" key. This will transfer the contents of the actual position in the "FROM" display to the "TO" display.

AUXILIARY FUNCTIONS

As noted previously, functions "30" and "31" are reserved for poor and bad brake times. The FROM display will show the pre-set time and the TO display will show actual stopping time in milliseconds. The "FRM" and "TO" keys are disabled in this mode.

Function "32" is an Input/Output test function. The "FRM" and "TO" keys are disabled in this mode. All inputs and outputs can be monitored by simply keying in the wire number of the device in question. This feature is described more thoroughly in the maintenance section.

OPERATING PROCEDURES

POWDER FEEDER

"RETRACT-ON-DELAY" SELECTOR

"ON" position - feeder will operate in a normal mode, moving in time with press motions.

"RETRACT" position - feeder will retract when selector is turned to "RETRACT" and will remain in the retracted position. It is recommended that the feeder selector be set in the "RETRACT" position while performing any maintenance in the tooling area, removing or setting tools.

"DELAY" position causes feeder to stop and delay traveling to its outermost position. This feature is used when tooling configuration does not allow feeder to move over die while press is in ejection position or when a part must be removed from the die by hand. The use of feeder delay reduces the amount of time the feeder is over the die cavity and it should not be used unless absolutely necessary. Feeder delay will probably be used when top punch holddown is used.

The point in the cycle where the feeder delay is started and where the feeder again begins to move is controlled by the sequence controller.

Caution:

1. Since the feeder is controlled by a DC electric motor with fixed acceleration, speed and deceleration, it may be necessary to change the point in the cycle when a motion command is given whenever the press speed is changed considerably.
2. When setting the feeder timing, it is important to make sure that the feeder will make it all the way over the die before the command is given to retract. Also, do not delay the retract command to the point where the feeder will not reach the "CLEAR" position by the time set on function "26".

SHAKER "OFF-ON" SELECTOR

When feeder shaker is turned "OFF" the feeder will operate normally in either the feeder selector "ON"

or "DELAY" positions. Shaking action takes place when the shaker switch is turned "ON". In the shaker mode the feeder drive is programmed to move back and forth from the feeder over die position to .5 inch retracted.

If no cycle delay is used, this shaking action will start when the feeder reaches its over the die position and stop when the press reaches the feeder retract position.

If a cycle delay is used at the fill position to provide more fill time, the shaking action will start when the press stops and continue until the press starts up after the delay or at the end of two (2) seconds, whichever happens first.

FEEDER SET-UP

To get the full benefit from the feeder drive, it is necessary to set the stroke and timing for the specific part which is being produced.

The following procedure can be used to set the feeder drive functions (#25-#29).

- a. The hand held feeder control station is turned to the auto position and the feeder retracted to its maximum retract position (limit switch) by using Main Selector switch.
- b. Inch the press to BDC (180°) with the ram adjustment up to avoid entering the die with the upper punch in case of delicate tooling.

At this position the feeder manual button is used to extend the feeder towards the die. The motion is stopped before any interference will take place between the feeder and the punch (.25-.5 inch clearance).

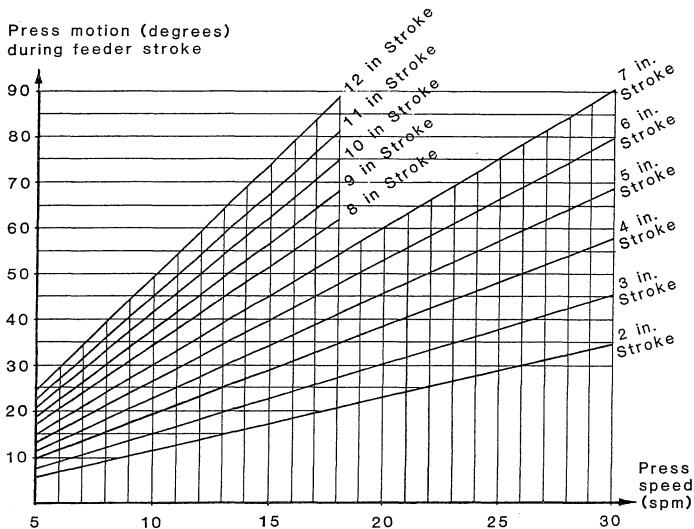
When using short punches make sure that the punch clamp ring and adapter will not interfere with the feeder with full punch penetration into the die.

- c. Call up function #25 on the sequence control. The "FROM" position will show the present position of the feeder in relation to the fully over the die position. With the run-program key in the program position, press the "ENT" key which places the number showing the "FROM" display to the "TO" display. This will now be the position the feeder will retract to each cycle (feeder clear position).
- d. To set the point in the cycle where the feeder starts to retract and starts toward the die, call up function #26.

The "FROM" position is the starting point of feeder retract motion. This position should be set so the feeder remains over the die as long as possible, however, it must be set so the feed shoe will reach its "CLEAR" position before interference with upper tooling and/or underfill.

Note that the faster the press speed and the longer the feeder stroke, the earlier it is necessary to retract the feeder in order for it to reach its clear position in time (see chart on following page).

For a given press speed and given length of feeder stroke, this chart will give the number of degrees the press moves from the time the feeder stroke starts until it is completed (one way).



As an example, if it is desired to have the feeder clear of the punch at 50° with a 5 inch feeder stroke and the press running 20 SPM, the chart will show that the press motion is 46° and therefore the "FROM" position on function #26 should be set no later than 4° (50° - 46°).

The "TO" position is where the feeder is asked to start the motion towards the die and to maximize feeder time over the die. It should be set to allow the feeder to contact the part at the moment the tooling reaches ejection position.

By using the above chart, the feeder over the die position can be estimated. As an example, with the above data and starting the feeder motion at 255°, the feeder will trip the feeder over the die switch at 301° (255° + 46°).

In cases where high press speed and long feeder stroke is used, make sure that the retract position does not occur before the feeder is over the die.

- e. To set feeder check limits, call up function #27 on the sequence control. Inch the press to the point where the feeder will just clear the upper punch on the down stroke of the press.

This position (in degrees) should be entered in the "FROM" position of function #27. If, however, underfill is used it should not exceed the underfill position (50°). In any case this setting should not exceed 70°. If this is attempted, the controls will automatically make it 70°.

The "TO" position of function #27 should be set just prior to the "TO" position of function #26. This will prevent the feeder from moving over the die too early if a change was made to function #26 by mistake.

- f. If it is desired to have the feeder start toward the die and then pause before moving the rest of the way, the set-up would be as follows:

Functions #25-27 would still be set as described above.

The manual mode of the feeder control is now used to move the feeder to the position where the pause is desired. Function

#28 is called up on the sequence controller and the actual feeder position in inches from being over the die can be seen on the "FROM" display. This setting is transferred to the "TO" display by pressing the "ENT" key. This will now be the position where the feeder will pause in its motion toward the die.

- g. To set the point in the cycle where the feeder will continue toward the die, first inch the press to that position and then call up function #29 where this press position should be entered in the "FROM" display.

When feeder delay is used, make sure the feeder will stroke all the way over the die before the return position is reached.

MAINTENANCE PROCEDURES

INPUT/OUTPUT TEST

Whenever a problem (fault) is caused by external device failures such as limit switches, solenoids, wiring, etc., it can be visually detected by monitoring the indicator lights provided on the input and output boards.

In addition to the monitor and the indicators on each Input/Output board, there is one other unique feature of the control. The inputs and outputs can be monitored directly from the front panel using the Sequence Control. This is accomplished by entering function #32 followed by any three digit number which corresponds to the particular wire number (XY) of the device in question.

EXAMPLE:

	FUNCTION	FROM	TO
Current Display =			
Press: "FNC" =			
3 =	03		
2 =	32		
"ENT" =	32	000	

NOTE: The control is now ready to accept the wire number. For this example the feeder retract limit switch which is connected to wire #62 (see schematic) will be entered.

Press: 0 =	32	000	
6 =	32	006	OFF
2 =	32	062	OFF

NOTE: The wire number is entered into the "FROM" display. The "TO" display will indicate "OFF" if the contact on the switch is open. If the contact on the switch is closed, the "TO" display will indicate "AC" for active or on. If a non-existent wire number is entered, the "TO" display will remain blank. To look at the next sequential wire number on a given board simply press the increment "INC" key.

Press: "INC" =	32	063	AC
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NOTE: To enter a new wire number, simply press three more digits.

Press: 1 =	32	131	OFF
2 =	32	312	
3 =	32	123	AC

NOTE: The numbers entered thru the keyboard will continuously shift to the left. Push the function "FNC" key to return to normal. This feature can be used any time the machine is running or at rest and it is not dependent upon the "PROGRAM" or "RUN" modes.

FEEDER SWITCHES AND ENCODER SETTINGS

SWITCHES

A. Feeder Retract Switch

This switch is a proximity switch mounted through the top of the feeder enclosure towards the rear. The function of the switch is to limit the maximum retract position of the feeder. The switch is tripped by a pin mounted on the top of the ball nut flange.

The proper clearance setting between the bottom of the switch and top of the trip pin is .030".

To check the operation of the switch, use function #32, wire #062 on the keyboard. By using the manual feeder control move the pin under the switch and away from the switch. The display should switch between "AC" and "OFF".

If it stays "OFF" all the time, readjust the trip clearance until switch is made.

If display stays "AC", either the switch or input board is faulty and should be replaced.

B. Feeder Extend Switch

This switch is also a proximity switch mounted through the top of the feeder drive enclosure but towards the front. The function of this switch is to provide a forward reference in order to double check the encoder. It stops the forward motion of the feeder if the encoder is not set properly.

The setting of the switch is done the same way as for the feeder retract switch except the wire number is #061.

C. Feeder Linkage Pin Switch

This switch is a proximity switch mounted to check the presence of the pin which joins the feed shoe linkage to the feeder drive shaft when the feeder selector switch is in the "ON" or "DELAY" position. The wire number for this switch is #063.

ENCODER SETTINGS

The proper setting of the feeder drive encoder is essential in obtaining troublefree functioning of the feeder.

The zero point of the encoder is the feeder over die position. By using the manual feeder control, the drive is moved forward until the feeder extend proximity switch is made.

At this point the encoder is adjusted by using the procedure outlined on the feeder drive assembly drawing. The encoder correctly adjusted should read .001 when the feeder is moved over the die by using the manual control.

FEEDER WIPER

Remove shuttle retainer guides by loosening hand knobs.

Lift shuttle up and pivot back.

Pry wiper off bottom using thin screwdriver.

Flip wiper over and put back on shuttle.

NOTE: Material may be belt sanded up to 1/8" to renew flat surface before replacing.

FEEDER DRIVE BEARINGS

Grease fitting on the drive enclosure at the rear of the press. Service every 200 hours with #2 EP grease lithium soap base (C.I. grease H-2EP).

FEEDER DRIVE BALL SCREW

Refill oil cup on top of enclosure with a light lubricating oil when needed.

Set oil drip rate to one drop every 15-30 minutes.

