

95445060



CDC[®] CT 103 A/B AND CT 105 A/B
LINE PRINTER EQUIPMENT

INTRODUCTION
INSTALLATION AND CHECKOUT
OPERATION
PRINCIPLES OF OPERATION
MAINTENANCE
LOGIC DIAGRAMS
UNIQUE CDC LOGIC

REFERENCE AND FIELD SERVICE MANUAL



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PREFACE

This publication contains reference and field service information required for the Printer Band Sharing (PBS) Line Printer. This manual provides installation, operation, principles of operation, maintenance, corrective maintenance, parts replacement, with logic and timing diagrams. This manual is intended to provide operators, customer engineers, and diagnostic engineers with the information required to understand and function the Line Printer.

The publications listed below are related publications available through the nearest Control Data Corporation sales office.

Publication	Publication No.
Parts Identification Manual	95445067
Computer Peripherals, Key to Logic Symbology	95390100
Special Options Manual	95445077

This product is intended for use only as described in this document. Control Data cannot be responsible for the proper functioning of undescribed features or undefined parameters.

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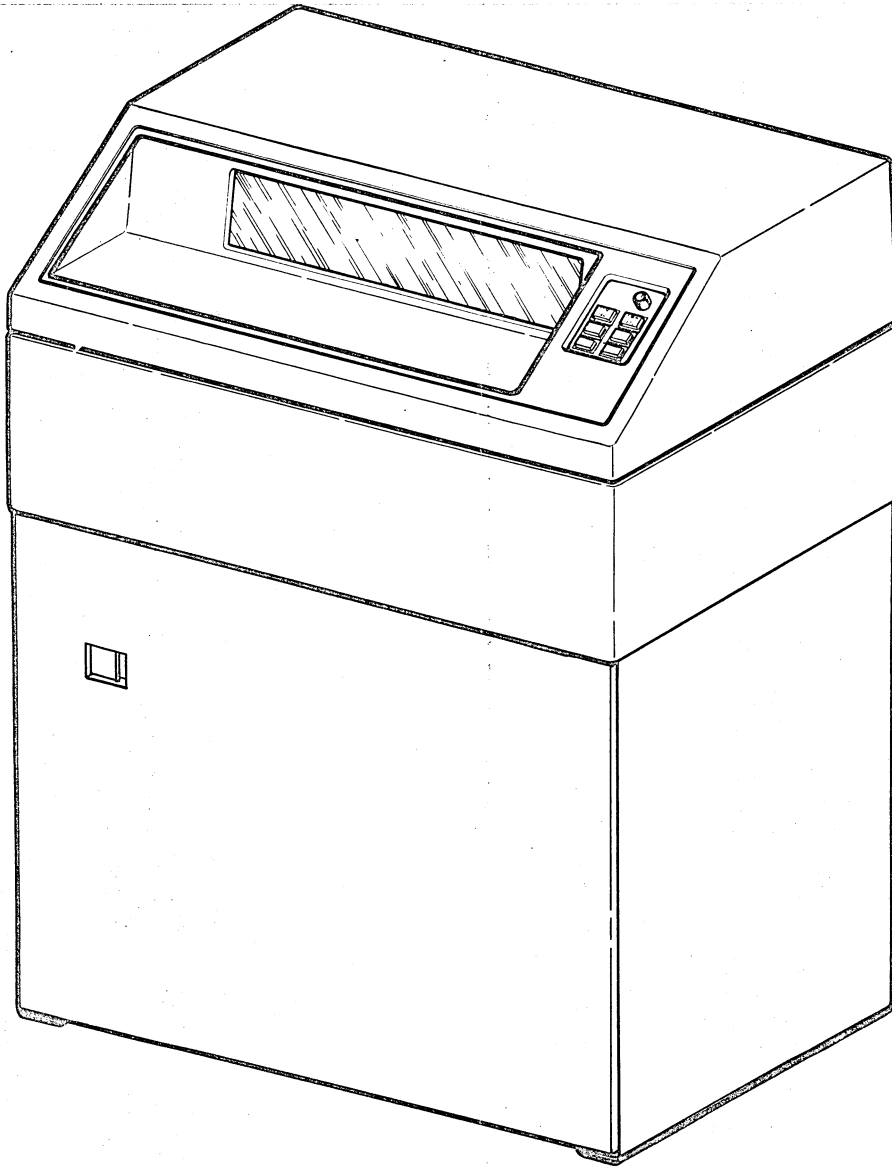
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PRINTER BAND SHARING

UNIQUE CDC FEATURES

UNIQUE FEATURES

This section of the manual covers the CDC printer models CT103A/B and the CT105A/B. The model CT-103 is a 600 lines per minute, two horizontal position printer when used with a 64 character band. A model CT 105 is a 300 line per minute, four horizontal position printer when using a 64 character band. The "A" model designation indicates a maximum 132 columns per line and the "B" model designation indicates a 136 columns per line. These printers include some standard and some unique features above and beyond the common printer covered in the common manual sections one through six. The common manual sections document the basic printer without a special Input/Output

(I/O) interface, Electronic Vertical Format Unit (EVFU) and optional control panel switches. The primary CDC differences include a special interface board (7PC5), I/O connector panel with a fully optioned control panel, and EVFU. Although this manual section includes a complete operation section including the EVFU for the operator, it doesn't complete the documentation for these printers with the incorporation of the EVFU. The EVFU is documented as a special option and a Special Option Manual is supplied along with the manuals. The special 9322 type interface (CL408 equivalent) logic is documented in Section 7 at the back of the manual. The principles of operation at the back of this section completes the description of the printer incorporating the special interface board (7PC5).

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MANUAL MODIFICATIONS (Section 1-6)

Due to the features incorporated in the CT103 and CT105 model printers it is necessary to perform some instructions in a different manor than those performed for the standard printer. The Operation Section 3 of the common manual is replaced by the operation instructions included in this section. References to off sheet locations in the common logic, Section 6 of the manual, will reference the special interface board (7PC5) by the note "SEE I/O KIT" or "SEE ADAPTER KIT". The logic schematic for the control panel should be used from the logic in Section 7 and not Section 6.

STANDARD FEATURES

The CT 103 and CT 105 printers incorporated the following features as standard items installed on all units:

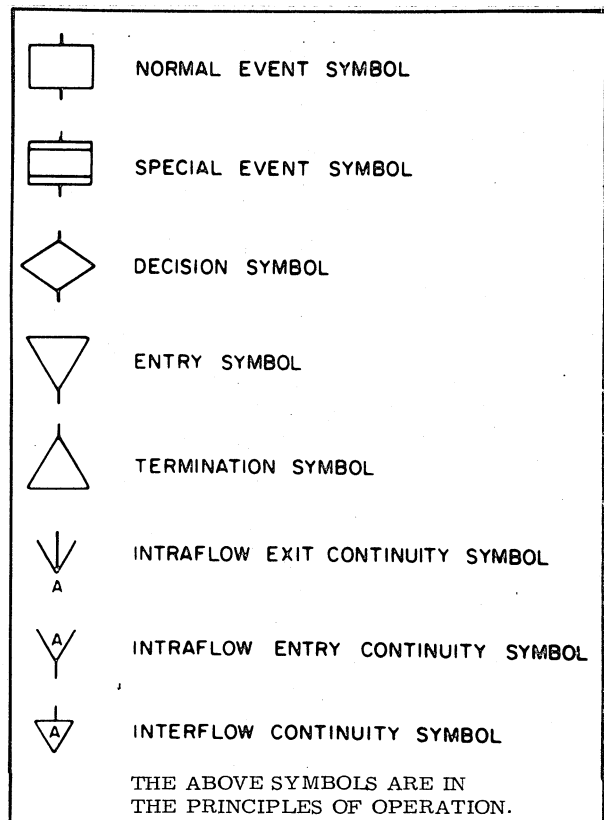
1. Quiet Cabinet
2. Paper Basket
3. Transformer 50/60 Hz
4. A. C. Voltage Selection
5. High Altitude Cooling (blower)
6. Line Counter (printed)
7. Casters, cabinet
8. Electronic Vertical Format Unit (EVFU)
9. Control Panel
10. C. E. Fault Indicators
11. I/O Connector and Panel
12. I/O Interface (9322 type)
13. International Safety Standard (warning stickers and band interlock)

The Transformer 50/60 Hz and the a-c voltage selection features work together to provide an input power range which functions as explained in Section 2, Alternate A. C. Transformer Connections.

Functional Features

The following operational features are incorporated increasing the versatility of the printer;

1. Auto Perf Skip
2. Remote Start/Stop Control (for Common Controller)
3. Interface Board Options
 - a. Long Line Drivers
 - b. I/O, 7 Data Bits
 - c. Transmission Parity
 - d. Character Request/Data Strobe I/O
 - e. Column Capacity 132 (CT 103A/CT 105A)
 - f. Column Capacity 136 (CT 103B/ CT 105B)
 - g. Buffer Clear
 - h. Post Print/Pre Print-Selectable
 - i. Line Counter (6 bit)
 - j. EVFU, 12 channel
 - k. Test Print Character (M)-Selectable
 - l. Compressed Pitch
 - m. Data Strobe Delay
4. EVFU Board Options
 - a. Tape Reader Load Mode
 - b. Auto Perf Skip
 - c. Tape Load Error Status
 - d. Bottom of Form -Channel 2



FLOWCHART SYMBOLS

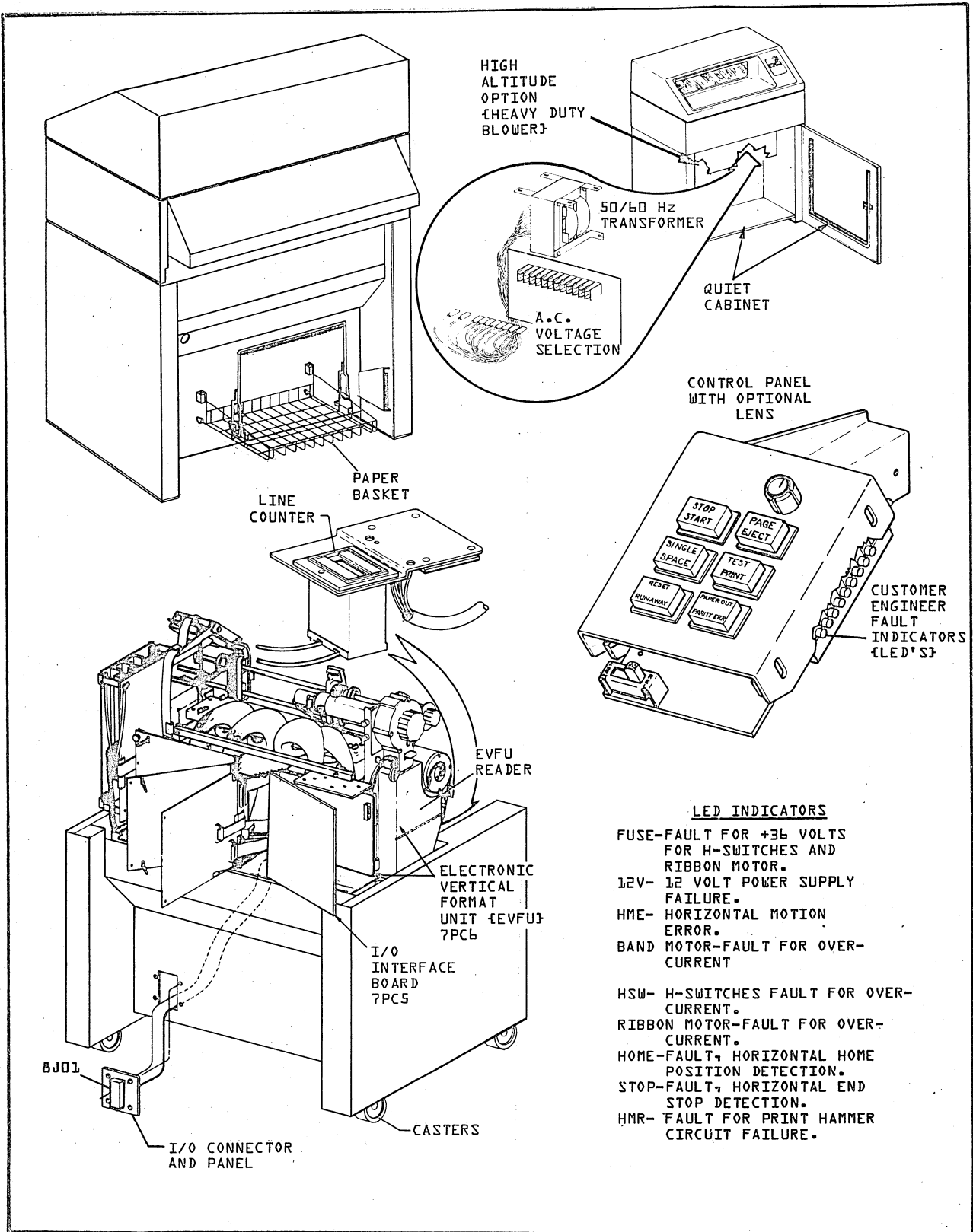


FIGURE 0-1. STANDARD FEATURES

OPERATION

This section contains information the operator needs to operate and maintain the line printer. There are two basic areas covered by this section and they are the printer's operation and maintenance. The operation section lists the controls and adjustments available to the operator and provides detailed procedures for forms loading and alignment, band installation, and ribbon installation. The maintenance section covers the normal maintenance operations required on the line printer. These operations include printer cleaning, changing the ribbon shield, correcting operator malfunctions, and recognizing symptoms of major malfunctions to relate to a qualified service representative.

To operate the printer properly it is necessary to have an understanding of the functions of all the switches,

indicators, and adjustment controls provided for the operator. The printer's main power ON/OFF switch is located just inside the front door at the right. The switches and indicators provided on the Control Panel include a Start/Stop indicator switch, Page Eject switch, Single Space switch, Test Print indicator switch, Reset/Runaway switch and indicator, Paper Out and Parity Error indicators. On the right side of the control panel is a customer engineer light panel. The Electronic Vertical format unit is mounted on the left side of the printer frame with a tape Read switch and Read LED indicator on the front. Two other switches are provided, the 6/8 Line switch, and the Forms Release switch, see Figure 0-2. Other operator adjustments include the Phasing Control, manual vertical adjustments controls, and the horizontal positioning of the forms tractors.

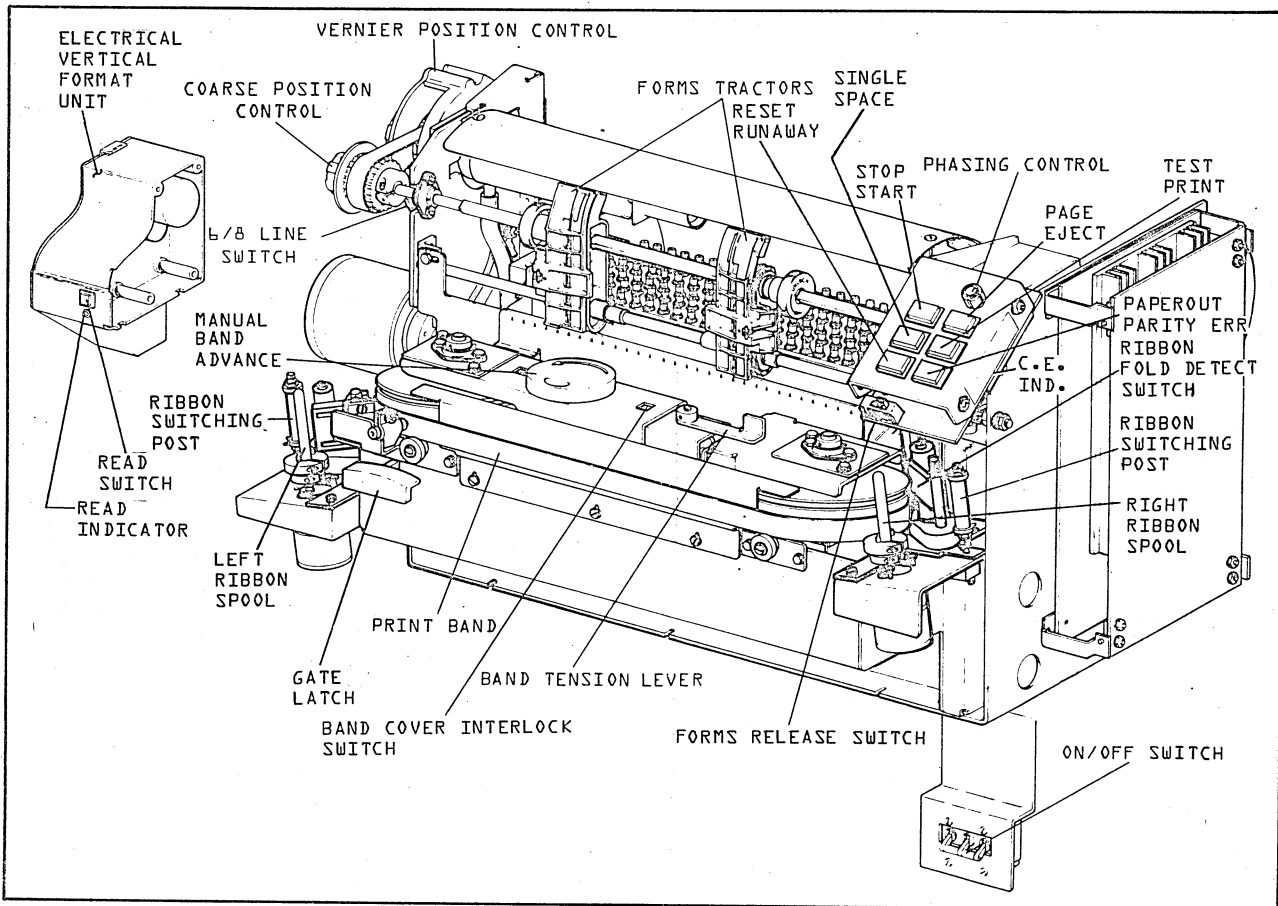


FIGURE 0-2. PRINTER INDICATORS AND CONTROLS

ON/ OFF Switch

This is a non-illuminated switch located in the front of the printer with the lower front door open. Actuation of this switch causes a-c power to be applied to all printer power circuits. This switch is also the main circuit breaker for the printer. Once power has been applied, this switch may be actuated at any time to remove power from the machine. If the mains AC switch is turned off this switch must be turned off and reset to On to supply printer power.

NOTE

THE UNIT SHOULD NOT BE REACTIVATED FOR A PERIOD OF AT LEAST THREE SECONDS. THE POWER SHOULD NOT BE CONSECUTIVELY CYCLED ON AND OFF FOR MORE THAN 3 TIMES WITHOUT A FIVE MINUTE OFF TIME.

START/STOP Switch Indicator

This is an illuminated momentary contact pushbutton switch/indicator. Depression of this switch causes the printer controller to go Ready if the printer was in the Not Ready mode and no detectable faults exist.

A 150 nsec. controller Start Clear is also generated and completed prior to the printer going Ready. The Ready state will be maintained until the START/STOP switch is again depressed, or a detectable fault occurs, removing the Ready condition.

Depressing the START/STOP switch while the printer is printing or moving paper will not inhibit these functions from being completed; however, new data cannot be loaded until the START/STOP switch is again depressed and the Ready Condition is established.

Depression of the START/STOP switch also clears a Forms Error or a Line Space Error.

If the START/STOP switch is depressed during a load cycle, printer will go to the not Ready condition and the printer will not respond to further data and the line will not be printed.

When in the Ready condition, the START portion of the indicator is illuminated. Depression of the START/STOP switch when Ready, causes the STOP portion of the indicator to be illuminated. When a Customer Engineer (CE) Fault occurs the STOP portion of the indicator will blink until the fault is corrected and the printer is powered down and back on again.

A Customer Engineer (CE) Fault causes the printer to desequene the +36 VDC power supply off. To restart, the printer must be powered off and then on after three seconds in the off state.

PAGE EJECT Switch Indicator

Non-indicating, momentary contact, pushbutton switch. Advances forms to the top of the next page. Active only when printer is Not Ready (STOP mode). Top of page is detected as a channel in the EVFU.

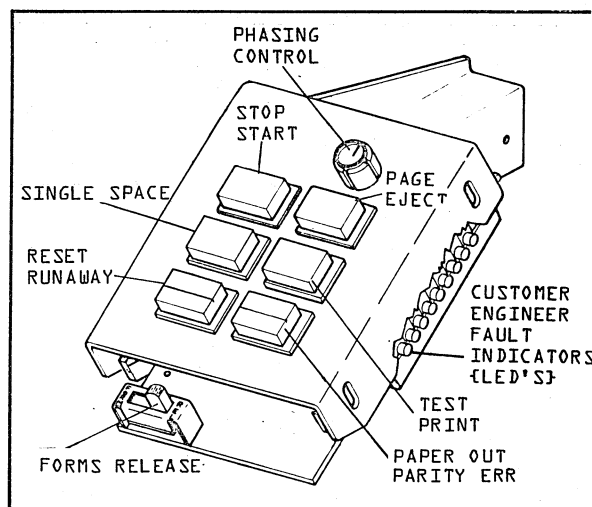


FIGURE 0-3. CONTROL PANEL

The indicator is illuminated when either a forms error or line space error is detected to alert the operator of either a paper jam, tear, or line space error. The indicator is extinguished after any paper problem is corrected and the START/STOP switch is depressed to clear the fault electrically.

SINGLE SPACE Switch

A Switch which moves paper one line space. This switch is operational only when the printer is in STOP mode.

TEST PRINT Switch

The test print feature will print full lines of the character whose code is selected by the 7 position DIP switch on the adapter board (7PC5).

A TEST PRINT switch/ indicator on the control panel as well as a switch on the printed circuit card are provided as part of this option. Depressing either switch when the printer is in the STOP mode will turn on the TEST PRINT lamp and initiate the all one character printing. Continuous printing of one character in all columns followed by the line spacing pattern selected by the Electronic Vertical Format Unit (EVFU).

During test printing the STOP switch or the TEST PRINT switch on the control panel or the TEST MODE switch on the printed circuit card will result in turning off the lighted switch and terminating the test print function.

NOTE

WHILE THE UNIT IS IN THE TEST MODE STATE, THE START LAMP ON THE CONTROL PANEL WILL BE ILLUMINATED, ALTHOUGHT THE PRINTER WILL NOT BE READY ON THE INTERFACE.

RESET Switch

This is a momentary contact switch used to initialize the controller logic. Depression of the switch will take the printer out of START, clear the buffer if a load is in process, clear certain error conditions. The error conditions cleared by the Reset switch are Paper Runaway and Parity Error. The Start switch must be pressed following depression of the Reset switch.

PAPER RUNAWAY Indicator

An indicator which lights when a Paper Runaway is detected by the EVFU. This condition is cleared by pressing the Reset switch. Reload the EVFU using the Read switch with the format tape installed in the reader.

PAPER OUT Indicator

A indicator which lights when the last line on the last form has been printed upon. The switch is approximately three inches below the print station. The printer stops when paper out is detected.

PARITY ERROR Indicator

This indicator on the operator's control panel lights when a transmission Parity Error occurs. The indicator remains lit until the Parity Error condition is removed by a Buffer Clear or Master Clear from the interface or until the control panel Reset switch is depressed. A Buffer Clear signal only clears the data line being sent and does not effect the printer status.

READ Switch (EVFU)

The Read switch is used to manually load the format tape information into the EVFU memory. The printer must be in STOP and a correct format installed before pressing the Read switch.

READ LED indicator (EVFU)

The Read Led indicator on the front of the EVFU assembly will light during a manual or automatic format tape read operation which stores the format information in the EVFU memory. The EVFU assembly will run error checking on the tape information and if no errors are found the Ready LED will extinguish. If a error is found during the read operation the Read LED will remain on (see Operators Fault Isolation). The Read LED will also light during the printers operation if a condition indicates the format memory is not loaded, a format parity error is detected, paper runaway, or a paper motion command was not executed (see Fault Isolation).

FORMS RELEASE Switch

This is a momentary contact switch which, when slid sideways and held, allows the operator to manually advance the paper via the manual vertical adjust knob. This switch functions only when the printer is in the Stop mode. This switch is located on the control panel and is accessible to the operator when the bonnet is open. (See the Forms Installation Procedure for a detailed description of the usage of this switch.) See Figure 0-3.

Phasing Control

Adjustment by the operator to achieve proper horizontal character phasing is accomplished through a rotary control located on the control panel. When various thickness of form sets are interchanged (single to 6-part), adjustments to the horizontal character phasing is required. Phasing is best adjusted in TEST PRINT, however observing the full width characters during normal printing will be acceptable. Observe the sides of the characters for clipping. Adjust the Phasing Control until the full character is seen on both left and right sides. See Figure 0-3.

6/8 Line Switch

The 6/8 line switch in a non-illuminated switch located in the paper motion reader assembly. Its purpose is to allow selection of either 6 LPI or 8 LPI vertical line spacing. See Figure 0-4.

NOTE

ACTUATION OF THIS SWITCH SHOULD ONLY OCCUR WITH THE PRINTER IN THE STOP MODE FOLLOWED BY AT LEAST ONE FORM FEED. IMPROPER SPACING MAY OCCUR IF THIS PROCEDURE IS NOT FOLLOWED.

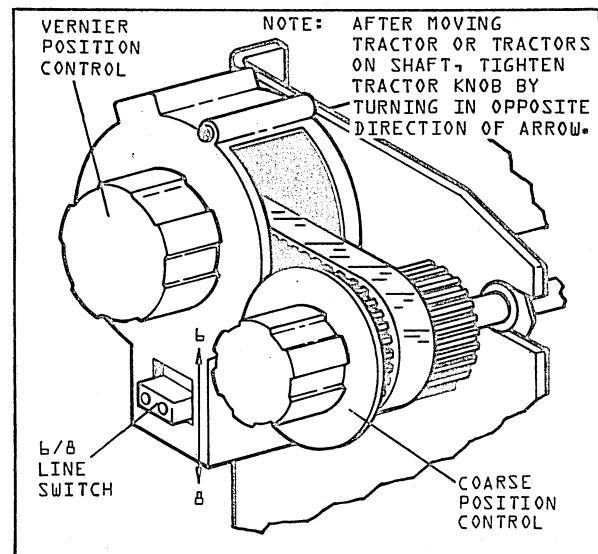


FIGURE 0-4. FORMS HANDLING CONTROL

Manual Vertical Adjustment Controls

Coarse Position Control. The Forms Release Switch on the control panel deactivates the vertical advance drive. This switch releases the vertical system and allows the operator to set forms position by rotating the Coarse Position Control. When the Forms Release Switch is released, the vertical advance system will position the forms to the nearest line position.

Vernier Position Control. The vertical advance Code Disc Reader provides fine positioning adjustment. Mounted at the end of the vertical advance motor shaft, it can be rotated manually, with corresponding forms motion, to set the form to any desired point within .5 inch (12.7mm). This adjustment should be made with the print gate open to avoid interference from the forms clamps. The Top Of Form (TOF) may be aligned with the aid of the TOF indicator (see Figure 0-5).

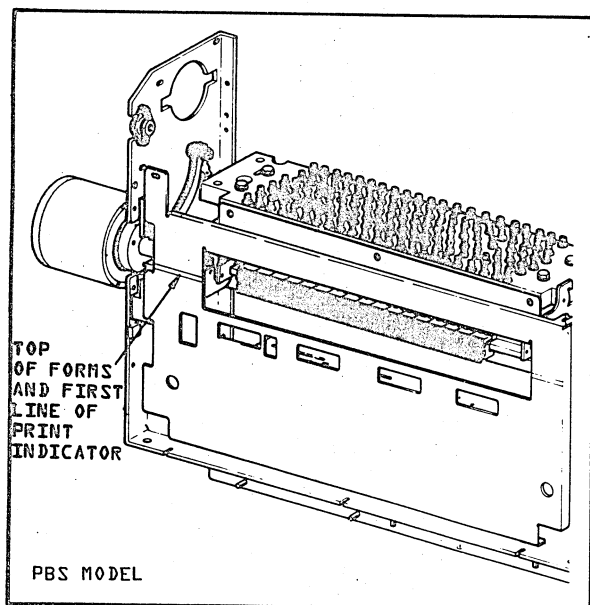


FIGURE 0-5. TOP OF FORM

Horizontal Forms Positioning (See Figure 0-6).

The horizontal position of the forms is adjusted by moving the forms tractors. The tractors are held in place by spring locking devices located on the outside of each tractor. With the printer's power on rotating the locking devices toward the rear of the printer allows the tractors to be moved to their desired positions. When the locking devices are released they require a slight physical pressure in the locking direction to lock the tractor in place. The left tractor, when positioned to the extreme left, provides a maximum forms margin of 2.38 inches (3.5cm) to the first print hammer. The right tractor can then be positioned to accommodate forms from 4 to 16.75 inches (10.16 to 42.54cm) wide. A column finder scale is mounted on top of the ribbon shield to aid in horizontal positioning. It is necessary to open the print gate to avoid interference from the forms clamps.

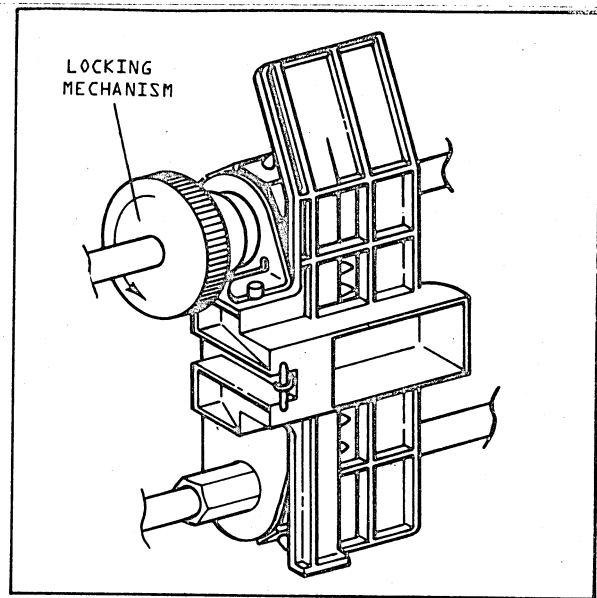


FIGURE 0-6. TRACTOR LOCKING

Print Bands

A standard 64 or 96 character band is available in a number of different character designs. Optional bands are available in 48 and 128, character sets, and compressed pitch. Character sets of 48, 128, or with unique characters will be supplied with Programmed Read Only Memories (PROM's) which the Customer Engineer (CE) must install on the Input Print board (7PC1). A PROM set installed for a 48 character, or a set installed for a 128 character set, will still allow any standard 64 or 96 character band to be used. A compressed pitch band has smaller characters, and when installed on the printer increases the number of horizontal positions printed by any one hammer, which increases the maximum characters that can be printed per line (PBS only). In compressed pitch a 132 column printer will print a maximum of a 198 characters per line, and 136 columns can be increased to 204 characters (refer to Compressed Pitch). Should a print band break call a Customer Engineer for replacement of the wear strip on the platen before installing a new band.

Compressed Pitch (PBS Only)

The compressed Pitch (C. P.) capability is in the printer and a C. P. band with slightly smaller characters may be installed to increase the characters printed per line. Compressed pitch bands can be identified from standard bands by checking above the characters for the home timing mark. Compressed pitch bands will have two home timing marks together while the standard band will have only one mark.

During maintenance inform the Customer Engineer if a compressed pitch band is used because the hammer flight time should be adjusted using the C. P. band.

A compressed pitch band is automatically sensed by the printer following band installation. Refer to preceding paragraph Print Bands for additional information.

TABLE 0-1. BAND PRINTING SPEED

DEVICE	UNIQUE BAND CHARACTERS			
	48	64	96	128
300	360 LPM	300 LPM	220 LPM	175 LPM
600	720 LPM	600 LPM	440 LPM	350 LPM
* 300	240 LPM	200 LPM	148 LPM	118 LPM
* 600	480 LPM	400 LPM	295 LPM	235 LPM

Auto Perf Skip

Auto Perf Skip is a standard option which provides a three line skip at the end to beginning of two forms attached by a perforation.

Electronic Vertical Format Unit (EVFU)

The EVFU has twelve channels, which means twelve different line spacing patterns may be selected for twelve different forms. More format combinations are possible by selecting combinations of channels. The EVFU requires loading each time the printer is power up, from then on until power-off, format channels may be selected over the interface. The EVFU option includes a reader for manual tape loading of the EVFU, and a logic board in location 7PC6. The logic board contains four fault isolation L. E. D. 's and the reader contains a Read switch and a Reading L. E. D. which aids in EVFU loading and fault isolation. The EVFU will be supplied with a Special Option manual. Normally the EVFU is loaded automatically during power up provided a format was installed in the tape reader prior to power up.

Line Counter (Formatting)

A format line counter is incorporated for direct line advance over the interface by code. Line counter codes are defined in this sections Principles of Operation under Paper Motion. The line counter codes are used in the program in place of selecting an EVFU channel. The 9322-2 interface has a two bit line counter and the 9322-4 has a six bit counter.

Paper Basket

A removable forms collector basket may be positioned at the lower back of the printer to stack printout. The basket increases stackability and decreases some static problems. When forms are loaded they should be advanced into the basket over the outside of the basket guide bar and the stack fold started in the correct position which may be located by observing the stacking while printing and positioning the stack so folds in both direction occur consistently. The basket guide bar over the basket should be position to achieve the longest time between operator interventions required. A starting point for the bar is two inches down from its maximum height and out from the printer enough to stack the forms in the center of the basket. A box of forms may stack at an angle and the stack position should be checked and corrected as required. See Figure 0-7.

Quiet Cabinet

A quiet cabinet may be selected to decrease audible noise levels. Printers with quiet cabinets require the front door to be opened when loading forms. The front door should be kept closed except when loading forms to decrease noise and avoid accidents.

Line Counter

A line counter is available which mounts on the left side of the printer on the cabinet base. The line counter counts the lines of print and is generally used to schedule printer maintenance. The line counters count may be recorded and used to indicate work load conditions, or job costs.

Customer Engineer Fault Indicators

These Light Emitting Diode (L. E. D.) indicators are located just below the control panel on the right side. The bonnet must be raised to see these indicators which aid in troubleshooting for Customer Engineers (see Figure 0-7). These indicators along with function and fault L. E. D. 's on the logic boards provide a means for quick diagnosis and repair. When any of the lights are lit the 36 volts will be powered down, the printer will be not ready, and the stop switch will flash. One or more of the indicators will light for each of the following faults:

- a. Fuse Fault
- b. ± 12 Volt Fault
- c. Horizontal Motion
- d. Band Motor Fault
- e. "H" Switch Fault
- f. Ribbon Motor Fault
- g. Horizontal Home Fault
- h. Horizontal End Stop Fault
- j. Hammer Fault

Anytime the Stop lamp flashes the operator should record the indicators lit on the C. E. Fault Indicator panel. Anytime a C. E. Fault occurs the printer will partially power down which will always cause the Fuse indicator to light. The ON/OFF switch must be turned off for at least three seconds before the ON position will bring the printers power back up.

SAFETY INTERLOCKS AND ERROR DETECTION

The printer is equipped with several safety interlocks and error detection circuits. The purpose of these features is to protect the operator and the equipment in cases of malfunction or oversight. Some of the interlocks and error detection circuits are not operator correctable and are, therefore, classified as C. E. faults. This type of fault is usually indicated by the STOP indicator blinking on and off. The operator should check the Operator Fault Isolation chart in Table 0-4 and follow the action required. A further description of the Customer Engineer faults is given in the Maintenance section of this manual. The following list and description of the interlocks and error detection circuits contains only those which can be corrected by operator intervention.

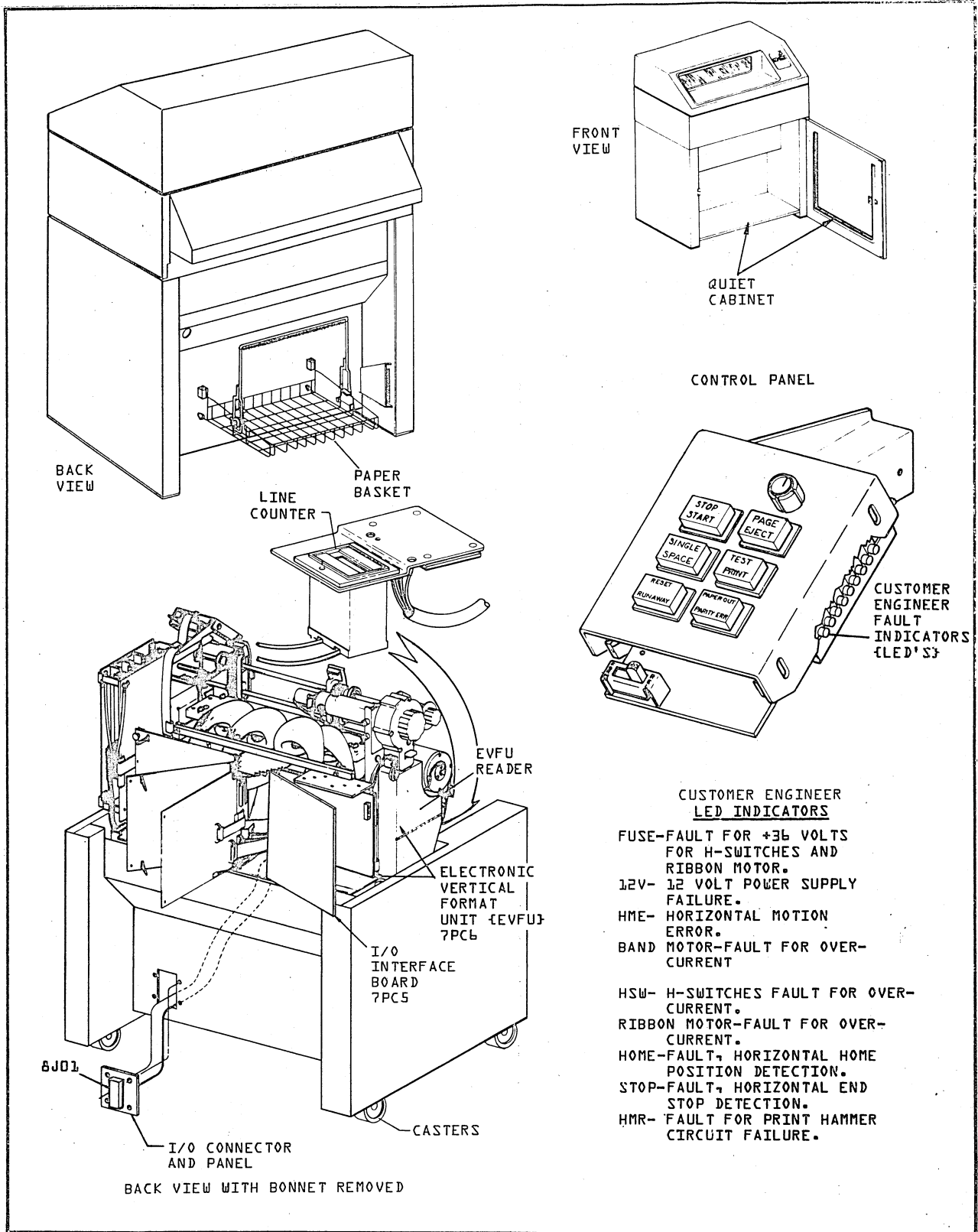


FIGURE 0-7. STANDARD FEATURES

Print Gate Switch

This switch opens anytime the gate latch is activated and remains open until the gate is again latched securely. When the switch is open, power is removed from the ribbon motors and the band motor. The printer can not be placed in the START condition with the gate unlatched. There is approximately 7 seconds of delay time between the time the gate is latched and the time the printer can be placed in the START condition. The purpose of this delay is to allow enough time for the band to reach its proper speed for printing before allowing the printer to go on-line to the data source.

Forms Error

A Forms Error condition occurs anytime a paper jam or paper tear condition is detected in the printer. Paper jams or paper tears are detected by a photo-electric sensor mounted in the right tractor. The sensor detects the absence of forms feed hole movement after 26 lines of a paper should have moved. If one of these faults is detected the PAGE EJECT indicator is illuminated and the printer is transferred to a STOP condition. After the fault has been corrected, the indication should be cleared by depressing the START/STOP switch.

Line Spacing Error

A Line Spacing Error condition occurs anytime the printer electronics calculates that an erroneous signal has been received from the vertical motion Code Disk Reader. When this error condition is detected the PAGE EJECT indicator is illuminated and the printer is transferred to the STOP condition. This fault can be cleared by depressing the START/STOP switch. If this error continues to occur, it should be treated as a Customer Engineer, fault and the local service representative should be called.

Band Cover Switch

This switch opens anytime the band cover is removed or the covers center latch is not positioned in the latch hole. When this switch is open, power is removed from the ribbon motors and the band motor. If the cover is not in position the printer cannot be placed in the Start mode. The cover latches are quarter turn fasteners and if not turned during the printers operation intermittent stops can occur indicating horizontal motion faults on the C.E. fault panel.

Ribbon Fold Detect Switches

These switches are used to monitor the edges of the ribbon in case the ribbon starts to fold in which case the printer is stopped. One switch is located at each end by the ribbon spools. The switches are opened to remove the ribbon and must be closed when ribbon is installed to allow printer operation.

Band Not Identified

This error condition occurs when the print band is not installed properly in the printer or the band is installed upside down. In this situation the printer is unable to go to the Start condition until the band is properly installed.

In this condition the band motor does not power down after 30 seconds, but continues to run until the printers power is turned off on the lower front of the printer.

Out of Paper Switch

The forms out condition is sensed by a switch at the left side of the gate in the forms throat area. This switch is positioned to detect when only 2.5 inches (64 mm) of the last form is left below the print station. The switch signal is then compared with the EVFU bottom of form channel to stop printing after the last line on the form is printed.

PRINTER START-UP PROCEDURE

1. Plug the printer into a suitable a.c. power source.
2. Open the bonnet and the print gate.
3. Install the print band. (See the Band Installation Procedure in this section).
4. Install the print ribbon. (See the Ribbon Installation Procedure in this section).
5. Install the band cover and fasten both quarter turn latches.
6. Install a punched format tape in the EVFU reader (See Format Tape Punching and EVFU Operation for tape loading procedure).
7. Turn on the main circuit breaker. (ON/OFF Switch).
8. After a few seconds the Read LED will come on and the format tape will be read and the data stored in the EVFU memory. The data read will be checked by the EVFU and within a few seconds the Read LED will go out if the read operation was successful. If the Read light fails to go out refer to Table 0-4, Operator Fault Isolation.
9. Install forms in the printer. (see the Forms Installation Procedure in this section).
10. Close and latch the print gate.
11. Depress the START/STOP switch. The START indicator should be illuminated. If the printer does not go to START, see the Fault Isolation Table in this section.
12. Close the printer bonnet. The printer is now ready for operation.
13. During the initial printing, adjust the Phasing Control for optimum print-out. (No clipping is visible on the sides of any characters).

BAND INSTALLATION

The print band installed in the printer contains the printable character font for the printer. There are four different size fonts possible (48, 64, 96 and 128 characters) and two possible pitches, standard and compressed. The standard pitch band prints 132 or 136 columns on 0.1 inch (2.54 mm) centers. The compressed pitch band prints 198 or 204 columns on 0.067 inch (1.70 mm) centers. The font size and character pitch is detected automatically by the printer. The operator can use any 64 or 96 character band in any of the printers. The 48 and 128 character bands are optional and require the addition of a Programmable Read Only Memory (PROM) to the printer electronics. The 48 and 128 character PROM's are mutually exclusive. Therefore, when one of the PROM's is installed, the printer is operational for the 64 and 96 character bands and either the 48 or 128 character bands. PROM's should be installed in the printer by a Customer Engineer and then an operator may interchange the selected bands as required.

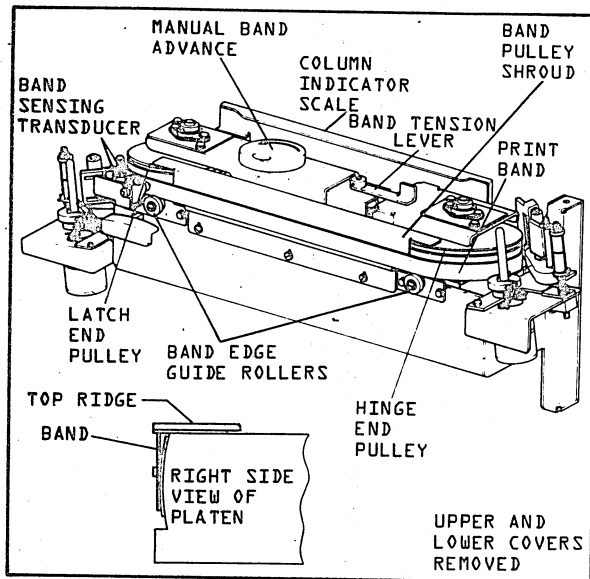


FIGURE 0-8. BAND INSTALLATION

Should a print band break call a Customer Engineer for replacement of the platen wear strip on the platen before installing a new band.

When handling the band, reasonable care should be exercised to maintain band reliability. The band should not be twisted, scratched, dented, or bent to a radius smaller than 4 inches (101.6 mm).

1. Open the bonnet and the print gate.
2. Remove the protective cover from the print gate.
3. Rotate the band tension lever clockwise until it contacts the stop. Remove the old band if one is already installed. Refer to Figures 0-8 and 0-9. Lift the band up off both pulleys.
4. Loop the new print band around the latch end band pulley with timing marks to the bottom, characters right side up.

5. Loop the other end of the print band over the hinge end band pulley. The band should rest on the band edge guide rollers.
6. Rotate the band tension lever counter-clockwise until tension begins to tighten the band, then rotate the manual band advance to seat the band against the upper ridge of the platen. If the band seats against the upper ridge on the platen then complete the rotation of the band tension lever until it contacts the stop. This will place tension on the band.
7. Rotate the Manual Band Advance Knob again to make sure the band doesn't ride up over the upper ridge of the platen. The platen is the surface the hammers press the band against during printing. The band must track against the top ridge of the platen or printing will appear slanted or clip the top or bottom off characters. Refer tracking problems to the Customer Engineer.

NOTE

THE BAND WILL NOT ROTATE UNTIL THE PROTECTIVE COVER IS IN PLACE AND THE GATE IS CLOSED.

8. Replace the protective cover and close the print gate.
9. The print band is now ready for operation.

RIBBON LOADING

The ribbon employed in the printer is 24 yards (22 meters) long and 2 inches (50.8 mm) wide. The ribbon is designed to last 300,000 lines at 30% print density when the printer is not in a compressed pitch mode. In compressed pitch a special band is used and the columns printed per line increased, decreasing ribbon life to 100,000 lines. For heavy left or right justified print patterns, the ribbon spools must be swapped end for end every 50,000 lines to achieve full ribbon life. Care should be exercised when handling the ribbon to prevent permanent staining of clothing.

1. Open the printers bonnet.
2. Remove the plastic band cover over the front printer gate as follows; Twist the two top quarter turn fasteners a quarter turn counter clockwise, lift the cover slightly and move to the left to clear the control panel.
3. Open the gate as required when removing the old ribbon, or installing a new one.
4. Remove the old ribbon, if one is installed, by opening the left and right fold detect switches. The fold switches open by pressing down on the knurled post and turning counter clock-wise.
5. Work with one spool at a time and carefully rotate the spool to loosen the ribbon. Care should be taken not to get cut turning the spool. The ribbon slacks by turning the right spool clockwise and the left spool counter clockwise on printers with guide rollers, without guide rollers turn the spools in the opposite direction.

11. Check the location of the ribbon reversing foil at the near empty ribbon spool. The foil is fastened near the end of the ribbon and must be positioned between the spool and the switching post or wound on the spool. Rotate the ribbon spools to take up any ribbon slack before closing the gate.
12. Close the fold detect switches by twisting the knurled post clockwise, post jumps up slightly when closed.
13. On printers with guide rollers the rollers must access the ribbon spool flanges freely without hanging on the outer edge of the spool flange.
14. Close the printers gate and replace the protective cover over the print gate band system.

NOTE

The ribbon motors are interlocked and will not run unless the protective cover is in place and both fold switches are closed.

15. The ribbon system is now ready for operation.

FORMS LOADING PROCEDURE

If the printer is to be used in the compressed pitch mode, the minimum forms weight for single part forms is 15 pounds. Also, multipart forms are limited to four part forms in compressed pitch.

1. Open a box of forms and remove the forms from the box.
2. Position the forms below the print gate at the front of the printer. Printers with quiet cabinets require the lower front door to be opened and the forms positioned on the paper shelf.

3. Open the bonnet and the print gate. Raise the first form up to the front of the printer. The front of the forms should be facing the operator or the forms stack must be turned around.
4. Power the printer On and open the Tractor flaps.
5. Install the forms in the left tractor and-close the flap.
6. Adjust the tractor for the desired left margin.
7. Install the forms in the right tractor and adjust its position for the proper horizontal tension.

NOTE

FORMS TENSION SHOULD BE SET TIGHT ENOUGH TO REMOVE ANY FORMS SLACK BETWEEN THE TRACTORS, BUT NOT TIGHT ENOUGH TO CAUSE ELONGATION OF THE FORMS FEED HOLES. LOCK THE TRACTORS IN PLACE WITH A SLIGHT PRESSURE ON THE RELEASE KNOBS IN THE LOCKING DIRECTION.

8. Depress the PAGE EJECT switch.
9. Hold the FORMS RELEASE switch on and use the First Line of Print indicator as an aid in alignment (see Figure 0-5).
10. Open the gate and depress the PAGE EJECT switch a second time and use the Vernier Positioning Control to fine adjust top of forms.
11. Feed the forms out the back of the bonnet.
12. Close the print gate and bonnet. Close the front door.
13. Advance forms until a forms stack is started.
14. The forms are now ready for printing.

ELECTRONIC VERTICAL FORMAT UNIT (EVFU)

The following is a brief description of a twelve channel electronic vertical format unit with a format tape reader. The 12 Channel Electronic Vertical Format Unit with Format Tape Reader is a microprocessor based assembly which stores format information from a 12 channel reader assembly in a 176 byte Format Tape Buffer (FTB). When the printer is powered on the format tape is automatically read into the FTB. Further loads are accomplished via a push button switch on the Reader Assembly.

Standard features of this option included limited paper runaway detection, FTB parity error detection, ROM checks, RAM checks, Customer Engineering (C.E.) Diagnostic Leds and Auto Perf. Skip.

The format tape reader is designed to read a format control tape (P/N 44713800) punched per Format Tape Preparation Instruction. The tape must be punched at 6 lines per inch. Printout will be at either 6 or 8 lines/inch depending on the position of the 6/8 line selection switch at the code disc reader of the vertical advance motor. The reader will accommodate tapes up to 29.33 inches (745mm) length, enabling format control of 22 inches (559mm) of paper printing at 8 lines/inch. The tape will be driven by a sprocket coupled to the output shaft of an A.C. timing motor and read by an optical reader.

A prepunched format tape is available (50370404) for an 11 inch form with channel one top of form, channel 2 bottom of form, and a three line skip between bottom and top. The first punch in channel 3 occurs five lines following channel 1. A punch in channel 4 follows channel 3 by six lines. Channel 5 follows 4 by six lines. Channel 6 follows 5 by six lines, etc., etc., on to channel 12 which follows 11 by six lines.

EVFU Operation

The printer will print at either six lines per inch or eight lines per inch depending on the position selected by the 6/8 LPI switch on the vertical reader. (The reader is located at the top left of the printer). Depending on the line spacing mode selected the electronic vertical format unit (EVFU) will supply the formatting information. The EVFU buffer memory must be loaded initially by a format tape punched for the line spacing mode selected in order to supply the correct formatting information. Before the printer is powered-on a format tape for the correct line spacing mode (6 or 8 LPI) must be installed. The 6/8 LPI switch position on the printer must coincide with the format tape pattern installed (6 or 8 LPI). When the LED (red) indicator on the front of the EVFU extinguishes, the Start (Stop/Start) switch may be pressed. The format buffer memory may be reloaded manually anytime by pressing the Stop Switch, installing a different format tape in the reader, and pressing the Read button. The format reader is located on the left side of the printer and the Read switch is on the front with the red Read LED indicator.

Automatic Operation

1. Printer power off-circuit breaker on the lower right part of pedestal in the down position.
2. Raise bonnet and open format reader door downward.

3. Open the format tape retainer by pressing in and turning counter-clockwise direction. Refer to the tape installation label on the format reader door for tape positioning.
4. Install the format tape with the direction arrows pointing in the clockwise (up) direction. Refer to the tape installation label on the format reader door for tape positioning.
5. Turn the knurled post clockwise to close the tape retainer.
6. Close the reader door and power the printer on-circuit breaker on the lower right part of pedestal in the up position.
7. Within a few moments the red LED indicator on the front of the reader will come on, the tape will be read and the light will go out. If the light fails to go out within a few minutes refer to Table 0-4.
8. Press the Start Switch and begin data transfer.

Manual Tape Reload

1. If the format tape is not installed, or is to be changed, follow the preceding procedure as far as loading the tape without powering the printer off and on.
2. With the tape loaded, press the Stop switch, then press the Read switch on the front of the reader.
3. When the Read LED goes out, press the Start switch.

FORMAT TAPE PUNCHING

Format tapes must be punched only at 6 LPI. When a tape is to be punched for 8 LPI, the punch must be set to 6 LPI on automatic punches, or the 6 LPI format tape marks on the tape must be used for manual punches. Although the tape is punched at 6 LPI, when the printer's 6/8 LPI switch is in the 8 LPI position, the paper motion will be performed at eight lines per inch. When punching a format tape for 8 LPI, the 6 LPI marks must be counted between punches because the half inch indicator lines across the tape will not apply at 8 LPI.

The format tape length must equal the vertical length of the form in inches as counted by the 6 LPI marks on the tape. At 6 LPI, every six marks will equal an inch of form. At 8 LPI, every eight 6 LPI marks will equal an inch of form. On forms with a vertical length less than 11 inches (279mm), the format tape would be too short to go around the reader, so the tape must be made two or more times the vertical length of the form. Each length of form added to the format tape must be punched the same as the first length or an error will be detected. The maximum length of tape that can be installed is 29.33 inches (745mm).

Tape Procedure

The format tape must be spliced to make a loop with a circumference between 11 and 29 inches (279-737mm). The length of the tape must be increased one or more form lengths for forms less than 11 inches (279mm).

1. Measure the length of the form in inches. Multiply the number of inches by six for 6 LPI, or eight for 8 LPI.
2. Count out the number in step 1 on the 6 LPI marks which are located on the channel 12 side of the format tape (44713800).
3. If a multiple length tape is being made, repeat the count for each length.
4. Check to be sure the 6 LPI marks have been counted and not the 8 LPI. Cut the tape at the point of final count plus the half inch.
5. Hold each end of the tape with a hand. Position the tape so the direction arrows point in a clockwise direction. Overlap the two tape ends by three 6 LPI marks placing the right hand edge over the left end. Draw a mark on the left side at the end of the overlap.
6. Use a thin coat of rubber cement (Duco cement of a similar pliable, non-brittle adhesive) on the top of the left edge of the tape as marked.
7. Allow the recommended adhesive to air dry until tacky, then fold the right end of the tape over the adhesive and press.
8. Clean off excessive adhesive with Chlorothene-Nu or other suitable solvent. Keep in a well ventilated area.
9. Position the loop so the arrows are going to the right, the channel on the outside is twelve, the channel on the inside is one. Punch a top of page punch in channel 1 at your selected line zero (0).
10. If your loop is a multiple of the form length, then count the 6 LPI marks to the left plus one more for the number of lines calculated in step 1. Count the punch as one when counting to the left for the next punch. Place the next top of form mark in channel 1. Repeat for any additional multiples of the form length.
11. Channel 2 is punched for bottom form positioning remember that with auto perf skip the forms will skip to channel 1 when bottom of form is detected. Count off the 6 LPI marks on the bottom of the channel 2 and punch the bottom of forms for each form length on the tape.
12. The other channels may be punched as required in any pattern of skips desired as long as each channel's pattern is exactly repeated for each form length multiple.

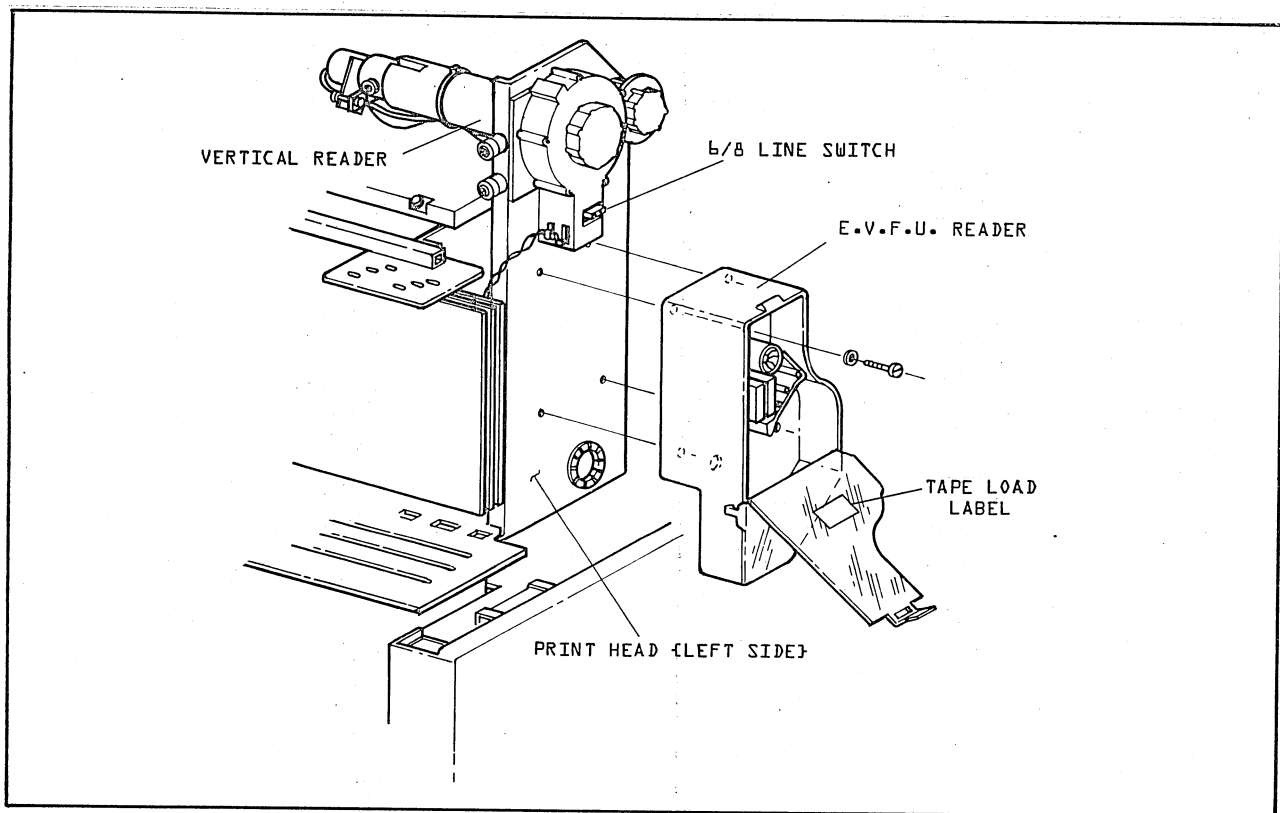


FIGURE 0-10. EVFU READER

OPERATOR MAINTENANCE

PRINTER CLEANING

The printer cabinet should be cleaned periodically using any commercially available household cleaner. The bonnet window should only be cleaned with water and a non-abrasive cloth.

A vacuum cleaner with a soft nozzle should be used to clean the paper dust and ribbon dust from the print station and print gate. A thorough cleaning should be performed at least weekly and lint removed from band transducers at ribbon changes.

OPERATOR SUPPLIES

Operator supplies consist of the consumable items an operator needs to operate and maintain the line printer. These items include cleaning materials, ribbon shields, ribbons, forms, and bands.

Cleaning Materials

These materials include several non-abrasive rags and any mild commercially available cleaning solution. A soft bristle brush may also be included in the cleaning supplies in place of a vacuum cleaner with a soft nozzle. Chloroethene-Nu solvent is used to clean the adhesive used to hold Mylar Ribbon Shields in place.

Mylar Ribbon Shields

Mylar ribbon shields are changeable by the operator and, thus are classified as an operator supply. The shields must be changed periodically to maintain optimum print quality. The procedure for changing the mylar shield is covered in the Ribbon Shield Replacement procedure in this section.

Ribbons

The ribbons employed in the printer are 24 yards (22 meters) long. Their width may vary from 1.97 to 2.06 inches. (50.04 to 52.32 mm). The aluminum foil strips mounted at each end should be the same height as the ribbon and from 1 to 1.5 inches (2.54 to 38.1 mm) wide. The strips should be .004 to .006 inch (0.1 to 0.15 mm) thick, and they should be located 12 to 13 inches (304.8 to 330.2 mm) from each end of the ribbon. The standard ribbons are .005 inch (0.127 mm) thick. OCR ribbons, that are .003 inch (0.076 mm) thick, may also be used, but they will result in a decreased ribbon life. See the recommended Ribbon Table for the types of ribbons available. The reversing foil at the ends of the ribbon must be on the inside of the ribbon rap as it goes around the spool on ribbon systems without guide rollers at the ribbon spools. The foil must be on the outside of the ribbon as it wraps around the ribbon spool on ribbon systems with guide rollers.

TABLE 0-2. RECOMMENDED RIBBONS

DESCRIPTION	INK	THICKNESS
MULTIPURPOSE	BLACK	.005 in. (0.127mm)
OFFSET	BLACK	.005 in. (0.127mm)
MULTIPURPOSE	PURPLE	.005 in. (0.127mm)
MULTIPURPOSE	BLUE	.005 in. (0.127mm)
OPTICAL CHARACTER	BLACK	.003 in. (0.076mm)
RECORD OR OCR	BLACK	.004" (.106 mm)

Forms

The printer can handle marginally perforated fan-fold paper and card stock from 4 to 16.75 inches (101.6 to 425.45 mm) wide and 8 to 14 inches (203.2 to 355.6 mm) long form fold to fold. The forms must have sprocket holes punched along both margins. These holes must be .151 to .161 inch (3.84 to 4.09 mm) in diameter and their centerlines must be located .247 to .253 inch (6.27 to 6.43 mm) from the paper edge. The distance between hole centerlines must be between .495 and .505 inch (12.57 and 12.83 mm) non-accumulative. The top and bottom drive holes (4 holes total per sheet) may be oversized to .200 inch (5.08 mm) in diameter to allow ring binding of the final printout.

Any multipart forms used in the printer must be fastened with crimps every two inches (50.8 mm) along both sides of the forms. The crimps must not come closer than .50 inch (12.9 mm) to the form fold. Each crimp must have four prongs, two of which enter the forms and the carbon and two of which enter the forms only.

CAUTION

NO MECHANICAL STAPLES, METAL OR PLASTIC, MAY BE USED TO HOLD THE PAPER STOCK OR CARBONS TOGETHER.

The maximum forms thickness the printer can handle is .020 inch (0.508 mm) in the print area. Across the crimp fastenings this dimension may be expanded to .030 inch (0.762 mm). See the Recommended Forms Table for a list of general purpose forms.

RIBBON MYLAR SHIELD REPLACEMENT

The ribbon mylar shield is designed to be operator changeable. The end of life of the shield is determined by its inability to prevent marking or smudging of the forms by the ribbon. This condition should not occur more than once per 3 million print lines. If the mylar shield is not correctly aligned it may effect the adjustment of the ribbon shield. Misalignment can cause poor print quality, ribbon smudging, interference noise, binding ribbon and tearing or jamming of the forms. Replacement shields come with the double sided tape already in position. To replace the shield perform the following procedure:

1. Open the print gate and remove the old ribbon shield and all the old tape residue using Chloroethene-Nu, solvent or masking tape. Masking tape may be placed over old tape residue and then removed taking off the residue. Refer to Figure 0-11.

TABLE 0-3. RECOMMENDED FORMS

<u>PARTS</u>	<u>WHITE SULPHITE BOND</u>	<u>CARBON INSERTS</u>
* 1	15 lb (56.69g/m ²)	
1	20 lb (75.85g/m ²)	
1	24 lb (90.23g/m ²)	
1	99lb (160.4g/m ²) (card Stock)	
2, 3, or 4	15 lb (56.69g/m ²) first part 12 lb (45.11g/m ²) copies	7-1/2 lb (28.19g/m ²)
5	15 lb (56.69g/m ²) first part 12 lb (45.11g/m ²) last part 10 lb (37.63g/m ²) inner leaves	7-1/2 lb (28.19g/m ²)
6	12 lb (45.11g/m ²) all parts	5 1/2 (20.68 g/m ²)
6	12 lb (45.11g/m ²) first part 10 lb (37.63g/m ²) all copies	5 1/2 (20.68 g/m ²)

*Minimum acceptable single part paper weight.

2. Remove the non-stick covering from the tape on the new shield.
3. Position the shield so that the holes in the shield align with the locating pins on the outer paper guide.
4. Press firmly around the taped edges of shield to secure the shield to the outer paper guide.

There should be no bowing or creasing across the surface of the shield (Refer to Section 5, Outer Paper Guide Adjustment).

OPERATOR FAULT ISOLATION

There are minor malfunctions affecting the operation of the printer which may be corrected by the operator. The Fault Isolation Table is designed to provide the operator with a quick reference to the type of problem he is capable of correcting. Anytime a problem is not operator correctable, the service representative should be called. The operator should be able to provide the service representative with a clear and concise description of the problem and, if applicable, provide a print sample of the problem.

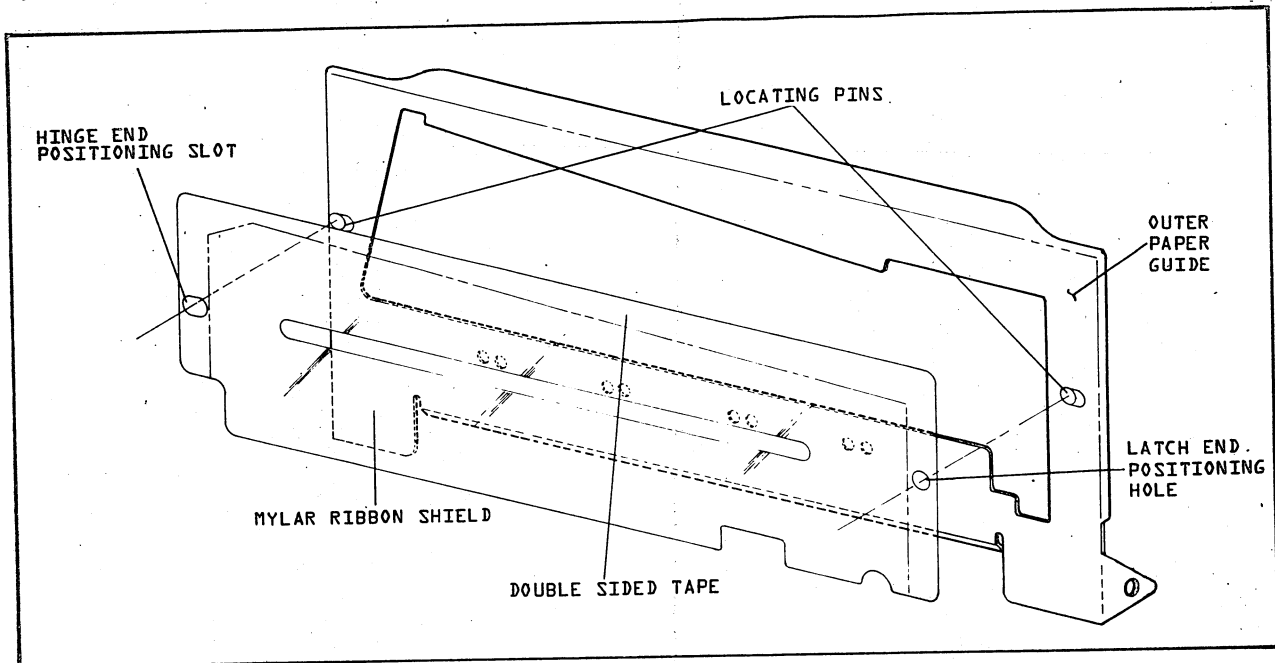


FIGURE 0-11. RIBBON MYLAR SHIELD INSTALLATION

TABLE 0-4. OPERATOR FAULT ISOLATION

NOTE: ALWAYS REFER TO THE FAULT ISOLATION TABLE IN ANY ADAPTER MANUAL SUPPLIED

SYMPTOM	PROBABLE CAUSE	ACTION REQUIRED
A. Printer can not be powered on (no lights or motor sounds).	A1. Printer is not plugged in. A2. Problem is not operator correctable.	A1. Locate the plug and reconnect. A2. Call the Service Representative.
B. Read LED on Tape reader remains lit after printer is power up and printer will not move paper or go to START. Also refer to C.	B1. Bad program ROM check during power up. B2. Bad RAM check during power up. B3. Problem is not operator correctable	B1. Power off and repeat power up sequence. B2. Power off and repeat power up sequence. B3. Call Service Representative.
C. Read LED on tape reader remains lit after printer is powered up and printer will not go to START. Pressing PAGE EJECT advances forms only one line. Also refer to B.	C1. No format tape installed. C2. Broken or damaged format tape. C3. No punch made in channel 1 for top of form. C4. Number of 6LPI marks between channel 1 punches exceeds 175.	C1. Installed a punched format tape. C2. Replace Tape. C3. Check Tape and punch or replace. C4. Repunch if possible or replace tape.
D. Printer does not go to START. STOP indicator is flashing.	D1. Problem is not operator correctable.	D1a. Power the printer off then 3 sec. later on again. Attempt restart. D1b. If problem persists, call the Service Representative.
E. Printer does not go to START and PAGE EJECT indicator is illuminated.	E1. Forms tear or jam has been detected. E2. Line Spacing error has been detected.	E1. Reinstall forms and set up top of form, then press START. E2. Press START. If fault continues to be detected call Service Representative.
F. Printer does not go to START a. No additional indication. b. Band keeps running. It should time out and stop.	F1. Print gate is not latched securely F2. Print band is not installed. F3. Ribbon has folded or one fold switch is dirty or open F4. Band cover not latched F5. Problem is not operator correctable. F6. Band not installed properly.	F1. Close and latch print gate. F2. Install the print band. F3a. Replace a folded ribbon. F3b. Clean dirty switch. F3c. Close open switch. F4a. Position and latch cover. F5. If problem persists call the Service Representative. F6. Check band installation.

Continued:

(Con't) TABLE 0-4. OPERATOR FAULT ISOLATION

SYMPTOM	PROBABLE CAUSE	ACTION REQUIRED
G. Printer goes to STOP and Read LED is lit, printer will not go to START, depressing PAGE EJECT advances forms one line.	G1. EVFU parity error detected. G2. Problem is not operator correctable.	G1. With tape in EVFU press Read switch, Read LED out, press START. G2. Call the Service Representative.
H. Paper runaway, printer goes to STOP, Read LED lit, printer will not go to START.	H1. Printer received an illegal format control code. H2. Format channel selected that was not punched on the tape used to load the EVFU	H1. Check program for illegal format codes. Reload and try again. H2. Check for any unpunched tape channels called out in the program. Reload and try again.
I. Printer goes to STOP, Read LED lit, printer will not go to START, PAGE EJECT doesn't move forms.	I1. No paper motion occurred upon command from the data source, printer defect.	I1. Power the printer off, pause power back on, press PAGE EJECT and if forms advance press START. If forms do not move call a Service Representative.
J. Printer consistently tears forms.	J1. Too much horizontal tension on the forms. J2. Forms stack is not centered below the print station. J3. Forms are skewed from left feed holes to right feed holes. J4. Ribbon mylar shield damaged. J5. Problem is not operator correctable.	J1. Readjust right tractor to decrease tension. J2. Reposition the forms stack. J3. Reinstall the forms insuring the same level feed holes engaged both tractors. J4. Replace shield. J5. Call Service Representative.
K. Print out is light.	K1. Ribbon is excessively worn. K2. Ribbon has not reversed due to improper installation or defective ribbon. K3. Problem is not operator correctable.	K1. Replace the ribbon. K2. Check the ribbon for proper installation or missing shorting strips. K3. Call the Service Representative.
L. Print Characters are missing left or right sides.	L1. Phasing Control is misadjusted.	L1. Readjust Phasing Control.
M. Printout is smudging.	M1. Mylar Ribbon shield is excessively worn, M2. Ribbon is inked excessively.	M1. Replace the mylar shield. M2. Replace the ribbon.
N. Line spacing is incorrect.	N1. Wrong length form installed for program being used. N2. Wrong EVFU Tape for form pattern. N3. Problem is not operator correctable	N1. Check the form length for 11 inch form (279mm) and also refer to the following Control Panel options. N2. Check EVFU tape against form pattern. Refer to forms loading procedure and setup top of forms position. N3. Call the Service Representative.

PRINCIPLES OF OPERATION

The following is an explanation of the circuitry on the interface adapter board (7PC5) and its operation as it pertains to its function as an interface to the common controller interface (7PC1/7PC2). The 7PC5 board is referred to as the Interface Board and the standard printer interface is referred to as the common control-

ler (7PC1 and 7PC2) which is documented in manual sections 1-6. The interface board (7PC5) is documented in this Section 0 and Section 7 which contains the logic. The Electronic Vertical Format Unit (EVFU) is documented as a special option with Special Option Manual, however the operator instructions in the section incorporate the EVFU's operation.

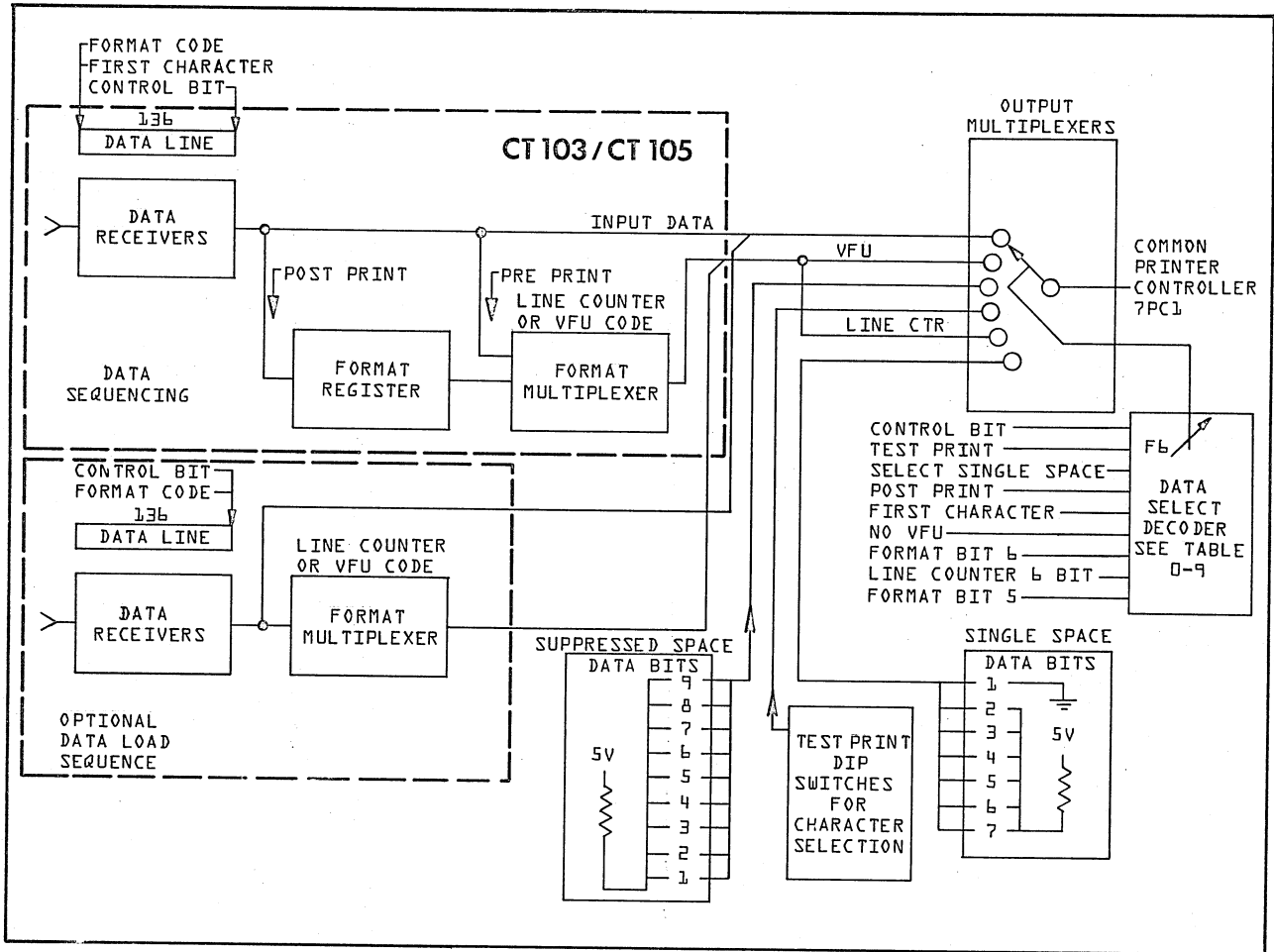


FIGURE 0-12. DATA SEQUENCING

TABLE 0-5. SINGLE ENDED I/O CONNECTION (NOT USED)

CONNECTOR	PIN NO.	SIGNAL
1J01	A	DATA STROBE
	B	DATA STROBE
	C	CHAR. REQ.
	D	CHAR. REQ.
	E	DATA BIT 0
	F	DATA BIT 0 Return
	H	DATA BIT 1
	J	DATA BIT 1 Return
	K	DATA BIT 2
	L	DATA BIT 2 Return
	M	DATA BIT 3
	N	DATA BIT 3 Return
	P	DATA BIT 4
	R	DATA BIT 4 Return
	S	DATA BIT 5
	T	DATA BIT 5 Return
	U	DATA BIT 6
	V	DATA BIT 6 Return
	W	Not Used
	X	Not Used
	Y	Not Used
	Z	Not Used
	a	CONTROL BIT
	b	CONTROL BIT Return
	c	PARITY BIT
	d	PARITY BIT Return
	e	BUFFER CLEAR
	f	BUFFER CLEAR Return
	h	READY
	j	READY Return
	k	LINE READY
	m	LINE READY Return
	n	PROC. MASTER CLEAR
	p	PROC. MASTER CLEAR Return
r	OUT OF PAPER Option	
s	OUT OF PAPER Return Option	
t	BUFFER OVERFLOW Option	
u	BUFFER OVERFLOW Return	
v	PARITY ERROR	
w	PARITY ERROR Return	
x	GND	
y	Not Used	
z	Not Used	
AA	Not Used	
BB	BAND DETECT 1 Option	
CC	BAND DETECT 1 Return	
DD	BAND DETECT 2 Option	
EE	BAND DETECT 2 Return	
FF	COMPRESSED PITCH	
HH	COMPRESSED PITCH Return	

NOTE: All return lines are connected to the transmitter or receiver board GND. Each signal line and its return should be a twisted pair in the data cable.

GENERAL INFORMATION (See Figure 0-12)

The interface board can be optioned to operate in two basic modes, one in which the printer requests data from the processor, in which the processor replies when the data byte is on the lines. The second optional mode is where the processor places the data on the lines and tells the printer the information is ready, the printer responds after sampling the data with Output Resume.

The data sequence which relates to the position of the format byte in a line of data is selectable. The standard data sequencing supplies the format command as the first data byte sent. A signal, First Character, is used to identify the format byte. The data line is always ended with the Control Bit signal. In this mode an option is available for the paper motion sequence, post print paper motion and preprint paper motion.

In post print paper motion the format code is received first and stored in the format register. After the data line has been received and the Control Bit is received ending the data line, the format multiplexer selects the format register input. The output multiplexer then selects the vertical format unit code or the line counter code which was just input into the format multiplexer.

In the pre print paper motion mode the format code is received first and placed in the format multiplexer. While the First Character signal is still present the output multiplexer selects the vertical format unit code or line counter code just input into the format multiplexer. The common controller incorporates an initial delay in the pre print mode because it operates in a post print mode. If the band is stopped the load operation must wait until the band is up to speed. The format code is received in the common controller along with the Control Code which indicates to the common

controller it has received a line of data. Since memory was not loaded with data, only blanks appear as the printer proceeds through a print cycle. At the end of the print cycle in which no printing occurs the printer then acts on the paper motion format command. After the paper motion the first data line is transferred to the common controller. At the end of the data line when the Control Bit signal is received the output multiplexer selects the suppressed space input to ignore the data lines. After this print cycle the next lines format code is loaded and performed. This causes approximately 0.5 msec. delay before the paper motion is completed and the printer can respond to load the rest of the data line.

The optional data load sequence is indicated by the Data Sequence signal being true. In this mode the data line characters are received first and the line is ended by the Control Bit signal. The Control Bit when received indicates the data byte on the lines is the format code. The output multiplexer on sensing the Control Bit selects the format multiplexer input containing the vertical format unit code or the line counter code.

INTERFACE CHARACTERISTICS

The following information provides a description of the interface options and signal definitions available with the 9322 compatible interface.

Data Cable

No data cable is provided with the standard unit. It is recommended that the cable used have a characteristic impedance of approximately 100 ohms \pm 10%, and have 24 or 26 gauge twisted pair wires. See Figure 0-13 for the recommended connector.

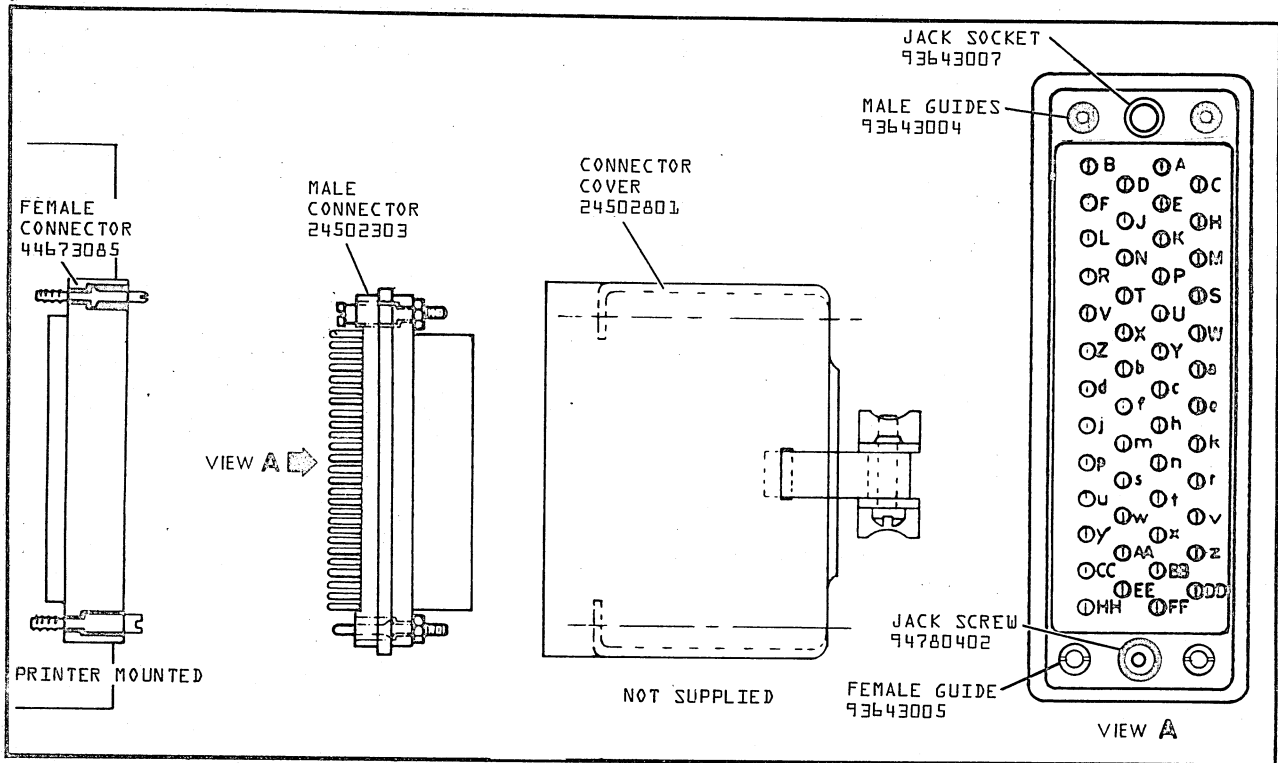


FIGURE 0-13. INTERFACE CONNECTOR

TABLE 0-6. DIFFERENTIAL MODE I/O CONNECTION (CT103/CT105)

CONNECTOR	PIN NO.	SIGNAL
1J01 ↑	A	DATA STROBE
	B	DATA STROBE
	C	CHAR. REQ.
	D	CHAR. REQ.
	E	DATA BIT 0
	F	DATA BIT 0
	H	DATA BIT 1
	J	DATA BIT 1
	K	DATA BIT 2
	L	DATA BIT 2
	M	DATA BIT 3
	N	DATA BIT 3
	P	DATA BIT 4
	R	DATA BIT 4
	S	DATA BIT 5
	T	DATA BIT 5
	U	DATA BIT 6
	V	DATA BIT 6
	W	Not Used
	X	Not Used
	Y	Not Used
	Z	Not Used
	a	CONTROL BIT
	b	CONTROL BIT
	c	PARITY BIT
	d	PARITY BIT
	e	BUFFER CLEAR
	f	BUFFER CLEAR
	h	READY
	j	READY
	k	LINE READY
	m	LINE READY
	n	PROC. MASTER CLEAR
	p	PROC. MASTER CLEAR
r	OUT OF PAPER Option	
s	OUT OF PAPER Option	
t	BUFFER OVERFLOW Option	
u	BUFFER OVERFLOW Option	
v	PARITY ERROR	
w	PARITY ERROR	
x	GND	
y	Not Used	
z	Not Used	
AA		
BB	BAND DETECT 1 Option	
CC	BAND DETECT 1	
DD	BAND DETECT 2 Option	
EE	BAND DETECT 2	
FF	COMPRESSED PITCH	
HH	COMPRESSED PITCH	
1J01 ↓		

Note: The true signal line (for example Data Bit 0) is at a high positive level when it is intended that the signal being sent should be a logical "1". See Figure 6 for voltage level.

Transmitter/Receivers Single Ended (Not Used)

The short line interface (up to 50 feet), is DTL and TTL compatible. Figure 0-15 shows a typical transmitter and receiver, and the recommended cable characteristics. See Table 0-5 for the data cable connection.

Transmitter/Receivers Differential (CT103/CT105)

An option is available which provides long line data transmission capability. Integrated circuit, differential transmitter/receivers are used. These devices provide good common mode noise rejection, while enabling the transmission of data over cables up to 500 feet in length. Figure 0-16 shows the configuration of the differential circuits. Also to avoid confusion, see Table 0-6 for I/O connector pin assignments for the differential mode. Since the differential circuits require two signal paths, the return ground line is no longer used as in single ended transmission. For this reason, the signal names have been redefined.

Interface Voltage Levels (Not Used)

When the recommended single ended configuration is used, the line voltage will be as follows:

OUTPUTS	INPUTS
Logic "1" $\geq 2.4V$ at $-1.2 Ma$ Max	$>2.0V = \text{True Level}$
Logic "0" $\leq 0.4V$ at $48 Ma$ Max	$<0.8V = \text{False Level}$

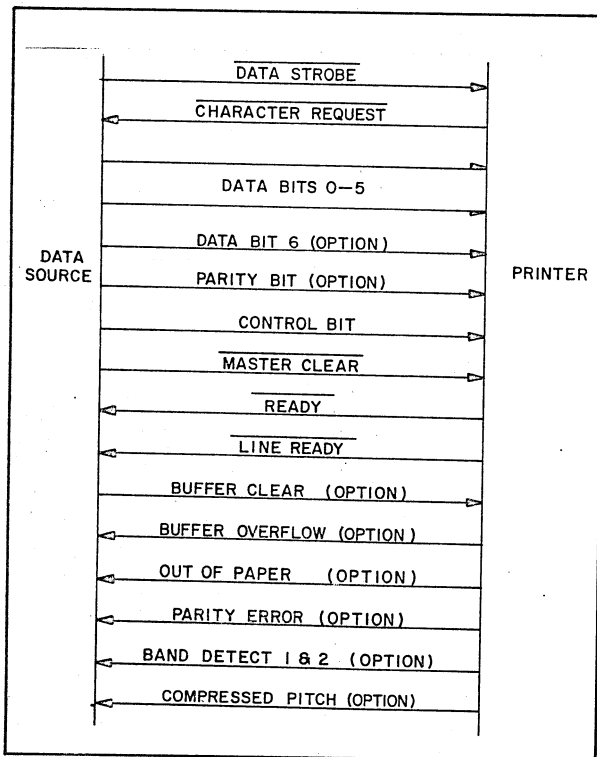


FIGURE 0-14. INTERFACE SIGNALS

Interface Signals (See Figure 0-14)

The bars above the signal names in the following sections indicate that the actual signal line has a negated logical sense. For example, $\overline{\text{READY}}$ would be equivalent to Not Ready. The printer would then be Not Ready when this signal line is at Logic "1", or 2.4 volts.

Data Bits

Six data lines (seven data lines are available as an option) carry the information (control codes and data characters) to the line printer controller. The data must be placed on the data lines 0.5 usec prior to the generation of the $\overline{\text{DATA STROBE}}$ or $\overline{\text{INFORMATION READY}}$ signal, and must not be removed until the $\overline{\text{DATA STROBE}}$ or $\overline{\text{INFORMATION READY}}$ signals goes true. See Figure 0-17 and Table 0-7 for the standard 6 bit code/character set.

Seven Data Bit Interface (See Table 0-8) (CT103/CT105)

The Seventh Data Bit is required whenever a 6 bit line counter is used with a vertical format unit, or whenever the printable character set plus blank code exceeds 64. ASCII codes are used on seven data bit machines unless special translator ROMS are installed.

$\overline{\text{READY}}$ Signal

The $\overline{\text{READY}}$ line is a signal from the printer which, when false, indicates the printer is fully operational. It means that no fault conditions exist, and that the control panel start/stop pushbutton has been depressed.

The Fault conditions which can exist are:

1. Fuse Fault (36 volt supply for "H" switches and ribbon motors).
2. "H" Switch Fault
3. ± 12 volt or +5 volt failure
4. Horizontal Motion Error
5. Hammer Fault
6. Gate Open
7. Forms Error
8. Paper Out
9. Line Space Error
10. Band Not Identified
11. EVFU Not Loaded
12. Band Cover Interlock Open
13. Band Motor Overcurrent
14. Ribbon Motor Overcurrent
15. Horizontal Home Fault
16. Horizontal Stop Fault

When the printer is in the Ready condition, depression of the Start/Stop switch will remove the unit from the Ready condition. If a print cycle is in process, the unit will remain Ready until the print cycle is completed.

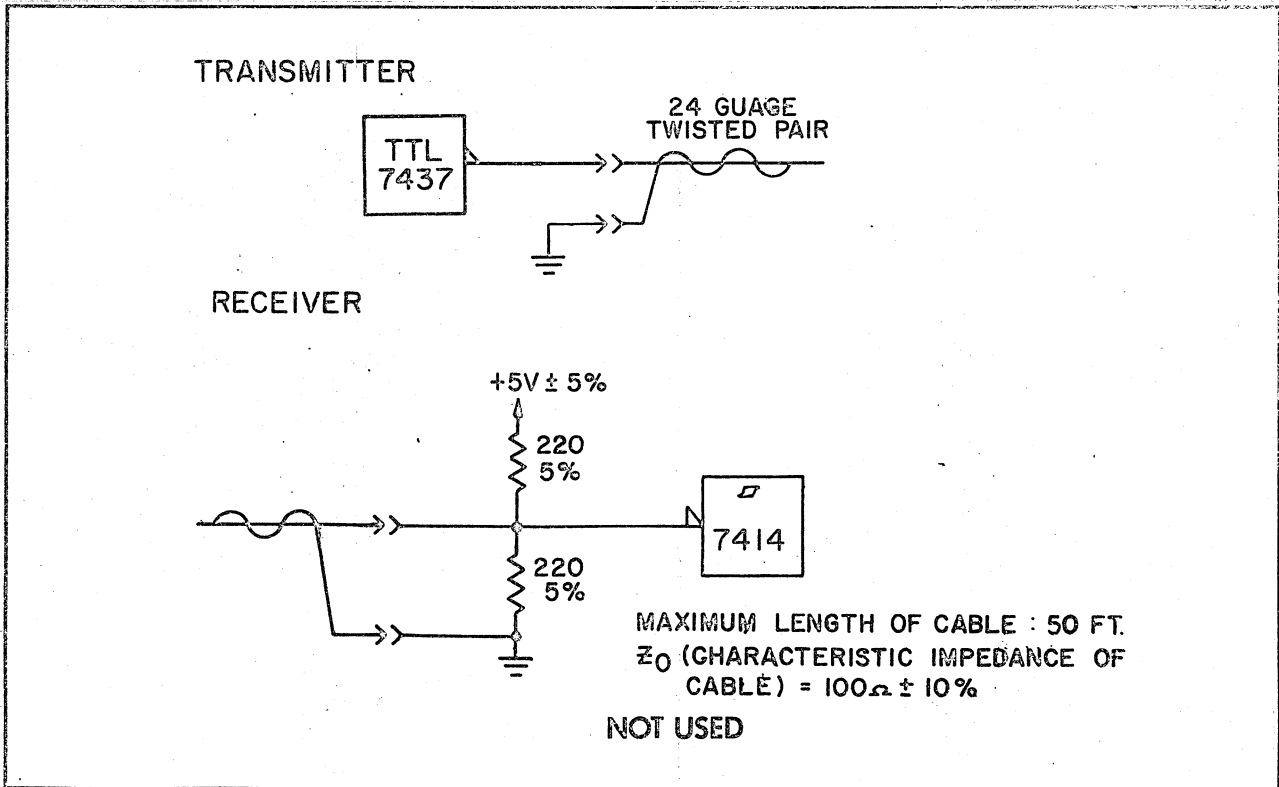


FIGURE 0-15. SINGLE ENDED, SHORT LINE INTERFACE

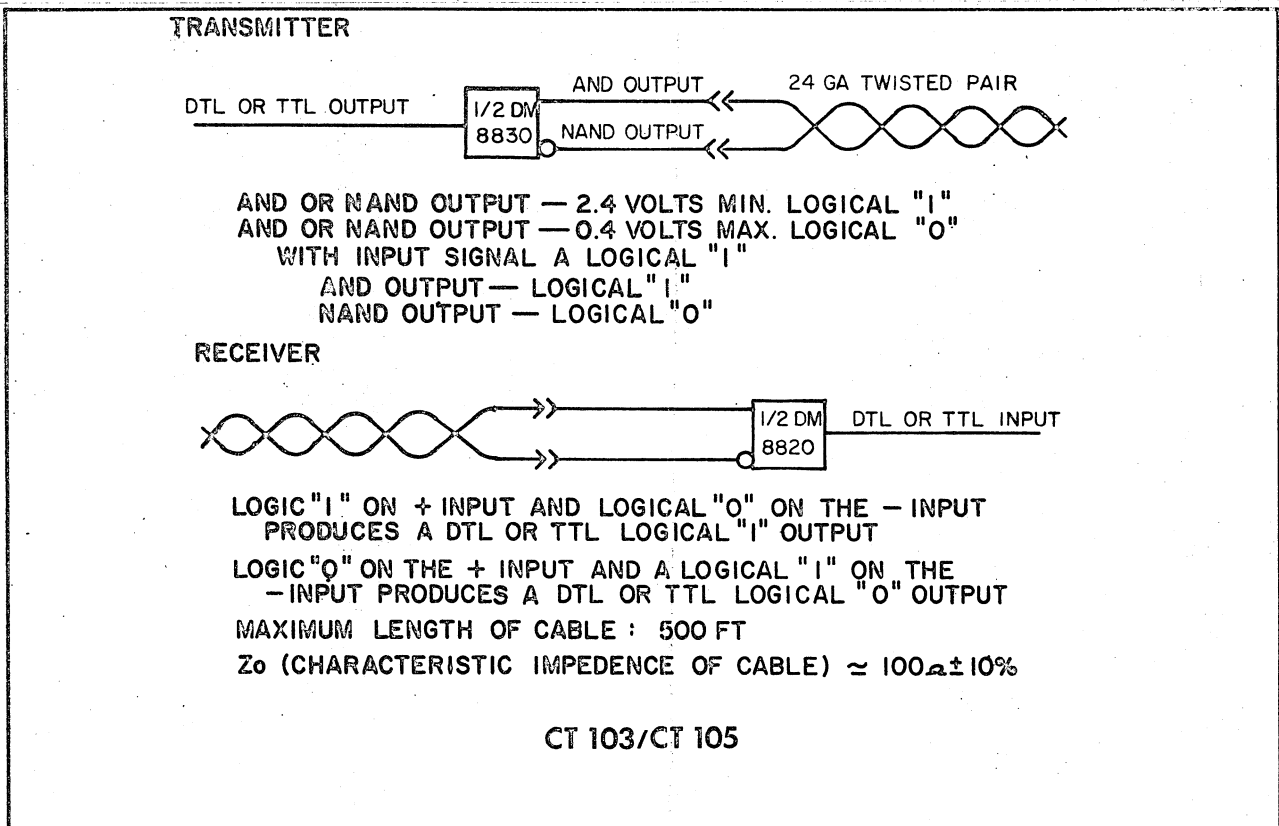


FIGURE 0-16. DIFFERENTIAL, LONG LINE INTERFACE

TABLE 0-7. CHARACTER AND CODE SET (6 DATA BIT I/O ONLY)

CHARACTER	CODE	CHARACTER	CODE
@	00	{blank}	40
A	01	!	41
B	02	"	42
C	03	#	43
D	04	\$	44
E	05	%	45
F	06	&	46
G	07	'	47
H	10	(	50
I	11	)	51
J	12	*	52
K	13	+	53
L	14	,	54
M	15	-	55
N	16	.	56
O	17	/	57
P	20	0	60
Q	21	1	61
R	22	2	62
S	23	3	63
T	24	4	64
U	25	5	65
V	26	6	66
W	27	7	67
X	30	8	70
Y	31	9	71
Z	32	:	72
[	33	; <	73
\	34	= >	74
]	35	^	75
^	36	_	76
_	37	?	77

NOT USED

TABLE 0-8. SEVEN DATA BIT I/O ASCII CHARACTER AND CODE SET

Bit positions				b7	bb	b5	0	0	0	0	1	1	1	1
b4	b3	b2	b1	0	0	0	0	1	1	0	1	0	1	0
CT 103/CT 105														
0	0	0	0					SP	0	@	P	\	p	
0	0	0	1					!	1	A	Q	a	q	
0	0	1	0					"	2	B	R	b	r	
0	0	1	1					#	3	C	S	c	s	
0	1	0	0					\$	4	D	T	d	t	
0	1	0	1					%	5	E	U	e	u	
0	1	1	0					&	6	F	V	f	v	
0	1	1	1					'	7	G	W	g	w	
1	0	0	0					(	8	H	X	h	x	
1	0	0	1					)	9	I	Y	i	y	
1	0	1	0					*	:	J	Z	j	z	
1	0	1	1					+	;	K	[	k	{	
1	1	0	0					,	<	L	\	l	;	
1	1	0	1					-	=	M	]	m	}	
1	1	1	0					.	>	N	^	n	~	
1	1	1	1					/	?	O	_	o	SP	

OPTIONAL

PROCESSOR MASTER CLEAR Signal

An interface signal from the data source which when false indicates to the printer controller that all circuits should be placed in their initial steady state condition. The signal does not, however, remove the printer from the START mode (READY line is a Logic "0"). The signal must be a minimum of 5 usec in duration. Note that this signal should only be used to clear error conditions in the printer. It is not required for normal operation of the unit. It should not be used indiscriminately or to initialize the printer before each normal operation when no printer faults exist.

OUT OF PAPER Signal (Not Used)

An optional status line is available which indicates an out of paper condition when at a logical "0". Specifically, the line indicates that the last line of the last form has been printed upon. When the No VFU option is used, the line will indicate that the bottom edge of the last form has been detected by the out of paper switches. At this time, there is approximately three inches of paper remaining between the bottom edge of the last form and the print station. Printing cannot occur at this time, however, since the out of paper condition causes a Not Ready condition.

BUFFER OVERFLOW Signal (Not Used)

A BUFFER OVERFLOW signal is available which, when at a logical "0", indicates that more than the maximum number of characters have been received. The line will indicate an overflow condition during the transfer of the first extra data byte. The overflow signal will be removed when a CONTROL BIT, truncates the input. All overflow characters will be responded to, but not stored or printed. Refer to Figure 0-17 for interface timing.

Band Detect 1 and 2 (BD1 and BD2) Signals (Not Used)

These signals contain binary coded information which state the type of band currently on the printer.

BD2	BD1	Type of Band
0	0	128 Character
0	1	96 Character
1	0	64 Character
1	1	48 Character

Compressed Pitch (CP) Signal (CT103/CT105)

An interface line from the printer which when True (a Logic "1"), states that the printer is in the compressed pitch mode. In this mode characters will print at 15 characters per inch. When CP is False (a Logical "0"), the printer is in standard pitch mode. In the standard pitch mode, characters are printed at 10 characters per inch. This line is stable during READY, equal to a Logical "0".

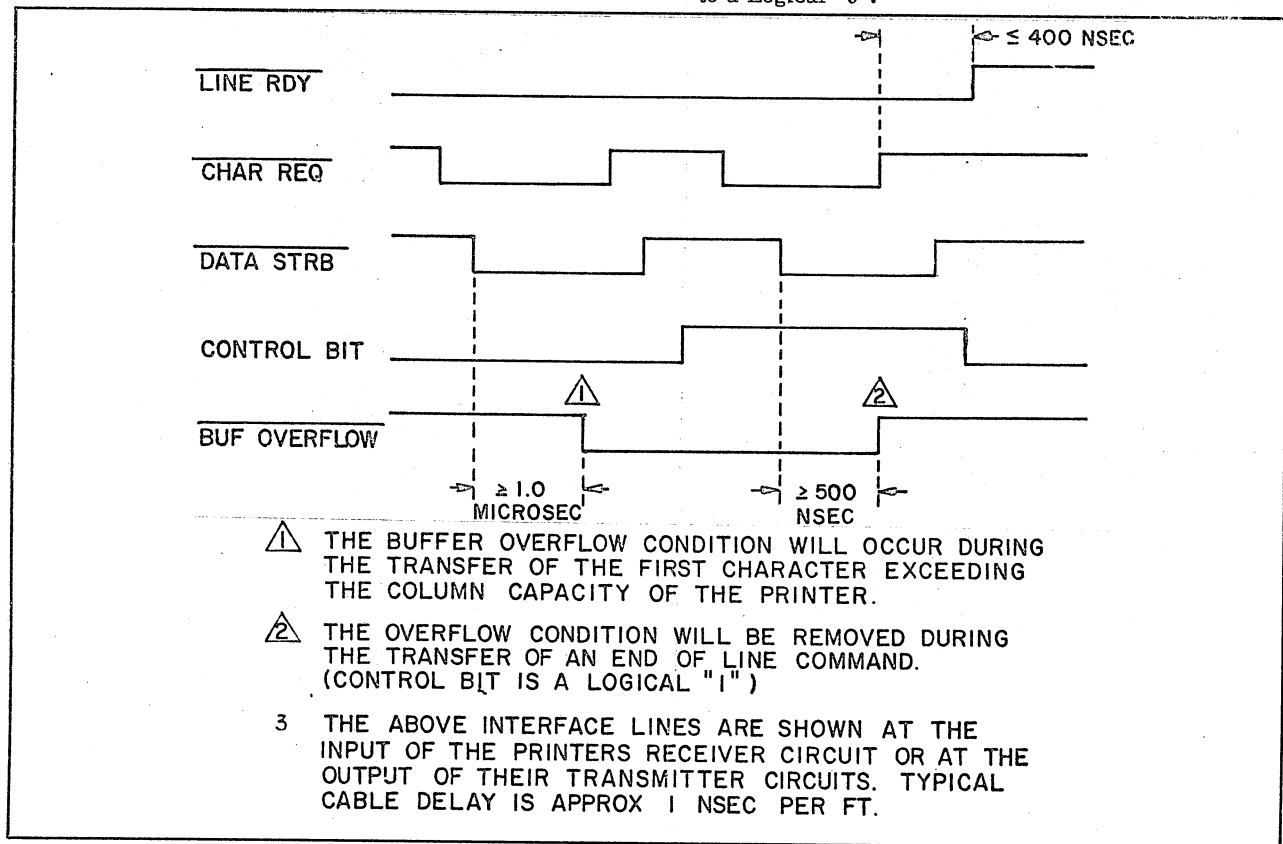


FIGURE 0-17. OPTIONAL BUFFER OVERFLOW INPUT/OUTPUT TIMING

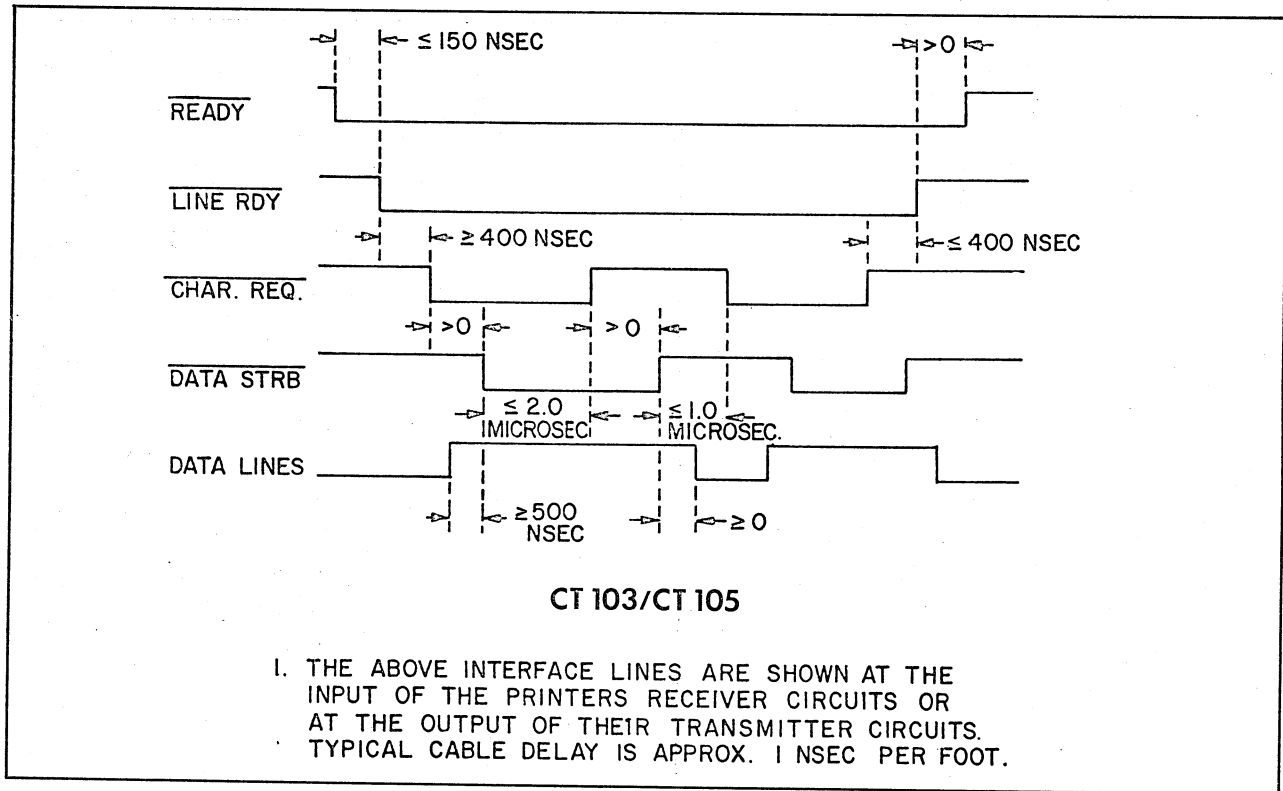


FIGURE 0-18. STANDARD INTERFACE TIMING

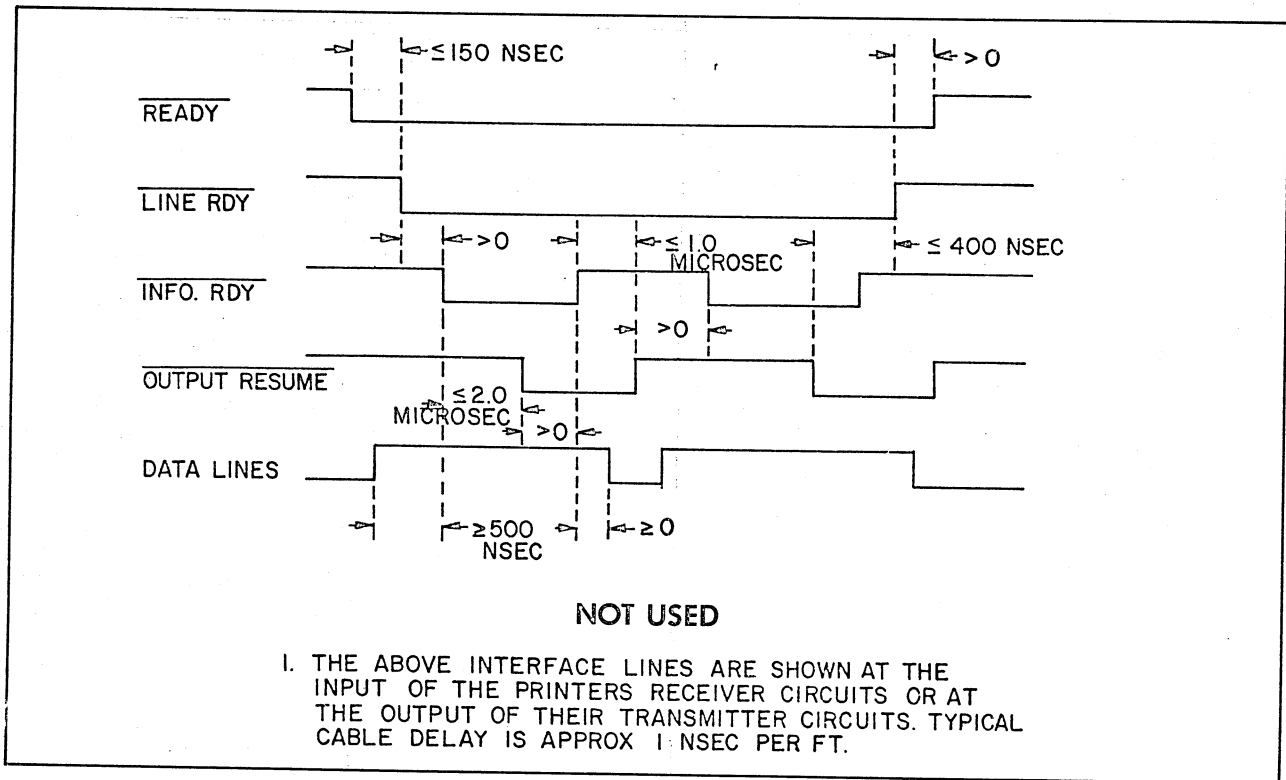


FIGURE 0-19. OPTIONAL INTERFACE TIMING

Column Capacity (Model A-132, Model B-136)

An option is available which provides 136 print columns instead of the standard 132 columns. Also compressed pitch bands can be used to increase print columns. With these bands, a 132 column machine can print up to 198 compressed pitch columns while a 136 column unit can print 204 compressed columns.

A switch is provided on the interface board (7PC5) which limits compressed pitch column width to the same as standard pitch machines. This switch may be used with the Buffer Overflow status option to select the desired column length. The compressed pitch mode is indicated as the I/O connection.

DATA INTERCHANGE TECHNIQUE (CT103/CT105)

The controller operates on an interlocked handshaking technique. The interlocked feature simply means that there are no stringent timing requirements on the data exchange signals. Transitions from one logic level to the other rather than pulses are used to exchange data. The printer controller asks for a character by placing in CHARACTER REQUEST signal at a Logic "0". The data source responds by placing the DATA STROBE line at a Logic "0". The printer will drop the CHARACTER REQUEST signal when the data byte has been sampled. When the printer senses the removal of DATA STROBE, it will generate another CHARACTER REQUEST when it is ready to accept another character. Therefore, the timing requirements are that, (1) CHARACTER REQUEST must be false, and data must be stable at least .5 microseconds prior to the generation of DATA STROBE, (2) The data source must sense the removal of the CHARACTER REQUEST signal before the DATA STROBE signal is removed and (3) Data be removed concurrently or after DATA STROBE is removed. Refer to Figure 0-18 showing the interface timing.

CHARACTER REQUEST

An interface line from the printer which when false (logic "0") indicates that the controller is ready to accept a data character from the data source. The data source must sense this line before the DATA STROBE signal is generated. This line will go true after the data byte has been sampled, and the DATA STROBE signal may be removed at this time, but not prior to sensing CHARACTER REQUEST being true. See Figure 0-18.

DATA STROBE

An interface line from the data source which, when false, indicates to the printer controller that the data byte has been stabilized, and the data lines may be sampled. Refer to Data Strobe Delay.

Data Strobe Delay (CT103/CT105)

This is a special option. It provides a nominal 275 nsec. ($\pm 3\%$) delay on the leading edge of Data Strobe. This allows the use of existing computer to printer I/O boards which raise the Control Bit at the same time as Data Strobe when operating in the Automatic Data Transfer (ADT) mode. This will decrease the data transfer rate by the amount of the delay.

Optional Data Interchange Technique (Not Used)

An optional data interchange technique is available in which the DATA STROBE line becomes an INFORMATION READY, and the CHARACTER REQUEST line becomes an OUTPUT RESUME line. In this mode of operation the data source indicates that the data lines may be interrogated by placing the INFORMATION READY line at a logical "0". This should be done only after the LINE READY line has been placed at a logical "0", otherwise the printer will not respond. The printer will respond by placing the OUTPUT RESUME line at a logical "0" when it has sampled the data byte. The INFORMATION READY line may be placed at a logical "1" after the data source senses the OUTPUT RESUME signal. A new INFORMATION READY signal may be generated when the data source sensed a logical "1" on the OUTPUT RESUME line. Therefore, the timing requirements are that; 1) LINE READY is false, OUTPUT RESUME is true, and data is stable at least .5 microseconds before INFORMATION READY is generated; 2) The data source must sense OUTPUT RESUME go false before INFORMATION READY is removed; and 3) Data be removed concurrently or after INFORMATION READY is removed. Refer to Figure 0-19.

INFORMATION READY Signal

An interface line from the data source which, when false (logical "0"), indicates to the controller that the data lines are stable and may be sampled. INFORMATION READY is to remain false until responded to by OUTPUT RESUME going to a logical "0".

OUTPUT RESUME Signal

An interface line from the printer which, when false (logical "0"), indicates that the data lines have been sampled. OUTPUT RESUME will remain false until INFORMATION READY goes true.

LINE READY Signal

An interface line from the printer which when false (logic "0") indicates that the printer is ready to accept a line of data. This line will become false preceding the generation of the first CHARACTER REQUEST and will remain false until the CONTROL BIT signal is received. This line will remain true during a print cycle indicating that the printer controller cannot and will not accept data. (After a period of idling, the receipt of the first character will cause the print band to start to come up to speed. The first line of data will be accepted during this time, but not printed until full speed is reached (approximately 5 seconds). Thus the second Line Ready and associated data transfer will be delayed by this amount. No delay will occur when the band is running at full speed).

NOTE: The next line of print may be loaded during the Paper Motion cycle of the previous line. Any errors detected during the paper motion will cause the loss of the new line of print when the error is cleared by MC or returning to start.

Data Sequencing, Standard Mode (CT103/CT105)

The first character transferred is recognized as the format character (CONTROL BIT MUST be a logical "0" at this time). The following characters (0 through n) are recognized as data characters and are printed with the first character is the left most column position. The input may be truncated at any time by the sending of a

CONTROL BIT. The code on the lines at this time is neither stored nor printed. A CONTROL BIT must be sent in order to end the line. Characters in excess of the column capacity (132 normally) will be responded to, but will not be stored or printed. If a short line is sent (less than the column capacity for that printer), the remaining positions will be filled with blanks.

CONTROL BIT Signal

The CONTROL BIT is an interface signal from the data source which, when true (logic "1"), indicates to the controller that the data input is being truncated, and that the printer may now enter its print cycle. The CONTROL BIT must be a Logic "1" at least 0.5 usec prior to placing the DATA STROBE signal at a logic "0", and must not be removed until the DATA STROBE signal goes to a Logic "1". The code on the data lines when CONTROL BIT is true is ignored. CONTROL BIT must be true in order to truncate the data input.

Data Load Sequence, Optional (Not Used)

A data loading option is available in which 0 through N data characters are recognized as print data. The CONTROL BIT being true truncates the input and causes the information on the data lines at that time to be recognized as the format character. Note that this option may not be used with the Pre-print mode option.

TRANSMISSION PARITY OPTION (CT103/CT105)

An optional input Parity option is available which will check parity on all incoming data characters and format commands. Parity is not checked when the CONTROL

BIT is true except when the Data Load Option, the format character is on the data lines coincident with CONTROL BIT, and Parity must be checked.

Additional Interface lines require include:

1. PARITY BIT
2. PARITY ERROR
3. BUFFER CLEAR

On a data word transfer, all data bits are examined for correct parity, and a PARITY ERROR is generated if parity is incorrect. The data source may, at its discretion, continue the line, or it may place the BUFFER CLEAR signal at a logic "0". The BUFFER CLEAR signal will reset the PARITY ERROR, and will condition the printer for the reception of a new line of information. The data in a line of information with a parity error is stored but never printed, or if it is a command instruction, is not executed. The BUFFER CLEAR signal may be generated at any time after the data source has sensed the PARITY ERROR line at a logical "0". The controller must receive a BUFFER CLEAR signal in order to reset the PARITY ERROR and prepare for a new line of data. The parity check may be obtained with a 6 or 7 bit data character interface and either even or odd parity may be checked. A control panel PARITY ERROR indicator may be provided as a part of this option. The PARITY ERROR signal should only be cleared by the BUFFER CLEAR signal since this signal clears selective circuits to prepare for retransmission of the line of data. MASTER CLEAR also clears this condition, but should be used only when the printer is in the STOP mode to prevent improper operation. Refer to Figure 0-20 for Timing relationships.

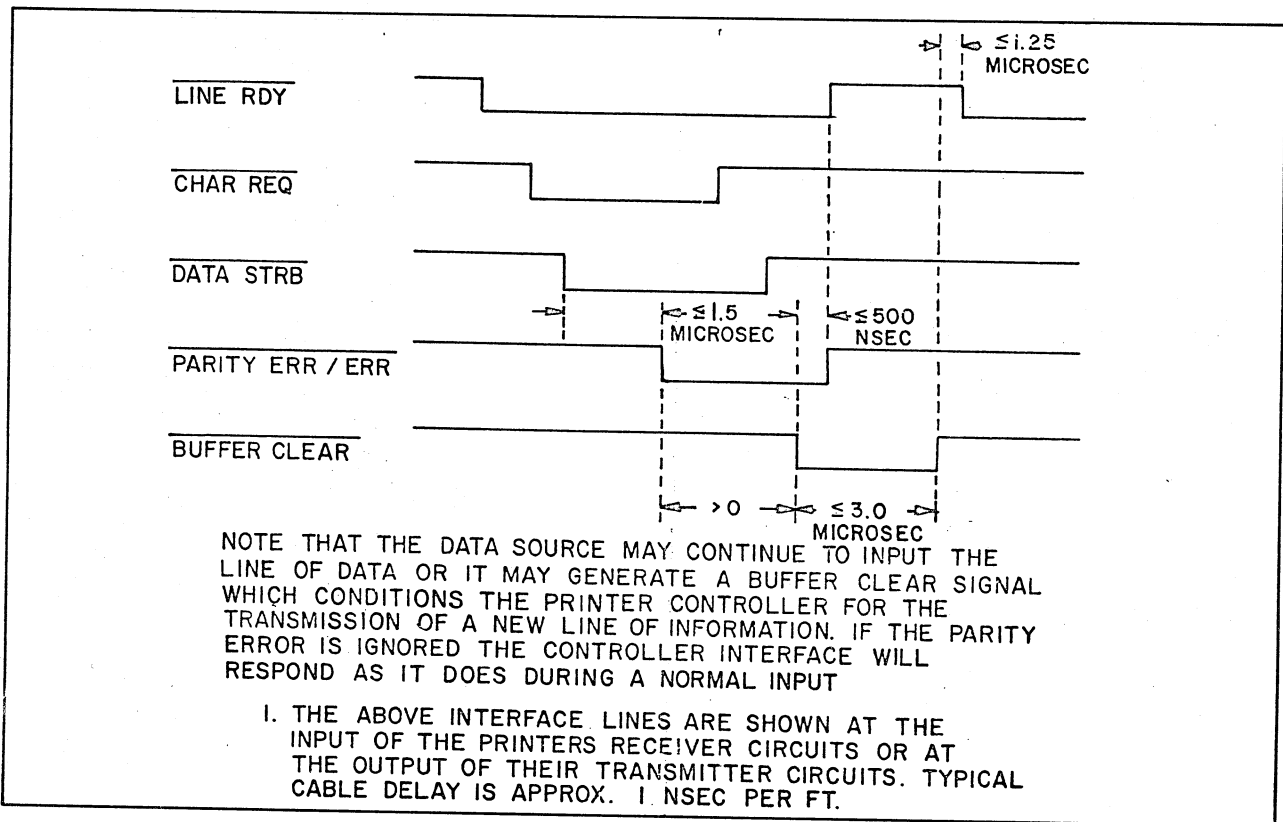


FIGURE 0-20. ERROR CHECK INPUT/OUTPUT TIMING

PARITY BIT Line

A PARITY BIT line is required as part of the transmission parity option. Timing requirements of this line are the same as the other data bits.

PARITY ERROR Signal

A PARITY ERROR line is available as part of the transmission parity option. The line will indicate a parity error has been detected when at a logic "0". The error signal may be removed by the generation of a BUFFER CLEAR by the processor.

BUFFER CLEAR Signal

This line is part of the Transmission Parity Option. It is used to clear data from the buffer without disturbing any other printer operation. The signal must be a minimum of 5 sec. in duration.

Parity Error Indicator

This option provides an indicator on the operator's control panel which lights when a transmission Parity Error occurs. The indicator remains lighted until the Parity Error condition is removed by a Buffer Clear or Master Clear from the interface or until the control panel reset switch is depressed.

This option is available only when the Transmission Parity option is also installed.

TEST PRINT OPTION (CT103/CT105)

A simple test print feature is available which will print full lines of the character whose code is selected by the 7 position DIP switch on the adapter board.

A TEST MODE switch/indicator on the control panel as well as a switch on the printed circuit card are provided as part of this option. Depressing either switch when the printer is in the STOP mode will turn on the TEST MODE lamp and initiate the all one character printing. Continuous printing of one character in all columns followed by a single line space will result. The START switch is disabled while test printing is in operation.

During test printing the Stop switch or the TEST PRINT switch on the control panel or the TEST MODE switch on the interface printed circuit card will result in turning off the lighted switch and terminating the test print function.

The TEST MODE switch/indicator on the control panel is not required for the test print option and may be excluded, if desired.

NOTE: While the unit is in the Test Mode State, the START lamp on the control panel will be illuminated, although the printer will not be READY on the interface.

TEST MODE Switch/Indicator

A TEST MODE switch/indicator is available which is part of the Test Print Option. The switch is operational when the printer is in STOP mode. The indicator is lighted when the printer is in TEST MODE.

POST PRINT PAPER MOTION (Selectable)

In post print paper motion the paper motion cycle is performed after the print cycle. The format command is received first by the printer (first character transferred) and stored until the data line is sent to the common controller (7PC1 and 7PC2) at which time the Format command is sent with the control bit to end the data line.

PRE-PRINT PAPER MOTION (Selectable)

A pre-print paper motion option is available which causes the paper motion cycle to occur before the print cycle: Paper motion is initiated upon reception of the format command (first transmitted character). The remainder of the line is then loaded while the paper advance cycle is in process, and the print cycle occurs after the advance cycle is complete. A new line of data may then be loaded after completion of the print cycle. Note that this option is not available with the Data Load Sequence Option.

Note that there will be a Max. 0.5 MS (5 sec. if the band is stopped and must come up to speed) delay between the format character and the response to print data characters in this mode.

PAPER MOTION, STANDARD PRINTER

Paper Motion commands will be executed according to the following table:

TWO BIT LINE COUNTER							
BIT	5	4	3	2	1	0	Command
0	∅	∅	∅	∅	0	0	Suppress Space
0	∅	∅	∅	∅	0	1	Single Space
0	∅	∅	∅	∅	1	0	Double Space
0	∅	∅	∅	∅	1	1	Triple Space

FOUR CHANNEL EVFU AND READER

1	∅	∅	∅	0	0	Chan. 1 (top of forms)
1	∅	∅	∅	0	1	Chan. 2 (bottom of forms)
1	∅	∅	∅	1	0	Chan. 3
1	∅	∅	∅	1	1	Chan. 4

Note: ∅ indicates that the bit is ignored.

Line Counter Options

The standard printer uses a 2 bit line counter. A 4 bit or a 6 bit line counter is available for increased paper motion capability. The commands will be executed according to the following tables:

4 Bit Line Counter

Bit	5	4	3	2	1	0	Command
0	∅	0	0	0	0	0	Suppress
0	∅	0	0	0	0	1	Single Space
0	∅	0	0	0	1	0	Double Space
0	∅	0	0	0	1	1	Triple Space
0	∅	1	1	1	1	1	15 Spaces

Note: ∅ indicates the bit is ignored.

6 Bit Line Counter (CT103/CT105)

Bit	5	4	3	2	1	0	Command
	0	0	0	0	0	0	Suppress
	0	0	0	0	0	1	Single Space
	0	0	0	0	1	0	Double Space
	1	1	1	1	1	1	63 Spaces

Note that the above 6 Bit Line Counter table is true only if the NO EVFU option is used. If there are any EVFU channels in the printer, a 7th data bit must be used for the format character in order to get 6 bit line counter capability. The following table must then be used.

Bit	6	5	4	3	2	1	0	Command
	0	0	0	0	0	0	0	Suppress Space
	0	0	0	0	0	0	1	Single Space
	0	0	0	0	0	1	0	Double Space
	0	1	1	1	1	1	1	63 Spaces

EVFU Options

The standard printer has Vertical Format Channels. The following is a list of the options and their respective commands.:

No EVFU

With this option, no EVFU selection is available. Paper motion is executed according to Line Counter selection only. In this situation only the lowest order bits corresponding to the number of bits in the line counter are significant. The higher order bits are ignored. For example, if a 4 bit line counter were used, only the 4 lowest order bits would be examined, and paper motion would be executed accordingly. The Page Eject switch is not available with the No EVFU option.

Two Channel EVFU

Bit	5	4	3	2	1	0	Command
	1	0	0	0	0	0	Channel 1 (Top of Forms)
	1	0	0	0	0	1	Channel 2(Bottom of Forms)

Eight Channel EVFU

Bit	5	4	3	2	1	0	Command
	1	0	0	0	0	0	Channel 1 (Top of Forms)
	1	0	0	0	0	1	Channel 2(Bottom of Forms)
	1	0	0	0	1	0	Channel 3
	1	0	0	1	1	1	Channel 8

Twelve Channel EVFU (CT103/CT105)

Bit	5	4	3	2	1	0	Command
	1	0	0	0	0	0	Channel 1(Top of Forms)
	1	0	0	0	0	1	Channel 2(Bottom of Forms)
	1	0	0	0	1	0	Channel 3
	1	0	1	0	1	1	Channel 12
	1	0	1	1	0	0	Illegal Function
	1	0	1	1	0	1	Illegal Function
	1	0	1	1	1	0	Illegal Function
	1	0	1	1	1	1	Illegal Function

NOTE

AN ILLEGAL FUNCTION PREVENTS AN EVFU CHANNEL FROM BEING SELECTED. THE CODE IS THEN STROBED INTO THE LINE COUNTER, AND PAPER MOTION IS EXECUTED ACCORDINGLY.

When any of the above EVFU options are used with a 6 bit line counter, Bit 6 (7th data bit) is examined for EVFU indication. From the above table it can be seen that Bit 5 (or Bit 6 if applicable) must be a logic "1" to select an EVFU channel. A logic "0" in this position will select the line counter. Note: With either 6 or 7 data bits, the EVFU uses only the 4 low order bits to select channels, the other bits being "don't cares".

Page Eject may be performed by control panel or data source command.

Printing will proceed to the bottom of forms when the bottom edge of the last form is detected. The printer will stop (go READY) when the bottom of forms, as detected by the EVFU, is reached. With a no EVFU option the printer will stop (go READY) immediately upon activation of the switch. The out of paper condition must then be removed to initiate data transfer. Note that it is possible to lose data when going out of paper, if the EVFU and the paper are not aligned properly, or if the bottom of forms channel is not loaded. For this reason, an operator should always insure that top of forms channel in the EVFU is aligned with the top of the page and the bottom of forms channel is loaded once per page before the START switch is depressed. If this precaution is overlooked, data may be lost. Note that a short period of printing on the band covered by the ribbon will not damage the band, but printing directly on the band will result in immediate band damage.

PAPER OUT Indicator (CT103/CT105)

An indicator is available which lights when the last line on the last form has been printed upon. Note that with a No VFU Option, the indication will light when the bottom edge of the last form has been detected by the paper out switches. This switch is approximately 2.5 inches below the print station.

Paper Runaway (CT103/CT105)

A controlled paper runaway will result if a Format Code is received which was not on the Format Tape loaded into the EVFU or an illegal code was sent. Paper will slew a maximum of 195 lines then stop. The printer will go NOT READY and the RUNAWAY indicator will be illuminated. To return the printer to Ready, the RESET switch should be used to clear the Runaway condition, a correct Format Tape should be loaded, and the START/STOP switch depressed to make the printer READY.

PAPER RUNAWAY Indicator (CT103/CT105)

An indicator is available which lights when the Paper Runaway is detected by the EVFU.

Auto Perf Skip (CT103/CT105)

An Automatic Perf Skip option is available which, when the bottom of forms is detected, moves paper automatically to the top of forms. This option eliminates the possibility of printing on the paper perforation. No EVFU channel can be selected between the bottom and top of forms. Also, if line counter paper motion is selected, the perf skip option will again not permit paper motion to stop until the top of forms is reached. If the line counter of EVFU command indicates a paper slew to or past the top of forms, paper motion will stop according to the specified command. For obvious reasons, the perf-skip option is not available when a NO EVFU option is used.

Data Select Decoder

The data select decoder determines the data source selected at the Output Multiplexers input to be strobed into the common controller. The binary input is added to give the word number which selects the 5603 ROM address. The address code then selects the Output Multiplexers input source. All zeros on the plus outputs selects the input data from the processor (refer to Table 0-9). Also refer to Figure 0-12.

TABLE 0-9. DATA SELECT DECODER MEMORY PATTERN

Word Number	OUTPUT				Word Number	OUTPUT				Word Number	OUTPUT				Word Number	OUTPUT			
	O ₄	O ₃	O ₂	O ₁		O ₄	O ₃	O ₂	O ₁		O ₄	O ₃	O ₂	O ₁		O ₄	O ₃	O ₂	O ₁
0	0	0	0	0	32	0	0	0	0	64	0	0	1	1	96	1	1	0	1
1	0	0	0	0	33	0	0	0	0	65	0	0	1	1	97	1	1	0	1
2	0	0	0	0	34	0	0	0	0	66	0	0	1	1	98	1	1	0	1
3	0	0	0	0	35	0	0	0	0	67	0	0	0	0	99	0	0	0	0
4	0	0	0	0	36	0	0	0	0	68	0	0	1	1	100	1	1	0	1
5	0	0	0	0	37	0	0	0	0	69	0	0	1	1	101	1	1	0	1
6	0	0	0	0	38	0	0	0	0	70	0	0	1	1	102	1	1	0	1
7	0	0	0	0	39	0	0	0	0	71	0	0	0	0	103	0	0	0	0
8	0	0	0	0	40	0	0	0	0	72	0	0	1	1	104	1	1	0	1
9	0	0	0	0	41	0	0	0	0	73	0	0	1	1	105	1	1	0	1
10	0	0	0	0	42	0	0	0	0	74	0	0	1	1	106	1	1	0	1
11	0	0	0	0	43	0	0	0	0	75	0	0	0	0	107	0	0	0	0
12	0	0	0	0	44	0	0	0	0	76	0	0	1	1	108	1	1	0	1
13	0	0	0	0	45	0	0	0	0	77	0	0	1	1	109	1	1	0	1
14	0	0	0	0	46	0	0	0	0	78	0	0	1	1	110	1	1	0	1
15	0	0	0	0	47	0	0	0	0	79	0	0	0	0	111	0	0	0	0
16	0	0	0	0	48	0	0	0	0	80	0	0	1	1	112	1	1	0	1
17	0	0	0	0	49	0	0	0	0	81	0	0	1	1	113	1	1	0	1
18	0	0	0	0	50	0	0	0	0	82	0	0	1	1	114	1	1	0	1
19	0	0	0	0	51	0	0	0	0	83	0	0	0	0	115	0	0	0	0
20	0	0	0	0	52	0	0	0	0	84	0	0	1	1	116	1	1	0	1
21	0	0	0	0	53	0	0	0	0	85	0	0	1	1	117	1	1	0	1
22	0	0	0	0	54	0	0	0	0	86	0	0	1	1	118	1	1	0	1
23	0	0	0	0	55	0	0	0	0	87	0	0	0	0	119	0	0	0	0
24	1	1	0	0	56	0	0	0	0	88	0	0	1	1	120	1	1	0	1
25	1	1	0	0	57	0	0	0	0	89	0	0	1	1	121	1	1	0	1
26	1	1	0	0	58	0	0	0	0	90	0	0	1	1	122	1	1	0	1
27	0	0	0	0	59	0	0	0	0	91	0	0	0	0	123	0	0	0	0
28	1	1	0	0	60	0	0	0	0	92	0	0	1	1	124	1	1	0	1
29	1	1	0	0	61	0	0	0	0	93	0	0	1	1	125	1	1	0	1
30	1	0	0	0	62	0	0	0	0	94	0	0	1	1	126	1	1	0	1
31	0	0	0	0	63	0	0	0	0	95	0	0	0	0	127	0	0	0	0
128	1	1	0	0	160	0	0	0	0	192	0	0	1	1	224	1	1	0	1
129	1	1	0	0	161	0	0	0	0	193	0	0	1	1	225	1	1	0	1
130	1	1	0	0	162	0	0	0	0	194	0	0	1	1	226	1	1	0	1
131	0	0	0	0	163	0	0	0	0	195	0	0	0	0	227	0	0	0	0
132	1	1	0	0	164	0	0	0	0	196	0	0	1	1	228	1	1	0	1
133	1	1	0	0	165	0	0	0	0	197	0	0	1	1	229	1	1	0	1
134	1	0	0	0	166	0	0	0	0	198	0	0	1	1	230	1	1	0	1
135	0	0	0	0	167	0	0	0	0	199	0	0	0	0	231	0	0	0	0
136	1	1	0	0	168	0	0	0	0	200	0	0	1	1	232	1	1	0	1
137	1	1	0	0	169	0	0	0	0	201	0	0	1	1	233	1	1	0	1
138	1	1	0	0	170	0	0	0	0	202	0	0	1	1	234	1	1	0	1
139	0	0	0	0	171	0	0	0	0	203	0	0	0	0	235	0	0	0	0
140	1	1	0	0	172	0	0	0	0	204	0	0	1	1	236	1	1	0	1
141	1	1	0	0	173	0	0	0	0	205	0	0	1	1	237	1	1	0	1
142	1	0	0	0	174	0	0	0	0	206	0	0	1	1	238	1	1	0	1
143	0	0	0	0	175	0	0	0	0	207	0	0	0	0	239	0	0	0	0
144	1	1	0	0	176	0	0	0	0	208	0	0	1	1	240	1	1	0	1
145	1	0	1	0	177	0	0	0	0	209	0	0	1	1	241	1	1	0	1
146	1	0	1	0	178	0	0	0	0	210	0	0	1	1	242	1	1	0	1
147	0	0	0	0	179	0	0	0	0	211	0	0	0	0	243	0	0	0	0
148	1	1	0	0	180	0	0	0	0	212	0	0	1	1	244	1	1	0	1
149	1	1	0	0	181	0	0	0	0	213	0	0	1	1	245	1	1	0	1
150	1	0	1	0	182	0	0	0	0	214	0	0	1	1	246	1	1	0	1
151	0	0	0	0	183	0	0	0	0	215	0	0	0	0	247	0	0	0	0
152	0	0	0	0	184	0	0	0	0	216	0	0	0	0	248	0	0	0	0
153	0	0	0	0	185	0	0	0	0	217	0	0	0	0	249	0	0	0	0
154	0	0	0	0	186	0	0	0	0	218	0	0	0	0	250	0	0	0	0
155	0	0	0	0	187	0	0	0	0	219	0	0	0	0	251	0	0	0	0
156	0	0	0	0	188	0	0	0	0	220	0	0	0	0	252	0	0	0	0
157	0	0	0	0	189	0	0	0	0	221	0	0	0	0	253	0	0	0	0
158	0	0	0	0	190	0	0	0	0	222	0	0	0	0	254	0	0	0	0
159	0	0	0	0	191	0	0	0	0	223	0	0	0	0	255	0	0	0	0

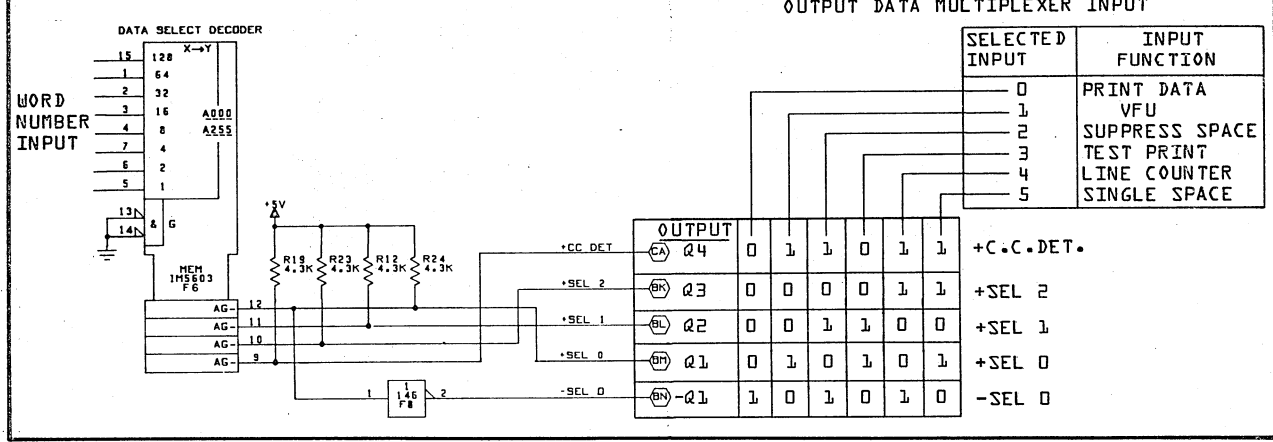


TABLE 0-10. LOGIC BOARD DIP SWITCH SETTING

DIP SWITCH POSITIONS FOR BOARD 7PC5

SWITCH NO.	ON	OFF	
SWN1-1	X		ON SELECTS BUFFER CLEAR OPTION
SWN1-2	X		ON SELECTS ODD PARITY
SWN1-3		X	ON SELECTS EVEN PARITY
SWN1-4	X		ON SELECTS 7 DATA BIT I/O
SWN2-1		X	OFF WITH CONTROL PANEL TEST PRINT SWITCH
SWN2-2		X	ON FOR BAND DETECT STATUS
SWN2-3		X	ON FOR BAND DETECT STATUS
SWN2-4		X	ON FOR COMPRESSED PITCH STATUS
SWN2-5		X	ON FOR BUFFER OVERFLOW STATUS
SWN2-6		X	ON FOR OUT OF PAPER STATUS
SWN2-7		X	ON FOR DATA SEQUENCE OPTION
SWN2-8	X		ON-CHAR. REQUEST/DATA STROBE, OFF-INFORMATION READY
SWN2-9		X	OFF WITH CONTROL PANEL SINGLE SPACE SWITCH
SWN3-1	X		ON FOR USING VFU CHANNELS (4 CHANNEL STD)
SWN3-2	X		LINE COUNTER-OFF FOR 2 OR 4 BIT, ON FOR 6 BIT
SWN3-3	X		ON FOR 12 VFU CHANNELS
SWN3-4	X		ON FOR 8 OR 12 VFU CHANNELS
SWN3-5	X		LINE COUNTER-OFF FOR 2 BIT, ON FOR 4 OR 6 BIT
SELECTABLE SWN3-6			ON-POST PRINT, OFF-PRE PRINT (CHECK PROGRAM)
SWN3-7		X	ON FOR NO VFU CHANNELS
SWN3-8	X		ON TO ENABLE COMPRESSED PITCH OPTION
SWN3-9	{132}	X {136}	PRINTED LINE COLUMNS, CT103A/CT105A-ON, OFF FOR MODEL B
SWN4-1	X		BIT 1
SWN4-2		X 0	BIT 2
SWN4-3	X		BIT 3
SWN4-4	X		BIT 4
SWN4-5		X 0	BIT 5
SWN4-6		X 0	BIT 6
SWN4-7	X		BIT 7

TEST PRINT CHARACTER ASCII "M"

DIP SWITCH POSITIONS FOR BOARD 7PC1

SWITCH NO.	ON	OFF
SWN3-1		X 300/600
SWN3-2	360	X 600
SWN3-3		X 300/600

PRINTER SPEED SELECTION

NOTE
600 LPM
SHOWN
SELECTED

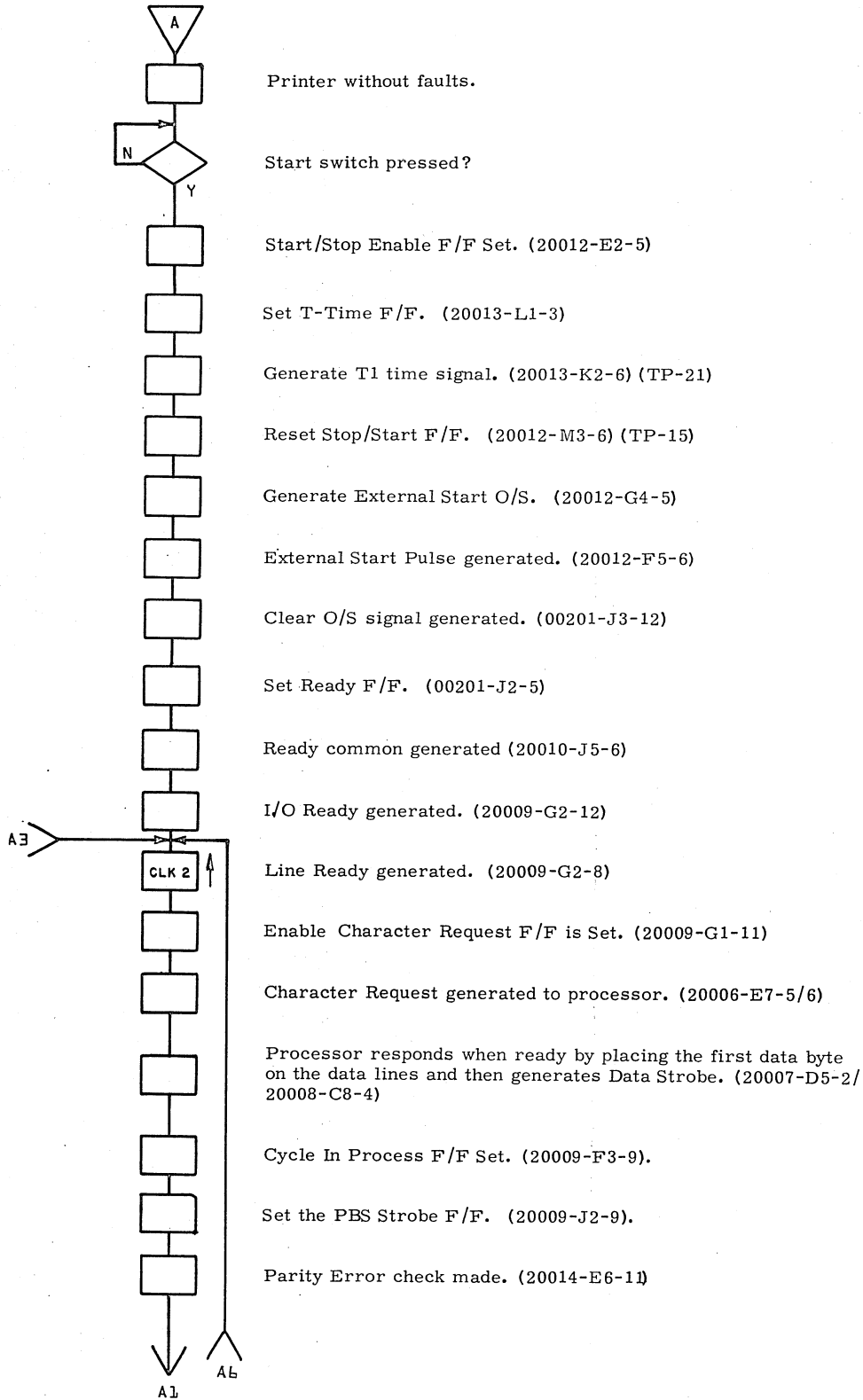
DIP SWITCH POSITIONS FOR BOARD 7PC6

SWITCH NO.	ON	OFF
SWN1-1		X
SWN1-2		X
SWN1-3	6 LPI	X 8 LPI
SWN1-4		X
SWN1-5	X	
SWN1-6		X
SWN1-7		X
SWN1-8	X	

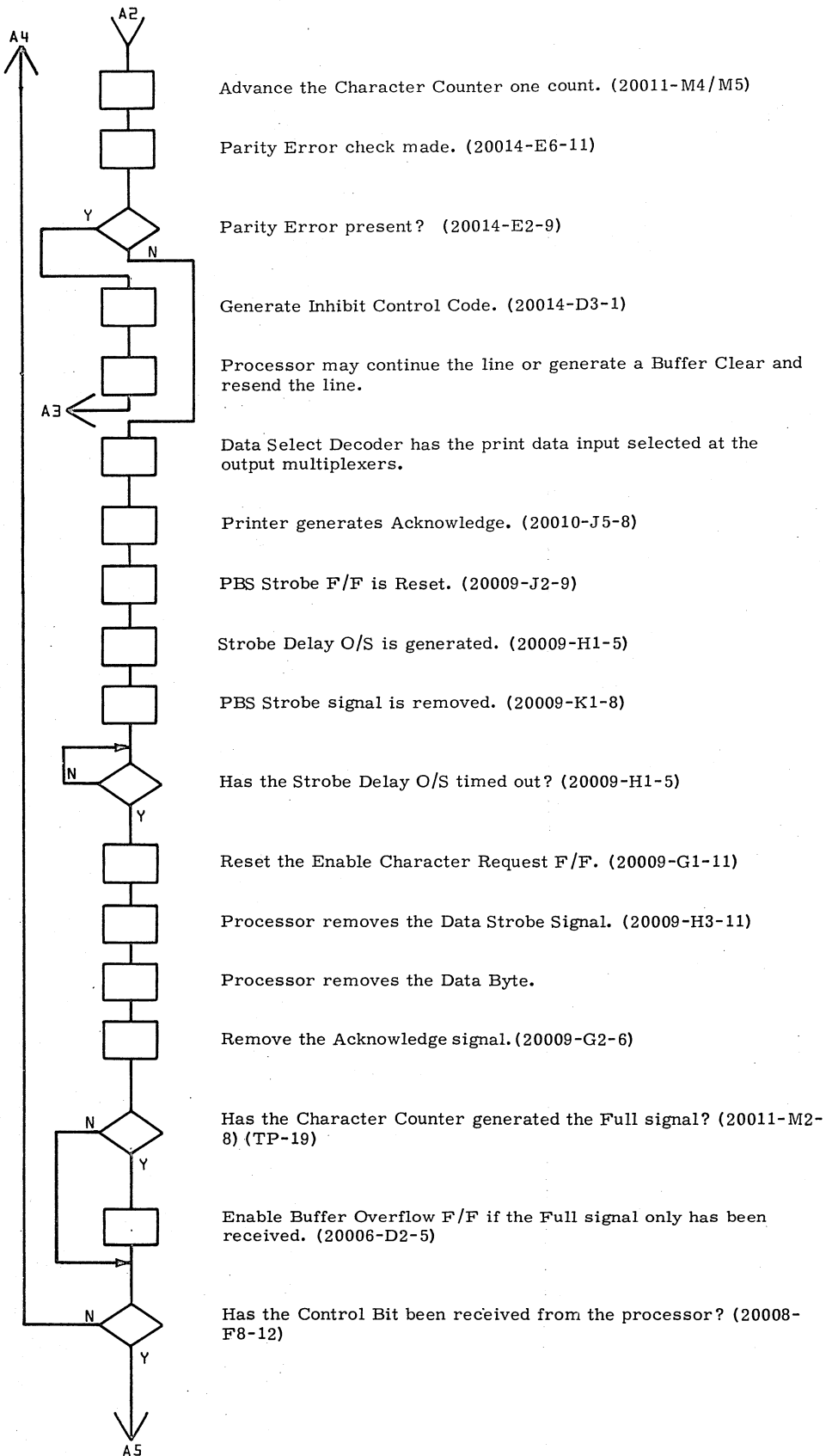
ON FOR I/O LOAD MODE
ON REMOVES AUTO PERF SKIP OPTION
INTERNAL EVFU TEST PROGRAM SPACING
ON FOR I/O EVFU LOAD ERROR DETECTION
ON FOR TAPE READER OR I/O LOAD MODE W/O BIT COUNTER.
ON FOR 12 BOTTOM OF FORM CHANNEL
ON FOR 8 BOTTOM OF FORM CHANNEL
ON FOR 2 BOTTOM OF FORM CHANNEL

NOTE- DIP SWITCHES MAY BE MARKED ON/OFF OR OPEN/CLOSED
ON=CLOSED OFF=OPEN -LOGIC ONE

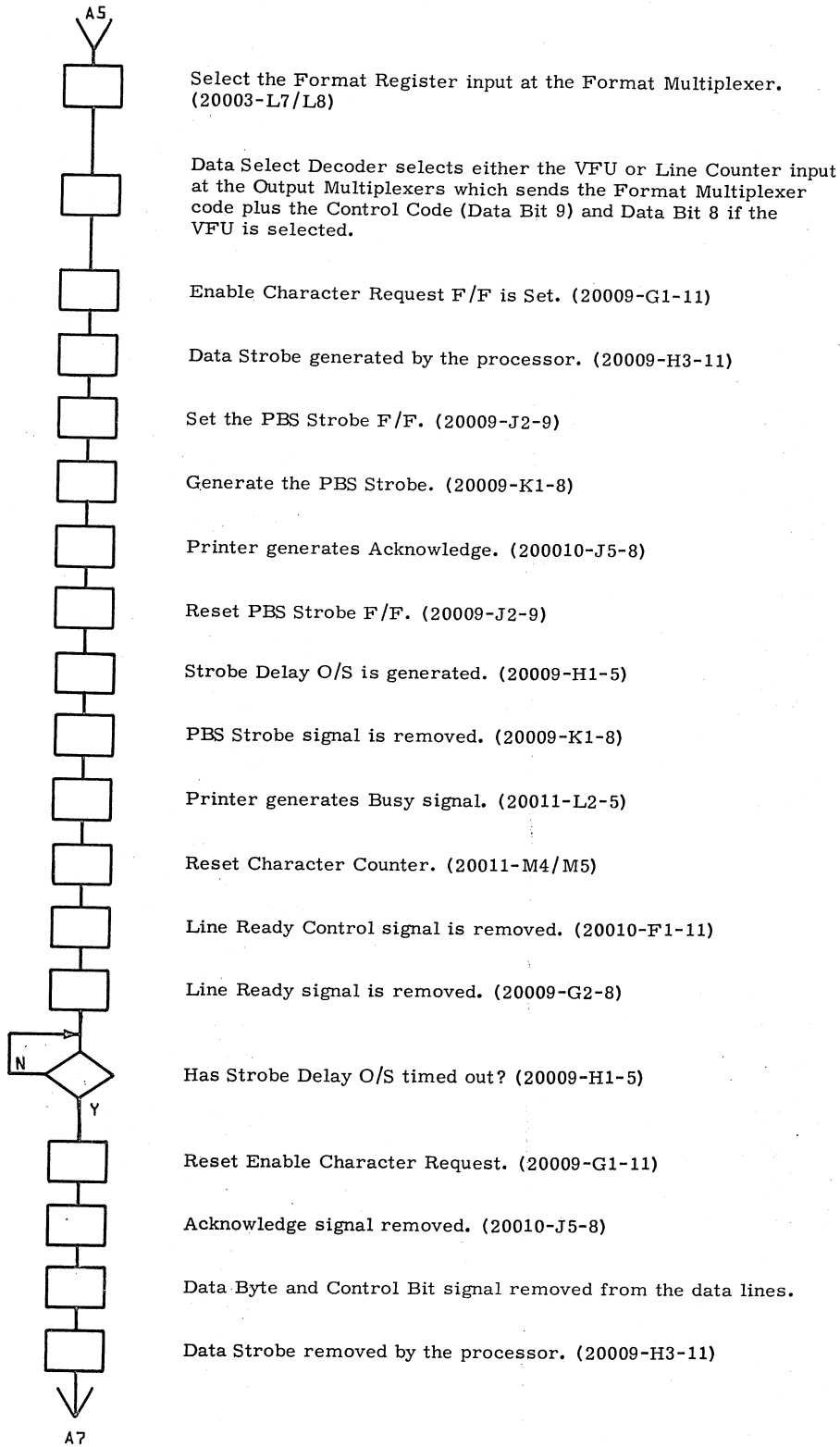
STANDARD DATA LOAD, POST PRINT, STANDARD SEQUENCING



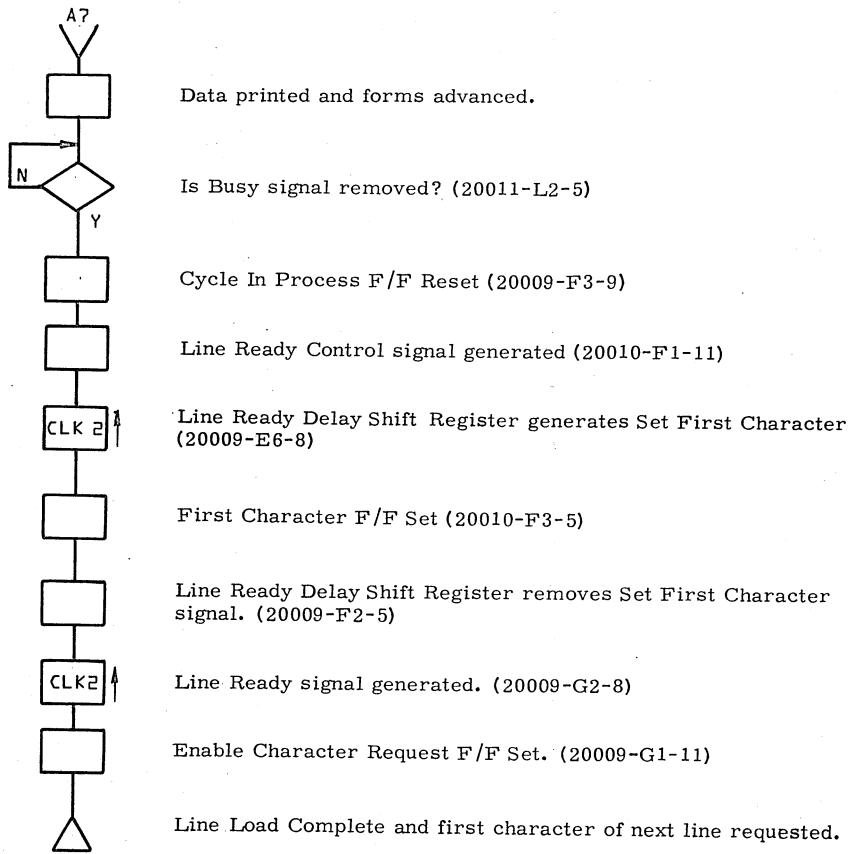
(CON'T) STANDARD DATA LOAD, POST PRINT, STANDARD SEQUENCING



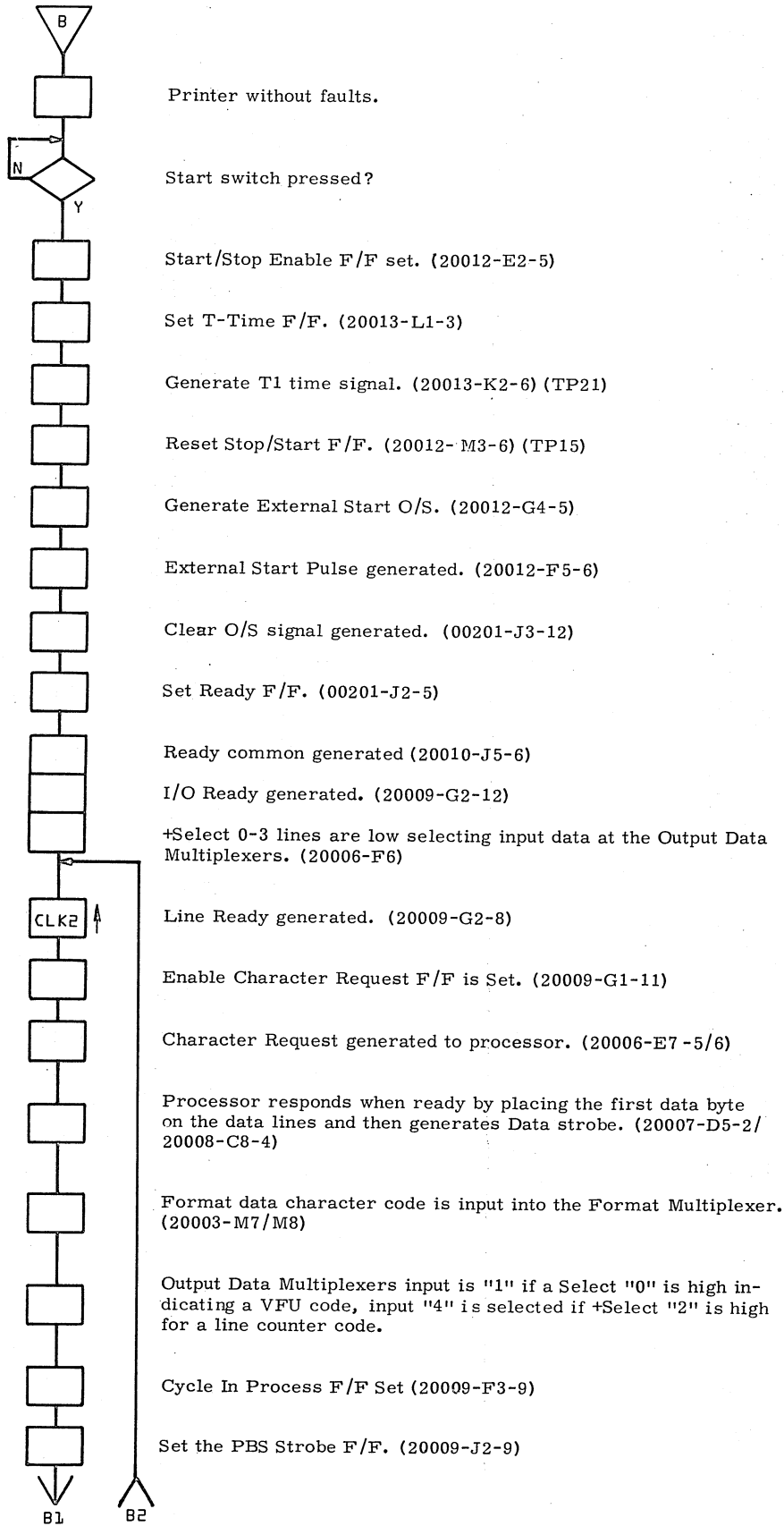
(CON'T) STANDARD DATA LOAD, POST PRINT, STANDARD SEQUENCING



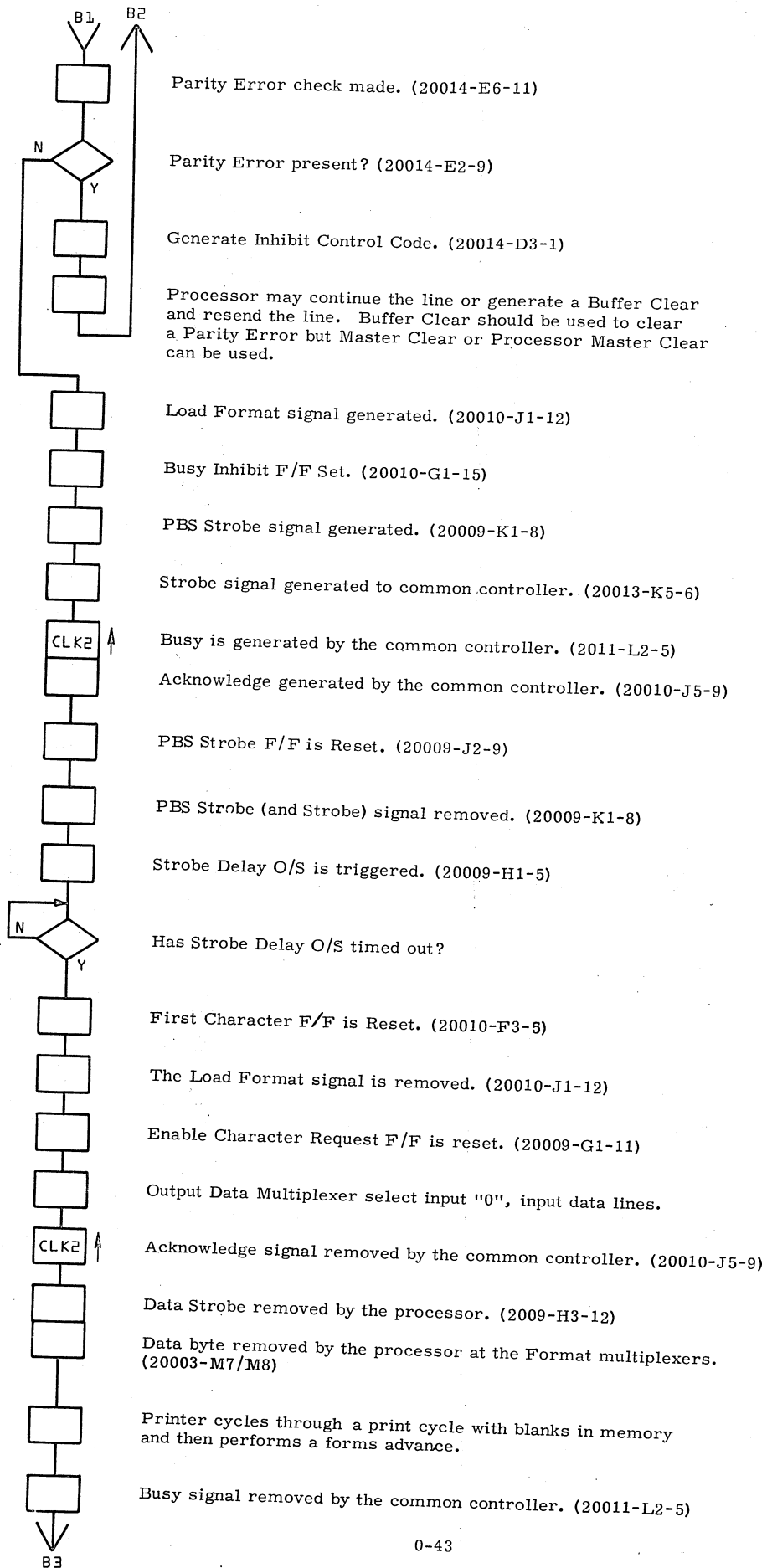
(Con't) STANDARD DATA LOAD, POST PRINT, STANDARD SEQUENCING

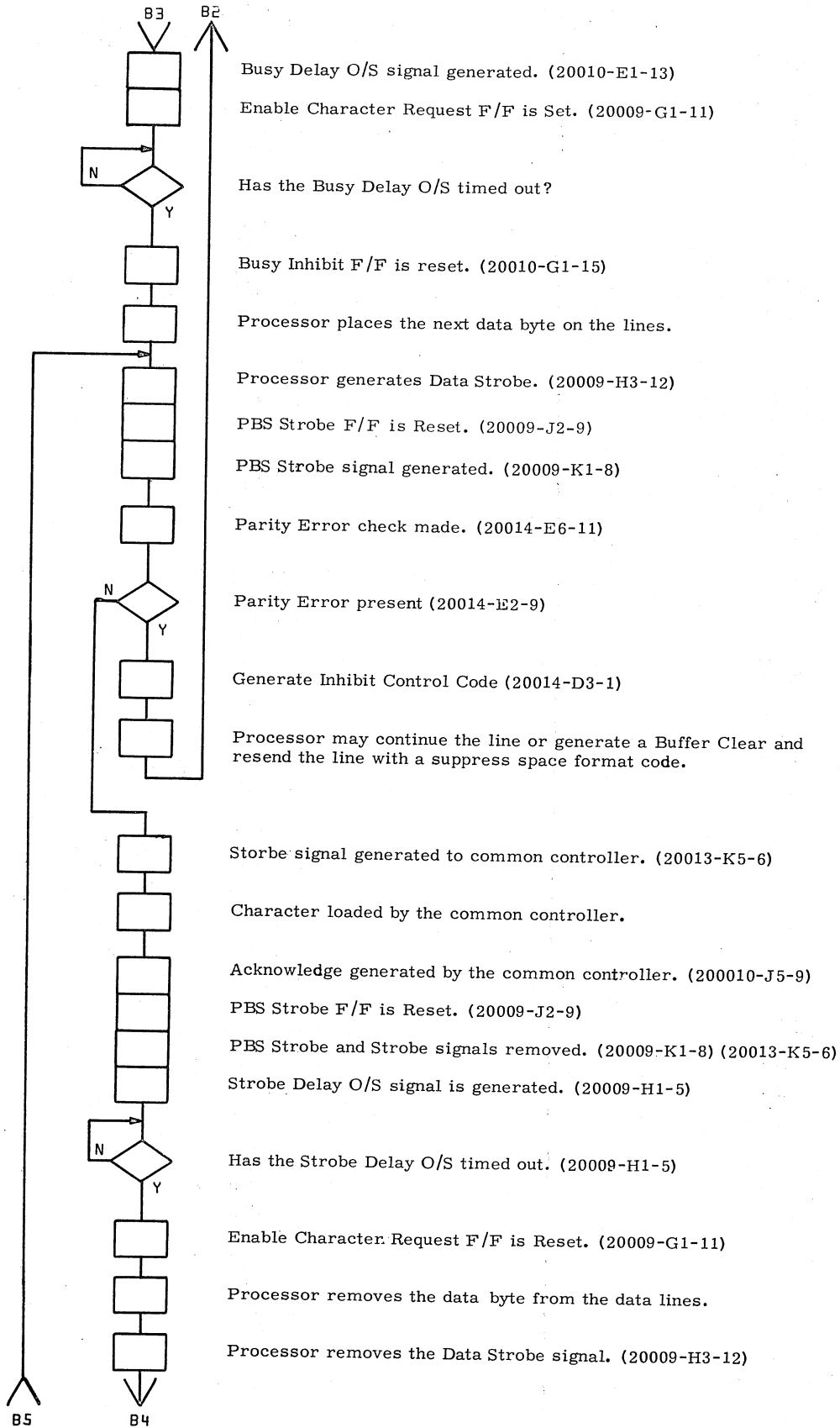


STANDARD DATA LOAD, PREPRINT, STANDARD SEQUENCING

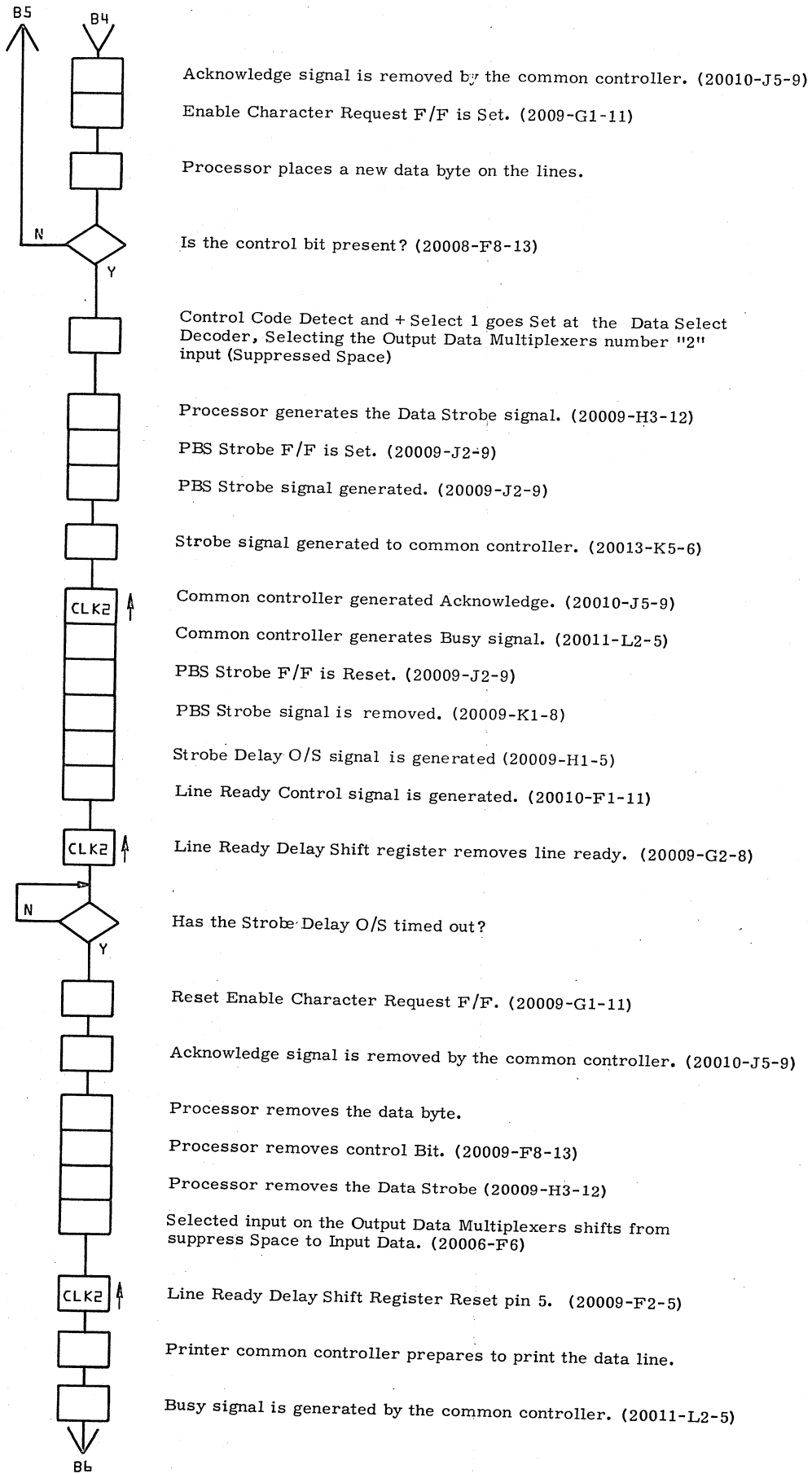


(Cont) STANDARD DATA LOAD, PRE PRINT, STANDARD SEQUENCING

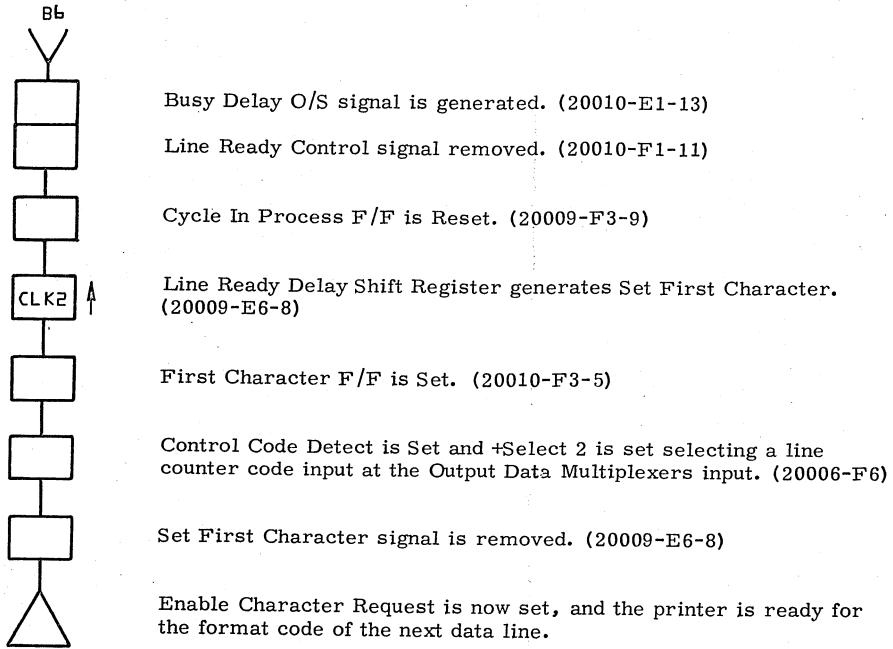




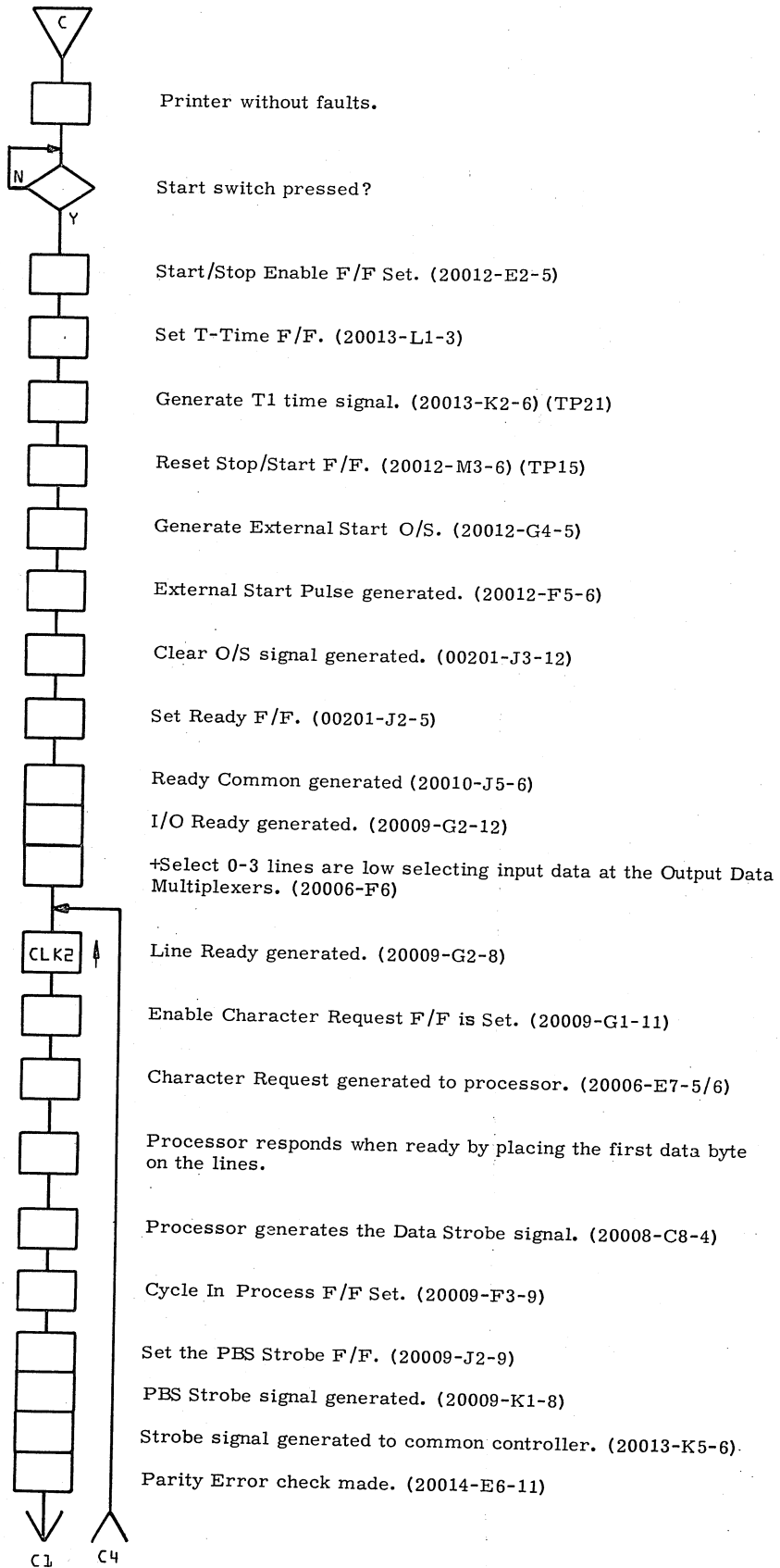
(Cont) STANDARD DATA LOAD, PRE PRINT, STANDARD SEQUENCING



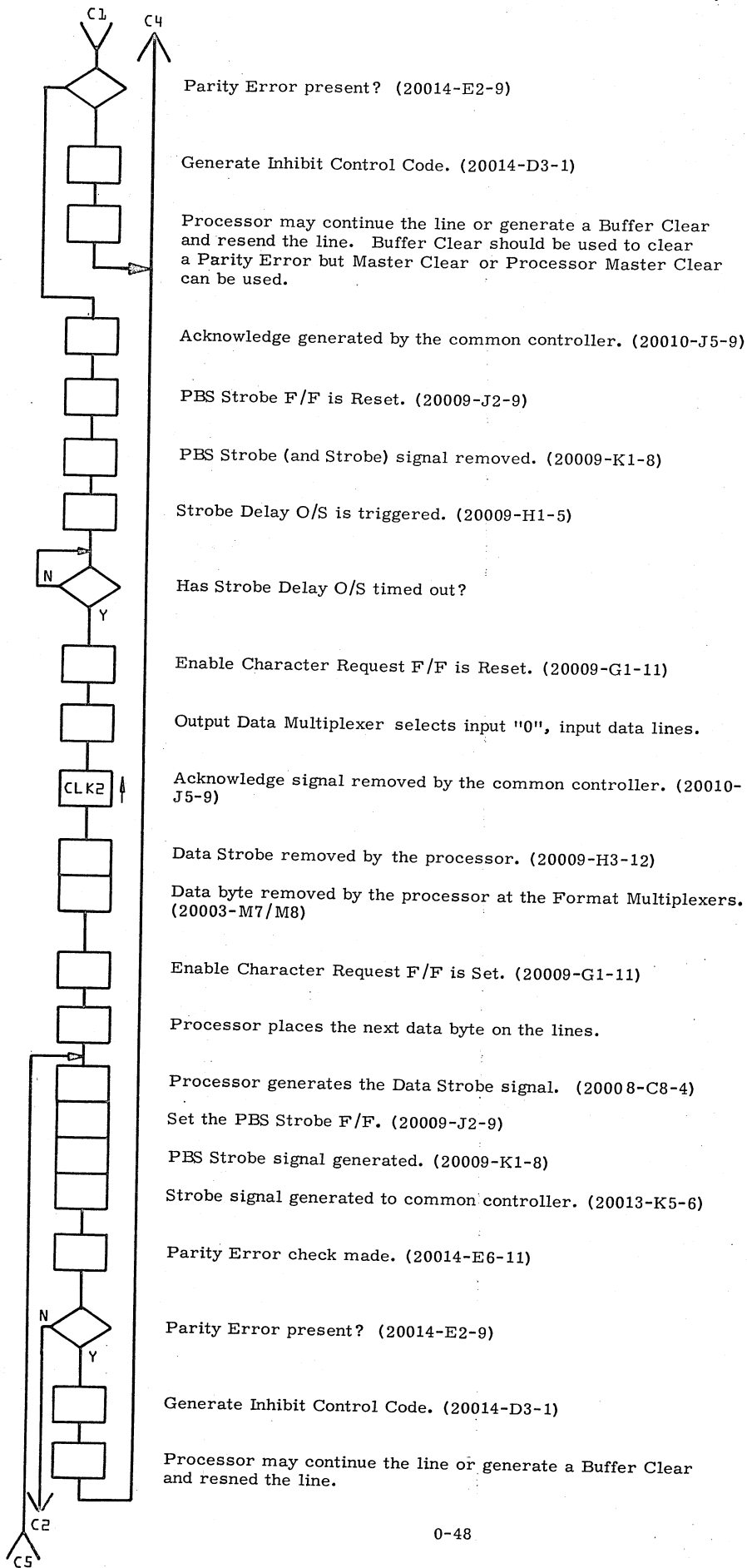
(Con't) STANDARD DATA LOAD, PRE PRINT, STANDARD SEQUENCING



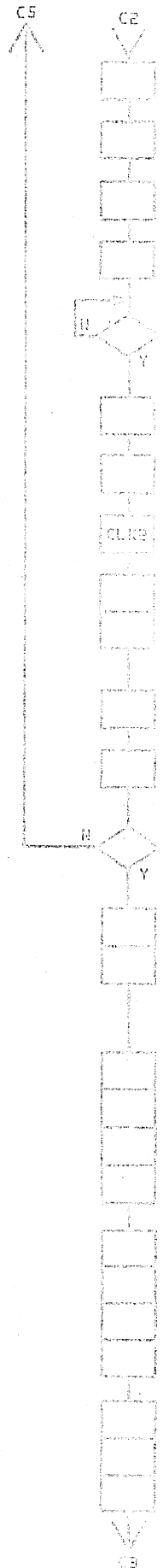
STANDARD DATA LOAD, POST PRINT, OPTIONAL SEQUENCE



(Con't) STANDARD DATA LOAD, POST PRINT, OPTIONAL SEQUENCE



(Cont'd) STANDARD DATA LOAD, POST PRINT, OPTIONAL SEQUENCE



Acknowledge generated by the common controller. (20010-J5-9)

PBS Strobe F/F is Reset. (20009-J2-9)

PBS Strobe (and Strobe) signal removed. (20009-K1-8)

Strobe Delay O/S is triggered. (20009-H1-5)

Has Strobe Delay O/S timed out?

Enable character request F/F is reset. (20009-G1-11)

Output Data Multiplexer selects input "0", input data lines.

Acknowledge signal removed by the common controller. (20010-J5-9)

Data Strobe removed by the processor. (20009-H3-12)

Data byte removed by the processor at the Format multiplexers.
(20009-M7/M8)

Enable Character Request F/F is Set. (20009-G1-11)

Processor places the next data byte on the lines.

Is the Control Bit present? (20008-F8-12)

Control Code Detect is generated. (20006-F6-9)

Select "2" is generated if the data code on the lines is a line counter code, +Select "0" is generated if the code is a VFU code. (20006-F6-10 or 12)

Data Strobe generated by the processor. (20009-H3-12)

PBS Strobe F/F is Set. (20009-J2-9)

PBS Strobe signal is generated. (20009-K1-8)

Strobe Signal generated to common controller. (200013-K5-6)

Busy signal generated by the common controller. (20011-L2-5)

Acknowledge generated by the common controller. (20010-J5-9)

Line Ready Control signal generated. (20010-F1-11)

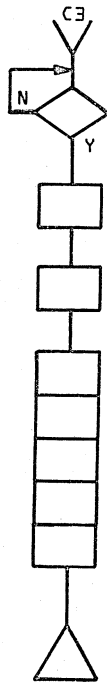
Line Ready signal removed. (20009-G2-8)

PBS Strobe F/F is Reset. (20009-J4-9)

PBS Strobe signal removed. (20009-K1-8)

Strobe Delay O/S signal generated. (20009-H1-5)

(Con't) STANDARD DATA LOAD, POST PRINT, OPTIONAL SEQUENCE



Has the Strobe Delay O/S timed out?

Enable Character Request F/F is Reset. (20009-G1-11)

Acknowledge signal is removed by the common controller. (20010-J5-9)

Processor removes the data byte

Processor removes the Data Strobe signal. (20009-H3-12)

Processor removes the Control Bit signal. (20009-F8-12)

Control Code Detect is removed. (20006-F6-9)

Select "2" or Select "0" is removed. (20006-F6-10 or 12)

Printer has now completed one line and is ready to generate Line Ready for the next line.

INTRODUCTION

GENERAL DESCRIPTION

The 300/600 devices are freestanding, backprinting, line at a time printers with high speed font (246 inches per second). A low speed font reduces the printing speed, and is only used with a special interface adapter. The printer uses time-shared hammer technology to print lines of 132 and up to 136 columns. Time sharing is accomplished by moving the hammer bar to its required positions through the use of a linear drive voice coil. The voice coil moves the hammer bar in increments of .1 inch (2.54mm) for standard pitch. There are four shift positions in the 300 device and two shift positions in the 600 device for standard pitch. Compressed pitch is also available where the hammer bar is shifted only 0.066 inch through six positions on the 300 device, and three positions on the 600 device. The print hammers accomplish the printing function by compressing the forms and a horizontally moving inked ribbon against a horizontally moving print font. The print font is contained on an operator changeable character band. Each band contains 384 characters which may be divided into 64 or 96 character sets. Optional 48 and 128 character sets are also available.

The print speed of each unit is determined by the model of the printer and size of the character set installed. The 300 device prints at a rate of 360 LPM with a 48 character set installed, 300 LPM with a 64 character set installed, 220 LPM with a 96 character set installed, and 175 LPM with an 128 character set installed. The

600 device prints at a rate of 720 LPM with a 48 character set installed, 600 LPM with a 64 character set installed, 440 LPM with a 96 character set installed, and 350 LPM with an 128 character set installed.

TABLE 1-1. CHARACTER SET PRINT SPEED

DEVICE	CHARACTER SET			
	48	64	96	128
300	360 LPM	300 LPM	220 LPM	175 LPM
600	720 LPM	600 LPM	440 LPM	350 LPM
*300 CP	240 LPM	200 LPM	148 LPM	118 LPM
*600 CP	480 LPM	400 LPM	295 LPM	235 LPM

*COMPRESSED PITCH

The printer contains all the electrical and mechanical components necessary to print, transport ribbon, and advance forms. In addition, the printer contains an integrated circuit controller capable of communicating with an external data source at a distance of up to 50 feet (15.3 meters). The controller is capable of storing one complete print line of 132(136) characters plus, one format command. Only three format commands are recognized by the printer with the common controller; Carriage Return (CR), Line Feed (LF), and Form Feed (FF). With optional controller interfaces and Electronic Vertical Format Unit (EVFU) more commands are available.

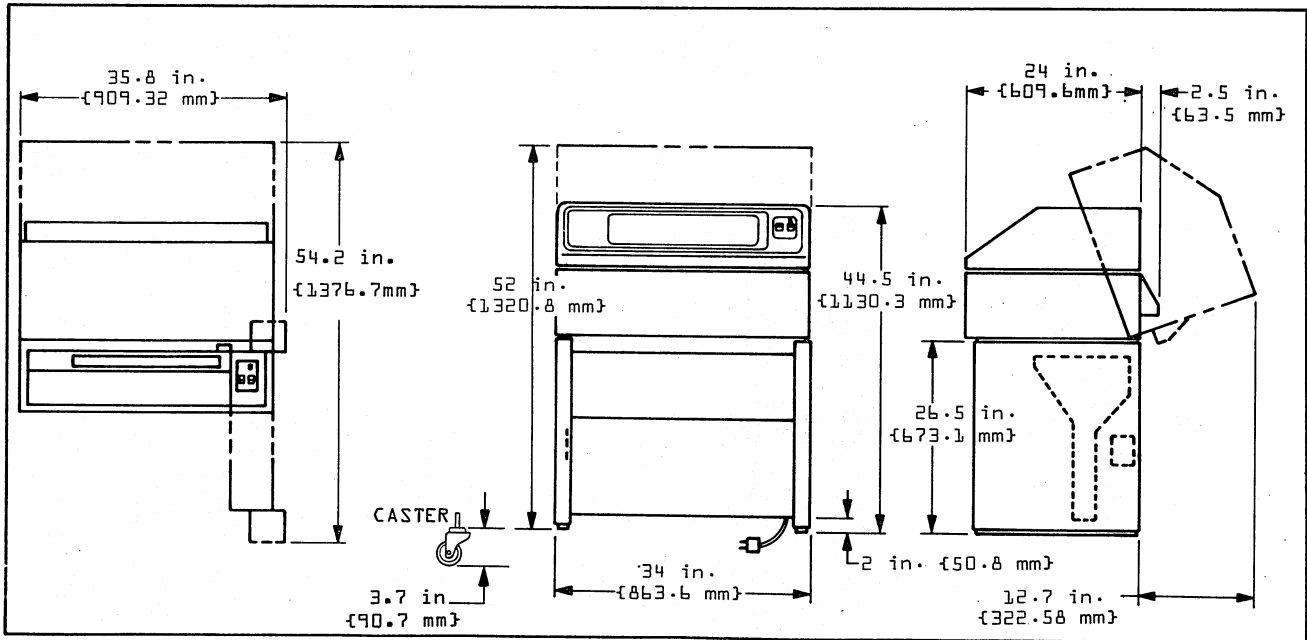


FIGURE 1-1. LINE PRINTER DIMENSIONS

The weight of the printer is approximately 300 pounds (136 Kg). Floor loading requirements are provided in Section 2. Its outside dimensions with the bonnet closed are:

Height: 44.5 inches (1130.3 mm)
Length: 34.0 inches (863.6 mm)
Depth: 24.0 inches (609.6 mm)

Maximum Height Required with Castors
55.7 inches (1414.8 mm)

With the bonnet and print gate open the outside dimensions are:

Height: 52.0 inches (1320.8 mm)
Length: 35.8 inches (909.32 mm)
Depth: 53.2 inches (1351.28 mm)

The printer is designed to operate at 59.0 to 60.6 Hz with a voltage input of 104 to 127 VAC RMS. In this configuration the 300 device will draw less than 8 amps of

current, while the 600 device will draw less than 10 amps of current. An alternate 50/60 Hz configuration is available which entails the use of a multitapped transformer. The transformer allows 59.0 to 60.6 Hz operation at nominal voltage inputs of 100 and 120 VAC RMS and 49.0 to 50.5 Hz operation at the nominal voltage inputs of 100, 120, 220, and 240 VAC RMS. The current drawn by the 300 device in 50 Hz, 240 volt configurations will be less than 4 amps. In the 600 device, the current drawn in the 50 Hz, 240 volt configuration will be less than 5 amps. Refer to Section O for printers designed for unique interfaces and specified power connections.

The printer has been designed to operate within the following environmental conditions:

Dry Bulb Temperature Range; 50°F to 95°F
10°C to 35°C

Maximum Wet Bulb Temperature; 80°F
26.5°C

Relative Humidity Range; 20 to 80% non-condensing

PHYSICAL DESCRIPTION

PRINTER ACCESS

The printer is designed to provide maximum access to all areas of the printer with a minimum of cabinet removal. When the printer bonnet is closed, access is provided to the control panel, forms stacks, and the main circuit breaker. The bonnet is counter-balanced to allow easy opening and closing. When the bonnet is lifted open, access is provided to the forms advance controls, the forms tractors, print gate and options like Electronic Vertical Format Unit and programmable forms length selector. The print gate can then be swung open to allow access to the forms path. With the gate open, the protective cover can be removed from the gate to allow access to the print band and print ribbon for easy replacement. For maintenance purposes, the front panel, which is secured by quarter turn fasteners, may be removed to allow access to the blower assembly, the power transformer, the line filter, main circuit breaker, and the blowers Thermal fuse link. For access to the rear of the printer, the bonnet must be removed. This is accomplished by first opening the bonnet, disconnecting the ground strap, then lifting the bonnet straight up until the counter-balances are clear of the cabinet base. The bonnet should be removed carefully to prevent hitting the logic boards. Once the bonnet has been removed the paper shroud and the rear protective plate can be removed. These two pieces cover the logic rack. When the covers are removed, the logic cards can be swung out to provide easy access to all the board components for troubleshooting purposes.

PRINTER SUBSYSTEMS

The freestanding peripheral contains all the subsystems necessary to store one line of data, print, move paper, and transport ribbon. There are nine major subsystems. These subsystems are discussed in the following sequence:

- Power Distribution
- Cooling System
- Control Panel
- Print Gate
- Hammer Bank
- Hammer Shifting
- Vertical Forms Motion
- Logic Chassis
- Forms Clamp

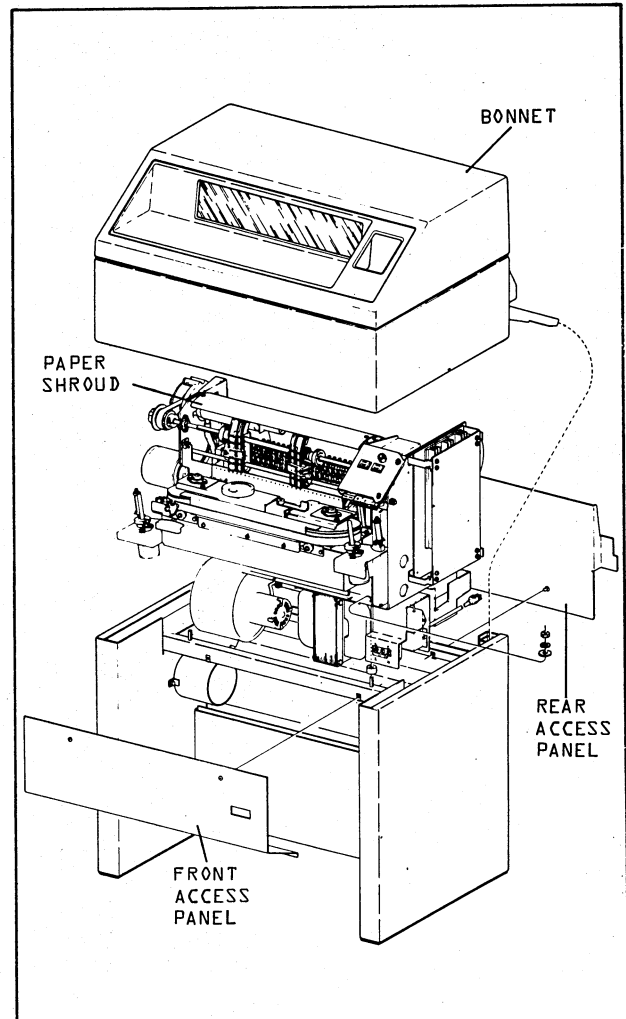


FIGURE 1-2. PRINTER ACCESS

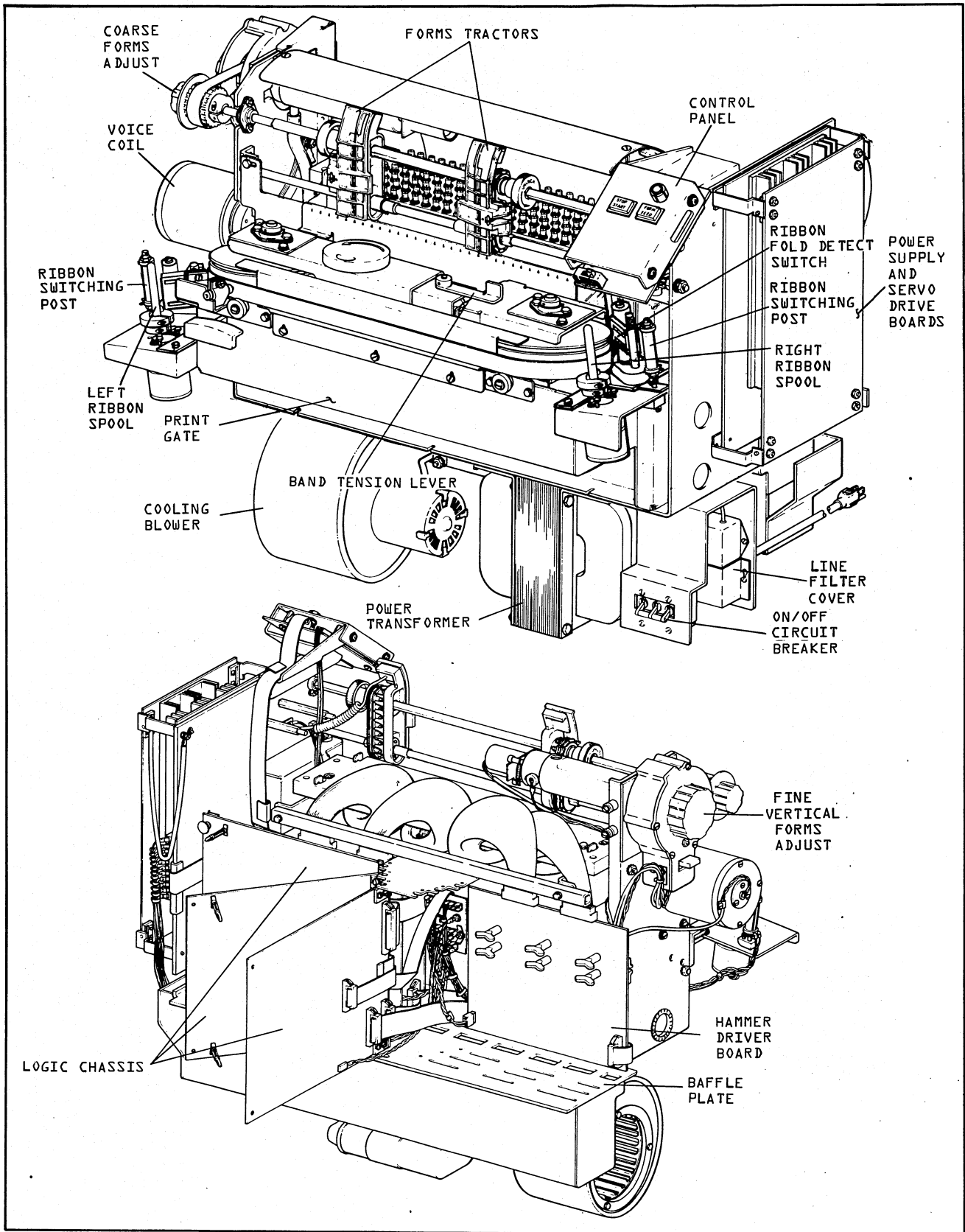


FIGURE 1-3. MAJOR ASSEMBLY LOCATOR

POWER DISTRIBUTION

Power distribution in the printer is divided into two sections; a. c. distribution and d. c. distribution. The a. c. distribution has three possible configurations, 60, 50 or 50/60 Hz. The 60 Hz only machines operate with a voltage input between 104 and 127 volts. The 50 Hz only units operate with a voltage input between 198 and 257 volts. The 50/60 Hz machines allow 50 or 60 Hz inputs between 100 and 257 volts. (Additional optional voltages may be used, and they are covered in an adapter kit manual). The a. c. input power is routed from the power cord to the linefilter and then to the main circuit breaker. The main circuit breaker acts as the on/off switch for the printer. When it is turned on, a. c. power is applied to the transformer and the blower motor. The blower motor is the only a. c. motor in the printer. The transformer provides three a. c. outputs which are used by the Power Supply PCB to develop the necessary d. c. voltages.

The d. c. distribution begins at the Power Supply PCB. This board takes the a. c. voltages from the transformer and develops the ± 12 v. d. c., the +5 v. d. c., and the +36 v. d. c. The ± 12 volts is routed to the Print Head PCB and the 'H' Switch PCB to provide the reference voltages for the operational amplifiers used to control the d. c. servo systems. The +5 volts is routed to each of the PCB's and the sensing circuits to provide the logic voltage for the majority of the logic circuits. The +36 volts is routed to a group of .08 farad capacitors for storage. From the capacitor bank, the voltage is routed to all the electro-mechanical assemblies to provide the power necessary to drive them. These assemblies include the d. c. servo systems, the hammer bank armature/strikers, the ribbon motors, and the forms clamp assembly. The +36 volts also goes to the Print Head Electronics board to generate +30 volts reference voltage.

COOLING SYSTEM

The printer is cooled by an a-c blower. The blower draws air through the hollow left leg of the cabinet base. The output of the blower is distributed to the printer assemblies through a baffle plate. The baffle plate directs the air flow to the areas most in need of cooling. There are two different blowers possible in the printer. The 300 LPM, 60Hz units use a smaller blower. All other printers including a 300 LPM, 60Hz unit with a high altitude option use a heavy duty blower. The cooling system has a thermal fuse link in the air duct which monitors air cooling. If air cooling is insufficient a thermal fuse opens and removes +36 volts which will cause the printer to become Not Ready and blink the Stop or Alarm indicator, if either is installed on the control panel. However an optional Engineer indicator may replace the Stop or Alarm indicators and it will light under a thermal fuse fault condition. Refer to Section 0 for cooling used on unique printers.

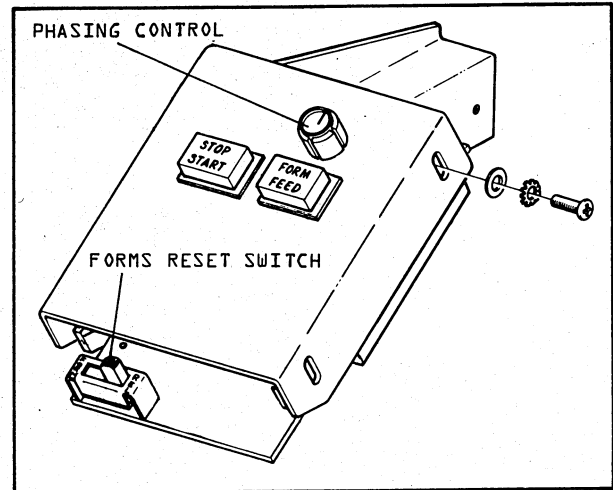


FIGURE 1-4. CONTROL PANEL

CONTROL PANEL

The control panel is located on the top right of the printer. It contains at least three switches and/or indicators, the phasing control. The three switches and/or indicators include:

START/STOP
FORM FEED
FORMS RESET

The START/STOP position is a split switch/indicator. When the printer is in START, the lower half of the indicator is illuminated. When it is in STOP, the top half is illuminated. Depressing the switch, transfers the printer from START to STOP or from STOP to START. The FORM FEED position is a switch/indicator. It is illuminated whenever a forms error is detected. The printer must not be in Start to use the Reset switch, which when depressed advances forms to the next top of form position. The FORMS RESET switch is a momentary action switch which disables the forms advance servo motor to allow adjustment of the forms position. For a further discussion of the control panel switches and indicators see the Operation section 2 of this manual. Optional control panel switches are discussed at the back of this section, under Optional Features. Any additional switches and indicators are discussed at the back of this section, under Optional Features. Any additional switches and indicators are discussed in Section 0 at the front of this manual, which will be incorporated if applicable to the printer.

PRINT GATE

The print gate is a swing-out, cantilever assembly that opens to allow complete access to the print station and ribbon transport system. This facilitates ribbon and forms loading operations. The print gate contains the ribbon transport system and the print band and its associated drive and sensing components.

The ribbon employed in the printer is 2 inches (50.8mm) wide by 24 yards (22 meters). This ribbon is transported diagonally across the print band by two d. c. gear motors. The ribbon motors are wired in series and rotate in the same direction. When the ribbon is moving toward the hinge end of the print gate both motors are rotating in a clockwise direction, but the hinge end motor is attempting to turn faster than the latch end motor. This difference in speed maintains a near constant tension on the ribbon. When the ribbon is moving towards the latch end of the print gate both motors are turning counterclockwise. In this case the latch end motor is attempting to turn faster than the hinge end motor, providing a near constant tension on the ribbon. The direction of ribbon travel is determined by a latching relay controlled by the switching posts. This relay reverses the direction of current flow through the ribbon motors in order to reverse their direction of rotation. The need for ribbon reversal is detected by the metal strips mounted on the switching posts which are activated by the conductive

strips at each end of the ribbon. As these strips cross the switching posts, they short the two metal strips together, switching the relay. The relay then reverses current flow to the ribbon motors, and the ribbon changes direction. A ribbon fold detect circuit monitors the ribbon at both ends of the gate to detect a ribbon which fails to track properly or folds which would reduce band life.

Print Band System

The band used in the printer is engraved steel. It contains 384 characters which are divided into identical character sets of 48, 64, 96, or 128 characters. 64 and 96 character sets are standard with 48 and 128 character sets being optional. The band is designed to be operator changeable to allow maximum character set flexibility. The band is driven by a d. c. servo motor at a rate of 246 inches (625 cm) per second. The position of the band is monitored through the use of two transducers and raised lines on the band. There are two sets of raised lines on the band. The set below the band characters generate the Character pulses. There is one pulse for each character on the band. The set above the band characters generate the Home pulses. There is one Home pulse generated at the start of each new print font around the band. If a compressed pitch band is installed there are two Home pulses generated at the start of each new print font spaced one character apart.

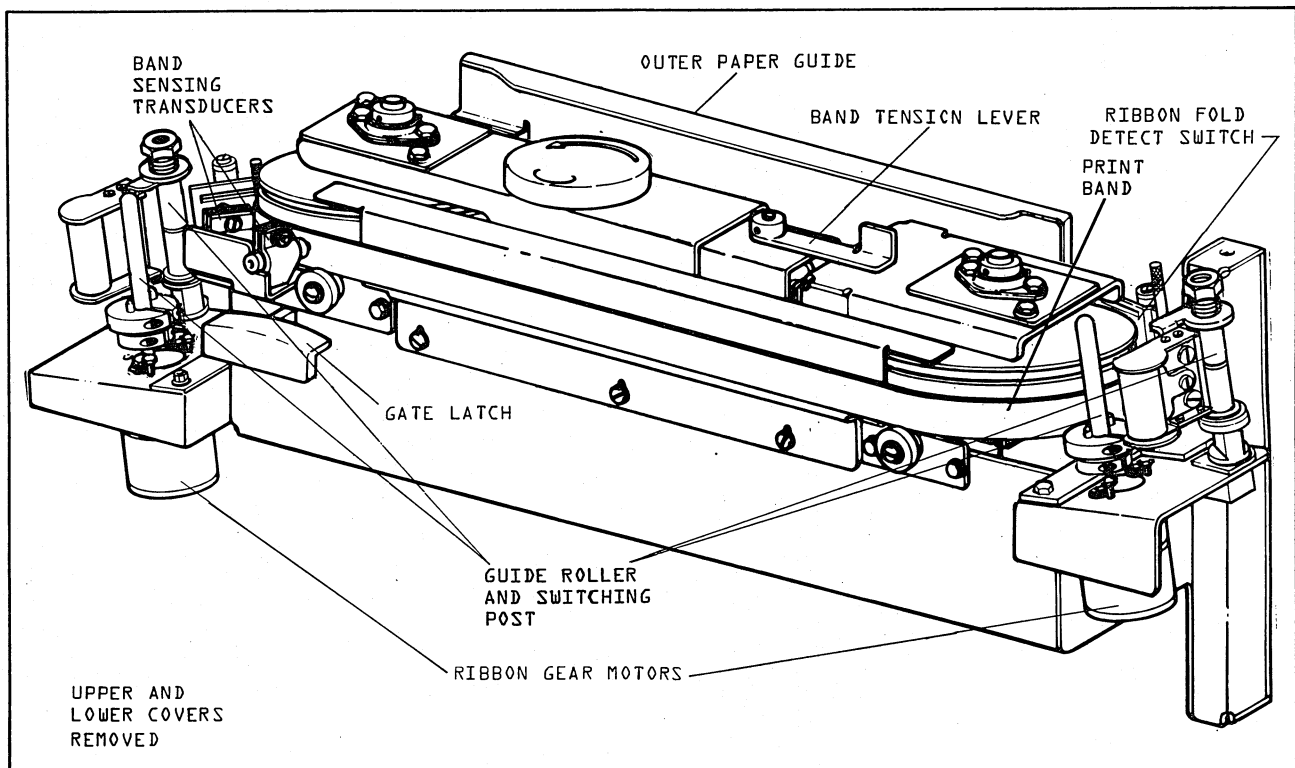


FIGURE 1-5. PRINT GATE ASSEMBLY

HAMMER SHIFTING

The printer uses time-shared hammer technology to print a line of data by shifting the hammer bar with a voice coil. In the 300 LPM machine, each hammer prints 4 columns in the standard pitch mode and 6 columns in compressed pitch mode. In the 600 LPM machine, each hammer prints 2 columns in the standard pitch mode and 3 columns in the compressed pitch mode. The hammers are mounted in removable modules on the hammer bar in a one to one relationship with the armature bank armature/strikers. There are up to 34 hammers in the 300 LPM printer, and up to 68 hammers in the 600 LPM printer for the maximum column width of 136. The hammer bar is positioned to its required locations by a linear drive voice coil that is closed loop servo controlled. The voice coil shifts the

TABLE 1-2. HAMMER SHIFT POSITIONS

PITCH	SHIFT POSITIONS	
	300 LPM	600 LPM
STANDARD	4	2
COMPRESSED	6	3

hammer bank in 0.1 in. (2.54mm) increments when operating in the standard pitch mode, and 0.066 in. (1.68mm) increments when operating in compressed pitch mode. Movement of the voice coil is monitored in increments of .033in. (0.84mm). There will be three position pulses for each shift position in the standard pitch mode and two position pulses for each shift position in the compressed pitch mode.

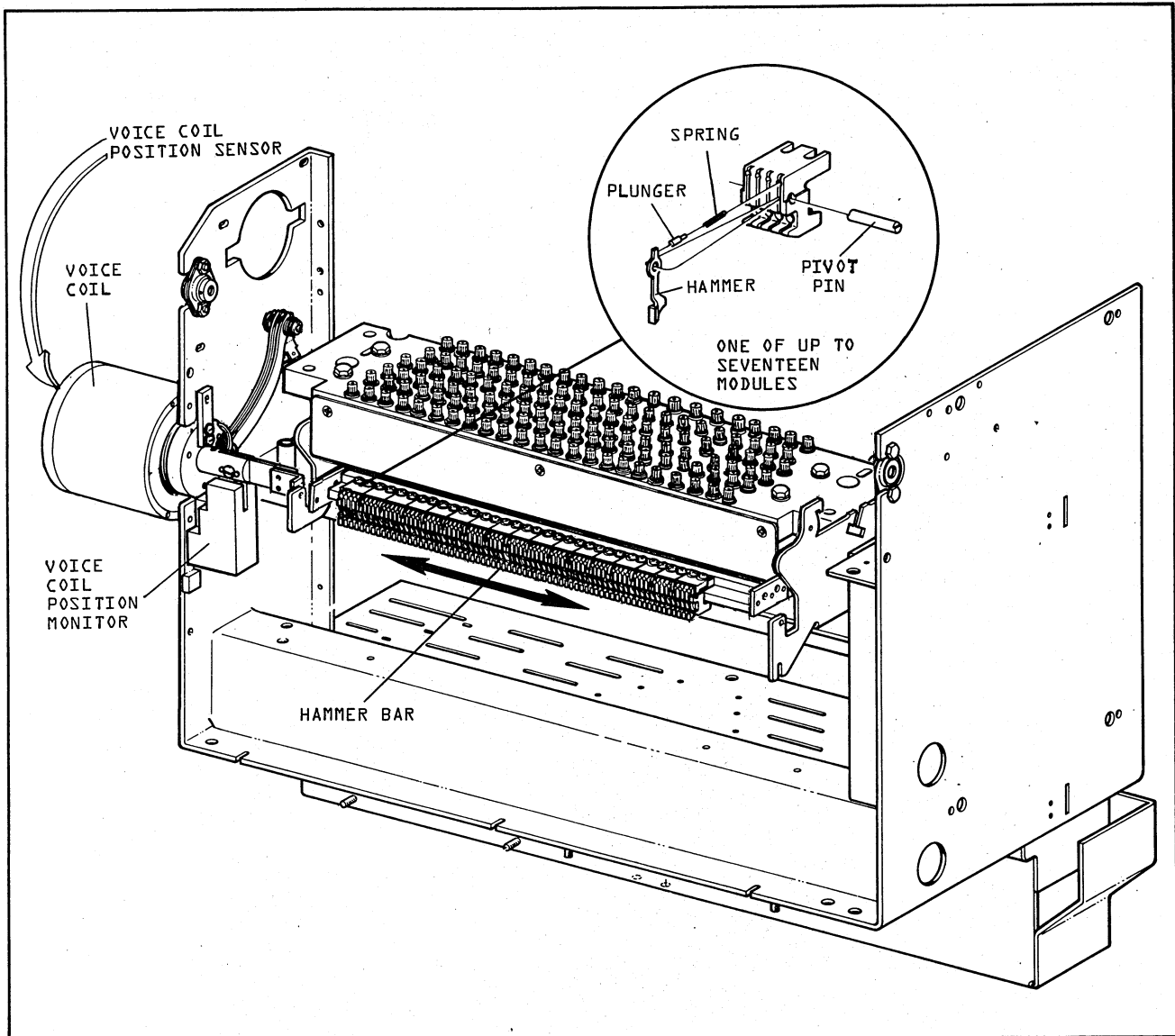


FIGURE 1-6. HAMMER SHIFTING

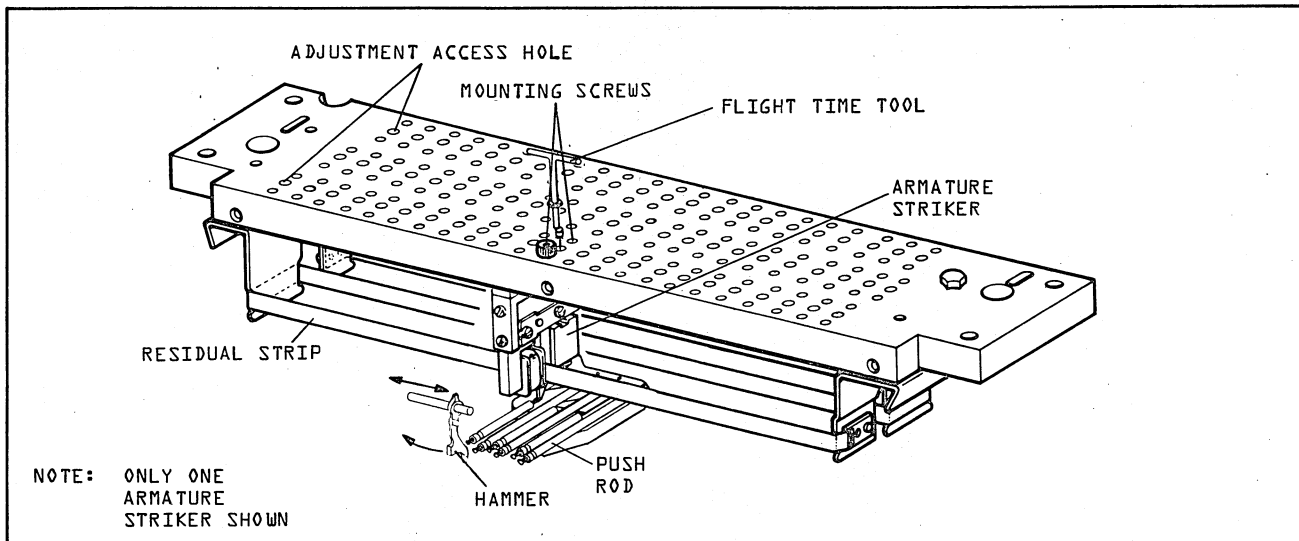


FIGURE 1-7. ARMATURE BANK

Compressed Pitch Mode

Compressed pitch is a standard available option and is also available as a kit. The compressed pitch kit modifies the printer and does not include a compressed pitch band. Printing in compressed pitch is accomplished by the use of an optional print band. When the compressed pitch band is installed on the printer, its automatically sensed, columns are printed closer together, and line length increases in character capacity but not length. The characters on a compressed pitch band are smaller with normal character spacing. In compressed pitch the hammers horizontal printing positions are closer together and the number of horizontal shifts is increased. A 300 or 600 machine with 136 columns in the standard mode will print 204 columns in compressed pitch. A 300 or 600 machine with 132 columns in the standard mode will print 198 columns in compressed pitch.

ARMATURE BANK

The armature bank is located centrally in the printer directly behind the hammer bar. The bank contains the armature/striker and pushrod assemblies that drive the printer hammers. The armature/strikers and the pushrods are arranged in a one to one relationship with the print hammers; for each hammer there is one push rod and one armature/striker. The 300 LPM printer contains up to 34 armature/strikers and 34 pushrods. While, the 600 LPM printer contains up to 68 armature/strikers and 68 pushrods. Each armature/striker assembly is composed of an armature, a striker, and a coil. The coil is controlled by a hammer driver

circuit located on a Hammer Driver PCB. When the coil is energized by its driver circuit, it attracts the armature propelling the striker tip towards the print font. The striker tip drives the push rod, which has the hammer spring-loaded against it, towards the print font, firing the hammer. At rest, the hammer face is a little over a tenth of an inch ($>2.5\text{mm}$) from the print band. The armature/striker and the push rod drive the hammer the first .08 in. (2.03mm). The inertia of the hammer carries it the remaining distance to the print band. This method of operation prevents the hammer from being powered into the print band. Using this method, no damage is incurred by either the hammer or print band if one of the hammer driver circuits malfunctions. Upon impact, the hammer rebounds to its starting position, and its oscillations are dampened by the hammer return spring. The spring brings the hammer to a complete rest before the next firing time of the hammer.

Due to the inherent physical differences between armature/striker and hammer components, flight time adjustments are provided for each armature/striker. The adjustment is performed by loosening both armature/striker mounting screws and moving the armature/striker. An access hole is provided for each assembly to facilitate this adjustment. For clipping on the right of the printed character the armature/striker should be moved towards the print band. For clipping on the left of the printed character, the armature/striker should be moved towards the rear of the printer.

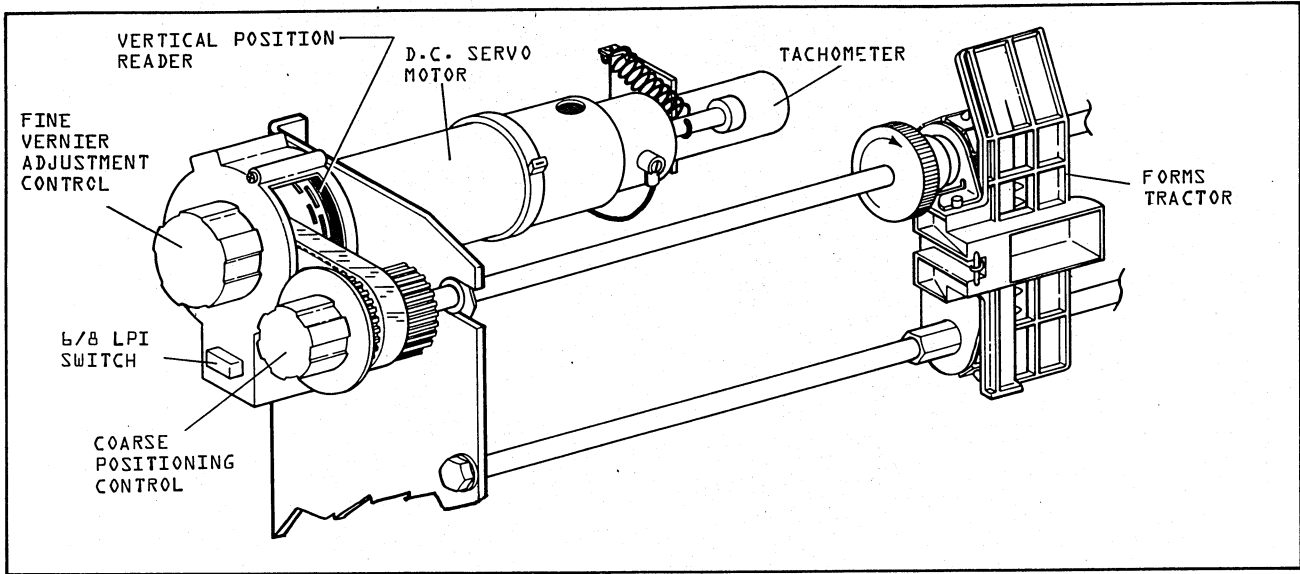


FIGURE 1-8. VERTICAL FORMS MOTION

VERTICAL FORMS MOTION

The forms motion system is comprised of a d. c. servo motor and its tachometer, vertical position reader, forms tractors and their drive shaft, position adjustment controls and the associated drive belt. The servo motor provides the drive for the system. It is capable of performing a single line advance in 16.25 msec. With a maximum slew rate of 20 inches (508mm) per second. The tachometer, mounted on the back of the servo motor, transmits a speed reference signal to the electronics. This signal allows the electronics to monitor and control the speed of the motor. Both the drive pulley and the vertical position reader code disk are mounted on the servo motor out-put shaft. The code disk contains four concentric sets of slots and two check strobe slots. The outer two sets are used for eight lines per inch spacing, the inner two sets are used for six lines per inch spacing. The line spacing selection is accomplished by physically moving the reader unit up or down relative to the code disk. In the up position the reader reads the 6LPI start and stop slots. In the down position it reads the 8 LPI start and stop slots. The check strobe slots are 180° apart and are used to detect vertical motion errors by checking for 6 or 8 (depending on spacing mode, 6/8 LPI) stopping points between check strobes.

The reader unit is attached to the movable reader housing. Rotating the housing changes the stopping point, allowing minor adjustment to print line positioning on the forms. The adjustment of the housing is referred to as the Vernier Adjustment Control. The forms drive pulley is connected to the tractor drive shaft via a toothed timing belt. As the tractor shaft is rotated, the tractor pins pull the forms up from the forms stack and push them out the exit slot at the rear of the machine. The knob located on the end of the tractor shaft is the Coarse Positioning Control. When the servo motor is turned off by the Forms Reset Switch on the Control Panel, the knob can be rotated to set the top of forms position. When the Forms Reset is released, the servo will home to the nearest stop point on the code disk.

Paper Motion Verification (PMV) monitors forms moving through the tractors. The PMV detector is located in the right tractor and monitors the forms feed holes moving through the tractor by light reflected off the white form between holes. Form motion failure will stop the printer and light the Form Feed indicator.

LOGIC CHASSIS

The minimum logic chassis contains the two common controller boards and the print head board. The boards swing out for easy access to all their components. The boards are connected to each other and the

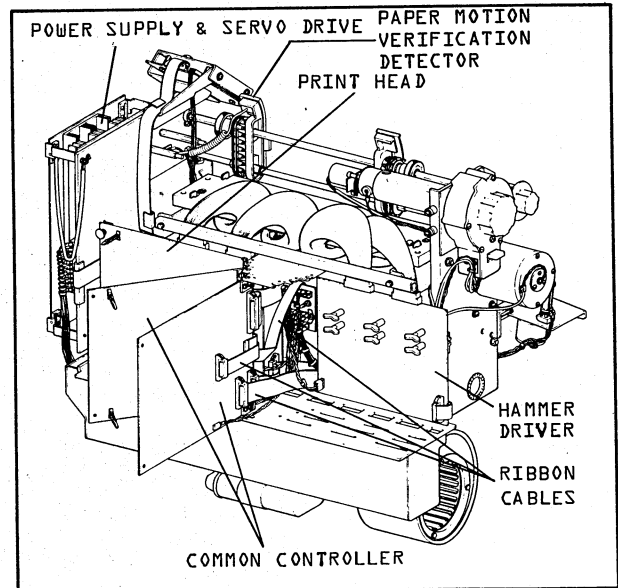


FIGURE 1-9. LOGIC CHASSIS

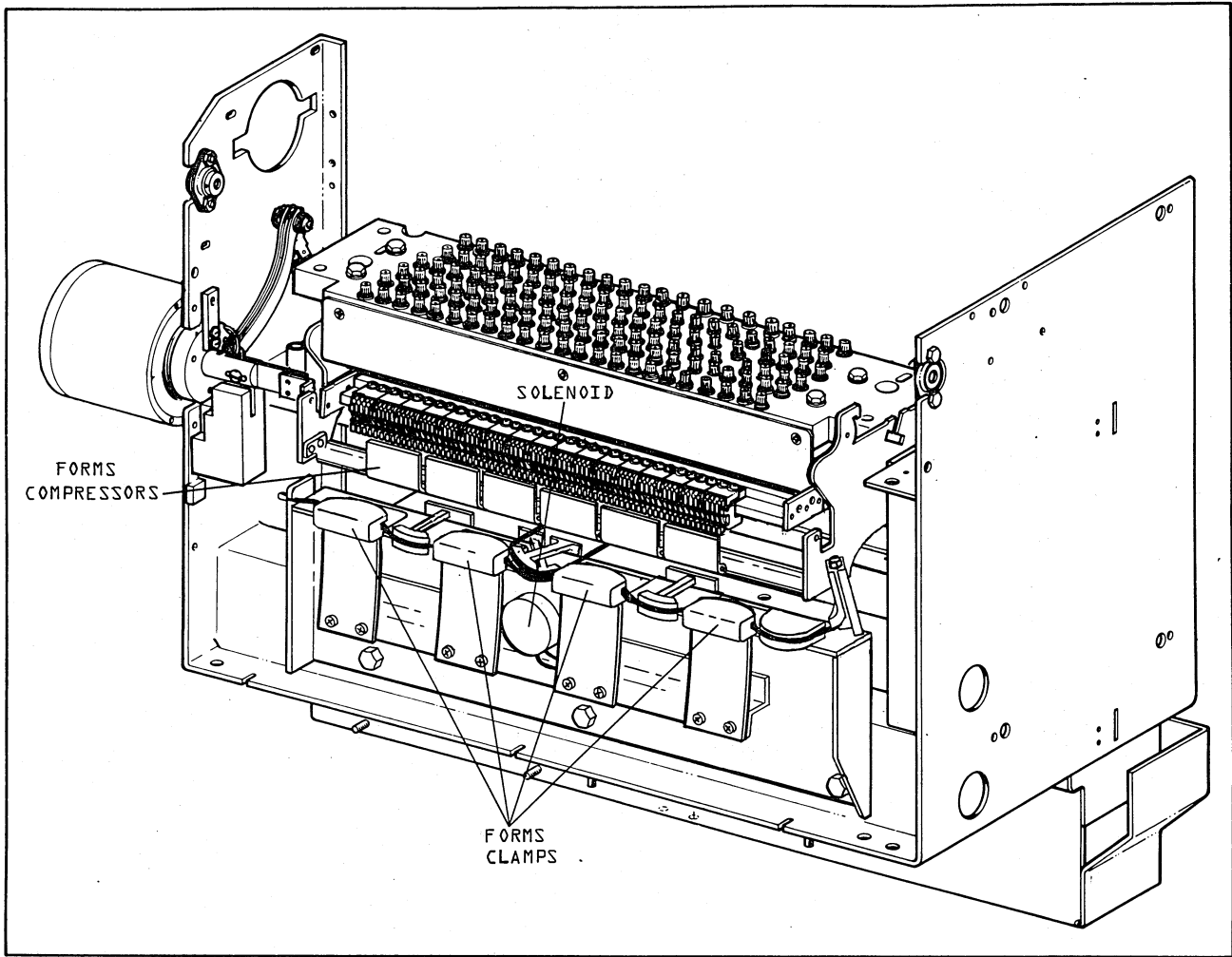


FIGURE 1-10. FORMS CLAMP ASSEMBLY

rest of the printer by plug-in ribbon cables. Additional space is also provided in the chassis to allow any interface adapter boards to be mounted in the printer. There are three additional printed circuit boards in the printer which are not located in the logic chassis; The Hammer Driver Board(s), the Power Supply Board, and the Servo Drive Board. The Power Supply Board and Servo Drive Board are located on the right side of the printer. The Servo Drive Boards swings down to allow access to the components of both boards. The Hammer Driver Board is mounted in the left rear of the printer in the 300 device. In the 600 device, a second Hammer Driver is installed behind the Print Head Board.

FORMS CLAMP ASSEMBLY

The forms clamp assembly is located directly below

the forms compressors and hammer bar. The assembly is composed of four clamping arms, a series of pulleys, and a control solenoid. The purpose of the assembly is to provide a constant hold on the forms whenever the printer is not advancing forms and the print gate is closed. The constant holding action of the clamps provides optimum vertical registration during a print operation. The control solenoid establishes the position of the clamps. When it is energized, the clamps are extended, holding the forms against the inside of the print gate. When the solenoid is de-energized, the spring tension of the clamping arms retracts the clamps, allowing free movement of the forms through the throat area. This assembly is energized anytime the printer is powered on with the exceptions of during a forms motion operation, whenever the print gate is open or when the Forms Reset Switch is activated.

PRINTER INTERFACE

The common controller interface is designed to communicate either with an external data source or an interface adapter installed in the printer. The single ended transmitters and receivers are capable of communicating with a data source at a distance of up to 50 feet (15.3 meters). The following is a brief description of the interface signals available. In depth explanations are provided in the Principles of Operation section of this manual. An interface adapter may modify the operation of these signals, and would be explained in Section O of the manual if required.

-READY (-RDY)

An interface line from the printer which, when low (logical "0"), indicates that the printer is fully operational, and ready to receive data. The RDY condition may be removed by any one of the following conditions:

1. Depression of START/STOP switch when in START.
2. A detectable fault occurs like gate open.

-MASTER CLEAR (-MC)

An interface line from the data source which, when low (logical '0'), resets the printer electronics. This signal cannot remove the printer from the RDY mode. The duration of the "0" level must be a minimum of 10 microseconds after the Busy signal becomes inactive.

-STROBE (-STB)

An interface line from the data source which, when low (logical '0'), indicates to the printer that the data lines are stable and may be sampled at the discretion of the printer.

-ACKNOWLEDGE (-ACK)

An interface line from the printer which, when low (logical "0"), indicates to the data source that the data lines have been sampled. This signal is an inter-locked signal whose duration is determined by the -STB signal.

-DATA BITS (-DB1 thru -DB9)

Seven (7) data lines (-DB1 thru -DB7) carry the information (control codes and data characters to the printer controller.) The data must be stable on the data lines a minimum of 200 nanosec. before and after the generation of the -STB signal. Optional data bits are used with increased character selections (-DB8, -DB9).

-OUT OF PAPER (-OOP)

An interface line from the printer which, when low (logical "0"), indicates that an Out of Paper condition exists in the printer. This condition will not inhibit further print or paper motion cycles in the printer. The data source must sense the Out of Paper condition and refrain from loading more data until paper is restored in the printer.

BUSY

An interface line from the printer which, when low

(logical "0"), indicates that the controller is ready to accept a line of data if the -RDY line is false (logical "0"). BUSY will go true (logical "1") to indicate that the printer has completed loading data from the interface and will again go false when the print cycle is completed. At this time, the printer will again be ready to accept data.

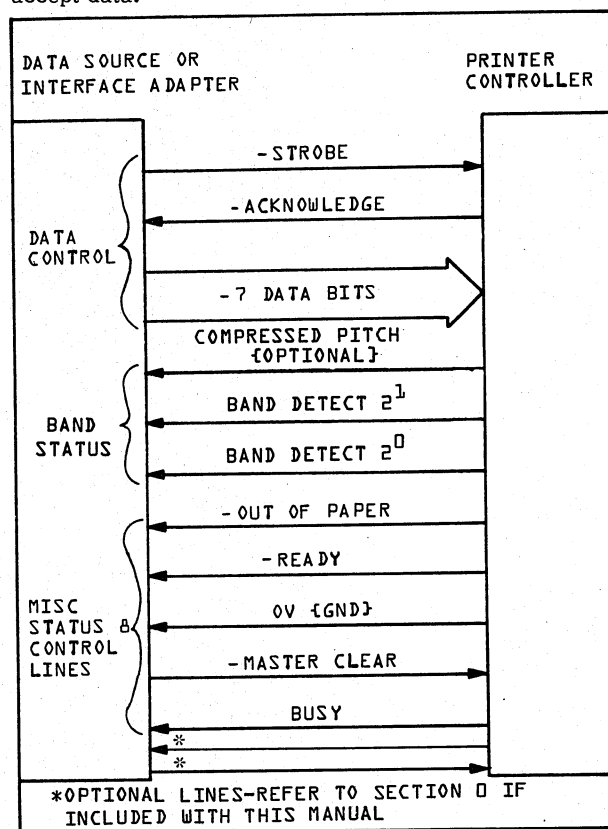


FIGURE 1-11. INTERFACE

BAND DETECT 2^1 and 2^0 (BD 2^1 and BD 2^0)

These signals contain binary coded information which state the type of band currently on the printer.

BD 2^1	BD 2^0	Type of Band
0	0	128 character
0	1	96 character
1	0	64 character
1	1	48 character

COMPRESSED PITCH (CP)

An interface line from the printer, which when high (a logical "1") states that the printer is in the compressed pitch mode. In this mode, characters will print at 15 characters per inch. When CP is false (a logical "0"), the printer is in standard pitch mode. In the standard pitch mode, characters are printed at 10 characters per inch. This line is stable during RDY equal to a logical "0". The compressed pitch option must be incorporated in the printer before a compressed pitch band will function.

OPTIONAL FEATURES

The printer may be ordered with the following features, which in some cases may be supplied as optional kits. Figure 1-12 will aid in the identification of the features installed on individual printers. Additional sections may be added to this manual to cover unique features, logic, or functions which are not covered as part of the standard printer. A Section 0 (zero) preceding this section will cover the unique features as to their effect on operation, function, and identification. Section 0 (zero) will also provide substitute instructions, procedures, and principles of operation. A Section 7 will be included when unique logic schematics are required. In certain cases an additional interface may be required in addition to the information supplied in Section O included in the manual. These interface systems will be covered by separate Interface Adapter manuals. Special options like Electronic Vertical Format Unit (EVFU) will be documented in a Special Option manual.

PAPER BASKET

A removable forms collector basket may be positioned at the lower back of the printer to stack printout. The basket increases stackability and decreases some static problems.

QUIET CABINET

A quiet cabinet may be selected as a field installable kit to decrease audible noise levels. Printers with quiet cabinets factory installed or as kits, will include a front forms shelf and a door with all necessary seals.

INPUT/OUTPUT I/O CONNECTOR

A standard interface connector and cable is available as a kit for installation on the back of the printer. Special processor interface adapter kits may include special I/O connectors along with the electronic package.

INTERFACE ADAPTER

Special processor interface adapter kits are available for different processing systems. Interface adapter kits may be factory installed or exchanged in the field. These kits can be identified by unique I/O connectors, or by the interface electronics located in the printed circuit board (PCB) rack at the back of the print head (location 7PC4). Some standard interfaces may be incorporated in the printer in locations 7PC4 and 7PC5, and are covered in Section "O" of the manual if included in the printer.

PRINT BANDS

A standard 64 or 96 character band is available in a number of different character designs. Optional bands are available in 48 and 128 character sets, and compressed pitch. Character sets of 48, 128, or with unique characters will be supplied with Programmed Read Only Memories (PROM's) which the Customer Engineer (CE) must install on the Input Print board

(7PC1). Some unique interfaces are setup to use a group of bands from 48 to 128 characters without PROM's, and use Dual-In-Line (DIL) jumper chips in place of PROM's for unique bands, such interfaces would be explained in Section O(zero). A PROM set installed for a 48 character, or a set installed for a 128 character set, will still allow any standard 64 or 96 character band to be used. A compressed pitch band has smaller characters, and when installed on the printer increases the number of horizontal positions printed by any one hammer, which increases the maximum characters that can be printed per line. In compressed pitch a 132 column printer will print a maximum of a 198 characters per line, and 136 columns can be increased to 204 characters. A 64 character band is available in ASCII, Western Europe OCR-B, United Kingdom OCR-B, Denmark/Norway OCR-B, Spanish OCR-B, Sweden/Finland OCR-B, Portugal OCR-B, ASCII OCR-A, and Domestic Compressed Pitch. A 96 character band is available in UC/LC 1403. A domestic character set is available as a 48 character band, and 128 character band is available in Katakana OCR, Arabic Standard, and Katakana/Kanji. All bands are not available for every printer and an up-to-date list appears in the parts manual.

VARIABLE FORM LENGTH

This option provides a thumbwheel counter below the control panel which provides a versatile selection of forms with varying length between perforations. The counter may be set between 001 and 199 which allows a form with up to 33 inches (838mm) between perforations to be used at 6 lines per inch (6 LPI). At 8 LPI a 24.5 inch (622mm) form may be used. With a standard 11 inch (279mm) form at 6 LPI the counter would be set at 066, which is the maximum number of lines at 6 LPI on the form. A setting of 066 would provide 63 printed lines and three blank lines which are aligned to miss the perforation. This counter is disabled if an Electronic Vertical Format Unit (EVFU) is installed.

ELECTRONIC VERTICAL FORMAT UNIT (EVFU)

The EVFU is available with up to twelve channels, which means twelve different line spacing patterns may be selected for twelve different forms. More format combinations are possible by selecting combinations of channels. The EVFU requires loading each time the printer is power up, from then on until power-off, format channels may be selected over the interface. The EVFU option includes a reader for manual tape loading of the EVFU, and a logic board in location 7PC6. The logic board contains four fault isolation L. E. D. 's and the reader contains a Read switch and a Reading L. E. D. which aids in EVFU loading and fault isolation. The EVFU will be supplied with a Special Option manual covering its operation.

COMPRESSED PITCH

Compressed pitch is available as an option or field installable kit which enables the use of compressed pitch bands. Compressed pitch prints smaller characters, closer together, and increases characters per line of print.

CUSTOMER ENGINEER FAULT INDICATORS

These Light Emitting Diode (L. E. D.) indicators are located just below the control panel on the right side. The bonnet must be raised to see these indicators which aid in troubleshooting for Customer Engineers (see Figure 1-12). These indicators along with function and fault L. E. D. 's on the logic boards provide a means for quick diagnosis and repair.

CONTROL PANEL FEATURES

The control panel may have many combinations of switches and indicators, many function through the special interface adapters. The function of a switch or indicator may vary between interface adapters, so only standard indicators and switches will be mentioned. If these switches and indicators or others are installed, refer to Section 0 (zero), if included at the front of this manual, or the interface adapter manual supplied with the printer. The following switch/indicators are standard features available in different combinations:

Page Eject, replaces Form Feed for advancing forms vertically.

Single Space, advances forms vertically one line at a time.

Test Print, prints lines of all one test character.

Reset, clears the electronic circuits after fault conditions are corrected.

Runaway, indicates when an uncontrolled forms slew or advance occurs. This condition is sensed when an optional Electronic Vertical Format Unit (EVFU) is installed and a code is selected that was not loaded. This can cause a slew of up to 195 lines.

Paper Out, indicates the end of the forms which in monitored by the Out Of Paper (OOP) switch, mounted on the inside surface of the gate.

Parity Error, indicates when the data bits received do not match the parity bit sent. Indicates a possible error in the data as received.

VOID AUTO PERF SKIP

The automatic perforation skip which is standard and also available with variable form length option, may be disabled as an option.

LINE COUNTER

A line counter is available which mounts on the left side of the printer on the cabinet base. The line counter counts the lines of print and is generally used to schedule printer maintenance. The line counters count may be recorded and used to indicate work load conditions, or job costs.

INPUT VOLTAGE SELECTION OPTION

Voltage selection is available by incorporating a terminal board below the power transformer for transformer tap selection on an optional multitap transformer for both 50 and 60 Hz.

HIGH ALTITUDE OPTION

This is a heavy duty cooling system available for the standard 60 Hz printer. This option incorporates a larger blower motor. All 50Hz and 50/60 Hz printers have the heavy duty blower installed as a standard feature.

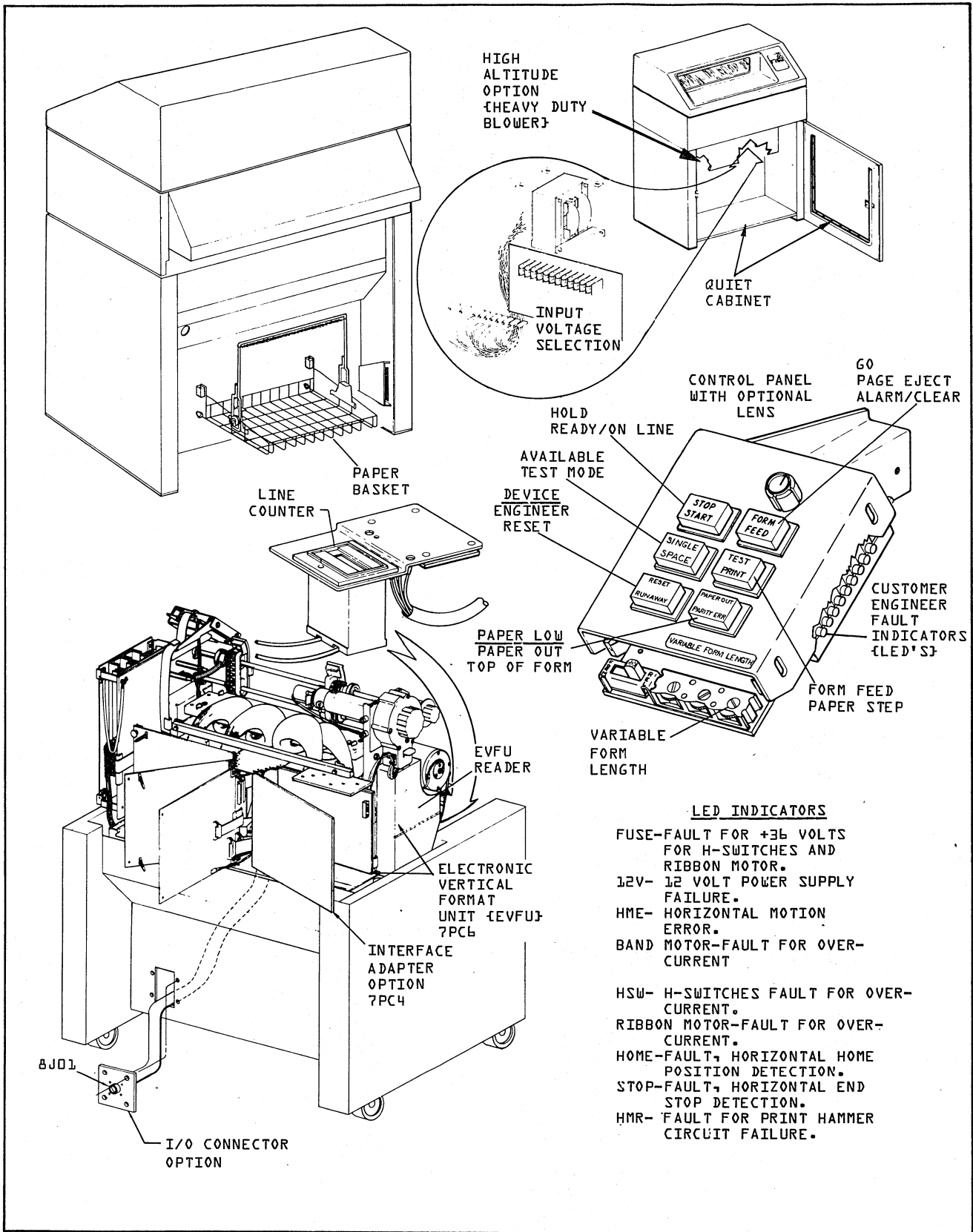


FIGURE 1-12. OPTIONAL FEATURES

INSTALLATION AND CHECKOUT

GENERAL INFORMATION

Before beginning, check the front of the manual for a Section 0 (zero), if included, this Section may be modified. It is recommended this entire section be read before the line printer is uncrated. This section contains all the information necessary to unpack the unit and bring it to its initial on condition. After the print-

er has been checked out and is operating correctly, remove power, and install any interface kits or options. Refer to the Interface Adapter or special option manual for the final checkout of the printer. For information regarding operating procedures refer to the Operation section of this manual and the Interface Adapter or kit manual.

SITE PLANNING

The site planning section covers all the site requirements for the printer including space and floor loading, electrical inputs, and environmental considerations.

able to hold 100 pounds (45Kg) per loading point. If there is any possibility of floor instability, the printer should be positioned on a metal plate. This will prevent any chance of frame flex causing misalignment of the hammer bar to the print gate.

SPACE REQUIREMENTS AND FLOOR LOADING

Adequate space must be provided to allow easy operations and servicing. The required space dimensions are shown in Figure 2-1. The weight of the printer will vary slightly depending upon the number and type of options installed. In general the printer will weigh 300 pounds (136 Kg). Its crated weight is approximately 350 pounds (159 Kg). The floor structure must be

ELECTRICAL REQUIREMENTS

Verify Section 0 (zero), if included at the front of this manual, does not modify this procedure. The input power to the printer is three wire, single phase a.c. The input cable is connected to the a.c. line filter (1LF01). See Table 2-1 for the input voltage parameters.

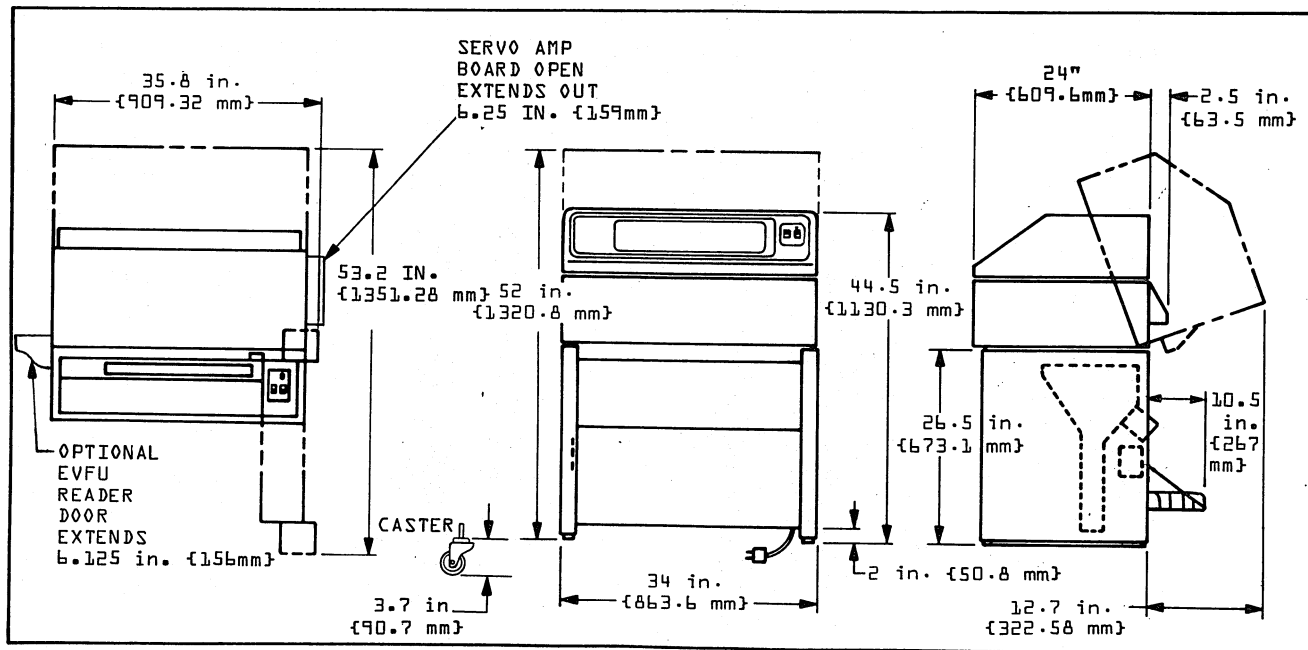


FIGURE 2-1. LINE PRINTER DIMENSIONS

TABLE 2-1. ELECTRICAL REQUIREMENTS

<u>60 HERTZ UNITS</u>	
VOLTAGE	104 To 127 (Nominal 120) VAC RMS.
FREQUENCY	59 To 60.6 Hz.
CURRENT	300 : Less Than 8 Amps. 600 : Less Than 10 Amps.
KVA	300 : 1.1KVA Maximum 600 : 1.3KVA Maximum
<u>50/60 HERTZ UNITS</u>	
VOLTAGE	RANGE 1 : 198 To 235 (NOMINAL 220) VAC RMS. RANGE 2 : 216 To 257 (NOMINAL 240) VAC RMS. RANGE 3 : 104 To 127 (NOMINAL 120) VAC RMS. RANGE 4 : 90 To 107 (NOMINAL 100) VAC RMS.
FREQUENCY	49 To 50.5 Hz. Or 59 to 60.6 Hz.
CURRENT	300 : Less Than 4 Amps at 220 VAC 600 : Less Than 5 Amps at 220 VAC
KVA	300 : 1.2 KVA Maximum 600 : 1.4KVA Maximum
<u>50 HERTZ UNITS</u>	
VOLTAGE	RANGE 1: 198 to 235 (NOMINAL 220) VAC RMS RANGE 2: 216 to 257 (NOMINAL 240) VAC RMS
FREQUENCY	49 to 50.5 Hz
CURRENT	300: Less Than 4 Amps 600: Less Than 5 Amps
KVA	300: 1.2KVA Maximum 600: 1.4KVA Maximum

TABLE 2-2. ENVIRONMENTAL REQUIREMENTS

<u>Operating Conditions</u>	
The printer has been designed to operate within the following ambient conditions:	
Temperature Range (Dry Bulb)	50 ^o to 95 ^o F 10 ^o to 35 ^o C
Temperature Range (Wet Bulb)	80 ^o F Maximum 26.5 ^o C Maximum
Temperature Change per Hour	18 ^o F Maximum 10 ^o C Maximum
Relative Humidity Range	20-80% Non-condensing
Relative Humidity Change per Hour	10% Maximum
Barometric Pressure	10.5 x 10 ⁴ N/M ² to 7.95 x 10 ⁴ N/M ² (Maximum equivalent altitude is 6,562 feet (2000 meters))
<u>Storage Conditions</u>	
For periods up to three months the printer can be stored in the following ambient conditions:	
Temperature Range	14 ^o to 122 ^o F -10 ^o to 50 ^o C
Temperature Change per Hour	27 ^o F Maximum 15 ^o C Maximum
Relative Humidity Range	10 to 90% Non-condensing
Barometric Pressure	10.5 x 10 ⁴ N/M ² to 3.8 x 10 ⁴ N/M ² (Maximum equivalent altitude is 24,935 feet (7600 meters))
<u>Transit Conditions</u>	
For transit periods of up to one week the printer can withstand the following ambient conditions:	
Temperature Range	-40 ^o to 158 ^o F -40 ^o to 70 ^o C
Temperature Change per Hour	36 ^o F Maximum 20 ^o C Maximum
Humidity Range	5 to 100%
Barometric Pressure	10.5 x 10 ⁴ N/M ² to 3.8 x 10 ⁴ N/M ² (Maximum equivalent altitude of 24,935 feet or 7600 meters)

PRINTER UNPACKAGING

Verify Section 0 (zero) if included at the front of this manual does not modify this procedure. Before unpacking the printer, it is best to have it delivered to the proposed operation area by fork-lift or other similar material handling equipment. Remove the printer from the container following the instructions attached to the outside of the container or the following procedure (refer to Figure 2-2).

Tools Required

1. Sheet Metal Shears
 2. Wrench 9/16 inch
 3. Fork Lift Equipment
 4. Wrench 3/8 inch
 5. Wrench 3/4 inch
1. Cut the strapping from around the corrugated container (used on air shipment).
 2. Lift off the corrugated container (used on Air Shipment).
 3. Remove the avis straps and plastic bag covering the printer.
 4. Remove any items other than the printer from the skid (used on Air Shipment).
 5. Remove the four bolts securing the printer to the skid (used on Air Shipment).
 6. Unpackage the four leveling pads or casters.
 7. Use a fork lift or similar device to lift the printer. The forks should engage the lower cross frame of the printer as close to the pedestal legs as possible.
 8. Raise the printer slowly until the skid (if installed) can be pulled out. One person should be steadying the printer as it is only resting on a narrow base.
 9. While the printer is still raised, screw in the leveling pads. One pad or caster is installed in each corner of the pedestal legs.
 10. Lower the printer and remove the fork lift.
 11. Remove the avis straps around the bonnet and gate.
 12. Open the printer bonnet and remove the shipping plate securing the print gate closed.
 13. Open the gate and remove the block and ty-rap from the left side of the hammer bar.
 14. Remove the band cover and remove the tape from each band drive pulley. Clean off tape residue.
 15. Remove the four shipping blocks, one mounted in each corner, between printhead and the pedestal.
 16. Remove the tape from the logic boards and vertical motion assembly.
 17. Remove the tape from the cover below the gate assembly.
 18. The printer is now ready for power connection.

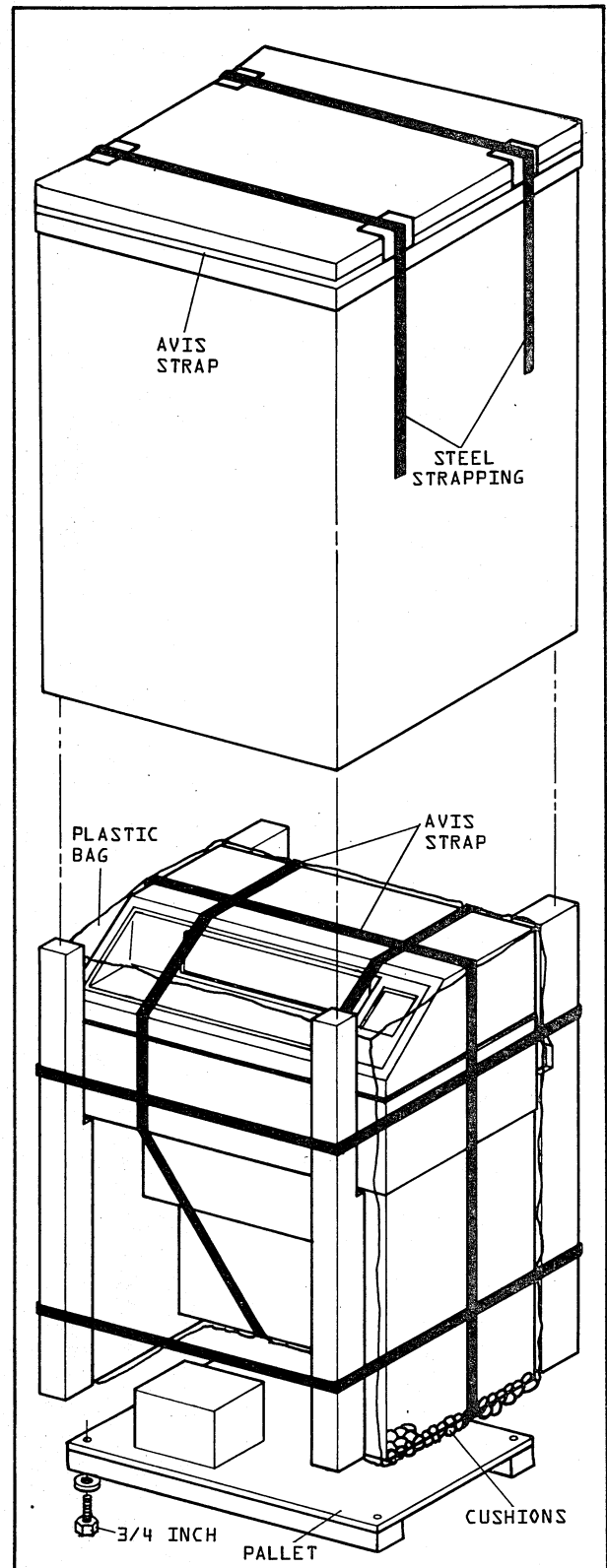


FIGURE 2-2. UNPACKING

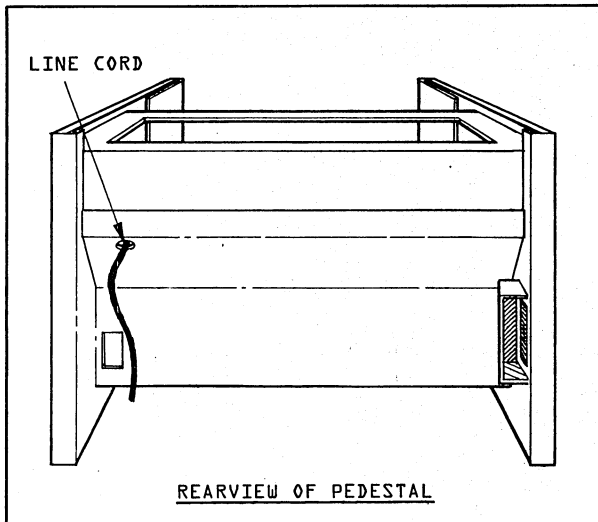


FIGURE 2-3. PEDESTAL PORT LOCATOR

A. C. INSTALLATION

This procedure is only for printers that do not have power cords already installed. The printer end of the power cord should be assembled as shown in Figure 2-4. After assembling the cord install it as instructed in the following procedure.

1. Remove the front access cover.
2. Loosen the strain relief clamp screws.
3. Remove the nuts holding the line filter connection cover and remove the cover.

4. Insert the cord through the rear access hole and insert it through the strain relief clamp (see Figure 2-3).
5. Make sure the clamp is around the cord shielding and then tighten the strain relief clamp screws (see Figure 2-4).
6. Connect the brown wire on the left section of the three section filter capacitor, at the upper terminal. Connect the blue wire at the upper terminal of the right section of the filter capacitor.
7. Remove the nut from the #8 stud just below the line filter and use it to secure the chassis ground ring terminal to the same stud.
8. Reinstall the protective cover.

ALTERNATE A. C. TRANSFORMER CONNECTIONS

The printer as delivered from the factory is wired for 120 volts, 60 Hz when either the 60 Hz only transformer or the voltage selection option with the 50/60 Hz transformer installed (see Figure 2-5). When the 50 Hz only transformer is installed, the printer is wired for 220 vac input. To modify the input configuration with the voltage selection option, perform the applicable procedure below (see Figure 2-6). All the possible transformers available are shown in Figure 2-7.

50Hz Only Transformer 220 to 240 VAC

1. Disconnect transformer lead 1A from the circuit breaker and connect transformer lead 1 to the circuit breaker.
2. Tape lead 1A and tie it back in the harness.
3. Update the input a-c power label on the back of the printer to reflect the a-c power configuration.
4. If an EVFU option is installed, refer to the following paragraph, EVFU Option Power.

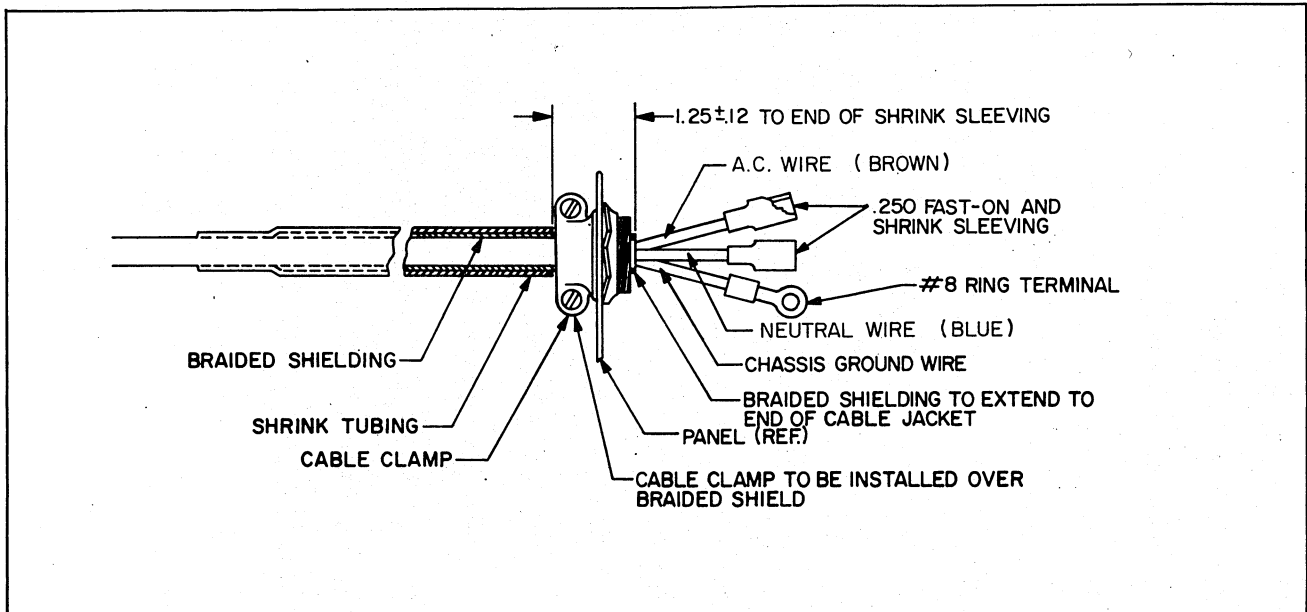


FIGURE 2-4. LINE CORD PREPARATION

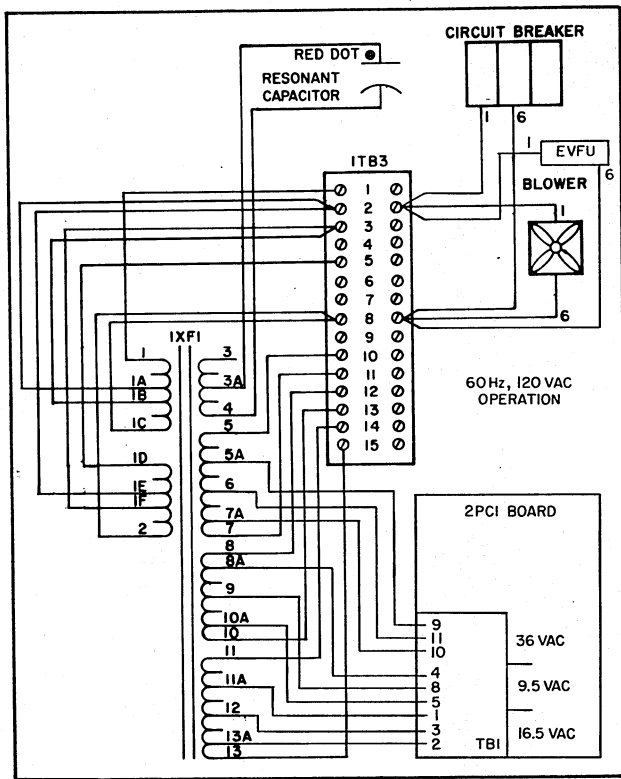


FIGURE 2-5. FACTORY WIRED 60 Hz, 120 VAC

50/60 Transformer 120 to 100 VAC

1. Disconnect the a. c. input from 1TB3 pin 2 and move it to 1TB3 pin 3.
2. Update the input a-c power label on the back of the printer to reflect the a-c power configuration.
3. If an EVFU option is installed, refer to the following paragraph, EVFU Option Power.

50/60 Hz Transformer 120 to 220 VAC, 60 to 50 Hz

1. Disconnect transformer lead 5A from 2PC1-TB1 pin 9 and connect it to 1TB3 pin 10. Disconnect transformer lead 5 from 1TB3 and connect it to 2PC1-TB1 pin 9.
2. Disconnect transformer lead 7A from 2PC1-TB1 pin 10 and connect it to 1TB3 pin 11. Disconnect transformer lead 7 from 1TB3 pin 11 and connect it to 2PC1-TB1 pin 10.
3. Disconnect transformer lead 8A from 2PC1-TB1 pin 4 and connect it to 1TB3 pin 12. Disconnect transformer lead 8 from 1TB3 and connect it to 2PC1-TB1 pin 4.
4. Disconnect transformer lead 10A from 2PC1-TB1 pin 5 and connect it to 1TB3 pin 13. Disconnect transformer lead 10 from 1TB3 pin 13 and connect it to 2PC1-TB1 pin 5.
5. Disconnect transformer lead 11A from 2PC1-TB1 pin 1 and connect it to 1TB3 pin 14. Disconnect transformer lead 11 from 1TB3 pin 14 and connect it to 2PC1-TB1 pin 1.
6. Disconnect transformer lead 13A from 2PC1-TB1 pin 2 and connect it to 1TB3 pin 15. Disconnect transformer lead 13 from 1TB3 pin 15 and connect it to 2PC1-TB1 pin 2.

7. Check that the leads were moved correctly by comparing 2PC1-TB1 inputs to the following checklist:

TB1 Pin	Transformer lead
9	5
11	6
10	7
4	8
8	9
5	10
1	11
3	12
2	13

8. Disconnect transformer lead 1E from 1TB3 pin 2 and connect it to 1TB3 pin 6.
9. Disconnect transformer lead 1F from 1TB3 pin 3 and connect it to 1TB3 pin 7.
10. Disconnect transformer lead 1C from 1TB3 pin 8 and connect it to 1TB3 pin 5.
11. Disconnect transformer lead 3A from the resonant capacitor 1C01 and connect it to 1TB3 pin 9. Disconnect transformer lead 3 from 1TB3 pin 9 and connect it to 1C01.
12. Check the transformer primary wiring to 1TB3 against the following checklist:

1TB3 Pin	Transformer Lead(s)
1	1
2	1A
3	1B
4	blank
5	1C 1D
6	1E
7	1F
8	2
9	3A

13. Disconnect the black blower motor lead to 1TB3 pin 2 and connect it to 1TB3 pin 5.
14. Printer is now ready for 50 Hz, 220 volt operation.
15. Update the input a-c power label on the back of the printer to reflect the a-c power configuration.
16. If an EVFU option is installed, refer to the following paragraph, EVFU Option Power.

50/60 Hz Transformer 120 to 240 VAC, 60 to 50 Hz

1. Perform the 120 to 220 conversion procedure.
2. Move the a. c. input wire from 1TB3 pin 2 to 1TB3 pin 1.
3. Update the input a-c power label on the back of the printer to reflect the a-c power configuration.

50/60 Hz Transformer 120 to 100 VAC, 60 to 50 Hz

1. Perform steps 1 through 7 of the 120 to 220, 60 to 50 procedure.
2. Disconnect transformer lead 1 from 1TB3 pin 1 and connect it to 1TB3 pin 5.
3. Disconnect transformer lead 1F from 1TB3 pin 3 and connect it to 1TB3 pin 7.

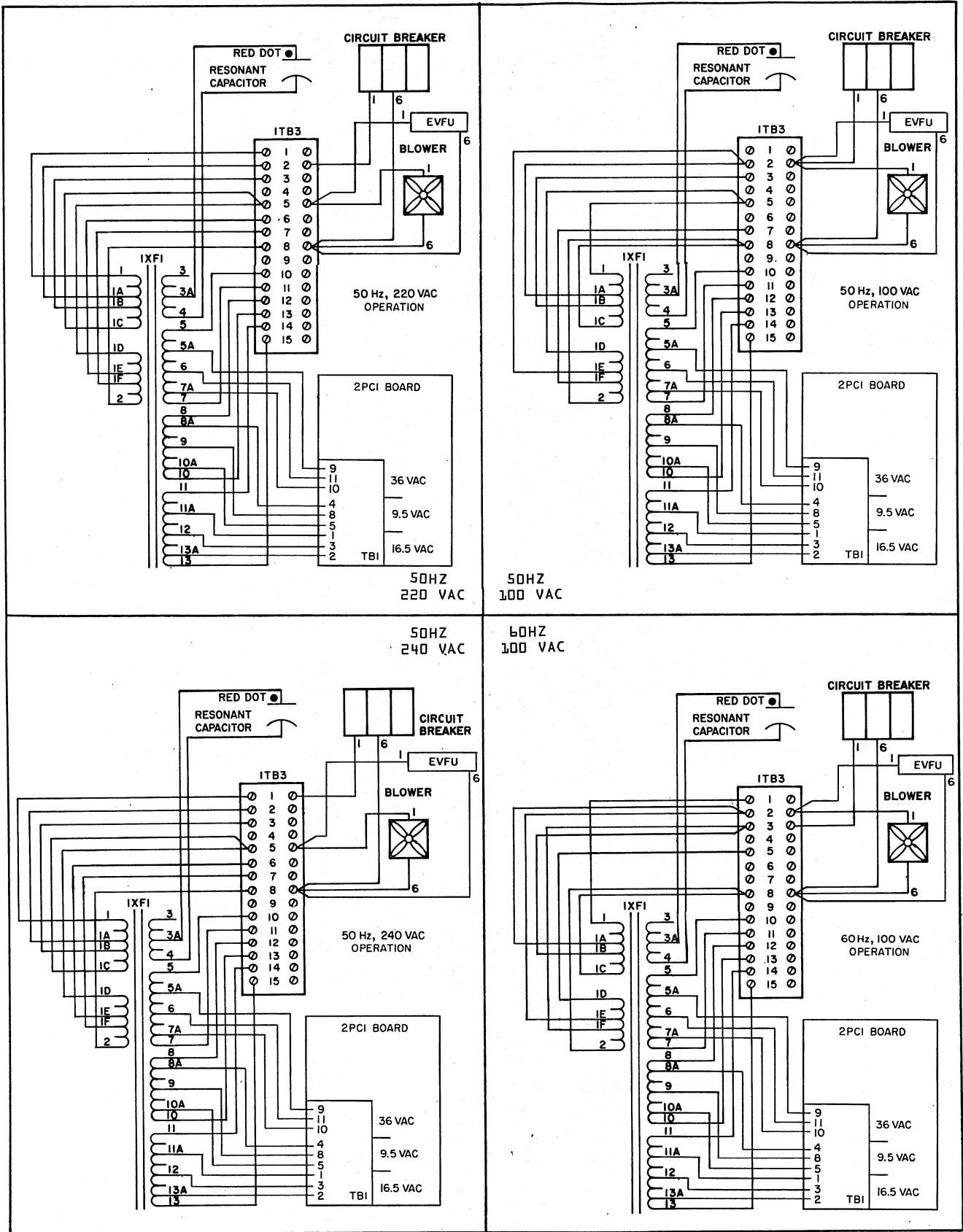
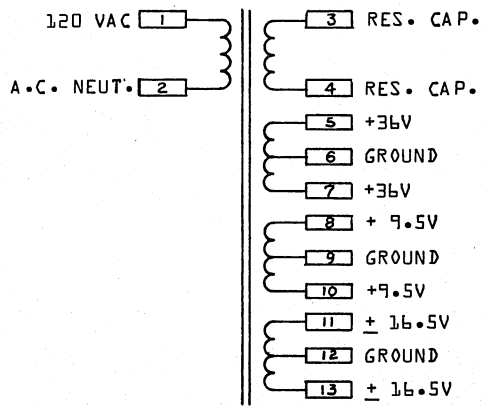
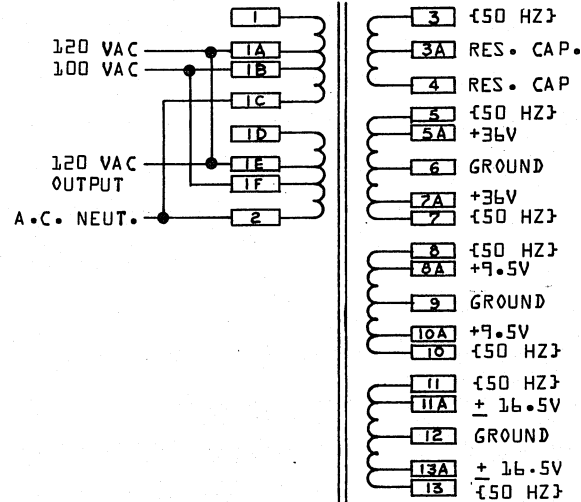


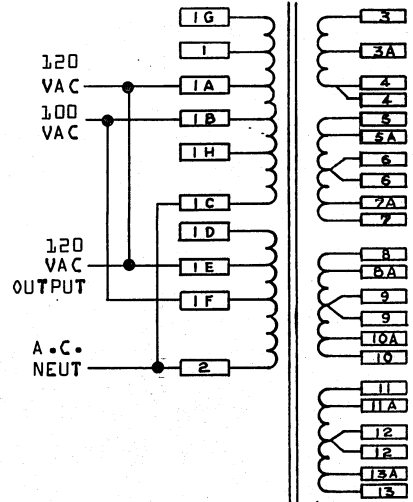
FIGURE 2-6. VOLTAGE SELECTION



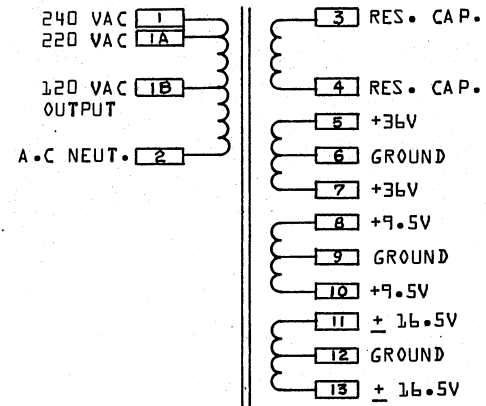
60 HERTZ ONLY



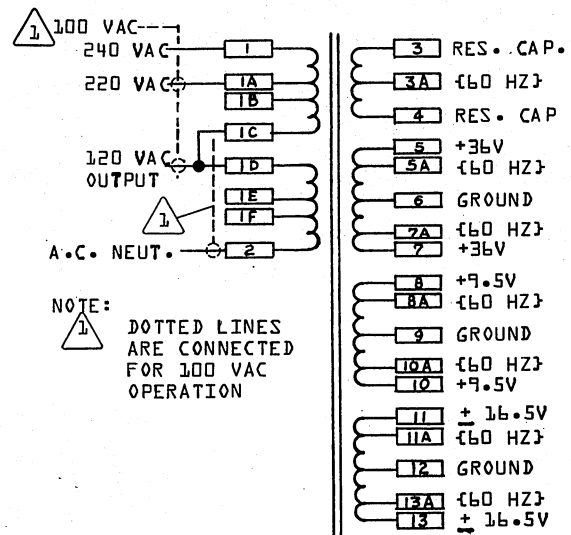
50/60 HERTZ WIRED FOR 60



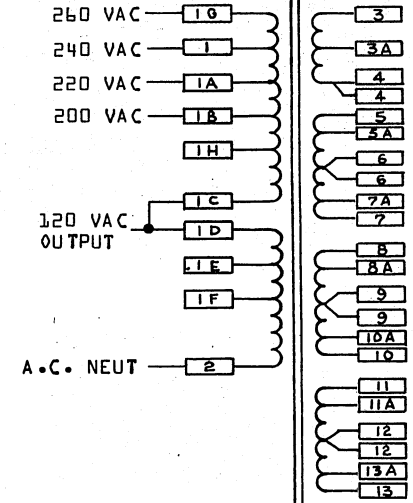
OPTIONAL TRANSFORMER CONNECTED FOR 60 HERTZ



50 HERTZ ONLY



50/60 HERTZ WIRED FOR 50



OPTIONAL TRANSFORMER CONNECTED 50 HERTZ

FIGURE 2-7. A.C. TRANSFORMER CONFIGURATIONS

4. Disconnect transformer lead 3A from the resonant capacitor 1C01 and connect it to 1TB3 pin 9. Disconnect transformer lead 3 from 1TB3 pin 9 and connect it to 1C01.
5. Disconnect the black blower motor lead from 1TB3 pin 2 and connect it to 1TB3 pin 5.
6. Check the transformer primary wiring to 1TB3 against the following checklist:

<u>1TB3 Pin</u>	<u>Transformer Lead (s)</u>
1	blank
2	1A & 1E
3	1B
4	blank
5	1 & 1D
6	blank
7	1F
8	2 & 1C
9	3A

7. Input a.c. is connected to 1TB3 pin 2
8. Update the input a-c power label on the back of the printer to reflect the a-c power configuration.
9. If an EVFU Option is installed, refer to the paragraph, EVFU Option Power.

EVFU Option Power

The EVFU blue and brown power leads from the reader motor are connected at the printers blower motor wires (blue and brown). Early production printers had the readers wires spliced into the blower motors wires with self tapping splices. Printers with the wires spliced with self tapping splices. Printers with the wires spliced with the blower motors wires have no problem because changing the blower motors power corrects the EVFU's a-c power. Later production printers have piggy back fastons mounted on the EVFU wires which are connected on the 1TB3 faston first and allows the blower leads to be connected to the EVFU wires. Printers with the piggy back fastons must have the EVFU leads moved with the blower motor leads per the previous procedures. Refer to Figures 2-5 and 2-6.

PRINTER CHECKOUT

A basic understanding of the principles of operation of the printer is recommended prior to attempting the initial checkout of the unit. Refer to Section 4 and the front of the manual to Section 0 (zero) if its incorporated in the manual for information regarding the principles of operation or unique printer procedures.

The following kits will be required for printer checkout: Band kit, and Interface Adapter kit. The band kit will be required to complete the checkout section of this manual. Always checkout the basic printer before installing or incorporating any special optional or interface kits not already installed.

Begin the printer checkout by inspecting the unit for any damage that may have been incurred during shipment. Remove the printer bonnet and the paper shroud (see

Printer Access in section 1), and check for any loose hardware. Also, ensure that all the connectors are securely attached and the circuit boards are installed properly. See Section 6 and the beginning of Section 7 (if included in the manual) for a listing of the appropriate boards and their locations. A fuse locator is also provided (see Figure 2-9) in case of a malfunction during checkout.

Identify all the bands to be used for the purpose of verifying if the compressed option should be incorporated and checked. Use the parts manuals print band parts list and the part number on the front of the band for identification. Two part numbers may appear on the band. One number should appear partially defaced. The most legible number will coincide with a band polished number of a band kit. A band for compressed pitch may also be identified by character height. Character height on compressed pitch characters of full height is about .090 inch (2.30mm) as compared to .096 inch (2.44mm) for standard characters. The compressed pitch band also has two Home timing marks together at the beginning of each character set on the band and the standard band has only one. The compressed pitch option must be installed in the printer to use a compressed pitch band. Compressed pitch is incorporated if a jumper is installed on the harness connector P3 of the print head board (7PC3), between pins 8 and 21.

1. Install the band on the printer following the instructions in the Operation section (3). Bands for 48 or 128 character sets require an electronic component swap, refer to the instructions with the band kit.

Band kits for a 48 character band contain two Programmed Read Only Memories (PROM's) which are installed on the 7PC1 board in location G6 for the lower four bit PROM, and H6 for the upper four bit PROM. With the 48 character PROM's installed other 64 or 96 character bands may be used. However a 128 character band requires its own set of PROM's to be installed which still allows the 64 and 96 character band to be used.

2. Install the ribbon referring to the Operation section.
3. Connect the printer to a suitable a.c. power source.
4. With the gate closed flip the POWER ON/OFF switch to the ON position. The band and ribbon motors should begin turning, the blower should start running, the hammer bar should move to left most position, a brake should be felt when attempting to turn the Manual Positioning Control, and the STOP indicator should be illuminated. After 30 seconds the band and ribbon motors will turn off.
5. Using a digital volt meter, check the power supply output voltages from the power supply board but do not adjust the +5 volts at this time (see Figure 2-8). Voltages out of tolerance with the exception of the +5 volts which is adjustable may require a fault isolation check of the power supply board. The +5 volts is adjusted later after warmup.

<u>Voltage</u>	<u>Location</u>	<u>Reading</u>
+36	2 PC1-TB2-5	33.12 to 38.88
+5	7PC3-R-162	4.99 to 5.01
+12	2 PC1-P1-3	11.4 to 12.6
-12	2 PC1-P1-1	-11.4 to -12.6
Ref.	5TB4	Ground

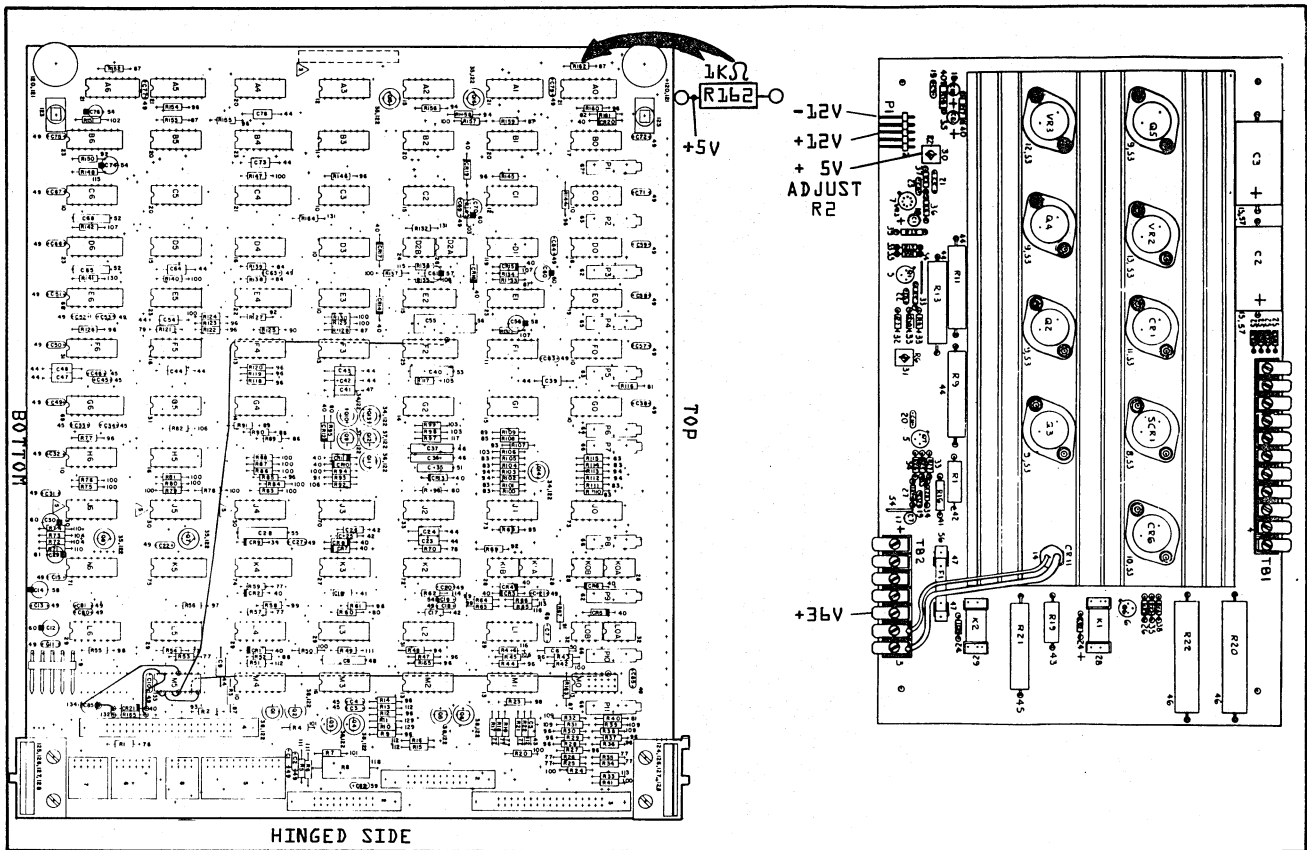


FIGURE 2-8. D. C. VOLTAGE LOCATOR

6. Install the forms referring to the Operation section and the Interface Adaptor or Special options manual.
7. Close the gate and pause for the band Up-To-Speed delay to time out (5-9 seconds). Depress the START/STOP switch. The START lamp should illuminate and the STOP lamp should turn off. If the START lamp does not illuminate check for the following conditions:
 - a. Print gate not latched securely.
 - b. Print band not installed properly.
 - c. Band Cover not installed properly.

If none of these conditions exist refer to the 7PC3 board and its logic (Reference No. 0305, and 0306).

8. Depress STOP switch. Remove the forms from the right tractor and depress the FEED switch. The FEED indicator should light. To clear the fault, reinstall the forms and depress the START switch.
9. Place the printer in the Start condition. Activate the print gate latch without opening the gate. The printer should switch to the Stop condition.
10. Place the printer in the Start condition. Release and raise the band cover. The printer should switch to the Stop condition.

11. Go back to step 5 and check the +5 volts again. If the +5 volts is not to specification adjust the potentiometer, R2, (See Figure 2-8) to achieve the proper voltage. There is no adjustment for the ± 12 volts and the +36 volts. If these voltages do not meet specification, either the circuit board must be replaced, repaired, or the a. c. input is not wired correctly.
12. Check the analog compensation network 30v reference using a digital voltmeter.

<u>Voltage</u>	<u>Location</u>	<u>Reading</u>
30v	(TP12 old) (TP11 new) 7PC3	29.99 to 30.01

(see Table 5-4 for Bd. TP's)
Adjust the potentiometer, 7PC3-P2 until the voltage meets specification.

13. If the optional variable form length counter is installed below the control panel refer to the Optional Feature Operation at the back of Section 3. Set the thumbwheel switch below the control panel for the number of lines on each form. The printer will skip three lines between forms when the thumbwheel count is set correctly (with Perf. skip option). If the Electronic Vertical Format Unit option is already installed the thumbwheel switches are disabled. Refer to the special option EVFU manual.

14. With the printer powered -off, (power plug removed), connect the I/O cable. This procedure assumes a standard I/O connector is installed on the printer, or supplied as a kit, plugging directly into the 7PC1 board. A board in location 7PC4, or 7PC5 indicates an I/O adapter is installed and the Section 0 (zero) of the manual, or an Interface Adapter manual should cover the printer checkout. If an I/O connector is not installed on the printer, or if an I/O kit is supplied with the printer, proceed and install the I/O. The standard I/O connector is either located on the lower back of the printer cabinet or facing down on the chassis. The chassis connector is accessed by removing the lower front panel and reaching up toward the bottom of the chassis between the blower and power transformer. Refer to Figure 2-10 in fabricating a mating I/O cable.
15. Connect the plug and with the printer powered-up in the stop mode, gate closed, forms and ribbon installed, and the band cover in place, depress the Start switch.
16. Initiate a data transfer from the processor. Check to be sure the correct data is being printed. When data is incorrect check, data source, Input Print board, Character and Home Pulse setup.
17. Check ribbon tracking at different times to make sure the ribbon does not curl over at the top or bottom in both directions. Make sure the ribbon switches directions at both ends. Refer to Ribbon tracking adjustment.
18. Adjust the Phasing control on the Control Panel so characters are not being clipped on either side. Check the range of the adjustment on single and multiple part forms. Refer to Character and Home Pulse setup.
19. Review the printout for print quality:
 - a. Density
 - b. Groups of characters clipped on one side.
 - c. Vertical registration
 - d. Horizontal registration
 Refer to Corrective Maintenance.
20. If performance appears correct, proceed and install any kits or options supplied. Refer to the checkout section of the manuals for those kits installed.

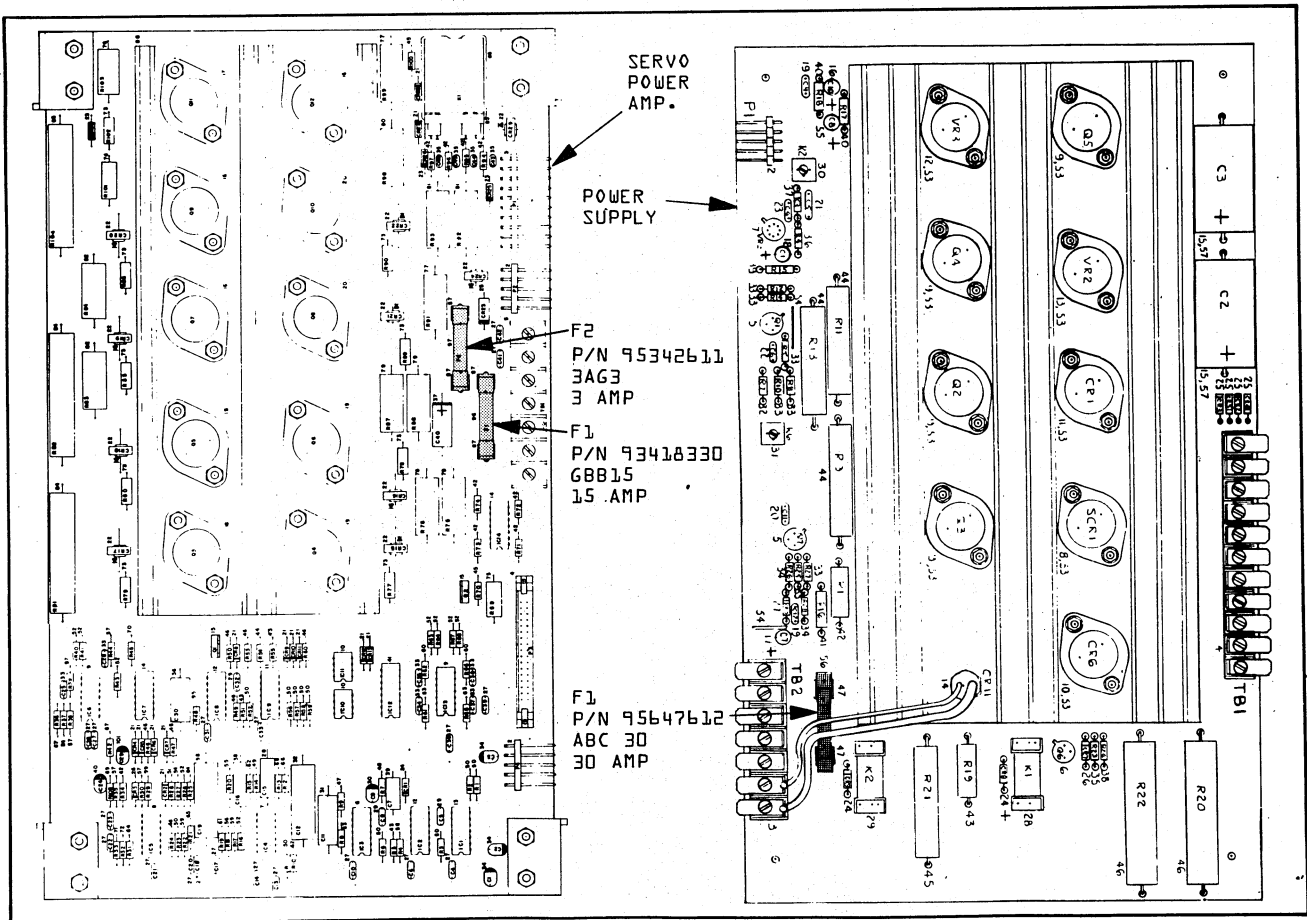
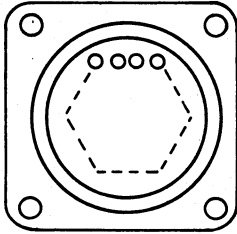
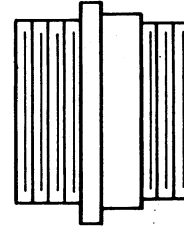


FIGURE 2-9. FUSE LOCATOR

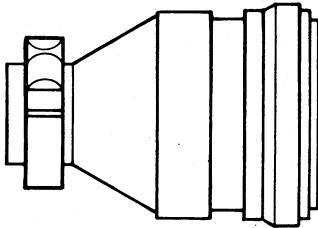
PIN CONTACT
P/N 93644003
AMP 66106-3



RECEPTACLE
P/N 59569302
AMP 206151-1

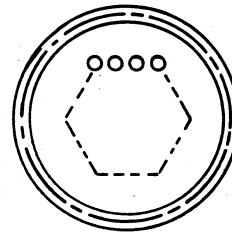


CHASSIS MOUNTED



PLUG
P/N 59569301
AMP 206150-1

I/O CABLE MOUNTED



SOCKET CONTACT
P/N 93645003
AMP 66108-3

<u>PIN NO.</u>	<u>SIGNAL</u>	<u>PIN NO.</u>	<u>SIGNAL</u>
1	<u>DATA BIT 1</u>	20	<u>ACK RETURN</u>
2	<u>DATA BIT 1 RETURN</u>	21	<u>READY</u>
3	<u>DATA BIT 2</u>	22	<u>READY RETURN</u>
4	<u>DATA BIT 2 RETURN</u>	23	<u>BUSY</u>
5	<u>DATA BIT 3</u>	24	<u>BUSY RETURN</u>
6	<u>DATA BIT 3 RETURN</u>	25	<u>MASTER CLEAR</u>
7	<u>DATA BIT 4</u>	26	<u>MASTER CLEAR RETURN</u>
8	<u>DATA BIT 4 RETURN</u>	27	<u>PAPER OUT</u>
9	<u>DATA BIT 5</u>	28	<u>PAPER OUT RETURN</u>
15	<u>DATA BIT 5 RETURN</u>	29	<u>GROUND</u>
14	<u>DATA BIT 6</u>	31	<u>DATA BIT 9</u>
13	<u>DATA BIT 6 RETURN</u>	32	<u>DATA BIT 9 RETURN</u>
12	<u>DATA BIT 7</u>	30	<u>COMPRESSED PITCH</u>
11	<u>DATA BIT 7 RETURN</u>	33	<u>COMPRESSED PITCH RETURN</u>
10	<u>DATA BIT 8</u>	34	<u>BAND DETECTED 2¹</u>
16	<u>DATA BIT 8 RETURN</u>	35	<u>BAND DETECTED 2¹ RETURN</u>
17	<u>STROBE</u>	36	<u>BAND DETECTED 2⁰</u>
18	<u>STROBE RETURN</u>	37	<u>BAND DETECTED 2⁰ RETURN</u>
19	<u>ACK</u>		

FIGURE 2-10. INTERFACE CONNECTOR CONFIGURATION

OPERATION

INTRODUCTION

This section contains information the operator needs to operate and maintain the line printer. A Section 0 (zero) if incorporated at the front of this manual may cover additional controls and functions required to operate the printer. An Interface Adapter or special options manual if supplied with the printer may modify its operation and should be referenced before continuing. There are three parts to this section, Operation, Maintenance, and Option Feature Operation. The operation section lists the controls and adjustments available to

the operator and provides detailed procedures for forms loading and alignment, band installation, and ribbon installation. The maintenance section covers the normal maintenance operations required on the line printer. These operations include printer cleaning, changing the ribbon shield, correcting operator malfunctions, and recognizing symptoms of major malfunctions to relate to a qualified service representative. The Option Feature Operation section covers the function of standard options available on the printer.

OPERATION

PRINTER INDICATORS AND CONTROLS

To operate the printer properly it is necessary to have an understanding of the functions of all the switches,

indicators, and adjustment controls provided for the operator. The switches and indicators provided in the printer include the power ON/OFF switch, the START/

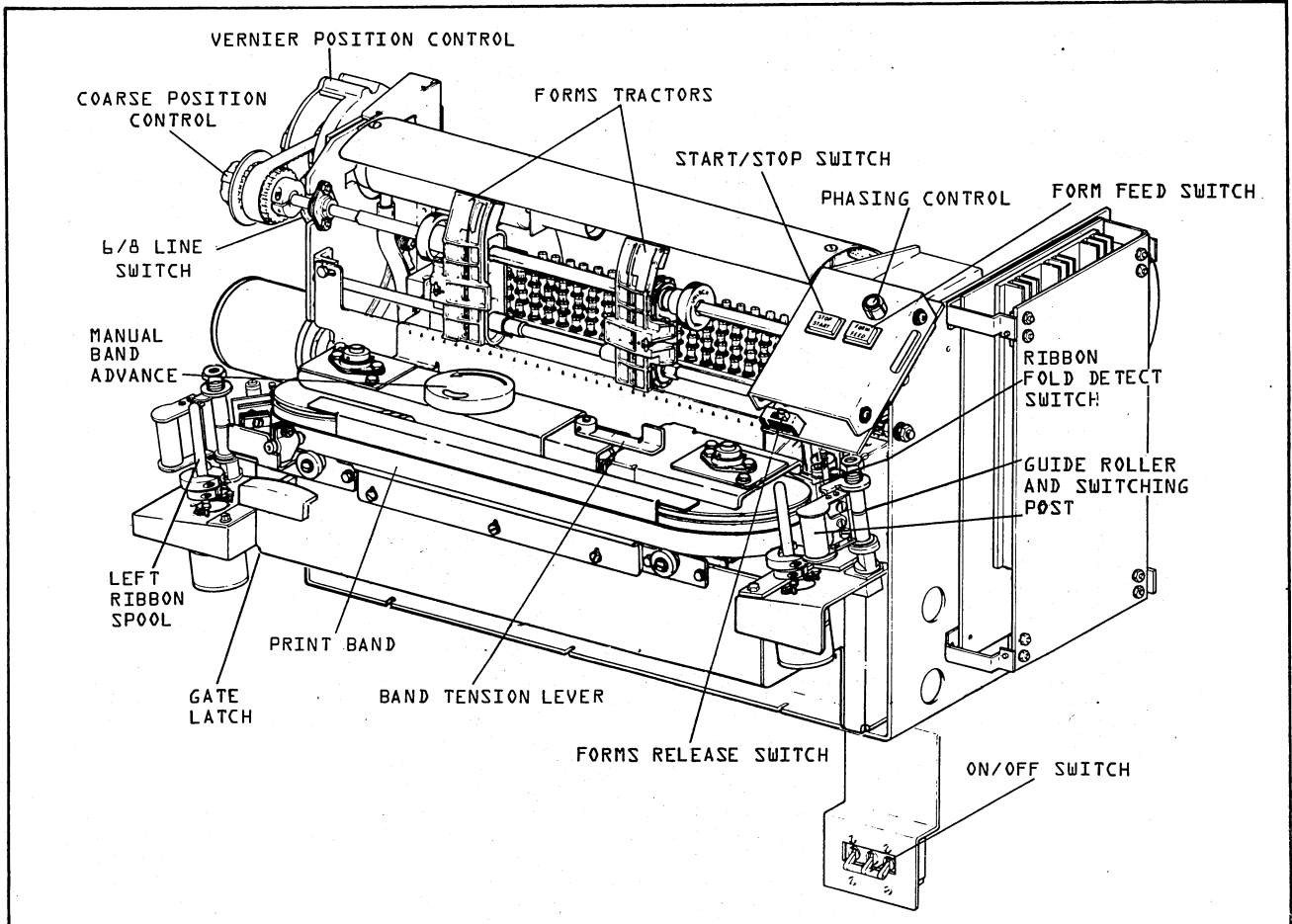


FIGURE 3-1. PRINTER INDICATORS AND CONTROLS

STOP switch/indicator, the FORM FEED switch/indicator, the 6/8 Line switch, the FORMS RELEASE switch. The operator adjustments include the Phasing Control, the Manual Vertical Adjustment Controls, and the horizontal positioning of the forms tractors.

ON/OFF Switch

This is a non-illuminated switch located in the front of the printer. Actuation of this switch causes AC power to be applied to all printer power circuits. This switch is also the main circuit breaker for the printer. Once power has been applied, this switch may be actuated at any time to remove power from the machine.

NOTE

THE UNIT SHOULD NOT BE REACTIVATED FOR A PERIOD OF AT LEAST THREE SECONDS. THE POWER SHOULD NOT BE CONSECUTIVELY CYCLED ON AND OFF FOR MORE THAN 3 TIMES WITHOUT A FIVE MINUTE OFF TIME.

START/STOP Switch Indicator

This is an illuminated momentary contact pushbutton switch/indicator. Depression of this switch causes the printer controller to go Ready if the printer was in the Not Ready mode and no detectable faults exist.

A 150 nsec, controller Start Clear is also generated and completed prior to the printer going Ready. The Ready state will be maintained until the START/STOP switch is again depressed, or a detectable fault occurs, removing the Ready condition.

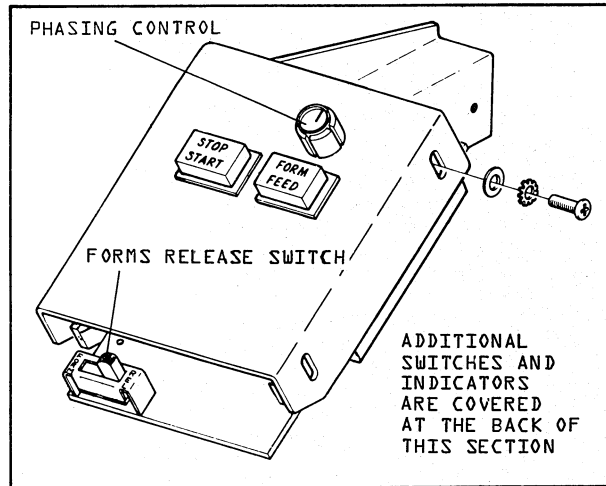


FIGURE 3-2. CONTROL PANEL

Depressing the START/STOP switch while the printer is printing or moving paper will not inhibit these functions from being completed; however, new data cannot be loaded until the START/STOP switch is again depressed and the Ready Condition is established.

Depression of the START/STOP switch also clears a Forms Error or a Line Space Error.

If the START/STOP switch is depressed during a load cycle, printer will go to the not Ready condition and the printer will not respond to further data and the line will not be printed.

When in the Ready condition, the START portion of the indicator is illuminated. Depression of the START/STOP switch when Ready, causes the STOP portion of the indicator to be illuminated. When a Customer Engineer (CE) Fault occurs the STOP portion of the indicator will blink until the fault is corrected and the printer is powered down and back on again.

A Customer Engineer (CE) Fault causes the printer to desequenece the +36 VDC power supply off. To re-start, the printer must be powered off and then on after three seconds in the off state.

FORM FEED Switch/Indicator (illuminated)

This is a momentary contact, pushbutton switch/indicator. Depression of this switch causes the paper motion system to advance to the Top of Forms. This switch is only active when the printer is in the Not Ready (Stop) condition.

The indicator is illuminated when either a forms error or line space error is detected to alert the operator of either a paper jam, tear, or line space error. The indicator is extinguished after any paper problem is corrected and the START/STOP switch is depressed to clear the fault electrically.

FORMS RELEASE Switch

This is a momentary contact switch which, when slid sideways and held, allows the operator to manually advance the paper via the manual vertical adjust knob. This switch is located on the control panel and is accessible to the operator when the bonnet is open. (See the Forms Installation Procedure for a detailed description of the usage of this switch.)

Phasing Control

Adjustment by the operator to achieve proper horizontal character phasing is accomplished through a rotary control located on the control panel. When various thickness form sets are interchanged (single to 6 part), adjustments to the horizontal character phasing are required. Observe the sides of the characters for clipping. Adjust the Phasing Control until the full character is seen on both left and right sides.

Fixed Forms Length. The Fixed Forms Length Auto Perforation Skip feature automatically prints 63 lines and skips three when in the 6 LPI mode or automatically prints 85 lines and skips three when in the 8 LPI mode.

6/8 Line Switch

The 6/8 line switch in a non-illuminated switch located in the paper motion reader assembly. Its purpose is to allow selection of either 6 LPI or 8 LPI vertical line spacing.

NOTE

ACTUATION OF THIS SWITCH SHOULD ONLY OCCUR WITH THE PRINTER IN THE STOP MODE FOLLOWED BY AT LEAST ONE FORM FEED. IMPROPER SPACING MAY OCCUR IF THIS PROCEDURE IS NOT FOLLOWED.

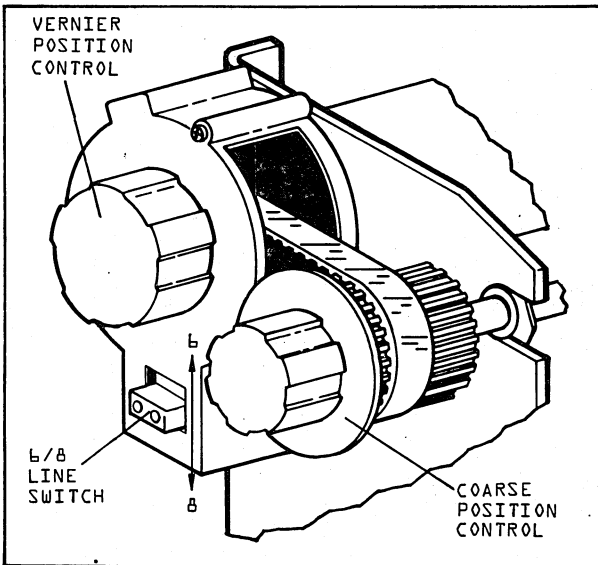


FIGURE 3-3. FORMS HANDLING CONTROL

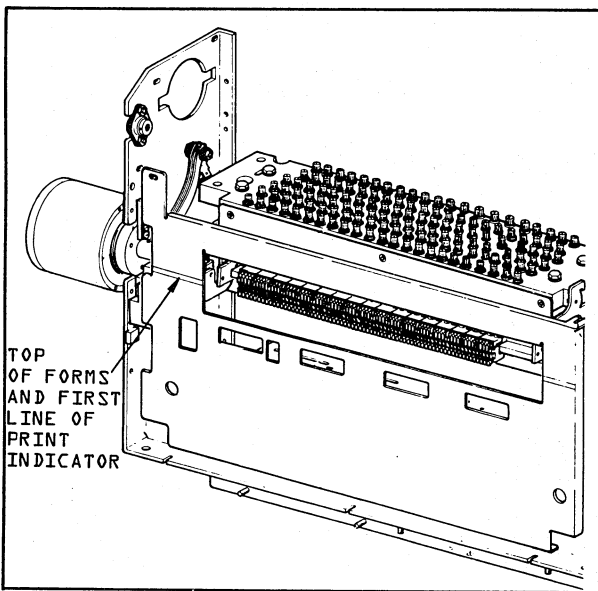


FIGURE 3-4. TOP OF FORM

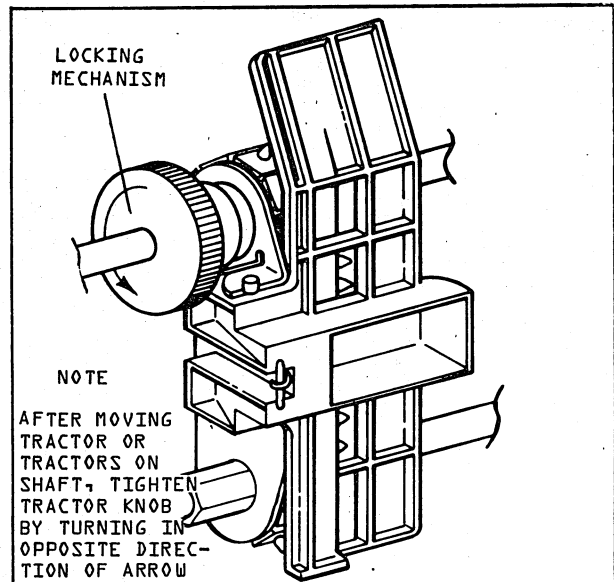


FIGURE 3-5. TRACTOR LOCKING

Manual Vertical Adjustment Controls

Coarse Position Control. The Forms Release Switch on the control panel deactivates the vertical advance drive. This switch releases the vertical system and allows the operator to set forms position by rotating the Coarse Position Control. When the Forms Release Switch is released the vertical advance system will position the forms to the nearest line position.

Vernier Position Control. The vertical advance Code Disc Reader provides fine positioning adjustment. Mounted at the end of the vertical advance motor shaft, it can be rotated manually, with corresponding forms motion, to set the form to any desired point within .5 inch (12.7mm). This adjustment should be made with the print gate open to avoid interference from the forms clamps. The Top Of Form (TOF) may be aligned with the aid of the TOF indicator (see Figure 3-4).

Horizontal Forms Positioning

The horizontal position of the forms is adjusted by moving the forms tractors. The tractors are held in place by spring locking devices located on the outside of each tractor. Rotating the locking devices toward the rear of the printer allows the tractors to be moved to their desired positions. When the locking devices are released they require a slight physical pressure in the locking direction to lock the tractor in place. The left tractor, when positioned to the extreme left, provides a maximum forms margin of 2.38 inches (3.5 cm) to the first print hammer. The right tractor can then be positioned to accommodate forms from 4 to 16.75 inches (10, 16 to 42.54 cm) wide. A column finder scale is mounted on top of the ribbon shield to aid in horizontal positioning. It is necessary to open the print gate to avoid interference from the forms clamps.

SAFETY INTERLOCKS AND ERROR DETECTION

The printer is equipped with several safety interlocks and error detection circuits. The purpose of these features is to protect the operator and the equipment in cases of malfunction or oversight. Some of the interlocks and error detection circuits are not operator correctable and are, therefore, classified as C. E. faults. This type of fault is usually indicated by the STOP indicator blinking on and off. The operator should check the Operator Fault Isolation chart in Table 3-3 and follow the action required. A further description of the Customer Engineer faults is given in the Maintenance section of this manual. The following list and description of the interlocks and error detection circuits contains only those which can be corrected by operator intervention.

Print Gate Switch

This switch opens anytime the gate latch is activated and remains open until the gate is again latched securely. When the switch is open, power is removed from the ribbon motors and the band motor. The printer can not be placed in the START condition with the gate unlatched. There is approximately 7 seconds of delay time between the time the gate is latched and the time the printer can be placed in the START condition. The purpose of this delay is to allow enough time for the band to reach its proper speed for printing before allowing the printer to go on-line to the data source.

Forms Error

A Forms Error condition occurs anytime a paper jam or paper tear condition is detected in the printer. Paper jams or paper tears are detected by a photo-electric sensor mounted in the right tractor. The sensor detects the absence of forms feed hole movement after 26 lines of a paper should have moved. If one of these faults is detected the FORMS FEED indicator is illuminated and the printer is transferred to a STOP condition. After the fault has been corrected, the indication should be cleared by depressing the START/STOP switch.

Line Spacing Error

A Line Spacing Error condition occurs anytime the printer electronics calculates that an erroneous signal has been received from the Code Disk Reader. When this error condition is detected the FORMS FEED indicator is illuminated and the printer is transferred to the STOP condition. This fault can be cleared by depressing the START/STOP switch. If this error continues to occur, it should be treated as a Customer Engineer, fault and the local service representative should be called.

Band Cover Switch

This switch opens anytime the band cover is removed. When this switch is open, power is removed from the ribbon motors and the band motor. If the cover is not in position the printer cannot be placed in the Start mode.

Ribbon Fold Detect Switches

These switches are used to monitor the edges of the ribbon in case the ribbon starts to fold in which case the printer is stopped. One switch is located at each end by the ribbon spools. The switches are opened to remove the ribbon and must be closed.

Band Not Identified

This error condition occurs when the print band is not installed properly in the printer or the band is installed upside down. In this situation the printer is unable to go to the Start condition until the band is properly installed.

In this condition the band motor does not power down after 30 seconds, but continues to run until the printers power is turned off on the lower front of the printer.

Out of Paper

An Out of Paper switch in the gate monitors the presents of forms. An O. O. P. signal is available at the I/O connector for the processor to stop sending data.

PRINTER START-UP PROCEDURE

1. Plug the printer into a suitable a. c. power source.
2. Open the bonnet and the print gate.
3. Install the print band. (See the Band Installation Procedure in this section.)
4. Install the print ribbon. (See the Ribbon Installation Procedure in this section.)
5. Install the band cover.
6. Turn on the main circuit breaker. (ON/OFF Switch).
7. Install forms in the printer. (See the Forms Installation Procedure in this section.)
8. Close and latch the print gate.
9. Depress the START/STOP switch. The START indicator should be illuminated. If the printer does not go to START, see the Fault Isolation Table in this section.
10. Close the printer bonnet. The printer is now ready for operation.
11. During the initial printing, adjust the Phasing Control for optimum print-out. (No clipping is visible on the sides of any characters.)

BAND INSTALLATION

The print band installed in the printer contains the printable character font for the printer. There are four different size fonts possible (48, 64, 96, and 128 characters) and two possible pitches, standard and compressed. The standard pitch band prints 132 or 136 columns on 0.1 inch (2.54 mm) centers. The compressed pitch band prints 198 or 204 columns on 0.067 inch (1.70 mm) centers. The font size and character pitch is detected automatically by the printer. The operator can use any 64 or 96 character band in any of the printers. The 48 and 128 character bands are optional and require the addition of a Programmable Read Only Memory (PROM) to the printer electronics. The 48 and 128 character PROM's are mutually exclusive. Therefore, when one of the PROM's is installed, the printer is operational for the 64 and 96 character bands and either the 48 or 128 character bands. PROM's should be installed in the printer by a Customer Engineer and then an operator may interchange the selected bands as required.

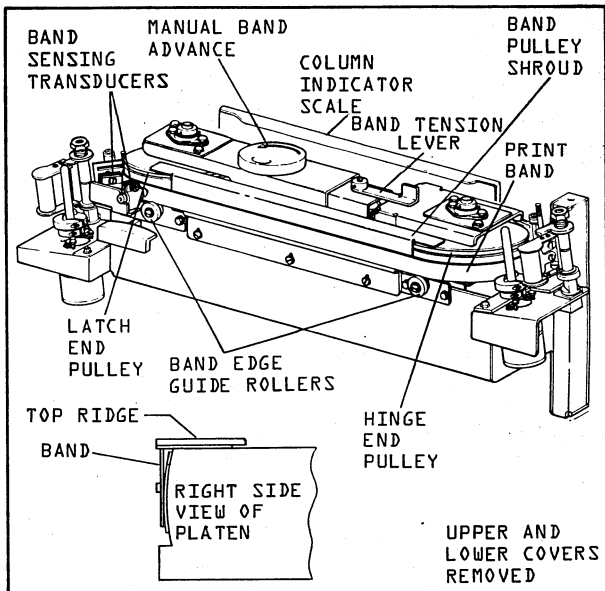


FIGURE 3-6. BAND INSTALLATION

Should a print band break call a Customer Engineer for replacement of the platen wear strip on the platen before installing a new band.

When handling the band, reasonable care should be exercised to maintain band reliability. The band should not be twisted, scratched, dented, or bent to a radius smaller than 4 inches (101.6 mm).

1. Open the bonnet and the print gate.
2. Remove the protective cover from the print gate.
3. Rotate the band tension lever clockwise until it contacts the stop. Remove the old band if one is already installed. Refer to Figures 3-6, and 3-7. Lift the band up off both pulleys.
4. Loop the new print band around the latch end band pulley with timing marks to the bottom, characters right side up.
5. Loop the other end of the print band over the hinge end band pulley. The band should rest on the band edge guide rollers.
6. Rotate the band tension lever counter-clockwise until tension begins to tighten the band, then rotate the manual band advance to seat the band against the upper ridge of the platen. If the band seats against the upper ridge on the platen then complete the rotation of the band tension lever until it contacts the stop. This will place tension on the band.

7. Rotate the Manual Band Advance Knob again to make sure the band doesn't ride up over the upper ridge of the platen. The platen is the surface the hammers press the band against during printing. The band must track against the top ridge of the platen or printing will appear slanted or clip the top or bottom off characters. Refer tracking problems to the Customer Engineer.

NOTE

The band will not rotate until the protective cover is in place and the gate is closed.

8. Replace the protective cover and close the print gate.
9. The print band is now ready for operation.

RIBBON LOADING

The ribbon employed in the printer is 24 yards (22 meters) long and 2 inches (50.8 mm) wide. The ribbon is designed to last 300,000 lines at 30% print density when the printer is not in a compressed pitch mode. In compressed pitch a special band is used and the columns printed per line increased, decreasing ribbon life to 100,000 lines. For heavy left or right justified print patterns, the ribbon spools must be swapped end for end every 50,000 lines to achieve full ribbon life. Care should be exercised when handling the ribbon to prevent permanent staining of clothing.

1. Open the printers bonnet.
2. Remove the plastic band cover over the front printer gate as follows; Twist the two top quarter turn fasteners a quarter turn counter clockwise, lift the cover slightly and move to the left to clear the control panel.
3. Open the gate as required when removing the old ribbon, or installing a new one.
4. Remove the old ribbon, if one is installed, by opening the left and right fold detect switches. The fold switches open by pressing down on the knurled post and turning counter clock-wise.
5. Work with one spool at a time and carefully rotate the spool to loosen the ribbon. Care should be taken not to get cut turning the spool. The ribbon slacks by turning the right spool clockwise and the left spool counter clockwise on printers with guide rollers, without guide rollers turn the spools in the opposite direction.

6. Pivot the guide roller away from the spool on printers with guide rollers. The spools are then removed by pulling up on one spool at a time, clearing the roller if installed by moving the ribbon around the outside. Raise the ribbon up from between the fold detect sensor. Press the ribbon down to clear the hook at the top of the guide post. Repeat the step to remove the other ribbon spool.
7. Remove any ribbon lint buildup especially around the band sensing transducers (see Figure 3-7).
8. Printers with guide roller ribbon systems require ribbons on plastic spools. Place the new ribbon spool on the latch end ribbon drive post so that ribbon feeds off the in-board edge of the spool on printers with guide rollers, or off the out-board edge on printers without guide rollers. The ribbon spool may have to be rotated up to one-half turn before it is engaged by the drive post.
9. Route the ribbon around the outside of the guide roller and its switching post or just the switching post on printers without guide rollers. Slip the ribbon through the open fold detect switch, then under the folded portion of the guide post. The ribbon should run under the folded upper (hook) portion of the ribbon guide bracket, away from the ribbon spool. Feed the ribbon across the print area between the ribbon shield and band, then over the left flexible band guide to the opposite ribbon guide.
10. Route the ribbon around the hinge end guide post and under the hook at the top. Feed the ribbon through the open fold detect sensor. Wrap the ribbon on the outside of the switching post and its guide roller (if installed). Printers with guide rollers require the guide roller to be swung out away from the spool drive sprocket before positioning the spool. Then drop the spool on the hinge end drive post. The spool may have to be rotated up to one-half turn before it is engaged by the drive post.

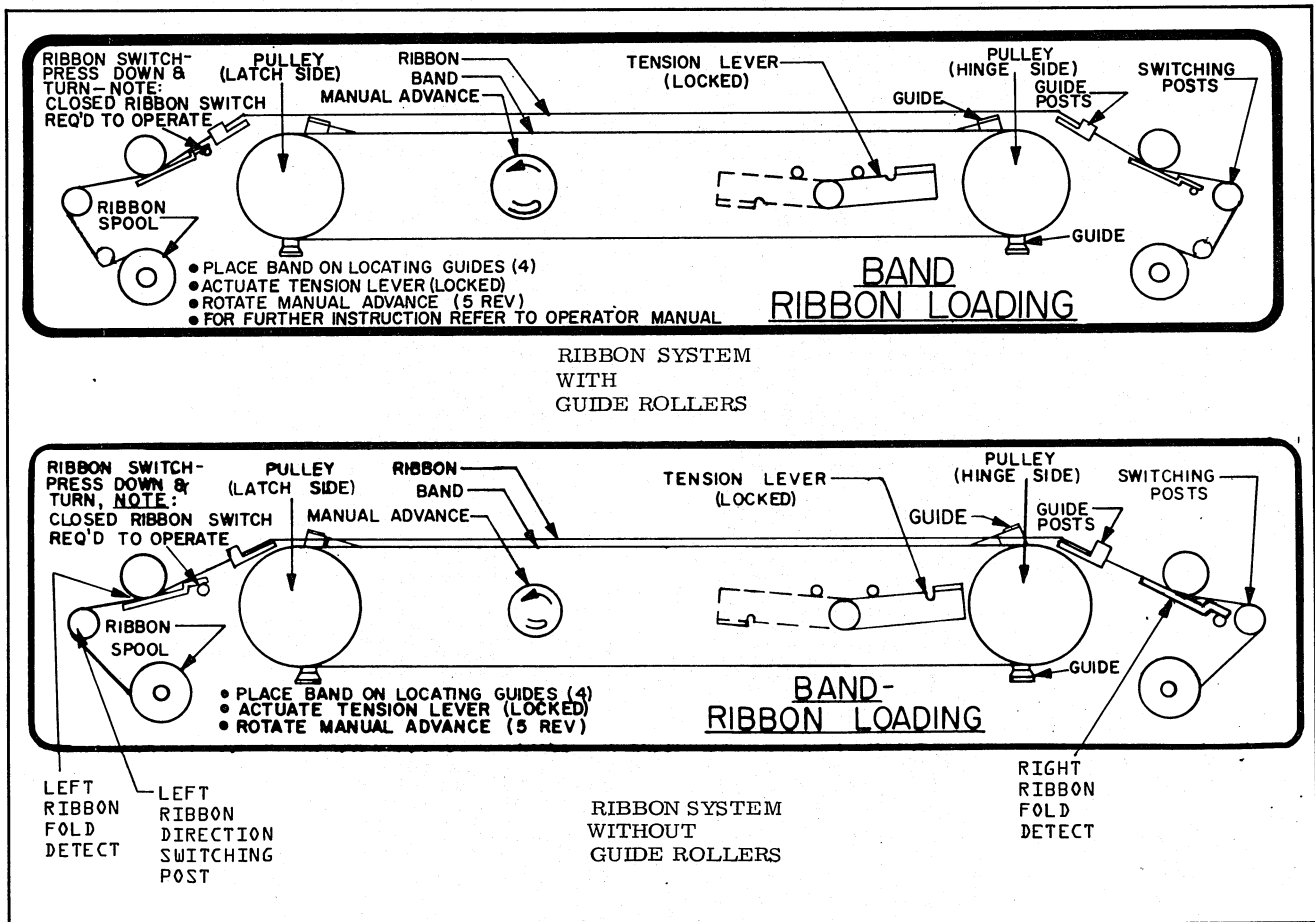


FIGURE 3-7. RIBBON/BAND INSTALLATION

11. Check the location of the ribbon reversing foil at the near empty ribbon spool. The foil is fastened near the end of the ribbon and must be positioned between the spool and the switching post or wound on the spool. Rotate the ribbon spools to take up any ribbon slack before closing the gate.
12. Close the fold detect switches by twisting the knurled post clockwise, post jumps up slightly when closed.
13. On printers with guide rollers the rollers must access the ribbon spool flanges freely without hanging on the outer edge of the spool flange.
14. Close the printers gate and replace the protective cover over the print gate band system.

NOTE

The ribbon motors are interlocked and will not run unless the protective cover is in place.

15. The ribbon system is now ready for operation.

FORMS LOADING PROCEDURE

If the printer is to be used in the compressed pitch mode, the minimum forms weight for single part forms is 15 pounds. Also, multipart forms are limited to four part forms in compressed pitch.

1. Open a box of forms and remove the forms from the box.
2. Position the forms below the print gate at the front of the printer. Printers with quiet cabinets require the lower front door to be opened and the forms positioned on the paper shelf.
3. Open the bonnet and the print gate. Raise the first form up to the front of the printer. The front of the forms should be facing the operator or the forms stack must be turned around.
4. Power the printer On and open the Tractor flaps.

5. Install the forms in the left tractor and close the flap.
6. Adjust the tractor for the desired left margin.
7. Install the forms in the right tractor and adjust its position for the proper horizontal tension.

NOTE

Forms tension should be set tight enough to remove any forms slack between the tractors, but not tight enough to cause elongation of the forms feed holes. Lock the tractors in place with a slight pressure on the release knobs in the locking direction.

8. Depress the FORM FEED switch.
9. Refer to the Option Feature Operation at the back of this section for instructions and identification of the following options: Auto Perf Skip, Variable Form Length, and Electronic Vertical Format Unit (EVFU).
10. Hold the FORMS RELEASE switch on and use the Coarse Positioning Control to set the top of forms position. Line Finder marks, corresponding to the hammer faces, are provided on the shroud to aid in alignment (see Figure 3-6).
11. Open the gate and depress the FEED switch a second time and use the Vernier Positioning Control to fine adjust top of forms.
12. Feed the forms out the back of the bonnet.
13. Close the print gate and bonnet. On quiet cabinet models close the front door.
14. Advance forms until a forms stack is started.
15. The forms are now ready for printing.

OPERATOR MAINTENANCE

PRINTER CLEANING

The printer cabinet should be cleaned periodically using any commercially available household cleaner. The bonnet window should only be cleaned with water and a non-abrasive cloth.

A vacuum cleaner with a soft nozzle should be used to clean the paper dust and ribbon dust from the print station and print gate. A thorough cleaning should be performed at least weekly and lint removed from band transducers at ribbon changes.

OPERATOR SUPPLIES

Operator supplies consist of the consumable items an operator needs to operate and maintain the line printer. These items include cleaning materials, ribbon shields, ribbons, forms, and bands.

Cleaning Materials

These materials include several non-abrasive rags and any mild commercially available cleaning solution. A soft bristle brush may also be included in the cleaning supplies in place of a vacuum cleaner with a soft nozzle. Chlorothene-Nu solvent is used to clean the adhesive used to hold Mylar Ribbon Shields in place.

Mylar Ribbon Shields

Mylar ribbon shields are changable by the operator and, thus are classified as an operator supply. The shields must be changed periodically to maintain optimum print quality. The procedure for changing the mylar shield is covered in the Ribbon Shield Replacement procedure in this section.

Ribbons

The ribbons employed in the printer are 24 yards (22 meters) long. Their width may vary from 1.97 to 2.06 inches (50.04 to 52.32 mm). The aluminum foil strips mounted at each end should be the same height as the ribbon and from 1 to 1.5 inches (2.54 to 38.1 mm) wide. The strips should be .004 to .006 inch (0.1 to 0.15 mm) thick, and they should be located 12 to 13 inches (304.8 to 330.2 mm) from each end of the ribbon. The standard ribbons are .005 inch (0.127 mm) thick. OCR ribbons, that are .003 inch (0.076 mm) thick, may also be used, but they will result in a decreased ribbon life. See the recommended Ribbon Table for the types of ribbons available.

Forms

The printer can handle marginally perforated fan-fold paper and card stack from 4 to 16.75 inches (101.6 to 425.45 mm) wide and 8 to 14 inches (203.2 to 355.6 mm) long form fold to fold. The forms must have sprocket holes punched along both margins. These holes must be .151 to .161 inch (3.84 to 4.09 mm) in diameter and their centerlines must be located .247 to .253 inch (6.27 to 6.43 mm) from the paper edge. The distance between hole centerlines must be between .495 and .505 inch (12.57 and 12.83 mm) non-accumulative. The top and bottom drive holes (4 holes total per sheet) may be oversized to .200 inch (5.08 mm) in diameter to allow ring binding of the final printout.

Any multipart forms used in the printer must be fastened with crimps every two inches (50.8 mm) along both sides of the forms. The crimps must not come closer than .50 inch (12.9 mm) to the form fold. Each crimp must have four prongs, two of which enter the forms and the carbon and two of which enter the forms only.

CAUTION

NO MECHANICAL STAPLES, METAL OR PLASTIC, MAY BE USED TO HOLD THE PAPER STOCK OR CARBONS TOGETHER.

The maximum forms thickness the printer can handle is .020 inch (0.508 mm) in the print area. Across the crimp fastenings this dimension may be expanded to .030 inch (0.762 mm). See the Recommended Forms Table for a list of general purpose forms.

RIBBON MYLAR SHIELD REPLACEMENT

The ribbon mylar shield is designed to be operator changable. The end of life of the shield is determined by its inability to prevent marking or smudging of the forms by the ribbon. This condition should not occur more than once per 3 million print lines. If the mylar shield is not correctly aligned it may effect the adjustment of the ribbon shield. Misalignment can cause poor print quality, ribbon smudging, interference noise, binding ribbon and tearing or jamming of the forms. Replacement shields come with the double sided tape already in position. To replace the shield perform the following procedure:

1. Open the print gate and remove the old ribbon shield and all the old tape residue using Chlorothene-Nu, solvent (1 gallon or 3.79 liters) or masking tape. Masking tape may be placed over old tape residue and then removed taking off the residue.

TABLE 3-1. RECOMMENDED RIBBONS

DESCRIPTION	INK	THICKNESS
MULTIPURPOSE	BLACK	.005 in. (0.127mm)
OFFSET	BLACK	.005 in. (0.127mm)
MULTIPURPOSE	PURPLE	.005 in. (0.127mm)
MULTIPURPOSE	BLUE	.005 in. (0.127mm)
OPTICAL CHARACTER	BLACK	.003 in. (0.076mm)
RECORD OR OCR	BLACK	.004" (.106 mm)

TABLE 3-2. RECOMMENDED FORMS

<u>PARTS</u>	<u>WHITE SULPHITE BOND</u>	<u>CARBON INSERTS</u>
* 1	15 lb (56.69g/m ²)	
1	20 lb (75.85g/m ²)	
1	24 lb (90.23g/m ²)	
1	99lb (160.4g/m ²) (card Stock)	
2, 3, or 4	15 lb (56.69g/m ²) first part 12 lb (45.11g/m ²) copies	7-1/2 lb (28.19g/m ²)
5	15 lb (56.69g/m ²) first part 12 lb (45.11g/m ²) last part 10 lb (37.63g/m ²) inner leaves	7-1/2 lb (28.19g/m ²)
6	12 lb (45.11g/m ²) all parts	5½ (20.68 g/m ²)
6	12 lb (45.11g/m ²) first part 10 lb (37.63g/m ²) all copies	5½ (20.68 g/m ²)

*Minimum acceptable single part paper weight.

2. Remove the non-stick covering from the tape on the new shield.
3. Position the shield so that the holes in the shield align with the locating pins on the outer paper guide.
4. Press firmly around the taped edges of shield to secure the shield to the outer paper guide.

There should be no bowing or creasing across the surface of the shield (Refer to Section 5, Outer Paper Guide Adjustment).

OPERATOR FAULT ISOLATION

There are minor malfunctions affecting the operation of the printer which may be corrected by the operator. The Fault Isolation Table is designed to provide the operator with a quick reference to the type of problem he is capable of correcting. Anytime a problem is not operator correctable, the service representative should be called. The operator should be able to provide the service representative with a clear and concise description of the problem and, if applicable, provide a print sample of the problem.

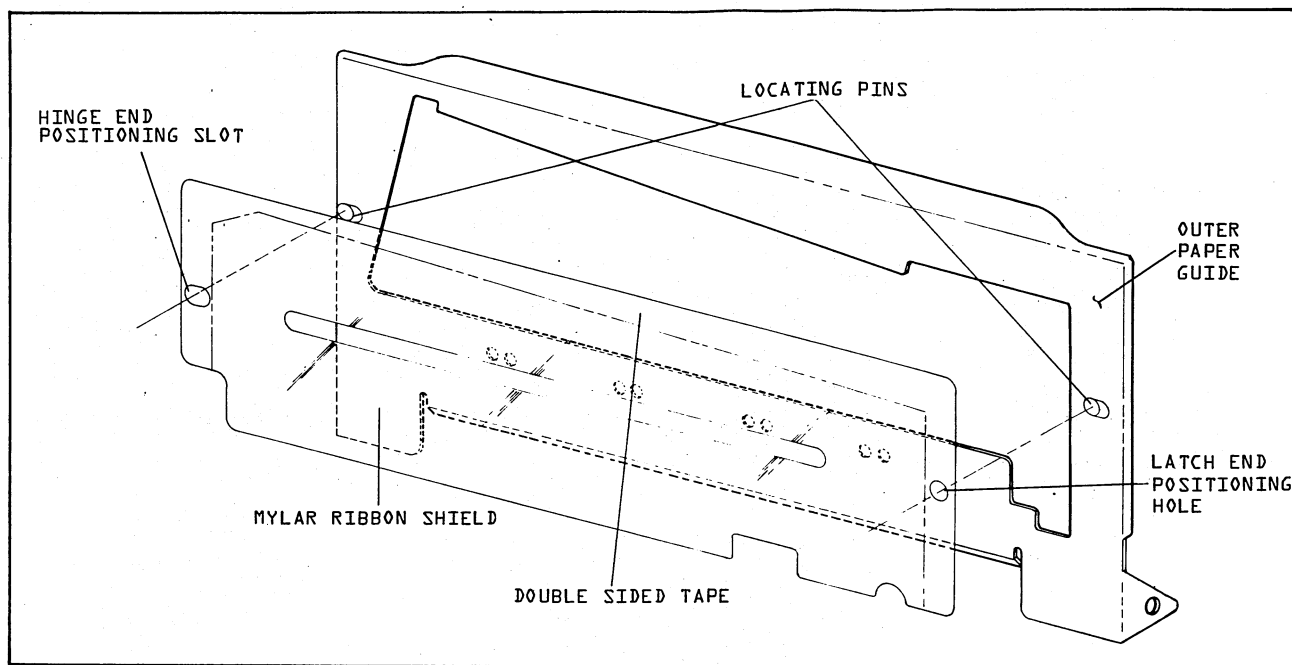






FIGURE 3-8. RIBBON MYLAR SHIELD INSTALLATION

TABLE 3-3. OPERATOR FAULT ISOLATION

 NOTE: ALWAYS REFER TO THE FAULT ISOLATION TABLE IN ANY ADAPTER MANUAL SUPPLIED
REFER TO SPECIAL OPTION MANUAL WHEN AN EVFU IS INCORPORATED

SYMPTOM	PROBABLE CAUSE	ACTION REQUIRED
A. Printer can not be powered on (no lights or motor sounds).	A1. Printer is not plugged in. A2. Problem is not operator correctable.	A1. Locate the plug and reconnect. A2. Call the Service Representative.
B. Printer does not go to START, STOP indicator is flashing.	B1. Problem is not operator correctable.	B1a. Power the printer off then 3 sec. later on again. Attempt restart. B1b. If problem persists, call the Service Representative.
C. Printer does not go to START or FEED indicator is illuminated. 	C1. Forms tear or jam has been detected. C2. Line Spacing error has been detected.	C1. Reinstall forms and set up top of form, then press START. C2. Press START. If fault continues to be detected call Service Representative.
D. Printer does not go to START No additional indication.  *Printers with Start/Stop Control on special interface boards will receive a fault signal but may not hold the printer in a Stop mode.	D1. Print gate is not latched securely D2. Print band is not installed. *D3. Ribbon has folded. D4. Band cover not latched. D5. EVFU option not loaded. D6. Problem is not operator correctable	D1. Close and latch print gate. D2. Install the print band. D3. Replace a folded ribbon. D4. Position and latch cover. D5. See Special Option Manual. D6a. Power the printer off then on again. Attempt restart. D6b. If problem persists call the Service Representative
E. Printer consistently tears forms.	E1. Too much horizontal tension on the forms. E2. Forms stack is not centered below the print station. E3. Forms are skewed from left feed holes to right feed holes. E4. Problem is not operator correctable.	E1. Readjust right tractor to decrease tension. E2. Reposition the forms stack. E3. Reinstall the forms insuring the same level feed holes engage both tractors. E4. Call Service Representative.
F. Print out is light.	F1. Ribbon is excessively worn. F2. Ribbon has not reversed due to improper installation or defective ribbon F3. Problem is not operator correctable.	F1. Replace the ribbon F2. Check the ribbon for proper installation or missing shorting strips. F3. Call the Service Representative.
G. Print Characters are missing left or right sides.	G1. Phasing Control is mis-adjusted.	G1. Readjust Phasing Control.
H. Printout is smudging.	H1. Mylar Ribbon shield is excessively worn. H2. Ribbon is inked excessively.	H1. Replace the mylar shield. H2. Replace the ribbon.
I. Line spacing is incorrect. 	I1. Wrong length form installed. (Check Control Panel options, end of section). I2. Problem is not operator correctable.	I1 Check the form length for 11 inch form (279 mm) and also refer to the following Control Panel options. I2. Call the Service Representative.

OPTION FEATURE OPERATION

The printer may have the following features. Figure 3-8 will aid in the identification of the features installed on individual printers. Additional sections may be added to this manual to cover unique features, or functions which are not covered as part of the standard printer. A Section 0 (zero) preceding this section will cover the unique features as to their effect on operation, function, and identification. Section 0 (zero) will also provide substitute instructions, and procedures. However unique interfaces to processing systems will not be included in this manual. Interface systems will be covered by separate Interface Adapter manuals. Special options like Electronic Vertical Format Unit (EVFU) will be documented in a Special Option manual.

PAPER BASKET

A removable forms collector basket may be positioned at the lower back of the printer to stack printout. The basket increases stackability and decreases some static problems. When forms are loaded they should be advanced into the basket over the outside of the basket guide bar and the stack fold started in the correct position which may be located by observing the stacking while printing and positioning the stack so folds in both direction occur consistently. The basket guide bar over the basket should be positioned to achieve the longest time between operator interventions required. A starting point for the bar is two inches down from its maximum height and out from the printer enough to stack the forms in the center of the basket. A box of forms may stack at an angle and the stack position should be checked and corrected as required. See Figure 3-8.

QUIET CABINET

A quiet cabinet may be selected to decrease audible noise levels. Printers with quiet cabinets require the front door to be opened when loading forms. The front door should be kept closed except when loading forms to decrease noise and avoid accidents.

PRINT BANDS

A standard 64 or 96 character band is available in a number of different character designs. Optional bands are available in 48 and 128 character sets, and compressed pitch. Character sets of 48, 128, or with unique characters will be supplied with Programmed Read Only Memories (PROM's) which the Customer Engineer (CE) must install on the Input Print board (7PC1). A PROM set installed for a 48 character, or a set installed for a 128 character set, will still allow any standard 64 or 96 character band to be used. A compressed pitch band has smaller characters, and when installed on the printer increases the number of horizontal positions printed by any one hammer, which increases the maximum characters that can be printed per line. In compressed pitch a 132 column printer will print a maximum of a 198 characters per line, and 136 columns can be increased to 204 characters (refer to Compressed Pitch). A 64 character band is available in ASCII, Western Europe OCR-B, United Kingdom OCR-B, Denmark/Norway OCR-B, Spanish OCR-B Sweden/Finland OCR-B, Portugal OCR-B, ASCII OCR-A, and Domestic Compressed Pitch. A 96 character band is available in UC/LC 1403. A domestic character set is avail-

able as a 48 character band, and 128 character band is available in Katakana OCR, Arabic Standard, and Katakana/Kanji. Should a print band break call a Customer Engineer for replacement of the wear strip on the platen before installing a new band.

COMPRESSED PITCH

When the Compressed Pitch (C.P.) capability is incorporated in the printer a C.P. band with slightly smaller characters may be installed to increase the characters printed per line. A Customer Engineer can determine if compressed pitch is enabled in the printer, if there is any doubt, by checking the procedure in the corrective maintenance section on compressed pitch.

Compressed pitch bands can be identified from standard bands by checking above the characters for the home timing mark. Compressed pitch bands will have two home timing marks together while the standard band will have only one mark.

During maintenance inform the Customer Engineer if a compressed pitch band is used, because the hammer flight time should be adjusted using the C.P. band.

A compressed pitch band is automatically sensed by the printer following band installation. Refer to preceding paragraphs on Band Installation and Print Bands for additional information.

TABLE 3-4. BAND PRINTING SPEED

DEVICE	CHARACTER SET			
	48	64	96	128
300	360 LPM	300 LPM	220 LPM	175 LPM
600	720 LPM	600 LPM	440 LPM	350 LPM
* 300	240 LPM	200 LPM	148 LPM	118 LPM
* 600	480 LPM	400 LPM	295 LPM	235 LPM
* Compressed Pitch				

VARIABLE FORM LENGTH

This option provides a thumbwheel counter below the control panel which provides a versatile selection of forms with varying length between perforations. The counter may be set between 001 and 199 which allows a form with up to 33 inches (838mm) between perforations to be used at 6 lines per inch (6 LPI). At 8 LPI a 24.5 inch (622mm) form may be used. This counter is disabled if an Electronic Vertical Format Unit (EVFU) is installed.

Auto Perf Skip

Auto Perf Skip is a standard option which provides a three line skip at the end to beginning of two forms attached by a perforation. The printer may be purchased without this option and a skip will not occur at the end of form. Without Auto Perf Skip printing may occur on the perforation if the forms are not adjusted accurately. Without Auto Perf Skip the Variable Form Length option cannot perform multiple line skip patterns.

Variable Form Length With Auto Perf Skip

This option allows the operator to select the number of lines to be printed between perforation skips. The selection is accomplished by setting the thumbwheel switches to the number of printable lines on the form (11 inch form at 8 lines per inch, dial is set at 88). The printer with Auto Perf Skip will automatically space three lines per form skip. Thus, when the counter is set to 88, 85 lines will be printed and three will be skipped. All settings will print three less lines than set on the counter with the following exceptions:

- 0 - Illegal
- 1 - Performs continuous single space
- 2 - Performs continuous double space
- 3 - Performs continuous triple space
- 4 - Performs continuous quadruple space

The switch can be set from 1 to 199. When this switch is installed the fixed Forms Length is disabled.

If this option is not installed, the Fixed Forms Length Auto Perforation Skip feature automatically prints 63 lines and skips three when in the 6 LPI mode or automatically prints 85 lines and skips three when in the 8 LPI mode. An EVFU option disables variable top of forms, refer to Special Option Manual.

ELECTRONIC VERTICAL FORMAT UNIT (EVFU)

The EVFU is available with up to twelve channels, which means twelve different line spacing patterns may be selected for twelve different forms. More format combinations are possible by selecting combinations of channels. The EVFU requires loading each time the printer is power up, from then on until power-off, format channels may be selected over the interface. The EVFU option includes a reader for manual tape loading of the EVFU, and a logic board in location 7PC6. The logic board contains four fault isolation L. E. D.'s and the reader contains a Read switch and a Reading L. E. D. which aids in EVFU loading and fault isolation. The EVFU will be supplied with a Special Option manual covering its operation.

CONTROL PANEL FEATURES

The control panel may have many combinations of switches and indicators, many function through the special interface adapters. The function of a switch or indicator may vary between interface adapters, so only standard indicators and switches will be mentioned. If these switches and indicators or others are installed, refer to Section 0 (zero), if included at the front of this manual, or the interface adapter manual supplied with the printer. The following switch/indicators are standard features available in different combinations:

Page Eject, replaces Form Feed for advancing forms vertically.

Single Space, advances forms vertically one line at a time.

Test Print, prints lines of all one test character.

Reset, clears the electronic circuits after fault conditions are corrected.

Runaway, indicates when an uncontrolled forms slew or advance occurs. This condition is sensed when an optional Electronic Vertical Format Unit (EVFU) is installed and a code is selected that was not loaded. This can cause a slew of up to 195 lines.

Paper Out, indicates the end of the forms which is monitored by the Out Of Paper (OOP) switch, mounted on the inside surface of the gate.

Parity Error, indicates when the data bits received do not match the parity bit sent. Indicates a possible error in the data as received.

CUSTOMER ENGINEER FAULT INDICATORS

These Light Emitting Diode (L. E. D.) indicators are located just below the control panel on the right side. The bonnet must be raised to see these indicators which aid in troubleshooting for Customer Engineers (see Figure 3-8). These indicators along with function and fault L. E. D.'s on the logic boards provide a means for quick diagnosis and repair. When any of the lights are lit, the 36 volts will be powered down, the printer will be not ready, and the stop switch will flash. One or more of the indicators will light for each of the following faults:

- a. Fuse Fault
- b. \pm 12 Volt Fault
- c. Horizontal Motion
- d. Band Motor Fault
- e. "H" Switch Fault
- f. Ribbon Motor Fault
- g. Horizontal Home Fault
- h. Horizontal End Stop Fault
- i. Hammer Fault

Anytime the Stop lamp flashes the operator should record the indicators lit on the C. E. Fault Indicator panel. Anytime a C. E. Fault occurs the printer will partially power down which will always cause the Fuse indicator to light. The ON/OFF switch must be turned off for a few seconds before the ON switch will bring the printers power back up.

LINE COUNTER

A line counter is available which mounts on the left side of the printer on the cabinet base. The line counter counts the lines of print and is generally used to schedule printer maintenance. The line counters count may be recorded and used to indicate work load conditions, or job costs.

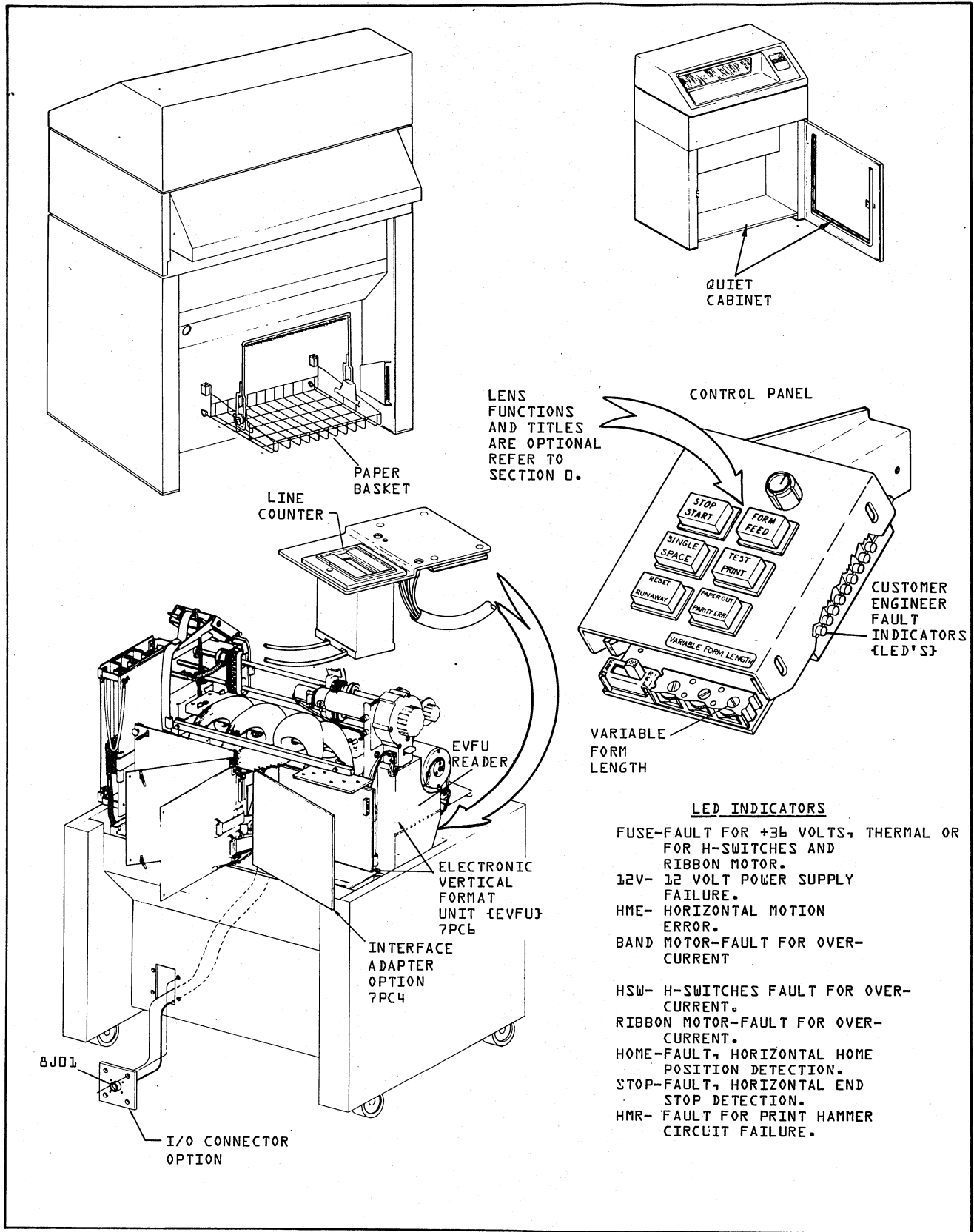
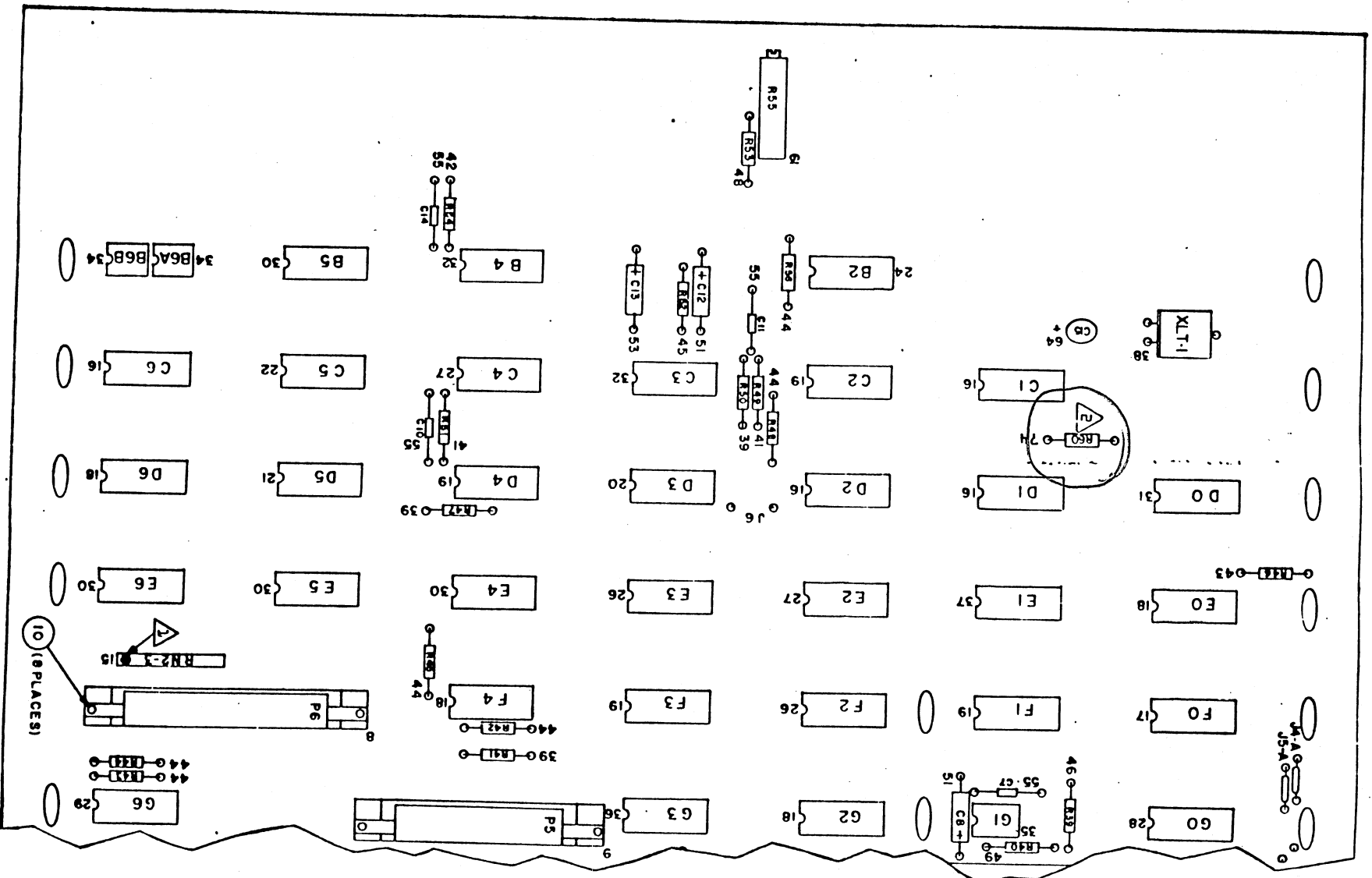
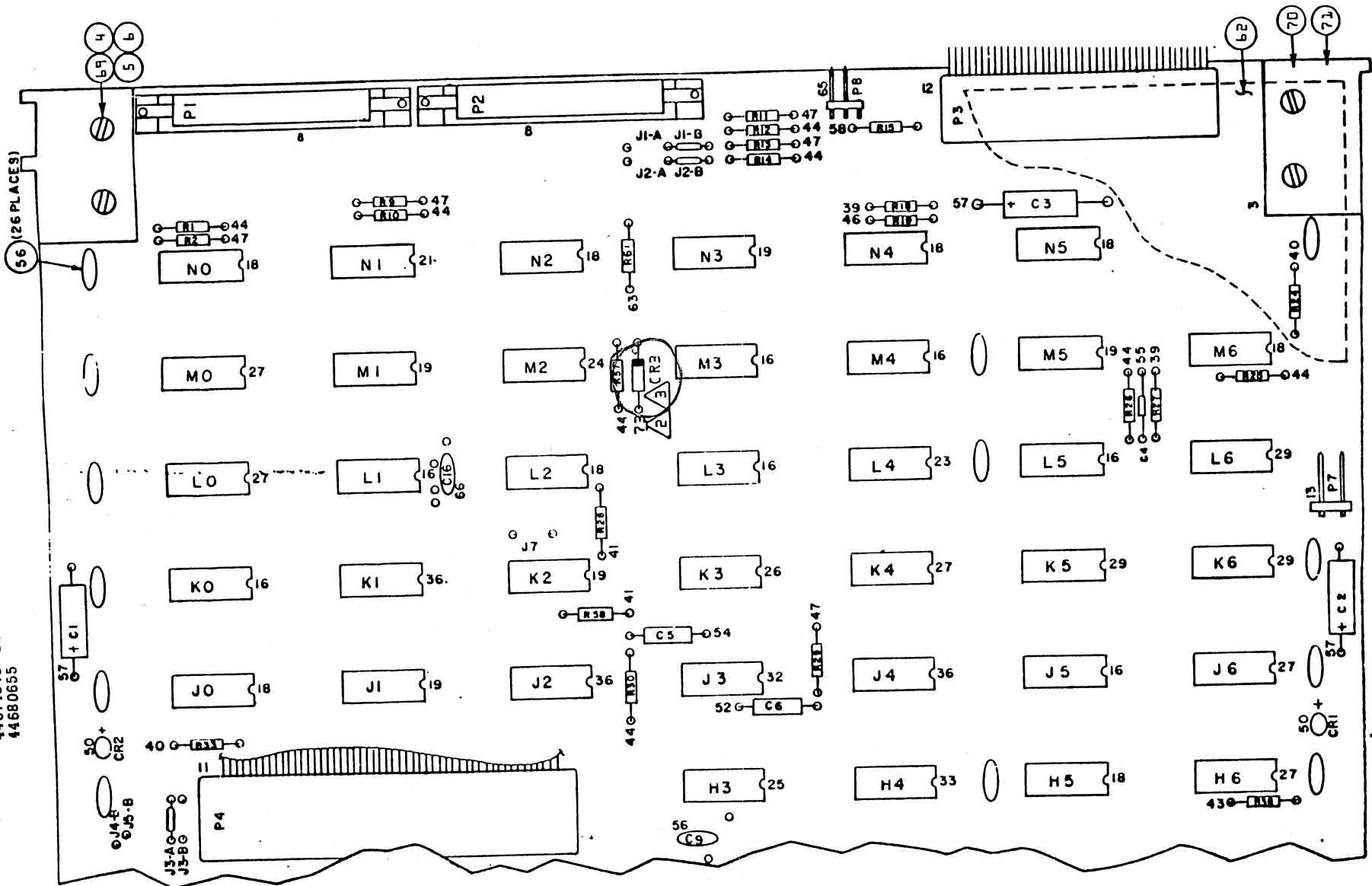


FIGURE 3-9. OPTION FEATURES



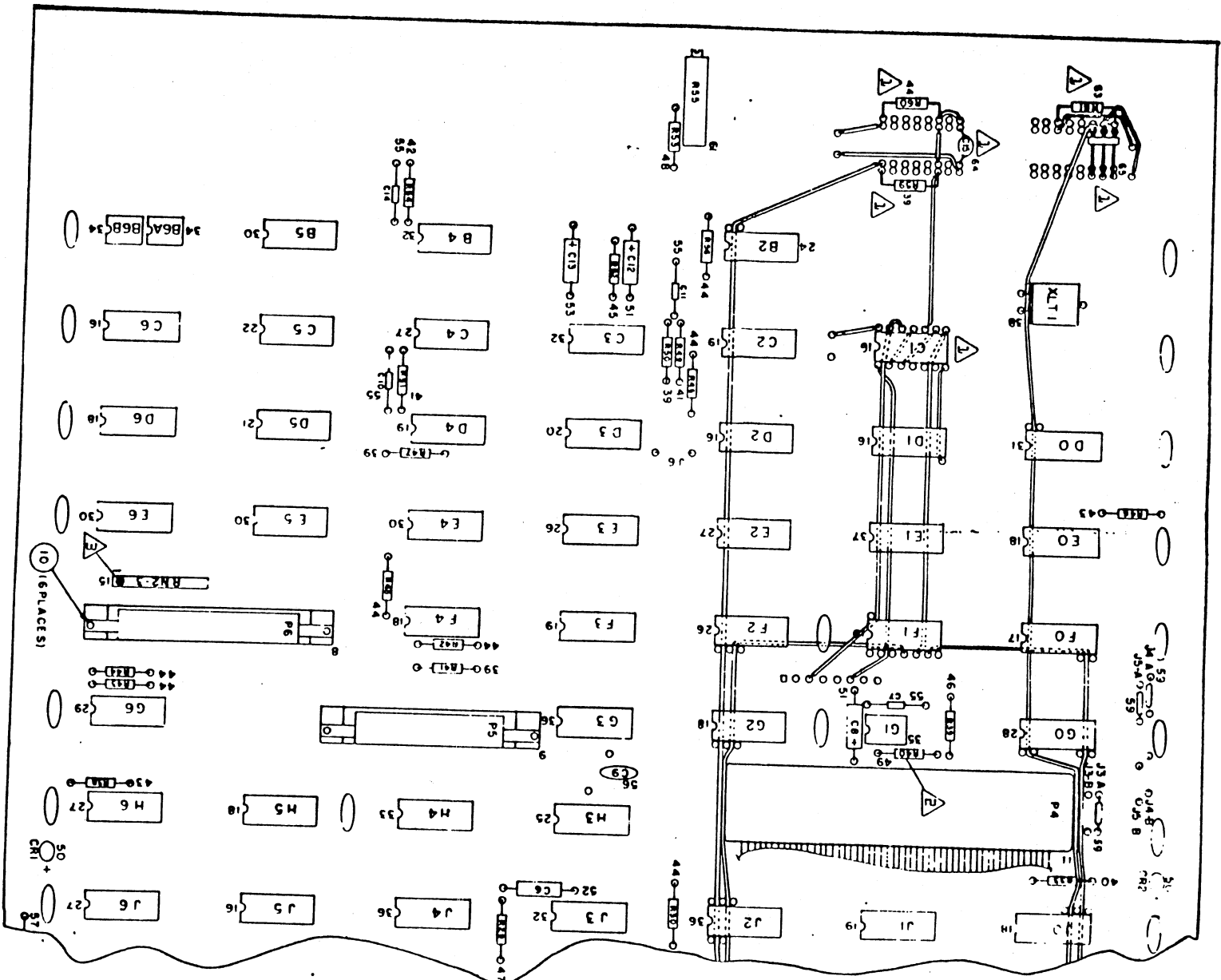


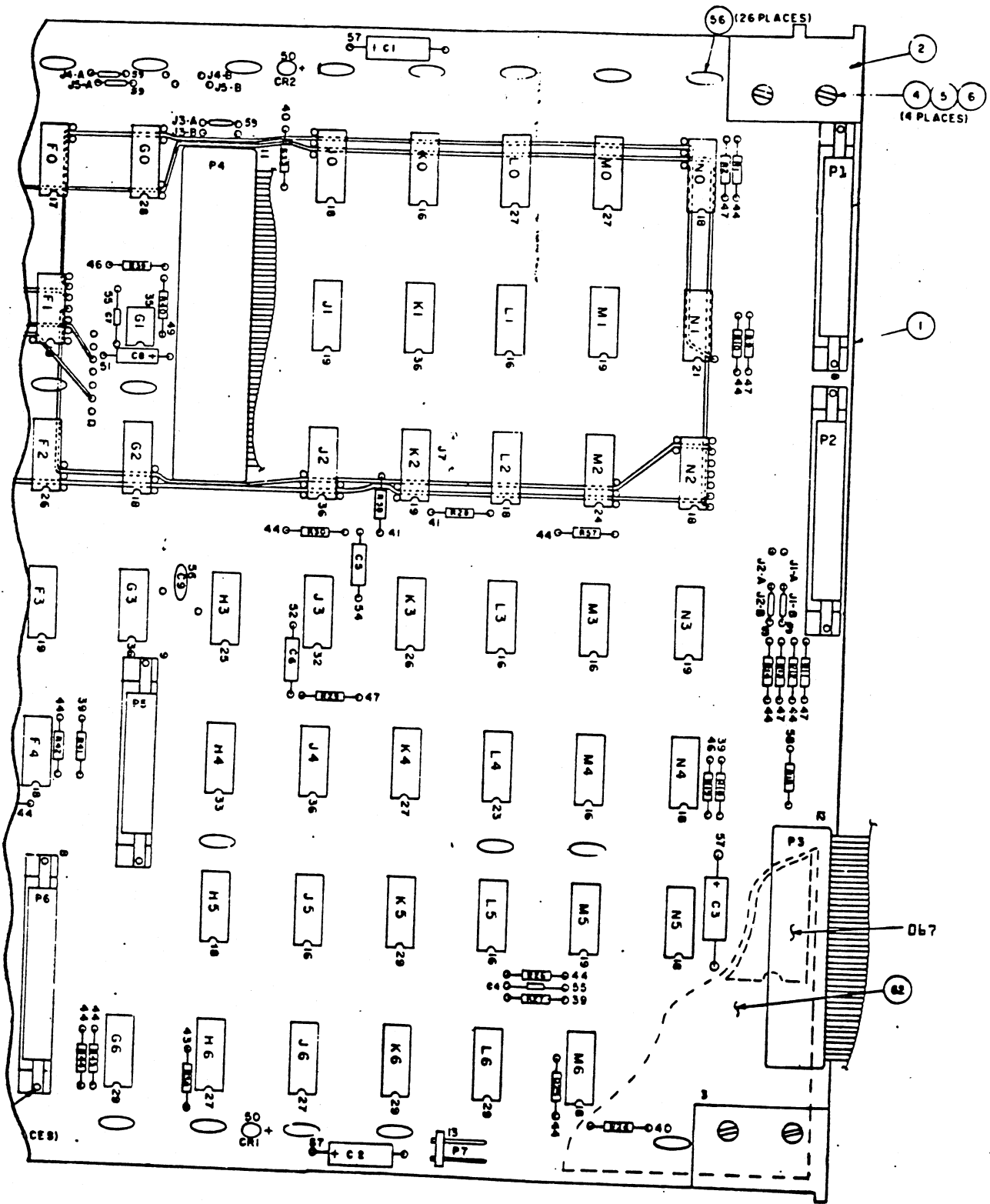
TITLE
**ASSY-OSC HORIZ (VERT) MOT

FND NUM	U/M	PART NUM	DESCRIPTION	NUM REQ	FND NUM	U/M	PART NUM	DESCRIPTION	NUM REQ
001	PC	44674843	BD OSC HORIZ (VERT MOT)	1	035	PC	15112100	IC 555	1
002	PC	44670614	PIVOT P.C. CARD UPPER	1	036	PC	15104800	IC 7474	4
003	PC	44670613	PIVOT P.C. CARD LOWER	1	037	PC	15105700	IC MC 4024	1
004	PC	10127117	SCR PAN HD PHL 6-32X.875	4	038	PC	95357000	CRYSTAL HIGH FREQUENCY	1
005	PC	10126103	WASHER INTL TOOTH LK 6	4	039	PC	24500024	RESISTOR 24 OHMS 1/4W 5	6
006	PC	10125105	NUT HEX MACH 6-32	4	040	PC	24500042	RESISTOR 130 OHMS 1/4W 5	2
008	PC	95433301	HEADER 26 PINS	3	041	PC	24500063	RESISTOR 1K 1/4W 5	4
009	PC	95433300	HEADER SOLDER TAIL	1	042	PC	24500070	RESISTOR 2K 1/4W 5	1
010	PC	95302715	SCR SELF TAP 4-40 X 1/4	8	043	PC	24500074	RESISTOR 3K OHMS 1/4 W 5	2
011	PC	44670360	CZ ASSY CABLE CONTRCLLER	1	044	PC	24500075	RESISTOR 3.3K OHMS 1/4W 5	15
012	PC	44670361	CZ ASSY CABLE PRT HD II	1	045	PC	24500236	RES 2.2K OHMS 1/4W 10	1
013	PC	95443451	CONN 2 POS	1	046	PC	24500080	RESISTOR 5.1K 1/4W 5	2
015	PC	44670458	S.I.P. 3.3K 1/4 W	1	047	PC	24500090	RESISTOR 13K OHMS 1/4W 5	5
016	PC	36186600	IC 7400	11	048	PC	24500087	RESISTOR 10K 1/4W 5	1
017	PC	36187000	IC 7402	1	049	PC	94360575	RESISTOR	1
018	PC	95350102	IC 7404	12	050	PC	94789500	RED LIGHT EMITTING DIODE	2
019	PC	95338002	IC 7408	9	051	PC	17620428	CAP 2.2 MFD 50 20V	2
020	PC	36187200	IC 7410	1	052	PC	94832017	CAP 2.7MF	1
021	PC	15129700	IC TYPE 7411	2	053	PC	17620407	CAP 3.3MF	1
022	PC	15109500	IC 7425	1	054	PC	17620421	.22 MFD, 50V, 20V	1
023	PC	36187400	IC 7430	1	055	PC	92496227	CAP .01MFD 200 100V	5
024	PC	15107000	IC 7437	2	056	PC	19115400	CAP FIXED CERAMIC 50 VOLTS 27	3
025	PC	15124800	IC 7414	1	057	PC	24504353	33MF, 200 10V	3
026	PC	17181500	IC 7476	3	058	PC	24500047	RESISTOR 220 OHMS 1/4W 5	1
027	PC	15105000	IC 74107	7	059	PC	44670462	JUMPER P.C.B.	1
028	PC	15106000	IC 74153	1	061	PC	94843311	POT 20K OHMS 3/4W 100	1
029	PC	51761500	IC 74161	4	062	PC	44672972	MYLAR SHIELD	1
030	PC	62031100	IC 74192	4	063	PC	24500051	RESISTOR 330 OHMS 1/4W 5	1
031	PC	17184200	FREQ DIV 74193	1	064	PC	95443333	CAP 33 MFD, 10V, 15V	1
032	PC	15139100	IC 74221 SPEC	3	065	PC	44677520	CONNECTOR	1
033	PC	15104500	IC 74175	1	066	PC	94842149	CAP 680 PF	1
034	PC	94791600	75453 TTL DUAL DRIVER	2	069	PC	10125605	WASHER PLAIN 6	4
					070	PC	44676078	PIVOT SPACER .19	2
					071	PC	44676079	PIVOT SPACER .06	2
					073	PC	94823900	DIODE 1N695A	1
					074	PC	24500099	RESISTOR 33K 1/4W 5%	1

NOTES:

- ① PIN 1 DESIGNATOR
- ② R59 FND NUM 039 WAS USED IN PLACE OF CR3 ON BOARDS 44674848. R60 WAS FND NUM 044 ON THESE BOARDS.
- ③ THESE PARTS USED ON BOARDS 44680655





TITLE
 **ASSY-OSC HORIZ (VERT) MOT

FND NUM	U/M	PART NUM	DESCRIPTION	NUM REQ	FND NUM	U/M	PART NUM	DESCRIPTION	NUM REQ
001	PC	44673051	BD OSC HORIZ (VERT MOT)	1	035	PC	15112100	IC 555	1
002	PC	44670614	PIVOT P.C. CARD UPPER	1	036	PC	15104800	IC 7474	1
003	PC	44670613	PIVOT P.C. CARD LOWER	1	037	PC	15105700	IC MC 4024	1
004	PC	10127114	SCR PAN HD PHL 6-32X.500	4	038	PC	95352000	CRYSTAL HIGH FREQUENCY	1
005	PC	10126103	WASHER INTL TOOTH LK 6	4	039	PC	24500024	RESISTOR 24 OHMS 1/4W 5	1
006	PC	10125105	NUT HEX MACH 6-32	4	040	PC	24500042	RESISTOR 130 OHMS 1/4W 5	2
008	PC	95433301	HEADER 26 PINS	3	041	PC	24500063	RESISTOR 1K 1/4W 5	4
009	PC	95433300	HEADER SOLDER TAIL	1	042	PC	24500070	RESISTOR 2K 1/4W 5	1
010	PC	95302715	SCR SELF TAP 4-40 X 1/4	8	043	PC	24500074	RESISTOR 3K OHMS 1/4 W 5	2
011	PC	44670360	CZ ASSY CABLE CONTROLLER	1	044	PC	24500075	RESISTOR 3.3K OHMS 1/4W 5	15
012	PC	44670361	CZ ASSY CABLE PRT HD II	1	045	PC	24500236	RES 2.2K OHMS 1/4W 10	2
013	PC	95443451	CONN 2 POS	1	046	PC	24500080	RESISTOR 5.1K 1/4W 5	1
019	PC	44670458	S.I.P. 3.3K 1/4 W	1	047	PC	24500090	RESISTOR 13K OHMS 1/4W 5	5
016	PC	36186800	IC 7400	11	048	PC	24500087	RESISTOR 10K 1/4W 5	1
017	PC	36187000	IC 7402	1	049	PC	94360575	RESISTOR	1
018	PC	95350102	IC 7404	12	050	PC	94789500	RED LIGHT EMITTING DIODE	2
019	PC	95338002	IC 7408	9	051	PC	17620428	CAP 2.2 MFD 50 20V	2
020	PC	36187200	IC 7410	1	052	PC	94832017	CAP 2.7MF	1
021	PC	15129700	IC TYPE 7411	2	053	PC	17620407	CAP 3.3MF	1
022	PC	15109500	IC 7425	1	054	PC	17620421	.22 MFD, 50, 20V	1
023	PC	36187400	IC 7430	1	055	PC	92496227	CAP .01MFD 200 100V	5
024	PC	15107000	IC 7437	2	056	PC	94740401	CAP .01 MFD 20 50 VOLTS	27
025	PC	15124800	IC 7414	1	057	PC	24504353	33MF, 200 10V	3
026	PC	17181500	IC 7476	3	058	PC	24500047	RESISTOR 220 OHMS 1/4W 5	1
027	PC	15105000	IC 74107	7	059	PC	44670482	JUMPER P.C.B.	6
028	PC	15106000	IC 74153	1	061	PC	94843311	POT 20K OHMS 3/4W 100	1
029	PC	51761500	IC 74161	4	062	PC	44673138	CABLE PROTECT GROUND SHIELD	1
030	PC	62031100	IC 74192	4	063	PC	24500051	RESISTOR 330 OHMS 1/4W 5	1
031	PC	17184200	FREQ DIV 74193	1	064	PC	95443333	CAP 33 MFD, 10, 15V	1
032	PC	15139100	IC 74221 SPEC	3	065	PC	44672520	CONNECTOR	1
033	PC	15104500	IC 74175	1	066	FT	52629909	WIRE SOLID 30 AWG WHT	5
034	PC	94791600	75453 TTL DUAL DRIVER	2	067	PC	44672972	MYLAR SHIELD CABLE PROTECT	1

REWORKED BOARDS

REWORK THE FOLLOWING BOARDS BY ADDING WIRES SHOWN ON DRAWING AND
 ADDING OR CHANGING COMPONENTS PER NOTES 1 AND 2.
 44673056 REWORK TO 44673061
 BOARD FOIL CHANGES ARE NOT SHOWN

NOTES:



ADD COMPONENTS SHOWN ON DRAWING
 CHANGE R40 FROM 17705932 TO 94360575 (604 OHM)
 PIN 1 DESIGNATOR

PRINCIPLES OF OPERATION

GENERAL

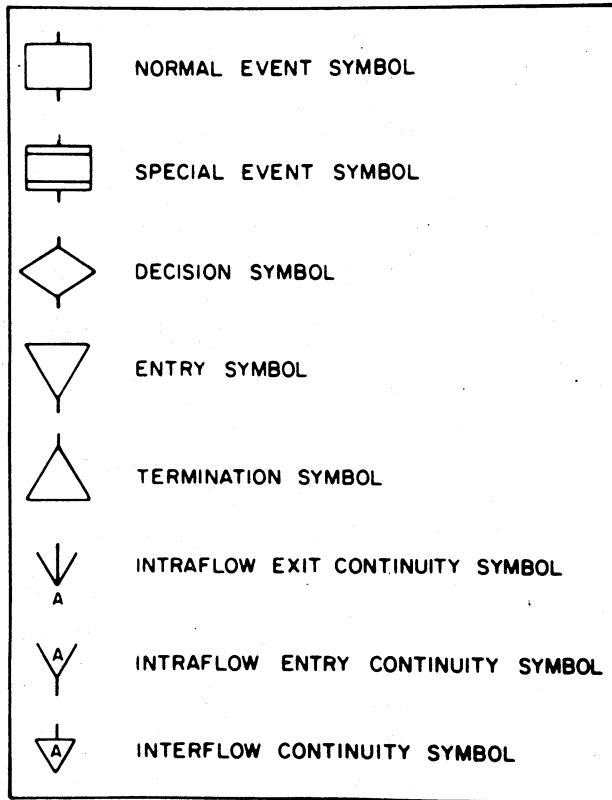
This section explains the principles of operation for the line printer. The explanations are divided into two major sections: Print Head Electronics and Electro-mechanical Assemblies; and Controller Electronics. The first section is explained through the use of functional drawings, timing diagrams and detailed written explanations. The explanations are arranged by assembly functions to facilitate location and use of the

information. The second section, Controller Electronics, also uses functional drawings, timing diagrams and detailed written explanations. In addition, flowcharts are employed to aid in establishing the sequence of logic events. These explanations are arranged in the sequence in which they would occur during normal printer operation. In addition, detailed explanations of the controller counters and special circuits are provided at the end of this section. A Section 0 (zero) may be added at the front of this manual to cover unique features incorporated in the printer. At the back of Section 0 (zero), additional information may be included on the principles of operation.

Printing is accomplished by the compression of forms and ribbon between an electro-magnet driven rotating hammer and a horizontally moving character. The characters are on a one piece steel band that also has one timing mark for each character and one mark for each font. Magnetic pick-ups transduce character position and font position and timing from these marks. The PBS 360/720 printers time share hammer columns and drive-by shifting the hammer bar. The amount of time sharing is four/two columns respectively. For example, with two column time sharing, a hammer prints one column, shifts horizontally 0.1 inch, and prints a second column. At each position, all hammers have the option of printing all the characters in a font, allowing half of any line to be printed for each position.

NOTE

WHEREVER THE SPECIFICATIONS ARE SEPARATED BY A (/), THE FIRST REFERS TO THE PBS 360 AND THE SECOND TO THE PBS 720.



FLOWCHART SYMBOLS

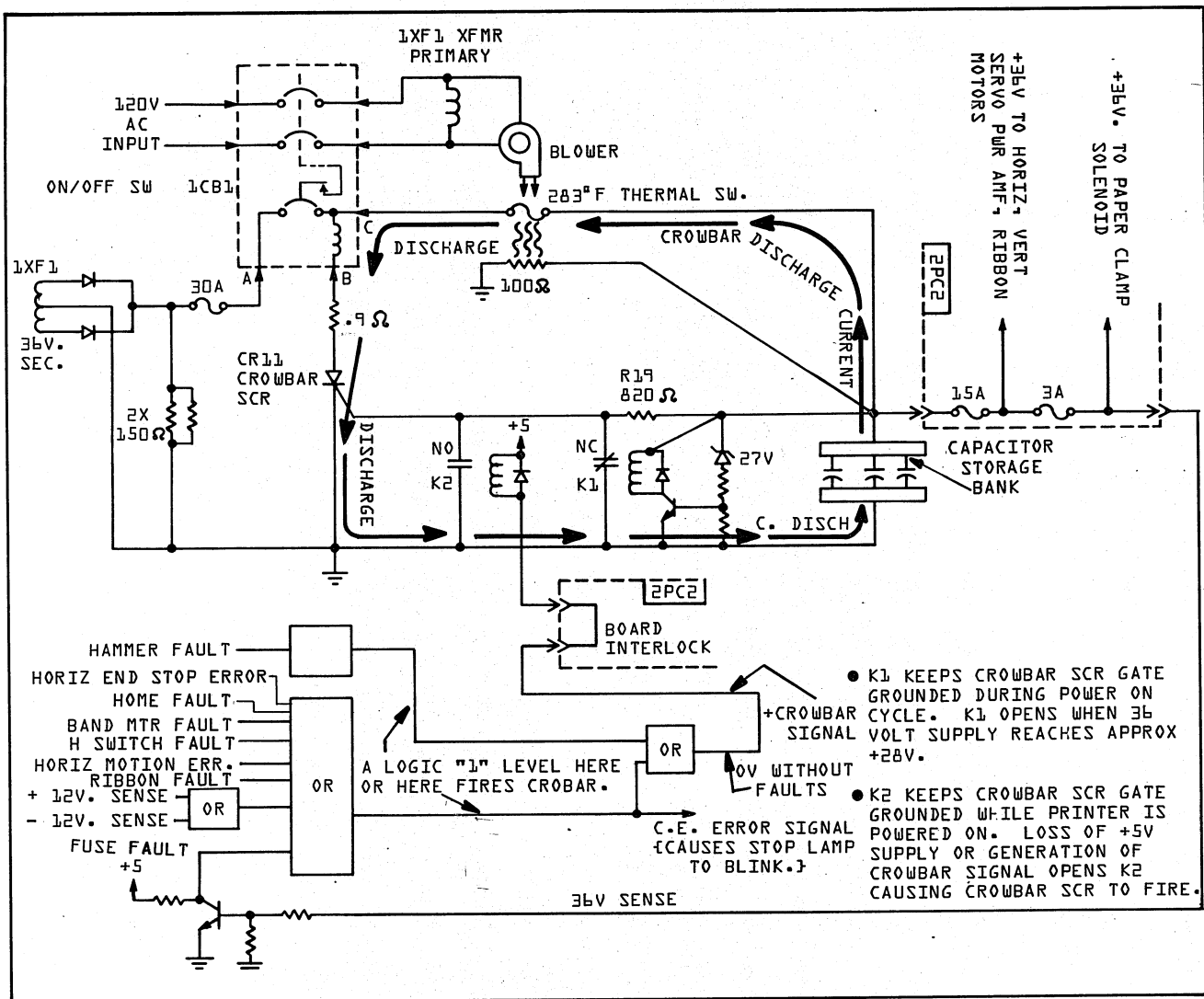


FIGURE 4-1. POWER SUPPLY +36 VOLTS AND CROWBAR

PRINT HEAD ELECTRONICS AND ELECTROMECHANICAL ASSEMBLIES

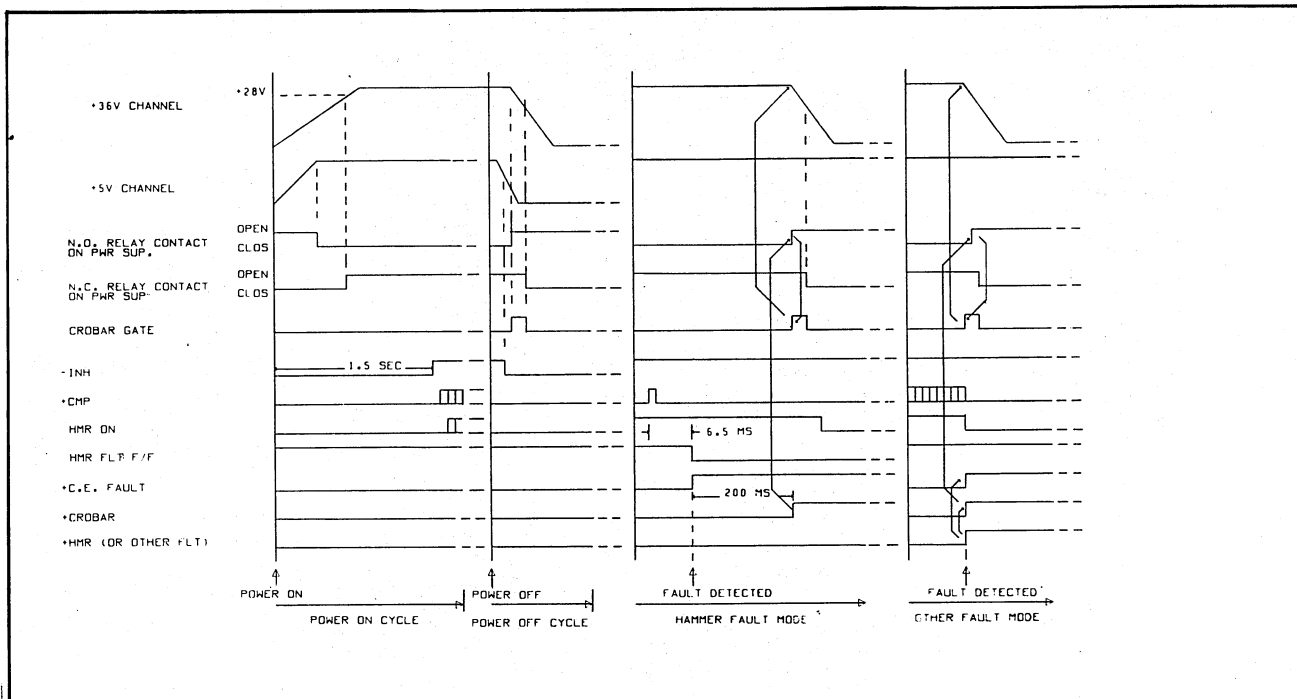


FIGURE 4-2. POWER ON AND CROWBAR TIMING

POWER ON AND START SEQUENCE

The power on and start sequence is initiated by placing the main circuit breaker (1CB01) in the POWER ON position, if the printer is connected to a suitable a.c. power source. The a.c. power is then routed to a step down transformer (1XF1). In the 120 volt units the blower is run directly from the circuit breaker. In all other voltage configurations, the blower input comes from the transformer. The stepped-down a.c. voltages from the transformer are fed to the Power Supply Board where the four d.c. voltages are developed; the +36, the +12 and the +5. Regulation is provided for the +12 and the +5 voltages. In addition the +5 has a current limiting circuit. This circuit is factory set for fold back at 21 amps. The +5 volt circuit also has overvoltage protection set for 5.6 volts. Overvoltage detection fires a 5 volt crowbar which causes current foldback. When the 5 volts goes down the +36 volt crowbar fires leaving only the blower running. The +36 is unregulated and may vary from approximately 33 to 39 volts. The +36 is routed through the main circuit breaker and a thermal fault assembly to the capacitor storage bank and then distributed to the remainder of the printer.

36 Volt Crowbar Circuit (See Figures 4-1 and 4-2)

A Crowbar circuit is provided on the Power Supply Board to remove the +36 voltage if a serious fault is detected. This circuit is initiated during power on. At power on time, the normally open contact of K2 is open and the

normally closed contact of K1 is closed. The normally closed contact of K1 holds the gate of CR11 at a ground potential. Relay K2 is energized by the +5 voltage while relay K1 is energized by the +36. During power on, the +5 voltage comes up much more quickly than the +36 due to the loading affect of the capacitor bank on the +36 voltage. As the +5 volt level is reached K2 energizes closing the contact. When the +36 voltage comes up to a level of approximately 28 volts, K1 energizes opening its contact. The gate of CR11 is now held at a ground potential by the K2 normally open contact. The ground side of K2 is controlled by the Crowbar signal. As long as the signal remains low, the +36 will remain high. If a serious fault is detected, the Crowbar signal goes high deenergizing K2 and opening its contact. At this time, the gate of CR11 goes high and the SCR fires. The SCR (CR11) shorts the +36 through the .9Ω resistor mounted on the circuit breaker to ground. The current developed across the resistor opens the +36 volt contacts of the circuit breaker but does not trip the breaker. To restore the +36 voltage, the printer must be powered off and then on again.

Inhibit Circuit (See Figure 4-4)

During the first 1.0 seconds after power on an Inhibit (7PC3) signal is generated to prevent any printer operations until the power supply voltages are fully up and stable. The Inhibit signal is generated through the use of a monostable multivibrator (one-shot) which is set up for a 1.0 second time out. The one-shot is triggered by the +5 volts. As the +5 volts comes up, the

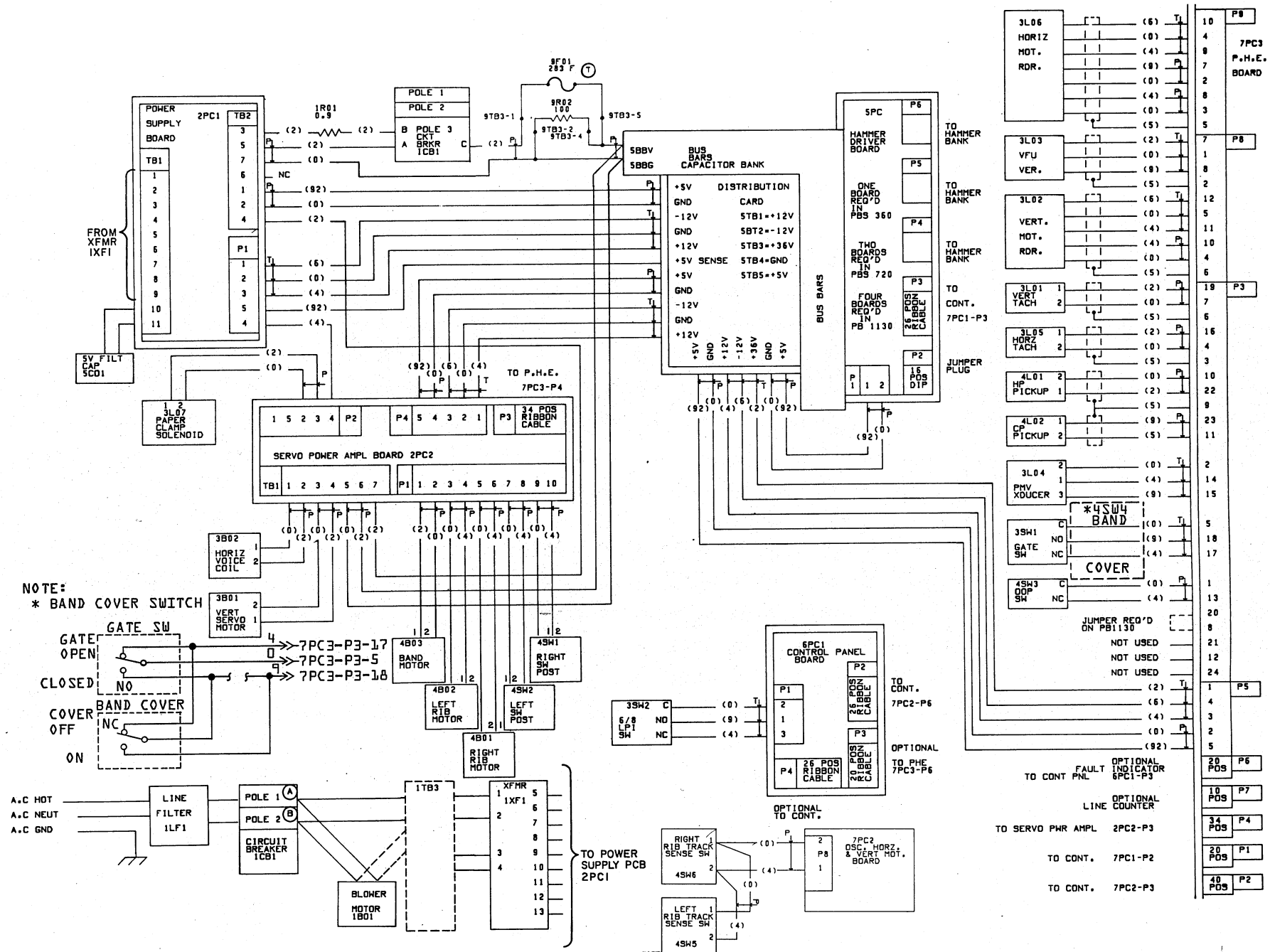


FIGURE 4-3. POWER DISTRIBUTION

reset is removed from pin 4. The 5 volts at the trigger input pin 2 is delayed by an RC network long enough for the one shot to sense the zero level at pin 2 and to generate a 1.0 second one level pulse. The one level prevents the relay D1 from energizing, holding a ground level on pin 1 of the relay which is the origin of the -Inhibit signal. After 1.0 seconds, the one-shot output goes to a zero energizing the relay. With the relay energized, pin 1 is opened and the -Inhibit signal goes high.

Start (Ready) Circuit (7PC2)

At the completion of the Inhibit operation, the Ready circuitry can be activated by depressing the START/STOP switch, if the print gate is closed, a print band is installed with cover, no C.E. fault is detected, and no Forms Error or Line Spacing Error is detected. When the switch is depressed, the Enable Ready F/F sets, removing the reset input from the Ready F/F

and triggering the Ready one-shot. After approximately 50 μ sec the one-shot times out setting the Ready F/F. When the flip-flop is set, the START indicator is illuminated and the Ready status line goes to a zero. The Flip-flop will remain set until either the switch is depressed a second time or one of the previously mentioned faults is detected. This circuits function can be modified by optional interfaces, refer to Section 0(zero) at the front of this manual if incorporated or the Interface Adapter or Special Option manual if supplied with the printer. The board 7PC2 contains an option jumper which may be positioned on certain boards to allow a remote Start/Stop feature over unique interface lines. When the remote Start/Stop function is incorporated the Enable Ready F/F is not used. Instead a Start Level signal is sent over the interface which may respond with an External Start Pulse. Unique control panels may communicate directly over the interface which will respond on the External Start/Stop Pulse lines.

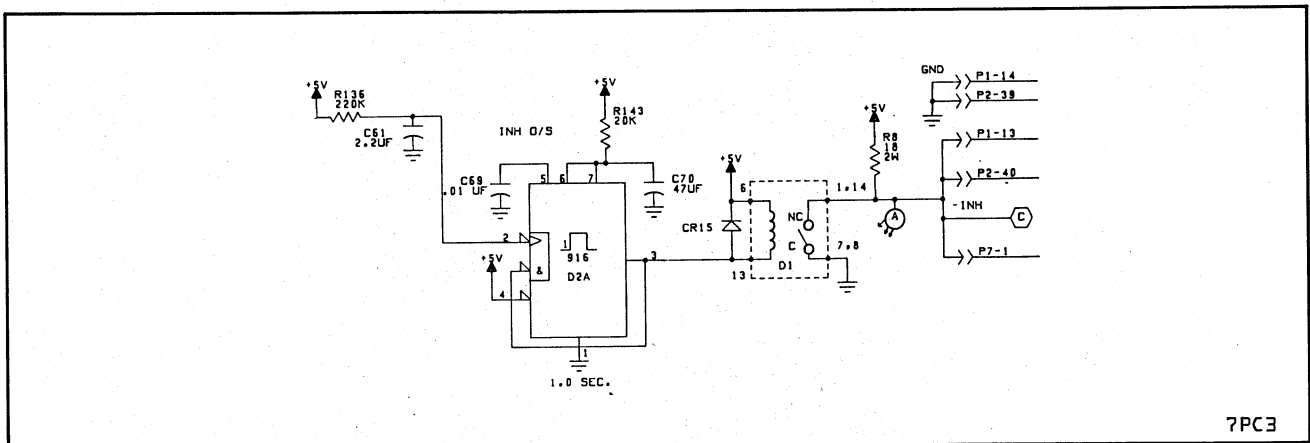


FIGURE 4-4. POWER ON INHIBIT CIRCUITRY

RIBBON SYSTEM

General

The ribbon transport system is composed of two d. c. gear motors wired in series, two ribbon switching posts, a latching relay, and miscellaneous control circuitry. The gear motors always turn in the same direction but they are attempting to turn at different speeds. The trailing motor is always running at a reduced speed. A two position latching relay is employed in the control circuits to determine the direction of ribbon travel. The latching function of the relay allows it to remember the direction of ribbon travel even when the printer is powered down. This ability allows even wear on the ribbon throughout its life cycle. The two ribbon switching posts serve dual functions. They act as guides for ribbon tracking and they detect the ends of the ribbon. When the switching posts detect the end of the ribbon, they switch the latching relay which switches the direction of ribbon travel. The two ribbon fold detect assemblies, one at each side of the ribbon system, monitor the upper and lower edge of the ribbon. As long as the ribbon edges maintain and open circuit a fold fault will not be sensed. The control circuitry for the ribbon system is located on the Servo Power Amp PCB (2PC2).

Functional Description

Ribbon Motion is enabled by the -Motors On signal generated on the Print Head PCB. This signal is active low whenever the print gate is closed, Inhibit and ribbon fold is not being generated, and the printer has been accessed by processor within the last half second or the gate has just been closed. The Motors On signal is generated by closing the gate or receiving input data from the processor. The Band Motor time Out F/F will maintain Motors On for 30 seconds, and the start of an Input Cycle will reset this F/F and continue Motors On. If a line is printed and the next line of printing is not started within approximately 800 msec., then ribbon motion is stopped by a O/S on the 7PC3 board which removes + ribbon drive. This short ribbon run on delay prevents ribbon smear on the forms. With the Motors-On signal,

the low input is inverted at IC09 pin 6 reverse biasing CR9 and forward biasing CR10 and CR11, turning transistor QN1-07 on. When QN1-07 turns on it turns on transistor Q2 which applies 36 volts to the relay contact pins 10 and 5. To drive the ribbon to the left 36 volts is applied through pin 10. To drive the ribbon to the right 36 volts is applied through pin 5. When driving to the left diode CR26 is forward biased placing R93 in parallel with the right ribbon motor, 4B01, slowing the motor down. The left ribbon motor, 4B02, is taking on ribbon and attempting to turn at maximum speed. The ground path for both series wired motors is through pin 7 of the relay. The ribbon will continue to drive to the left until the foil strip on the right end of the ribbon contacts the right switching post, 4SW1. At this time the relay contacts are switched and the 36 volts is applied through pin 5 of the relay. This reverses the direction of ribbon travel and forward biases CR25 placing R92 in parallel with the left ribbon motor, 4B02, slowing motor down. The right ribbon motor is now taking on ribbon and attempting to turn at maximum speed. The ground path for both series wired motors is now through pin 8 of the relay. A current sense circuit monitors ribbon current to detect jammed ribbon motors (both jammed) or circuit shorts. An R-C network prevents faults during start-up. If a current fault is detected, a C.E. fault is generated and the +36 volts is crowbarred down. A Customer Engineer fault causes the Stop lamp to blink.

Ribbon Fold Detection

When the printer is busy except during an Input cycle, a ribbon fold condition can be detected by the ribbon fold switches. A ribbon fold once detected will generate a fault signal to any special feature or interface board installed in the printer. Without a special feature or interface board installed in the printer the Ready Signal will be removed and the printer will go to STOP mode. Most special interfaces will also perform a Stop mode action. Refer to Section "0" if incorporated or any Interface adapter manual supplied with the printer.

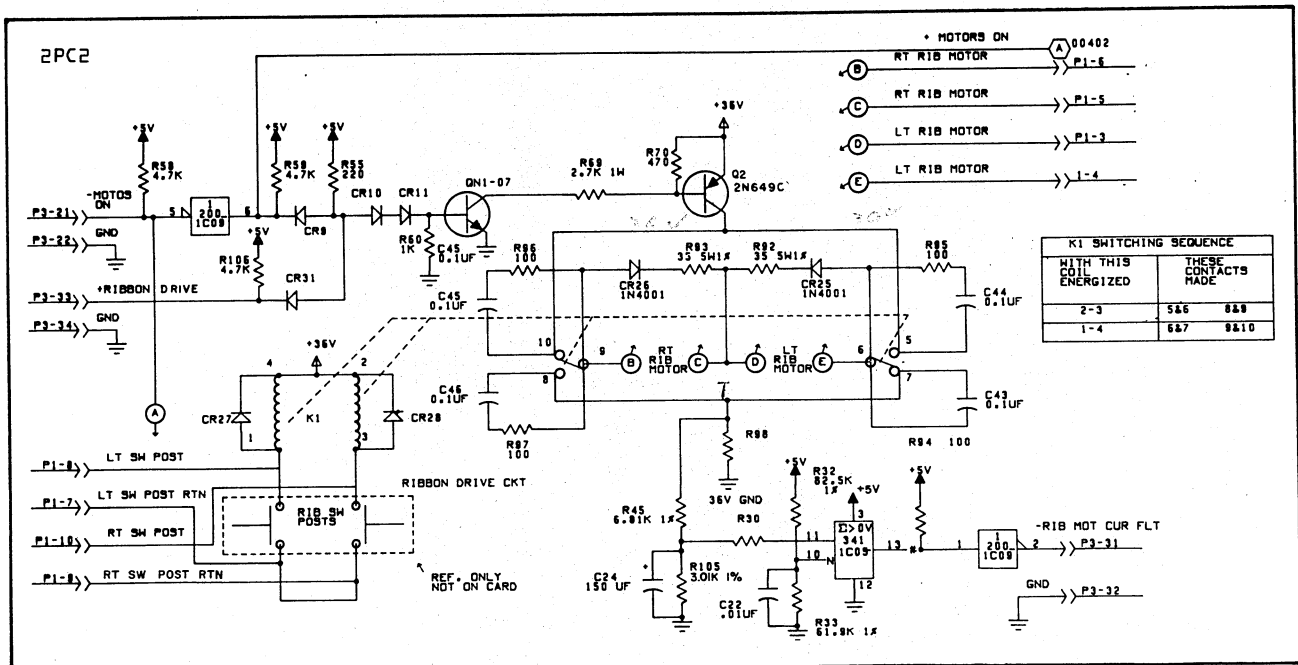


FIGURE 4-5. RIBBON DRIVE CIRCUITRY

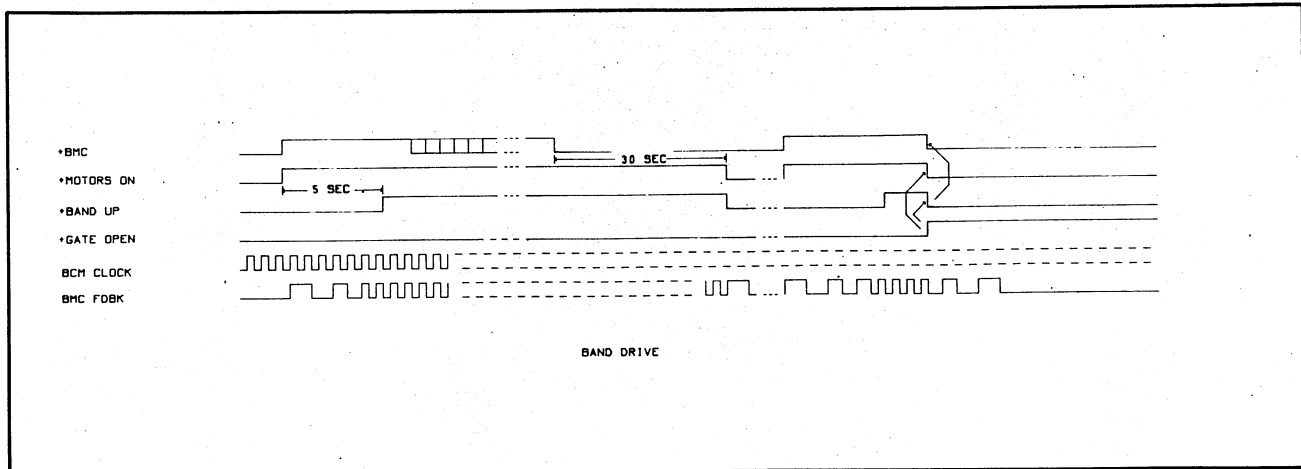


FIGURE 4-6. BAND MOTOR CONTROL TIMING

BAND MOTOR CONTROL (2PC2)

The band motor is started by the Motors On signal which also enables the ribbon to move once printing starts. Printing is delayed for 5 seconds following Motors On to allow the band to reach proper speed (Band Up F/F). The print band is driven by a d. c. servo motor. The band speed is maintained at a constant rate of 246 inches (6250 mm) per second through the use of a servo system. The servo system uses phase lock loop techniques to compare the motor speed reference signal (Character pulse) against a crystal oscillator clock reference. Any difference between the two reference signals produces an error voltage. This error voltage is summed with the current feedback signal from the motor to prevent an overcurrent condition and with a rate damping signal to control the acceleration of the motor.

The Band Motor Control circuit consists of four blocks; a speed error detection circuit, a rate damping circuit, current chopper circuit, and overcurrent fault detection.

Speed Error Detection Circuit

The speed error detection circuit uses a MC 4044 phase/frequency detection chip to compare the frequency of the print band character pulses with the frequency of a clock. The clock is derived from the controller 1 MHz. logic clock, and is divided down in counters to the appropriate frequency of 1.852 KHz. The output of the phase/frequency detector is fed to a digital to analog converter (called a charge pump) which is also on the MC 4044 chip. The charge pump produces an output voltage which is centered at +1.5 volts for 0 phase error. The output clamps at approximately 2.25 volts for under frequency and at 0.75 volts for over frequency. The voltage from the charge pump is fed to an active filter to control servo characteristics.

Current Chopper Circuit

The current chopper circuit uses a current feedback amplifier and two comparator circuits to interrupt the

motor control current at between 2-5 KHz. This causes the drive transistor to operate in the digital, or full off-full on mode. Current feedback is negative with respect to the error correction voltage at the error amplifier, and cancels the error correction signal when the current reaches a danger level. Error correction cancellation causes the error amplifier to switch turning off the power amplifier. The motor shuts off decreasing the current. When the current feedback signal declines, the speed error correction signal again predominates at the summing junction and turns the motor back on. This on/off oscillation is determined by the inductive reactance of the motor and the resistive/capacitive network following the error amp.

Rate Damping Circuit

When the phase locked loop servo system is in lock, the error signal will be a voltage which is a function of velocity difference between the reference clock and the band character pulses. To stabilize the servo and to allow a higher gain, a signal proportional to the rate of change of velocity is fed back. This signal is derived from the character pulses by filtering to produce a voltage proportional to velocity, and differentiating to produce a voltage proportional to rate of change of velocity. This signal is used to control acceleration and prevent overcurrent, however this signal is inhibited for 1.2 seconds during motor startup.

Overcurrent Fault Circuit

Overcurrent detection allows approximately 5 seconds for motor start up current of about nine amps and a maximum run current of 3.2 amps. The fault circuit monitors the voltage of the current feedback amplifier which is filtered through the over current detector amplifier and applied to a low pass filter network (R/C network). The R/C network provides the 5 second delay during motor start up and the resistor in parallel with the capacitor acts with the R/C network resistor to form a voltage divider. The voltage divider provides a voltage for comparison with a fixed voltage divider at the input of the fault error switch. The comparison voltage is selected to detect a motor running current in excess of 3.2 amps.

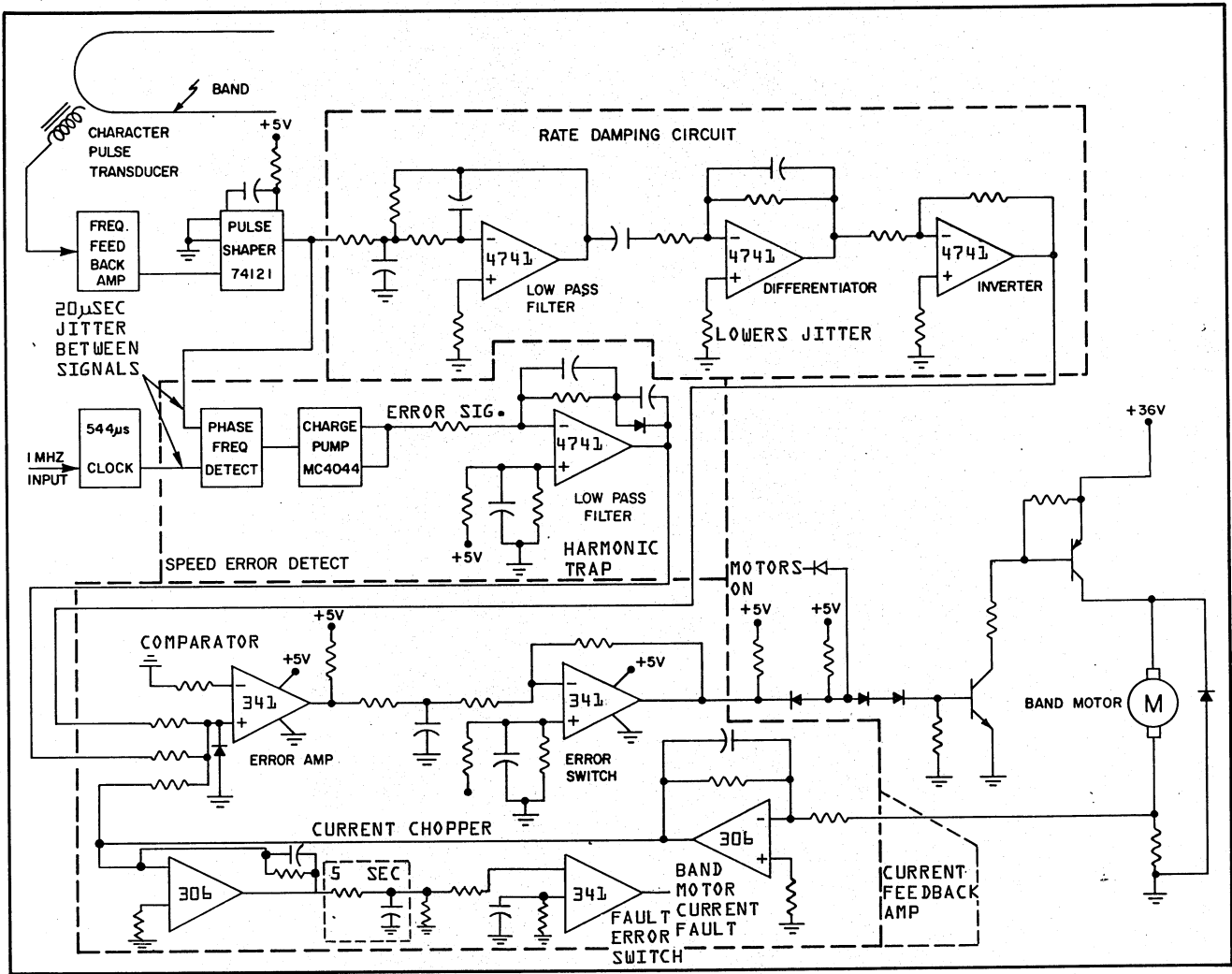


FIGURE 4-7. BAND MOTOR CONTROL FUNCTIONAL DIAGRAM

CHARACTER AND HOME PULSE GENERATION

The print band is moving at a rate of 246 inches (6250 mm) per second. At this speed there is approximately 540 μ sec between characters. The time for a complete font scan varies with the size of the font: 48 character font = 26 msec; 64 character font = 34.5 msec; 96 character font = 52msec; 128 character font = 69msec. There will be one complete font scan for each horizontal position of the hammer bar. Two pulses are generated by the band when it is in motion, the Character pulse and the Home pulse. One Character pulse is generated for each band character, 384 per band revolution. There is one Home pulse generated for each character font. The number of Home pulses per band revolution will vary with the size of the character font: 48 Character font = 8 Home pulses; 64 character font = 6 Home pulses; 96 character font = 4 Home pulses; 128 character font = 3 Home pulses. The Home pulse is used to synchronize the controller Band Code Counter to the band. Also the controller counts the number of Character pulses between each Home pulse to automatically determine the size of the character font. The Home pulse also indicates to the printer head electronics whether the band is standard or compressed pitch. The standard pitch band generates one home pulse at the beginning of each font. With the compressed pitch band, two Home pulses are generated at the beginning of each font.

Circuit Description

Each band contains two sets of raised lines. The upper set is the Home pulse lines. The lower set is the Character pulse line. As these lines pass the transducers mounted on the latch end of the gate, the transducers generate sine wave signals. The signals must have a negative swing of -.8 volts minimum to -7.0 volts maximum. As the Character pulse swings negative, at approximately -.5 volt, transistor Q3 turns off and Q2 turns on. Q2 turning on turns Q1 off, removing the reset input from the Character Pulse cross-coupled latch. Q3 turning off provides a high signal to M3 pin 1, where it is inverted to provide the set input to the cross-coupled latch. The -Character Pulse signal is generated until the sine wave input swings positive. As the signal reaches approximately the 0.0 volt level, transistor Q3 turns on and Q2 turns off. Q3 turning on places a low signal on M3-1 which inverts it, removing the set input from the latch Q2 turning off allows Q1 to turn on, resetting the latch. The Home Pulse detection circuitry functions in an identical manner to the Character Pulse and will not be discussed further.

COMPRESSED PITCH DETECT

The printer electronics automatically detects a compressed pitch band installed in the printer when the

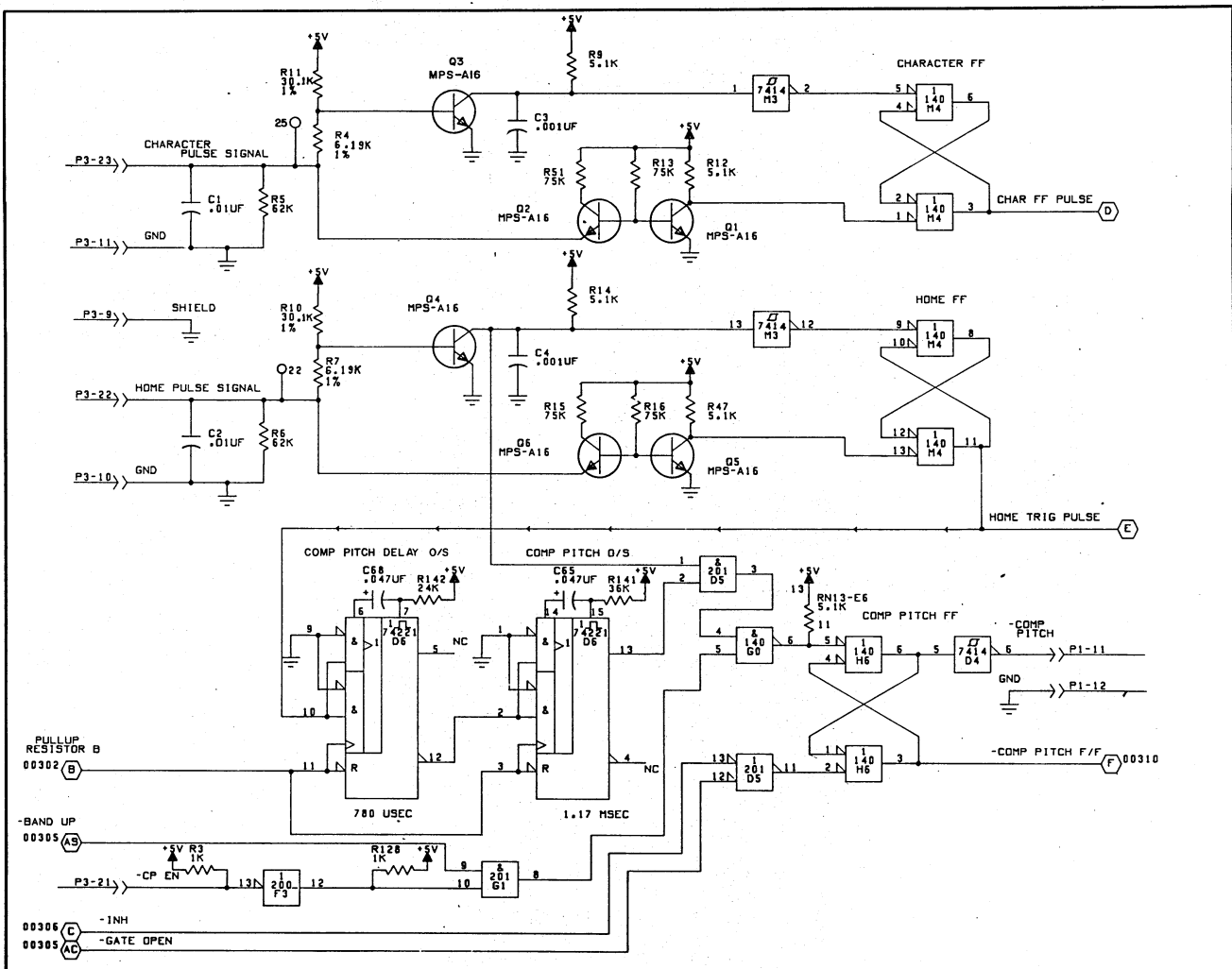


FIGURE 4-8. CHARACTER PULSE AND HOME PULSE

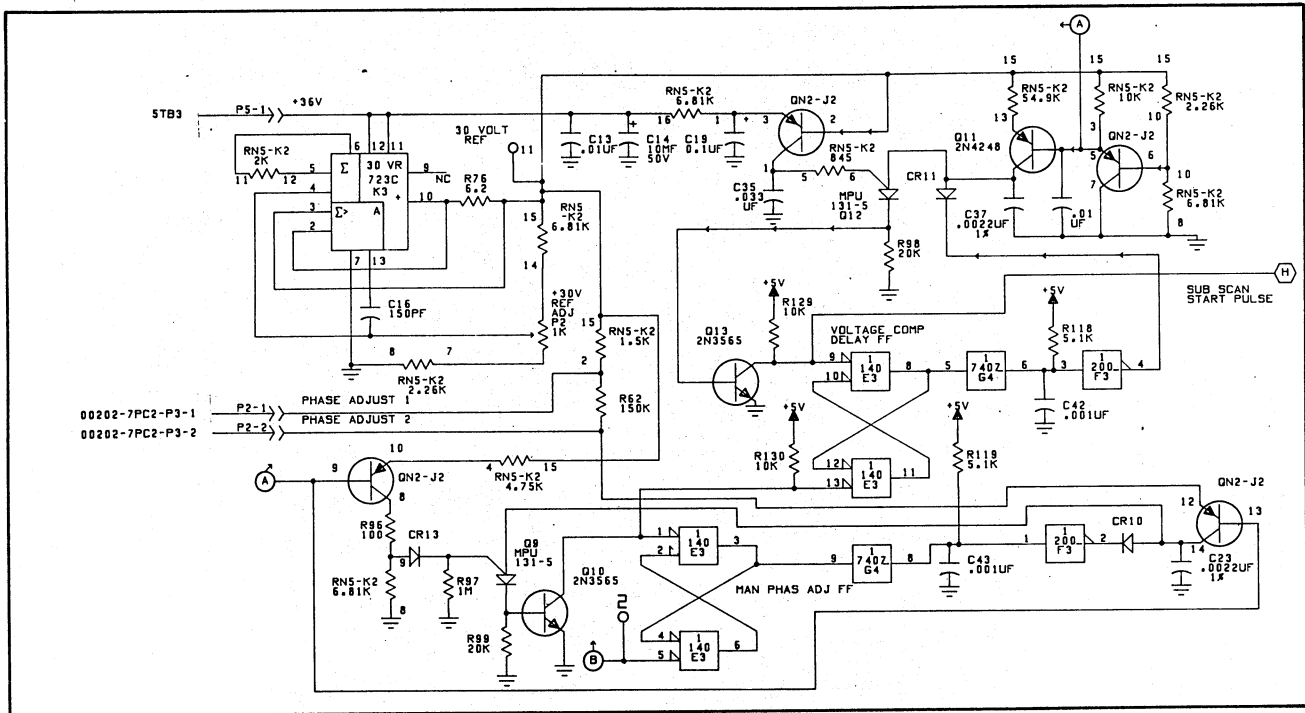


FIGURE 4-9. SUBSCAN COMPENSATION (PHASING) CIRCUITRY

compressed pitch option is enabled. Each compressed pitch band has two home pulse generating marks instead of the one generating mark on the standard pitch band. The first Home Pulse generated triggers the 780 μ sec one/shot D6 pin 12. After the 780 μ sec delay, a second one/shot is triggered. If a second Home pulse is generated within the second one/shot timeout (1.17 msec), then the gate D5 pin 3 is enabled and the Compressed Pitch cross-coupled latch H6 pin 6 is set if the band is up to speed. The appearance of a second Home Pulse within the 1.17 msec window which follows the first Home Pulse can only occur when a compressed pitch band is installed. The Compressed Pitch latch remains set until either the print gate is opened, or the printer is powered down. When the printer is powered on and the print gate is again closed, the detect circuit again checks to see if the band is compressed pitch. If it is, the latch is again set.

SUBSCAN COMPENSATION (7PC3)

The signal generating the subscan is the band character pulse which is input at point B in Figure 4-9. The analog compensation network electrically adjusts the start of the Subscans corresponding to the voltage level of the +36 volt supply and the position of the Phasing Control Potentiometer. By adjusting the start of the Subscans, the firing time of the hammers is also adjusted accordingly. Thus, if the +36 volts is low or the Phasing Control is adjusted for single part forms, the hammers are fired early. Correspondingly, if the +36 volts is high or the Phasing Control is adjusted for multiple part forms, the hammers are fired later. The analog compensation network automatically adjusts for these conditions or any combination of these conditions.

Circuit Description

The analog compensation circuit is triggered by the 7 μ sec negative going - Character pulse. As the pulse goes to a 'zero', it resets the Manual Phase Adjust cross-coupled latch (E3-5) (TP8). The low going set side output is buffered at G4-9 and inverted at F3-2. The one level at F3-2 reverse biases CR10 removing

the ground path from pin 14 of QN2-J2-14. QN2-J2-14 now must conduct through C23 to ground, C23 begins charging. The charging rate of C23 is determined by the Phasing Control potentiometer, which is wired in parallel with R62, the 150K resistor in the emitter circuit of QN2-J2-12. The potential developed at the capacitor is felt at the anode of the PUT, Q9. The voltage level on the gate is always constant. When C23 charges to level .6 of a volt higher than the gate voltage, the PUT, Q9 turns on placing a one level on the base of Q10, turning it on. The output of Q10 sets the Manual Phase Adjust cross-coupled latch and resets Voltage Compensation Delay cross-coupled latch. Setting the Manual Phase Adjust latch again forward bias CR10, restoring the normal ground path to QN2-J2 and discharging C23. The discharge of C23 turns the PUT, Q9, off. Resetting the Voltage Compensation Delay latch reverse biases CR11, removing the normal ground of Q11. Q11 now conducts charging C37 to ground, and C37 begins a charging at a fixed rate. The potential at Q12 is at a potential established by the conductivity of QN2-J2-1. The emitter of QN2-J2-3 is tied to the +36 volts from the power supply. The base of QN2-J2-2 is tied to the regulated 30 volts. The difference in these two voltages establishes the conductivity of QN2-J2-1, developing the potential at the gate of Q12. Thus, the lower the +36 volts, the lower the potential at the gate, and the quicker C37 charges to the level required to fire Q12. Conversely, the higher the +36 volts, the higher the potential at the gate, and the longer it takes C37 to charge to level required to fire Q12. When C37 charges to .6 of a volt greater than the gate potential, Q12 fires, turning on Q13. The low going output of Q13 sets the Voltage Compensation Delay latch and generates the -Subscan Start pulse. Setting the latch forward biases CR11 restoring the ground path to Q11 and discharging C37. As C37 discharges, the PUT, Q12 turns off, turning off Q13. When Q13 turns off, the -Subscan Start pulse goes back to a high level.

SUBSCAN PULSE GENERATOR (7PC3)

The Subscan Pulse Generator splits the time between each Character pulse into four subscans. During each subscan every third print band character is aligned with every fourth print position. The subscan pulses correspond to the print time for each print position.

Circuit Operation

This generator is running continuously anytime the print band is moving. This description of the circuit operations starts just before the generation of the Subscan Start Pulse. At this time flip-flops B2-3 and B2-5 are set, and flip-flops B1-5 and B1-3 are reset. The two counter chips, A0 and A1, are held in the load condition by A2 pin 6 and each Clock pulse is strobing the count of 121₁₀ into the counter. Upon receipt of the -Subscan Start Pulse, flip-flops B2-3 and B2-5 are reset. This action sets flip-flop B1-5 which generates the fourth Subscan Pulse and the Home Pulse Enable signal. At the same time these two pulses are generated, the Load input is removed from the counter, and it begins counting. The counter is clocked by a 1MHz clock pulse. This pulse increments the counter by one count every microsecond. When the counter reaches the count of 128₁₀, its four least significant

bits are lows. This condition causes a high output from B0-8 which resets flip-flop B1-5, terminating the fourth-Subscan Pulse and the Home Enable Pulse seven microseconds after their origination. The counter continues to be incremented every microsecond until it reaches the count of 255₁₀. At this time, 'And' gate A2-8 is enabled. On the trailing edge of the clock pulse flip-flop B1-3 sets and the counter is reloaded to the count of 121₁₀. The setting of flip-flop B1-3 generates the first-Subscan Pulse for the Character pulse. The leading edge of the next clock pulse increments the counter. At the count of 128₁₀, the four least significant bits are again all lows causing flip-flop B1-3 to reset. As the flip-flop resets, the first -Subscan Pulse is terminated and flip-flop B2-3 is set. The counter continues to be incremented every microsecond until it reaches the count of 255₁₀. At 255₁₀, 'And' gate A2-8 is again enabled. When the clock pulse drops, flip-flop B1-3 is again set and the counter is reloaded to 121₁₀. Flip-flop B1-3 generates the second -Subscan Pulse. The counter starts counting again. At the count of 128₁₀, flip-flop B1-3 is reset, terminating the second -Subscan Pulse, resetting flip-flop B2-3 and setting flip-flop B2-5. The counter continues to be incremented every microsecond until it reaches the count of 255₁₀. At this time, 'And' gate A2-8 is again enabled, and on the trailing edge

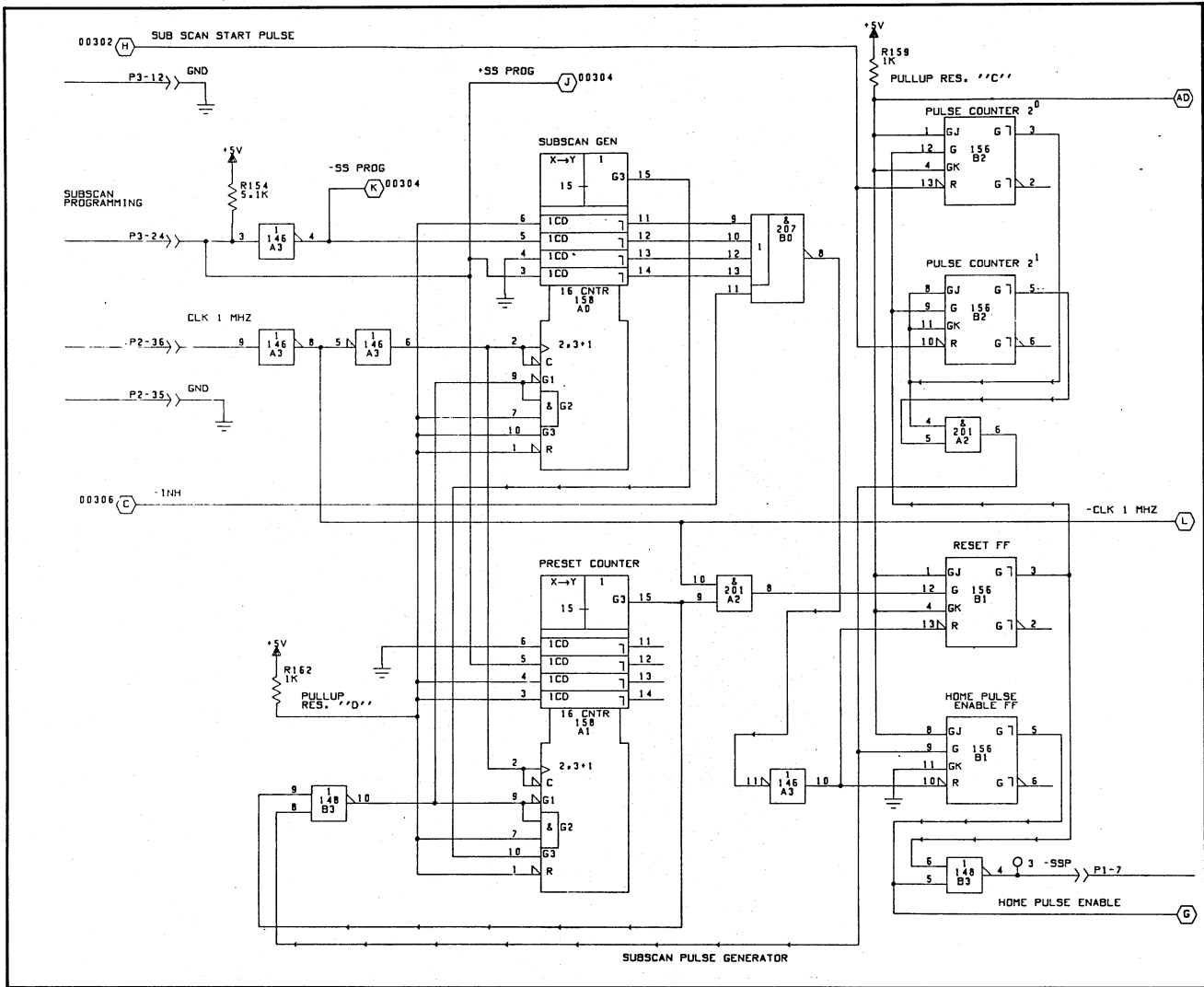


FIGURE 4-10. SUBSCAN PULSE GENERATOR

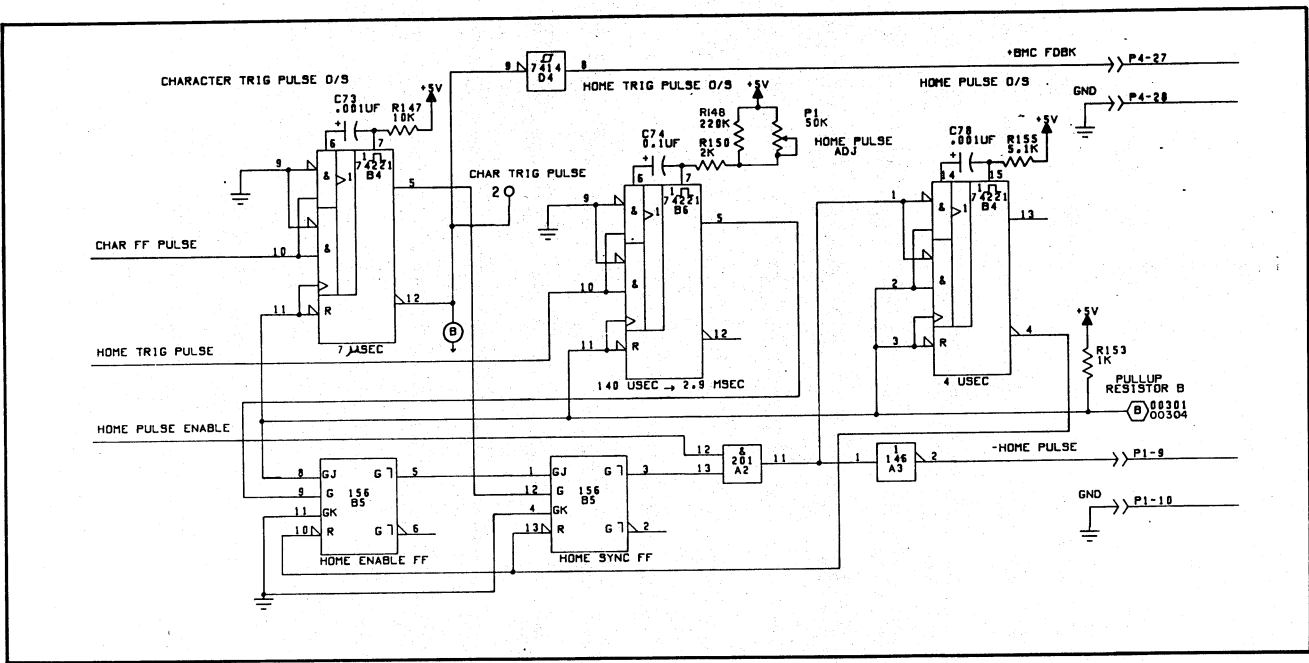


FIGURE 4-11. HOME TO CHARACTER PULSE SYNCHRONIZATION

of the clock flip-flop B1-3 is again set, and the counter is reloaded to the count of 121₁₀. Flip-flop B1-3 generates the third -Subscan Pulse¹⁰. The counter resumes counting at the next clock pulse. When the counter reaches the count of 128₁₀, flip-flop B1-3 resets terminating the third -Subscan Pulse and setting flip-flop B2-3. At this time both flip-flops B2-3 and B2-5 are set, enabling 'And' gate A2-6. This holds a constant load signal on the counter, disabling it until the next -Subscan Start Pulse. The fourth -Subscan Pulse is not generated until the receipt of the next -Subscan Start Pulse. When it is received, flip-flops B2-3 and B2-5 are reset. This action sets flip-flop B1-5 which generates the fourth -Subscan Pulse and the Home Pulse Enable signal. At this same time, the Load signal is removed from the counter and it begins counting again.

HOME TO CHARACTER PULSE SYNCHRONIZATION

This circuit electrically compensates for any mechanical misalignment between the Character Pulse Transducer and the Home Pulse Transducer. The adjustment of the Home Pulse Synchronization one-shot, B6-5, allows the Home Pulse to be centered on any one of five Character Pulses. See the Corrective Maintenance portion of Section 5 for proper set-up of this one-shot.

Circuit Description

The circuit operation is initiated when the Home Pulse is generated. The Home Pulse triggers one-shot B6-5. The pulse width of this one-shot may vary between .140 and 2.9 msec. This pulse width is preset from the factory or during preventive maintenance to center the trailing edge of the pulse on the proper Character Pulse. On the trailing edge of the one-shot pulse, flip-flop B5-5 is set. The Character Pulse aligned with the Home Pulse has already triggered the 7μsec one-shot B4-5. The trailing edge of this one-shot pulse sets flip-flop B5-3. When the Home Pulse Enable pulse is generated during the fourth subscan for this Character Pulse 'And' gate A2-11 is enabled and the -Home Pulse is generated. When the 7μsec Home

Pulse Enable pulse drops, the reset one-shot B4-13 is triggered. This 4μsec pulse resets both flip-flops B5-5 and B5-3 terminating the synchronization operation.

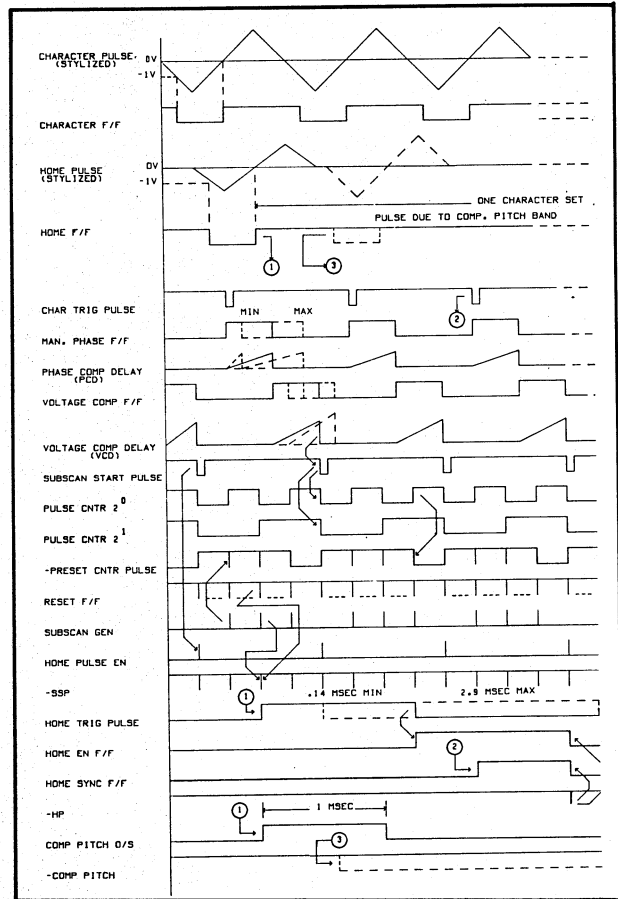


FIGURE 4-12. BAND MONITORING TIMING

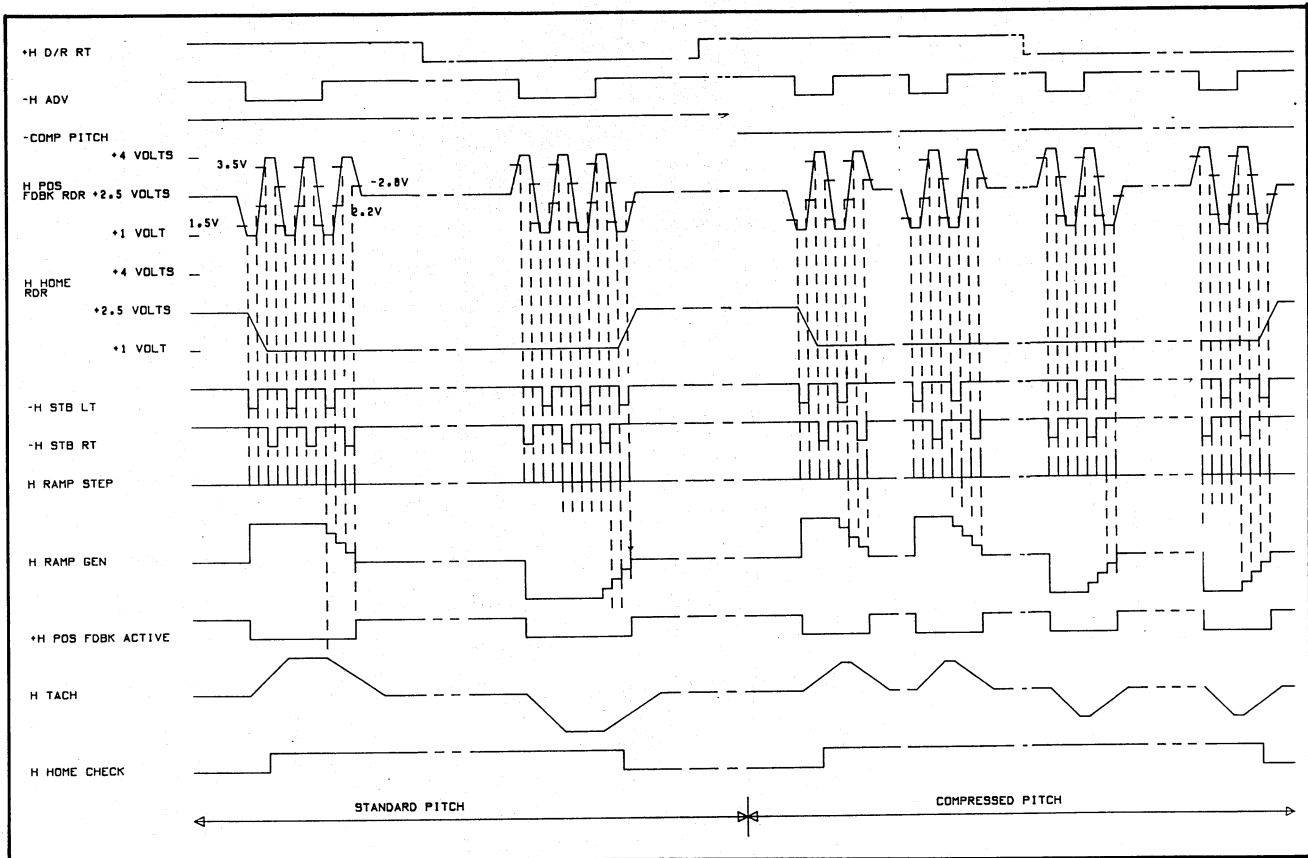


FIGURE 4-13. HORIZONTAL SHIFT TIMING

HORIZONTAL SHIFT CONTROL

The Horizontal Shift mechanism uses a linear drive voice coil that is closed loop servo controlled to position the hammer bar for printing. For standard pitch operation, the bar is moved in increments of 0.1 inch (2.54 mm). When the compressed pitch option is employed, the bar is moved in increments of .067 inch (1.69 mm). The movement of the bar is sensed through the use of a light source, a photo-electric sensor and a grid mounted on the end of the hammer bar. As the grid moves between the light source and the sensor, a sine wave signal is generated every .033 inch (0.85 mm). During standard pitch operation, every third pulse signifies one complete horizontal shift, while every second pulse signifies a complete shift during compressed pitch operation. The following Table breaks down the number of shifts necessary to print one complete line of data.

MACHINE SPEED	NUMBER OF SHIFTS	
	STANDARD	COMPRESSED
300	4	6
600	2	3

Control Circuit Description

The Horizontal Motion operation is initiated when the -Horizontal Advance signal goes low. This action clears the Ramp Step Shift Register (E4-1). When the most significant bit of the shift register goes low the bilateral switch (J4-8) closes and the reference voltage from the resistor network is fed to one of the inputs of the Ramp Generator (L3-5 or 6). The input pin is selected by the -Horizontal Direction Right Signal. If the signal is low, a shift to the right is required, bilateral switch J4-2 is closed, and the reference signal is fed to pin 6 of L3 producing a negative going ramp at pin 7. If the -Horizontal Direction Right signal is high, a shift to the left is required, bilateral switch J4-4 is closed, and the reference signal is fed to pin 5 of L3 producing a positive going ramp at pin 7. The ramp output is summed with the Tachometer input at pin 2 of L1. At this point the tachometer signal is opposite in polarity to the ramp. The sum of the tachometer and the ramp is inverted at L1 pin 1 and fed to the summing network feeding the comparator L0A pin 3. The summing network sums the error signal with the horizontal current sense, the position feedback signal, and a modulating 10 KHZ triangular clock pulse. The comparator inverts the summed input at pin 7. The polarity of the comparator output determines the direction of the drive. A negative going signal provides an active output from the Right Drive (KOB) amplifier. A positive going signal provides an active output from the Left Drive (KOA) amplifier. The output of the amplifiers is fed to the horizontal drive 'H' switch.

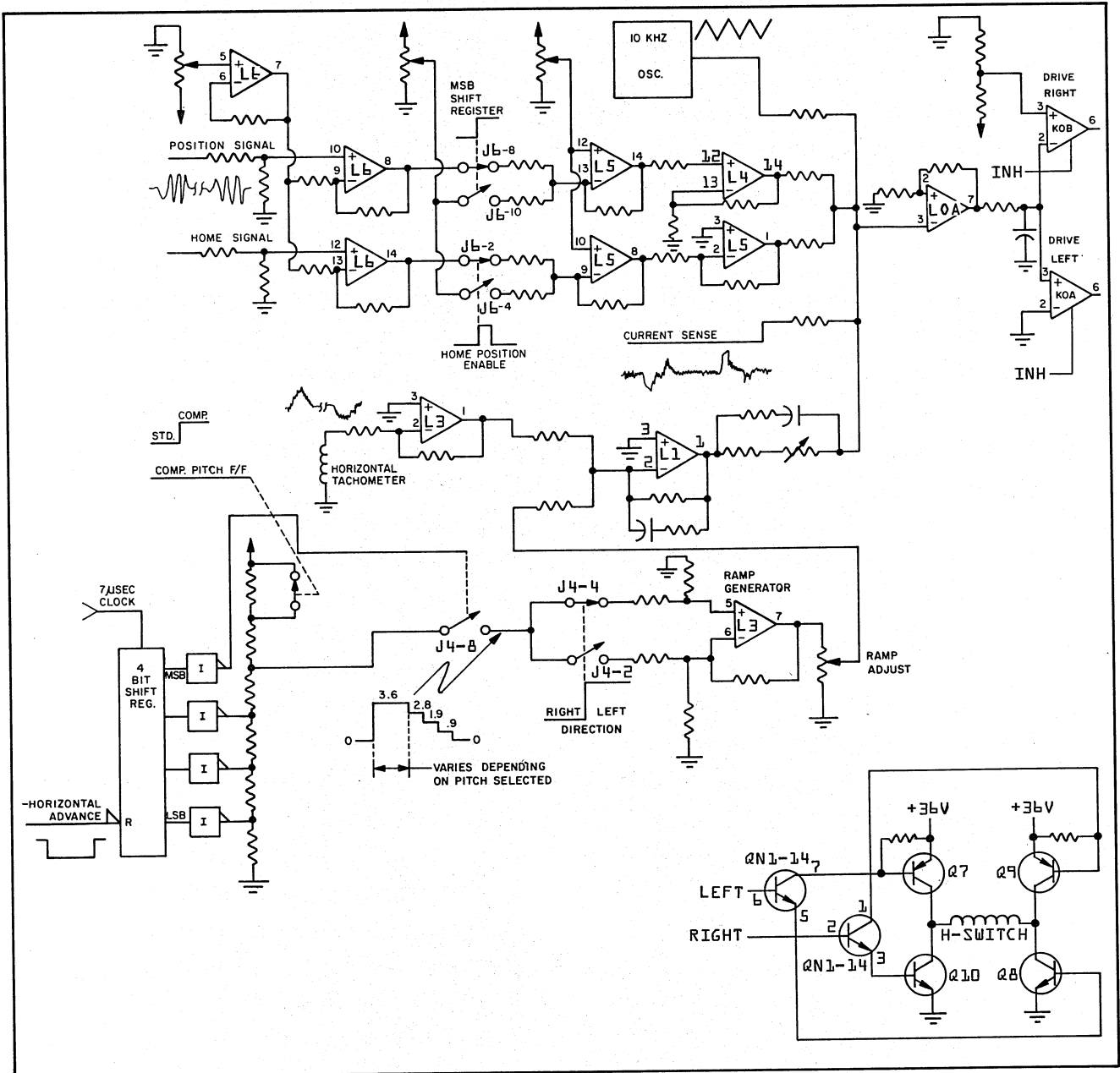


FIGURE 4-14. HORIZONTAL SHIFT FUNCTION DRAWING

The distance of motion is monitored by the Horizontal Position Feedback Reader. For every .033 in (.85 mm) of motion a Horizontal Position sine wave signal is generated by the reader. When the voice coil is moving to the right, the sine wave goes negative first, then positive. When moving to the left, the sine wave goes positive first, then negative. During the negative swing of the signal, from approximately 1.5 volts back up to 2.2 volts, the Horizontal Strobe Left pulse is generated. During the positive swing, from approximately 3.5 volts back down to 2.8 volts, the Horizontal Strobe Right pulse is generated. There will be a Strobe Left and a Strobe Right for each Horizontal Position signal. The number of Horizontal Position pulses necessary to terminate the Horizontal Motion is determined by the pitch

selected, standard or compressed. Standard pitch requires three Horizontal Position pulses and compressed pitch requires two pulses. When moving to the right, on the trailing edges of the first (compressed pitch) or second (standard pitch) Horizontal Strobe Right pulse, the Horizontal Advance signal is terminated. When moving to the left, on the trailing edge of the first (compressed pitch) or second (standard pitch) Horizontal Strobe Left pulse, the Horizontal Advance signal is terminated. The horizontal shifts are terminated by the Horizontal Reset Enable which counts the Strobe Left/Right signals. Upon termination of the Horizontal Advance signal, the reset is removed from the Ramp Step Shift Register. The shift register reduces the output of the ramp generator in four steps to provide a controlled rate of deceleration. The shift register is clocked on the leading and trail-

ing edges of both the Horizontal Strobe Right and Left pulses. Each pulse generates two seven microsecond clock pulses for the register. When shifting to the right, the first two clock pulses are generated by the Strobe Left pulse and the last two are generated by the Strobe Right pulse. On the trailing edge of the Strobe Right pulse, the final clock pulse shifts the register activating the most significant stage of the register. The most significant stage of the counter controls the bilateral switch J4-8. When the stage goes active, the switch opens and the ramp goes to zero volts, terminating the shift motion. When shifting to the left, the Strobe Left pulse generates the final clock pulse which terminates the shift. When the shift is complete the Horizontal Position Feedback Active signal goes high and remains high until the next Horizontal Advance pulse. This signal prevents any printing from occurring during a shift operation. The horizontal inhibit circuit prevents horizontal motion during power up inhibit or following a customer engineer error or if the ribbon is not in motion.

Horizontal 'H' Switch

The 'H' switch provides bidirectional drive to the voice coil. The switch is activated by either the Right or Left input signal. When the Left signal goes high, QN1 pin 14 goes low and QN1 pin 5 goes high. The low level at QN1-14 turns on the PNP transistor Q7 placing +36 volts on the Left input to the voice coil. At the same time, the high level at QN1-5 turns on the NPN transistor Q8, providing a ground path at the Right input of the voice coil. The voice coil then drives to the left. When the Right signal goes high, QN1 pin 1 goes low and QN1 pin 3 goes high. The low level at QN1-1 turns on the PNP transistor Q9 providing +36 volts on the Right input to the voice coil. At the same time, the high level at QN1-3 turns on the NPN transistor Q10, providing a ground path at the Left input of the voice coil. The voice coil then drives to the right.

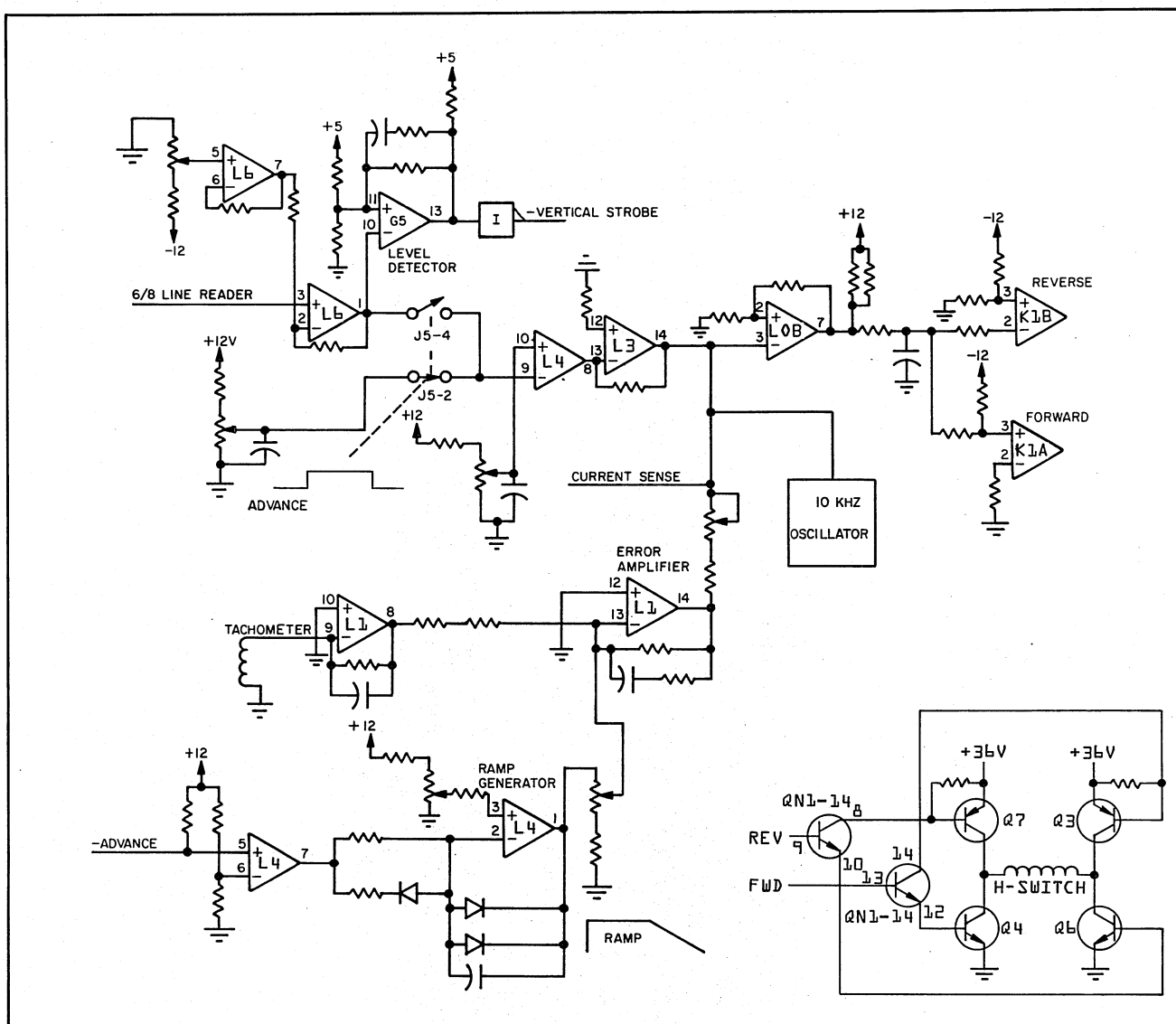


FIGURE 4-15. VERTICAL MOTION FUNCTIONAL DRAWING

HORIZONTAL END STOP FAULT WAVEFORMS
 (Cross Reference Number 00304)
 Example shown is for a PBS 720 in STANDARD PITCH mode.

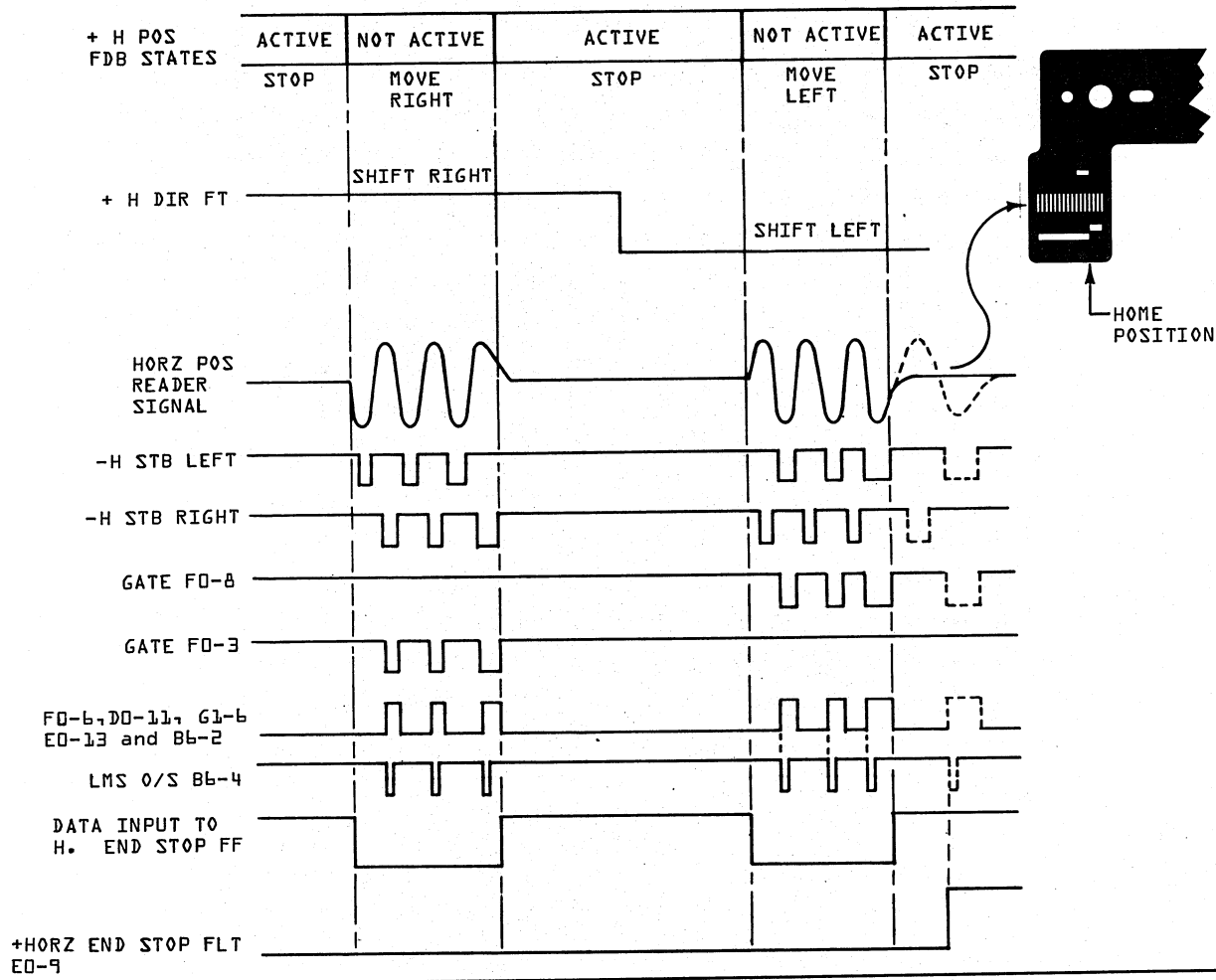


FIGURE 4-16A

HORIZONTAL END STOP FAULT

This fault circuit detects a horizontal motion error where- by the horizontal system moved greater than 1/10th inch (2.54mm) in standard pitch or greater than 1/15th inch (1.7mm) in compressed pitch when performing a shift right or left operation. Hence, this circuit detects if the horizontal system moved beyond the end of its normal stop point. Horizontal End Stop Fault is not checked when performing a Horizontal Home function. Detection of a Horizontal End Stop Fault causes a C.E. Fault to be generated which desequences the 36 volt power supply. The printer is reset by turning off the On/Off circuit breaker for three seconds and then back to On. Adjust- ment of the horizontal electronics may be required if faults continue to occur.

Circuit Description

During normal operation, the horizontal strobe right and left pulses are generated only during the time horizontal position feedback is not active, i.e. hori-

zontal system is in motion. When horizontal position feedback goes active (+H POS FB ACTIVE goes high) indicating completion of a horizontal shift, no more horizontal strobe right or left pulses are generated. The data input to the H. END STOP flip flop (EO-12) is low during the time horizontal position feedback is not active. During each horizontal strobe pulse the reset input to H. END STOP flip flop is removed and the 1 ms O/S output drives the flip flop clock input. Since the data input is always low, the flip flop is never set high and no end stop fault is generated. When horizontal position feedback goes active, indicating the end of a shift operation, the data input to the H END STOP flip flop goes high. If the horizontal system continues to move beyond this point, an extra horizontal strobe right or left pulse is generated. This extra pulse also removes reset from the flip flop and generates another 1 ms clock pulse. Since the data input to the flip flop is not high, the flip flop goes set and a Horizontal End Stop Fault is generated. This fault condition is reset by the INHIBIT signal or in the case of the PB 1130 Printer, Horizontal Inhibit maintains the H. END STOP flip flop reset.

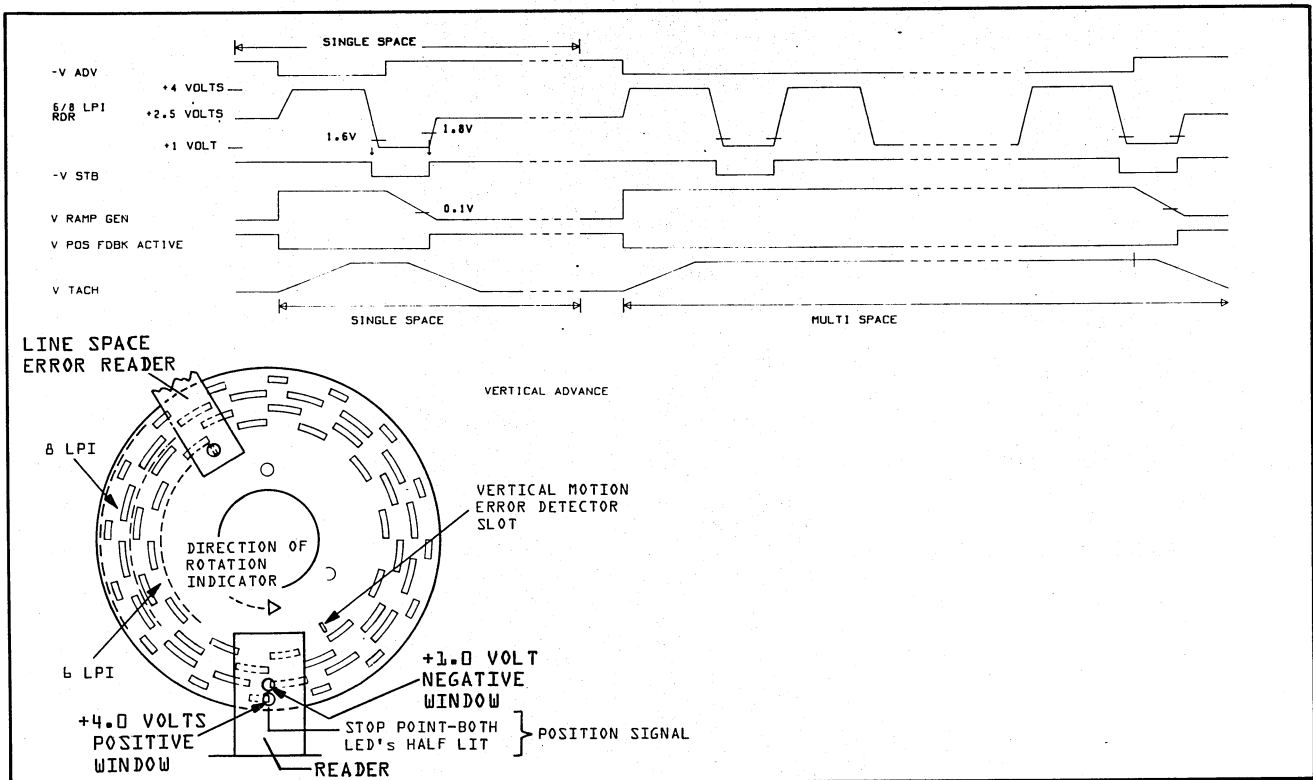


FIGURE 4-16. VERTICAL MOTION TIMING

VERTICAL ADVANCE SERVO SYSTEM

The vertical advance is controlled by a linear drive closed loop servo system. This system is capable of advancing forms at a rate of 20 inches (508mm) per second. The advance can be in increments of 6 or 8 lines per inch as selected at the reader. The duration or number of lines advanced is determined by the Advance signal. The Advance signal in the standard printer is controlled by the controller electronics which interprets the format data character. There are a number of options which effect the Advance signal like; variable top of forms, electronic vertical format unit, remote forms control. The board 7PC2 contains optional jumper positions to allow control of the vertical system by the electronic vertical format unit, or remote interface control by monitoring the Line Feed O/S signals. Refer to Section "0" if incorporated at the front of this manual for special options controlling vertical motion. If an Electronic Vertical Format Unit (EVFU) is installed on the left side of the printer refer to the Special Option manual.

Circuit Description

The servo controlled advance operation is initiated by the -Advance signal from the controller going low. When this occurs the ramp generator L4-1 is turned on. The ramp is then summed with the inverted tachometer signal. The difference between these two signal is amplified by the Error Amplifier L1-14. This error output is then summed with the Current Sense input and a 10 KHz oscillator. The Current Sense input is opposite in polarity to the error signal and it

will over-ride the error if an excessive current is being drawn by the advance motor. The 10 KHz oscillator modulates the error signal to maintain a linear drive. When the Advance signal is active, the position signal is not used by servo systems. Instead, a null voltage level fed to the servo system at L4-9.

The switching from the position reader input to a null voltage input is controlled by two CMOS bilateral switches, H5-4 and H5-2 is closed. Although the position reader signal is not used by servo system during advance, it is used by the controller to monitor the advance. The reader input is fed to a level detector G5-10. As the input signal goes negative below approximately 1.6 volts, the level detector generates the Vertical Strobe signal. The Vertical Strobe is sent to the controller to terminate the advance operation. If the advance operation has been completed, the controller terminates the Advance signal. As the Advance signal is deactivated the ramp slopes towards 0 volts. The rate of slope is determined by the capacitor in the feedback circuit of the ramp generator. This slope on the trailing edge of the ramp provides a gradual deceleration rate. As the ramp reaches approximately .1 volts, the bilateral switch H5-4 closes and switch H5-2 opens. This places the system under control of the position reader. The reader seeks to balance its input at 2.5 volts. This corresponds to a point on the code disk on the leading edge of the positive window and the trailing edge of the negative window. If the code disk is moved in either direction, one of the windows predominates creating an error condition and the system drives in the other direction until the null points is again reached.

HAMMER DRIVER SHIFT REGISTER

The H. D. Shift Register is composed of four eight bit shift register chips and two J/K flip/flops per board. This provides a capacity of 34 locations for each H. D. circuit board. The purpose of the shift register is to provide a temporary storage medium between the printer memory and the H. D. CMOS digital timers (MC 14415). A temporary storage medium is necessitated by the fact the print memory is optioned (Option Cycle) one character ahead of the actual band location. During an Option Cycle every other character (600) or every fourth character (300) Compare signal level is loaded into the shift register. At the completion of an Option Cycle the Shift register is completely loaded (34 locations in 300 and 68 locations in 600). The shift register then holds the Compare level information until the digital timers have been fired. This is assumed to have occurred by TSSP 4 time of Sub Scan 4. At that time, the Shift Register to Hammer Driver pulse is generated. This pulse loads the active shift register outputs into the digital timers. At TSSP 5 time the next Option Cycle is initiated and the shift register is loaded again.

Shift Registers Interconnection

Three jumpers are provided on each Hammer Driver Board to control the flow of Compare signal levels. These jumpers are necessary because the hammer driver is designed to be interchangeable from board location to board location and from printer to printer regardless of machine type (300 or 600). When the shift register is being loaded (Option Cycle), the least significant memory location Compare level is loaded into the most significant location of the shift register. As each succeeding Compare level is loaded into the shift register, the least significant Compare level is shifted down the shift register locations until, at the completion of the load, the least significant Compare level is in the least significant location of the shift register.

In the 300 LPM units only one hammer driver board is used with only one jumper (J1) installed. The Compare level is loaded directly into the most significant location (IC15 pin 9) of the shift register. When the load operation is complete, the first Compare level has been shifted to the least significant location (IC03 pin 13).

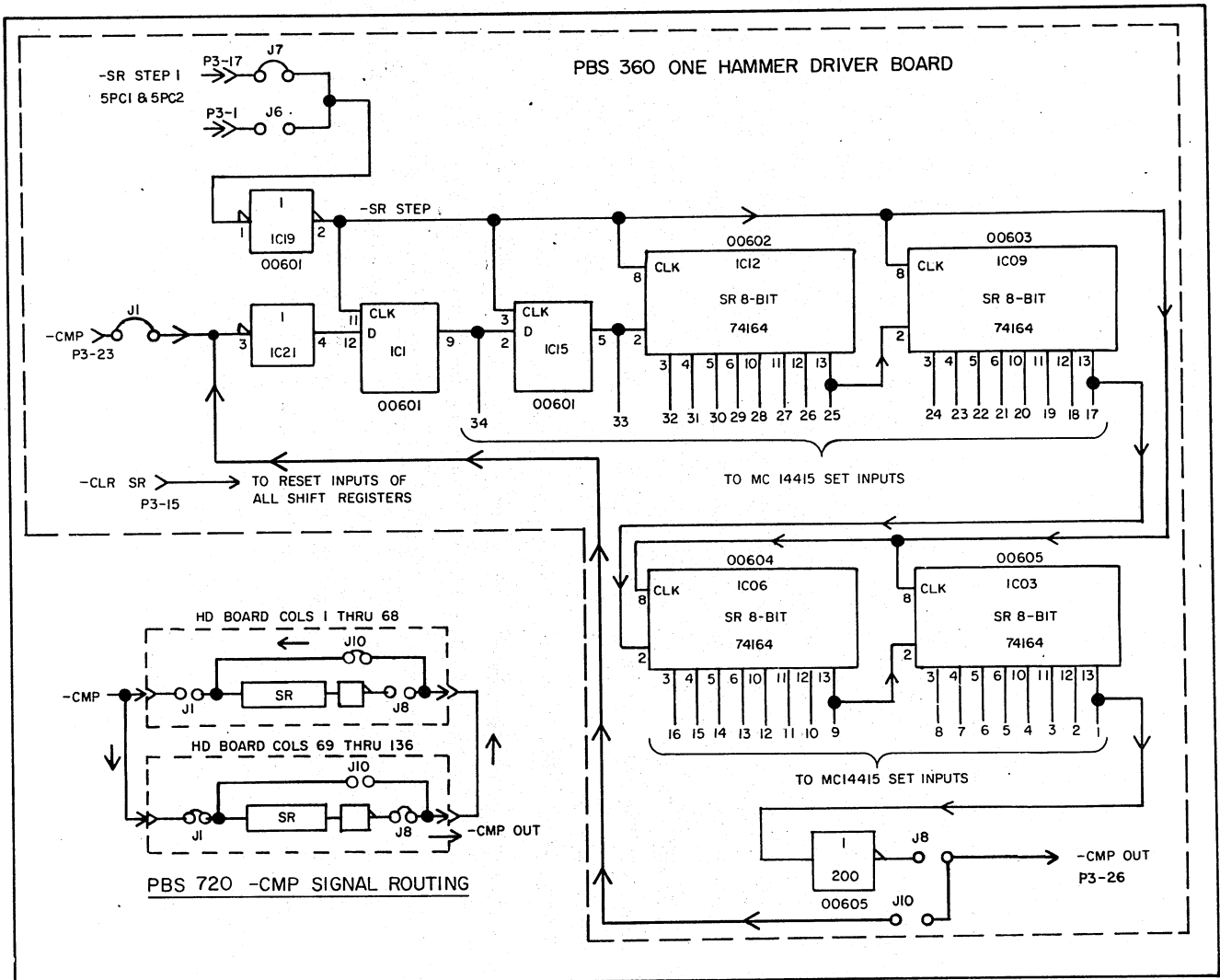


FIGURE 4-17. HAMMER DRIVER SHIFT REGISTER

In the 600 LPM units two hammer drivers are used (locations 5PC1 & 5PC2). The driver board in location 5PC1 controls print columns 1 through 68. The remainder of the columns are controlled by the hammer driver in location 5PC2. On board location 5PC2 two jumpers are installed, J1 and J8. J1 routes the Compare level signal from the board input pin to the most significant stage of the shift register. J8 routes the output from the least significant shift register location on the board to the board output pin. From this point, the signal is routed to the same pin on the board in location 5PC1. On board 5PC1 only jumper J10 is installed. This jumper routes the Compare level from the least significant stage of the shift register on 5PC2 to the most significant stage of the shift register on 5PC1. When the load operation is complete, the first Compare level loaded into the most significant location of the shift register on 5PC2 is now the Compare level stored in the least significant location of the shift register on 5PC1.

HAMMER DRIVER CIRCUIT OPERATION

The hammer driver circuits control the operation of the armature/striker assemblies which drive the print hammer. There are 34 driver circuits contained on one circuit board in the 300 LPM units and 68 driver circuit contained on two circuit boards in the 600 LPM units. With a column capacity of 136 columns each driver circuit goes to operate a armature/striker assembly. When a smaller column capacity is used, load resistors are installed on the hammer driver connector for the last columns not used. On a 360 LPM, 132 column machine each hammer prints four columns so one resistor is installed. A 720 LPM, 132 column machine has two resistors as each hammer prints only two columns.

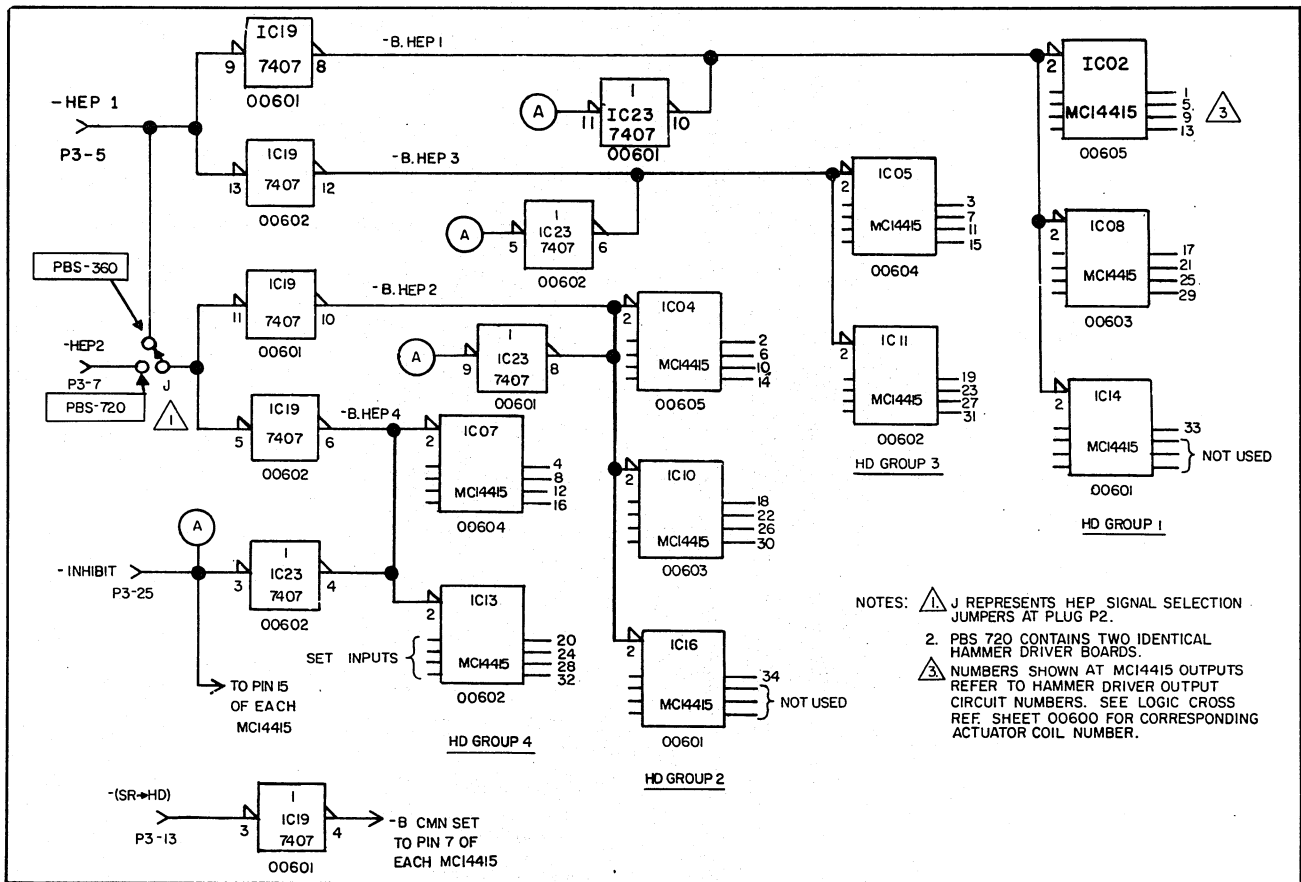


FIGURE 4-18. HAMMER DRIVER CIRCUITS

Each driver circuit is composed of a shift register location, a CMOS digital timer and a drive transistor. The complete shift register is loaded during each Option Cycle of a Print Cycle. During an Option Cycle the level of the Compare signal is loaded into the shift register each time the Shift Register Step 1 pulse is generated. The level of the Compare signal is determined by comparing the Memory output code with the code in the Band Code Generator. If the codes are identical, the Compare signal level is low. The Shift Register Step 1 pulse is generated every time the Shift Register Step Counter is equal to the Horizontal Position Counter. These two counters will be equal any time the memory location being optioned is printable with the hammer bar in its present location. This will occur 34 times per Option Cycle in the 300 LPM units and 68 times per Option Cycle in the 600 LPM units.

At the completion of an Option Cycle the shift register is completely loaded. During the first Option Cycle of any Print Cycle no printing is done. When the Sub Scan Register equals the count of 4, at TSSP 4 time, the Shift Register to Hammer Driver (SR HD) pulse is generated. This pulse strobes the shift register out-

puts into the digital timers. Once the timers have been loaded the shift register can be loaded by the next Option Cycle which begins at the first $\Phi 2$ Clock after TSSP 5 time. The timers will hold the information from the Option Cycle until the Hammer Enable Pulse (HEP) is generated. (See the HEP Generation explanation in this section). The HEP signal will trigger the timer outputs of the circuits loaded with "ones". Upon receipt of the HEP signal, these timer outputs go high turning on the driver transistors which energize the actuator coils. The timer outputs remain high turning on the driver transistors which energize the actuator coils. The timer outputs remain high for 100 Hammer Driver Clock pulses, which is 1.1m sec. At the one hundredth clock pulse the timer outputs go low and its internal circuitry is cleared in preparation for the next transfer from the shift register. By the time the timer operation is complete, the shift register has already been loaded with the Compare levels for the next band character. During Subscan 4, at TSSP 4 time, the SR HD pulse is again generated and the shift register information is transferred to the timer. The hammer driver circuits will continue to operate in this manner until the Print Cycle is terminated.

CONTROLLER ELECTRONICS

PRINTER INTERFACE

The standard interface uses 7414 hex schmitt trigger circuits as single ended receiver chips and 7437 quad two input nand buffers as single ended transmitters. This configuration allows communication with a data source through data cables of up to 50 feet (15.3 meters) in length. On the interface lines a logic '1' (high) is 3.25 ± 0.5 volts. A logic '0' (low) is 0.2 ± 0.2 volts. The receiver chips invert the interface signal (i.e., a 'zero' on the lines provides a 'one' on the receiver output). The nand buffer transmitters require two 'ones' on its inputs to provide a 'zero' on the output.

Many optional and unique interfaces may be connected at the front of the standard interface for special processing systems. Special interfaces are described in Section "0" if incorporated at the front of the manual or in an Interface Adapter manual supplied with the printer.

INTERFACE SIGNALS

There are sixteen interface lines plus a logic ground between the common controller and an external data source or an adapter interface installed in the printer. The interface lines include -Ready, -Master Clear, -Strobe, -Acknowledge, seven Data Bits, Out of Paper, Busy, Band Detect 2⁰, Band Detect 2¹, and Compressed Pitch.

-READY (-RDY)

An interface line from the printer which, when low (logical "0"), indicates that the printer is fully operational, and ready to receive data. The -RDY condition may be removed by any one of the following conditions:

1. Depression of START/STOP switch when RDY.
2. A detectable fault occurs. The detectable faults are either Customer Engineer faults which require a service call or Operator faults which can be corrected by the operator.

Customer Engineer (CE) Faults

- a. Fuse fault (36 volt supply for "H" switches and ribbon motors.)
- b. "H" switch fault.
- c. ± 12 volt Fault
- d. Horizontal Motion Error
- e. Hammer Fault.
- f. Horizontal End Stop Error
- g. Horizontal Not Home Fault
- h. Band Motor Fault
- i. Ribbon Motor Fault

Operator Faults

- a. Gate open
- b. Forms error; out of paper, paper motion verification
- c. Line space error
- d. Band not identified
- e. Optional EVFU not loaded.
- f. Band cover off/loose.
- g. Ribbon Fold Detectors, sense error or open

If the data source should sense a -RDY condition during a data transfer, the data handshaking will be halted, and the data source must assume that the line is to be retransmitted. If the data source senses a -RDY during a BUSY, it should assume that the line will be or attempted to be printed.

-MASTER CLEAR (MC)

An interface line from the data source which, when low (logical '0'), resets the printer electronics. This signal cannot remove the printer from the RDY mode. The duration of the "0" level must be a minimum of 10 microseconds.

Due to the required initialization of the hammer bar to its leftmost position, the sensing of a -MC is inhibited during the print cycle. To insure sensing of a MC when BUSY, -MC must be held to a logical "0" during BUSY and for 10 microseconds after BUSY goes from a logical "1" to a logical "0".

-STROBE (-STB)

An interface line from the data source which, when low (logical '0'), indicates to the printer that the data lines are stable and may be sampled at the discretion of the printer.

-ACKNOWLEDGE (-ACK)

An interface line from the printer which, when low (logical "0"), indicates to the data source that the data lines have been sampled. This signal is an interlocked signal whose duration is determined by the STB signal.

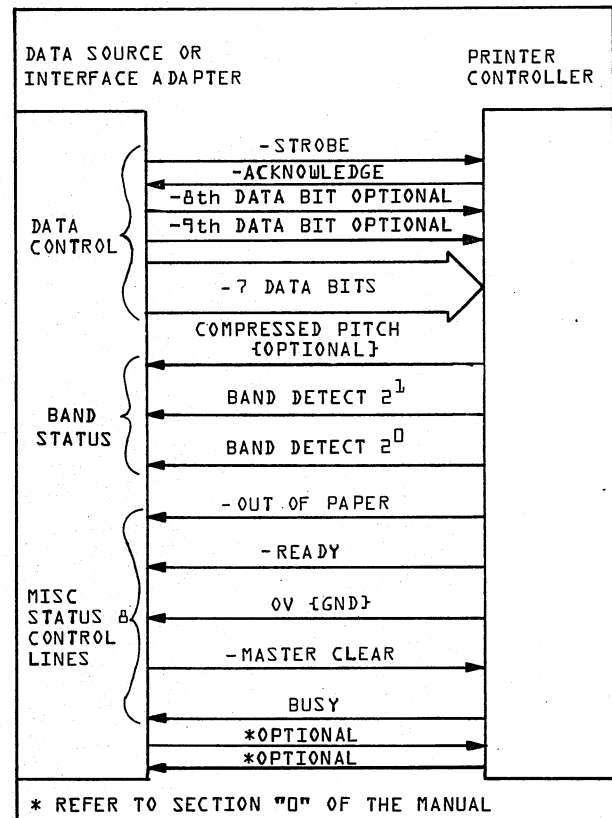


FIGURE 4-19. INTERFACE SIGNALS

DATA BITS (-DB1 thru -DB7)

Seven (7) data lines (DB1 thru DB7) carry the information (control codes and data characters) to the printer controller. The data must be stable on the data lines a minimum of 200 nanosec. before and after the generation of the STB signal.

-OUT OF PAPER (-O.O.P.)

An interface line from the printer which, when low (logical "0"), indicates that no Out of Paper condition exists in the printer. This condition will not inhibit further print or paper motion cycles in the printer. The data source must sense the Out of Paper condition via the O.O.P. line and refrain from loading more data until paper is restored in the printer. If the data source should sense an Out of Paper condition while loading data or during BUSY, it should assume that a -MC must be generated within 1.5 msec. This precaution will insure that the last line will not be printed on a bare band when going -O.O.P. The line should then be retransmitted when paper has been restored. Note that the data source need not generate the -MC if it is keeping track of the print position on the forms. An Out of Paper condition is generated when 2.5 inches of the last form remains below the print line. The operation of Out of Paper status may vary, refer to the Interface Adapter or Special Option manual if supplied with the printer.

A short period of printing on the band covered by the ribbon will not damage the band, but printing directly on the band will result in immediate band damage.

BUSY

An interface line from the printer, which when low (logical "0"), indicates that the controller is ready to accept a line of data if the -RDY line is low (logical "0"). BUSY will go high (logical '1') to indicate that the printer has completed loading data from the interface and will again go low when the print cycle is completed. At this time, the printer will again be ready to accept data.

If the printer is performing a manual Forms Feed function and a RDY condition is generated, the BUSY line will go high (logical '1') until the forms feed function is completed.

The BUSY line will go high concurrent with -ACK going to a logical "0" when a control code is received. The busy line will remain true (a logical "1") until either the forms advance is initiated or the print cycle is terminated unless a CE fault is detected.

If a control panel -RDY (depression of the START/STOP switch when RDY) condition occurs, the BUSY line will remain high until either the print cycle is completed or a forms advance is initiated.

The busy line will go a logical "0" and the RDY line will go a logical "1" whenever a CE Fault occurs.

BAND DETECT 2¹ and 2⁰ (BD2¹ and BD2⁰)

These signals contain binary coded information which state the type of band currently on the printer.

<u>BD2¹</u>	<u>BD2⁰</u>	<u>Type of Band</u>
0	0	128 character
0	1	96 character
1	0	64 character
1	1	48 character

COMPRESSED PITCH (CP)

An interface line from the printer, which when high (a logical "1") states that the printer is in the compressed pitch mode. In this mode, characters will print at 15 characters per inch. When CP is low (a logical '0'), the printer is in standard pitch mode. In the standard pitch mode, characters are printed at 10 characters per inch. This line is stable during RDY equal to a logical "0". Compressed pitch is a standard option and must be enabled before the printer can respond to a compressed pitch band. Refer to Corrective Maintenance for a procedure on compressed pitch to verify C. P. incorporation.

CONTROLLER CHARACTERISTICS

Transmitters and Receivers

The controller has single ended transmitters/receivers which are capable of communicating on I/O cables up to 15.3 meters (50 feet) in length.

Interface Voltage Levels

When the recommended configurations (Figure 2) are used, the line voltages will be as follows:

$$\begin{aligned}\text{Logic "1"} &= 3.25 \pm 0.5V = \text{True Level} \\ \text{Logic "0"} &= 0.2 \pm 0.2V = \text{False Level}\end{aligned}$$

Interface Signals

The bars above the signal names in the following sections indicate that the actual signal line has a negated logical sense. For example, $\overline{\text{ACK}}$ would be equivalent to ACK NOT. The printer would then be sending an ACK signal when the ACK line is a logical "0". Figure 4-19 shows the primary interface signals and their origin. All signal voltages and delays are to be measured at the printer I/O connector.

Data Interchange Technique

The basic controller operates on an interlocked handshaking technique. The interlocked feature simply means that there are no stringent timing requirements on the data interchange's signals. Transitions from one logic level to the other rather than pulses are used to exchange data.

The data source transmits a character by placing the STB line at a logical "0". When the printer controller has sampled the data byte, the $\overline{\text{ACK}}$ line will be placed at a logical "0". The STB line may be removed concurrently or after the data source senses the STB line at a logical "1", the $\overline{\text{ACK}}$ line will be placed at a logical "1". The data lines must be stable a minimum of 200 nanosec. Before and after the generation of the STB signal.

Data Sequencing

A full line buffer memory allows the loading of 0 thru 132 characters and 1 Control Code. The data load cycle may be terminated at any time by the control code.

A control code must always terminate the data transmission. If more than 132 data characters are sent without a control code, the data will be accepted but not stored or printed - only the first 132 characters will be printed when the control code is received.

The codes recognized as valid control codes which will terminate the input cycle are the ASCII codes; FF, LF and CR.

Note that the ASCII control Code VT is invalid and will not terminate the print line.

Control Codes

Carriage Return (CR)

The ASCII code CR terminates the input cycle and indicates a print cycle if the CR was preceded with data. CR has no function with regards to paper motion and is considered as a suppress space.

Paper Motion Control Codes (LF and FF)

The forms length of the basic printer is set of an 11" form.

The ASCII code LF will result in a single line advance unless in the perf area (3 lines from Top of Forms.), in which case the forms will go to Top of Forms. The ASCII code FF will result in a paper motion terminating at Top of Form.

Special Characteristics

Forms Feed may be performed by command from the front control panel or data source.

The standard 64 and 96 character codes versus character are shown on Table 4-1. Any code appearing in the shaded areas on Table 4-1 will appear as a space when loaded into memory. When using a 64 character band, character codes for the 96 character set which are outside the 64 character set will also appear as spaces when loaded into memory.

Character Sets

Optional character set sizes are 48 or 128 characters. Either font size requires the addition of a PROM set and corresponding band. The 48 and 128 character set options are mutually exclusive for any given printer configuration. Therefore, with this option, the printer is operational with the standard 64 and 96 character set and either the 48 or 128 character set.

Use of the 128 character set option requires the use of DATA Bit 8.

Character code selection for the 48 or 128 character set option is only restricted to the following:

The character codes must not contain the ASCII codes for LF, VT, FF, or CR. When the DATA Bit 8 line option is used, the ASCII control codes are decoded assuming DATA Bit 8 equals a logical "1".

DATA Bit 8

This line is used with the 128 character set option. The ASCII control codes for CR, LF, VT, and FF are decoded as the lower 7 ASCII bits with DATA Bit 8 equal to a logical "1".

When DATA Bit 8 is used with a 64 or 96 character band, the controller treats DATA Bit 8 as a don't care for the data code. Therefore, DATA Bit 8 may be a logical "1" or "0" when referring to Table 4-1, character and code set.

DATA Bit 9

This signal used with the 12 channel EVFU option DATA Bit 9 at a logical "0" indicates to the controller that the data on the line is format information and is interpreted as a control code. Refer to the Special Option Manual on the EVFU option.

Hammer Fault LED

Two hammer fault LED's are located on each hammer driver card. These indicators are illuminated whenever a hammer driver Darlington is shorted and/or remains on for 4.8 msec. after the last hammer has been activated. These indicators are illuminated for an open coil. The activation of this fault will also desequenece the 36 volt supply, make the system go RDY and blink the stop light to indicate a CE fault.

Input Cycle LED

This LED is located on the "INPUT/PRINT" (7PC1) controller board. The LED is illuminated upon reception of the first byte in the transmission line and remains illuminated until the memory is loaded and the previous paper motion is completed.

Enable Print LED

This LED is located on the "INPUT/PRINT" (7PC1) controller board. It is illuminated during a print or horizontal motion cycle.

Horizontal Motion LED

This LED is located on the "OSC, Horizontal and Vertical Motion" (7PC2) controller board. It is illuminated during a horizontal motion cycle.

Vertical Motion LED

This LED is located on the "OSC, Horizontal and Vertical Motion" (7PC2) controller board. It is illuminated during a vertical motion.

TABLE 4-1. CHARACTER AND CODE SET

Bit Positions				b7	b6	0	0	0	0	1	1	1	1
						0	0	1	1	0	0	1	1
					b5	0	1	0	1	0	1	0	1
b4	b3	b2	b1										
0	0	0	0			SP	0	@	P			P	
0	0	0	1		!	1	A	Q	a	q			
0	0	1	0		"	2	B	R	b	r			
0	0	1	1		#	3	C	S	c	s			
0	1	0	0		\$	4	D	T	d	t			
0	1	0	1		%	5	E	U	e	u			
0	1	1	0		&	6	F	V	f	v			
0	1	1	1		'	7	G	W	g	w			
1	0	0	0		(	8	H	X	h	x		
1	0	0	1		)	9	I	Y	i	y	
1	0	1	0		LF	*	:	J	Z	j	z		
1	0	1	1			+	;	K	[k	{		
1	1	0	0		FF	,	<	L	\	l	!		
1	1	0	1		CR	-	=	M]	m	}		
1	1	1	0			.	>	N	^	n	~		
1	1	1	1			/	?	0	-	o	Spec. Char.		

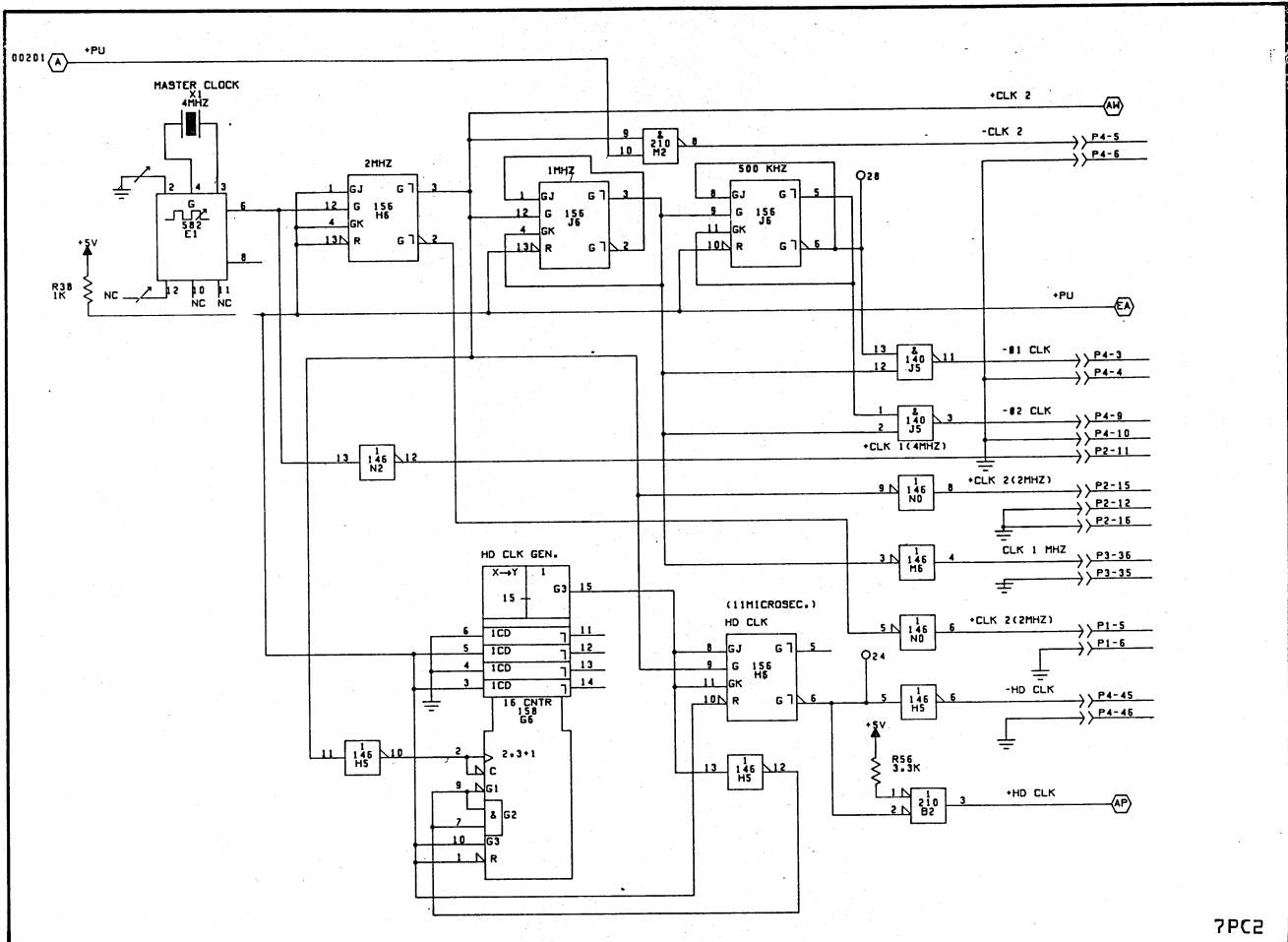


FIGURE 4-20. CONTROLLER CLOCK GENERATOR CIRCUITRY

CONTROLLER CLOCKS

The printer controller operates synchronously under the control of 4 megahertz oscillator. The oscillator generates a series of pulses having a pulse width of 125 nsec. and a pulse repetition time of 250 nsec. The Clock 1 frequency is then divided by a J/K flip flop to form the 2 megahertz Clock 2 pulse. The Clock 2 pulse has a pulse width of 250 nsec and a pulse repetition time of 500 nsec. The Clock 2 frequency is then divided to form a 1 megahertz Clock pulse. The Clock pulse is 500 nsec wide with a pulse repetition time of 1µsec. The Clock frequency is then divided to form a 500 kilohertz signal used to generate the Ø1 and Ø2 Clock pulses. The Ø1 and Ø2 Clocks are generated by 'anding' the Clock pulse with the 500 Kilo-hertz signal, producing 500 nsec pulses with pulse repetition times of 2µsec. The Ø1 and Ø2 Clocks are offset from each other by 1µsec.

An additional Clock signal, Hammer Driver Clock is developed in the controller for use in the head electronics. The Hammer Driver Clock is generated by a four bit counter that is clocked by the Clock 2 signal. The counter is pre-loaded to the count of 5 by the first Clock 2 pulse. Each succeeding Clock 2 pulse

increments the counter. When the counter reaches the count of 15₁₀, the Load signal is activated and the counter is reset to the count of 5. At the same time the Hammer Driver Clock F/F is set. When the counter again reaches the count of 15₁₀, the F/F is reset. This provides a HD CLK pulse with a width of 5.5µsec. and a repetition time of 11µsec.

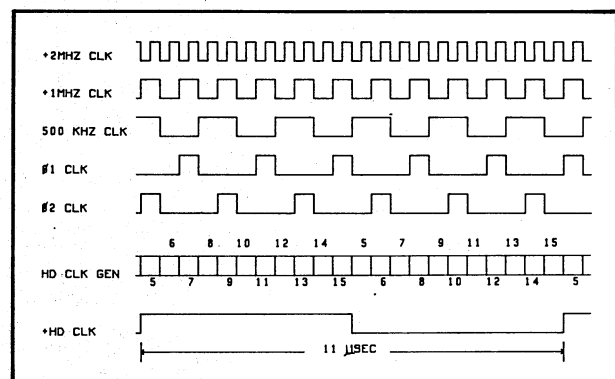


FIGURE 4-21. CONTROLLER CLOCK TIMING.

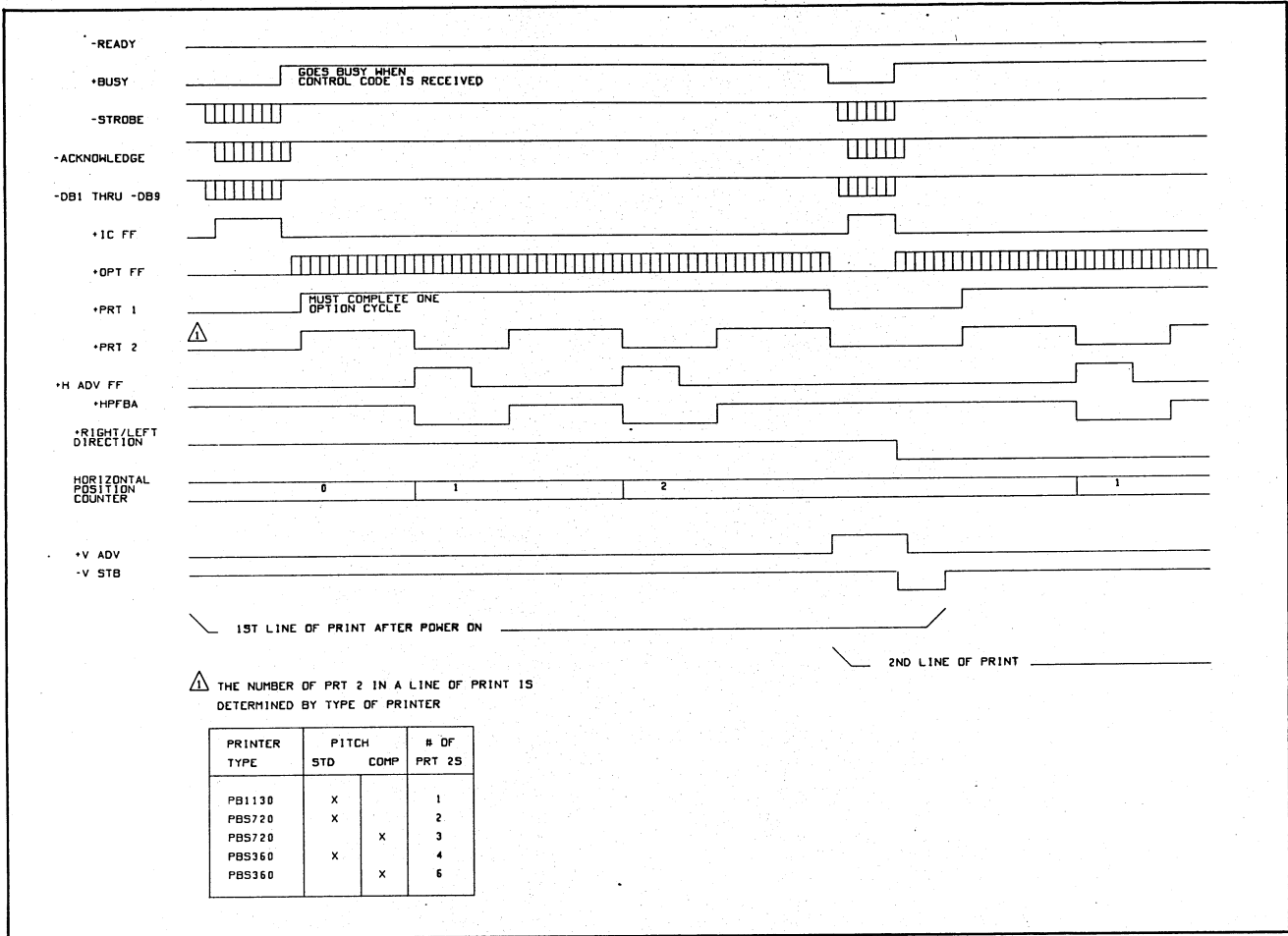


FIGURE 4-22. CONTROLLER ON-LINE OPERATION TIMING

ON-LINE PRINTER OPERATION

The line printer is accessible to an external data source anytime the printer status is -Ready and -Busy. At this time the printer will accept and store a data line of up to 132 or 136 data characters depending on the column capacity plus one Control code if the printer is in the standard pitch mode. This line capacity is increased to 198 (132) or 204 (136) data Characters, if the printer is in the compressed pitch mode. During the data transfer, each data character is placed on the data lines and then the Strobe interface line is activated. Upon receipt of the Strobe signal, the printer stores the information in its Random Access Memory. The completion of the storage operation is signaled to the data source by the printer activating the Acknowledge interface line. At this time, the data source deactivates the Strobe line and places the next Character on the data lines followed by the reactivation of the Strobe. The transfer operation continues in this manner until the printer detects a Control Code on the data lines. A Control Code is defined as the ASCII codes FF, LF and CR. Upon receipt of a Control Code, the printer goes to the Busy status preventing further communication with data source. It also stores the Control Code in the Format Register and initiates the Print Cycle Operation.

During the Print Cycle operation, the entire contents of the Random Access Memory are optioned once per shift position for each character of the character set (i.e. 64 option cycles for a 64 character set, 128 op-

tion cycles for a 128 character set, etc.) The characters which are printable in the present shift position are stored in the Hammer Driver Shift Register and then printed at the proper Sub Scan time of the following Character pulse. When the complete character set has been optioned, the Horizontal Shift command is issued and the Voice Coil assembly repositions the Hammer Bar to print the next segment of the data line. Once again the entire contents of memory are optioned once for each character of the character set for the present horizontal position. When this operation has been performed for each horizontal position, the print cycle is terminated and the forms advance operation is initiated, dropping the Busy status.

The duration of the forms advance operation is determined by the Control Code stored in the Format Register. The LF code will allow the forms to be advanced only one line, unless the one line advance carries the form into the perforation skip area. In this instance, the advance will continue until the next top of forms position is recognized. The FF code will permit the advance to continue until the next top of forms is recognized. The CR code will act as a suppress space code and will not allow any advance to be performed. During the Advance operation, the next line of data may be loaded.

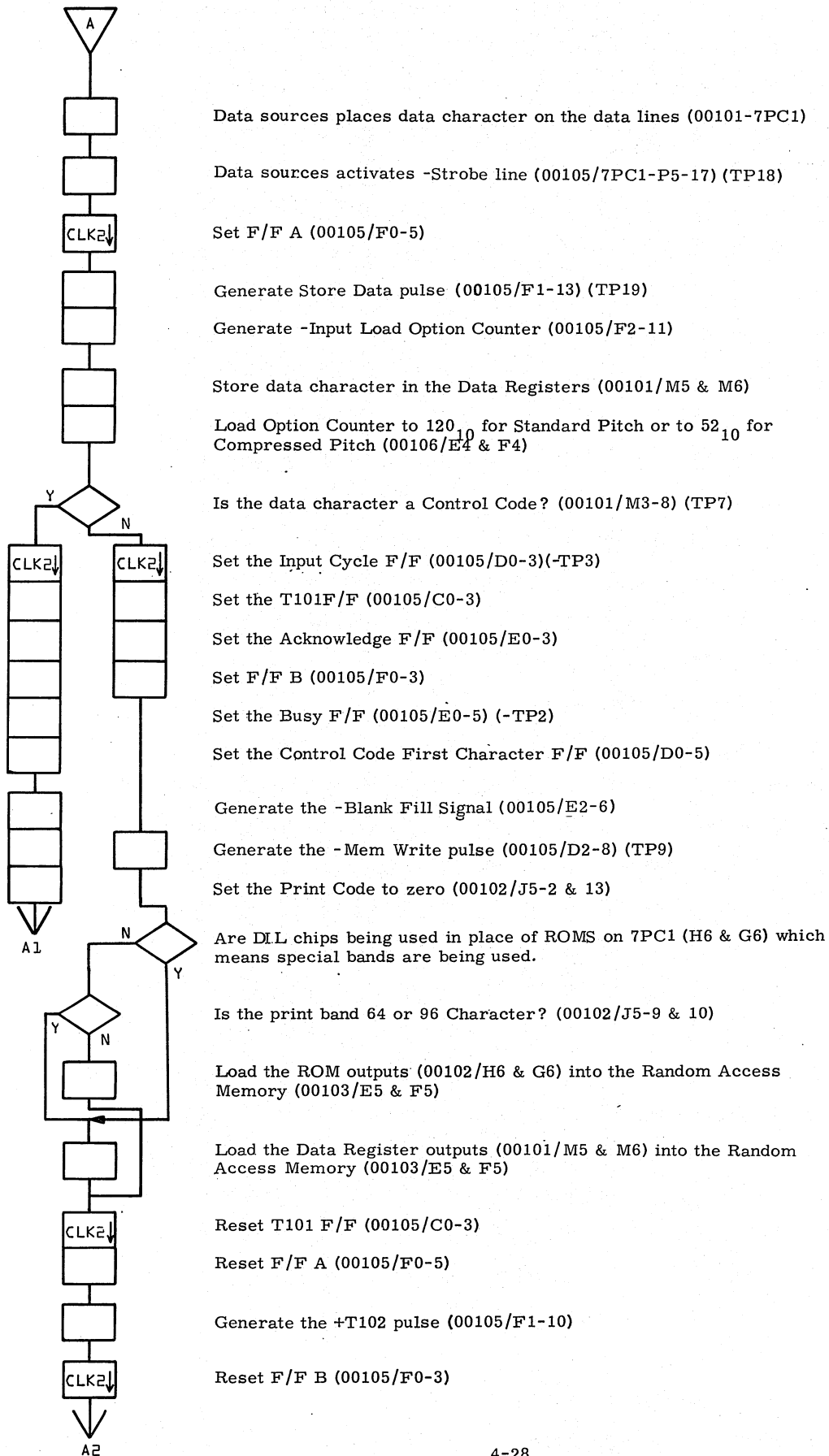
DATA INPUT CYCLE

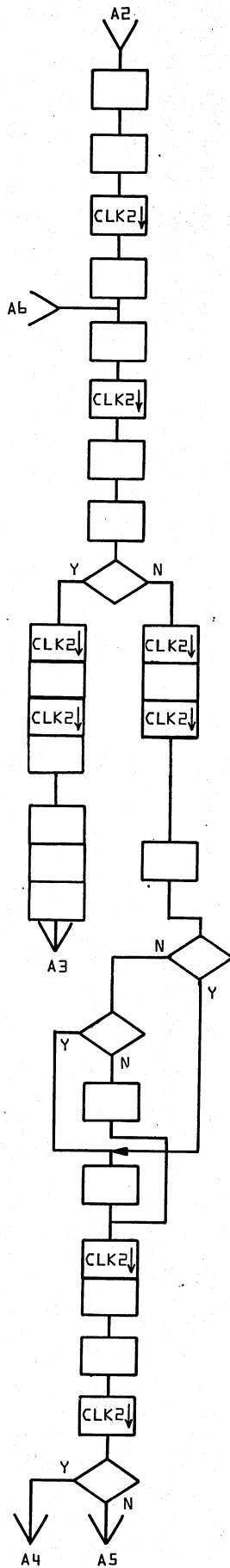
The input cycle of the printer covers the loading of a line of data characters plus one format character. A line of data may be from 0 to 132 (or 136 depending upon the printer configuration) characters long. If a compressed pitch band is being used, the interface must sense the Compressed Pitch (C. P.) interface line and increase the characters sent per line of data. The line capacity in compressed pitch for a 132 column printer is 198 columns and 204 columns for 136 column printer. The transfer of data may be initiated by the data source anytime the printer is Ready and not Busy. The data source initiates the transfer by first placing a data or format character on the data lines and then activating the Strobe signal line. Upon receipt of the Strobe signal, the printer places the character from the data lines into the Data Register. If the first character is a format character (Control Code), the printer automatically

loads the remainder of memory with nonprintable codes after responding with an Acknowledge. The print cycle is skipped and the printer goes directly from an input cycle to the forms advance operation. If the first character is not a format character (Control Code), the character is transferred from the Data Register into the Memory after generating the Acknowledge. Each succeeding data character is transferred in this manner: The data source places the character on the data lines; It then activates the Strobe line; The printer stores the character in the Data Register; The printer then responds with the Acknowledge signal; Character in the Data Register is transferred to Memory. When the format character (Control Code) is received, the printer raises the Busy line and begins a Blank Fill operation. During a Blank Fill the remaining Memory locations are loaded with nonprintable characters. When the Memory is completely loaded, the printer initiates a Print Cycle operation and terminates the Input Cycle.

THIS FLOW CAN ONLY
BE ENTERED WHEN THE
PRINTER IS READY AND
NOT BUSY

COMMON CONTROLLER
DATA INPUT CYCLE





Increment the Option Counter (00106/E4 & F4)

Data source deactivates the -Strobe line (00105/7PC1-P5-17)

Reset the Acknowledge F/F (00105/E0-3)

Data source places another data character on the data lines (00101/7PC1)

Data source activates the -Strobe line (00105/7PC1-P5-17)

Set F/F A (00105/F0-5)

Generate the Store Data pulse (00105/F1-13) (TP-19)

Store the data character in the Data Register (00101/M5 & M6)

Is the data character a Control Code? (00101/M3-8) (TP7)

Set the T101 F/F (00105/E0-3)

Set the Acknowledge F/F (00105/C0-3)

Set the F/F B (00105/F0-3)

Set the Busy F/F (00105/E0-5) (-TP2)

Set the Print Code Bit to zero (00102/J5-2 & 13)

Generate the -Memory Write pulse (00105/D2-8) (TP9)

Generate the -Blank Fill signal (00105/E2-6)

Are DIL chips being used in place of ROMs on 7PC1 (H6 & G6) which means special bands are being used.

Is the print band 64 or 96 character? (00102/J5-9 & 10)

Load the ROM outputs (00102/H6 & G6) into the Random Access Memory (00103/E5 & F5)

Load the Data Register outputs (00101/M5 & M6) into the Random Access Memory (00103/E5 & F5)

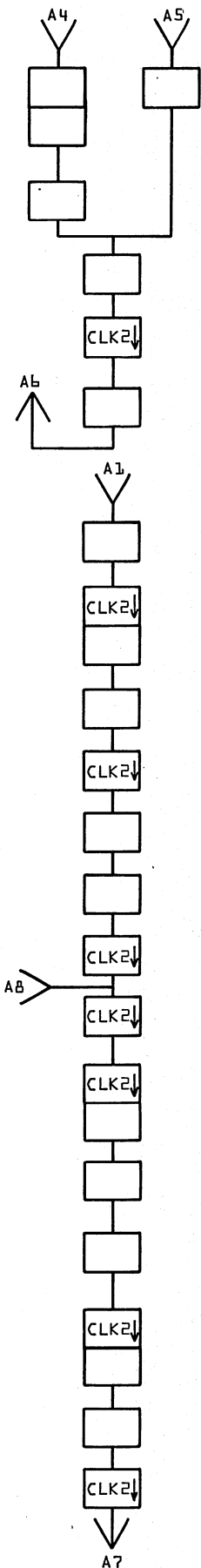
Reset the T101 F/F (00105/C0-3)

Reset the F/F A (00105/F0-5)

Generate the +T102 pulse (00105/F1-10)

Reset F/F B (00105/F0-3)

Does the Option Counter = 255_{10} ? (00106/E4-12)



Increment the Option Counter (00106/E4 & F4)

Set the Input Option Counter Maximum F/F (00106/H4-9) (-TP22)

Disable the -Memory Write pulse until a new Input Cycle is initiated (00105/D2-8)(TP9)

Data Source deactivates the -Strobe line (00105/7PC1-P5-17)

Reset the Acknowledge F/F (00105/E0-3)

Data Source places another data character on the data lines (00101/7PC1)

Load the Control Code into the Random Access Memory (00103/E5 & F5)

Reset the T101 F/F (00105/C0-3)

Reset F/F A (00105/F0-5)

Generate the +T102 pulse (00105/F1-10)

Reset F/F B (00105/F0-3)

Increment the Option Counter (00106/E4 & F4)

Data source deactivates the -Strobe line (00105/N5-8) (TP18)

Reset the Acknowledge F/F (00105/E0-3)

Set F/F A (00105/F0-5)

Set F/F B (00105/F0-3)

Set the T101 F/F (00105/C0-3)

Generate - Memory Write pulse (00105/D2-10) (TP9)

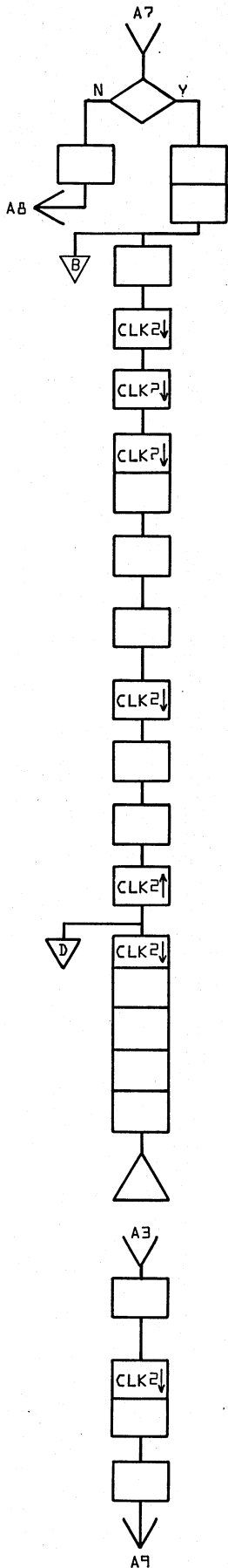
Print code at "0" causes the printer to load a non-printable character into the Random Access Memory (00103/E5 & F5)

Reset the T101 F/F (00105/C0-3)

Reset F/F A (00105/F0-5)

Generate the T102 pulse (00105/F1-10)

Reset F/F B (00105/F0-3)



Does the Option Counter = 255_{10} ? (00106/E4-12)

Increment the Option Counter (00106/E4 & F4)

Set the Input Option Counter Maximum F/F (00106/H4-9) (-TP22)

Disable the -Blank Fill Signal (00105/E2-6)

Set the Recycle F/F (00105/C0-5) (-TP4)

Set F/F A (00105/F0-5)

Set F/F B (00105/F0-3)

Set the T101 F/F (105/C0-3)

Generate the -Load Format Register pulse (00105/D3-6) (TP13)

Transfer the Control Code from the Data Register (00101/M5 & M6) into the Format Register (00207/H4)

Reset F/F A

Generate the T102 pulse (00105/F1-10)

Generate the Set/Reset Enable Print pulse (00105/E1-3)

Generate the -Enable Advance pulse (00105/N1-11)

Reset F/F B (00105/F0-3)

Reset the Busy F/F (00105/E0-5) (-TP2)

Reset the Control Code First Character F/F (00105/D0-5)

Reset the Input Cycle F/F (00105/D0-3) (-TP3)

Reset the Recycle F/F (00105/C0-5) (-TP4)

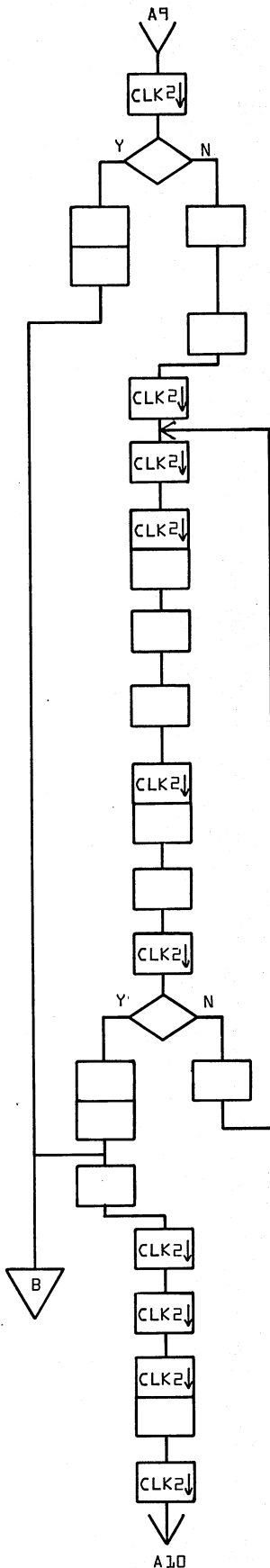
Input Cycle is complete

Load a non-printable character into the Random Access Memory (00103/E5 & F5)

Reset the T101 F/F (00105/C0-3)

Reset F/F A (00105/F0-5)

Generate the T102 pulse (00105/F1-10)



Reset F/F B (00105/F0-3)

Does the Option Counter = 255_{10} ? (00106/E4-12)

Increment the Option Counter (00106/E4 & F4)

Set the Input Option Counter Maximum F/F (00106/H4-9) (-TP22)

The data source deactivates the -Strobe line (00105/7PC1-P5-17)

Reset the Acknowledge F/F (00105/E0-3)

Set F/F A (00105/F0-5)

Set F/F B (00105/C0-3)

Set the T101 F/F (00105/C0-3)

Generate the -Memory Write pulse (00105/D2-8) (TP9)

Print code at "0" cause the printer to load a non-printable character into the Random Access Memory (00103/E5 & F5)

Reset the T101 F/F (00105/C0-3)

Reset F/F A (00105/F0-5)

Generate the T102 pulse (00105/F1-10)

Reset F/F B (00105/F0-3)

Does the Option Counter = 255_{10} ? (00106/E4-12)

Increment the Option Counter (00106/E4 & F4)

Set the Input Option Counter Maximum F/F (00106/H4-9) (-TP22)

Disable the -Blank Fill signal (00105/E2-6)

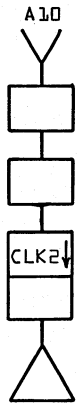
Set the Recycle F/F (00105/C0-5) (-TP4)

Set F/F A (00105/F0-5)

Set F/F B (00105/F0-3)

Set the T101 F/F (00105/C0-3)

Reset F/F A (00105/F0-5)



Generate the T102 pulse (00105/F1-10)

Generate the Set/Reset Enable Print pulse (00105/E1-3)

Reset F/F B (00105/F0-3)

Reset the Input Cycle F/F (00105/D0-3) (-TP3)

Input Cycle is complete

OPTION CYCLE

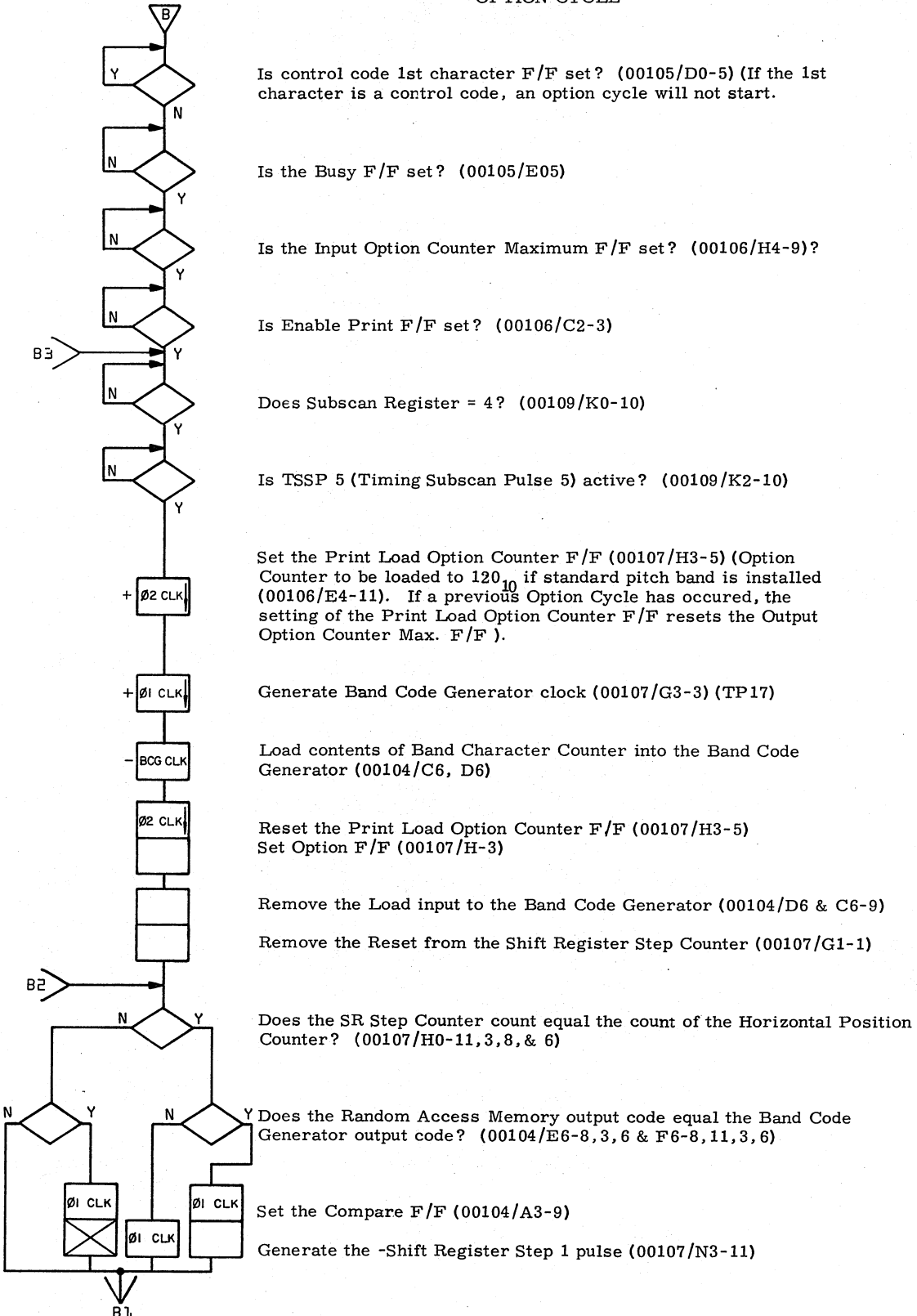
The Option Cycle operation is initiated by the Input Option Counter Maximum signal which is generated when the memory is completely loaded. Upon receipt of this signal, the printer initiates an option cycle. During the Option cycle, each location of memory is compared against the band character that is approaching in the next scan. This is accomplished by comparing the Memory output to the Band Code Generator. If they compare, the Compare F/F is set. If they do not compare, the compare F/F is reset. An option cycle is processed for each scan. A scan is the period of time between one band characters alignment with one hammer and the next band characters alignment with the same hammer. The compares generated during a scan are sent to the Hammer Driver Shift Register if their relationship to a hammer is correct. This relationship will depend on the hammer bars horizontal position, the band, standard or compressed pitch, and the type printer, 360 or 720 LPM. The hammer bar positions the hammers to print certain columns, so the printer must be in the correct horizontal position to print. The

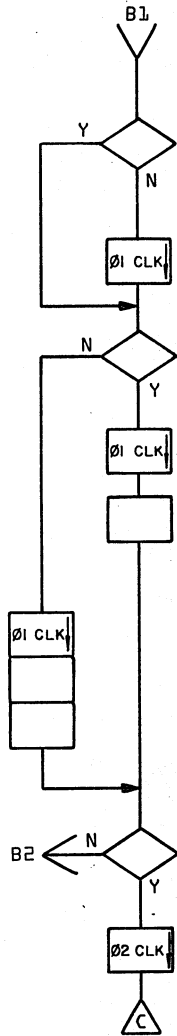
type band standard or compressed determines the number of horizontal positions to print a line of data. The type printer varies the number of hammers that can be selected during a scan. Because of the low number of hammers in a 360LPM printer, printing occurs only once during a scan time. A 720 LPM printer prints twice during a scan time. Another model printer not covered in this manual prints four times during a scan time. A scan time is divided into four subscans during which printing can occur. A 360 or 720 LPM printer will print during subscans as determined by the horizontal position of the hammer bar.

Once an option cycle is started an option cycle will be processed during each scan of a Print 1. The duration of a Print 1 is the printing of a line of data and comprizes many options cycles and all horizontal positions. Horizontal positions occur during a Print 2 signal. At the completion of a print cycle (Print 1 reset), Busy and Enable Print flip/flops are reset.

During compressed pitch, option cycles occur during the additional horizontal positions or Print 2 times just as those for a standard band.

OPTION CYCLE





Does option counter bits 2^0 and 2^1 equal one (3₁₀)? (00106/F4-2,3) If in compressed pitch only bit 2^0 need equal one for a yes decision.

Generate Band Code Generator clock (00107/G3) (TP17)

Does Option Counter equal 255₁₀? (00106/E4-12)

Set the Output Option Counter Maximum F/F (00106/H4-5)

Option Counter count goes from 255₁₀ to zero (00106/E4 and F4)

Increment the Option Counter (00106/E4-5 and F4-5)

Increment the Shift Register Counter (00107/G1-2).

Load the Compare signal into the Hammer Driver Shift Register (00601/IC 1-12).

Is the Output Option Counter Maximum F/F set? (00106/H4-5)

Reset the Option F/F (00107/H3-3)

Proceed to Print Cycle flowchart

PRINT CYCLE

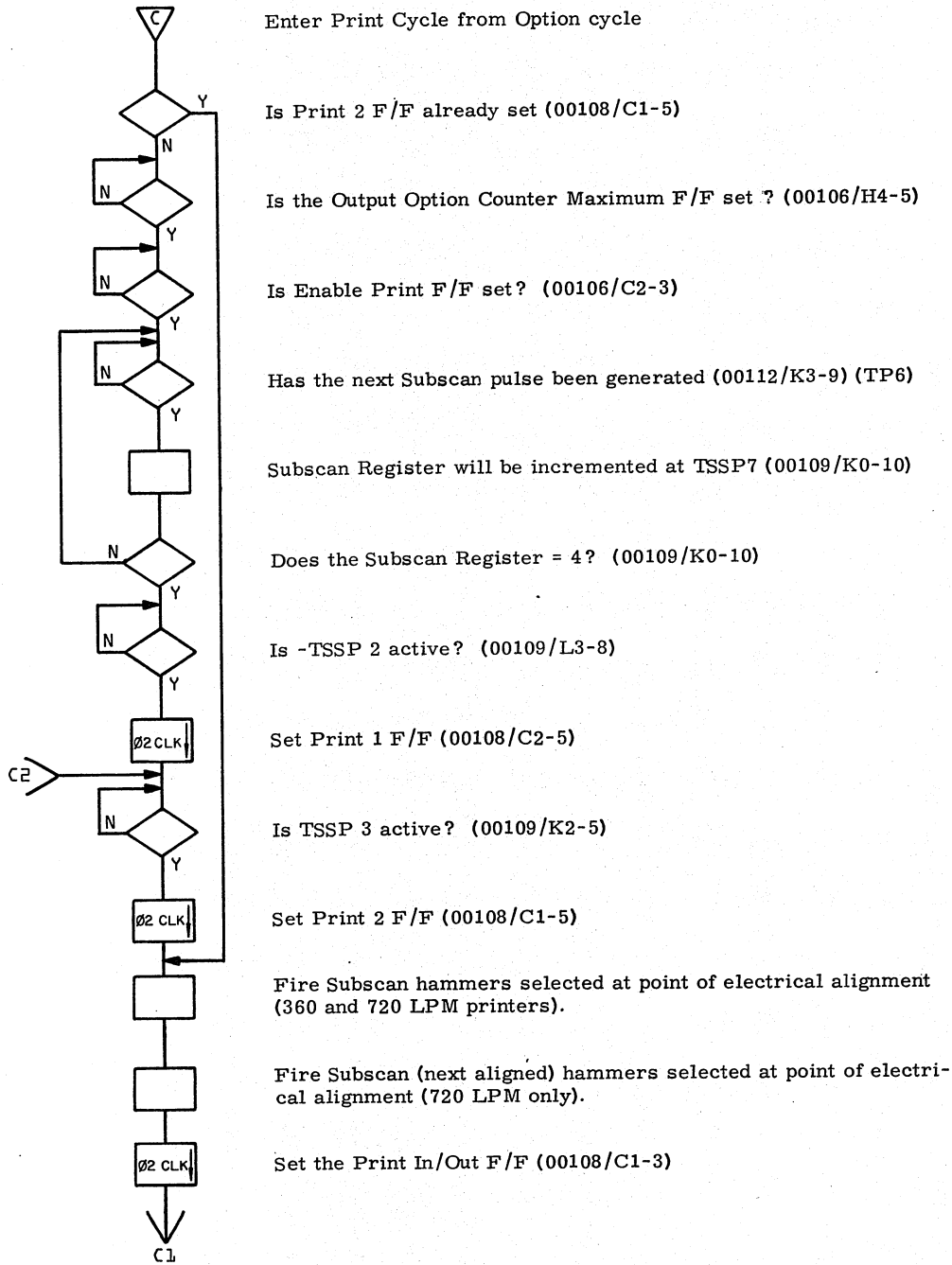
The Print Cycle operation is initiated after the memory is loaded with a line of data and the first option cycle is complete. At this time the Output Option Counter Maximum flip/flop is set. Print Cycle is started as Print 1 is set. Print 1 will remain set during each scan and printing and all option cycles performed for each scan. Printing can start when Print 2 is set which indicates a horizontal position of the hammer bar. A 360 LPM printer has four horizontal positions for a standard pitch band and six positions for a compressed pitch band. A 720 LPM printer has two horizontal positions for a standard pitch band and three for a compressed pitch band. Print 2 is reset at the start of horizontal motion between horizontal positions and is set when horizontal motion stops at the next position.

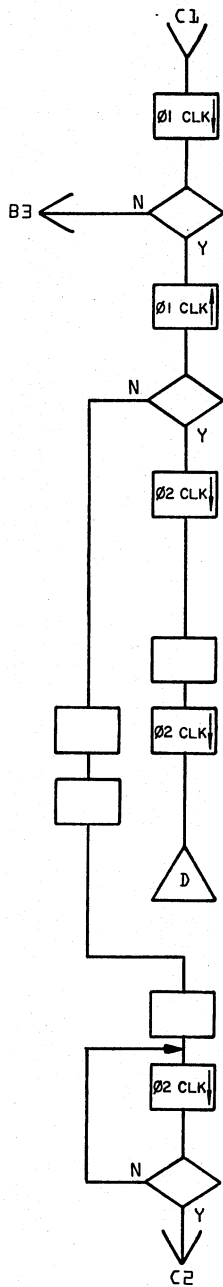
The termination of the print cycle is determined by the scan counter reaching its maximum count of 255 and all Print 2's or horizontal positions having been performed. At this point the End Print 1 detector resets the Print 1 flip/flop.

In order to again initiate a Print Cycle (Print 1 and Print 2's), the hammers must be settled which is determined by the Hammer Settle Counter reaching maximum, and the Subscan Register equal to a count of four.

When a compressed pitch band is installed the number of horizontal positions or Print 2's per Print 1 is increased to cover the additional columns to be printed. In compressed pitch the distance between horizontal positions is decreased and the characters are printed closer together. Compressed Pitch mode increases the characters printed per line but not the physical length of the line. A 132 or 136 column printer will increase its line capacity to 198 and 204 respectively in the compressed pitch mode.

PRINT CYCLE





Increment the Scan Counter at TSSP 2 (00108/F3 & E3)

Does the Scan Counter equal 255_{10} ? (00108/F3-15)

Shift the End Print 1 Register (00108/J3-9)

Has a Print 2 been performed for each shift position? (00108/J2-5)

Reset the Print 1 F/F (00108/C2-5)

Generate the End Print 1 pulse (00108/B3-6)

Reset the Print 2 F/F (00108/C1-5)

Horizontally shift the hammer bar one column position for standard pitch but only 2/3 of that distance if in compressed pitch.

Proceed to Vertical Advance flowchart.

Load the Hammer Settle Counter

Increment Hammer Settle Counter (00112/K4 & L4)

Does the Hammer Settle Counter equal count of 255_{10} (00112/K4-15)

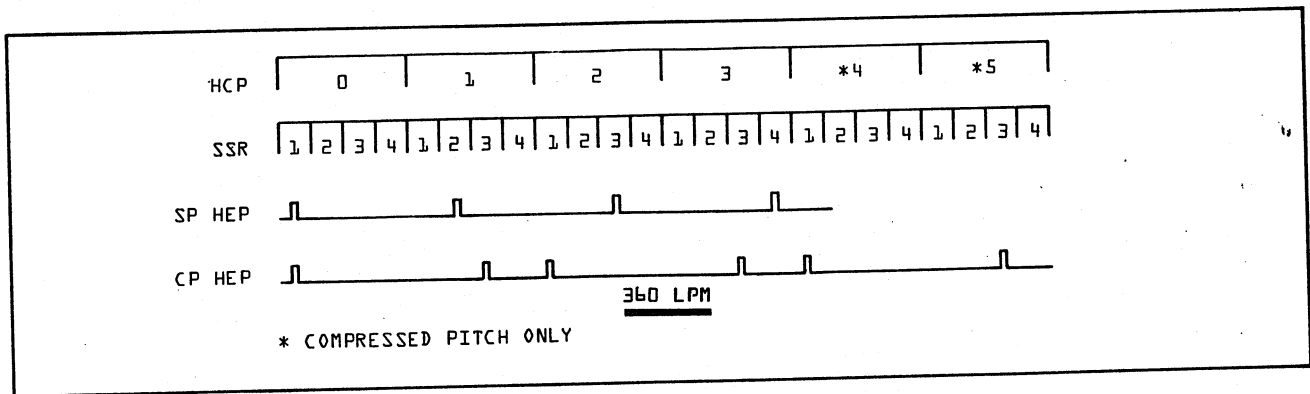


FIGURE 4-23. HEP GENERATION FOR 360 LPM

HAMMER ENABLE PULSE (HEP) GENERATION

The HEP signal initiates the firing time of the print hammers. Its generation time will be determined by the type of machine (360 or 720), the position of hammer bar ($HPC2^0$, $HPC2^1$, and $HPC2^2$) and the character pitch selected (Standard or Compressed). 360 LPM units use only the HEP 1 signal. 720 LPM units use both HEP 1 and HEP 2 to fire the print hammers. The two tables, the functional drawing, and the timing diagram accompanying this explanation aid in understanding this operation.

360 HEP Generation

In 360 LPM units only the HEP 1 Multiplexer is used. The active input is selected by the Horizontal Position Counter outputs ($HPC2^0$, $HPC2^1$, and $HPC2^2$). Each count in the counter corresponds to a hammer bar position. In standard pitch operation there are four hammer bar horizontal positions possible so only the four multiplexer inputs (0 through 3) are selectable. The multiplexer is enabled by the Print 2 signal and the TSSP 2 pulse. When these two signals are active, the selected input is inverted and transferred to the output. For standard pitch operation, input 0 ($HPC=0$) is active during Sub-Scan 1, input 1 ($HPC=1$) is active during Sub Scan 2, input 2 ($HPC=2$) is active during Sub Scan 3 and input 3 ($HPC=3$) is active during Sub Scan 4. See Table 4-2 and Figures 4-23 and 4-25.

TABLE 4-2. HPC/SUBSCAN, 360 LPM

HPC INPUT	SP	CP
0	SSR1	SSR1
1	SSR2	SSR3
2	SSR3	SSR1
3	SSR4	SSR3
4	N/A	SSR1
5	N/A	SSR3

During compressed pitch operation there are six hammer bar horizontal positions necessitating the selection of two additional multiplexer inputs (4 and 5). As in standard pitch operation, the multiplexer is enabled by the Print 2 signal and the TSSP 2 pulse. For compressed pitch operation, input 0 ($HPC=0$) is active during Sub Scan 1; input 1 ($HPC=1$) is active during Sub Scan 3; input 2 ($HPC=2$) is active during Sub Scan 1, input 3 ($HPC=3$) is active during Sub Scan 3; input 4 ($HPC=4$) is active during Sub Scan 1; input 5 ($HPC=5$) is active during Sub Scan 3. See Table 4-2 and Figures 4-23 and 4-25.

720 HEP Generation

In 720 LPM units both HEP 1 and HEP 2 are used to trigger the hammer driver digital timer. HEP 1 triggers the odd driver circuits and HEP 2 triggers the even driver circuits. The active input for both multiplexers is selected by the Horizontal Positions Counter ($HPC2^0$, $HPC2^1$, & $HPC2^2$). Each count in the counter corresponds to a hammer bar position. In standard pitch operation there are two hammer bar horizontal positions possible so only the first two inputs (0 & 1) of both multiplexers are selectable. Both multiplexers are enabled by the Print 2 signal and the TSSP 2 pulse. When both signals are active, the selected input is inverted and transferred to the output. For standard pitch operation, input 0 ($HPC=0$) is active during Sub Scan 1 for the HEP 1 Multiplexer and during Sub Scan 3 for HEP 2 Multiplexer; input 1 ($HPC=1$) is active during Sub Scan 2 for the HEP 1 Multiplexer and during Sub Scan 4 for the HEP 2 Multiplexer. See Table 4-3 and Figures 4-24 and 4-25. During compressed pitch operation, there are three hammer bar positions possible necessitating the selection of an additional multiplexer input (2). As in standard pitch operation, the multiplexers are enabled by the Print 2 signal and the TSSP 2 pulse. For compressed pitch operation, input 0 ($HPC=0$) is active during Sub Scan 1 for the HEP 1 Multiplexer and during Sub Scan 3 for the HEP 2 Multiplexer; input 1 ($HPC=1$) is active during the Sub Scan 3 for the HEP 1 Multiplexer and during Sub Scan 1 for the HEP 2 Multiplexer; input 2 ($HPC=2$) is active during Sub Scan 1 for the HEP 1 Multiplexer and during Sub Scan 3 for the HEP 2 Multiplexer. See Table 4-3 and Figures 4-24 and 4-25.

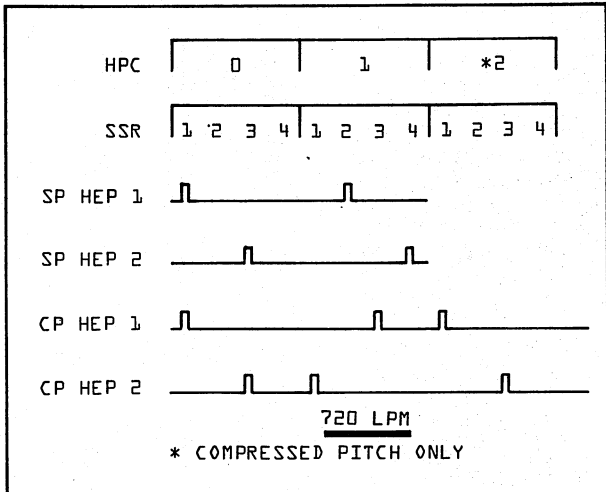


TABLE 4-3. HPC/SUBSCAN, 720 LPM

HPC INPUT HEP	MUX 1		HEP MUX 2	
	SP	CP	SP	CP
0	SSR1	SSR1	SSR3	SSR3
1	SSR2	SSR3	SSR4	SSR1
2	N/A	SSR1	N/A	SSR3

FIGURE 4-24. HEP GENERATION FOR 720 LPM

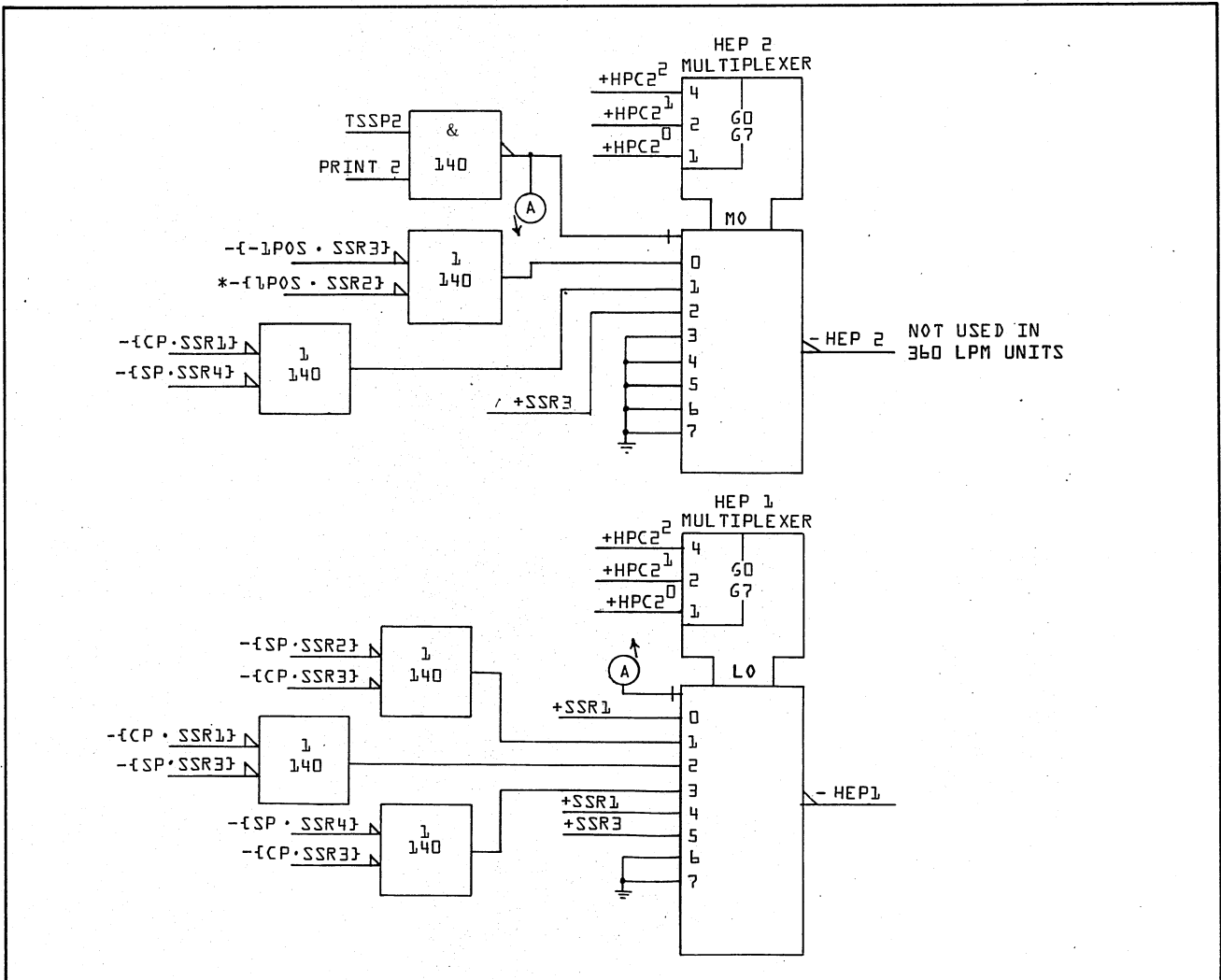


FIGURE 4-25. HEP MULTIPLEXERS

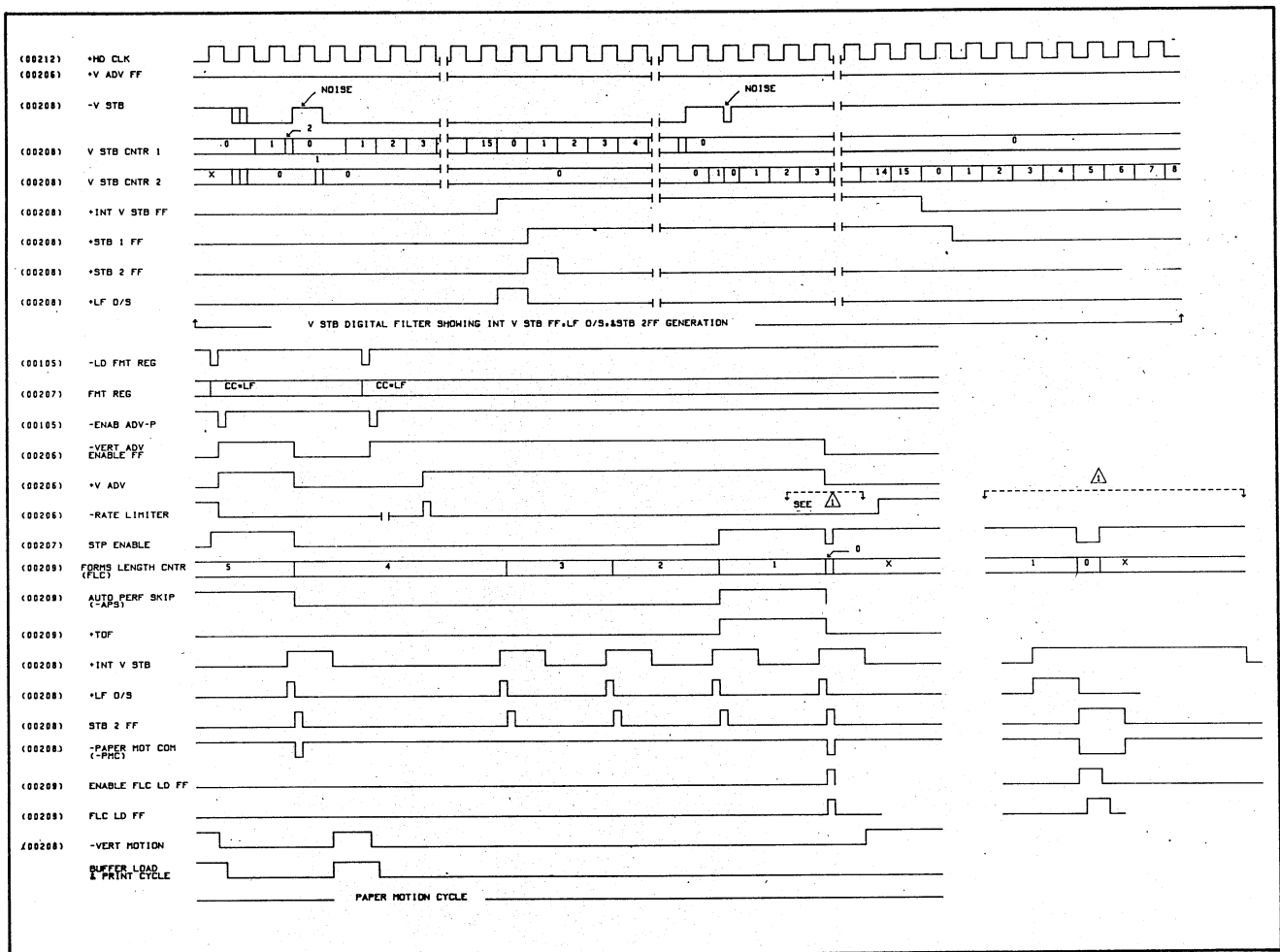
VERTICAL ADVANCE

On the standard printer the vertical advance operation is initiated by either the End Print 1 signal or the Control Code First Character signal. In either case, the printer first transfers the character from the Data Register to the Format Register and then attempts to initiate a forms advance. With no interface adapter the printer can only perform two advances; single space (LF) and form feed (FF). A third code, CR, is legal but it will not cause a forms advance. There are special interfaces which control the Advance signal over the interface and advance forms while loading data. Unique control of forms advance is covered in Section 0 at the front of the manual if applicable.

When performing a single space (LF) the controller will send an -Advance signal to the print head servo system to begin advancing forms. When the print head signals that the line has been advanced by sending the Vertical Strobe pulse, the controller will terminate the advance, unless the Auto Perf Skip feature is enabled. If this feature is enabled, the advance will not be terminated if the Forms Length Counter is equal to the count of 3 or less. The advance will continue until the next top of forms location is reached. The top of forms

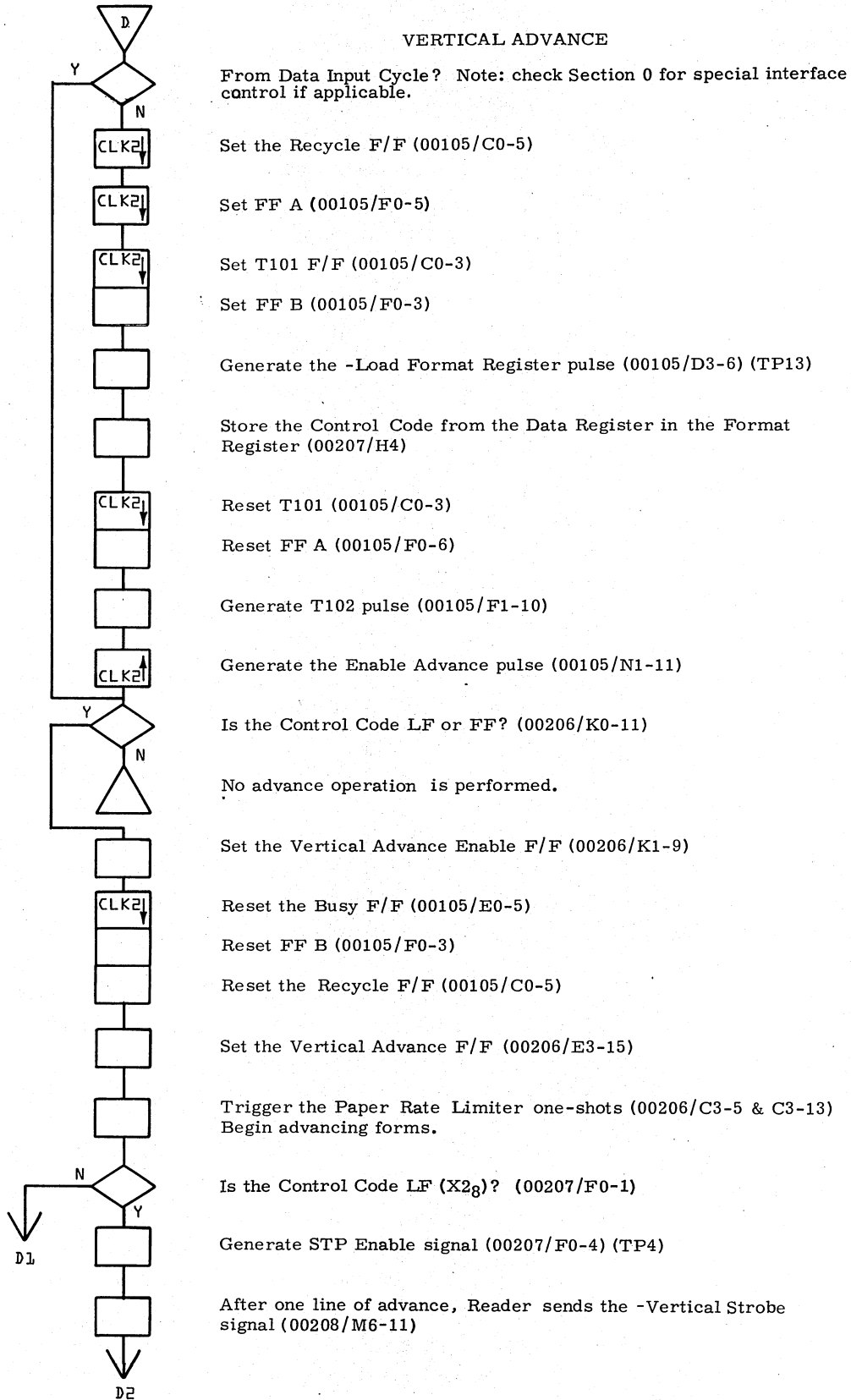
location corresponds to the count of 1 in the Forms Length Counter. At this time the Forms Length Counter will be reloaded. If the Forms Length Selector feature is installed, it will be loaded to the count on the selector switches. If this feature is not installed, the counter will be loaded to 66_{10} when the position reader is in 6 LPI or to 88_{10} when the reader is in 8 LPI.

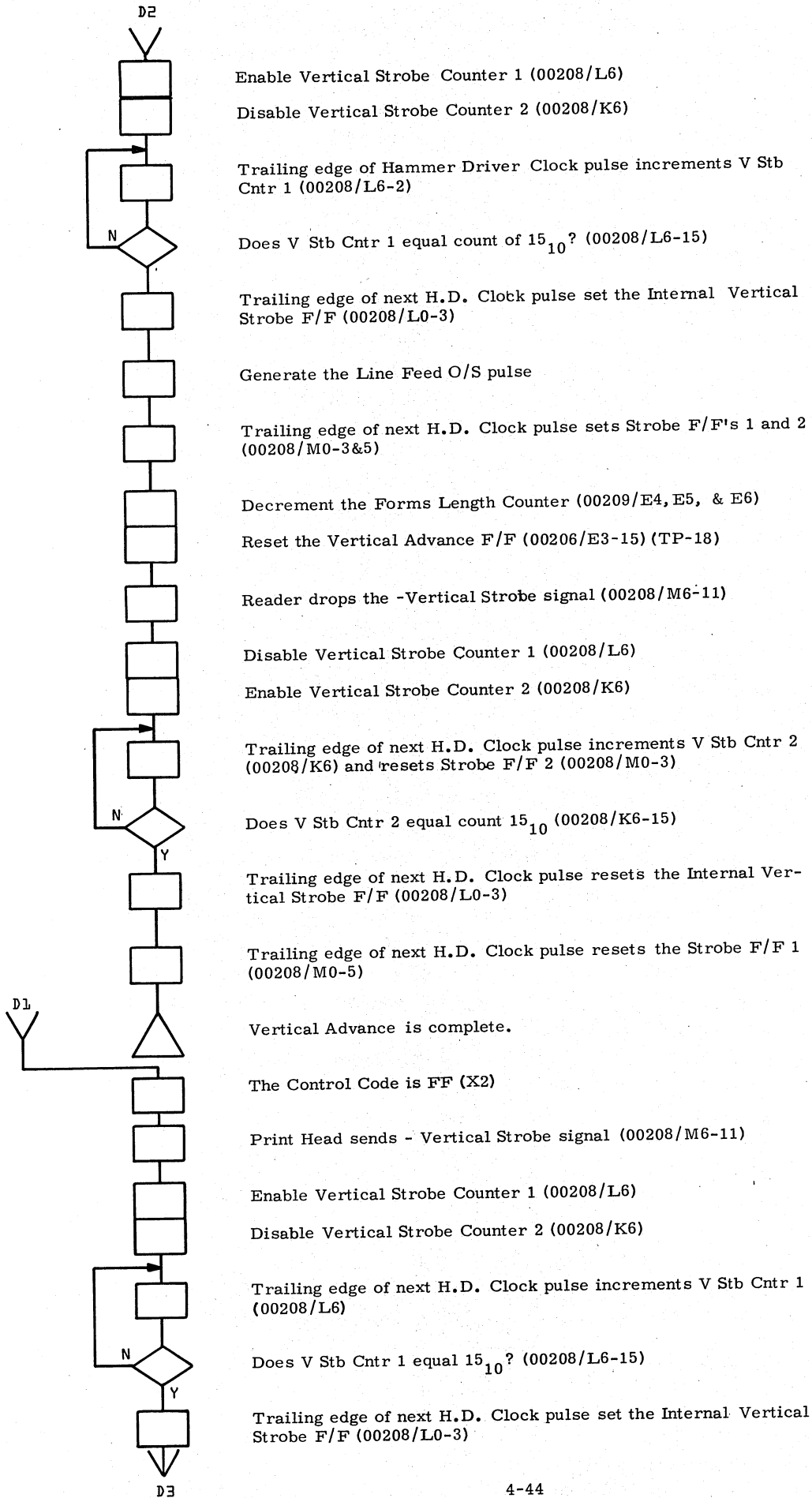
When a form feed (FF) operation is being performed, the controller will send an -Advance to the print head servo system to begin advancing forms. For each line advanced the print head will generate a Vertical Strobe pulse. The controller uses the Strobe to decrement the Forms Length Counter. When the counter reaches the count of 1, the advance is terminated. At this time the Forms Length Counter is reloaded. If the Forms Length Selector feature is installed, it will be loaded to the count on the selector switches. If this feature is not installed, the counter will be loaded to 66_{10} when the position reader is in 6 LPI or to 88_{10} when the reader is in 8 LPI.

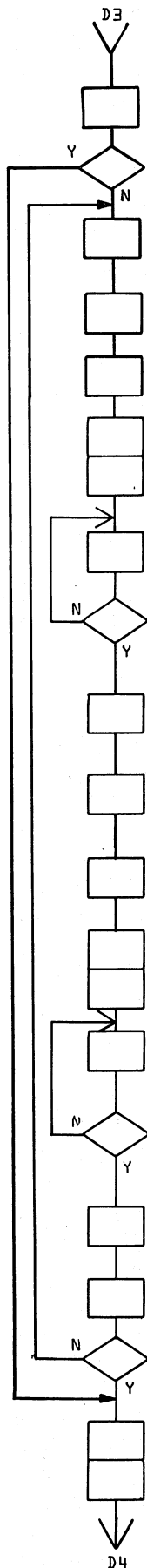


THIS FLOW IS ENTERED
WHEN PRINT CYCLE IS
TERMINATED OR CONTROL
CODE IS FIRST CHARACTER

VERTICAL ADVANCE







Generate the +Line Feed O/S pulse (00208/M2-6) (TP8)

Does the Forms Length Counter equal 1? (00209/D4-11) (TP20)

Trailing edge of next H.D. Clock pulse sets the Strobe F/F's 1 and 2 (00208/M0-3 & 5)

Decrement the Forms Length Counter (00209/E4, E5, E6)

The Reader Terminates the -V Strobe signal (00208/M6-11)

Disable the Vertical Strobe Counter 1 (00208/L6)

Enable the Vertical Strobe Counter 2 (00208/K6)

Trailing edge of the next H.D. Clock pulse increments the V Strobe Counter 2 (00208/K6) and reset Strobe F/F 2(00208/M0-3)

Does V Strobe Counter 2 equal count of 15_{10} ? (00208/K6-15)

Trailing edge of next H.D. Clock pulse resets the Internal Vertical Strobe F/F (00208/L0-3) (TP1)

Trailing edge of next H.D. Clock pulse resets the Strobe F/F 1 (00208/M0-5)

After next line of advance the Print Head sends the next -Vertical Strobe signal (00208/M6-11)

Enable the Vertical Strobe Counter 1 (00208/L6)

Disable the Vertical Strobe Counter 2 (00208/K6)

Trailing edge of H.D. Clock pulse increments V Stb Cntr 1 (00208/L6-2)

Does the V Stb Cntr 1 equal count of 15_{10} (00208/L6-15)

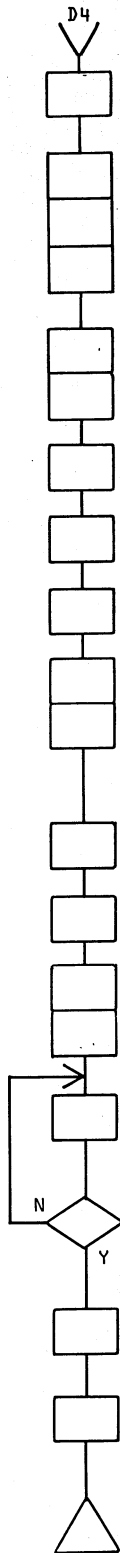
Trailing edge of next H.D. Clock pulse sets the Internal Vertical Strobe F/F (00208/L0-3)

Generate the +Line Feed O/S pulse (00208/M2-6) (TP8)

Does the Forms Length Counter equal 1? (00209/D4-11) (TP20)

+Top of Forms is active. (00209/D4-11) (TP20)

+STP Enable is high (00207/F0-4) (TP4)



Next H.D. Clock pulse trailing edge sets the Strobe F/F's 1 and 2 dropping the LF O/S pulse (00208/M0-3 & 5)

Reset the Vertical Advance F/F (00206/E3-15) (TP18)

Decrement the Forms Length Counter to zero (00209/E4, E5, & E6)

Set the Enable Forms Length Counter Load F/F (00209/C4-5)

Drop the TOF signal (00209/D4-11)

Generate the -Paper Motion Complete signal (00208/M4-11)

Reset the Vertical Advance Enable F/F (00206/K1-8)

Set the Forms Length Counter Load F/F (00209/C4-3)

Generate the Forms Length Counter Load pulse (00209/C6-11) (TP21)

Reset the Enable Forms Length Counter Load F/F (00209/C4-5)

Load the Forms Length Counter to either the count on the Programmable Forms Length Counter or to 66 when in 6 LPI mode or 88 when in 8LPI mode (00209/E4, E5, & E6)

Reset the Forms Load FF (00209/C4-3)

-Vertical Strobe signal is dropped (00208/M6-11)

Disable the Vertical Strobe Counter 1 (00208/L6)

Enable the Vertical Strobe Counter 2 (00208/K6)

Trailing edge of next H. D. Clock pulse increments the V Strobe Counter 2 (00208/K6) and resets Strobe F/F 2 (00208/M0-3)

Does V Strobe Counter 2 equal count of 15_{10} ? (00208/K6-15)

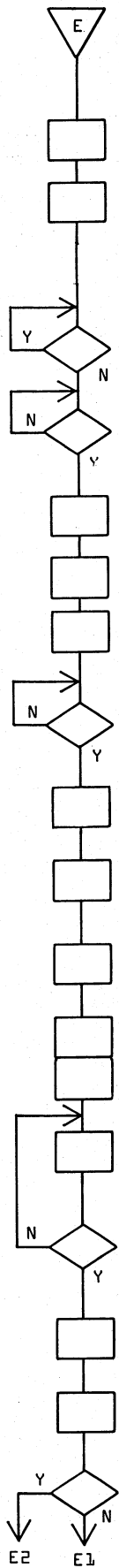
Trailing edge of next H. D. Clock pulse resets the Internal Vertical Strobe F/F (00208/L0-3) (TP1)

Trailing edge of next H. D. Clock pulse resets the Strobe F/F 1 (00208/M0-5)

Vertical Advance is complete.

Manual Forms Advance

Note: Check Section 0 for special interface control if applicable.



Depress the Forms Feed Switch.

Set the Form Feed Latch (00207/F4-12)

Is a Vertical Motion in process? (00208/N1-9)

Is the Printer -Ready and -Busy? (00205/M1-3)

Set the Form Feed F/F (00207/G3-9)

Set the Vertical Advance Enable F/F (00206/K1-9)

Enable lower half of STP Enable Multiplexer (00207/G0-15) and disable upper half (00207/G0-1)

Has the Paper motion Rate Limiter timed out (00206/F3-8)

Set the Vertical Advance F/F (00206/E3-15) (TP18)

Send the -Vertical Advance signal to the Reader and begin advancing forms.

After one line of advance the Reader sends the -Vertical Strobe signal (00208/M6-11)

Enable the Vertical Strobe Counter 1 (00208/L6)

Disable the Vertical Strobe Counter 2 (00208/K6)

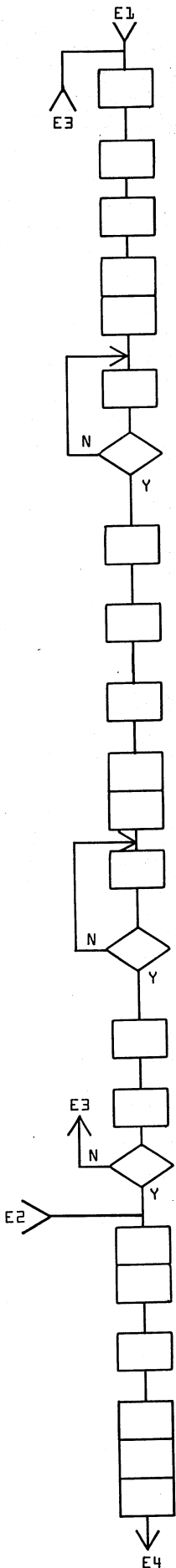
Trailing edge of Hammer Driver Clock pulse increments V Stb Cntr 1 (00208/L6-2)

Does V Stb Cntr 1 equal count of 15₁₀? (00208/L6-15)

Trailing edge of next Hammer Driver Clock pulse sets the Internal Vertical Strobe F/F (00208/L0-3)

Generate the +Line Feed O/S pulse (00208/M2-6) (TP8)

Does the Forms Length Counter equal 1? (00209/D4-11) (TP20)



Trailing edge of the next Hammer Driver Clock pulse sets Strobe F/F's 1 and 2 (00208/M0-3 & 5)

Decrement the Forms Length Counter (00209/E4, E5, & E6)

The Reader Terminates the -V Strobe signal (00208/M6-11)

Disable the Vertical Strobe Counter 1 (00208/L6)

Enable the Vertical Strobe Counter 2 (00208/K6)

Trailing edge of the next H.D. Clock pulse increments the V Strobe Counter 2 (00208/K6) and reset Strobe F/F 2(00208/M0-3)

Does V Strobe Counter 2 equal count of 15_{10} ? (00208/K6-15)

Trailing edge of next H.D. Clock pulse resets the Internal Vertical Strobe F/F (00208/L0-3)

Trailing edge of next H.D. Clock pulse resets the Strobe F/F 1 (00208/M0-5)

After next line of advance the Print Head sends the next -Vertical Strobe signal (00208/M6-11)

Enable the Vertical Strobe Counter 1 (00208/L6)

Disable the Vertical Strobe Counter 2 (00208/K6)

Trailing edge of H.D. Clock pulse increments V Stb Cntr 1 (00208/L6-2)

Does the V Stb Cntr 1 equal count of 15_{10} (00208/L6-15)

Trailing edge of next H.D. Clock pulse sets the Internal Vertical Strobe F/F (00208/L0-3)

Generate the +Line Feed O/S pulse (00208/M2-6) (TP8)

Does the Forms Length Counter equal 1? (00209/D4-11) (TP20)

+Top of Forms is active. (00209/D4-11) (TP20)

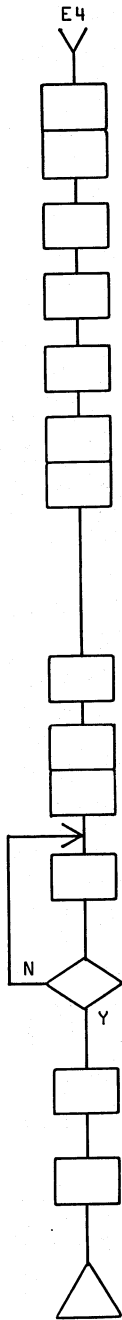
+STP Enable is high (00207/F0-4) (TP4)

Next H.D. Clock pulse trailing edge sets the Strobe F/F's 1 and 2 dropping the LF O/S pulse (00208/M0-3 & 5)

Reset the Vertical Advance F/F (00206/E3-15)

Decrement the Forms Length Counter to zero (00209/E4, E5, & E6)

Set the Enable Forms Length Counter Load F/F (00209/C4-5)



Drop the TOF signal (00209/D4-11) (TP20)

Generate the -Paper Motion Complete signal (00208/M4-11)

Reset the Vertical Advance Enable F/F (00206/E3-15) (TP-18)

Set the Forms Length Counter Load F/F (00209/C4-3)

Generate the Forms Length Counter Load pulse (00209/C6-11) (TP21)

Reset the Enable Forms Length Counter Load F/F (00209/C4-5)

Load the Forms Length Counter to either the count on the Programmable Forms Length Counter or to 66 when in 6 LPI mode or 88 when in 8LPI mode (00209/E4, E5, & E6)

-Vertical Strobe signal is dropped (00208/M6-11)

Disable the Vertical Strobe Counter 1 (00208/L6)

Enable the Vertical Strobe Counter 2 (00208/K6)

Trailing edge of next H. D. Clock pulse increments the V Strobe Counter 2 (00208/K6) and resets Strobe F/F 2 (00208/M0-3)

Does V Strobe Counter 2 equal count of 15₁₀? (00208/K6-15)

Trailing edge of next H. D. Clock pulse resets the Internal Vertical Strobe F/F (00208/L0-3)

Trailing edge of next H. D. Clock pulse resets the Strobe F/F 1 (00208/M0-5)

Manual Vertical Advance is complete.

FORMS MOTION DETECTION

The vertical forms motion is checked in two ways to verify the forms are advancing correctly. The primary check is made by counting the holes at the edge of the form as the forms advance through the right tractor. The forms hole check is referred to as Paper Motion Verification. A secondary check, Line Space Error, monitors the vertical code disk signals (6/8 LPI) and compares them to a vertical check Strobe signal from a second reader on the code disk. These two systems together check both the forms and the code disk reader for errors.

Paper Motion Verification

Paper motion verification circuits are used to verify the correct advancement of forms through the printer by monitoring the number of forms feed holes passing through the upper right tractor. The paper motion verification circuits will also detect the absence of forms from the upper right tractor when the forms advance system is in operation.

The paper motion verification system will allow 24 lines at 6 or 8 lines per inch to be advanced without a paper motion verification reset signal. On the 24th line the paper motion verification system will send a signal to the controller, stopping the printing. The "Forms Error" condition could be caused by having six consecutive paper feed holes covered at 8 LPI (eight at 6 LPI) of having the paper out of the tractor while advancing forms between printed lines. During normal operation, every moving paper feed hole which is sensed resets the paper motion verification system and allows 3 or 4 (8 or 6 LPI) more inches of forms to be advanced. This process repeats itself for every feed hole sensed.

The upper right tractor sensor operates on its own generated light from an L. E. D. which is either reflected off the white form passing in the tractor or absorbed into space through the feed hole. The light reflected from the form comes back into the sensor and activates a phototransistor sensing the presence of paper.

The reflective sensor indicates a high state for a paper (drive) feed hole (black state) and a low state for the presence of paper (white state). The phototransistor of the reflective sensor assembly forms one leg of the input circuit of a voltage comparator. This comparator is used to amplify the sensor output signal and make this signal TTL compatible.

The output of the voltage comparator is inverted and the positive edge of this signal triggers a one shot. The one shot output is ANDed with its input signal to produce a paper motion verification reset pulse (PMV). This method of ANDing is used to produce an output only when a change from the white state to the black state occurs (white paper to non-reflecting feed hole), also when a black state remains longer than the one shot time 1.0 ms the output is removed. The output signal generated is Paper Motion Verification Clear (PMV CLR).

During a forms advance, a code disk attached to the paper advance motor generates Line Feed O/S signals which corresponds to the 6 or 8 lines per inch spacing. The Line Feed O/S signal from the code disc is fed to a mode 24 counter which is being reset by the PMV pulse when the paper feed hole passes by the black/white sensor assembly. If the counter is allowed to count 24, Line Feed O/S signals without a PMV CLR pulse, the system will generate a "Forms Error" signal and stop the printing operation. The count twenty four flip/flop is set at the count of sixteen on the Paper Motion Verification counter. This count twenty four flip/flop then enables the Forms Error flip/flop to be set at the count of twenty four if not reset by PMV CLR first.

The Paper Motion Verification Counter is normally reset by Paper Motion Verification signals but is also reset by the Start switch when pressed or one of the following optional switches: Go, or On Line.

Line Space Error

This error detection system is used as a vertical reader fault detection circuit and operates by monitoring the 6 or 8 LPI Line Feed O/S signals. During vertical forms motion the first check strobe signal initiates the counting of the Line Feed O/S signals. Line Feed O/S signals are counted until the next check strobe signal, then the count is clocked down by the following Line Feed O/S signals until the next check strobe signal at which time the count must be zero or a Line Space Error is generated. A Line Space Error generates a fault which stops the forms advance and stops the printer, illuminating the Stop lamp. Refer to Figure 4-16 for a view of the code disk.

When first starting the printer the Line Space Error counter is held reset until the first -Vertical Check Strobe signal is detected. When the check strobe is detected the counter then counts the Line Feed O/S signals until the next check strobe signal is detected. The counter is then clocked back down by the Line Feed O/S signals until the next check strobe signal is detected. At this point the counter must be at a count of zero or an error in the reader signals has been detected and a Forms Error is generated. A forms error condition also occurs if the counter ever reaches the count of ten or if the -Vertical Check Strobe signal ever occurs during a +Strobe F/F 2 pulse time, at which time it should not occur.

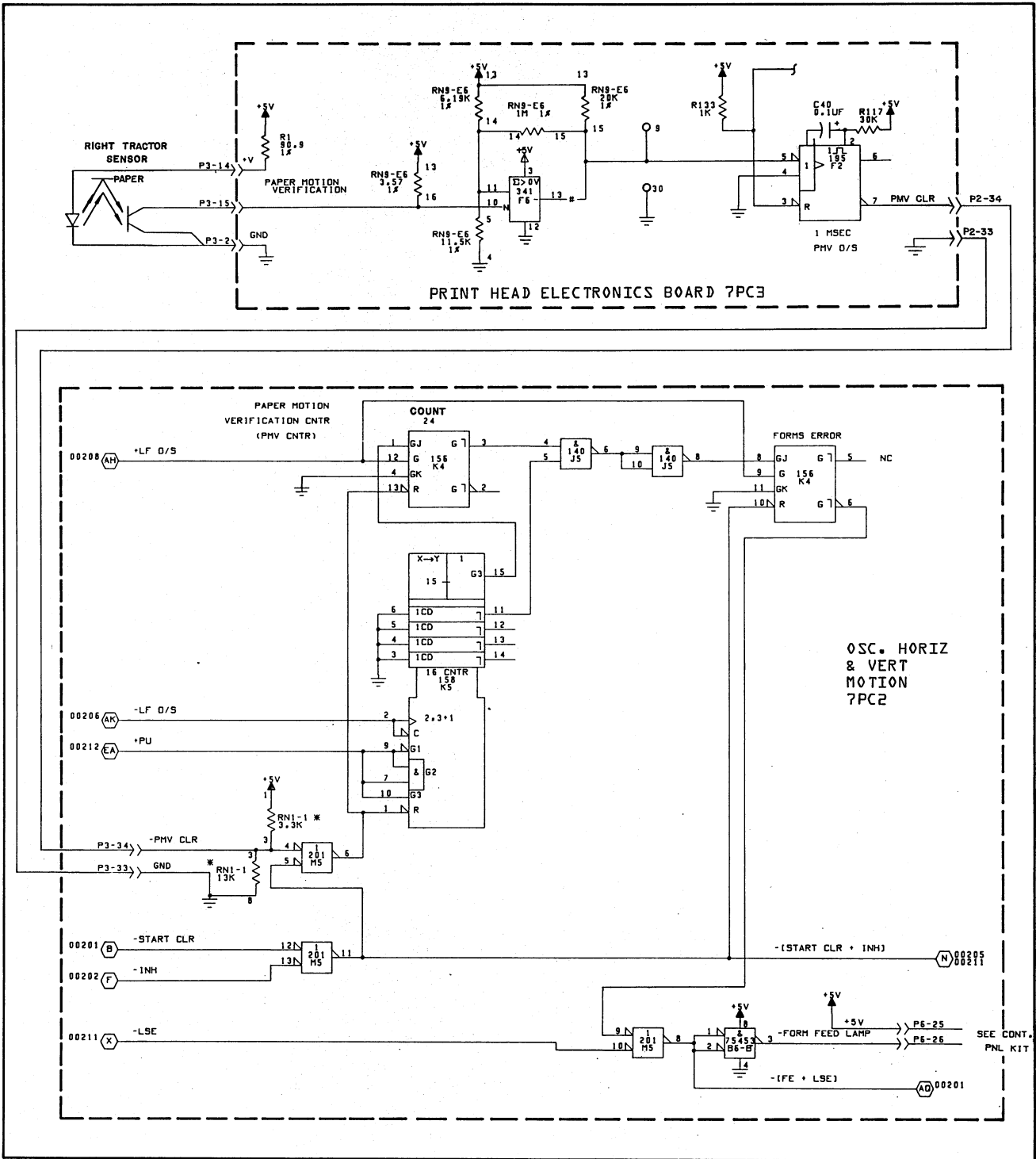
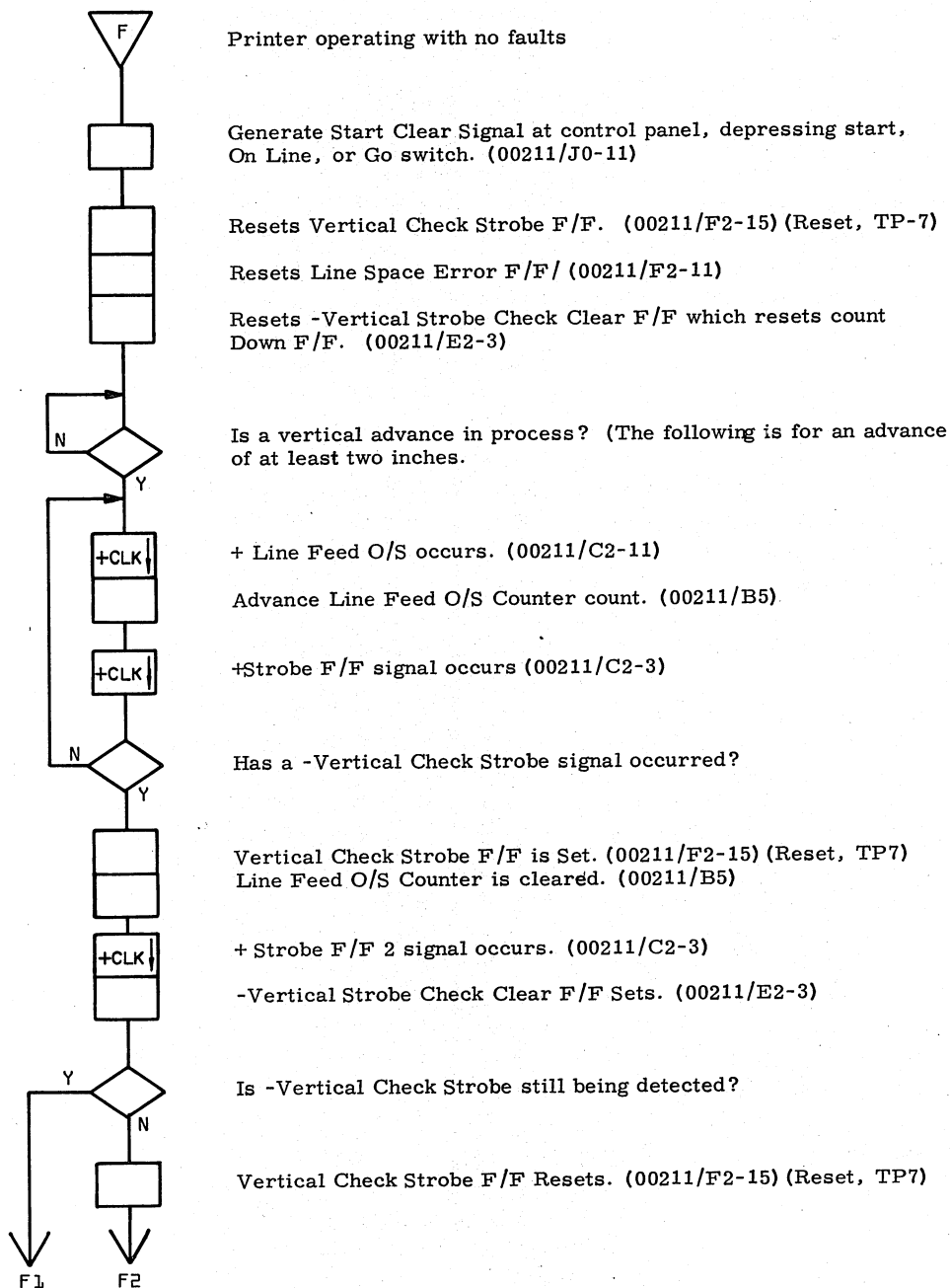
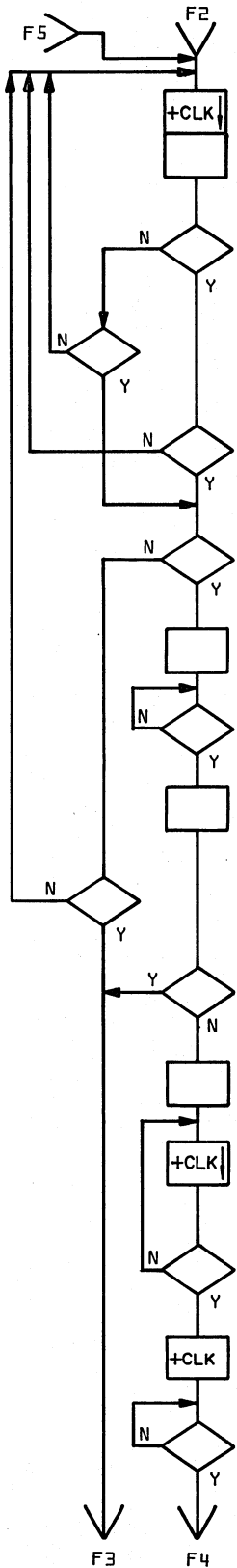


FIGURE 4-26. PAPER MOTION VERIFICATION

LINE SPACE ERROR





Next Line Feed O/S occurs. (00211/C2-11)

Line Feed O/S Counter advances count (00211/B5)

Is the printer in the 6 LPI mode?

Has the Line Feed O/S Counter advanced to the count of 8. (00211/B5)

Has the Line Feed O/S Counter advanced to the count of 6. (00211/B5)

Has the next -Vertical Check Strobe occurred?

Vertical Check Strobe F/F is Set. (00211/F2-15) (Reset, TP7)

Has the +Strobe F/F 2 signal occurred.

Count Down F/F Is Set (00211/E2-5) (Reset, TP9)

Has the Line Feed O/S Counter reached the count of ten?

Is the -Vertical Strobe signal still being detected?

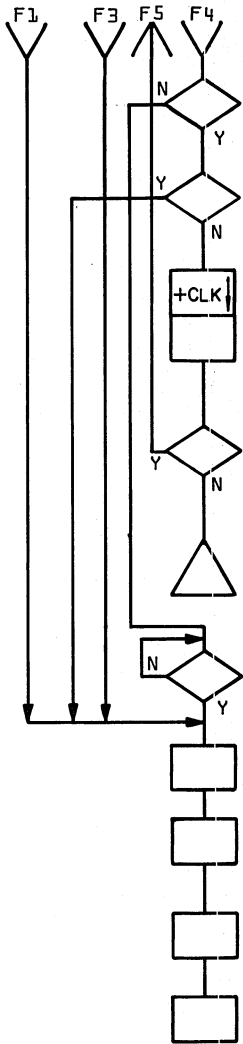
Vertical Check Strobe F/F resets. (00211/F2-15) (Reset, TP7)

+Line Feed O/S decrements the Line Feed O/S counter (00211/B5).

Has the next -Vertical Check Strobe occurred?

Vertical Check Strobe F/F sets. (00211/F2-15) (Reset, TP7)

Has the +Strobe F/F 2 signal occurred?



Does the Line Feed O/S Counter equal zero count?

Is the -Vertical Strobe signal still being detected?

The Count Down F/F Resets. (00211/E2-5) (Reset, TP9)

The Vertical Check Strobe F/F Resets (00211/F2-15) (Reset, TP7)

Two inches of forms advance have now occurred but less than three, is the forms advance to continue?

Count continues at the next forms advance unless reset by the Start signal.

Has the next +Strobe F/F 2 signal been detected?

Set the Line Space Error F/F. (00211/F2-11)

Generate a Forms Error + Line Space Error signal. (00210/M5-8)

Generate a Fault signal (to the processor) (00201/N1-6)

Light the form feed lamp on the control panel (if incorporated) or the Alarm, Device, or Page Eject indicators.

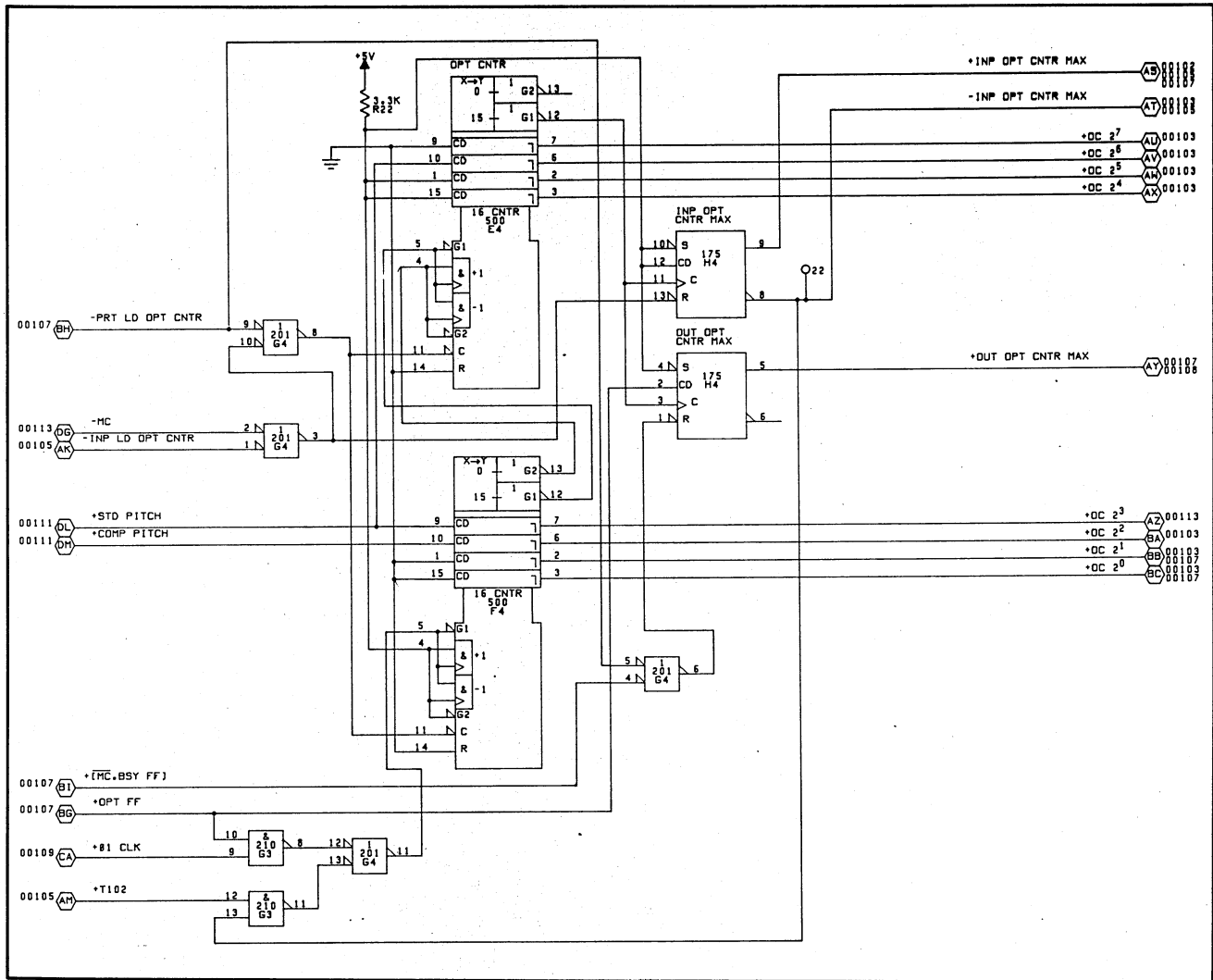


FIGURE 4-27 OPTION COUNTER LOGIC

OPTION COUNTER

This counter is used during both an input and a print cycle to access the Random Access Memory. During an input cycle, the counter is loaded by the Input Load Option Counter signal which is generated by the first Store Data pulse. The counter is pre-loaded to the count of 120_{10} for the standard pitch and to 52_{10} for compressed pitch. The first data character is stored in that location of the memory. For each succeeding character the Option Counter is incremented accessing a new memory location. When the Option Counter reaches the count of 255_{10} , the Input Option Counter Maximum F/F is set, terminating the input cycle and initiating the print cycle. The count of 255_{10} corresponds to the maximum number of usable print positions

that can be available; 136 when in the standard pitch mode and 204 in the compressed pitch mode. The Input Option Counter Maximum F/F remains set until the next Input Load Option Counter signal is generated.

During the print cycle portion of the counter operation, the counter is pre-loaded to the count of 120_{10} or 52_{10} by the Print Load Option Counter signal which is generated at the start of each Option cycle. The counter is incremented by each $\emptyset 1$ Clock pulse while the Option F/F is set. When the count of 255_{10} is reached, all the memory characters have been optioned and the Output Option Counter Maximum F/F is set, terminating the Option cycle. The Output Option Counter Maximum F/F is reset when either the next Print Load Option Counter pulse is generated or the printer goes -Busy.

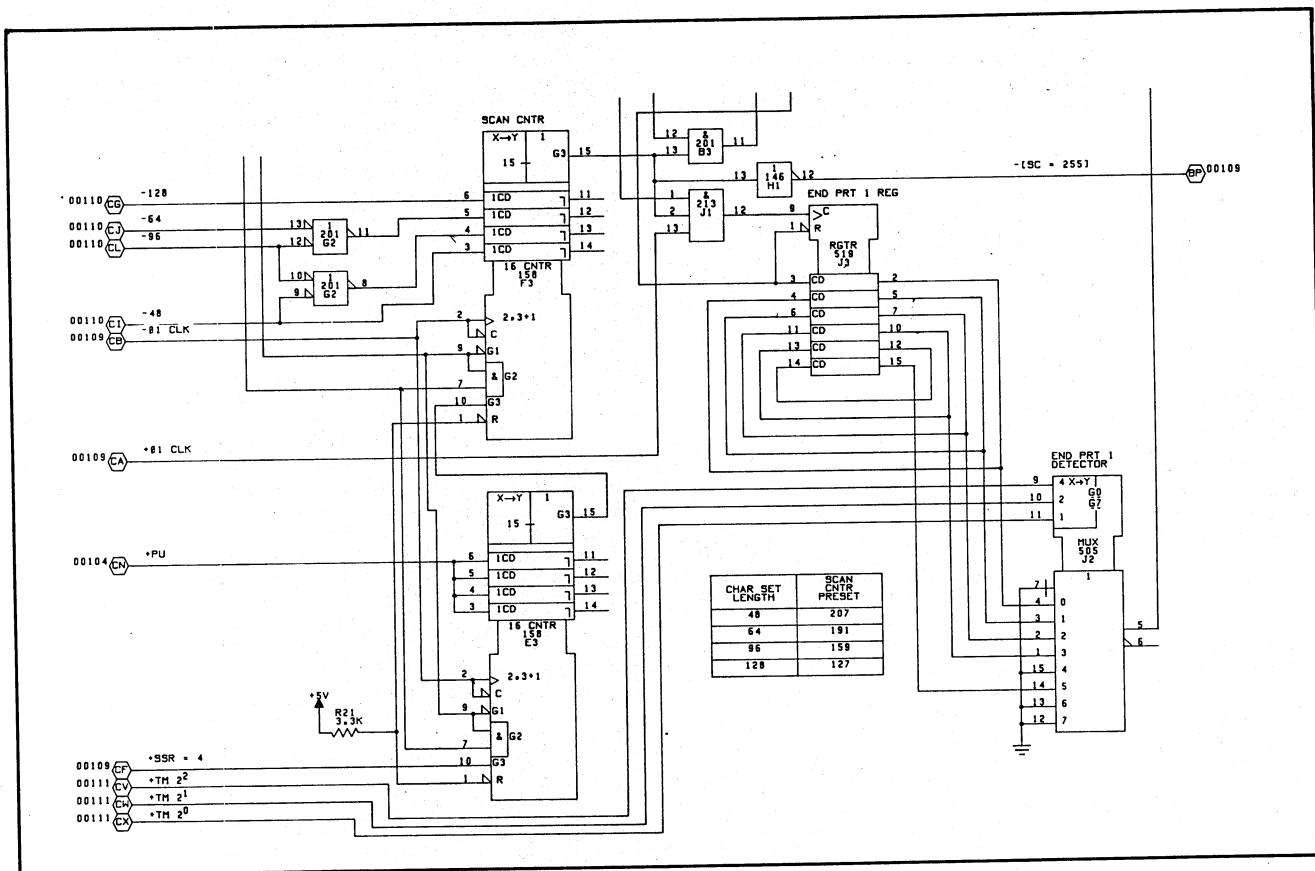


FIGURE 4-28 SCAN COUNTER & END PRINT 1 DETECT

SCAN COUNTER

The Scan Counter is used to keep track of the number of print character positions optioned during the Print 2 portion of a Print Cycle. When all possible characters have been optioned, the Scan Counter resets the Print 2 F/F, terminating the print operation for the horizontal position the hammer bar is in at that time. The Scan Counter is pre-loaded when the Print 2 F/F is not set. The pre-load count will vary with the band character set length: for a 48 character set pre-load is 207₁₀; for a 64 character set pre-load is 191₁₀; for a 96 character set pre-load is 159₁₀; and for a 128 character set pre-load is 127₁₀. When the Print 2 F/F is set, the Scan Counter is allowed to count. The counter is incremented by the 01 Clock pulse at TSSP2 time if the Sub Scan Register equals the count of 4. The significance of the SSR=4 signal is that all possible alignments of band characters to print hammers corresponding to the character in print position 1 have been optioned and that particular scan is complete. The Scan Counter continues to be incremented until the counter reaches the count of 255₁₀. At this time, when the TSSP3 signal goes active the

End Print 1 Register is strobed. At the following TSSP5 time the Print 2 F/F is reset. Resetting the Print 2 F/F activates the Load input of the counter and the proper pre-load count is strobed into the counter by the 01 Clock pulse.

END PRINT 1 REGISTER AND DETECTOR

The End Print 1 Register keeps track of the number of Print 2's that have been run for each Print operation. The input to the shift register is taken from Print 1 F/F. When the flop is reset, the register is held clear. As soon as the Print 1 F/F sets, the reset input is deactivated and the shift register input goes high. Each time the Scan Counter reaches the count of 255₁₀ the register is shifted. The outputs of the End Print 1 Register are fed to the End Print 1 Detector. The detector is a multiplexer. The input to be transferred to the output of the multiplexer is determined by the Type of Machine Code (TM2^x). The Type of Machine code corresponds to the number of shifts the hammer bar makes to print a complete line of data. When the selected input goes high the Print 1 F/F is reset by the 02 Clock pulse, terminating the Print Cycle Operation.

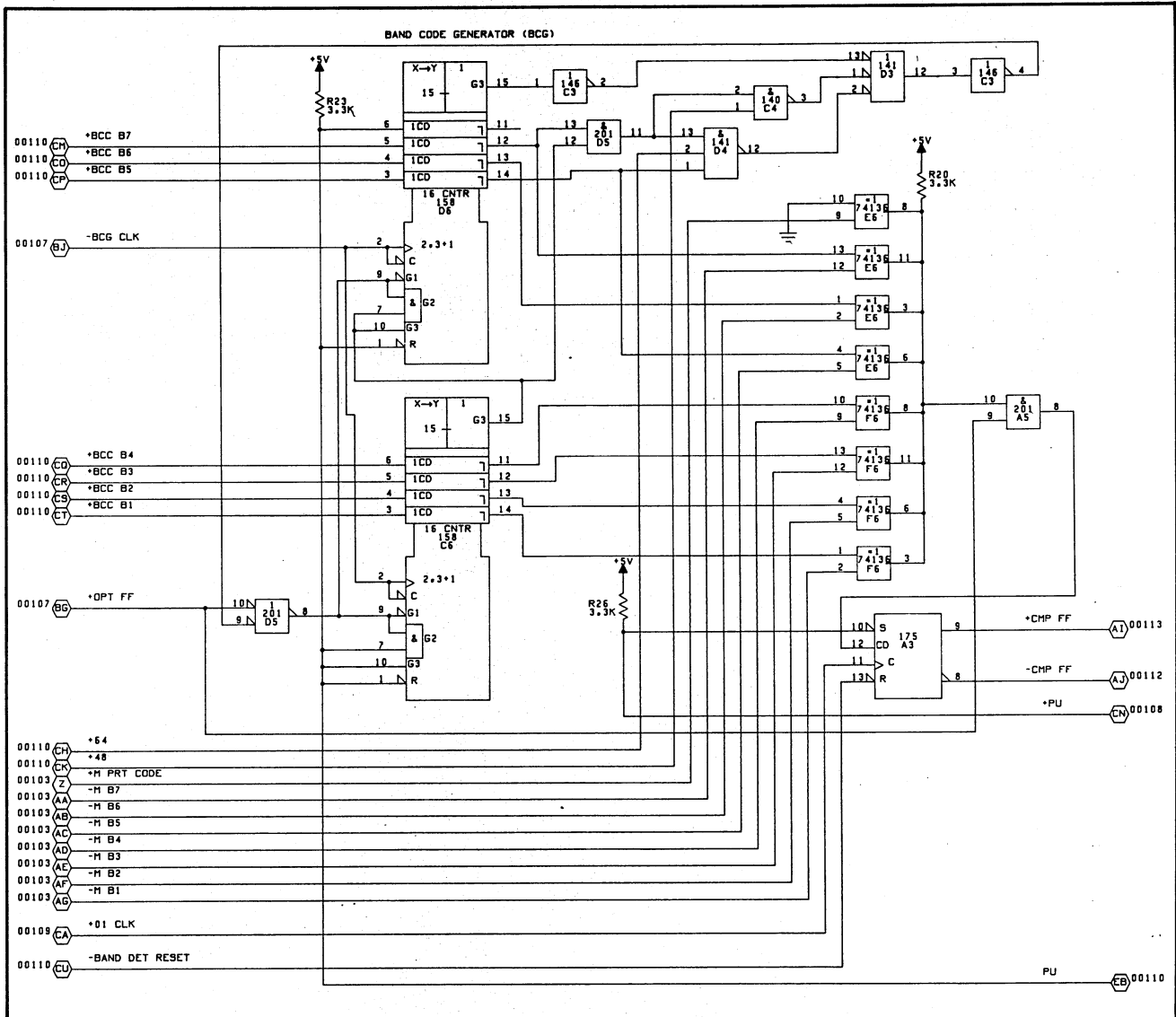


FIGURE 4-29 BAND CODE GENERATOR

BAND CODE GENERATOR

The Band Code Generator is used during each Option Cycle to generate the codes of the print characters that will be aligned with each print position for this character pulse. During an Input Cycle, the Band Code Generator is loaded with the output of the Band Character Counter. The Character Counter contains the count of the print character aligned with the first print position. When the Option F/F sets, starting a print operation, the Load input (G1) is removed from the counter and the enable counting input (G2) is enabled. On the trailing edge of each succeeding BCG Clock pulse, the Band Code Generator is incremented. The BCG Clock pulse is generated by each 01 clock pulse except when the two least significant bits of the Option

Counter are both active. This skipping of every fourth clock pulse allows for the fact that every fourth print character is printable in both Sub Scan 4 and Sub Scan 1 (See Tables on succeeding pages). When the Band Code Character reaches the count corresponding to the size of the character set, it is reloaded. With a 48 character set, the generator is loaded to the count of 32_{10} when a count of 79_{10} is reached. With a 64 character set, the generator is loaded to the count of 32_{10} when a count of 127_{10} is reached. With a 128 character set, the generator is reloaded to the count of 00 when a count of 127_{10} is reached. The most significant bit of the generator is always high, but it is ignored for purposes of counting and comparing. It is only used to enable the carry output of chip D6 for the purpose of detecting the 96 and 128 character sets.

TABLE 4-4. 360 LPM HAMMER AND HORIZONTAL POSITION RELATIONSHIPS

SS																					SCAN 1 IN POSITION 0 (HMRS ENERGIZED) (Q) SUBSCAN=1			
BAND	1	A*		D		G		J		M		P												
CODE	2		B		E		H		K		N		Q											
GENERATOR	3		C		F		I		L		O													
	4		D		G		J		M		P													
COLUMN		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20			
HORIZ. POS.		0	1	2	3	0	1	2	3	0	1	2	3	0	1	2	3	0	1	2	3			
HAMMER		1			2				3				4						5					
SS																					SCAN 2 IN POSITION 0 (HMRS ENERGIZED) (Q) SUBSCAN=1			
BAND	1	B		E		H		K		N		O												
CODE	2		C		F		I		L		O													
GENERATOR	3		D		G		J		M		P													
	4		E		H		K		N		Q													
COLUMN		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20			
HORIZ. POS.		0	1	2	3	0	1	2	3	0	1	2	3	0	1	2	3	0	1	2	3			
HAMMER		1			2				3				4						5					
SS																					SCAN 1 IN POSITION 1 (HMRS ENERGIZED) (Q) SUBSCAN=2			
BAND	1	A		D		G		J		M		P												
CODE	2		B		E		H		K		N													
GENERATOR	3		C		F		I		L		O													
	4		D		G		J		M		P													
COLUMN		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20			
HORIZ. POS.		0	1	2	3	0	1	2	3	0	1	2	3	0	1	2	3	0	1	2	3			
HAMMER		1			2				3				4						5					
SS																					SCAN 2 IN POSITION 1 (HMRS ENERGIZED) (Q) SUBSCAN=2			
BAND	1	B		E		H		K		N		O												
CODE	2		C		F		I		L		O													
GENERATOR	3		D		G		J		M		P													
	4		E		H		K		N		Q													
COLUMN		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20			
HORIZ. POS.		0	1	2	3	0	1	2	3	0	1	2	3	0	1	2	3	0	1	2	3			
HAMMER		1			2				3				4						5					
* ALPHABETIC CHARACTERS SHOWN IN BAND CODE GENERATOR REPRESENT ACTUAL BINARY EQUIVALENTS.																								

TABLE 4-5. 720 LPM HAMMER AND HORIZONTAL POSITION RELATIONSHIPS

<p>BAND CODE GENERATOR</p> <p>1 A D G J M P</p> <p>2 B E H K N Q</p> <p>3 C F I L O</p> <p>4 D G J M P</p> <p>COLUMNS 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20</p> <p>HORIZ. POS. HAMMERS 0 1 0 1 0 1 0 1 0 1 0 1 0 1 0 1 0 1 0 1</p> <p>1 2 3 4 5 6 7 8 9 10</p>	<p>SS</p>	<p>SCAN 1 IN POSITION 0 (ODD HAMMERS ENERGIZED @ SS1 EVEN HAMMERS ENERGIZED @ SS3)</p>
<p>BAND CODE GENERATOR</p> <p>1 B E H K N Q</p> <p>2 C F I L O</p> <p>3 D G J M P</p> <p>4 E H K N Q</p> <p>COLUMNS 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20</p> <p>HORIZ. POS. HAMMERS 0 1 0 1 0 1 0 1 0 1 0 1 0 1 0 1 0 1 0 1</p> <p>1 2 3 4 5 6 7 8 9 10</p>	<p>SS</p>	<p>SCAN 2 IN POSITION 0 (ODD HAMMERS ENERGIZED @ SS1 EVEN HAMMERS ENERGIZED @ SS3)</p>
<p>BAND CODE GENERATOR</p> <p>1 A D G J M P</p> <p>2 B E H K N Q</p> <p>3 C F I L O</p> <p>4 D G J M P</p> <p>COLUMNS 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20</p> <p>HORIZ. POS. HAMMERS 0 1 0 1 0 1 0 1 0 1 0 1 0 1 0 1 0 1 0 1</p> <p>1 2 3 4 5 6 7 8 9 10</p>	<p>SS</p>	<p>SCAN 1 IN POSITION 1 (ODD HAMMERS ENERGIZED @ SS2 EVEN HAMMERS ENERGIZED @ SS4)</p>
<p>BAND CODE GENERATOR</p> <p>1 B E H K P Q</p> <p>2 C F I L O</p> <p>3 D G J M P</p> <p>4 E H K N Q</p> <p>COLUMNS 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20</p> <p>HORIZ. POS. HAMMERS 0 1 0 1 0 1 0 1 0 1 0 1 0 1 0 1 0 1 0 1</p> <p>1 2 3 4 5 6 7 8 9 10</p>	<p>SS</p>	<p>SCAN 2 IN POSITION 1 (ODD HAMMERS ENERGIZED @ SS2 EVEN HAMMERS ENERGIZED @ SS4)</p>

MAINTENANCE

INTRODUCTION

This section contains information and instructions necessary to maintain the printer in optimum operating condition. This section is divided into five sub-sections:

Maintenance Aids
Preventive Maintenance
Corrective Maintenance
Parts Replacement
Fault Isolation

MAINTENANCE AIDS

TOOLS AND MATERIALS

Tools and materials required for maintaining the printer are listed in three groups; maintenance tools, special maintenance tools and maintenance materials.

Maintenance tools are items normally used by field engineers and are specially needed in maintaining this printer. Special maintenance tools are items of special design or items not considered a part of a standard set of field maintenance tools. Maintenance materials are basic supplies ordinarily used during maintenance.

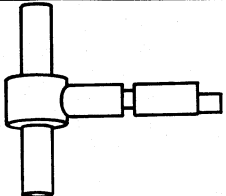
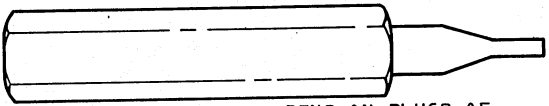
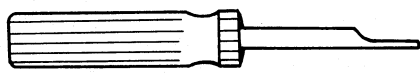
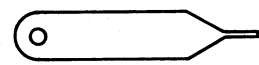
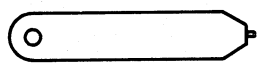
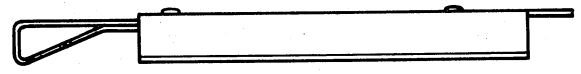
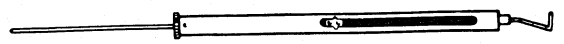
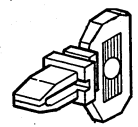
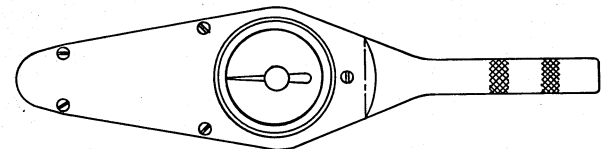
TABLE 5-1. MAINTENANCE TOOLS

OSCILLOSCOPE: Dual trace, d.c. to 10mHz minimum, calibrated triggered sweep.
DIGITAL VOLTMETER: four digit
SCREWDRIVER ASSORTMENT: flat blade and phillips.
SOLDERING IRON: 6 or 15 watt recommended
VACUUM CLEANER: with hand held brush and nozzle.
WRENCH ASSORTMENT: open end American sizes through 9/16"
HEX KEY WRENCH SET: .050 through 3/16 inch
RULER: 6" or metric equivalent
SQUARE (small right angle)

TABLE 5-2. MAINTENANCE MATERIALS

ALCOHOL -for general cleaning
SILICON GREASE -for print gate
CHLOROTHENE-Nu-gate, adhesive removal

TABLE 5-3. SPECIAL MAINTENANCE TOOLS

<p>44670888 BAND TRACKING/FLIGHT TIME TOOL 44674186 MASTER BAND</p> <p>This tool is required (1) to adjust the print hammer actuator assemblies for proper print hammer flight time and (2) to adjust the left and right band drive pulley upper bearing locations for correct band tracking using a Master Band.</p>	
<p>94806769 CONNECTOR PIN EXTRACTOR (AMP NO. 458994-1).</p> <p>Used for removing connector pins from the connector block which plugs into the AC Select Board used in a special configuration, universal power supply. Optional, required only when AC select board is used.</p>	<p>OPTIONAL TOOL</p>  <p>USED ONLY ON CONNECTOR PINS ON PLUGS OF OPTIONAL A.C. SELECT BOARD</p>
<p>94806768 CONNECTOR PIN EXTRACTOR (AMP NO. 465644-1) - 95323900</p> <p>Used for removing circular type pins from connector blocks attached to the Ribbon Motor cable connectors and the Paper Motion Verification sensor cable connector.</p>	
<p>94806770 CONNECTOR PIN EXTRACTOR (AMP NO. 91065-1)</p> <p>Used for removing square type pins from connector blocks attached to circuit board D.C. power cables, D.C. power and signal connector cables 2PC2-P1, 2PC2-P2 and 2PC2-P4 on the Servo Amplifier board and D.C. power connector 2PC1-P1 on the Power Supply board..</p>	
<p>94806771 CONNECTOR PIN EXTRACTOR (AMP NO. 91052-1)</p> <p>Used for removing pins from all miniature black plastic connector blocks attached to the Print Head board and special interface boards.</p>	
<p>94806776 CONNECTOR PIN EXTRACTOR (AMP 457241-1)</p> <p>Used for removing pins from the Hammer Striker harness connectors which plug into the Hammer Driver circuit board(s).</p>	
<p>12210947 SPRING SCALE</p> <p>For adjusting belt tensions, Band tension. Push/Pull gauge to 5lbs or 2.5 kilograms.</p>	
<p>44672885 LATCH QUARTER TURN</p> <p>For setup on the band cover interlock switch without using the band cover.</p>	
<p>84133800 TORQUE WRENCH 0-75 in. lbs. (0-86 cm/kg)</p> <p>(alternate wrench 0-50 in. lbs. minimum may be used)</p> <p>Used to torque the platen bolts and band collar clamps.</p>	

TESTING WITHOUT NOISE

During repair of the printer the following may be performed to quietly cycle the printer.

1. Disconnect hammer driver board connectors on all hammer driver boards, P1, P3, P4, P5, P6.
2. Disconnect paper clamp by using extraction tool and remove clamp wire from Servo Amp Board plug P2-3.
3. Remove forms and ribbon.
4. Tape down the Out Of Paper switch.
5. Disable Paper Motion Verification (PMV) by making a paper loop from the edge of a form which will run through the right tractor or ground pin 1 on chip K5 on board 7PC2, counter reset pin.

Test Print Method

1. Select blank code test print character (40g).
2. Operate Test Print switch.

High Risk Method

This method should only be used by experienced service personnel on printers with known good hammer driver circuits.

WARNING

DAMAGE MAY OCCUR TO THE HAMMER DRIVER BOARDS OR HARNESS, AND POSSIBLY THE PRINT BAND IF THIS METHOD IS USED AND A FAILURE OCCURS ON A HAMMER CIRCUIT.

1. Disconnect P3 on the Input Print board (7PC1). (Constantly monitor the printer while this connector is disconnected).

WARNING

HAZARDOUS VOLTAGE AND HAZARDOUS ENERGY LEVELS

During maintenance operations switch off the mains supply whenever possible. When power is applied care must be taken when servicing equipment to avoid contact with parts at Hazardous Voltages such as mains circuits and the high voltage section of high frequency switching power supplies which are common on most equipment.

On low voltage circuits an additional hazard exists due to the high short circuit current/energy (often hundreds of amps) which can flow into a fault. Great care must be taken to avoid short circuiting the opposite poles of low voltage supplies by tools or personal metallic adornments such as rings or watchstraps.

MOS COMPONENTS

MOS components may be damaged by static electricity which is commonly caused by human movement such as walking over carpeted floors or by friction between clothing and chair seats or desk tops. Those handling MOS components or assemblies should read: Handling Procedures for MOS components.

The following rules should be observed: -

1. Components should be stored in conductive trays (i.e. metal or foil lined containers) or have their pins joined by conducting foam.
2. High static materials should be excluded from the working vicinity.
3. Personnel handling MOS components should previously earth themselves via ground or earthed metalwork.

Metal oxide-silicon semi-conductors are being used in this printer. There is considerable risk of accidental damage being caused to such components by the discharge of static electricity through the elements.

PRINTED CIRCUIT BOARDS CARRYING METAL OXIDE SILICON SEMI-CONDUCTORS

It is, therefore, important that all personnel liable to handle PCBs carrying MOS semi-conductors are aware of the risk and of the correct method of handling. (There is no easy way of recognising a MOS semi-conductor so, if in doubt, assume that one is fitted to the PCB you are handling.)

Take the following precautions:

1. The PCBs must always be transported in the container provided.
2. When a replacement board is to be fitted into an equipment, the Engineer must first touch bare, earthed metal frame to discharge any static electric charge he is carrying. Having done so he should avoid taking any more steps on the floor prior to fitting the PCB into the equipment. He should then remove the PCB from its container, handling it in a way which avoids any contact with any conducting part of the PCB. He should then remove any protective clip, if fitted to the MOS device, and insert the PCB.
3. Prior to removing a PCB the Engineer must again touch a bare, earthed metal frame and, avoiding taking any further steps on the floor, remove the PCB from the equipment, handling it as described above, fit protective clips where appropriate, and place the PCB in the container provided for the purpose.
4. Technology advise that no PCBs fitted to an equipment containing MOS devices should be inserted or removed with the power to the equipment switched on.

Damage resulting from static discharge or other causes may not become evident until some time later.

PREVENTIVE MAINTENANCE

Preventive Maintenance on the 300/600 devices is divided into two levels. Level 1 P. M. is required every 3 months or 4.5 million (300 LPM)/9 million (600 LPM) printed lines, whichever occurs first. The Level I operations require approximately 1 hour to perform. Level II P. M. is required every 12 months or 18 million (300 LPM)/36 million (600 LPM) printed lines, whichever occurs first. The Level II operations require 1 additional hour to perform.

Preventive maintenance is not intended to cover such things as ribbon changes, paper loading or removal, and ribbon shield replacements. These operations are considered to be operator functions. In addition, the operator is required to keep the paper path clean and to remove accumulated paper dust and lint during ribbon changes.

LEVEL	DESCRIPTION	P. M. TOOLS AND MATERIALS											
		VACUUM	ALCOHOL	CLEANSER	OSCILLOSCOPE	ALLEN WRENCHES	PUSH PULL GAUGE	RULE	BEARING TAPE	DIGITAL VOLT METER	FLIGHT TIME TOOL	SILICON GREASE	
1.1	PRINTER CLEANING	X	X	X									
1.2	PAPER CLAMPS				X								
1.3	RESIDUAL STRIP					X							
1.4	FLIGHT TIME					X					X		
1.5	PLATEN WEAR STRIP								X				
2.1	DRIVE BELT						X	X					
2.2.1	POWER SUPPLY									X			
2.2.2	SUBSCAN COMPENSATION									X			
2.2.3	CHARACTER TO HOME				X								
2.2.4	HORIZONTAL SERVO				X								
2.2.5	VERTICAL SERVO				X								
2.3	GATE LUBRICATION												X

WARNING

NOISE LEVEL UNDER BONNET WHILE PRINTING MAY BE HAZARDOUS TO HEARING. KEEP EXPOSURE TO A MINIMUM.

LEVEL I MAINTENANCE

1.1 PRINTER CLEANING

CHECK/Conditions

1. Printer powered off and print gate open.
2. Remove print gate cover and print band.
3. All printer skins in place.

Actions

- Vacuum hammer modules and horizontal reader to remove paper dust and chad.
1. Clean lint from platen and top guide.
 2. Wipe band pulleys surfaces with alcohol.
 3. Clean ribbon residue from ribbon posts and guides.
- Remove all surface dirt using a non-abrasive commercial cleaner.

1.2 PAPER CLAMP ADJUSTMENT

CHECK / Conditions

- Adjustment should be checked when printed lines across the form appear wavy. Cause could also be a band floating problem covered in Corrective Maintenance.
1. Printer powered off and bonnet removed.
 2. Install 15lb. single part forms and briefly operate the printer.
 3. Remove the paper from the tractors.
- CHECK: Use a spring scale to pull the forms up through the throat area. Does the paper drag go up and exceed four pounds (1.814 kg) ?
4. Replace the forms in tractors, operate the printer and then power it down and remove the paper from the tractors.
- CHECK: Use a spring scale to pull the forms up through the throat area. Is the tension less than one pound (454g) ?

Actions

- Perform the Paper Clamp Adjustment Procedure in the Corrective Maintenance Section.
- Perform the Paper Clamp Adjustment Procedure in the Corrective Maintenance Section.

1.3 RESIDUAL STRIP ADJUSTMENT OR REPLACEMENT

CHECK/Conditions

1. Printer powered off.
2. Remove ground strap and lift off bonnet.
3. Remove paper bail.
4. Remove 3 allen screws securing armature bar.
5. Unplug hammer driver cables.

Actions

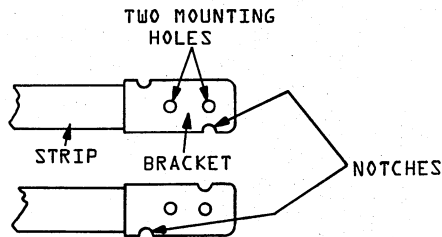
1.3

RESIDUAL STRIP ADJUSTMENT OR REPLACEMENT (con't)

CHECK/Conditions

6. Lift out armature bar.

CHECK: If residual strip has not been shifted before as evidenced by wear in only one position then perform action step 1. If strip has been shifted perform action step 2.



Action

The residual strip has two positions and when a hole occurs at any one or more strikers then the strip is shifted.

1. Move residual strip mounting brackets on each side of armature bar to unused hole. Remove the one on the inside hole first to relieve tension.
2. Remove residual strip. Install new strip, placing mounting brackets on opposite holes. If left side is on inside hole, right side should be an opposite hole, or vice versa. Notches on brackets aid in installation. Install upper notch to upper notch or lower notch to lower notch.

1.4

HAMMER FLIGHT TIME ADJUSTMENT

CHECK/Conditions

1. Printer printing all one character pattern of M's or H's. If compressed pitch bands are used, install one when performing this adjustment/check.

CHECK: Are all characters printed equally on both sides? Remember each hammer prints more than one column, and errors appear in groups of two (720 LPM) or four (360 LPM). In compressed pitch the group pattern is three (720 LPM) and six (360 LPM).

Action

Perform Flight Time Adjustment procedure Corrective Maintenance Section

1.5

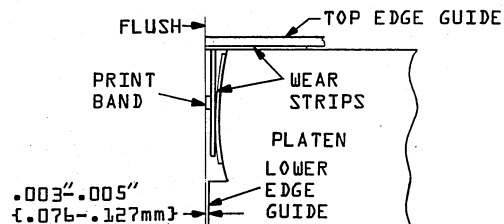
PLATEN WEAR STRIP CHECK (BEARING TAPE)

CHECK/Conditions

1. Power the printer off.
2. Remove upper gate cover and open the gate.
3. Remove band.

CHECK: Surface of wear strip should not have bare spots. Wear strips are located in the printing area on the platen front surface and top edge.

Action



For replacement of wear strip refer to Parts Replacement.

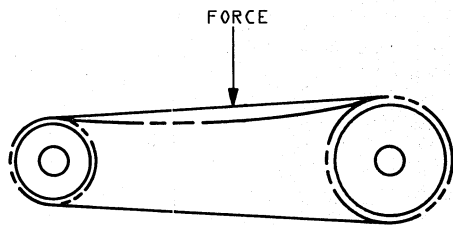
LEVEL II MAINTENANCE

2.1 DRIVE BELT INSPECTION

CHECK/Conditions

1. Printer powered off.

CHECK: Inspect the drive belts for signs of wear and check their tension.



Action

1. Replace worn belts
2. Perform the belt tension adjustments specified in the Corrective Maintenance section

BELTS	OUNCES (U.S.A.)		DEFLECTION	GRAMS (METRIC)		DEFLECTION
	MIN.	MAX.		MIN.	MAX.	
Band Motor	16 oz	24 oz	.150.	454 g	680 g	3.8 mm
Forms Advance	32 oz	40 oz	.150	907 g	1134 g	3.8 mm

2.2 ELECTRICAL ADJUSTMENTS

2.2.1 POWER SUPPLY +5 VOLTS

CHECK/Conditions

1. Printer powered on.
2. Bonnet and paper bail removed.
3. Digital Volt Meter connected to R162 on the 7PC3 board (refer to Installation and Checkout) for +5 volt, and 5TB4 for GND

CHECK: +5 volt equals 4.99 to 5.01 volts.

Action

1. Allow printer warm-up for a half hour. Adjust pot R2 on 2PC1 to obtain correct voltage.

2.2.2 SUBSCAN COMPENSATION REFERENCE VOLTAGE

CHECK/Conditions

1. Printer powered on.
 2. Bonnet and paper shroud removed.
 3. Plus DVM lead connected to 7PC3 (TP 11 new) (TP12 old) (see Table 5-4 for board numbers), return lead to TP30.
- CHECK: +30 volt reference voltage equal 29.99 to 30.01 volts.

Action

1. Adjust pot P2 on 7PC3 to obtain correct voltage.

2.2.3

CHARACTER TO HOME PULSE SYNCHRONIZATION

CHECK/Conditions

If misadjusted the wrong character will be printed.

1. Printer powered on.
2. Bonnet and paper bail removed.
3. Open and close gate to keep band rotating.

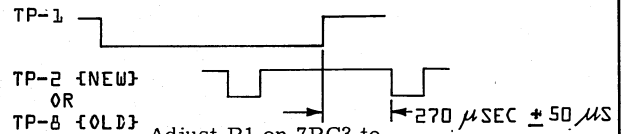
CHECK/Conditions

4. Using a dual trace oscilloscope, sync neg. and monitor TP1 of 7PC3 with channel 1.
5. Monitor 7PC3 (TP2 new) (TP8 old) (see Table 5-4 for board numbers) with channel 2.

CHECK: TP2 (TP8) should go negative between 220 and 320 usec following positive edge of TP1.

Action

Action



Adjust P1 on 7PC3 to achieve this timing relationship. Check to see that correct characters are being printed.

2.2.4

HORIZONTAL SERVO ADJUSTMENT

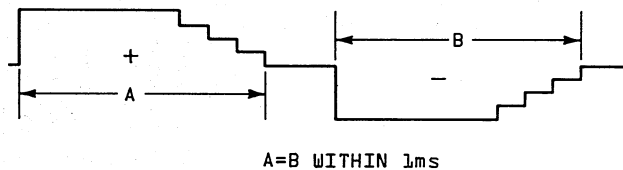
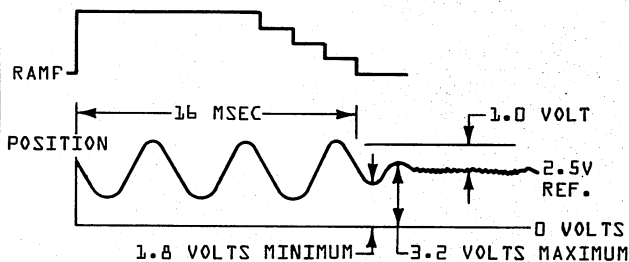
CHECK/Condition

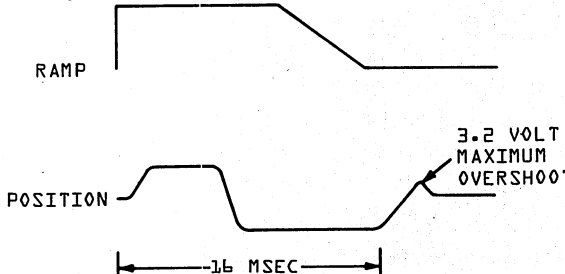
1. Remove ground strap and lift off bonnet.
2. Remove paper bail and protective plate from rear of card rack.
3. Using a dual trace oscilloscope sync (+) and monitor TP26 on 7 PC3 (Ramp). Ground oscilloscope at TP30.
4. With second channel monitor 7PC3 (TP17 new) (TP18 old) (see Table 5-4 for board numbers) position signal.
5. Initiate a print operation.

CHECK: Position signal must damp out within one volt of the 2.5 volt reference level within 16ms. The overshoot must be greater than 1.8 volts during the negative swing and less than 3.2 volts during the positive swing. At 25 msec, the oscillations must be less than .3 volts peak to peak.

Action

Perform the Horizontal Servo System Set-up procedure in the Corrective Maintenance Section.



2.2.4 HORIZONTAL SERVO ADJUSTMENT (con't)	
<p>6. Change the sync to (-) while monitoring the same points to check the minus ramp. Plus and minus ramps must be equal within 1ms.</p> <p>CHECK: The minus ramp position signal is the same as for (+) sync except positive portion of the Position signal will occur first.</p>	<p>Perform the Horizontal Servo System Set-up procedure in the Corrective Maintenance section.</p>
2.2.5 VERTICAL SERVO ADJUSTMENT	
<p>CHECK/Condition</p> <ol style="list-style-type: none"> 1. Remove ground strap and lift off bonnet. 2. Remove the paper bail and protective panel from the rear of the card rack. 3. Using a dual trace oscilloscope sync (+) and monitor 7PC3(TP16 new) (TP17 old) (see Table 5-4 for board numbers) Ramp signal. 4. Connect the second channel to 7PC3 (TP12 new) (TP14 old) (see Table 5-4 for board numbers) position signal. 5. Initiate continuous single line advances in 6 LPI mode. <p>CHECK: Position signal starts to swing positive a maximum .16 msec after leading edge of ramp. Maximum positive overshoot is 3.2 volts. At 25msec, the oscillations must be less than 0.3 volts peak to peak.</p> 	<p>Action</p> <p>If signal is not correct, perform Vertical Servo System Set-up procedure in Corrective Maintenance section.</p>
2.3 PRINTER LUBRICATION	
<p>CHECK/Conditions</p> <ol style="list-style-type: none"> 1. Printer powered off. 2. Print gate open. 	<p>Action</p> <p>Apply G.E. silicone grease to gate pivot pin and latch pin.</p>

CORRECTIVE MAINTENANCE

<u>Procedure</u>	<u>Page</u>
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Residual Strip Positioning (see Parts Replacement)	

7PC3 CONDENSED REPLACEMENT PROCEDURE

START, POWER OFF, NEW 7PC3 INSTALLED, USE TABLE 5-4 TO CONVERT REFERENCE NUMBERS TO TEST POINTS.

	DESCRIPTION
1. Remove the two wires at 2PC2-TB1 pins 1 and 3, secure wires. Both wires are black, if not laced to identify position tag one wires location. Open printers gate.	Disconnects Horizontal and Vertical H-Switches.
2. Set +5 volts between 4.99 and 5.01 volts at the bottom of R-162, top outer edge of 7PC3 board. (1K Ohm). Adjust top pot on power supply 2PC1.	Refer to Installation and Checkout section of the manual.
3. Adjust P-5 on 7PC3 for 2.5 + .02 volts at Ref. M, Table 5-4.	Horizontal and Vertical Reference Voltage.
4. Adjust P-2 on 7PC3 for 30.00 ± .01 volts at Ref. K, Table 5-4.	Reference 30 volts.
5. Adjust P-8 on 7PC3 for -8.33 volts at chip L6 pin 7.	Horizontal and Vertical offset voltage.
6. Adjust P-9 on 7PC3 for 1.10 volts at chip L5 pin 10.	Horizontal Code Disk bias adjustment.
7. Adjust P-3 on 7PC3 for 1.15 volts at chip L4 pin 10.	Vertical Code Disk bias adjustment.
8. Check the outputs of the readers on 7PC3 at Ref. Q, U, and L from Table 5-4 for a voltage of (more than) 4.0 volts but (less than) 1.0 volts when moving the hammer bar or tractors.	Ref. L Vertical reader Ref. Q Horizontal Position. Ref. U Horizontal Home.
9. Ground Ref. H on 7PC3 and adjust P-6 on 7PC3 for 7.0 + .05 volts at Ref. P, Table 5-4, on 7PC3. If the seven volts cannot be obtained perform step 10 first and then repeat this step.	Vertical Velocity Control Adjustment.
10. Remove the ground from Ref. H on 7PC3 and vertically advance the tractors manually to make sure the advance is cleared. Adjust P-4 on 7PC3 for 0.0 ± .01 volts at Ref. O, Table 5-4.	Vertical Ramp Offset adjustment.
11. On board 7PC3 ground Ref. E, Table 5-4. Adjust P-11 on 7PC3 for -4.00 volts at TP-26.	Horizontal Velocity Control adjustment.
12. Remove the ground at 7PC3 at Ref. E, Table 5-4. Move hammer bar until TP-26 goes to zero volts.	Clears horizontal drive
13. Power the printer off and connect the two wires disconnected at the start from 2PC2-TB1 pins 1 and 3.	Enables Horizontal and Vertical H-Switches.
14. Close the printers gate and power the printer up.	
15. With the band motor running adjust P-9 on 7PC3 for 2.5 ± .05 volts at Ref Q, Table 5-4	Horizontal Code Disk bias adjustment
16. Depress Form Feed switch or optional Page Eject, or Top Of form.	
17. Readjust P-3 on 7PC3 for 2.5 ± .05 volts at Ref. L, Table 5-4.	Vertical Code Disk bias.
18. With 15 lb. paper, advance the forms, Power the printer down. With the forms out of the tractors pull the forms through the throat using a spring scale. Adjust cable nut if pull is not less than one pound (454 g). Repeat step to check.	Paper Clamp Tension.
19. Power on, and in the 6 LPI mode perform a form to form (Form Feed/Page Eject) advance while adjusting P-6 on 7PC3 for 8.6 ms at Ref, L, Table 5-4.	Slew Rate, trigger plus adjust for start of plus cycle to next start of plus cycle
20. Cycle the printer, refer to quiet testing at the front of Maintenance.	
21. Sync a scope positive at 7PC3 Ref. P, Table 5-4, and adjust P-7 on 7PC3 for 16ms at Ref. L, Table 5-4, settle should be ± 1 volt.	Refer to vertical waveforms in Corrective Maintenance.
22. Sync a scope positive at TP-26 on 7PC3 and adjust P-11 on 7PC3 for 15 ± 1 ms at Ref. Q, Table 5-4.	Positive ramp signal.

(CONTINUED)

- | | | DESCRIPTION |
|-----|---|--|
| 23. | Now sync negative and check for the opposite 15 ± 1 ms. Adjust P-5 on 7PC3 as required. | Negative ramp signal. |
| 24. | Sync and check both positive and negative at TP-26 on 7PC3 and adjust P-10 for ± 1 volt settle at 16 ms at Ref. Q, Table 5-4. | Refer to horizontal waveforms in Corrective Maintenance. |
| 25. | Sync a scope on 7PC2, TP-18 negative. Adjust R-55 on 7PC2 for 54.6-60ms at 7PC2 chip F3 pin 8. | Paper Rate Limiter Adjustment. |
| 26. | Print an all one character pattern and adjust P-1 on 7PC3 for the correct character. Shifts by character while adjusting. | Use Test Print if available. |
| 27. | Sync negative at Ref. A, Table 5-4, on 7PC3 and adjust P-1 on 7PC3 so the positive switch point of TP-1 is between two pulses at Ref. B, Table 5-4. | Character adjustment. |

TABLE 5-4. TEST POINTS 7PC3 BOARDS

REF.	LOGIC SET 95400401		LOGIC SET 95400400		LOGIC SHEET REFERENCE	DESCRIPTION
	PRESENT BOARDS 44674254 44674255	EARLY BOARDS 95419502 95419503 95419504 95419505 95419506				
A	TP-1	B6-12	302			Home Pulse Delay
B	2	TP-8	302			Character Trigger Pulse
C	3	TP-3	303			Subscan Pulse
D	4	TP-9	301			Paper Motion Verification Signal
E	5	E4-1	310			Horizontal Advance
F	6	TP-10	310			Home Enable
G	7	L4-8	307			Vertical Code Disc Bias
H	8	G2-6	307			Vertical Advance
I	9	TP-11	305			Motors On
J	10	L6-3	307			Vertical Motion Reader Signal
K	11	TP-12	302			30 volt Reference
L	12	TP-14	307/308			Vertical Reader Output
M	13	TP-15	309			Reference 2.5 volts
N	14	M3-10	307			Vertical Strobe
O	15	L4-1	307			Vertical Ramp Offset Voltage
P	16	TP-17	308			Vertical Ramp
Q	17	TP-18	309			Horizontal Position Signal Output
R	18	L6-10	309			Horizontal Position Signal
S	19	TP-20	311			Horizontal Command
T	20	TP-21	308			Vertical Command
U	21	TP-22	309			Home Signal
V	22	R6/R7 Junct.	301			Home Pulse Signal
W	23	TP-24	308			Vertical Tach Output
X	24	L3-8	308			Oscillator 10 KC
Y	25	R4/R5 Junct.	301			Character Pulse Signal
Z	26	TP-26	311			Horizontal Ramp Generator
AA	27	TP-27	311			Horizontal Current Sense
AB	28	TP-28	308			Vertical Current Sense
AC	29	TP-25	311			Horizontal Command
AD	TP-30	TP-30	301			Reference Ground
AE	A3-2	TP-2	302			Home Pulse
AF	C5-2	TP-4	305			Band Up
AG	C5-6	TP-5	305			Band Motor Time Out F/F
AH	G4-5	TP-6	302			Voltage Compensation Delay F/F
AI	E4-11	TP-7	310			Horizontal Ramp Step
AJ	G5-2	TP-13	307			Vertical Position Feedback
AK	L3-14	TP-16	307			Position Feedback
AL	J4-10	TP-19	310			Compressed Pitch
AM	R2/R20 Junct.	TP-23	308			Vertical Tach
AN	RN7-J3/R50	TP-29	311			Horizontal Tach

BOARD REPLACEMENT CHECKS AND ADJUSTMENTS

WHEN REPLACING THE BELOW BOARDS
MAKE THE INDICATED CHECKS IN NUMERICAL
SEQUENCE STARTING WITH ONE.

	CHECK + 5 VOLTS	CHECK + 12 VOLTS	CHECK + 36 VOLTS	CHECK BOARD DIP SWITCH POSITIONS 1	CHECK BOARD JUMPERS INSTALLED 1	CHECK FOR CORRECT JUMPER BLOCK - LOWER RIGHT 3	CHECK G-6 AND H-6 PROM/DIL LOCATIONS 2	CHECK PAPER RATE LIMITOR ADJUSTMENT	CHECK FLIGHT TIME ADJUSTMENT	CHECK +30V VOLTAGE COMPENSATION ADJUSTMENT	CHECK CHARACTER AND HOME PULSE SET-UP	CHECK HORIZONTAL SERVO SYSTEM SET-UP	CHECK VERTICAL SERVO SYSTEM SET-UP	CHECK FOR CORRECT ROM'S INSTALLED
2PC1 POWER SUPPLY	1	2	3											
2PC2 SERVO AMP	1	2	3									4	5	
5PC1-2 HAMMER DRIVER	2		3			1			3					
*, ** 7PC1 INPUT PRINT	1			2	3		4							5
** 7PC2 OSC. HORIZ. & VERT. MOT	1				2			3						
7PC3 PRINT HEAD ELECT	USE PRECEDING PROCEDURE													
** 7PC4 INTERFACE BOARD	1			2	3									
** 7PC5 SPECIAL	1			2	3									
** 7PC6 EVFU	1	2		3	4									5

*NOTE: Refer to Parts Identification Manual under Print Bands. Special bands may require PROM's to be installed on 7PC1.

**NOTE: Board part number also reflects a jumper configuration on the board. Refer to the Parts Identification Manual using the printer's TLA number on the identification tag to locate the Assembly Common Controller Complete for 7PC1/2, or the Interface Complete for 7PC4 or 7PC5, which will identify the board part numbers. The board assembly in the Parts Manual will identify the jumper configuration for a board part number. When replacing a board in location 7PC6, refer to the Special Option Manual for the board assembly. Some 7PC5 boards are documented in Interface Adapter Manuals.

- 1st- Locate TLA No. in parts manual
- 2nd- Locate Assy Common Cont Compl on the TLA list.
- 3rd- Locate the printer board numbers on the Assy Common Cont Compl list.
- 4th- Locate board assy and verify jumpers installed.

- 1 Check drawing or Table of board assembly in Parts Manual.
- 2 Check print bands in Parts Manual.
- 3 Check Fault Isolation Section.
- 4 A special Band may require a change of jumpers J13 and J14.

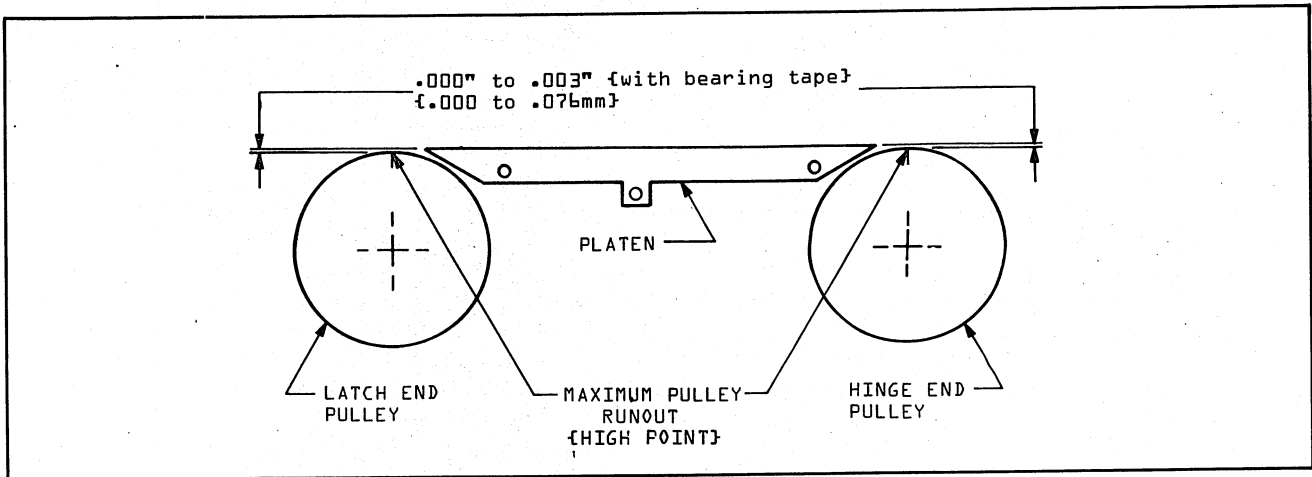


FIGURE 5-1. PLATEN TO DRIVE PULLEY ALIGNMENT

PLATEN TO DRIVE PULLEY ALIGNMENT

This procedure should only need to be performed if the drive pulleys are replaced or if the platen is moved. This adjustment affects the tracking of the band across the platen surface which may affect print quality. Always check for bare spots on the wear strip and replace the wear strip if required before aligning platen. Refer to Parts Replacement for Platen Wear Strip procedure.

Tools Required

- Straight Edge (Thicker than 0.070" or 1.6mm)
- Feeler Gauges (.001" and .003") (.025, .076mm)
- 3/8" Open End Wrench or Socket
- Torque Wrench

Procedure

1. Printer powered off.
2. Remove the upper gate protective cover.
3. Remove the ribbon and the print band.
4. Open the print gate and swing open the ribbon shield.
5. Loosen the three platen mounting nuts.
6. Place a straight edge along the crown of the platen so that it extends over both pulleys. This can be done to one end of the platen at a time if a long enough straight edge 17 inches long and .070" thick (430 x 1.6mm) is not available. Set pulley high points as shown in Figure 5-1.
7. Place a .001" (.025mm) between the pulley and the straight edge.
8. Move the platen so that it is .001 (.025mm) the entire length of the straight edge. Snug down the nut at the end where the feeler gauge was inserted.
9. Perform steps 6, 7, and 8 at the opposite end of the platen.
10. Tighten all three platen mounting nuts to 25/30 in. lbs. (28.8-34.6 cm/kg).
11. While again holding the straight edge along the crown of the platen, rotate each pulley 360° ensuring that the pulleys do not make contact at any point with the straight edge. If contact is made reperform steps 5 through 11.

12. With the straight edge again resting along the crown of the platen, attempt to insert the .003" (.076mm) feeler gauge between each pulley and the straight edge. The feeler gauge should fit very snugly or not at all. If it does fit easily, reperform steps 5 through 12.

UPPER BAND GUIDE ALIGNMENT

It is necessary to perform this procedure if the band guide is replaced or inadvertently moved. It must also be performed if the platen is replaced. Always check the condition of the wear strip before performing this adjustment and replace the upper band guide if necessary. Refer to the Upper Band Guide Replacement Procedure.

Tools Required

- Straight Edge
- Feeler Gauges (0.010", 0.012") (0.254mm, 0.305)
- 1/4" Open End Wrench or Socket
- Torque Wrench

Procedure

1. Printer powered off
2. Pull up on the two locking assemblies and remove the gate protective cover.

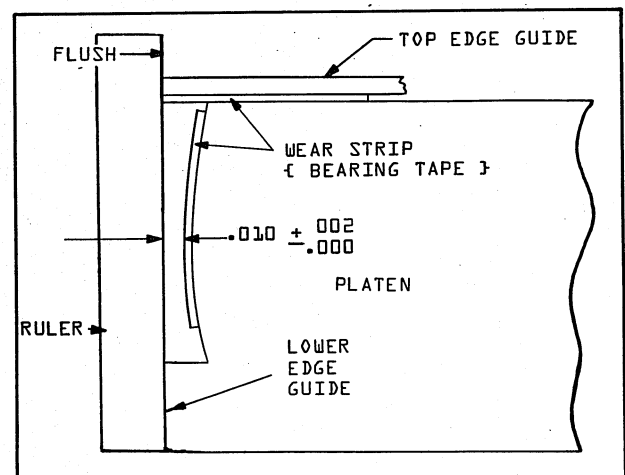


FIGURE 5-2. TOP EDGE GUIDE ALIGNMENT

3. Remove the ribbon.
4. Open the print gate.
5. Remove the Print Band.
6. Place a straight edge pocket ruler vertically against the front of the front of the platen. The bottom of the ruler should be against the bottom edge guide which is the lower part of the platen. The top of the ruler should rest against the front edge of the top edge guide. Make the following check at the ends and middle of the platen.
7. Insert first a 0.010" feeler gauge (0.254mm) and then a 0.012" (0.305mm) feeler gauge between the ruler and the platen wear strip which the band rides against.
8. The .010" (.254mm) feeler gauge should fit snugly between the ruler and the bearing wear tape.
9. The .012 (.305mm) feeler gauge should not fit or fit very snugly between the ruler and the bearing wear tape.
10. If either of the dimensions in steps 8 and 9 are not met, reperform steps 11 through 12 until they do.
11. If the 0.010" (0.254mm) feeler gauge does not fit, then loosen the top edge guide and move it towards the ruler until the feeler gauge fits and is snug. Tighten the top edge guide in place.
12. If a 0.012" (0.305mm) feeler gauge fits easily, then loosen the top edge guide and insert a 0.010" (0.254mm) feeler gauge in place of the 0.012". Move the top edge guide back until the 0.010" (0.254mm) feeler gauge is snug and tighten the guide.
13. Check the top edge guide in three places, both ends and middle. All three positions should be equal.
14. Perform Band Pulley Tracking Procedure.

BAND TENSION ADJUSTMENT

This adjustment is necessary if any of the tension

assembly components are replaced. This adjustment may also be necessary if there is evidence of the band slipping (horizontal misregistration, incorrect character print out) or the band is difficult to remove even with tension removed.

Tools Required

Spring scale
 Ruler
 1/2" Open End Wrench or Socket
 1/4" Open End Wrench of Socket

Procedure

1. Power the printer off.
2. Remove the print band.
3. Remove the 4 hex head screws that hold the tension assembly to the gate and remove the two hex head screws that hold the assembly to the pulley housing
4. Lift the tension assembly out of the printer.
5. Using a ruler measure the compression of the tension spring.
6. Turn the tension adjustment screw to obtain a spring compression of 1 inch (25.4mm).
7. Reinstall the tension assembly. Tighten the two screws that hold the plate to the pulley housing, but do not tighten the four screws that hold the assembly to the gate.
8. Install a print band.
9. Place the band tension level in a 90° position. (See Figure 5-3).
10. Using a spring scale place a force of 5 ± 2 pounds (4.148-9.678 kg/cm) on the inside of the tension assembly. (See Figure 5-3).
11. While maintaining the force applied in step 10, tighten the four mounting screws. The adjustment is complete.

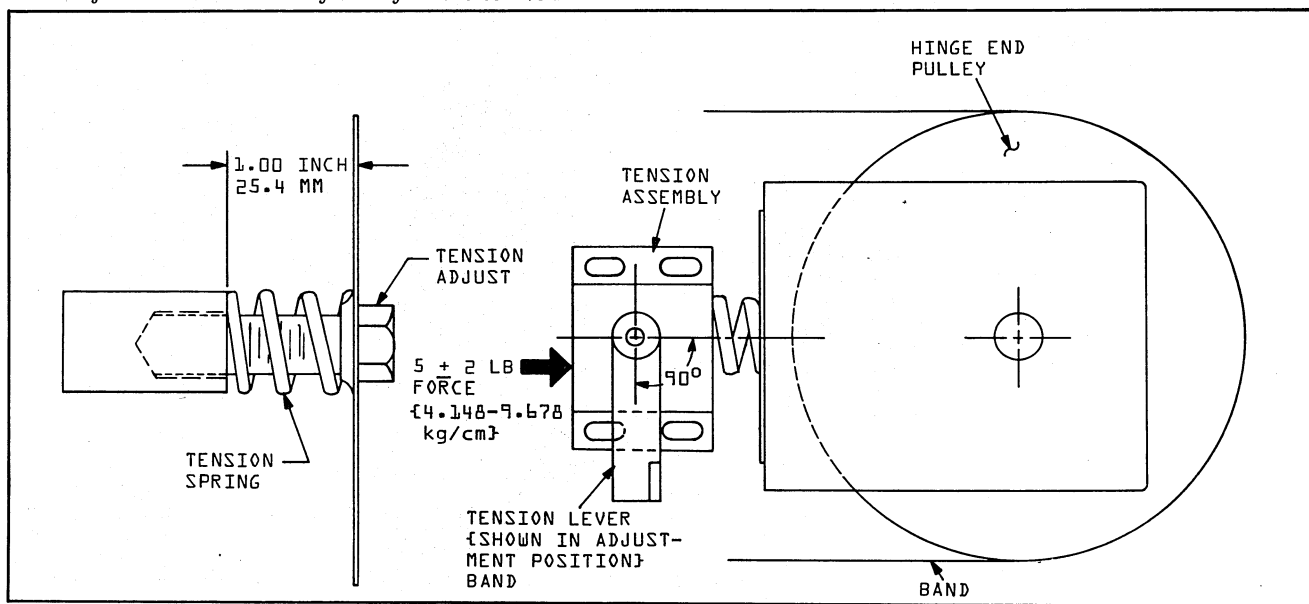


FIGURE 5-3. BAND TENSION ASSEMBLY ADJUSTMENTS

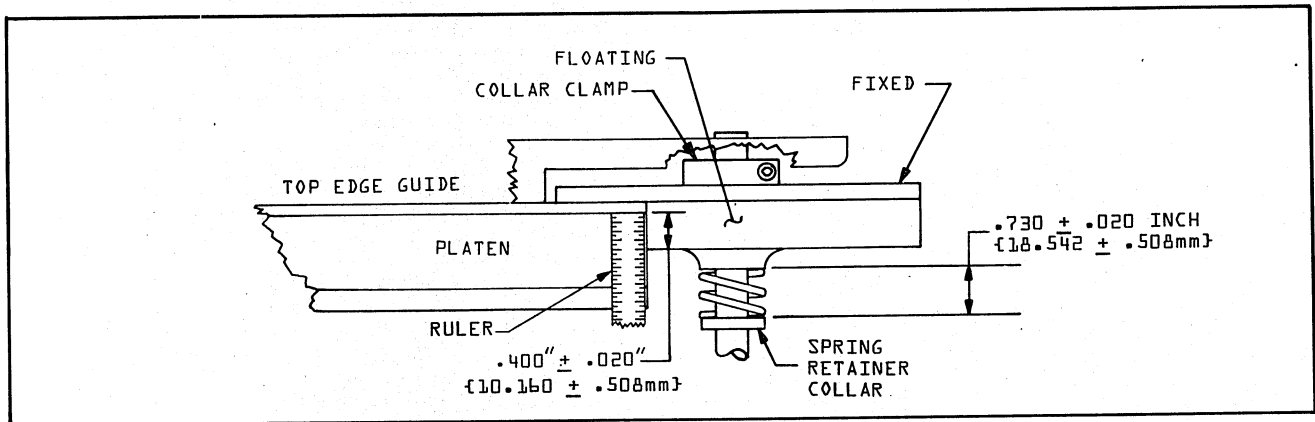


FIGURE 5-4. LATCH END PULLEY ADJUSTMENT

BAND PULLEYS HEIGHT ADJUSTMENT

This procedure needs to be performed anytime one of the pulleys is replaced. The adjustment may affect band vertical tracking which may affect the vertical registration of the print characters.

Tools Required

Allen Set
Ruler
Torque Wrench

Procedure Hinge End Pulley

1. Printer powered off.
2. Remove the upper gate protective cover.
3. Open the print gate.
4. Remove the ribbon and the print band.
5. Hold the lower, floating portion of the idler pulley up against the upper, fixed portion of the pulley.
6. Place the ruler against the lower edge of the top edge guide and measure the distance to the bottom edge of the floating pulley.
7. If this distance is not between .38 to .42 inch (9.7 to 10.7mm), loosen the collar clamp that holds the pulley to the shaft and reposition the pulley assembly up or down as required.
8. Tighten the collar clamp to 30-34 in. lbs. (34.6-39 cm/kg) and recheck the dimension in step 7.
9. Perform Band Pulley Tracking procedure.

Procedure Latch End Pulley

1. Printer powered off.
2. Remove the upper gate protective cover.
3. Open the print gate.
4. Remove the ribbon and the print band.
5. Hold the lower, floating portion of the drive pulley up against the upper, fixed portion of the pulley.
6. Place the ruler against the bottom edge of the top edge guide and measure the distance to the bottom edge of the pulley surface.
7. If this distance is not between .38 to .42 inch (9.7 to 10.7 mm) loosen the collar clamp and reposition the pulley assembly up or down as required.
8. Tighten the collar clamp and recheck the dimension in step 7.
9. Using the ruler, measure the compression of the spring beneath the latch end drive pulley. With the latch end pulley raised, measure from the top of the collar to the bottom of the hub.

NOTE

THIS SPRING MEASUREMENT AND ADJUSTMENT APPLIES ONLY TO THE LATCH END PULLEY.

10. If the compression is not between .71 to .75 inch (17 to 19 mm), loosen the spring retaining collar and move it up or down as required.
11. Tighten the spring retaining collar and recheck the dimension in step 10.
12. Perform Band Pulley Tracking procedures.

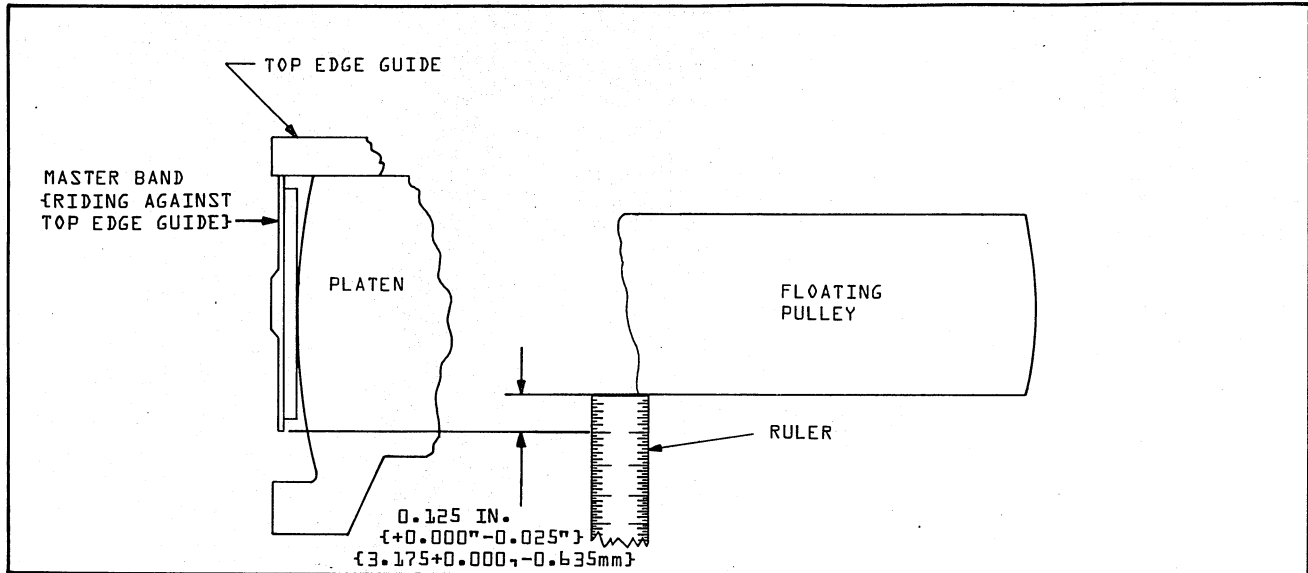


FIGURE 5-5. BAND PULLEY BEARING ADJUSTMENTS

BAND PULLEY TRACKING ADJUSTMENT

This procedure should be performed anytime a band pulley or pulley bearing is replaced. This adjustment affects the tracking of the print band. If this adjustment is performed without a Master Band, band interchangeability will be lost.

Tools Required

Ruler
Flight Time Tool
5/16" Open End Wrench or Socket
Master Band

Procedure

1. Printer powered off.
- 1a. Remove the upper gate protective cover.
2. Open the print gate.
3. Remove the ribbon and install a Master Band.
4. Perform the Character and Home Pulse Set-up procedures in this section to ensure that the band does not hit the reluctance pick-ups.
5. Rotate the band until it is in contact with the top edge guide the entire length of the platen.
6. Power the printer on and run the Master Band for 30 sec. to seat the band. Remove printer power.
7. Place the ruler behind the band in the area where the band is in contact with the pulley surface.
8. Move the ruler up until it contacts the bottom edge of the floating pulley surface. Note the distance from the bottom edge of the pulley to the bottom edge of the band.
9. If the distance noted is not .125 +.000-.025 inch (3.175 + .000-.635mm), the eccentric mounted pulley bearing must be adjusted.

10. Loosen the two bolts mounting the bearing plate assembly to the print gate (see Figure 5-6).
11. Place the flight time tool in the adjusting slot and rotate it to change the angle of the bearing.
12. Rotate the band one full revolution and then recheck the distance per steps 5 through 7.
13. When the proper dimension is achieved tighten the mounting bolts and perform this procedure on the other pulley.
14. Perform the Character and Home Pulse Set-Up procedure, checking the reluctance pick-up clearance.

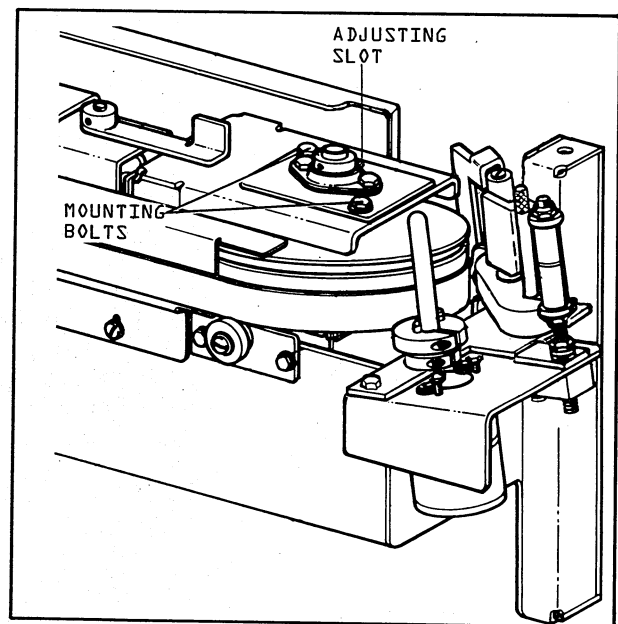


FIGURE 5-6. TRACKING ADJUSTMENTS LOCATOR

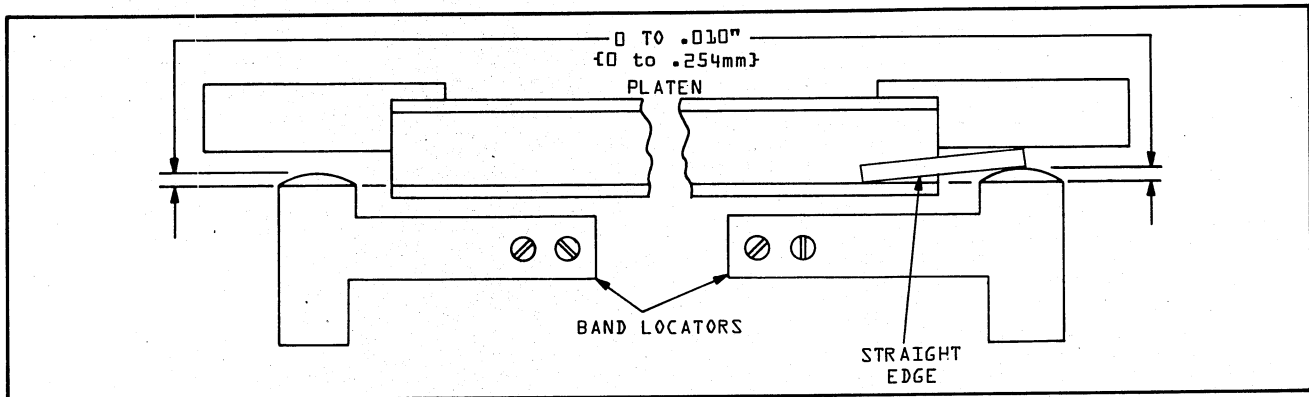


FIGURE 5-7. PRINT BAND LOCATORS ADJUSTMENT

BAND LOCATORS ADJUSTMENT

The band locators are installed to facilitate band loading. If they are installed too low, the band may catch on the lower edge guide during installation possibly causing damage to the band. The band may also be damaged if the locators are installed too high, causing the band to catch on the top edge guide.

Tools Required

Straight Edge
 .010" Feeler Gauge (.254mm)
 Flat Blade Screwdriver

Procedure

1. Printer powered off.
2. Remove the upper gate protective cover.
3. Open the print gate and swing out the ribbon shield.
4. Remove the print band and the ribbon.
5. Place the straight edge on the lower edge guide.
6. Slide the straight edge out until the end is over the crest of the locator.
7. The straight edge should contact the locator. If it does not, the locator is too low. Loosen the two screws and raise the locator.
8. If the straight edge contacts the locator, allow the locator to rise to its normal position by holding the straight loosely against the platen.
9. Attempt to place the .010" (.254mm) feeler gauge into the gap between the straight edge and the lower edge guide created in step 8.
10. The feeler gauge should not fit. If it does, loosen the two screws and lower the locator.

INNER PAPER GUIDE ADJUSTMENT

This adjustment must be performed anytime the paper guide is removed. If the paper guide is too far out, it will interfere with forms motion. If the paper guide is too far in, it will interfere with the paper clamp assembly.

Tools Required

Feeler Gauges (.040", .060", & .090")
 (1.0, 1.5, and 2.3mm)
 5/16" Open End Wrench or Socket
 1/4" Open End Wrench or Socket

Procedure

1. Printer powered off.
2. Print gate closed and latched.
3. Attempt to insert a .040" (1.0mm) feeler gauge between the top of the inner paper guide and the outer paper guide. Slide the gauge along the entire length of the guides.
4. If the feeler gauge does not fit easily into the gap, skip to step 7. If it fits, continue with step 5.
5. Attempt to insert a .090" (2.3mm) feeler gauge between the bottom of the paper guide and the bottom of the outer paper guide at approximately column locations 20 and 120.
6. If the feeler gauge does not fit, the alignment of the top portion of the paper guide is correct, skip to step 13. If it fits, continue with step 7.
7. Loosen the mounting bracket that holds the paper guide to the side plate on the latch end and the screw that holds the paper guide to the mounting bracket on the hinge end.
8. Place a .060" (1.5mm) feeler gauge between the ribbon shield and the paper guide at column location 120.

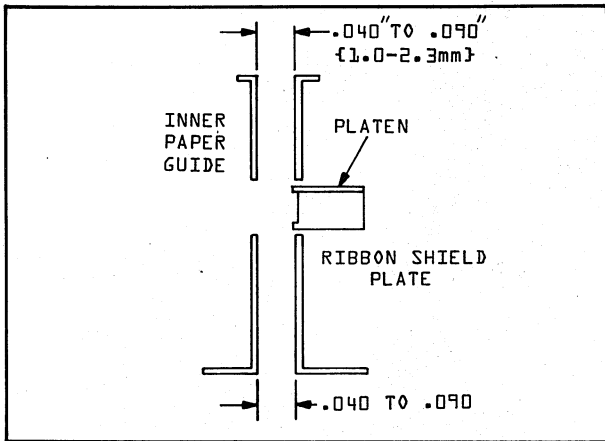


FIGURE 5-8. INNER PAPER GUIDE SET-UP

9. Hold the hinge end of the inner paper guide snugly against the feeler gauge and tighten the hinge end screw.
10. Move the feeler gauge to column location 20.
11. Hold the latch end of the inner paper guide snugly against the feeler gauge and tighten the latch end mounting bracket.
12. Recheck steps 3 and 5.
13. Attempt to insert a $.040''$ (1.0mm) feeler gauge between the bottom of the inner paper guide and the bottom of the outer paper guide. Slide the gauge along the entire length of the guides.
14. If the feeler gauge does not fit easily into the gap, skip to step 17. If it fits continue with step 15.
15. Attempt to insert a $.090''$ (2.3mm) feeler gauge between the bottom of the inner paper guide and the bottom of the outer paper guide at approximately column locations 20 & 120.

16. If the feeler gauge does not fit, the alignment of the bottom portion of the paper guide is correct. If it fits, continue with step 17.
17. Loosen the three mounting bolts that hold the inner paper guide to the base plate.
18. Place a $.060''$ (2.1mm) feeler gauge between the inner and outer paper guide at column location 120.
19. Hold the hinge end of the inner paper guide snugly against the feeler gauge and tighten the hinge end bolt.
20. Move the feeler gauge to column location 20.
21. Hold the latch end of the inner paper guide snugly against the feeler gauge and tighten the latch end bolt.
22. Tighten the center bolt and then recheck steps 13 and 15.

PAPER CLAMP STOP ADJUSTMENT

The clamp stops set the position of the outer paper guide relative to the paper clamps. If they are misadjusted, it can cause paper tearing or poor vertical registration during printing. If they are misaligned to each other, a ringing sound will occur each time the clamp assembly is activated. This is caused by one of the paper clamps hitting an area of the outer paper guide that is not supported by one of the clamp stops.

Tools Required

Straight Edge
 Allen Set
 Feeler Gauges ($.060''$ & $.070''$) (1.5 & 1.8mm)

Procedure

1. Printer powered off.
2. Remove the print gate protective cover.
3. Open the print gate.

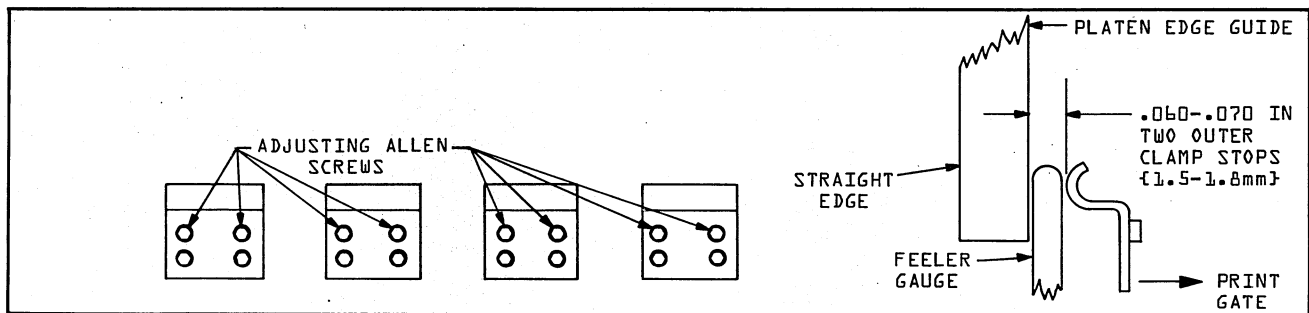


FIGURE 5-9. PAPER CLAMP STOP ADJUSTMENTS

4. Remove the ribbon and the print band.
5. Place the straight edge against the lower edge guide, perpendicular to the guide, directly over the hinge end clamp stop.
6. Attempt to insert a .060" (1.5mm) feeler gauge between the straight edge and the surface of the clamp stop.
7. The feeler gauge should fit easily. If it does not turn both clamp stop allen screws counter-clockwise until the feeler gauge fits.
8. Attempt to insert an .070 (1.8mm) feeler gauge between the straight edge and the surface of the clamp stop.
9. The feeler gauge should fit snugly or not at all. If it fits easily, turn both clamp stop allen screws clockwise until the feeler gauge does not fit.
10. If the clamp stop was moved, recheck step 6.
11. Perform steps 5 through 10 for the latch end clamp stop.
12. Adjust the two center clamp stops so that they are both behind the plane of the two outer clamps.
13. Close the ribbon shield.
14. Adjust the two center clamp stops by turning the allen screws clockwise until the clamp stops contact the ribbon shield. This can be determined by tapping the ribbon shield lightly in the area of the clamp stop surface. The metallic sound will deaden when the clamp stop makes contact.
15. Check that the center clamp stops were not moved too far forward, lifting the ribbon shield off the outer clamps. Back off the center clamp stops if this occurs.

OUTER PAPER GUIDE ADJUSTMENT

The outer paper guide can affect paper motion and print quality. If it is too far out from the platen, it can cause paper to tear as it passes through the print station. If the guide is too tight against the platen, it can cause binding in the ribbon system or ribbon smudging on the forms. If the outer guide is too high or too low, the mylar shield may interfere with the hammers striking the band. This will cause a reduction in mylar life expectancy and a degradation in print quality.

Tools Required

- Feeler Gauge (.005 & .020 in) (0.127 & 0.51mm)
- Flat Blade Screwdriver
- Ruler

Procedure

Before beginning, refer to Section 3 and review the Ribbon Mylar Shield Replacement procedure and make sure the mylar shield is correctly installed. Also check that the paper clamp stops have been properly adjusted. Refer to the paper clamp stop adjustment in this section.

1. Printer powered off.
2. Open the print gate and remove the top gate protective cover.
3. Remove the ribbon.
4. Make sure the print band is riding against the top edge guide.
5. Remove the outer paper guide opening bracket by removing the two mounting screws on the right side of the printhead.
6. Hold the mylar shield against the band at one end of the slot.
7. Using a ruler, check that the distance between the slot's top edge and the top of the band character is 0.040 to 0.060 in. (1.0mm & 1.5mm). Refer to Figure 5-10.
8. Repeat steps 6 & 7 for the other end of the slot in the mylar shield.
9. If this dimension is not correct, slightly loosen the four mounting bracket screws and move the outer paper guide assembly up or down as needed.
10. Tighten the mounting bracket screws.
11. Remove the print band. This check can be performed with or without the mylar installed. Position a ruler vertically over the mylar if installed in the area of one end of the platen, up to the top of the outer paper guide. Press the ruler against the platen and top edge guide (with mylar in between, if installed). Check the clearance at the top of the ruler to the top of the outer paper guide. The guide can be flush to 0.015 inch back from the ruler. Insert feeler gauges to verify a clearance of 0.000 to 0.015 inch (0.00-0.38mm).
12. If the distance is not correct, loosen the two hinge mounting screws on each end of the outer paper guide and move the plate in or out as needed. (The screws on the hinge end of the gate can be reached more easily by closing the gate).
13. Tighten the hinge mounting screws.
14. Install the outer paper guide opening bracket.

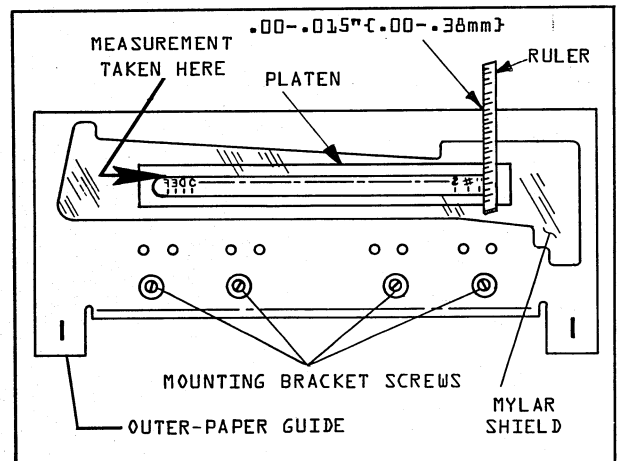


FIGURE 5-10. OUTER-PAPER GUIDE

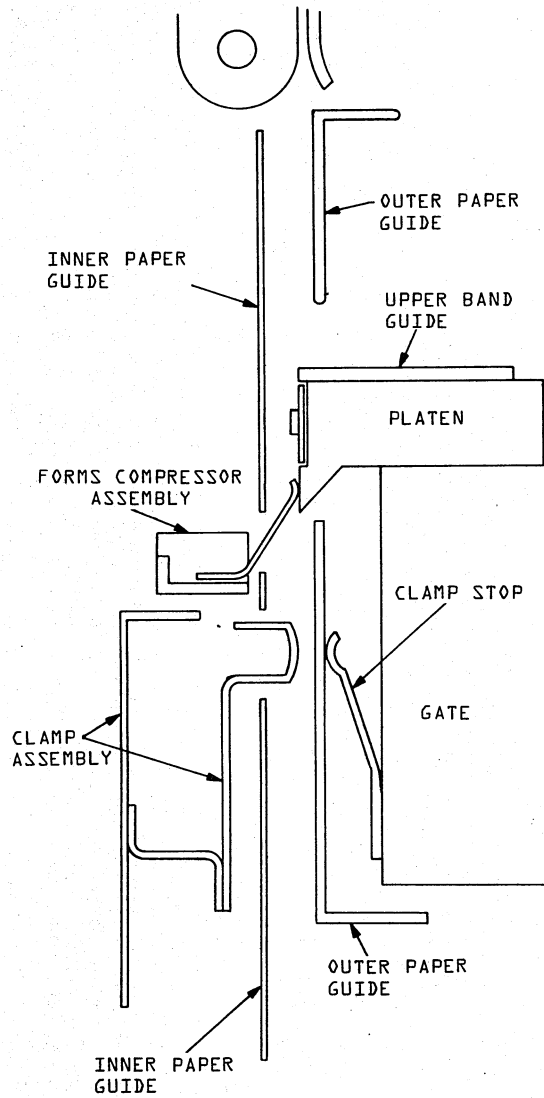


FIGURE 5-11. PAPER THROAT COMPONENT LOCATOR

PAPER CLAMP PULLEY ALIGNMENT

This adjustment must be performed anytime one of the clamp pulleys is replaced. The adjustment of clamps will affect the performance of the clamp system. Also, if the clamp pulleys are too far out, they may interfere with the inner paper guide.

Tools Required

Ruler
 Straight Edge
 Allen Set
 11/32" Open End Wrench
 1/4" Open End Wrench or Socket

Procedure

1. Power the printer off.
2. Open the print gate.
3. Remove the inner paper guide.
4. Remove the hammer modules directly above the clamp pulleys.
5. Remove the two screws that secure the forms compressor mounting brackets on both ends and remove the compressor bar assembly.
6. Place the straight edge against the surface of the module mounting bar so that one end of the straight edge contacts the top of the pulley to be adjusted.
7. Using the ruler, measure from the inside edge of the straight edge to the outside edge of the pulley.
8. If the distance measured is not .180 to .220 inch (4.6 to 5.6 mm), loosen the two nuts beneath the pulley and move the pulley in or out until the proper dimension is achieved.
9. Reinstall the hammer modules and the forms compressor bar. Be sure to perform the Forms Compressor Adjustment procedure.
10. Reinstall the inner paper guide. Perform the Inner Paper Guide Adjustment procedure.

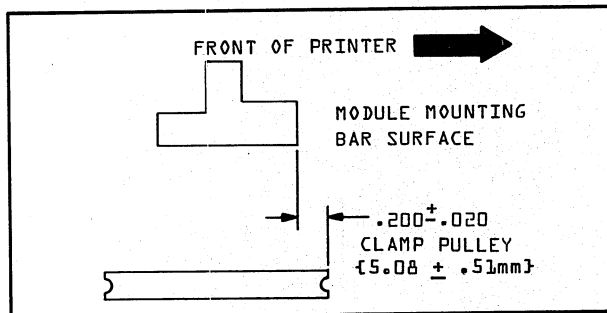


FIGURE 5-12. PAPER CLAMP PULLEY SET-UP

FORMS COMPRESSOR ADJUSTMENT

The forms compressors will need to be adjusted anytime the assembly is removed from the printer. It is adjustable in both the horizontal and the vertical plane. If the compressors are too high, they may interfere with the print hammers. If they are too low, the compressors may hit below the platen causing forms to tear. If the compressors are too far back from the platen, they will not hold the paper close enough to the print font causing degradation of the print quality. If the compressors are too close to the platen they may interfere with paper motion and hammer firing.

Tools Required

Ruler
 Straight Edge
 Allen Set
 1/4" Open End wrench or socket.

Procedure

1. Printer powered off.
2. Open the print gate and remove the inner paper guide.
3. Measure the distance from the top of the module mounting bar to top surface of the compressor mounting plate.
4. If this distance is not 2.40 to 2.44 inches (61 to 62 mm), loosen the two screws at each end that hold the mounting brackets and move the compressor mounting plate up or down as required.
5. Remove the hammer modules for columns 12, 56, and 114.
6. Place a straight edge against the front surface of the module mounting bar so that the end of the straight edge just touches the tip of the compressor.

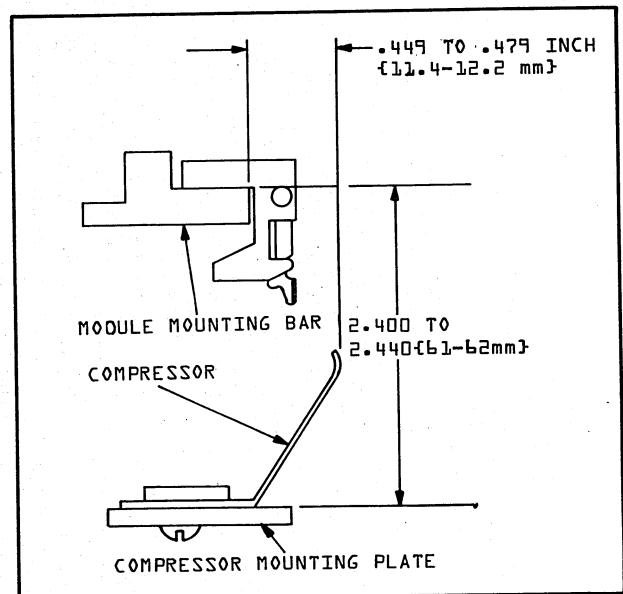


FIGURE 5-13. FORMS COMPRESSOR ALIGNMENT

7. Measure the distance from the inside edge of the straight edge to outside surface of the compressor. Perform steps 6 and 7 in column locations 12, 56, and 114.
8. If the distance measure in all three locations is not between .450 to .480 inch (11.3 to 12.2 mm), loosen the four screws holding the compressors to the mounting plate.
9. Move the compressors in or out until the proper dimensions are achieved.
10. Reinstall the inner paper guide and perform the Inner Paper Guide Adjustment procedure.

BAND MOTOR BELT TENSION ADJUSTMENT

This adjustment must be performed anytime the belt is removed or the band drive motor plate is moved. It should also be checked anytime the band timing seems unstable or the belt shows excessive wear.

Tools Required

Spring Scale
 Straight Edge
 Ruler
 1/4" Open End Wrench or Socket

Procedure

1. Printer powered off.
2. Unlock the quarter turn fasteners and remove the lower gate protective cover.
3. Make a mark on the spring scale shaft .150 inch (3.8 mm) from the tip of the shaft.
4. Place a straight edge on the outer edge of both pulleys.
5. At a point midway between the pulleys, depress the belt with the spring scale until the mark on the shaft is aligned with the inside edge of the straight edge (.150 inch belt deflection) (3.81 mm).
6. Read the force necessary to achieve this deflection from the spring scale.

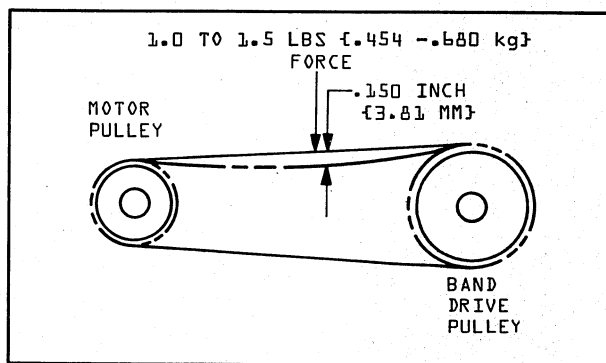


FIGURE 5-14. BAND MOTOR BELT TENSION

7. Check to see the pulleys are vertically 1.38 ± 0.02 inches (35.05 ± 0.59 mm) below the frame. The end of the shaft must be flush with bottom surface of the pulleys.
8. If the force is not between 1.00 and 1.5 pounds (.454 to .680 kg) loosen the four outer bolts on the motor mounting plate and move the motor assembly to obtain the proper tension.

PAPER ADVANCE MOTOR BELT TENSION

This procedure should be performed any time the belt is changed or the advance motor mounting plate is moved. It should also be performed when there is evidence of vertical line spacing problems or excessive belt wear.

Tools Required

Spring Scale
 Straight Edge
 Ruler
 3/8" Open End Wrench or Socket
 Flat Blade Screwdriver

Procedure

1. Printer powered off.
2. Make a mark on the spring scale shaft .150 inch (3.8 mm) from the tip of the shaft.
3. Place a straight edge on the upper edge of both pulleys.
4. At a point midway between the pulleys, depress the belt with the spring scale until the mark on the shaft is aligned with the bottom of the straight edge (.150 inch belt deflection). (3.8mm).
5. Read the force necessary to achieve this deflection from the spring scale.

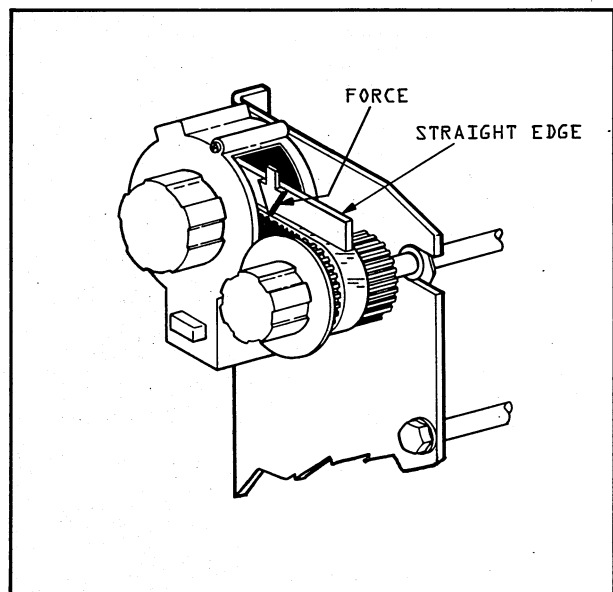


FIGURE 5-15. PAPER ADVANCE BELT TENSION

6. If the force required is not between 2.00 and 2.50 pounds (2.30 to 2.88 cm/kg), remove the paper bail.
7. Loosen the three nuts that hold the paper motion mounting plate to the side casting and move the paper motion assembly to obtain the proper tension.
8. Reinstall the paper bail.

FLIGHT TIME ADJUSTMENT

This procedure should be performed anytime there is evidence of horizontal clipping or horizontal mis-registration of print characters by individual hammers. In the 300 LPM printers individual hammer clipping appears as four consecutive columns, while in the 600 LPM printers it appears as two consecutive columns. If the printer is used with a compressed pitch band, the final check should be made in compressed pitch. In compressed pitch, columns affected by one hammer are in groups of six on a 300 LPM printer and groups of three on a 600 LPM printer.

WARNING

NOISE LEVEL UNDER BONNET WHILE PRINTING MAY BE HAZARDOUS TO HEARING. KEEP EXPOSURE TO A MINIMUM.

Tools Required

Flight Time Tool
Allen Wrench Set

Procedure

1. Remove the bonnet ground strap and lift off the printer bonnet.
2. Remove the paper bail, and pedestal rear cover.

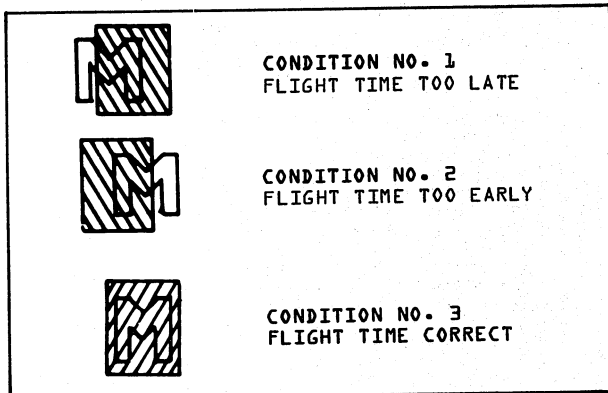


FIGURE 5-16. FLIGHT TIME CHECK

3. Slightly loosen the two allen screws holding the hammer actuator in place.
4. Insert the flight time tool into the adjusting slot.
5. Initiate an all one character printout of all 'M's.
6. Move the actuator with the flight time tool until there is no evidence of horizontal clipping.
7. While holding the actuator in its new position, torque the two allen screws to 20 inch pounds (23 cm/kg).

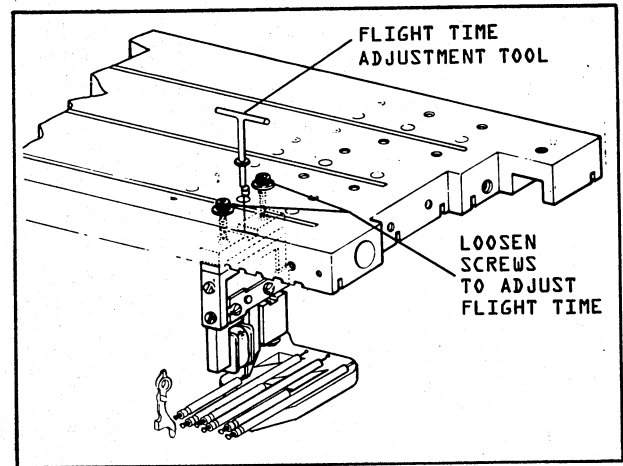


FIGURE 5-17. FLIGHT TIME ADJUSTMENT

HAMMER BAR HOME POSITION ALIGNMENT

This adjustment should be performed anytime the hammer bar is disconnected from the voice coil. Any misalignment of the home position will cause horizontal clipping in the print out.

Tools Required

Flat Blade Screwdriver
Feeler Gauges (.005, .010, .015) (.127, .245, .381mm)
5/16" Open End Wrench or Socket
1/4" Open End Wrench or Socket.
Ruler

Procedure

1. Printer powered off.
2. Remove the printer bonnet.
3. Remove the paper bail and the protective plate covering the logic cards.
4. Open the print gate.
5. Remove the inner paper guide.
6. Loosen the screws coupling the hammer bar to the hammer bar locator so that the bar can be moved without moving the locator.

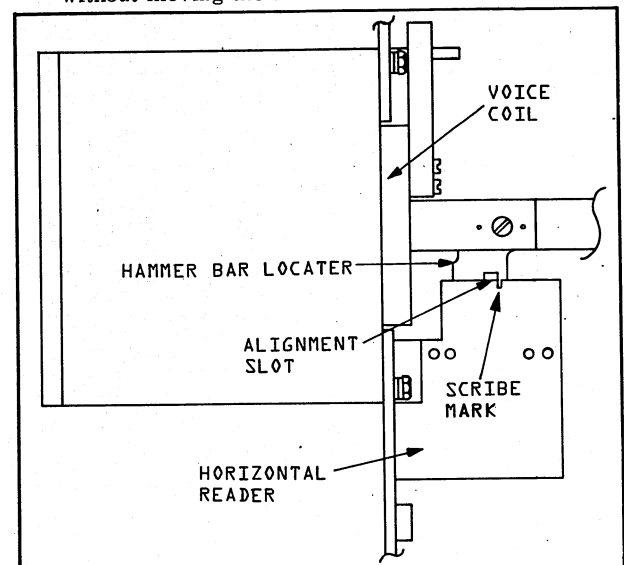


FIGURE 5-18. VOICE COIL HOME POSITION

7. Refer to Table 5-4 and jumper Ref. F (Horizontal Home Enable) to TP30 (ground) on 7PC3 (Print Head Electronics board).
8. Power the printer on.
9. Gently depress the gate latch switch and hold. This will home the voice coil.
10. Check that the scribe mark on the horizontal reader and the alignment slot in the hammer bar locater are positioned as shown in Figure 5-18.
11. Position a .010 inch (.245mm) feeler gauge between the hammer bar and the hammer bar stop screw on the left side of the hammer bar.
12. Tighten the hammer bar in this position with the two screws and check that the distance between the hammer bar and hammer bar stop screw is .005 to .015 inch (.127 to .381mm).
13. Using a ruler, check that the distance between the hammer bar and the hammer bar stop screw on the right side is as shown in Figure 5-19.
14. Remove the jumper wire and reassemble the printer.
15. Perform the Inner Paper Guide Adjustment procedure.

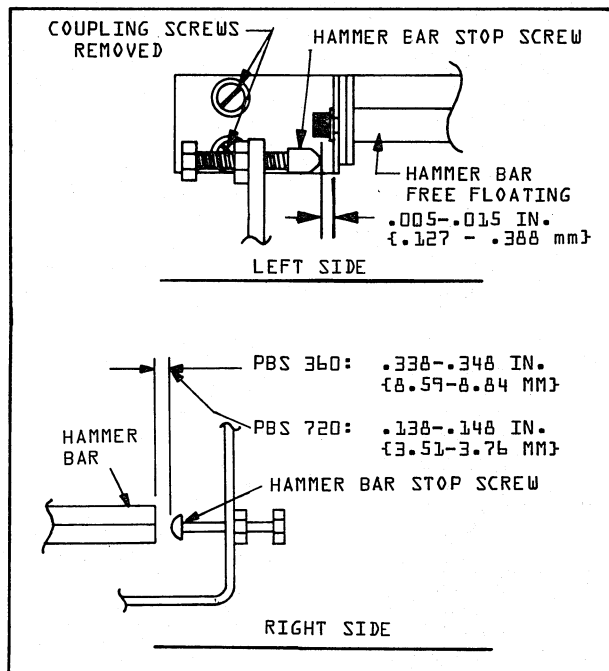


FIGURE 5-19. HAMMER BAR HOME POSITION

TRACTOR ASSEMBLY ADJUSTMENTS

There are three adjustments associated with the tractor assembly; belt tension, tractor flap clearance and tractor body alignment. If the belt is too tight, it can cause the tractor assembly to bind. Too loose a belt can affect line spacing. If there is too little clearance between the tractor flap and the tractor body, the forms may tear as they pass through the tractor. If the flap clearance is too great or tractor body alignment is incorrect, the forms will have a tendency to jump off the tractor drive pins.

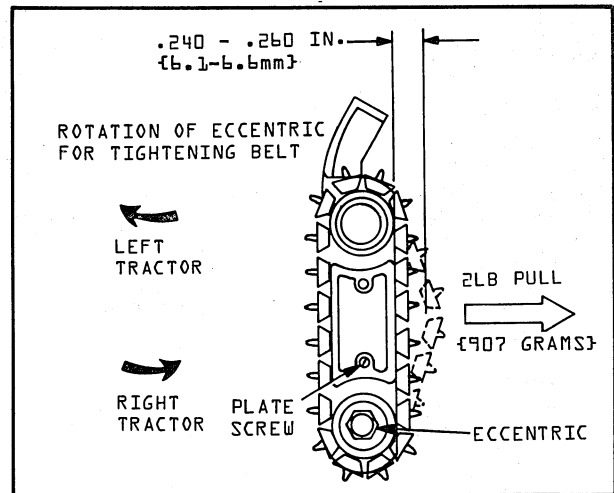


FIGURE 5-20. TRACTOR BELT TENSION

Tools Required

Spring Scale
 Ruler
 Feeler Gauges (.020" & .030") (.5, .8mm)
 Allen Set
 Phillips Screwdriver
 Square (Right Angle-90°).

Tractor Belt Procedure

1. Power the printer off.
2. Open the print gate and remove the forms.
3. Remove the paper bail. Also remove the plastic (chad remover) strip over the belt teeth (cogs) by pulling it apart at its junction.
4. From the rear of the tractor hook the spring scale under the belt between the teeth, as close to the center of the tractor body as possible.
5. Exert a force of 2.0 pounds (908 grams) on the belt towards the rear of the printer.
6. Using the scale measure the gap between the tractor guide surface and the belt (between the links).
7. If the gap is not between .240 to .260 inch (6.1 to 6.6 mm), loosen the screw above the eccentric that holds the metal plate to the tractor housing.
8. To tighten the belt, the left tractor eccentric should be rotated clockwise and the right tractor eccentric should be rotated counter-clockwise.

CAUTION

DO NOT TURN THE ECCENTRICS IN THE WRONG DIRECTION.

9. Recheck the gap before tightening the metal plate mounting screw.
10. When the tension is correct, tighten the metal plate mounting screw.

Tractor Flap Clearance Procedure

1. Power the printer off.
2. Open the print gate and remove the forms.
3. Insert a .020 inch (0.5 mm) feeler gauge between the tractor flap and the tractor body. Pass the gauge through Zone A of the tractor flap. (See Figure 5-21).
4. If the feeler gauge does not fit easily in the gap throughout Zone A, turn the adjusting set-screw clockwise until it does.
5. Insert a .030 inch (0.8 mm) feeler gauge between the tractor flap and the tractor body. Pass the gauge through Zone A of the tractor flap.
6. The feeler gauge must make contact in at least one point of Zone A. If it does not, turn the adjusting set-screw counter-clockwise until the gauge makes contact.
7. Recheck steps 3 and 4.

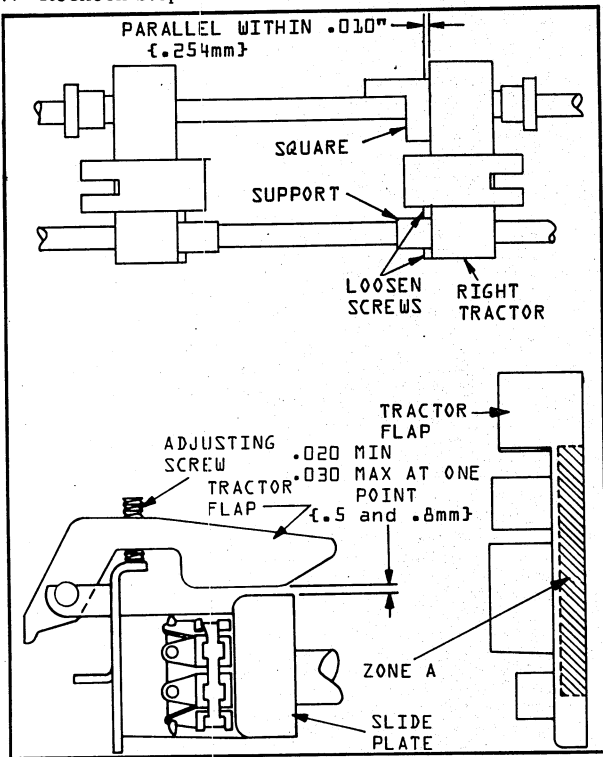


FIGURE 5-21. TRACTOR FLAP ADJUSTMENT

Tractor Body Alignment

1. Check both tractor body assemblies for a perpendicular alignment with the upper tractor drive shaft using a square (right angle).
2. If a tractor is not within 0.010" (.254mm) of being perpendicular to the drive shaft, loosen the two screws on the support and adjust to within tolerance.

RIBBON TRACKING ADJUSTMENTS

This procedure should be performed anytime one of the ribbon system components is replaced or if the ribbons are continually mistracking before their specified end of life. Two different methods of ribbon tracking have been developed. The latest design uses a guide roller which pivots within the ribbon spool flanges and requires the ribbon flanges to be made of plastic. This improved system is being incorporated by FCO PH15274. In the following text a procedure is provided for both systems.

Tools Required

Ruler
 Straight Edge
 Flat Blade Screwdriver
 Allen Wrench Set
 Open End Wrench
 Feeler gauges .0020, .020 inch (.050, .6mm)
 Empty Plastic Ribbon Spool

Static Ribbon Operation

For testing purposes and ribbon tracking observation it may be necessary to operate the ribbon system without printing and with the gate open. The following procedure provides a testing method required with the latest printer boards. Early testing methods were easier using test points, however the latest design changes to prevent ribbon smearing on the forms now prevent earlier methods. Any tracking adjustments must be performed on one side (left or right) at a time with that motor taking on ribbon. During static testing the printer should not be unattended by Customer Engineering. Even final static testing should be performed with ribbon and forms installed and the gate closed.

1. Power the printer off, raise the bonnet and disconnect its ground strap. Carefully raise and remove the bonnet.
2. Remove the plastic cover over the power supply and servo amplifier boards (2PC1 and 2PC2). Pivot the retaining clips at the top of the servo amplifier board (2PC2) and swing the board open from the top.
3. Connect a jumper from the side of R69 (2.7k, 1w) which goes to QN1-07, and the other end to ground (P4-2 or CR-1 anode). Refer to Figure 5-21B.
4. A ribbon with a plastic spool must be installed in the revised method if the ribbon system incorporates the pivoting guide rollers at the ribbon spools. Refer to the operators section which covers both ribbon systems.
5. With the ribbon installed, power on the printer. Ribbon motion will start as the +36 volts comes up to potential.

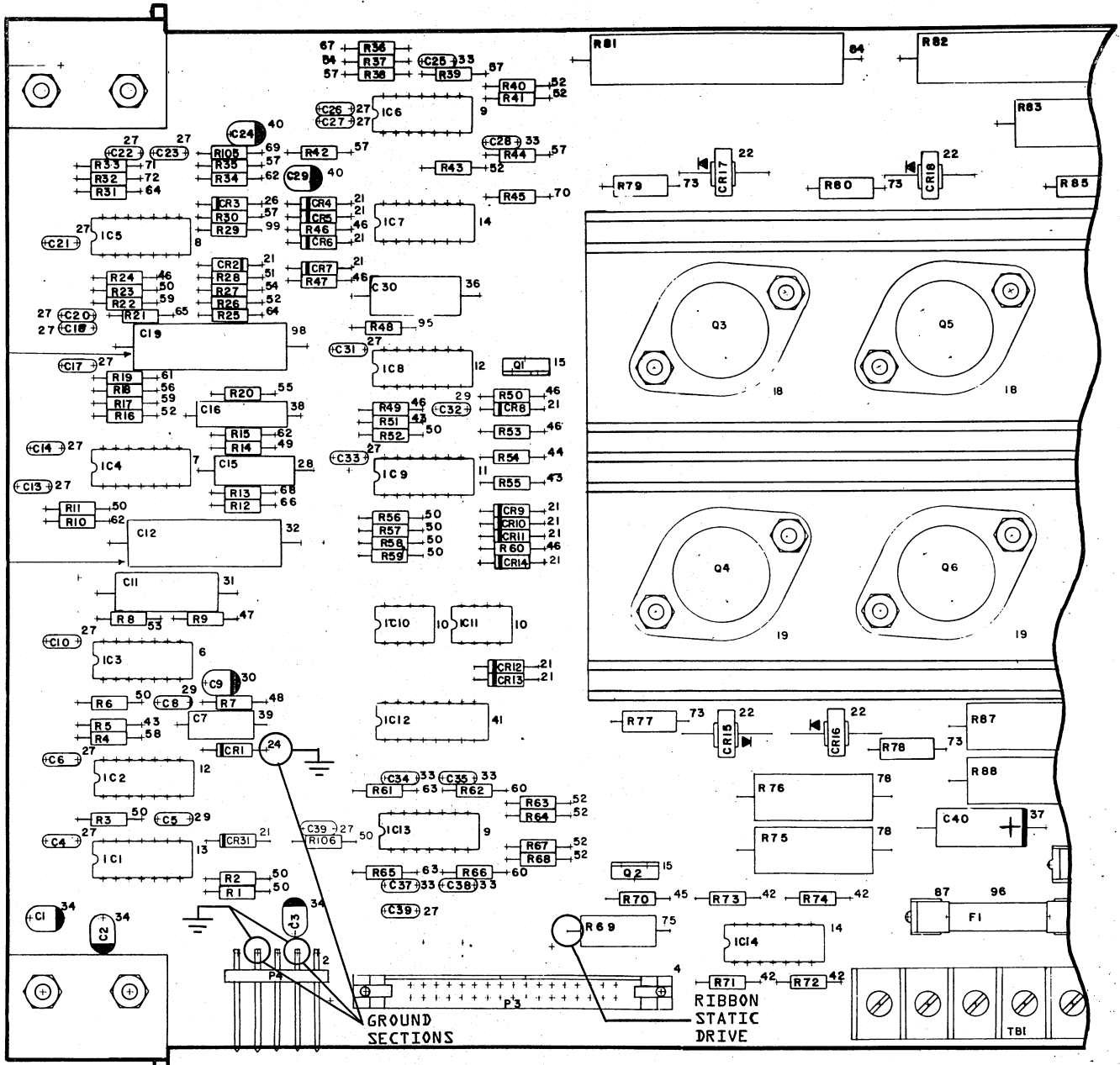


FIGURE 5-21A. STATIC RIBBON OPERATION

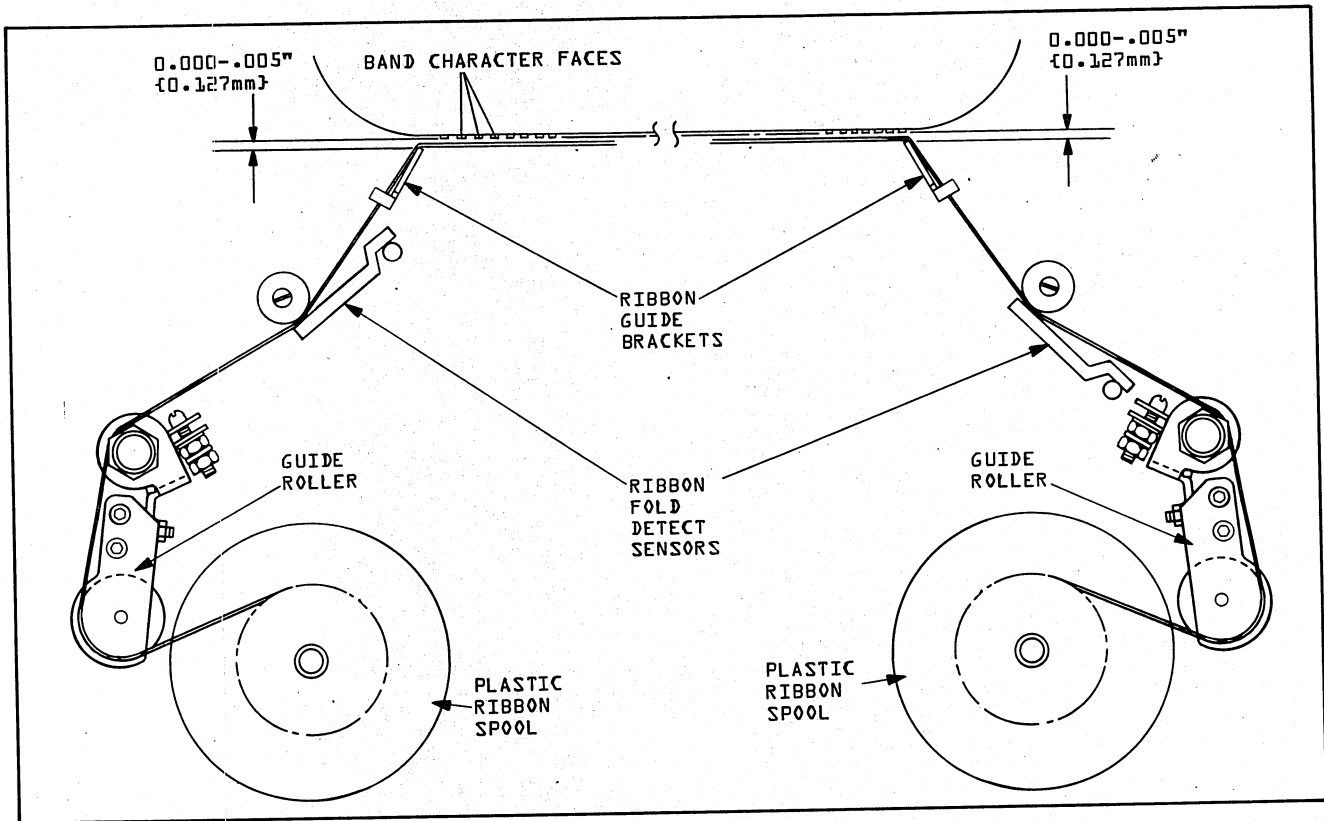


FIGURE 5-21B. RIBBON SYSTEM WITH GUIDE ROLLERS

Ribbon System with Guide Rollers (Figure 5-21B)

Ribbon tracking is adjusted one side at a time (left or right) with single part paper installed and a new ribbon installed. Adjustment may be performed while printing, or with just the ribbon in motion with the gate closed. This system requires flexible ribbon spool flanges which makes the use of plastic ribbon spools a must condition. Tracking adjustments should only be made on the motor side that is taking on ribbon.

The ribbon is adjusted to just barely ride against the top surface of the lower ribbon guide on the switching posts (see Figure 5-21D). The guide roller must move freely between the ribbon spool flanges with only light contact. The ribbon spool may raise slightly off the drive sprocket, but the guide roller must freely center the space between the ribbon spool flanges. The ribbon when lightly contacting the lower ribbon guide on the switching post, may also contact the bottom roller ribbon guide (thin plate holding the roller), see Figure 5-21D. Correct tracking against the guides occur when light contact by the ribbon occurs without folding or buckling of the ribbon fabric.

Major Checks and Adjustments

Perform the following major checks for problems of short ribbon life, or folding ribbons. Proceed to Roller Tracking Adjustments for observed minor tracking adjustments.

1. Power the printer off and raise the printer bonnet.
2. Remove the print band plastic cover, and then remove the ribbon. Open the printer gate as required.
3. Refer to the preceding Static Ribbon Operation and operate the printer or ribbon spool post and observe for wobble. Stop the printer or disconnect the test jumper to stop the post at a point of center vertical alignment with minimum offset caused by wobble. (see Figure 5-21C). Apply a slight pressure back and forth at the top of the ribbon spool post to identify any mechanical play which would require center positioning. Repeat the test as required until the post appears vertical without wobble.
4. Install a empty plastic ribbon spool on the left or right ribbon drive assembly being checked or adjusted.

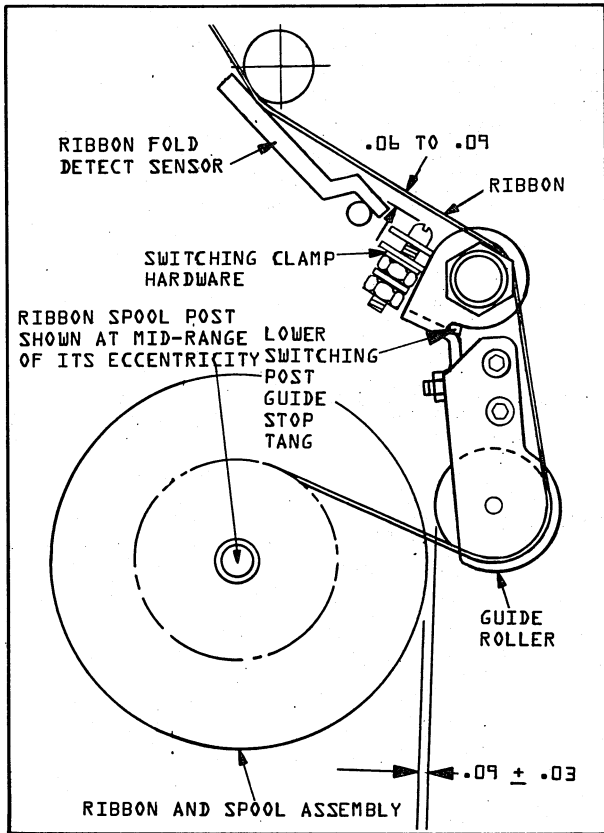


FIGURE 5-21C. GUIDE ROLLER POSITIONING

- Slightly loosen the three nuts on the three vertical screws between the rollers top and bottom guides (see Figure 5-21D). Adjust the top and bottom eccentric shoulder screws so the flats cut on the side of the bolts are located at the top. Snug down the three vertical nuts.
- Swing the guide roller into the spool flanges. If the guide roller fails to enter the spool flanges with only minimal light contact then the spool drive sprocket must be adjusted to allow easy roller entrance. Check to see the top surface of the lower ribbon guide on the switching post is in line (flush) with or up to 0.005 inch (.127mm) above the top surface of the bottom roller guide. If the drive sprocket is just a little out of spec then go on, this check will be repeated later.
- Swing the guide roller in against the center of the empty ribbon spool. Check to see the roller touches vertically against the center of the ribbon spool (see Figure 5-21D). If either top or bottom fails to touch the spool, then barely loosen the four small allen head screws holding the roller guides. Gently move the roller against the ribbon spool and tighten the four screws.

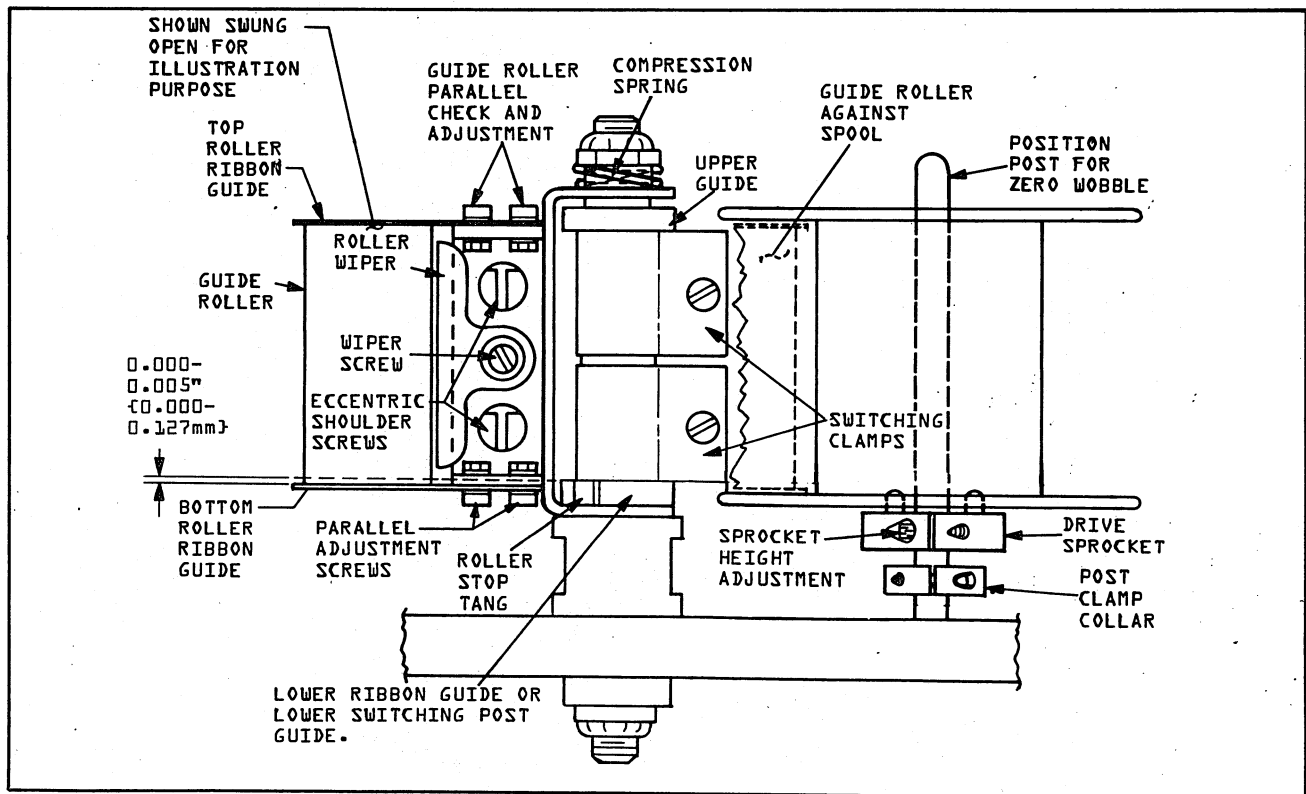


FIGURE 5-21D. ROLLER SWITCHING POST ASSEMBLY

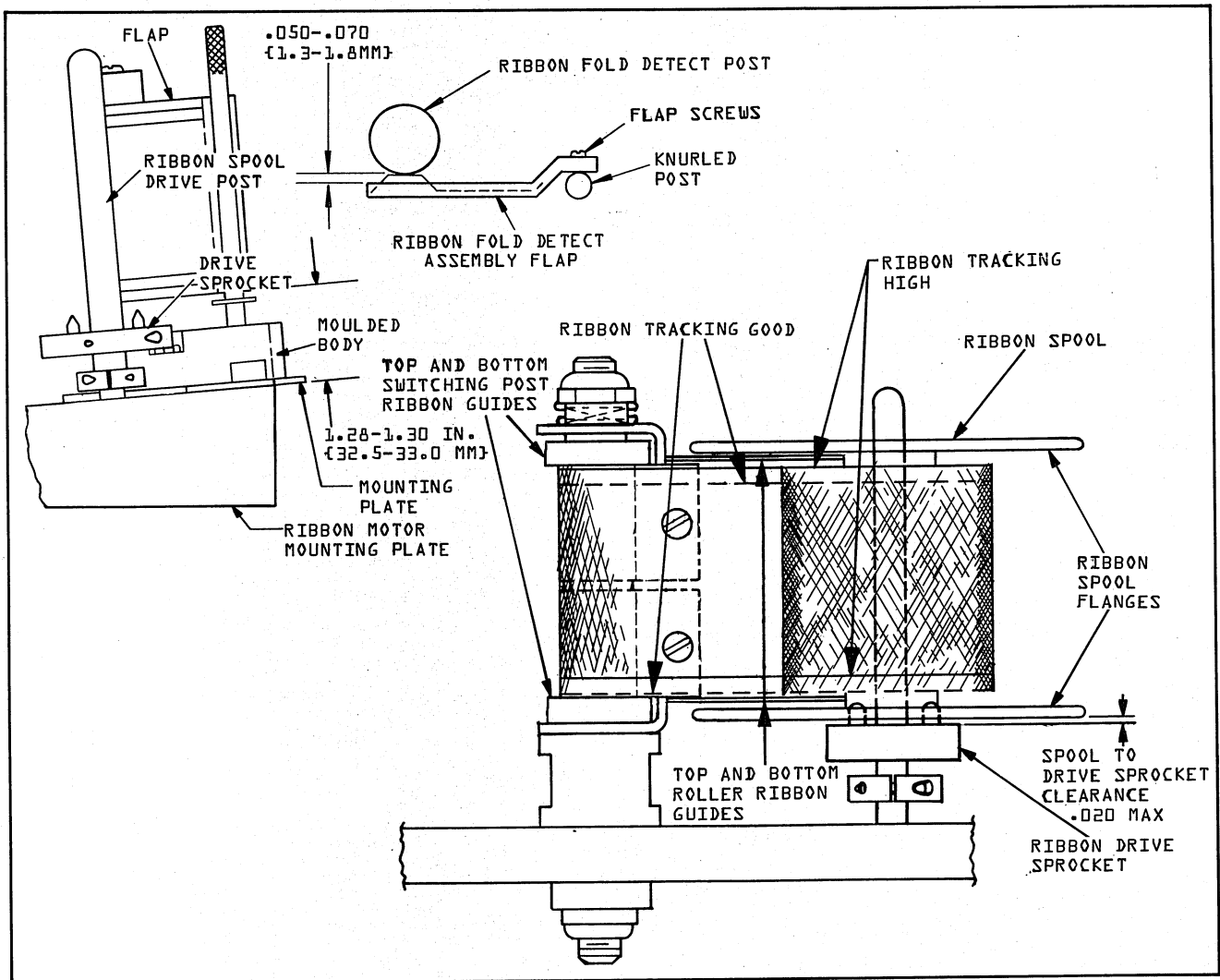


FIGURE 5-21E. TRACKING ADJUSTMENTS

8. Place a straight edge horizontally across the band character surface and check that both ribbon guides are from .000 to .005 inch (.000 to .127 mm) behind the character surface. The end guide can be adjusted by loosening the two mounting screws (see Figure 5-21A).
9. Using a ruler check that the bottom of the ribbon fold detect assembly flap is 1.28 to 1.30 in. (32.5 to 33.0 mm) above the top of the ribbon motor mounting plate. See Figure 5-21E.
10. Loosen the two mounting screws on the flap and move the flap up or down as required. See Figure 5-21E.
11. Use feeler gauges to check that the gap between the ribbon detect assembly flap and the ribbon fold detect post is .050 to .070 in. (1.3 mm to 1.8 mm) with the pivot mechanism in the locked closed position. To adjust, remove the assembly from the printer. Remove the moulded body from the mounting plate. Loosen the screw at the bottom of the knurled post. Insert .060 in. (1.52mm) feeler gauge in between and tighten the screw at the bottom of the knurled post. Recheck and reassemble and mount on the printer (see Figure 5-21E).

12. Perform the Outer Paper Guide adjustment procedure earlier in this section. Check for conditions which are pinching the ribbon.
13. Check for and remove any sharp edges on the ribbon fold detect assembly flaps at ribbon contact points. The fold detect assemblies should be positioned as far back towards the back of the printer to reduce ribbon wrap-around at the ribbon guides.
14. Install a new ribbon on the drive spools. Ensure that the entire ribbon except for the start wrap is wound on to one spool with the foil between the spool and the switching post.
15. Follow the ribbon installation procedure for the guide roller system and install a new ribbon. Refer to the Operation section of the manual.
16. Pivot the roller away from the ribbon spool and check for a gap between $0.090 \pm .030$ inch (2.29 ± 0.76 mm) between roller and the spool flange (see Figure 5-21C). Check for a clearance of 0.060 to 0.090 inch (1.52-2.29 mm) between the ribbon and the hardware holding the switching clamps.
17. Adjustment of the guide roller to spool clearance is determined by a small tang on the lower switching post guide (see Figure 5-21 C/D). The clearance of the switching clamp hardware is adjusted by rotating the switching clamps (see Figure 5-21 C/D). Loosen the special lock nut at the top of the switching post assembly decreasing spring tension on the assembly. Slightly loosen the hardware holding the switching clamps. Adjust the tang on the lower ribbon guide by rotating the guide to obtain the guide roller to spool flange clearance. Holding the lower ribbon guide in position, adjust the lower switching clamp to obtain hardware clearance with the ribbon, then press the switching clamp down on the lower ribbon guide and snug down the switching clamp hardware. Align the upper switching clamp with the lower switch clamp. Maintain the lower guide and switching clamps positions while tightening the special lock nut on the top of the switching post. Tighten the nut, compressing the spring, until the lower ribbon guide is securely in place when swinging the guide roller against the stop. The guide roller must swing easily. Tighten the hardware on the switching clamps.
18. Proceed to the following Roller Tracking Adjustments.

Roller Tracking Adjustments

Always check to see the guide rollers pivot freely and the roller rotates easily. If the wiper is hitting the roller loosen the wiper screw and move the wiper back a little for the present. A very good or new ribbon with plastic spools must be installed. The guide rollers must enter the ribbon spool flanges easily, although this may bind the ribbon spool slightly as the ribbon tracking is adjusted. Bind-

ing of the guide roller on the ribbon spool requires the drive sprocket below the ribbon spool be lowered. The top surface of the lower ribbon guide on the switching post must be in line (flush) with or up to 0.005 inch (0.127mm) above the top surface of the bottom roller ribbon guide. The ribbon spool is allowed to ride up off its drive sprocket by 0.020 inch (.508mm) as long as the rollers do not bind or hang up entering the ribbon spool during ribbon operation (see Figure 5-21E).

1. During testing the band cover must be removed. Printers equipped with a band cover interlock must have the interlock circumvented by placing an object in the cover latch to activate the switch. A special tool is available for this purpose if required, part number 44672885.
2. Operate the ribbon system while observing the position on the ribbon rounding the switching post on the side winding ribbon on the spool. Correct tracking occurs if the ribbon tracks downward just slightly touching the lower switching post guide. Reverse the ribbon direction by short circuiting the switching clamps momentarily. Observe tracking on the other side of the ribbon system.
3. Adjustment of ribbon tracking is performed by slightly loosening the nuts of the wiper for the guide roller and the eccentric shoulder screws above and below the wipers screw (see Figure 5-21 D). The nuts should be snug enough to maintain the roller position with the ribbon pressure.
4. Stop the ribbon system to make slight tracking adjustments and check to see the eccentric shoulder screw nuts are still snug before restarting the ribbon. Adjust either the upper or lower eccentric screw to vary ribbon tracking. Adjust the upper eccentric counter clockwise or the lower eccentric clockwise to track ribbon downward. Tighten the upper and lower eccentric shoulder screw nuts without moving the screws (see Figure 5-21D).
5. Raise the ribbon spool and ribbon away from the guide roller. Use a feeler gauge and position the roller wiper between 0.002 and 0.005 inch (.051-.127mm) from the roller and tighten the screw and nut holding the wiper (see Figure 5-21 D).
6. Install the spool and position the ribbon back in place. Operate the ribbon system and recheck tracking, roller access into the spool flanges, and ribbon spool height above drive sprocket if visible. The ribbon spool should not be raised more than 0.020 inch (.51 mm) above the drive sprocket (see Figure 5-21 E).
7. Repeat the tracking adjustment for the other side if required. Always complete a ribbon tracking check while printing and check tracking in both directions. When the ribbon is tracking against the switching post guide, it must touch the switching post guide first or simultaneously with any contact with the guides holding the roller.

Ribbon System Without Guide Rollers

This procedure should be performed anytime one of the ribbon system components is replaced or if the ribbons are continually mistracking before their specified end of life.

Procedure

1. Power printer off and remove the band protective cover.
2. Open the print gate and remove the print ribbon.
3. This check and adjustment is very important. Visually check that the two ribbon guides appear parallel to the ribbon spool drive posts. Established this parallelism by bending the guide posts on the early version cams. The new version cams (see Figure 5-25) have two small set screws to adjust parallelism. When adjusting the set screws be sure to keep the lock nut above the wave washer tight. It is important that these surface be parallel. Two long rulers against these surfaces will aid in this alignment. The following ribbon contact surfaces and spool posts should all be vertically parallel: ribbon guide plate, ribbon guides, and ribbon switching posts. The ribbon fold detect assembly is not adjustable vertically.
4. Place a straight edge horizontally across the band character surface and check that both ribbon guides are from .000 to .005 inch (.000 to .127 mm) behind the character surface. The end guide can be adjusted by loosening the two mounting screws (see Figure 5-23).
5. Check that the adjustment cams are installed as shown in Figure 5-24. The wedges must be installed parallel to the adjustment cams.
6. Using a ruler check that the bottom edge of the ribbon fold detect assembly flap is 1.28 to 1.30 in. (32.5 to 33.0 mm) above the top surface of the ribbon motor mounting plate. See Figure 5-25.
7. Loosen the two mounting screws on the flap and move the flap up or down as required. See Figure 5-22.
8. Use feeler gauges to check that the gap between the ribbon detect assembly flap and the ribbon fold detect post is .050 to .070 in. (1.3 mm to 1.8mm) with the pivot mechanism in the locked closed position. To adjust, remove the assembly from the printer. Remove the moulded body from the mounting plate. Loosen the screw at the bottom of the knurled post. Insert .060 in. (1.52 mm) feeler gauge between flap and fold detect post. Hold the flap against the post with the feeler gauge in between and tighten the screw at the bottom of the knurled post. Re-check and reassembly and mount on the printer (see Figure 5-25).
9. Using a ruler check that the distance from the top surface of the lower guide (located on the ribbon switch post) to the mounting plate is 1.10 to 1.12in. (27.9 to 28.4mm) See Figure 5-25.
10. Check that the lower surface (surface closest to the mounting plate) of the ribbon drive post collar clamp is flush to the end of the ribbon spool post.
11. Using the final measurement made in step 9 as the point of reference, the distance from the top surface of the drive sprocket to the mounting plate is 0.047 to 0.053 inch (1.194-1.346mm) lower than the top surface of the lower guide on the ribbon switching post.
12. Perform the Outer Paper Guide adjustment procedure earlier in this section. Check for conditions which are pinching the ribbon.

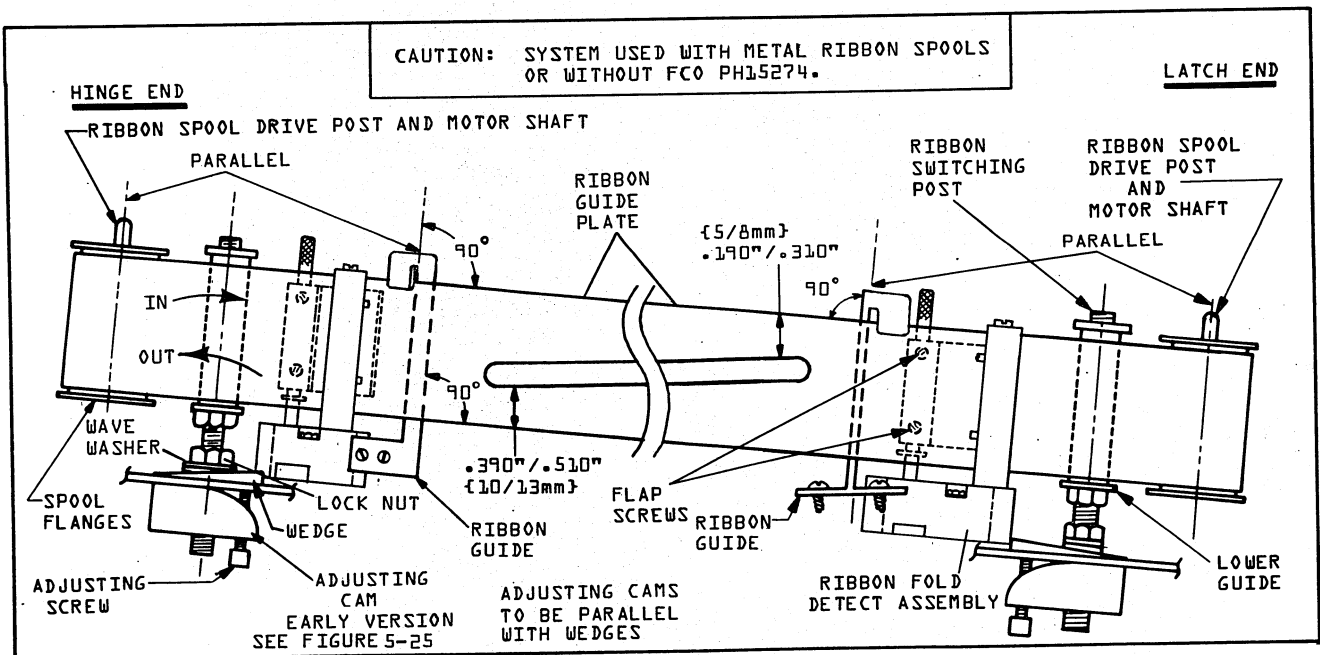


FIGURE 5-22. RIBBON SYSTEM

13. Check for and remove any sharp edges on the ribbon fold detect assembly flaps at ribbon contact points. The fold detect assemblies should be positioned as far back towards the back of the printer to reduce ribbon wrap-around at the ribbon guides.
14. Check the upper and lower guides on the switching post for a dished surface caused by overtightening. Check the center spacer on the switching post is flush with the contact surfaces and not sticking out.
15. Install a new ribbon on the drive spools. Ensure that the entire ribbon except for the start wrap is wound on to one spool with the foil between the spool and the switching post.

Before attempting to dynamically adjust the ribbon system it is extremely important to ensure that a good ribbon is being used. First check that the test ribbon is cut straight along its edges and that the spool flanges are not bent.

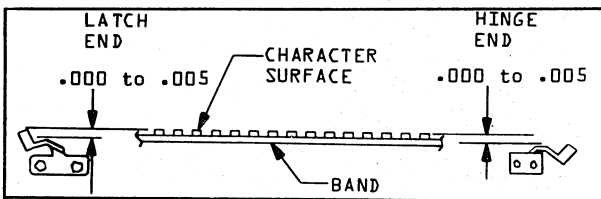


FIGURE 5-23. RIBBON GUIDE POSITION

16. Printer powered on and single part forms installed.
17. Refer earlier to Static Ribbon Operation to operate the ribbon system.

18. With the ribbon winding and no printing taking place, check the ribbon tracking on the take-up spool side. At the ribbon switch post the lower edge of the ribbon must just touch or ride no higher than .020 in. (0.5mm) from the top surface of the lower guide washer. No ribbon fold-over should occur.

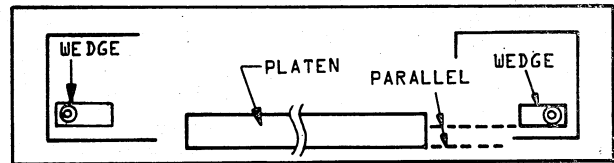


FIGURE 5-24. CAM AND WEDGE POSITION

19. If the ribbon is not properly tracking adjust the angle of the switch post at the take up spool as follows: (The new cams required a locking nut to be loosened see Figure 5-25).
 - A. To raise the ribbon level, tilt the switch post in (tighten the adjusting screw). Tightening the adjusting screw in pivots the bottom of the threaded ribbon switching post outward which increases the compression of the wave washer, pivoting the top of the switching post inward.
 - B. To lower the ribbon level, tilt the switch post out (loosen the adjusting screw). Loosening the adjusting screw pivots the bottom of the switching post inward which decreases the compression on the wave washer, pivoting the top of the switching post outward. During this adjustment the lock nut above the wave washer must be tight keeping the wave washer partially compressed.

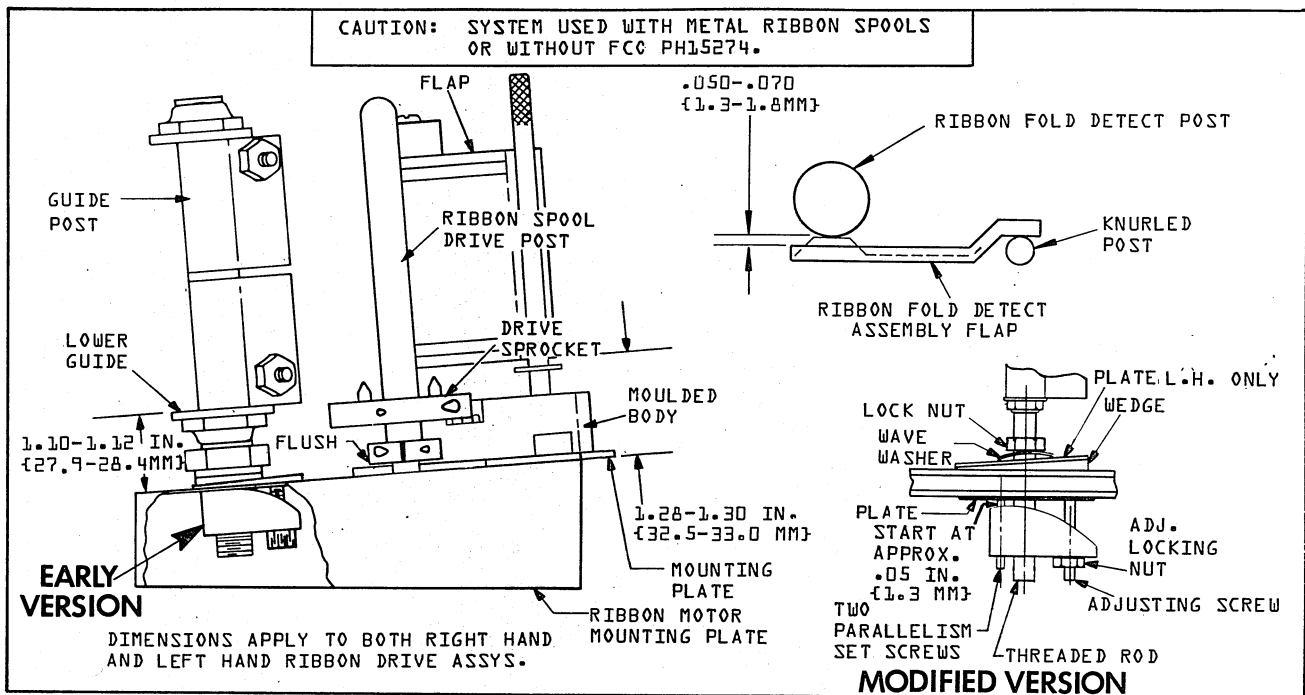


FIGURE 5-25. RIBBON SYSTEM SET-UP

20. Allow the ribbon to completely fill the initially empty spool, switch and return to the first spool. Repeat the run once more so that the ribbon has completely wound on the spools a total of two times each. (Four complete passes of the ribbon).
21. If tracking appears correct remove the jumper from Ref. I, 7PC3, see Table 5-4.
22. Initiate a sliding alphabet print operation and check for proper ribbon tracking for one pass of the ribbon in each direction.
23. Repeat steps 15 through 18 if necessary to achieve proper tracking.

+5V POWER SUPPLY ADJUSTMENT

1. Printer powered on, half an hour minimum.
2. Connect a DVM to the Printhead Electronics Board (7PC3) at the -5V side of R162 and 5RB4 (ground). See Figure 2-8.
3. Adjust pot R2 on Power Supply Board (2PC1) to obtain a voltage of 4.99 to 5.01 volts.

+30V VOLTAGE COMPENSATION ADJUSTMENT

1. Printer powered on, half an hour minimum.
2. Refer to Table 5-4 and connect a DVM to Ref. K of 7PC3 and reference TP30 (gnd.).
3. Adjust pot P2 on 7PC3 to obtain a voltage of +29.99 to 30.01 volts.

CHARACTER AND HOME PULSE SET-UP

1. Printer powered on.
2. Perform the +30V Voltage Compensation Adjustment.
3. Set the phase adjust pot on the control panel to its midrange position.

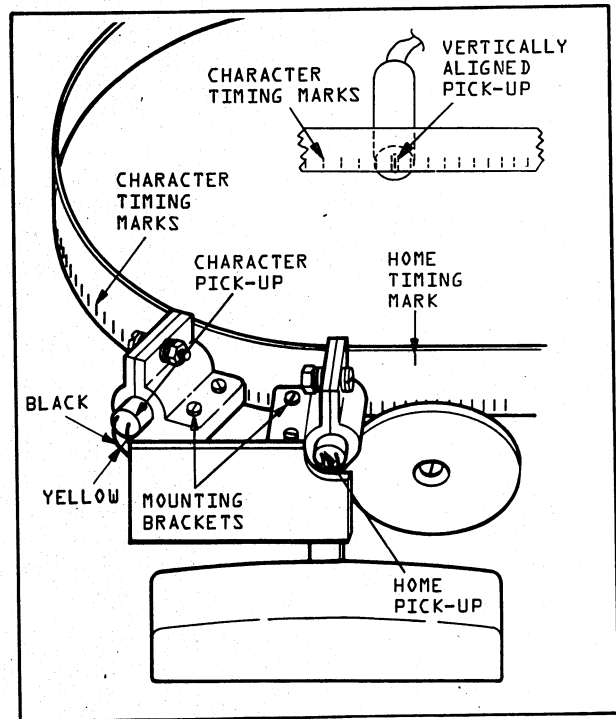


FIGURE 5-26. CHARACTER AND HOME PULSE

4. Open the print gate.
5. Loosen the character pickup mounting bracket screws and set the pickup in its midrange position on the gate.
6. Loosen the home pickup mounting bracket screws and set the pickup to its left most position on the gate.
7. Loosen the screws holding both pickups to their respective mounting brackets and use a 0.006 in. (0.152 mm) feeler gauge to set the gap between the pickups and the band timing marks at the high point on the band pulley. Pickups must be vertically aligned with the timing marks with an air gap of $0.006 \pm .001$ inch (0.127-0.178mm). Vertical alignment is obtained by the use of shims, refer to the parts manual. The band must be properly seated and resting against the platen top edge guide when checking vertical alignment.

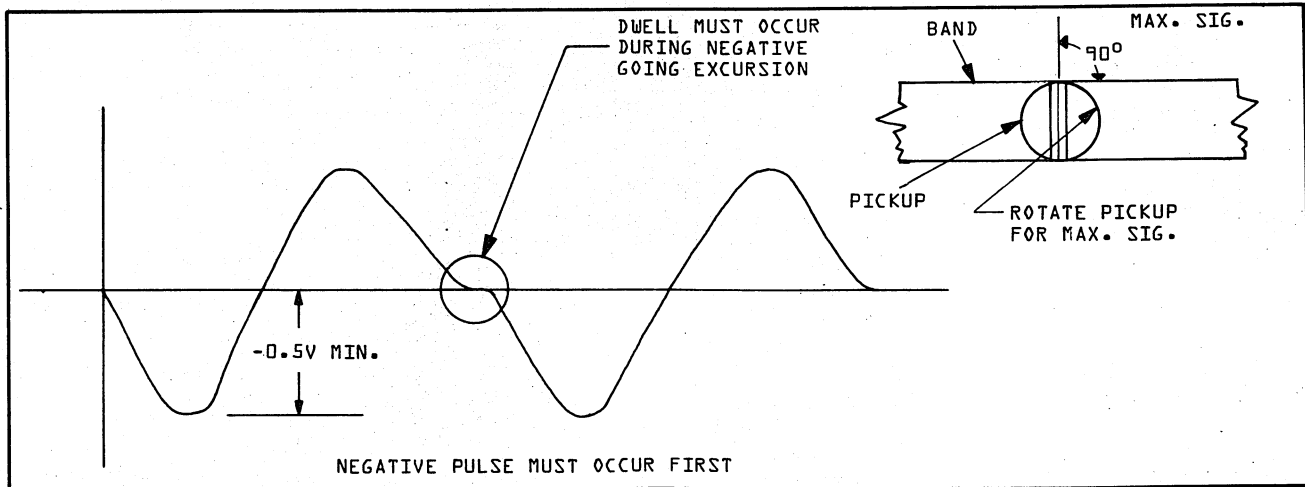


FIGURE 5-27. CHARACTER AND HOME PULSE WAVE SHAPES

8. Start the band running and use an oscilloscope to check the polarity of the character 7PC3-P3-23 and TP30 (ground) and Home 7PC3-P3-22 and TP30 (ground) pulses. Rotate pickup for maximum signal. (Always stop the band when adjusting pickups and rotate by hand to check the band to pickup clearance). Alternate test points for making this polarity check are R5 (character) and R6 (Home) on 7PC3 (Print-head Electronics Board). Refer to the Parts Identification Manual assembly drawing for component location.

9. Install multi-part forms in the printer.

CAUTION

DO NOT USE SINGLE PART FORMS. DAMAGE MAY OCCUR TO THE BAND WHILE THE PICKUPS ARE BEING ADJUSTED.

10. Initiate a print operation of all one character.
11. If either of the sides of the character are being clipped, the character pickup must be moved laterally. If clipping on the left, move the pickup to the left. If clipping to the right, move the pickup to the right. Always stop the band when making adjustments and rotate band manually to check band to pickup clearance.
12. Initiate a print operation of all "M"s.
13. If the character "M" is not printed, adjust pot P1 on 7PC3 until the "M" character appears. Adjustment of P1 shifts the printout by character.
14. Sync (+) and monitor chip B6 pin 12 (TP1) on 7PC3.
15. Refer to Table 5-4 and monitor Ref. B on 7PC3 and adjust P1 so that Ref. B goes negative 220 to 320 usec after B6-12 (TP1) trailing edge switches. See Figure 5-28.
16. Ensure that all "M"s are still being printed. If they are not, readjust P1 until all "M"s are printed, then set step 14 timing again.

17. Check that the positive going pulse on B6-12 (TP1) is greater than 1.3 msec. If it is not, loosen the mounting brackets and move the pickups closer together and repeat steps 11 through 17.

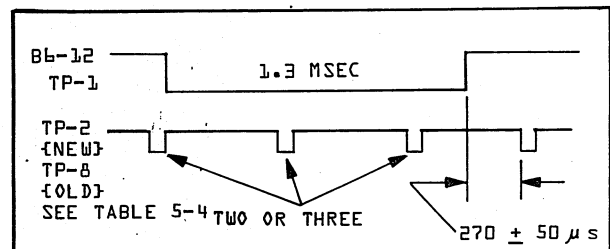


FIGURE 5-28. CHARACTER ADJUSTMENT

HORIZONTAL SERVO SYSTEM SET-UP

The Horizontal Set-Up procedure following, sets up the reference voltage that is also used in the vertical servo set-up. Table 5-4 will provide Test Points for different 7PC3 boards.

1. Power the printer down and remove the 15 amp 'H' Switch fuse F1 on 2PC2 (36 volts). See Fuse Table Section 2.
2. Power the printer on.
3. After a five minute warmup check power supply's +5 volts.
4. Connect a DVM to Ref. M (see Table 5-4) on 7PC3 and reference TP30 ground (2.5 volt reference).
5. Adjust pot P5 on 7PC3 to obtain a voltage of 2.48 to 2.52 volts (2.5 volt reference adjustment).
6. Connect a jumper from Ref. R (see Table 5-4) to ground (TP30) on 7PC3. Connect a DVM to Ref. Q (see Table 5-4) and reference ground (TP30). Adjust P8 on 7PC3 for 2.49 to 2.51 volts.
7. Connect a scope on Ref. S (see Table 5-4) and slowly adjust P9 for a switch point which appears as a 10 KHz sine wave increasing in amplitude to approximately 20 volts peak to peak and then decreasing. Set a maximum.

8. Remove jumper to ground at Ref. R (see Table 5-4).
9. Check the null reference of the vertical system in these three steps by jumpering Ref. J. (see Table 5-4) to ground (TP 30) and monitoring Ref. L (see Table 5-4) with a DVM for 2.45 to 2.55 volts on 7PC3. Replace the board (7PC3) if incorrect voltage.
10. Connect a scope on Ref. T. (see Table 5-4) and slowly adjust P3 for a switch point which appears as a 10 KHz sinewave increasing in amplitude to approximately 20 volts peak to peak and then decreasing. Set at maximum.
11. Remove the jumper to ground at Ref. J (see Table 5-4).
12. Connect the DVM to Ref. U (see Table 5-4) on 7PC3 and reference TP30 ground (Home Signal).
13. Move the hammer bar slowly from side to side and check that the maximum voltage detected is at least 4 volts and the minimum is 1 volt or less. If these parameters are met skip to step 14
- 13A. Loosen the reader mounting screws and set the top surface of the reader flush with the bottom edge of the alignment slot in the code disk.
14. Perform step 13 with the DVM connected to Ref. Q (see Table 5-4) on 7PC3 (Horizontal Position Signal). If correct proceed to the next step, in incorrect repeat 13A and go back to step 12.
15. Power printer down and replace 15 amps 'H' Switch fuse F1 on 2PC2.
16. Power the printer on.
17. Ground the Horizontal Ramp at TP26 on 7PC3.
18. Close the gate to apply power to the horizontal voice coil and connect the DVM to Ref. Q. (see Table 5-4) on 7PC3 and reference TP30 ground (Horizontal Position Signal).
19. Adjust pot P9 (H Code Disc Bias Adj.) on 7PC3 to obtain a voltage of 2.45 to 2.55 volts. This sets up the code disk to the horizontal position L. E. D. detector in the reader.
20. Ground the Home Enable pulse at Ref. F. (see Table 5-4) on 7PC3. Do not remove the ground from TP26. This moves the voice coil to the home position.
21. Connect the DVM at Ref. U (see Table 5-4) on 7PC3 and reference TP30 ground to make sure home position is sensed.
22. Check for a voltage of 2.45 to 2.55 volts. If incorrect the code disk may be dirty, or reader misaligned, or faulty.
23. Remove grounds from Ref. F. (see Table 5-4) and TP26 on 7PC3.
24. Open the print gate.
25. Ground the Horizontal Advance signal at Ref. E. (see Table 5-4) on 7PC3.
26. Ground the Horizontal Direction signal at chip G4 pin 13 on 7PC3.
27. Connect the DVM on TP26 on 7PC3 and reference TP30 ground (Horizontal Ramp).
28. Adjust pot P11 on 7PC3 to obtain a voltage of -3.9 to -4.1 volts.

(CONTINUED)

P₁ *P₂* *P₃*
 vertical Horizontal Vel.

 Vol Trigger neg TP6
 Display TP 31 15ms +- 0,5

 Home TP 25
 Horiz. Pos. TP 16 } +5V oder mehr
 -5V oder mehr

 Zwischen TP16 + TP25 coincidence Voltage max ~ 1V

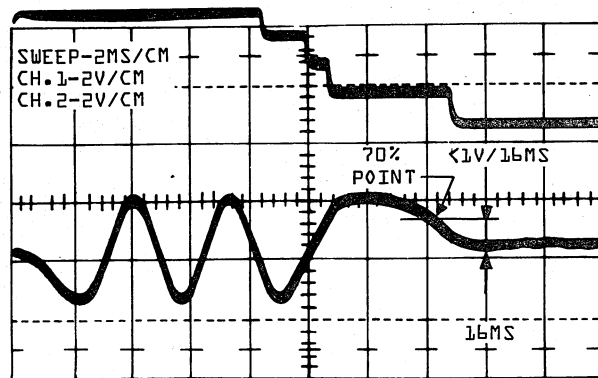
POSITIVE RAMP

7PC3
TP-26

THIS SIGNAL OCCURS WHEN THE HORIZONTAL VOICE COIL IS MOVING TO THE RIGHT FOR EACH HORIZONTAL POSITION. A NEGATIVE RAMP SIGNAL IS GENERATED WHEN MOVING TO THE LEFT.

POSITION SIGNAL {SEE TABLE 5-4} TP-17 {NEW}
TP-18 {OLD}

STARTS NEGATIVE FOR THE POSITIVE RAMP AND STARTS POSITIVE FOR THE NEGATIVE RAMP.



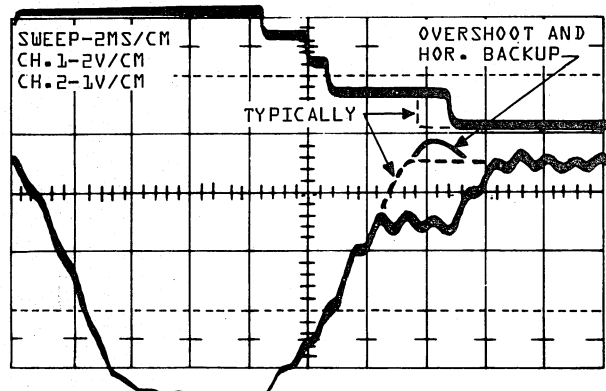
POSITIVE RAMP

7PC3
TP-26

THIS SIGNAL AS SHOWN HAS A LONGER THAN NORMAL LAST STEP WHICH IN THIS CASE WAS AN IMBALANCE BETWEEN THE POSITIVE AND NEGATIVE RAMP. NEGATIVE RAMP POSITION SIGNAL WAS NOT <1 VOLT AT 16MS, POSITIVE RAMP WAS WELL WITHIN THE 16MS.

TACHOMETER VELOCITY {SEE TABLE 5-4} TP-29 {NEW}
TP-25 {OLD}

INDICATES A CONSTANT SPEED BEING HELD DURING THE LONGER THAN NORMAL LAST RAMP STEP. WITH BOTH POS. AND NEG. RAMP. BALANCED THE RAMP STEPS ARE EQUAL AND THE TACH. SIG. SLOPES TO ZERO WITHOUT A STEP. HOWEVER A TACH. SIG. THAT SLOPES TO ZERO AND GOES POSITIVE INDICATES OVERSHOOT AND RETURN {BACK MOTION}.



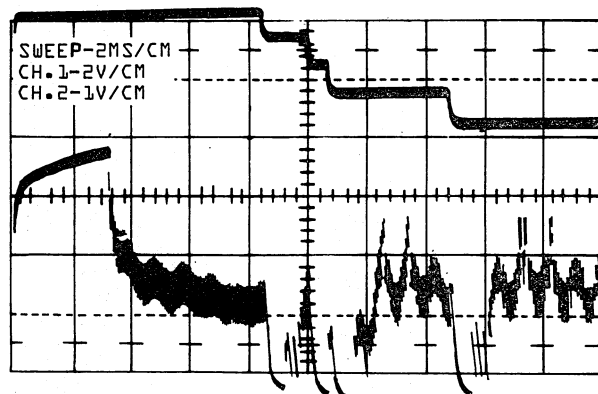
POSITIVE RAMP

7PC3
TP-26

FINAL ADJUSTMENT REQUIRES THE POS. AND NEG. RAMP DURATIONS BE EQUAL WITHIN 1 MS.

CURRENT WAVEFORM TP-27

AMPLIFIER VOLTAGE OUTPUT WHICH REPRESENTS THE CURRENT WAVEFORM ACROSS THE VOICE COIL.



POSITIVE RAMP

7PC3
TP-26

THE STAIRSTEPS OF THE RAMP REPRESENT THE PRECISE CLOCKED STOPPING OF THE VOICE COIL. IN THIS CASE THE LAST STEP IS HELD HIGH WHEN THE READER POSITION SIGNAL IS SWITCHED IN BECAUSE THE HOME POSITION IS NOT DETECTED UNTIL THE POSITION SIG. IS LESS THAN 1 VOLT. IF THE LAST STEP DOES NOT DROP WITHIN 25MS A HOR. MOTION ERROR IS GENERATED.

SUMMING POINT {SEE TABLE 5-4} TP-19 {NEW}
TP-20 {OLD}

FOR INFORMATION ONLY. SHOWS TOTAL SUM VOLTAGE FOR A RIGHT DRIVE.

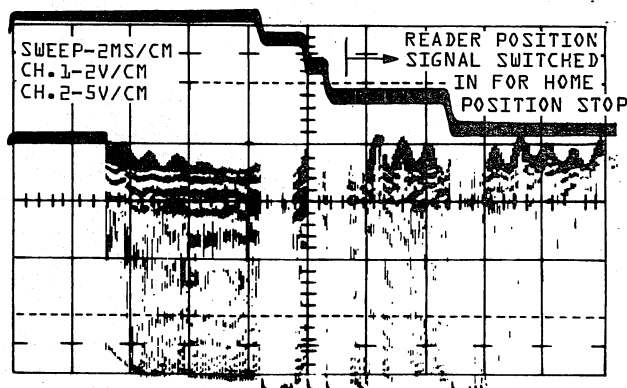


FIGURE 5-29. TYPICAL HORIZONTAL WAVEFORMS

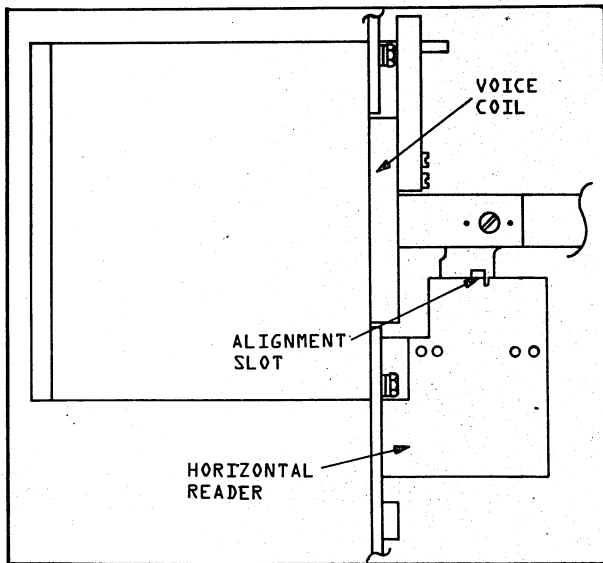


FIGURE 5-30. READER ALIGNMENT

29. Remove the grounds from TP5 and chip G4 pin 13.
30. Initiate a print operation.
31. Sync and monitor TP26 on 7PC3 (Horizontal Ramp). Refer to the oscilloscope waveforms shown in Figure 5-29.
32. Alternately monitor Ref. AC (see Table 5-4) (Tachometer) and Ref. Q (see Table 5-4) (Position) with channel 2 of the scope.
33. Alternately adjust pots P10 and P11 until both Ref. points AC and Q damp out to within 1 volt of the 2.5 volt reference level within 16 msec.
34. Alternately switch the scope trigger polarity for the Ramp signal being monitored on channel 1. Check to see both plus and minus Ramp signals damp out to less than one volt before 16ms. Re-adjust P-11 and P-10 as required to get both ramps to damp out within one millisecond of each other and still in less than 16ms time.

VERTICAL SERVO SYSTEM SET-UP

The following procedure is dependent on the reference voltage set-up in the preceding Horizontal Servo procedure. The reference voltage must be set-up during the Horizontal set-up because it is the most critical. The following procedure will reference the Horizontal procedure if required. Table 5-4 will provide Test Points for different 7PC3 boards.

1. Power the printer down and remove the 15 amp 'H' Switch fuse F1 on 2PC2 (36 volts). Refer to the fuse locator in Section 2.
2. Power the printer on (Stop or the Alarm lamp will flash if installed on the Control Panel).
3. Connect the DVM to Ref. L (see Table 5-4) on 7PC3 and reference TP30 ground (Position Signal).
4. Rotate the tractor shaft slowly through one full revolution.
5. Check that the maximum voltage generated at Ref. L (see Table 5-4) is at least 4 volts and the minimum voltage is 1 volt or less. If these parameters are met skip to step 6.

- 5a. Remove the outer reader housing and adjust the code disk so that it is not rubbing on the reader and recheck step 5. If the code disk is not rubbing repeat the preceding Horizontal Servo system Set-Up.
6. Ground the Vertical advance signal at Ref. H (see Table 5-4) on 7PC3. *TP8*
7. Connect the DVM to Ref. P (see Table 5-4) on 7PC3 and reference TP30 ground (Ramp Signal). *TP16*
8. Adjust pot P6 on 7PC3 to obtain a voltage of 6.95 to 7.05 volts.
9. Remove the ground from Ref. H (see Table 5-4) and rotate the tractor shaft one full revolution to clear error reference. *TP8*
10. Connect the DVM to Ref. 0 (see Table 5-4) on 7PC3 and reference TP30 ground (Vertical Ramp Offset Adjustment). *TP15*
11. Adjust pot P4 on 7PC3 to obtain a voltage of -0.01 to 0.01 volts.
12. Power the printer down and replace the 15 amps 'H' Switch fuse F1 on 2PC2.
13. Power the printer on in the 6 LPI mode.
14. Repeatedly press the Feed switch. *Page Eject*
15. Sync and monitor Ref. L (see Table 5-4) to adjust the vertical slew rate. *TP12*
16. Adjust P6 on 7PC3 for 8.6 ms if the printer has been turned off for more than an hour (see Figure 5-31). If power has been on between 10 and 30 minutes, adjust P6 for 8.5ms. If power has been on over 30 minutes adjust P6 for 8.4 ms.

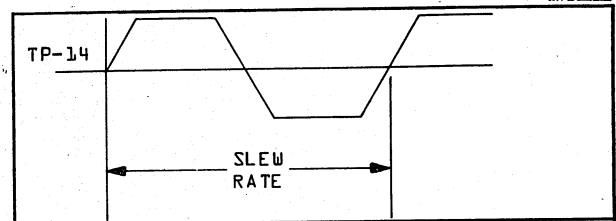


FIGURE 5-31. SLEW RATE

17. Initiate continuous single line advances.
18. Sync + and monitor Ref. P (see Table 5-4) Refer to Figure 5-32.
19. Alternately monitor Ref. W (see Table 5-4) (Tachometer) and Ref. L (Position) with channel 2. *TP12*
20. Adjust Pot P7 on 7PC3 until the position signal (Ref. L, Table 5-4) comes out of saturation at 16ms or less.
21. Recheck the vertical null reference adjusted in the Horizontal Setup by placing the printer in Stop mode and measure Ref. L (see Table 5-4) with a DVM referenced to ground (TP30), for a voltage of 2.45 to 2.55 volts. Adjust P-3 on 7PC3 board.

PAPER RATE LIMITER ADJUSTMENT

1. Power the printer on.
2. Initiate single line advances.

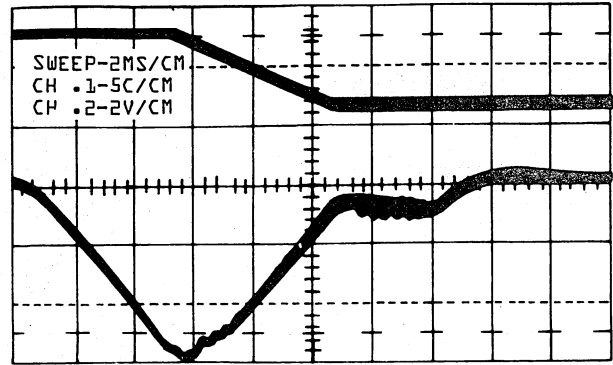
VERTICAL RAMP {SEE TABLE 5-4}

THIS IS THE DRIVING SIGNAL WHICH ADVANCES THE FORMS VERTICALLY THROUGH THE TRACTORS.

TACHOMETER {SEE TABLE 5-4}

THIS SIGNAL MONITORS THE VELOCITY OF FORMS MOTION AND LIMITS SPEED ON MULTIPLE LINE ADVANCES AND BRINGS THE SYSTEM TO A STOP.

7PC3
TP-16 {NEW}
TP-17 {OLD}



VERTICAL RAMP {SEE TABLE 5-4}

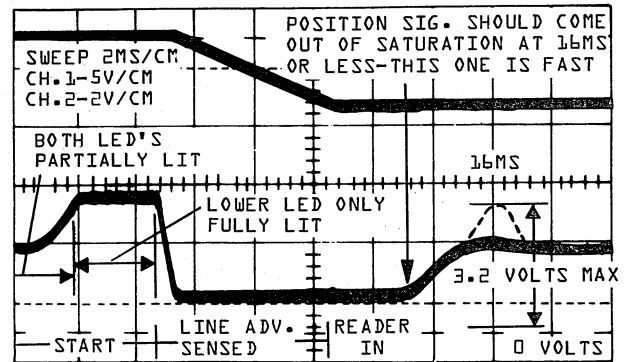
RAMP SIGNAL STARTS AND MAINTAINS FULL VERTICAL DRIVE AS LONG AS THE ADVANCE SIGNAL IS PRESENT.

POSITION SIGNAL {SEE TABLE 5-4}

THIS SIGNAL COMES FROM THE CODE DISK AND READER. DURING ADVANCE THIS SIGNAL IS USED BY THE CONTROLLER TO COUNT THE LINES ADVANCED. WHEN ADVANCE IS REMOVED AND THE RAMP SLOWS THE SYSTEM DOWN, THE READER IS SWITCHED IN FOR FINAL STOP POSITIONING.

7PC3
TP-16 {NEW}
TP-17 {OLD}

TP-12 {NEW}
TP-14 {OLD}



VERTICAL RAMP {SEE TABLE 5-4}

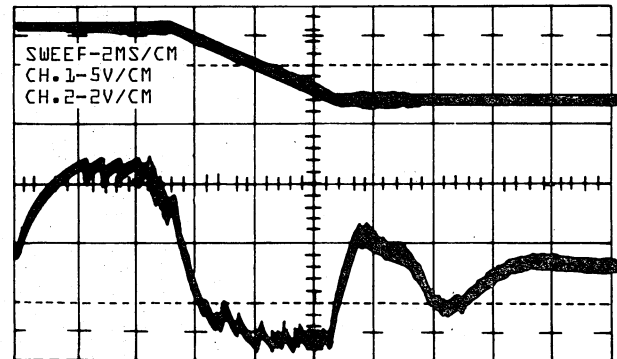
DURING THE RAMP STOP THIS SIGNAL IS MONITORED TO DETERMINE WHEN TO SWITCH IN THE READER POSITION SIGNAL FOR FINAL STOP POSITION {0.1 VOLT}.

CURRENT SIGNAL

THIS IS AN AMPLIFIER VOLTAGE OUTPUT REPRESENTING THE CURRENT WAVEFORM.

7PC3
TP-16 {NEW}
TP-17 {OLD}

TP-28



VERTICAL MOTION ERROR DETECTOR LED

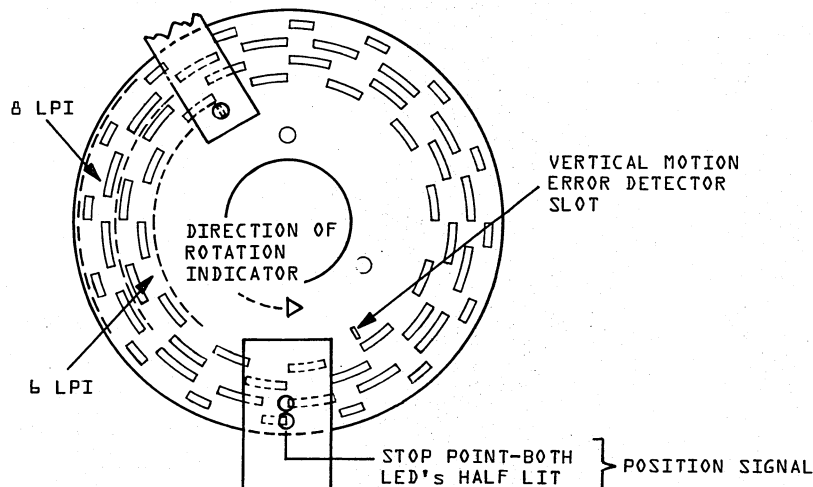


FIGURE 5-32. TYPICAL VERTICAL WAVEFORMS

3. Sync (-) and monitor TP18 on 7PC2 (-Vert. Adv).
4. Monitor chip F3 pin 8 on 7PC2 (Rate Limiter).
5. Adjust pot R55 on 7PC2 so that pin 8 goes to a low level for 54.6 to 60 msec (See Figure 5-33).

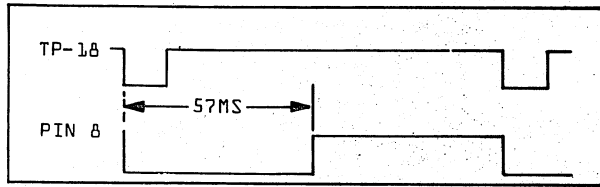


FIGURE 5-33. RATE LIMITOR ADJUSTMENT

GATE LATCH PLATE ADJUSTMENTS

The gate latch plate is installed so that the print gate is held securely against the gate stop. If the latch is not properly adjusted, print quality can be affected and it may also be difficult to open and close the gate. The print gate switch must be properly adjusted to prevent loss of ready mode or damage to the switch.

Tools Required

Feeler Gauge (.015") (.375mm)
 1/4" Open End Wrench or Socket
 7/16" Open End Wrench or Socket
 5/16" Open End Wrench or Socket
 Flat Blade Screwdriver

Procedure

1. Printer powered off.
2. Print gate closed and latched.
3. The .015" (.375mm) feeler gauge must slide easily between the gate structure and the gate latch knob as shown in Figure 5-34. If the gauge does not fit easily, proceed to step 4.
4. Swing open the print gate.
5. Remove the inner paper guide plate.
6. Close the print gate.
7. Loosen the two hex. head mounting screws on the gate latch pin bracket. Adjust the bracket so that the (.015") (.375mm) feeler gauge fits easily between the gate latch knob and gate structure.
8. The print gate switch must be adjusted so that when the gate is in the closed position, the latch actuates the switch but does not bottom it out. Adjust the switch if necessary by loosening the two slotted head screws on the mounting bracket. See Figure 5-34.
9. Reinstall the inner paper guide. Perform the inner paper guide adjustment procedure.

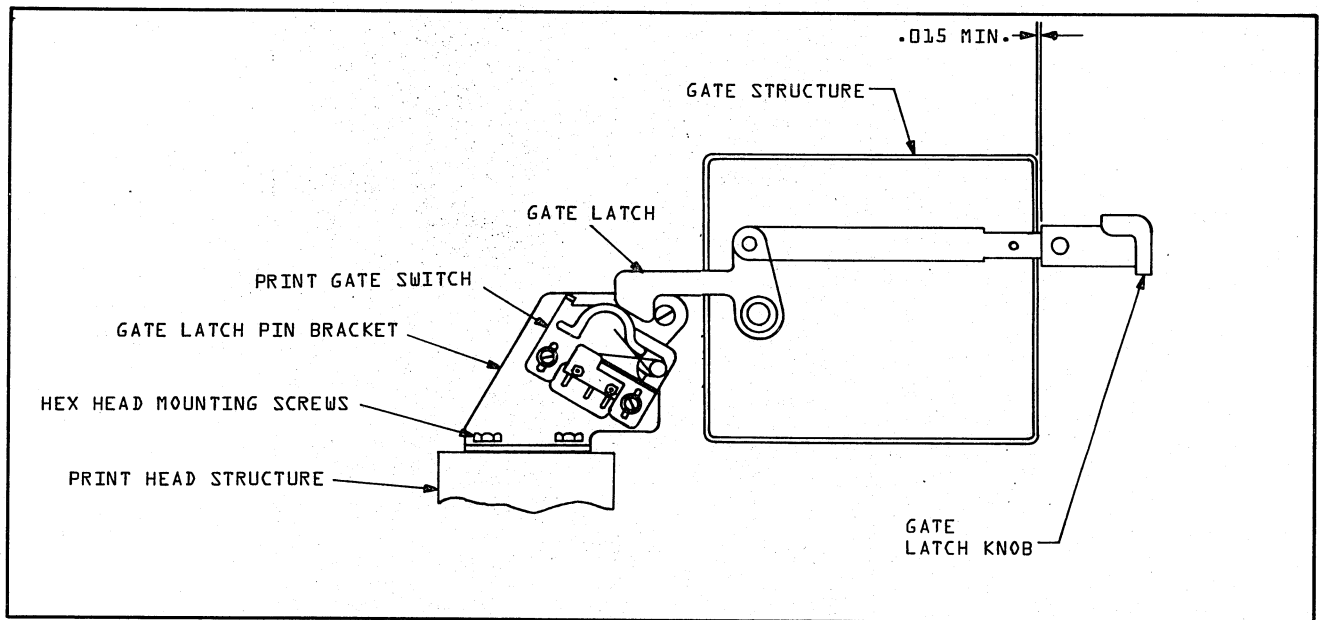


FIGURE 5-34. GATE LATCH PLATE ADJUSTMENT

PAPER CLAMP ADJUSTMENT

This procedure should be performed anytime the paper clamp components have been replaced. It should also be checked if forms tear or forms holes become elongated. Improperly adjusted clamps may also cause the printed lines to appear wavy across the form.

Tools Required

Spring Scale

7/16" Open End Wrench or Socket

Feeler Gauges (.020 & .026 in.) (0.51 & 0.66mm)

1. Printer powered off.
2. Remove the bonnet.
3. Open the print gate.
4. Remove the inner paper guide.
5. Using feeler gauges check that the solenoid armature travel is .020 to .026 inch (.51 to .66mm) as shown in Figure 5-35.
6. Adjust the spring clamp set screws if necessary to achieve the correct travel.
7. Re-install the inner paper guide and perform the inner paper guide adjustment procedure.
8. Install 15 lb. single part paper and briefly operate the printer.
9. Remove the paper from the tractors keeping the power on and gate closed.
10. Using a spring scale, pull the forms up through the throat area and check that the paper drag goes above 4.0 lbs (1.814 kg).

11. Adjust the cable length nut to achieve the proper paper drag and while adjusting pull the paper upward until the clamps release (indicated by a sudden drop in the paper drag).
12. Check at the release point that the adjusting nut is properly seated and then loosen the nut $90^{\circ} \pm 15^{\circ}$.
13. Reinstall the paper in the tractors and briefly operate the printer.
14. Power the printer off.
15. Remove the paper from the tractors.
16. Pull the paper up through the throat area and check that the tension is 1.0 lb. (454g) or less.
17. Re-perform steps 10 through 16 if necessary to achieve the proper tension.

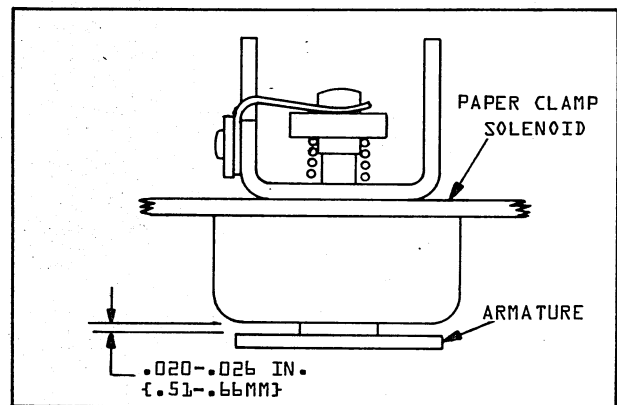


FIGURE 5-35. PAPER CLAMP ADJUSTMENT.

COMPRESSED PITCH PROCEDURE

This procedure is intended to cover the installation and maintenance of the compressed pitch feature. Before a compressed pitch band will function, the printer's compressed pitch feature must be enabled. Maintenance on a printer using compressed pitch will be increased due to the increased sensitivity of the print hammer flight time adjustment.

Requirements:

1. Compressed pitch jumper.
2. Compressed pitch linefinder.
3. Compressed pitch print band.
(Refer to the parts manual)

Printer Compressed Pitch Feature

The printer can detect a compressed pitch band if the compressed pitch jumper is installed. The jumpers installation can be verified by removing the bonnets ground strap and then the bonnet. The jumper is located in the harness connector P3 at the 7PC3 board. The jumper is connected at the back of P3 between pins 8 and 21.

Jumper Installation Procedure

1. Remove bonnet ground strap and bonnet. Remove pedestal rear cover and paper bail.
2. Open logic boards to 7PC3.
3. Disconnect P3 on 7PC3.
4. Connect jumpers pins into pins 8 and 21 on the harness side of P3.
5. Complete the band installation procedure following before replacing the bonnet, rear cover, and paper bail.

Column Indicator Installation

1. With a standard band installed, obtain a printout of all one full width character like an "M". Adjust the Phasing Control on the control panel for best print quality with minimum character side clipping. Do not remove the form with the printout from the printer, but compare the character columns to the linefinder label. The characters must appear consistent across the line to the marks on the linefinder or hammer flight time adjustment is required. Do not try to adjust the flight time of all the hammers if the linefinder sticker is just mis-positioned. As long as the printed characters appear equally spaced as compared to the linefinder marks, then flight time adjustment is not required at this time.

WARNING

NOISE LEVEL UNDER BONNET
WHILE PRINTING MAY BE
HAZARDOUS TO HEARING. KEEP
EXPOSURE TO A MINIMUM.

2. Perform the hammer flight time adjustment on the hammer columns that appear horizontally shifted from the average or on those columns where the printed character is clipped or missing on one side. Remember a hammer column prints more than one column in a print line. Flight time errors will appear in groups of four on a 300 LPM printer and in groups of two on a 600 LPM printer.

3. Make sure the compressed pitch jumper is installed in the printer. Refer to the previous procedure on jumper installation.
4. Refer to the following procedure and install a compressed pitch band.
5. With the compressed pitch band on and operating, carefully peel off the old linefinder if it is not a combination label covering both 136 and 204 print locations. The linefinder sticks to the top edge of the throat plate.
6. Clean the mounting surface on the top of the throat plate with alcohol.
7. Without removing the backing on the combination linefinder lay the linefinder in position in front of the printout. Compare a line of characters to the marks on the linefinder. The end hammers may not always align, so use the middle and ends to determine the most correct location. Mark the linefinder position with a pencil, any end or group of characters slightly misaligned may be correct by flight time adjustment.
8. Remove the linefinder backing and carefully position the linefinder in the marked location.
9. Check the printout to the new linefinder for character groups horizontally misaligned or clipping on one side. Remember in compressed pitch one hammer prints more locations than in standard pitch. On a 300 LPM printer look for groups of six adjacent characters misaligned, and on a 600 LPM printer look for groups of three.
10. Refer in this section of the manual to the Flight Time Adjustment procedure to make print hammer corrections.

Band Installation

1. Power the printer off.
2. Open the bonnet and gate, and then remove the upper gate protective cover if not already done.
3. Pivot the outer paper guide away from the band. Rotate the band tension lever clockwise. Carefully lift up and remove any band already installed.
4. Has the compressed pitch jumper been installed in the printer. Refer to the previous procedure on jumper installation.
5. Check the contents and character set of the compressed pitch band kit. Bands with 64 or 96 characters without Programmed Read Only Memories (PROM's) supplied with the kit, may be installed on the printer. Bands with 48 or 128 characters or any band supplied with PROM's in the kit, require a check be made on component locations G6 and H6 of the 7PC1 board. Remove the bonnet and its ground strap, rear cover, and paper bail to check the 7PC1 board. If PROM chips are in locations G6 and H6, they should be the same as those supplied with the band. If no PROM's are installed, then those supplied with the band must be installed in the proper location, as indicated by the parts

manual under the band kit number. Boards with DIL chips (shorting jumper chips) would normally not have bands with PROM's, and could use any of a special set of bands from 48 to 128 characters with only the DIL chips. Standard bands used on a printer normally with DIL chips would require a set of PROM's regardless of the number character set.

6. Install the compressed pitch band with character right side up as normally read. Position the band carefully around the pulleys and down between the character magnetic pickups. The band should rest on the band edge guide rollers. Make sure the correct band is installed, a compressed pitch band has two Home Timing marks close together. Home timing marks are above the characters on the band, and Character timing marks are below.
7. Turn the manual band advance counter-clockwise while slowly turning the band tension lever counter-clockwise. This should position the band up against the upper band guide. Refer to the Figures in the Operation section of the manual.
8. Install the upper gate protective cover and outer paper guide if required.
9. Close the gate and power on the printer.
10. Print an all one character (M) pattern and adjust the control panel Phasing Control for best print quality with minimum character side clipping.
11. If a compressed pitch linefinder is already installed on the printer, check and adjust the hammer flight time for best print quality. If the linefinder is to be installed, refer back to the column indicator procedure. Refer to this section of the manual for the Flight time Adjustment procedure.

BAND COVER INTERLOCK SWITCH ADJUSTMENT

This interlock switch prevents power from being applied to the printer's gate with band cover removed or not fastened properly. Check this switch adjustment if the printer fails to operate, or is intermittent.

Tools Required

Latch 1/4 turn (optional-Setup)

Setup Procedure

1. Power the printer off and open the bonnet.
2. Remove the band cover.
3. Insert an non-metal object like a plastic writing pen into the center band cover fastener hole on the top of the gate.
4. Power the printer on with forms and ribbon installed, and the gate closed.
5. If the band operates for the first 30 seconds before the band times out and stops, then the switch is operational.
6. If the problem appears corrected as determined from the printers prior to operation, then the band cover interlock switch must be raised.
7. Power the printer off and remove the print band.
8. Remove the shield band edge from the front of the gate to gain access to the screws holding the interlock switch.
9. If a new switch is being installed, loosen the two screws holding the interlock switch assembly and lower the switch assembly to its lowest position.
10. Raise the switch assembly in small increments, each time tightening the two screws and checking the printers operation. Using the latch quarter turn tool will save the time required removing and installing the band cover. Keep the switch position as low as possible to ensure the band cover is correctly installed and latched. The band cover installed but not latched must prevent printer operation. The center band cover quarter turn latch controls the interlock operation and must be turned ninety degrees. When checking the printers operation, the Shield Band Edge must be replaced and the band installed.

PARTS REPLACEMENT

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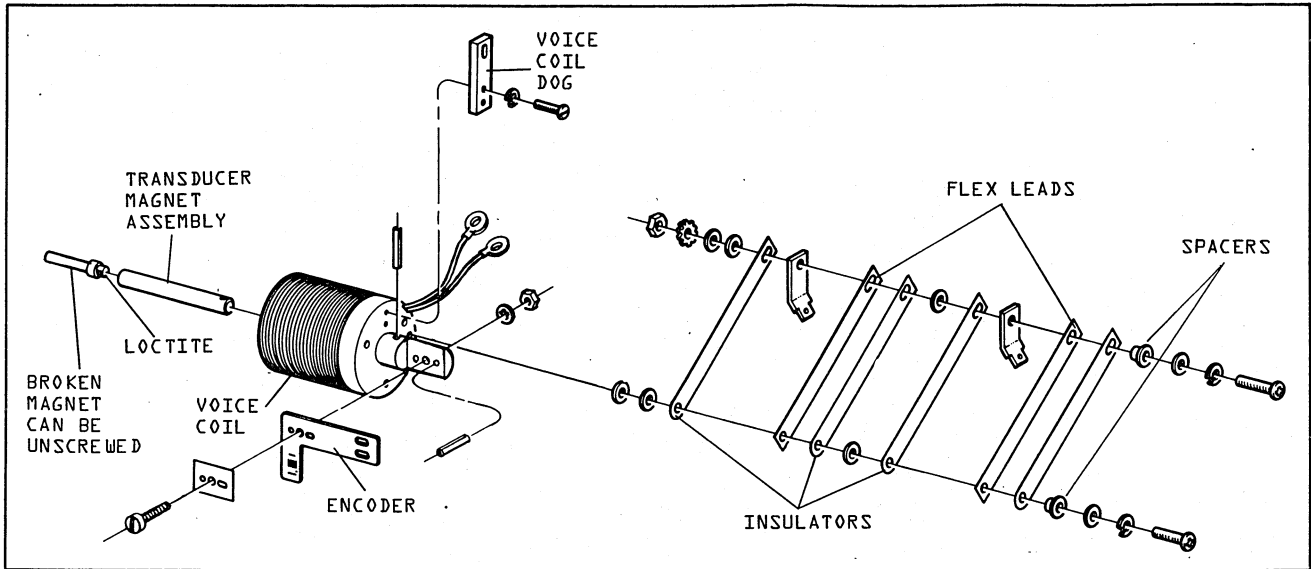


FIGURE 5-35. VOICE COIL ASSEMBLY

VOICE COIL REMOVAL AND REPLACEMENT

1. Power printer off.
2. Remove inner paper guide.
3. Remove the two (2) screws securing the encoder plate to the hammer bar (see Figures 5-35 and 5-36).
4. Remove the nut from the outside of the side plate that secures the flex leads.
5. Unplug the two leads from the flex lead assembly.
6. Remove the two screws that secure the voice coil dog and slide it off its mounting pin.
7. Unplug the two leads connected to the tachometer.
8. While holding onto the outer housing remove the three screws holding the housing to the side plate.
9. Slide the housing out to the left while holding onto the voice coil.
10. Remove the voice coil carefully so as not to bend or otherwise damage the encoder. Pull the coil to the left until the encoder clears the reader, then twist counter clockwise to clear the encoder from the reader.
11. Remove the bolt holding the encoder to the voice coil and slide the encoder off the locating pins.
12. Remove the screw holding the flex leads to the voice coil. Do not lose any of the spacers.
13. Support the voice coil post and drive out the roll pin securing the transducer magnet assembly with a small punch and slide out this assembly.
14. Install the transducer magnet assembly in the new voice coil and secure with the roll pin. Make sure

the voice coil post is supported to prevent bending while driving in the roll pin.

15. Reconnect the flex leads to the voice coil as shown in the figure below.
16. Slide the encoder on the locating pins of the new encoder and secure with the bolt taken from the old voice coil.
17. Install the voice coil dog and install the screws holding it to the voice coil.
18. Position the voice coil with the encoder in the reader slot.
19. Slide the outer housing over the voice coil so that the voice coil dog mounting pin protrudes through the side casting.

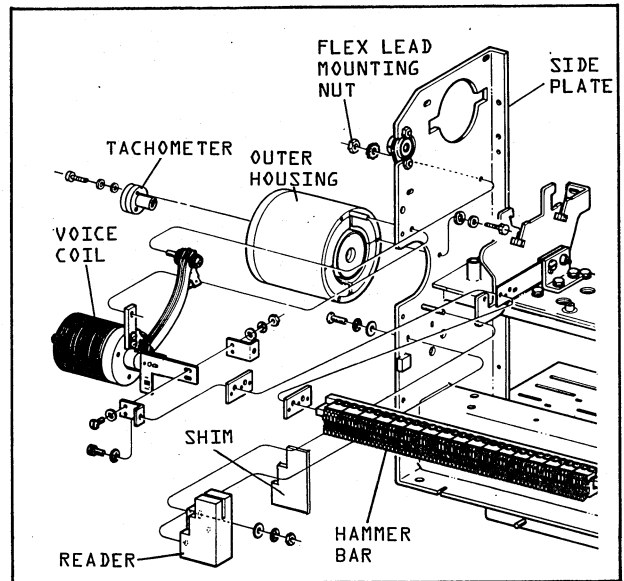


FIGURE 5-36. VOICE COIL REPLACEMENT

20. Fasten the outer housing in place using the three mounting screws.
21. Connect the tachometer leads, red lead to the terminal with the red dot.
22. Re-connect the flex lead assembly to the side plate.
23. Re-connect the two fast-on leads to the flex lead assembly, red lead corresponds to the red lead from the voice coil.
24. Attach the encoder to the hammer bar with the two screws removed in step 3 but do not tighten the screws completely.
25. Perform the Hammer Bar Home Position Alignment procedure.

HORIZONTAL READER REPLACEMENT

1. Printer powered off. If the printer incorporates an EVFU assembly refer to the Special Option manual and remove the reader assembly.
2. Open the gate and remove the inner paper guide.
3. Remove the seven bolts holding the paper clamp assembly. Disconnect the wire to the clamp solenoid and remove the paper clamp assembly.
4. Use a 1/4 inch socket set or spin tight to remove the nut and washers holding the reader from inside the frame.
5. Remove the two screws holding the reader in place from the outside of the frame. Retain the shim if installed between the reader and frame. Lower the reader down and off the encoder.
6. Disconnect the connector from P9 on the 7PC3 board. Cut the tie raps required to free the cable.
7. Check the shim removed if a new one is not on hand. If the shim has an imprint of the old reader, it should not be reused.
8. Check the mounting surface of the new reader and if it is flat then a mounting shim is required. If base material has been machined away around the mounting screw holes then a shim is not required. However, a shim can be used with the new reader and decreased any horizontal encoder adjustment required.
9. Mount the reader and shim as determined above.
10. Tie rap the cable in place and connect to P9 of the 7PC3 board.
11. Connect the paper clamp solenoid wire and mount the paper clamp assembly with seven bolts.
12. Perform the Horizontal Servo System Setup procedure.
13. Perform the Hammer Bar Home Position Alignment procedure.
14. Install the inner paper guide.
15. Perform the Inner Paper Guide Adjustment procedure.
16. Reinstall the EVFU assembly on those printers incorporating an EVFU.

BAND MOTOR REPLACEMENT

1. Printer powered off and open the bonnet.
2. Remove the lower protective cover and open the the print gate.
3. Remove the band cover and the print band.
4. Remove the shield band edge
5. Loosen the set screw through the hole in the gate frame, behind the shield band edge, that holds the band positioning knob to the motor and remove the knob.
6. Loosen the four screws holding the motor mounting plate and slide the drive belt off the pulley.
7. Remove the mounting plate screws and slowly lower the motor assembly.
8. Unplug the two motor leads and remove the motor assembly.
9. Loosen the set-screw that secures the drive pulley to the motor shaft and slide the pulley off.
10. Remove the four screws that hold the motor to the mounting plate.

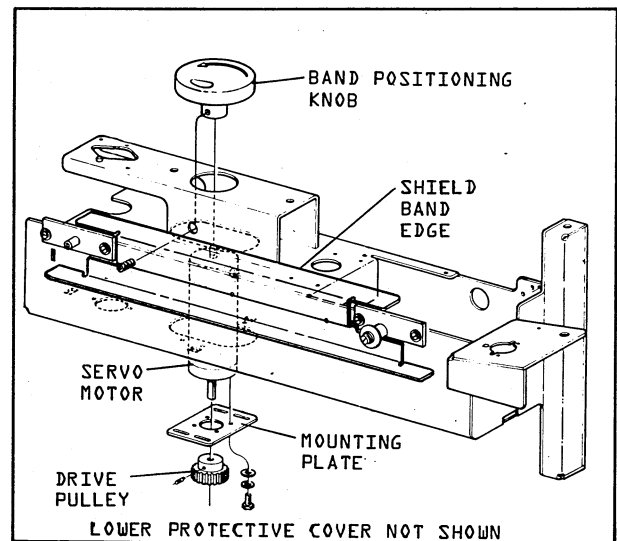


FIGURE 5-37. BAND MOTOR REPLACEMENT

11. Use the same four screws to secure the new motor to the mounting plate.
12. Position the drive pulley on the motor shaft and tighten the set screw.
13. Plug the two leads onto the motor, red lead goes to the terminal with the red dot.
14. Slide the motor assembly up into the gate assembly and attach the mounting plate to the gate with the four screws removed in step 5.
15. Slide the band position knob onto the top of the motor and tighten the set-screw.
16. Install the shield band edge.
17. Install the print band and band cover.
18. Reinstall the band drive belt.
19. Perform the Belt Tension Adjustment procedures and then replace the lower gate protective cover.

FORMS MOTION COMPONENT REPLACEMENT

Tachometer Replacement

1. Printer powered off.
2. Remove the ground strap and lift off printer bonnet.
3. Remove the paper bail.
4. Disconnect the return spring from the tachometer assembly.
5. Pull loose the tachometer leads.
6. Loosen the locking collar holding the tachometer to the servo motor and slide the tachometer out of the motor shaft.
7. Remove the spring plate from the old tachometer and mount it on the new tachometer.
8. Slide the new tachometer in to the motor shaft and secure it with the locking collar.

9. Reconnect the two leads to the tachometer; black to pin 1 and red to pin 2.
10. Connect the return spring to the tab on the tachometer spring plate.
11. Reinstall the paper bail.
12. Replace the printer bonnet.

6/8 Line Micro-switch Replacement

1. Power the printer off.
2. Remove the ground strap and lift off the printer bonnet.
3. Remove the five screws that hold the position reader cover in place and remove the cover.
4. Remove the two screws that hold the micro-switch in place and remove the switch.
5. Note the lead connections and unsnap the leads from the old switch and connect them to the new switch.
6. Position the new switch in the reader and secure with the same mounting screws.
7. Replace the reader cover and check continuity at the switch terminals. Check to see the N. O. and N. C. contacts function when the switch is moved between 6/8 LPI. The switch is actuated in the 8 LPI (down) position.
8. Replace the printer bonnet.

Position Reader Replacement

1. Perform steps 1 through 4 of the 6/8 Line Micro-switch Replacement procedure.
2. Cut all the ty-raps between the reader and plug P8 on 7PC3 that secure the reader cable.
3. Slide the position reader down and out of the assembly.
4. Using the pin extraction tool remove the four reader leads from plug P8 (see Special Tools).

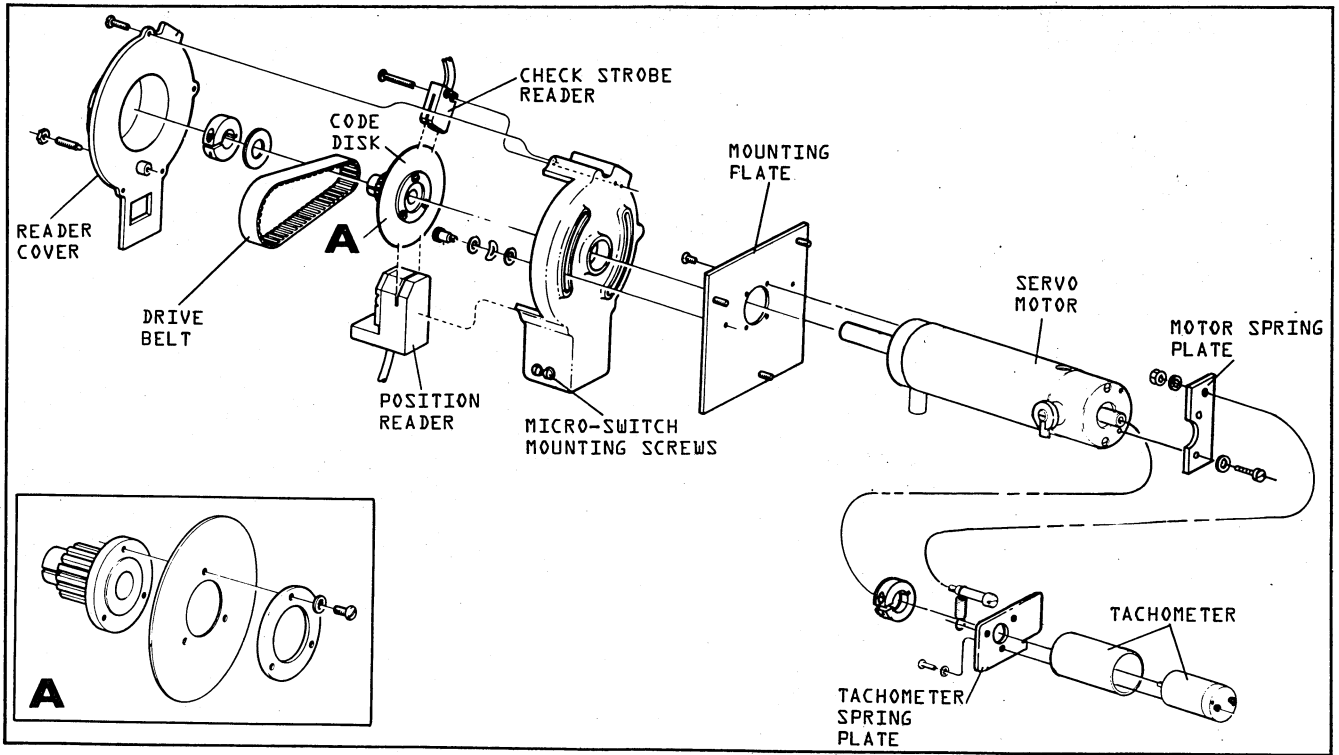


FIGURE 5-38. FORMS MOTION COMPONENT REPLACEMENT

5. Insert the new reader leads in plug P8.
6. Insert the new reader in the reader assembly.
7. Position the micro-switch beneath the reader and secure with the two mounting screws.
8. Replace the ty-raps that were cut off in step 3.
9. Replace the reader cover.
10. Replace the printer bonnet.

Check Strobe Reader Replacement

1. Perform steps 1 through 3 of the Position Reader Replacement procedure.
2. Remove the paper shroud.
3. Loosen the three nuts that hold the motor mounting plate to the printer side plate.
4. Loosen the locking collar that holds the forms positioning knob to the tractor shaft and slide the knob off the tractor shaft.
5. Remove the forms drive belt.
6. Loosen the locking collar that holds the code disk assembly to the drive shaft.
7. Remove the two screws securing the check strobe reader and slide the reader and the code disk assembly out of the reader assembly.
8. Using the pin extraction tool, remove the four reader leads from plug P8 on 7PC3.
9. Insert the new reader leads in plug P8.
10. Place the code disk assembly in the reader slot and slide the code disk assembly back onto the the drive shaft.
11. Secure the reader in place using the same two mounting screws and tighten the code disk locking collar.
12. Slide the position reader into the assembly.
13. Position the micro-switch beneath the reader and secure with the mounting bolts.
14. Place the drive belt on the drive pulley.
15. Loop the drive belt around the forms positioning and reposition the knob on the tractor shaft. Tighten the locking collar.
16. Perform the Belt Tension Adjustment procedures.
17. Reinstall the paper shroud and the printer bonnet.

Servo Motor Replacement

1. Printer powered off.
2. Remove the ground strap and lift off the bonnet.
3. Remove the paper bail.

4. Disconnect the return spring from the tachometer assembly.
5. Loosen the locking collar holding the tachometer to the motor and slide the tachometer out of the motor shaft.
6. Remove the two screws that hold the spring plate to the servo motor and remove the plate.
7. Cut the ty-raps around the motor.
8. Unplug the leads from the motor.
9. Remove the five screws that hold the position reader cover in place and remove the cover.
10. Remove the two screws that hold the micro-switch in place and remove the switch.
11. Slide the position reader down and out of the assembly.
12. Loosen the three nuts that hold the motor mounting plate to the printer side plate.
13. Loosen the locking collar that holds the forms positioning knob to the tractor shaft and slide the knob off the tractor shaft.
14. Remove the forms drive belt.
15. Loosen the locking collar that holds the code disk assembly to the motor shaft.
16. Remove the two screws securing the check strobe reader and slide the reader and code disk assembly out of the reader assembly.
17. Remove the two shoulder screws that secure the reader housing to the motor mounting plate and remove the housing.
18. Unplug the air plenum hose from the servo motor.
19. Remove the four screws that hold the motor to the mounting plate and remove the motor.
20. Position the new motor against the mounting plate and secure with the same four screws.
21. Reconnect the air plenum hose to the motor.
22. Mount the reader housing on the mounting plate with the two shoulder screws and their spacers.
23. Slide the check strobe reader and the code disk assembly back into the reader assembly.
24. Secure the reader with the two mounting screws.
25. Tighten the code disk assembly locking collar.
26. Slide the position reader into the assembly.
27. Position the micro-switch beneath the reader and secure with the two mounting bolts.
28. Place the drive belt on the drive pulley.
29. Loop the drive belt around the forms positioning knob and reposition the knob on the tractor shaft. Tighten the locking collar.

30. Plug the two leads into the new motor. Red lead to the terminal with the red dot.
 31. Secure the spring plate to the motor using the two mounting screws.
 32. Slide the tachometer into the motor shaft and secure it with the locking collar.
 33. Connect the return spring to the tab on the tachometer spring plate.
 34. Ty-rap the motor and tachometer leads to the body of the motor.
 35. Perform the Belt Tension Adjustment procedure.
 36. Reinstall the paper shroud and the printer bonnet.
5. Unplug the hammer drive cables.
 6. Lift the armature bar out of the printer.
 7. Unclip the residual strip and remove it.
 8. Remove the two mounting screws of the defective armature and remove the armature.
 9. Using the pin extractor tool, remove the armature leads from the plug.
 10. Plug in the two leads of the new armature.
 11. Position the new armature in the armature bank and secure it with the mounting screws. Be careful not to crossthead the special nuts retained by clips to the frame.

ARMATURE REPLACEMENT

1. Printer powered off.
2. Remove the ground strap and lift off the printer bonnet.
3. Remove the paper bail.
4. Remove the three hex head screws that hold the armature bar in position.
5. Unplug the hammer drive cables.
6. Lift the armature bar out of the printer.
7. Unclip the residual strip and remove it.
8. Remove the two mounting screws of the defective armature and remove the armature.
9. Using the pin extractor tool, remove the armature leads from the plug.
10. Plug in the two leads of the new armature.
11. Position the new armature in the armature bank and secure it with the mounting screws. Be careful not to crossthead the special nuts retained by clips to the frame.
12. Reinstall the residual strip.
13. Place the armature bank back in the printer and secure it with the three mounting screws.
14. Plug in the hammer driver cables.
15. Perform the Flight Time Adjustment procedure.
16. Reinstall the paper bail and the printer bonnet.

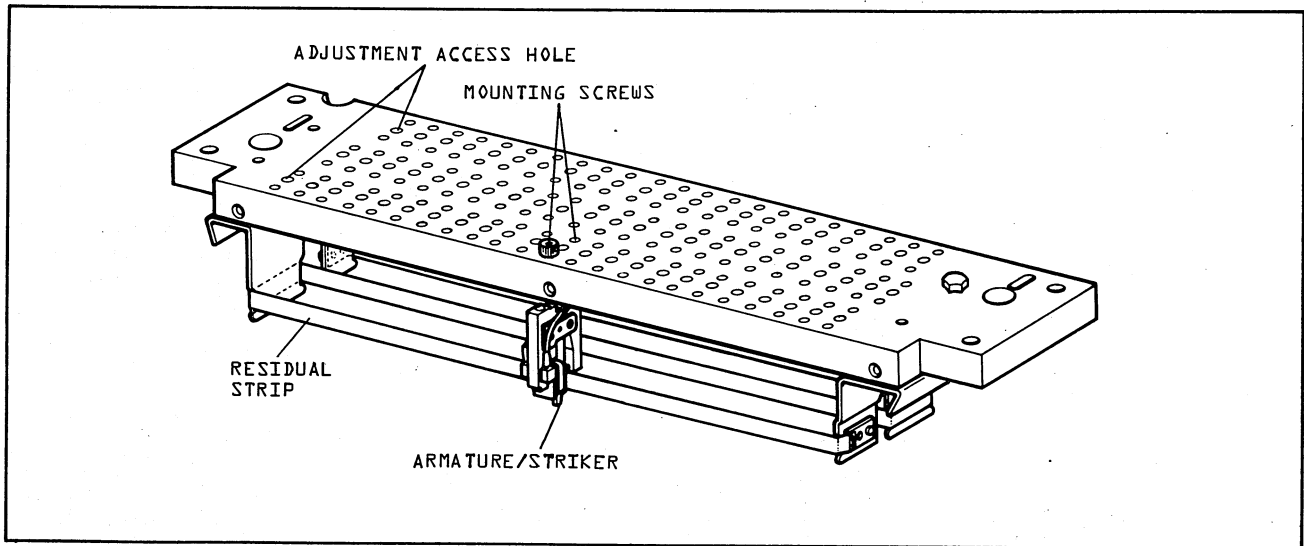


FIGURE 5-39. ARMATURE REPLACEMENT

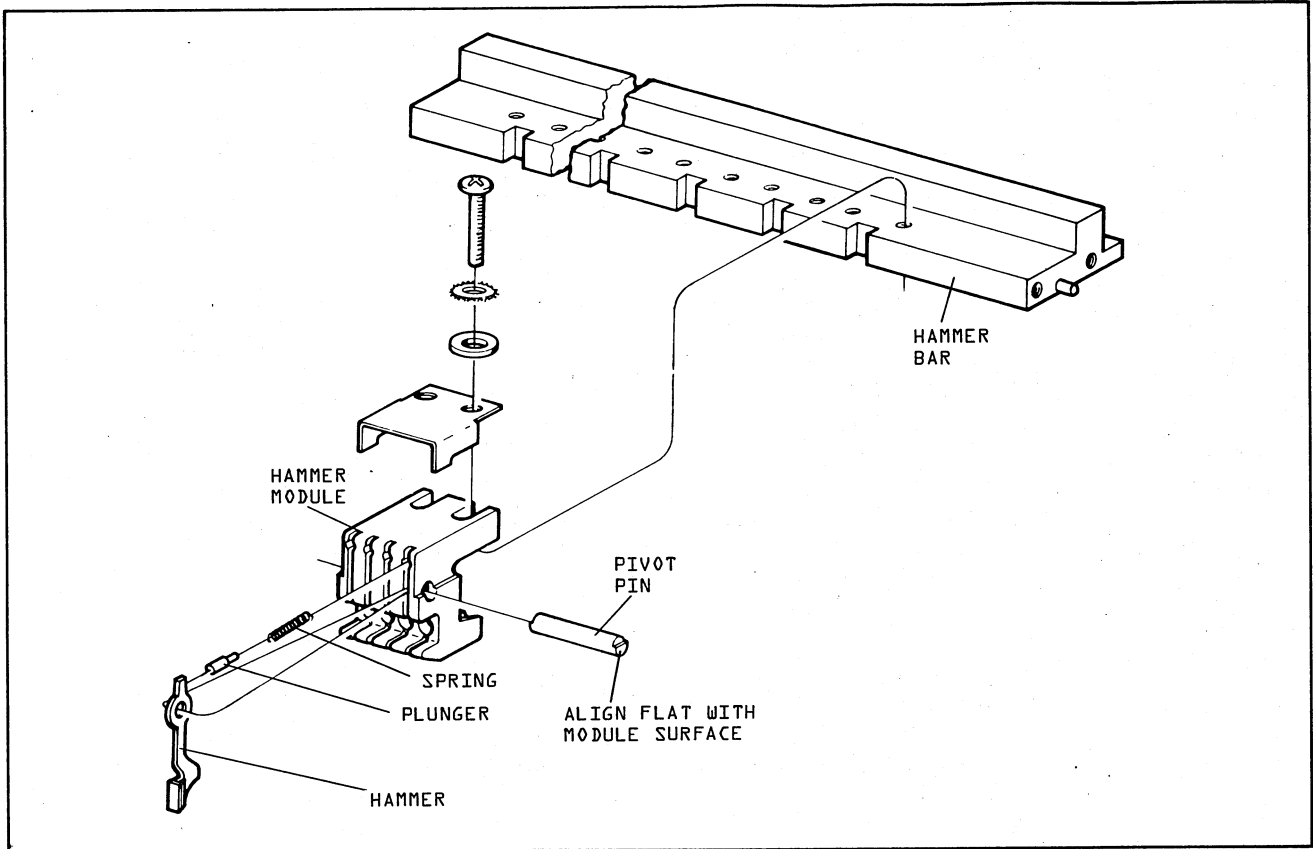


FIGURE 5-40. PRINT HAMMER REPLACEMENT

PRINTER HAMMER REPLACEMENT

1. Printer power off.
2. Remove the inner paper guide.
3. Locate the module containing the defective hammer.
4. Remove the two module mounting screws and slide the module off the hammer bar.
5. Slide the pivot pin out of the module until the defective hammer can be reached.

CAUTION

THE HAMMERS AND PLUNGERS ARE SPRING LOADED AND WILL SHOOT OUT UNLESS THEY ARE RELEASED SLOWLY.

6. Place the new hammer in the module and slide the pivot pin back into the module.
7. Mount the module back on the hammer bar.
8. Reposition the inner shroud.

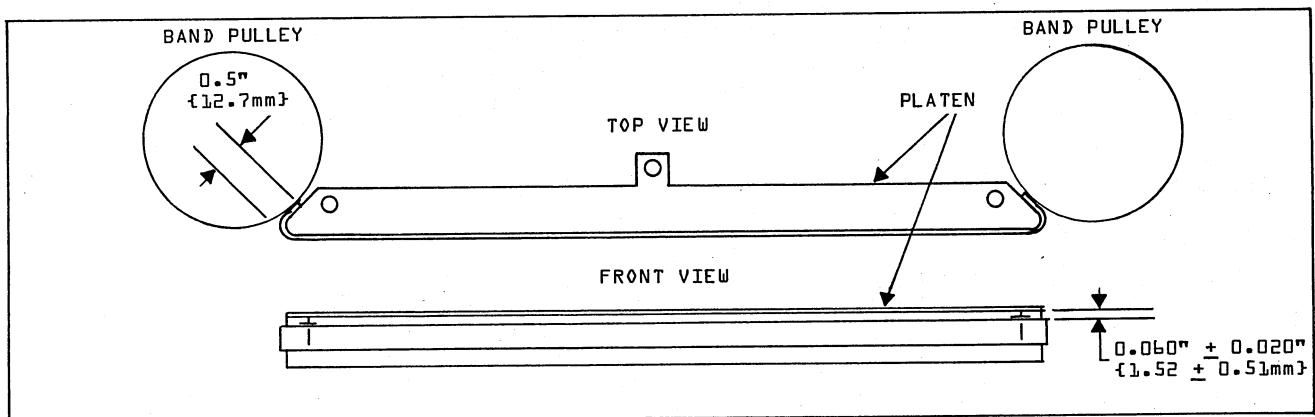


FIGURE 5-41. PLATEN WEAR STRIP

PLATEN WEAR STRIP REPLACEMENT

Replace the platen wear strip at the first signs of fraying, peeling or wearing. The wear strip must also be replaced if a band breaks during operation. Also check the Upper Band Guide wear strip for damage. The wear strip on the Upper Band Guide is not replaceable and requires a new Upper Band Guide.

1. Open the printer cabinet and remove the band cover.
2. Open the gate and remove the band.
3. Peel off the old wear strip (bearing tape).
4. Make sure the platen is clean. Any sticky residue may be removed by rubbing with finger tip. Wipe the platen off to remove oil from fingers, ribbon ink, and paper dust (alcohol may be used).
5. Place a vertical pencil mark one inch from each end of the new wear strip (front side). The wear strip should be 15 inches (380mm) in length.
6. The new wear strip will be positioned 0.060" (1.52 mm) down from the top of the platen. In the space above where the wear strip will be positioned, place a vertical mark a half inch (12.7mm) from each end of the platen.
7. Measure down with a scale from the top edge of the platen at or near the vertical marks. Place a horizontal mark 0.060" (1.52mm) down from the top of the platen, ± 0.020 " (0.51mm).
8. Remove the sticky back protection on the new wear strip very carefully.
9. Hold the new wear strip near the ends and hold it up in front of the platen. Visually align the vertical and horizontal marks and stick the wear strip in place.
10. Smooth the wear strip in place across the platen and carefully fold the ends around the ends of the platen.

CONTROL PANEL LENS AND LAMP REPLACEMENT

1. Printer powered off.
2. Remove the lens by placing a screwdriver in the groove on the side of the lens and prying up. See Figure 5-42.

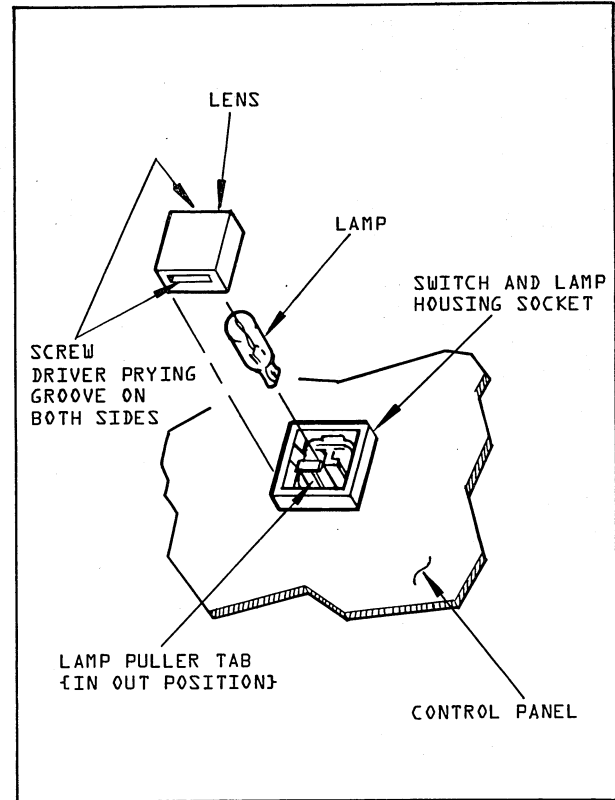


FIGURE 5-42 CONTROL PANEL LENS AND LAMP REPLACEMENT

3. Place a screwdriver under the tab on the lamp puller and pull it out until the lamp is disengaged from its socket.
4. Remove the lamp.
5. Push down on the lamp puller tab until it is seated.
6. Place a new lamp in the switch and lamp housing socket so that the lamp contacts are in line with the right and left socket contacts.
7. Push down on the top of the lamp until it is seated in the socket.
8. Place the lens on top of the switch and lamp housing socket and push down on the lens until it snaps in place.

TRACTOR REMOVAL AND REPLACEMENT

1. Printer powered off.
2. Remove the bonnet.
3. Remove the paper bail and top gate protective cover.
4. Remove the paper motion verification sensor from the right tractor.
5. Loosen the lower tractor shaft mounting hardware and remove the outer hex. head nuts.
6. Loosen the collar clamp and remove the forms adjusting knob from the upper shaft. See Figure 5-43.
7. Loosen the set screws which hold the shaft bearings on the upper shaft.
8. Slide both shafts to the left until the right ends clear the right side of the printhead structure.
9. Swing the two shafts toward the front of the print-head and slide the tractors off the right end of the shaft.

10. Replace or repair the tractors as required.
11. Slide the shafts to the right as far as possible. The shoulders on the shafts will locate the shafts on the right side. Reinstall the outer retaining nut on the right side only.
12. The inner nut on the lower shaft must first be positioned so that it just touches the print head. The outer retaining nut should then be tightened.

CAUTION

DAMAGE TO THE PRINTHEAD STRUCTURE MAY OCCUR IF EITHER THE INNER OR OUTER RETAINING NUTS ARE IMPROPERLY TIGHTENED.

13. Tighten the upper shaft bearing set screws.
14. Reinstall the forms adjusting knob and drive belt.
15. Perform the tractor alignment procedure.

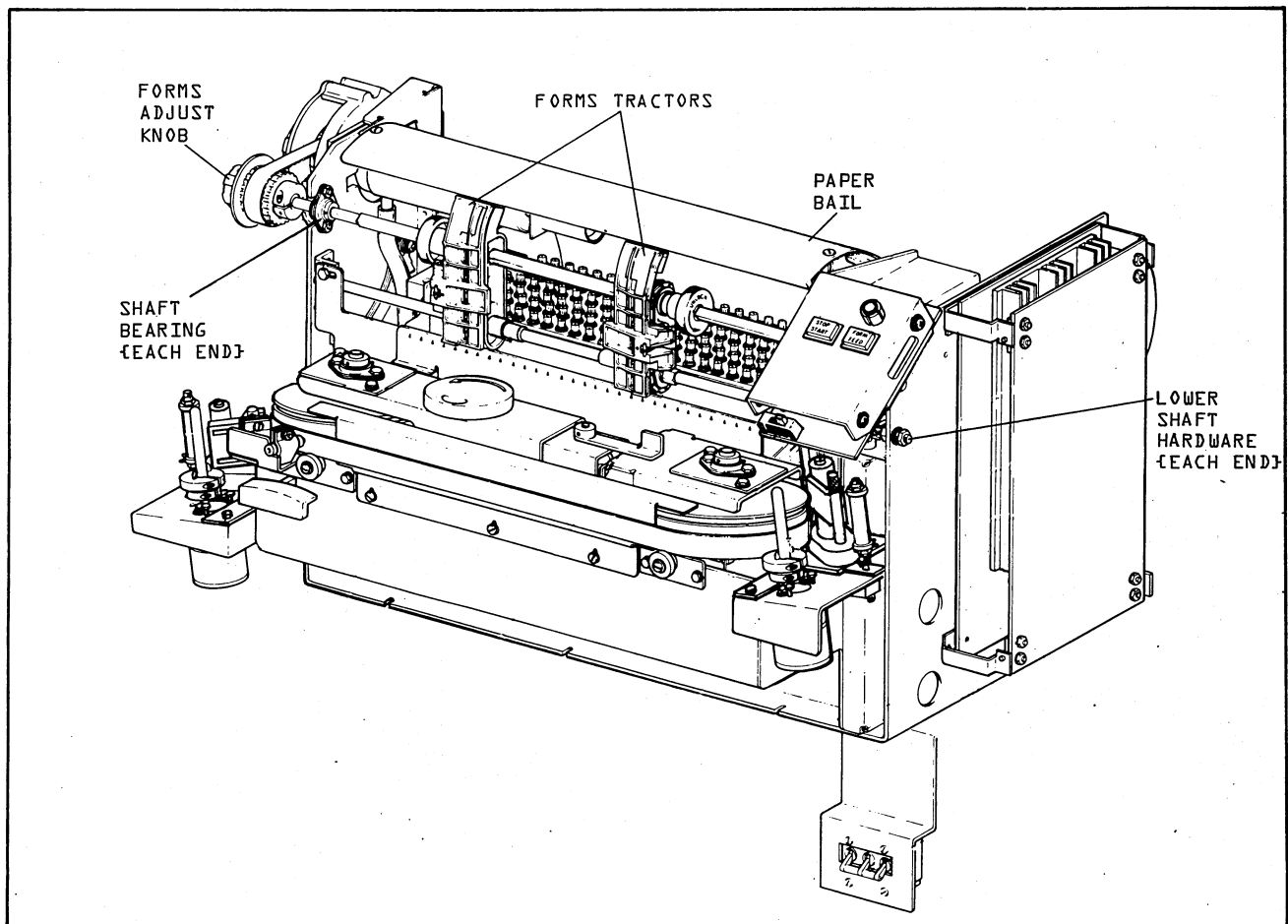


FIGURE 5-43 TRACTOR REMOVAL AND REPLACEMENT

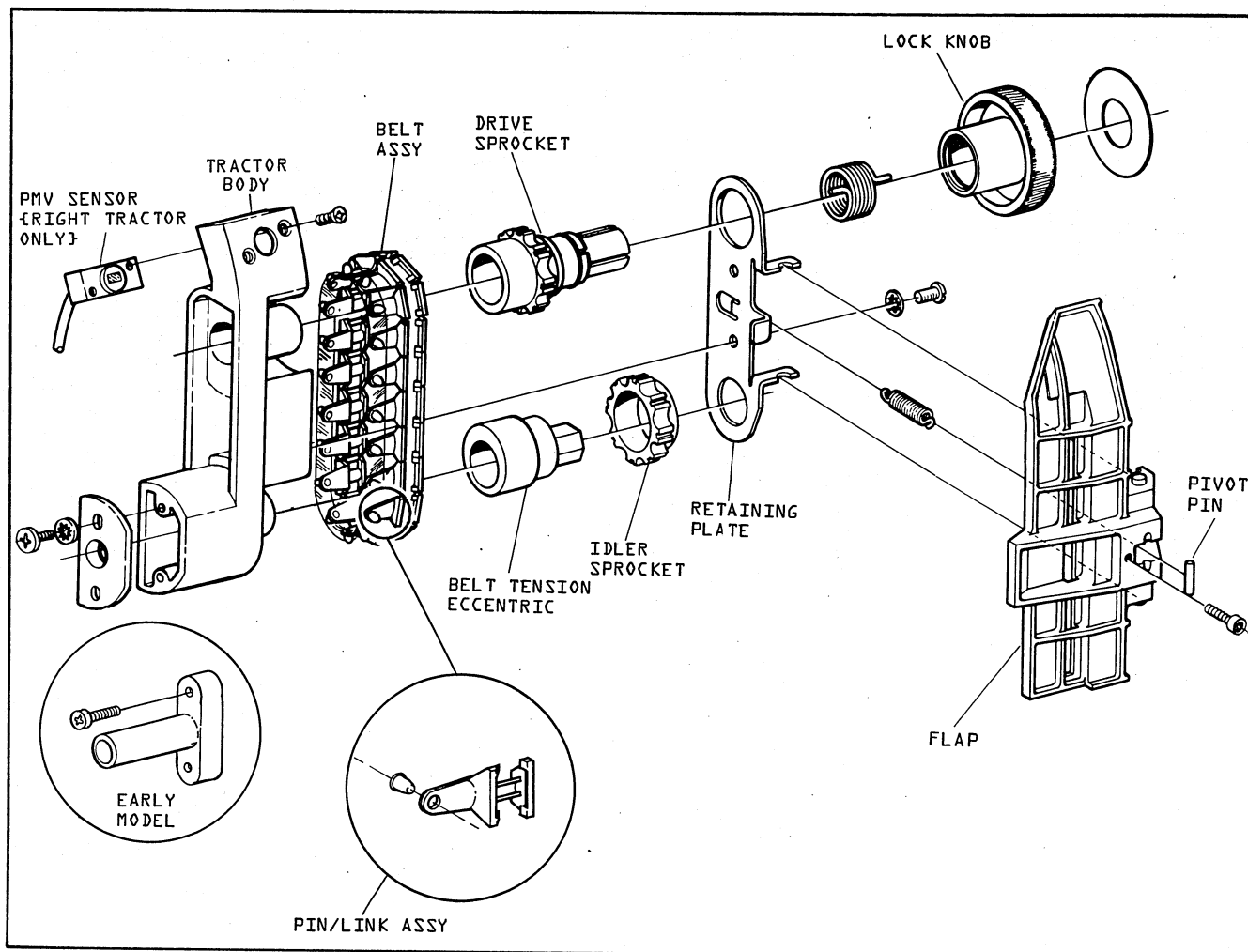


FIGURE 5-44. TRACTOR COMPONENTS LOCATER

TRACTOR COMPONENTS REPLACEMENT

NOTE

THE TRACTOR FLAP AND PIN/LINK ASSEMBLY COMPONENTS MAY BE REPLACED WITHOUT TAKING THE TRACTOR ASSEMBLY OFF THE PRINTER.

Flap Replacement

1. Printer powered off.
2. Open the print gate.
3. Remove the flap spring from around the pin making sure that the pivot pin does not fall into the other printer components.
4. Remove the flap.
5. Replace the flap and re-install the pivot pin and spring.
6. Perform the Tractor Flap Clearance procedure.

Pin/Link Assembly Replacement

1. Printer powered off.
2. Remove the bonnet and paper bail.
3. Remove the lock knob by pulling it off the tractor body. If necessary pry at the base of the knob using a large flat blade screwdriver.
4. Remove the screws holding the retaining plate on the tractor body and slide the plate away from the tractor body.
5. Slide the belt and sprockets off the tractor body.
6. Remove the chad remover plastic strip.
7. The pin/link assembly can now be removed by twisting it off the belt.
8. Replace the pin/link assembly.
9. Reinstall the belt and sprockets.

10. Reinstall the retaining plate making sure that the serrations in the plate properly mate with the belt tension eccentric serrations.
11. Press the locking knob back in place.
12. Perform the Belt Tension Adjustment procedure.

Body, Sprockets, Belt or Knob Replacement

1. Perform the tractor removal procedure.
2. Remove the locking knob. If necessary pry at the base of the knob using a large flat blade screwdriver.
3. Remove the metal retaining plate from the tractor body.
4. Slide the sprockets and belt off the body.
5. Replace defective parts.
6. Re-assemble the tractor making sure the retaining plate serrations properly mate with the serrations on the belt tension eccentric.
7. Reinstall the tractor on the printer referring to the Tractor Removal and Replacement procedure.
8. Perform the Tractor Belt Tension and the Tractor Body Alignment procedures.

RESIDUAL STRIP REPLACEMENT

1. Printer powered off.
2. Remove the bonnet and the paper bail.
3. Unplug the hammer driver cables.

4. Remove the three allen screws holding the armature bar assembly to the printhead.
5. Slide the armature bar back and lift it out of the mounting brackets.
6. The residual strip has two possible mounting positions to permit maximum use of the strip. If the strip indicates wear in only one position, move the mounting tabs to the other (unused) holes and proceed to step 9. A strip that has been used in both positions must be replaced as per steps 7 and 8.
7. Position the strip's mounting tabs so that on one side of the armature bar the inner hole (closest to the strip) is positioned over the locating pin. On the opposite side of the armature bar, the mounting tab must be positioned over the pin using the outer hole. See Figure 5-45.
8. Check that the strip is not twisted or folded over in its routing.
9. Reassemble printer.

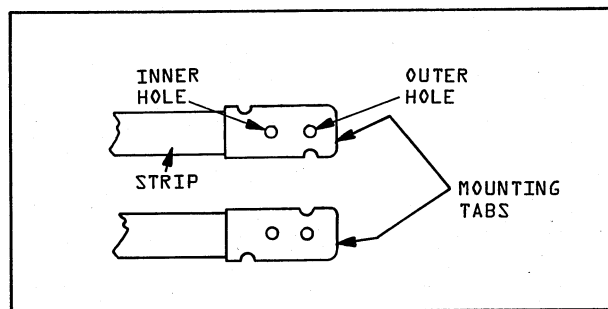


FIGURE 5-45. RESIDUAL STRIP REPLACEMENT

BAND PULLEY FLYWHEEL ASSEMBLY REPLACEMENT

Latch End Components

1. Printer powered off.
2. Open the bonnet.
3. Remove the upper and lower gate protective cover.
4. Open the print gate and remove the ribbon and print band.
5. Remove the ribbon detect sensor mounting plate screws so the assembly may be moved.
6. Remove the outer paper guide assembly.
7. Remove the belt sprocket at the bottom of the pulley shaft.
8. Remove the ribbon guide bracket.
9. Loosen the upper and lower bearing collar screws.
10. Loosen the screws on the collar clamps located on the top and bottom of the pulley-flywheel assembly.
11. Slide the shaft up and out of the lower and upper bearings.
12. Remove the pulley flywheel assembly, collar clamps and spring from the gate assembly.
13. Replace components as required.

NOTE

THE PULLEY ASSEMBLY IS VERY FRAGILE. CARE MUST BE TAKEN WHEN HANDLING THE ASSEMBLY TO AVOID DAMAGING IT.

14. Align the pin on the flywheel to the bushing on the pulley and slide the assemblies together.
15. Place the collar clamp on top of the flywheel.
16. Position the pulley, flywheel and collar between the bearings on the gate.
17. Insert the pulley shaft through the top bearing and pulley-flywheel assembly.
18. Before sliding the shaft through the bottom bearing, slide the lower collar clamp and pulley spring on the shaft.
19. Slide the shaft into the bottom bearing until approximately 0.12 in. (3.0 mm) of the shaft protrudes above the top bearing.
20. Tighten the hardware to secure the shaft.
21. Reassemble the printer.
22. Perform the Band Pulleys Height Adjustment Procedure for the Latch End Pulley.
23. Perform the Outer Paper Guide Adjustment Procedure.

Hinge End Components

1. Printer powered off.
2. Open the bonnet.
3. Remove the upper and lower gate protective covers.
4. Open the print gate and remove the ribbon and print band.
5. Remove the band edge shield.
6. Loosen the collar clamp on the top of the pulley-flywheel assembly.
7. Loosen the collars on the shaft's upper and lower bearings.
8. Slide the shaft downward until it clears the pulley-flywheel assembly.
9. Remove the pulley-flywheel and spring from the gate structure.

NOTE

THE PULLEY ASSEMBLY IS VERY FRAGILE. CARE MUST BE TAKEN WHEN HANDLING THE ASSEMBLY TO AVOID DAMAGING IT.

10. Replace components as required.
11. Compress and secure the pulley spring.
12. Install a flywheel assembly on the pulley and place a collar clamp on the top of the flywheel.
13. Slide the pulley-flywheel assembly back into the gate.
14. Place the compressed spring over the shaft.
15. Slide the shaft up through the pulley-flywheel assembly and the upper bearing until the shaft protrudes approximately 0.12 in. (3.0mm) above the upper bearing.
16. Tighten the hardware to secure the shaft.
17. Release the tension on the pulley spring.
18. Reassemble the printer.
19. Perform the Band Pulleys Height Adjustment Procedure for the Hinge-End Pulley.

PAPER CLAMP SOLENOID ASSEMBLY REPLACEMENT

1. Printer powered off.
2. Open the bonnet and remove the upper gate protective cover.
3. Remove the ribbon and band.
4. Open the print gate.
5. Remove the inner paper guide.
6. Remove the paper clamp assembly by removing the screws attaching the mounting plate to the print head. Unplug the solenoid wires.
7. Remove the two hex nuts attaching the solenoid assembly to the mounting plate and slide the assembly off the plate.
8. Replace the solenoid assembly.
9. Using feeler gauges check that the travel of the solenoid armature is .020 to .026 in. (0.51 to 0.66 mm). See Figure 5-35.
10. If the travel is incorrect loosen the two screws mounting the spring clamp and move the clamp as required.
11. Reassemble the printer.
12. Perform the Inner Paper Guide Adjustment procedure.
13. Perform the Paper Clamp Adjustment Procedure.

UPPER BAND GUIDE REPLACEMENT

Any signs of wear or damage on the upper band guide's wear strip requires a replacement of the guide. The wear strip can not be replaced independently.

1. Power the printer off
2. Open the bonnet and remove the upper gate protective cover.
3. Open the print gate.
4. Remove the ribbon and the band.
5. Remove the six screws mounting the upper band guide to the platen.
6. Replace the upper band guide.
7. Perform the upper band guide adjustment procedure found in the Corrective Maintenance Section.

PUSH ROD REPLACEMENT

This procedure may be performed as a repair procedure for a pivot module assembly. Indication of failure appears as adjacent columns dropping out on the print-out. Flight time adjustment may sometimes appear to correct this problem, but is usually only temporary. Check both ends of push rods on the effected columns for missing tips (glass like, clear shiny tips) or bent rods at the rod ends.

1. Printer power off.

2. Remove the ground strap and lift off the printer bonnet.
3. Remove the paper bail.
4. Remove the Armature Bar by removing the three hex head screws that hold the armature bar in position.
5. Unplug the hammer driver cables from the armature bar plugging into the hammer driver boards.
6. Lift the armature bar out of the printer.
7. Remove the two screws holding the pivot module in position (module containing the push rod in question). Check the hole sequence in which the push rods are positioned in at the back of the hammer bar. Back the pivot module away from the hammer bar and remove the pivot module.
8. Examine the push rods for missing or bent tips.
9. Use small pliers to raise and disconnect the small springs holding the push rod assembly to the base on any faulty push rod. Use care not to lose the small springs.
10. Note the direction (or side) of the opening on the side of copper colored sleeve. The opening on the side of the sleeve is keyed for only one direction. Slide the sleeve off the guide, moving away from the pivot mount.
11. Separate the upper and lower push rod guides and remove the push rod.
12. Install a new push rod and reassembly the module in the reverse sequence. All push rods must be inserted into the hammer bar behind the correct hammer. When installing the armature bar make sure the push rod back ends are center aligned with all armature assemblies.
13. Adjust the flight time screw on any hammer protruding out or back from the average hammer position for only those push rods changed.
14. Perform the Flight Time Adjustment procedure.

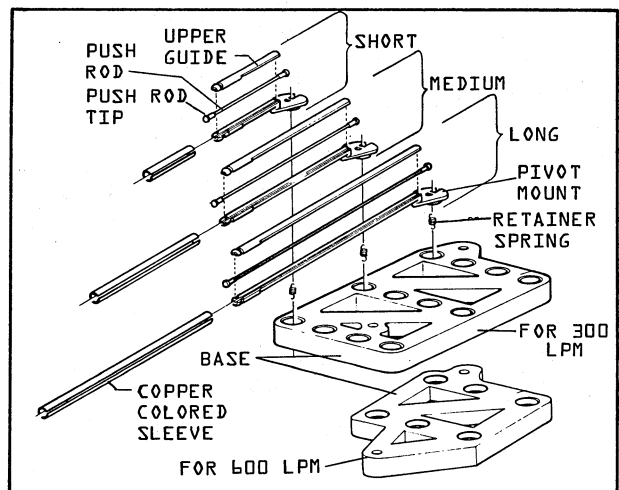


FIGURE 5-46 PIVOT MODULE

BLOWER FAULT DETECTOR REPLACEMENT

WARNING

REMOVE POWER FROM THE PRINTER BY DISCONNECTING A-C POWER CORD FROM THE VOLTAGE SOURCE.

1. Locate the two hex-head sheet metal screws which attach the circuit breaker mounting bracket to the print head structure. They are located at the top of the bracket behind the circuit breaker.
2. Using a $\frac{1}{4}$ -inch socket on a six-inch or longer extension, remove the two screws.
3. Lower the circuit breaker - line filter assembly to the extent allowed by the length of wires attached.
4. Locate blower fault detector terminal block mounted on the panel behind the circuit breaker bracket.
5. Make note of the wire colors and position on the terminal block, then remove the wires.
6. Remove the blower fault detector by removing two socket-head screws securing the terminal block to the panel. Observe the wiring arrangement of the 8-watt resistor and thermal cutoff (within the resistor) for correct orientation of new part.
7. Install new blower fault detector assembly with screws removed in step 6.
8. Connect wires to terminal block in the order noted in step 5.
9. Mount the circuit breaker -line filter assembly with the two screws removed in step 2. Before tightening the screws all the way, slide the assembly rearward so that the screws are against the ends of the screw slots in the bracket.

PAPER MOTION VERIFICATION SENSOR REPLACEMENT

1. Printer power off.
2. Disconnect bonnet ground strap and lift bonnet off printer.
3. Remove exit idler roller assembly and paper bail.
4. Remove PMV sensor by removing two screws securing sensor to right-hand tractor.
5. Withdraw sensor cable from wire retaining clip and disconnect inline sensor cable connector.
6. Install new PMV sensor with the photocell (a bright spot as seen through the sensor window) to the left. Use screws removed in step 4.
7. Connect inline cable connector and push sensor cable into wire retaining clip.
8. Reinstall paper bail and exit idler roller assembly.
9. Reinstall bonnet and ground strap.

FAULT ISOLATION

INTRODUCTION

This section on fault isolation is intended to be used with the Corrective Maintenance section and the Diagrams section. The following information is intended to aid in

the diagnosis of the printer and interface problems. The following information makes use of the C. E. Fault check points. Printers which do not have the optional customer engineer fault panel have the check points which may be monitored on the 7PC3 Print Head Electronics board.

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PRINTER WON'T POWER ON

Assumptions:

1. Line Printer power cord is connected to a-c power.
2. A. C. voltage is within 10% as rated.

GO DOWN TO ACTION FOR A YES						
CONDITIONS:	↓ YES/NO ↓					
Is the Stop Light flashing? (or ENGINEER lit)	Y	N	N	N	N	Y
Is the Circuit Breaker (OFF/ON switch) on?	-	N	N	Y	Y	Y
Does the Circuit Breaker trip each time set?	-	N	Y	N	N	N
Is the blower running?	-	-	-	N	Y	Y
ACTION: PERFORM IN NUMERICAL SEQUENCE						
Look to the CE Fault Checks .	1					1
Switch the Circuit Breaker On.		1				
Use Procedure 1			1		2	
Use Procedure 2				1	3	
Use Procedure 3					1	
Use Procedure 4						2

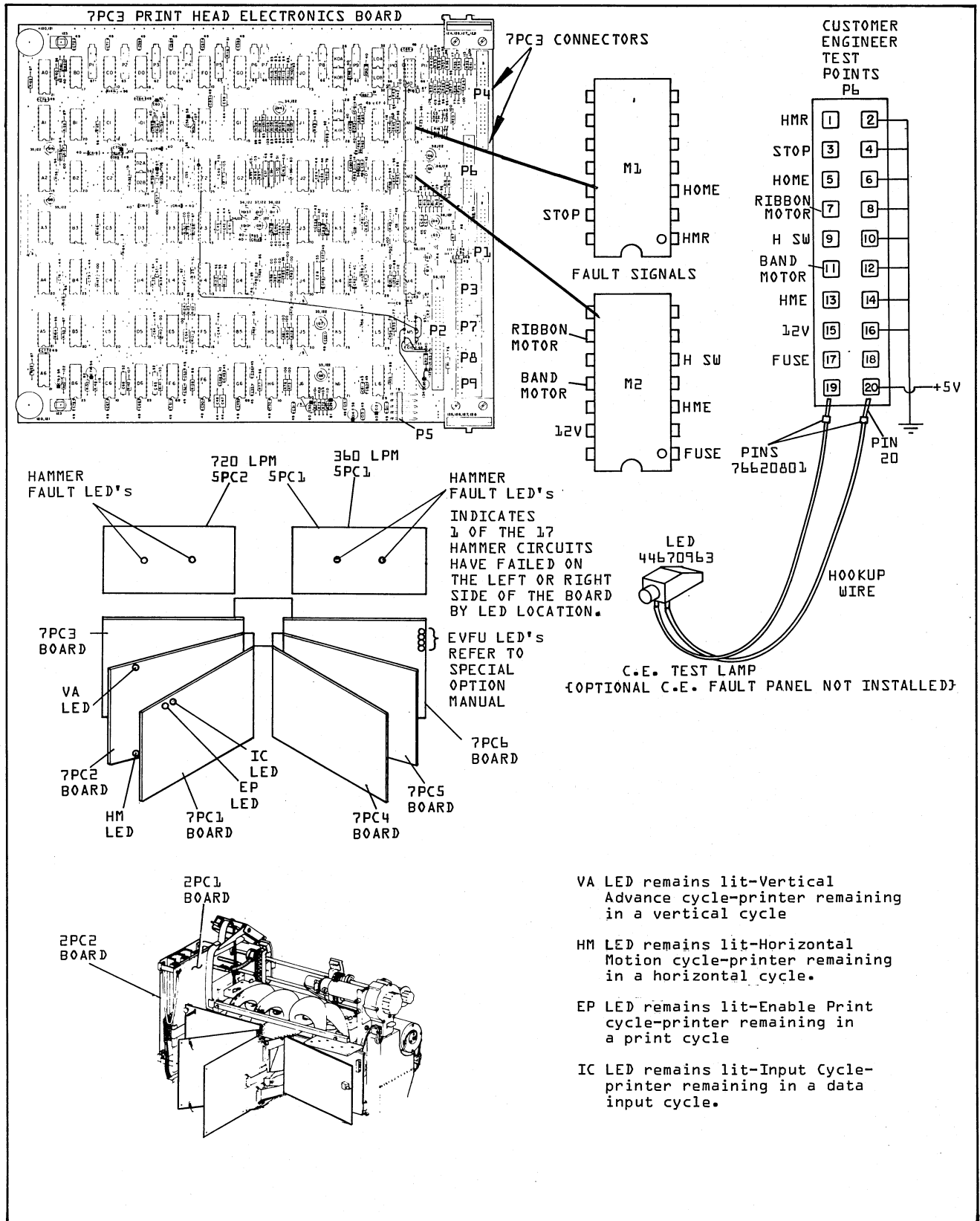


FIGURE 5-48. FAULT ISOLATION POINTS

CUSTOMER ENGINEER FAULT CHECKS

ASSUMPTIONS:

1. Printer is powered ON
2. Stop Light is Flashing (or ENGINEER indicator lit).
3. A C. E. Fault has occurred and the +36 volts has been shut down. After making fault checks the power ON/OFF circuit breaker must be turned off and then back on to power the printer back on. Pause in the OFF position at least three seconds to cool the crowbar circuit. Cycling the printer off and on more than three times consecutively requires a five minute off cooling period.

CHECK FOR THE FOLLOWING C.E. FAULTS	SCOPE OR METER fault checks on 7PC3 chips M1 and M2 YES equals a logic "1". FIGURE 5-48	C. E. Test Lamp or optional fault indicator panel lamp lit for YES (Y)		Y=YES, True Condition X=POSSIBLY TRUE *= ALSO TRUE with another fault READS DOWN for action most likely-1,2,3,etc.
		TEST LAMP P6 PINS FIGURE 5-48	OPTIONAL C.E. FAULT PANEL	
1. 12 VOLT FAULT	M2-13	15	12V	Y
2. +36V FUSE FAULT	M2-1	17	FUSE	* Y * * * * * * *
3. HORIZ. MOTION FAULT	M2-3	13	HME	Y X X
4. BAND MOTOR FAULT	M2-11	11	BAND MOTOR	Y X
5. H-SWITCH FAULT	M2-5	9	H-SW	Y
6. RIBBON MOTOR FAULT	M2-9	7	RIBBON MOTOR	Y
7. HORIZ HOME FAULT	M1-3	5	HOME	X X X Y X X
8. HORIZ END STOP FAULT	M1-13	3	STOP	X X X X Y X
9. HAMMER FAULT	M1-1	1	HMR	X Y X
ACTION:				ACTIONS
Replace 7PC3 Print Head Electronics Board & make the following adjustments found in the Maintenance Section: +30 Volt Voltage Compensation, Character and Home Pulse Set-UP, Horizontal Servo System Set-UP, & Vertical Servo System Set-UP. Refer to front of Corrective Maintenance for condensed procedure.				1 6 3 4 3 3 2 2
Replace 2PC1 the Power Supply Board				2
Turn OFF then ON 1CB1 (OFF/ON Switch)				1
Use Procedure 4				2
Check Fuse F-1 on 2PC2 Servo Power Amp Bd. if blown replace 2PC2				3
Check Fuse F-2 on 2PC2 Servo Power Amp Bd. if blown replace the Paper Clamp Solenoid.				4
Check 9F01 Thermal Fuse (behind 1CB1)				5
Horizontal Servo was on for too long. Adjust horizontal servo system set-up using the procedure found in the Maintenance Section.				1
Replace 7PC2 OSC. HORIZ. & VERT MOT PCB and adjust the Paper Rate Limitor using the procedure found in the Maintenance Section.				2
Replace 2PC2 Servo Power Amp. PCB				4 2 2 2
Clear Ribbon Jam and adjust ribbon tracking using the procedure in the Reference and Field Service Man.				1
Check Band for binding adjust as required				1
Replace band motor				3
Check the vertical motion motor and horizontal voice coil for binding and repair as required.				1
Do the Horizontal Servo Set-Up using the procedure in the Maintenance Section.				1 1
Replace the Hammer Driver Board with the LED lit.				1
Check for shorted or open armature connected to card.				2

NOTE: Refer to the front of Corrective Maintenance for checks to make when replacing a Printed Circuit Board (PCB).

A. C. POWER CHECK

PROCEDURE 1

1. Unplug the power cable (or de-energize a-c power and label for safety).
2. Remove the front pedestal cover. (Cover over the Power On switch)
3. Disconnect the blower motor (1B01) from the main circuit breaker (1CB1)
4. Remove the Bonnet.
5. Remove the power board cover.
6. Hinge out the servo power amp board.
7. Remove F1 (30 AMP Fuse) from the power supply printed circuit board.
(This is to protect the thermal detector when the blower is disconnected.)
8. Reconnect the a-c power.
9. Switch the main circuit breaker (1CB1) on.
10. Check to see if the breaker still trips.
11. If the breaker did not trip go to step (12) if it still trips go to step (18).
12. Turn off the circuit breaker and unplug the power cable or de-energize a-c power.
13. Replace the blower assembly.
14. Reconnect the a-c power.
15. Replace fuse F1 in the power supply.
16. Replace removed covers and hardware.
17. Return the unit to operation.
18. Turn off the circuit breaker and unplug the power cable or de-energize a-c power.
19. Reconnect the blower motor (1B01) to the main circuit breaker (1CB1).
20. On the power supply disconnect the wire going to TB1-6. (This disconnects the 5 Volt filter Capacitor.)
21. Be sure there is no voltage on the cap (wire just removed) then; check the continuity from this wire to TB-7 (ground). NOTE: You are checking a 73,000 uf capacitor for a short.
22. If shorted replace the capacitor and check (CR1 on the power supply to ensure the diodes are not shorted. (TB1-4 to plus side of C1 and TB1-5 to plus side of C1.) Replace the power supply if required and adjust the output voltage as listed in the Installation and Checkout section of the manual. Return the unit to service.
23. If the capacitor was not shorted disconnect and tag (This if for reconnection later) the following wires to the power supply: TB-1, TB1-2 (16.5 VAC input) TB1-4, TB1-5 (9.5 VAC input) and TB1-9, TB1-10 (38 VAC input).
24. Reconnect the a-c power.
25. Place the main circuit breaker (1CB1) in the ON position.
26. If the circuit breaker does not trip replace the power supply board. If the breaker still trips ensure that the transformer is wired for the proper voltage. This information is found in the Installation and Checkout section of the manual. If the wiring is incorrect; correct it. If the wiring is correct replace the circuit breaker if a problem still exists replace the transformer and its resonant capacitor.

A. C. INPUT CHECK

PROCEDURE 2

1. Unplug the power cable (or de-energize a-c power and label for safety).
2. Remove the front pedestal cover. (cover over Power On switch area)
3. Remove the cover over the circuit breaker.
4. Remove the Line Filter cover. (behind the circuit breaker)
5. Check continuity of the power cable to the input of the line filter.
6. If the power cord was ok go to the next step. If the power cord does not check out repair or replace as required and return to service.
7. Check continuity through the line filter, also, check to see that the line filter inputs are not shorted to ground or to each other.
8. If the line filter was ok go to the next step. If not replace the line filter and return the unit to service.
9. Check (1CB1) circuit breaker for continuity. If no continuity replace the unit; otherwise go to the next step.
10. Reconnect the a-c power.
11. Turn on (1CB1)
12. Check for 120 VAC going to the blower motor (1B01). (the output of 1CB1)
13. If present, power down and replace the motor assembly and check 9F01 (thermal link) for continuity (9TB3-1 to 9TB3-5). Replace if needed. If power is not present return to step (1) and recheck.

D. C. 5 VOLT CHECK

PROCEDURE 3

1. Remove the Bonnet.
2. Remove the Power Board cover (2PC1).
3. Hinge out the Servo Amp. board (2PC2).
4. On the Power Supply board check for +5VDC. Plus lead to TB2-1, and minus lead to TB2-2.
5. If present go to step 19 if not go to step 6.
6. Check for 9.5 VAC from TB1-4 to TB1-8 and from TB1-5 to TB1-8 on the power supply board (2PC1).
7. If the voltage is not present go to Procedure 1. If the voltage is present go to step 8.
8. Power down the printer.
9. Unplug connector P-1 on the power supply board (2PC1).
10. With a jumper lead connect P1-4 to TB2-2. This disables the crobar circuit from turning off the power supply.
11. Disconnect the wire from TB2-1. This is the +5VDC from the power supply to the rest of the printer.
12. With a jumper lead connect P1-5 to TB2-1. This connects the sense circuit of the power supply to its output.
13. Turn on the printer.
14. On the power supply board check for +5VDC. Plus lead to TB2-1, minus lead to TB2-2.
15. If +5VDC is not present replace the power supply (2PC1). If +5VDC is present go to the next step.
16. Remove the two jumper, reconnect P-1, and reconnect the wires to TB2-1. The problem you have is over current fold back in the power supply.
17. Power down the printer.
18. Disconnect all the connections from any printed circuit card. Power the printer on and again check the +5VDC. If it comes up change the printed circuit card you disconnected. If not reconnect the card and disconnect another. Repeat this until all cards have been checked or a defective card has been found. If no defective cards were found replace the power supply.
19. You have found the +5VDC present. If either the + or - 12VDC was down the stop light would flash or the ENGINEER indicator is lit and the 12V C. E. Fault would be present. If the 36V were down the stop light would be flashing or the ENGINEER indicator is lit and the Fuse C. E. fault would be present. The unit should be powered up.

D. C. 36 VOLT CHECK

PROCEDURE 4

1. Turn Off the Printer.
2. Remove the Printer Bonnet.
3. Remove the Power Board Cover.
4. Remove and Check F1 on the Power Supply Board (2PC1).
5. If not blown return to the chart. If blown go to the next step.
6. Replace F1 and power the unit on. If F1 blows again go to the next step.
7. Turn off the Printer. Replace F1 and disconnect a (the) Hammer Driver board (5PC1/5PC2).
8. Power up the printer and if F1 does not blow replace the defective Hammer Driver board. If F1 did blow disconnect the other Hammer Driver board if this is a 720 and repeat the test.
9. Disconnect P5 on 7PC3 (Print Head Electronics Card) and then try again. If the fuse did blow go to the next step if it did not blow replace 7PC3 and make the following adjustments found in your Reference and Field Service Manual; +30 Volt Voltage Compensation, Character & Home Pulse Set-Up, Horizontal Servo System Set-Up, & Vertical Servo System Set-UP.
10. Check for a shorted filter capacitor in the capacitor bank. Replace as required.

PRINTER FAULT ISOLATION

SYMPTOMS		Y=YES-GO DOWN FOR ACTION SEQUENCE											
Fault LED's-IC, EP, HM, ED see Fig. 5-48													
Printer powers up but C. E. Fault occurs	1	Y											
Printer powers up but Start won't light when pressed	2 7	Y											
Printer goes to Start	4		Y										
Printer stops and always the IC LED is lit	11			Y									
Printer stops and always the EP LED is lit	6 11				Y								
Printer stops and always the EP is lit	9 11					Y							
Printer stops and always the HM and ED LED's are lit	9 11						Y						
Printer stops and always the VA LED is lit	6 9 10 11							Y					
Printer stops with no pattern to the LED's lit each time	9 11								Y				
Printer drops columns in no pattern.										Y			
Printer drops columns in patterns.											Y		
Printer prints junk.												Y	
ACTIONS		Action Sequence 1, 2, 3, etc. down ↓											
Replace 2PC2	3										2	3	1
Replace 5PC1 (720 LPM also has 5PC2).													7
Replace 7PC1	3						1	2					4 3
Replace 7PC2	3					3	3	1	3	1	2		3 4
Replace 7PC3	3					7	5		3	1	2	4	6
Replace 7PC4 (Optional)	3					5		3					5 6 7
Replace 7PC5 (Optional)	3					4		2					5 4 5 6
Replace 7PC6 (Optional)	3											3	
Press Start switch	4							2					
Check for correct band.													1
Check processor or coupler setting.						6		4					5
Go back to Printer won't power on.						1							
Check circuits on 7PC3, Inhibit, Gate Open, Bandup.							2	4					
Check hammer driver connectors at boards.													3
Check for correct ROM/DIL chips on 7PC1.													2
Check forms installation and 6/8 LPI switch position.							1						
Check EVFU load (Optional, see Special Option Manual)							1						
Check for static problem (static eliminators and humidity).												1	7
Check character and home pickup adjustment to band.													1 2
Check character and home pickup adjustment on 7PC3	3												2
Check hammers, pushrods, flight time on those columns.													1

NOTES:

- 1 Optional;
 - a. Stop flashes
 - b. Alarm flashes
 - c. Engineer lights

- 2 Optional;
 - a. On Line
 - b. Available and then go switches won't light Auto

- 3 Make board checks at front of Corrective Maintenance

- 4 Optional;
 - a. On Line
 - b. Auto

- 5 Optional;
 - a. Form Feed
 - b. Top of Form
 - c. Page Eject
 - d. Device

- 6 No C. E. Faults
- 7 Optional
Manual indicator flashes

- 8 Optional
Manual indicator lights

- 9 Note any C. E. Faults and refer to C. E. Faults checks

- 10 LED lit on Hammer Driver Board

- 11 Refer to Figure 5-47

CUSTOMER ENGINEER FAULT LIGHTS

LED INDICATORS

FUSE-FAULT FOR +36 VOLTS FOR H-SWITCHES AND RIBBON MOTOR.

12V- 12 VOLT POWER SUPPLY FAILURE.

HME- HORIZONTAL MOTION ERROR.

BAND MOTOR-FAULT FOR OVER-CURRENT

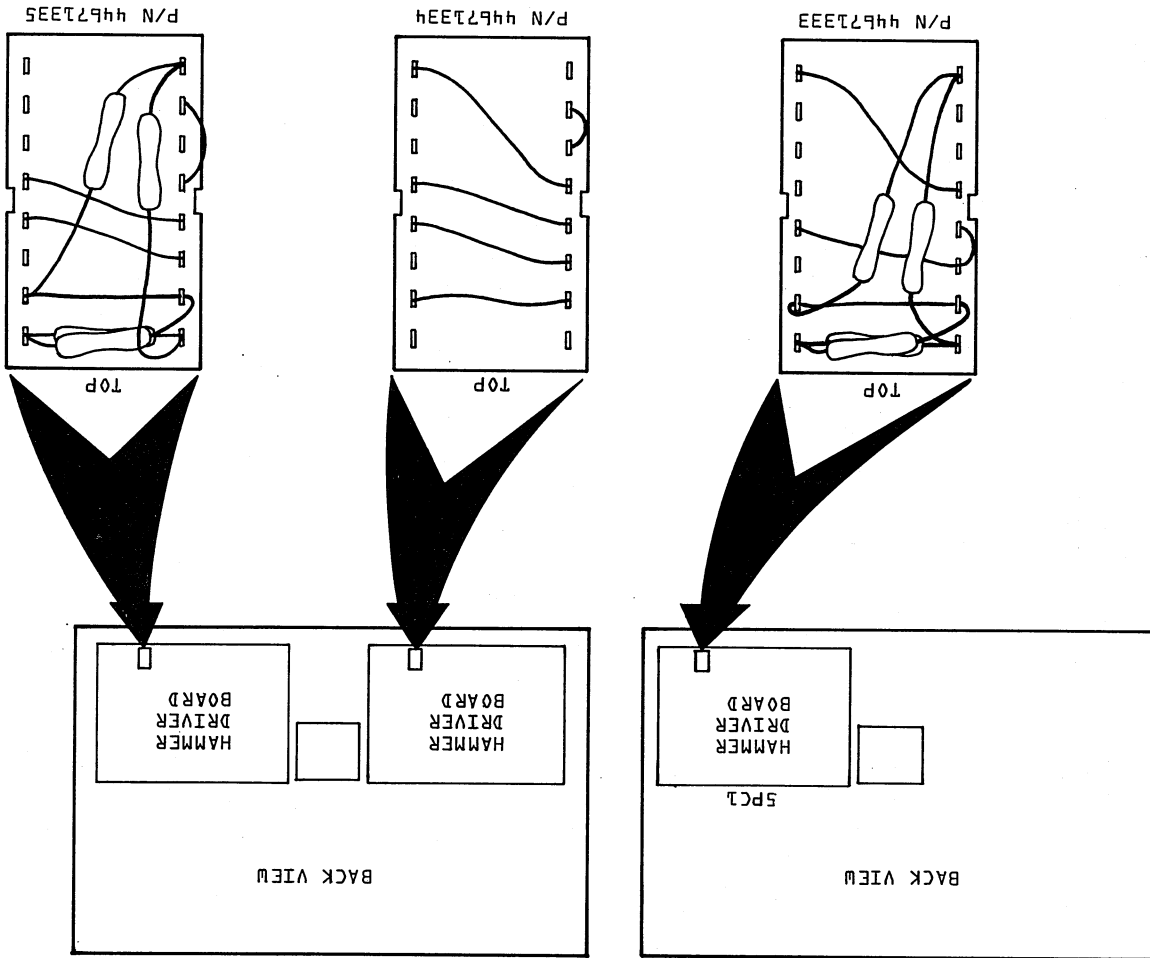
HSW- H-SWITCHES FAULT FOR OVER-CURRENT.

RIBBON MOTOR-FAULT FOR OVER-CURRENT.

HOME-FAULT, HORIZONTAL HOME POSITION DETECTION.

STOP-FAULT, HORIZONTAL END STOP DETECTION.

HMR- FAULT FOR PRINT HAMMER CIRCUIT FAILURE.



HAMMER DRIVER BOARD TERMINATOR POSITIONS
 350 LPM PRINTER
 720 LPM PRINTER

Power Transformer	use preceding A. C. Power Check.
Blower 60Hz	Green to Blue/Green to Brown infinite, Blue to Brown 10 ohms
Blower 50/60Hz	Green to Blue/Green to Brown infinite, Blue to Brown 9 ohms
Vertical Motor	Stopped 5 ohms, rotate slow 10 (increases with speed)
Vertical Tachometer	Rotate slowly 150-180 ohms
Horizontal Motion Coil	2.5 Ohms
Horizontal Monitor Coil	500 Ohms
Armature Striker Coil	6 Ohms

APPROXIMATE RESISTANCE CHART

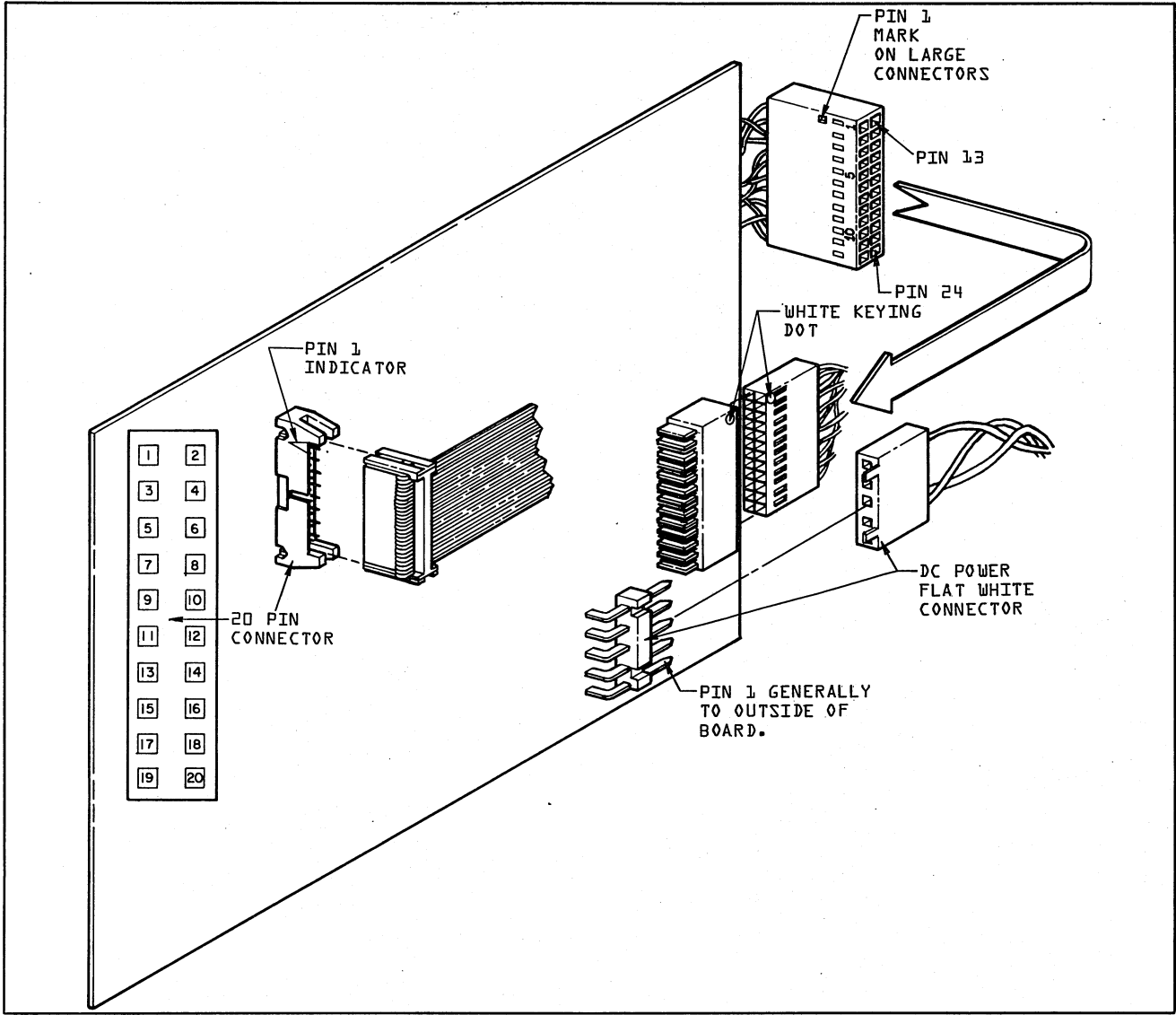


FIGURE 5-49. CONNECTOR PIN IDENTIFIER

PART A

BAND PRINTER LOGIC DIAGRAMS

CONTENTS

<u>Title</u>	<u>Page</u>		<u>Title</u>	<u>Page</u>
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Parts Locator	6-4	WARNING	Controller Electronics Block Diagram	6-18
Component Locator	6-6	NOISE LEVEL UNDER BONNET WHILE PRINTING MAY BE HAZARDOUS TO HEARING.	Controller Osc. Hor. & Vert. Motion Block Diagram	6-19
Special Nomenclature	6-8	KEEP EXPOSURE TO A MINI- MUM. REFER TO MAINTENANCE AIDS TO QUIETLY TEST.	Timing Diagrams	6-20
Element Identifier List	6-10		Input/Print (Dual Pitch) 7PC1	6-36
A. C. Wiring Diagram	6-11	NOTE	Oscillator Horizontal/Vertical Motion 7PC2	6-51
D. C. Wiring Diagram	6-12	THIS MANUAL COVERS THE LOGIC BOARDS AS LISTED ON THIS PAGE.	Print Head Electronics 7PC3	6-65
Power Supply Block Diagram	6-13	REFER TO THE PARTS MANUAL TO IDENTIFY OTHER BOARDS. A PRECEDING LOGIC SET MANUAL	Servo Power Amplifier 2PC2	6-77
Servo Power Amplifier Block Diagram	6-14	DOCUMENTS EARLIER BOARDS AND LOGIC SET 95400400. PRINTERS CON- TAINING A MIXTURE OF BOARDS FROM THE TWO LOGIC SETS WILL REQUIRE THE USE OF BOTH MANUALS.	Power Supply 2PC1	6-82
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			△ Kit Logic PBS Series 1 I/O And Control Panel	6-94
			Line Counter	6-96

BOARD IDENTIFICATION FOR LOGIC SET 95400401

CROSS REF NO.	LOCATION	PART NUMBER	EARLIER NUMBER
501	2PC1	95385903	95385902
401-404	2PC2	44674237	-----
600-605	5PC1	44671576	-----
701	6PC1	OPTIONAL	-----
100-114	* 7PC1	44674833	-----
	↓	44674834	-----
	↓	44674835	-----
	↓	44674836	-----
200-212	* 7PC2	44674844	-----
	↓	44674845	-----
	↓	44674846	-----
	↓	44674847	-----
	↓	44674848	-----
301-311	7PC2	44674848	-----
	↓	44674255	44674254

*SEE PARTS MANUAL FOR BOARD IDENTIFICATION

PART B

(page 6-99)

Part B documents earlier boards still being used from logic set 95400400

Input/Print (Dual Pitch) 7PC1	6-101
Oscillator Horizontal/Vertical Motion 7PC2	6-117
Print Head Electronics 7PC3	6-131
Servo Power amplifier 2PC2	6-143

△ Applies to CT107A & CT108A Models Only

TESTING WITHOUT NOISE

During repair of the printer the following may be performed to quietly cycle the printer.

1. Disconnect hammer driver board connectors on all hammer driver boards, P1, P3, P4, P5, P6.
2. Disconnect paper clamp by using extraction tool and remove clamp wire from Servo Amp Board plug P2-3.
3. Remove forms and ribbon.
4. Tape down the Out Of Paper switch.
5. Disable Paper Motion Verification (PMV) by making a paper loop from the edge of a form which will run through the right tractor or ground pin 1 on chip K5 on board 7PC2, counter reset pin.

Test Print Method

1. Select blank code test print character (40g).
2. Operate Test Print switch (Optional Switch).

High Risk Method

This method should only be used by experienced service personnel on printers with known good hammer driver circuits.

WARNING

DAMAGE MAY OCCUR TO THE HAMMER DRIVER BOARDS OR HARNESS, AND POSSIBLY THE PRINT BAND IF THIS METHOD IS USED AND A FAILURE OCCURS ON A HAMMER CIRCUIT.

1. Disconnect P3 on the Input Print board (7PC1). (Constantly monitor the printer while this connector is disconnected).

WARNING

HAZARDOUS VOLTAGE AND HAZARDOUS ENERGY LEVELS

During maintenance operations switch off the mains supply whenever possible. When power is applied care must be taken when servicing equipment to avoid contact with parts at Hazardous Voltages such as mains circuits and the high voltage section of high frequency switching power supplies which are common on most equipment.

On low voltage circuits an additional hazard exists due to the high short circuit current/energy (often hundreds of amps) which can flow into a fault. Great care must be taken to avoid short circuiting the opposite poles of low voltage supplies by tools or personal metallic adornments such as rings or watchstraps.

MOS COMPONENTS

MOS components may be damaged by static electricity which is commonly caused by human movement such as walking over carpeted floors or by friction between clothing and chair seats or desk tops. Those handling MOS components or assemblies should read: -Handling Procedures for MOS components. The following rules should be observed:

1. Components should be stored in conductive trays (i.e. metal or foil lined containers) or have their pins joined by conducting foam.
2. High static materials should be excluded from the working vicinity.
3. Personnel handling MOS components should previously earth themselves via ground or earthed metalwork.

Metal oxide-silicon semi-conductors are being used in this printer. There is considerable risk of accidental damage being caused to such components by the discharge of static electricity through the elements.

PRINTED CIRCUIT BOARDS CARRYING METAL OXIDE SILICON SEMI-CONDUCTORS

It is, therefore, important that all personnel liable to handle PCBs carrying MOS semi-conductors are aware of the risk and of the correct method of handling. (There is no easy way of recognising a MOS semi-conductor so, if in doubt, assume that one is fitted to the PCB you are handling.)

Take the following precautions:

1. The PCBs must always be transported in the container provided.
2. When a replacement board is to be fitted into an equipment, the Engineer must first touch bare, earthed metal frame to discharge any static electric charge he is carrying. Having done so he should avoid taking any more steps on the floor prior to fitting the PCB into the equipment. He should then remove the PCB from its container, handling it in a way which avoids any contact with any conducting part of the PCB. He should then remove any protective clip, if fitted to the MOS device, and insert the PCB.
3. Prior to removing a PCB the Engineer must again touch a bare, earthed metal frame and, avoiding taking any further steps on the floor, remove the PCB from the equipment, handling it as described above, fit protective clips where appropriate, and place the PCB in the container provided for the purpose.
4. Technology advise that no PCBs fitted to an equipment containing MOS devices should be inserted or removed with the power to the equipment switched on.

Damage resulting from static discharge or other causes may not become evident until some time later.

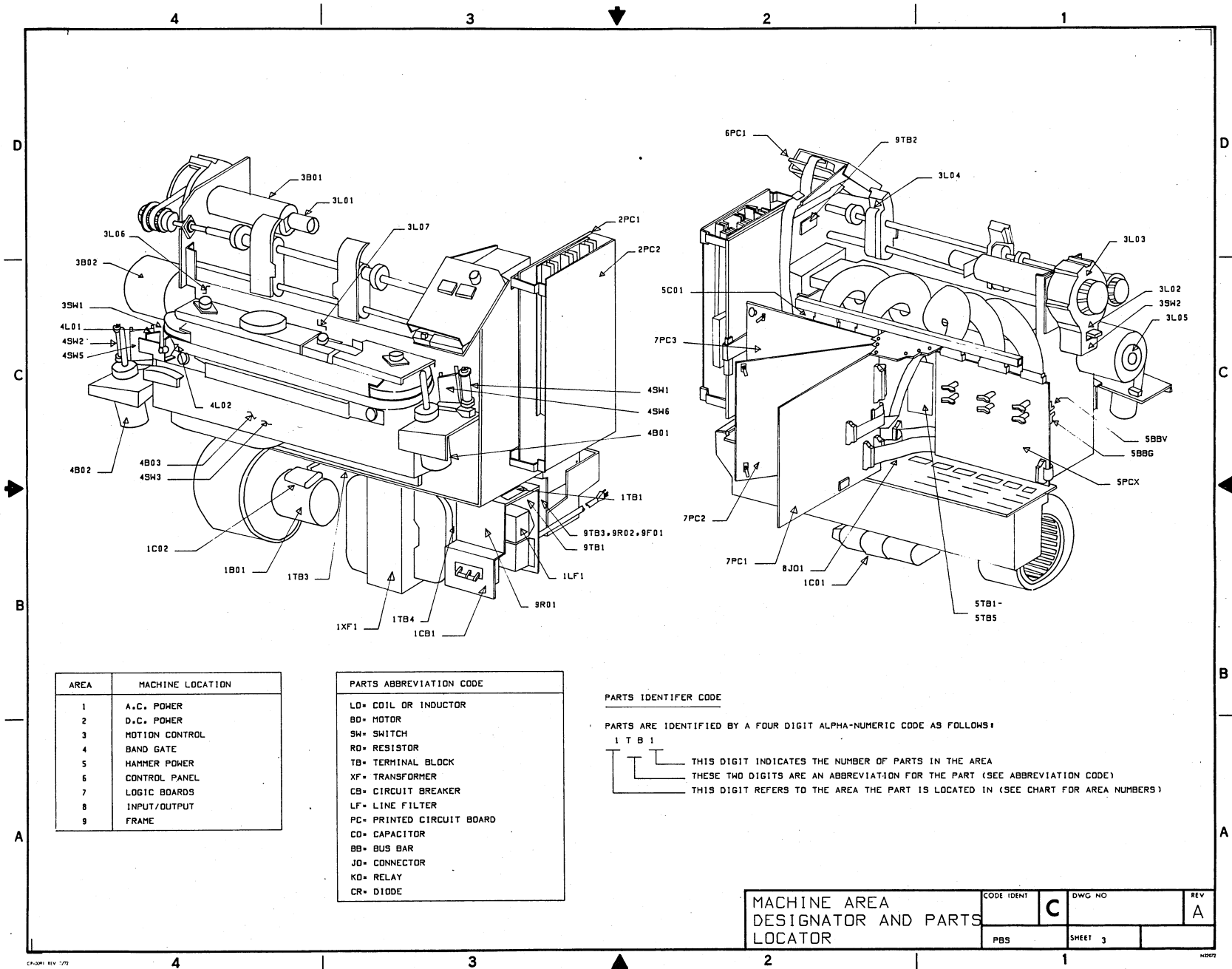
SHEET NO.	CROSS REF NO.	MODULE LOCATION	LOGIC DIAGRAM TITLE
58	00209	7PC2	OSC. HORZ. & VERT. HOT
59	00210	7PC2	OSC. HORZ. & VERT. HOT
60	00211	7PC2	OSC. HORZ. & VERT. HOT
61	00212	7PC2	OSC. HORZ. & VERT. HOT
62	00301	7PC3	PRINT HEAD ELECTRONICS BOARD
63	00302	7PC3	PRINT HEAD ELECTRONICS BOARD
64	00303	7PC3	PRINT HEAD ELECTRONICS BOARD
65	00304	7PC3	PRINT HEAD ELECTRONICS BOARD
66	00305	7PC3	PRINT HEAD ELECTRONICS BOARD
67	00306	7PC3	PRINT HEAD ELECTRONICS BOARD
68	00307	7PC3	PRINT HEAD ELECTRONICS BOARD
69	00308	7PC3	PRINT HEAD ELECTRONICS BOARD
70	00309	7PC3	PRINT HEAD ELECTRONICS BOARD
71	00310	7PC3	PRINT HEAD ELECTRONICS BOARD
72	00311	7PC3	PRINT HEAD ELECTRONICS BOARD
73	00401	2PC2	SERVO POWER AMP BOARD
74	00402	2PC2	SERVO POWER AMP BOARD
75	00403	2PC2	SERVO POWER AMP BOARD
76	00404	2PC2	SERVO POWER AMP BOARD
77	00501	2PC1	POWER SUPPLY
78	00600	5PCX	HAMMER DRIVER BOARD
79	00601	5PCX	HAMMER DRIVER BOARD
80	00602	5PCX	HAMMER DRIVER BOARD
81	00603	5PCX	HAMMER DRIVER BOARD
82	00604	5PCX	HAMMER DRIVER BOARD
83	00605	5PCX	HAMMER DRIVER BOARD
84	00701	6PC1	CONTROL PANEL BOARD

CROSS REFERENCE NUMBER CODES

- HO-- * HIRING DIAGRAM
- BD-- * BLOCK DIAGRAM
- TD-- * TIMING DIAGRAM
- 001-- * INPUT/PRINT BOARD
- 002-- * OSC. HORZ. & VERT. HOT BOARD
- 003-- * PRINT HEAD ELECTRONICS BOARD
- 004-- * SERVO POWER AMP BOARD
- 005-- * POWER SUPPLY BOARD
- 006-- * HAMMER DRIVER BOARD
- 007-- * CONTROL PANEL BOARD

LOGIC DIAGRAM SET		CODE IDENT	DWG NO	REV
CONTENTS SHEET		C		A
		PB/PBS	SHEET 2	

SHEET NO.	CROSS REF NO.	MODULE LOCATION	LOGIC DIAGRAM TITLE
1			COVER SHEET & REVISION LEVELS
2			LOGIC DIAGRAM SET CONTENTS SHEET
3			MACHINE AREA DESIGNATOR AND PARTS LOCATOR
4			MACHINE AREA DESIGNATOR AND PARTS LOCATOR
5			PCB COMPONENT LOCATIONS
6			PCB COMPONENT LOCATIONS
7			SPECIAL NOMENCLATURE PAGE 1
8			SPECIAL NOMENCLATURE PAGE 2
9			GENERAL NOTES & IDENTIFIER LIST
10	HD01		HIRING DIAGRAM-A.C. POWER
11	HD02		HIRING DIAGRAM-D.C. DISTRIBUTION
12	BD01		BLOCK DIAGRAM-POWER SUPPLY BOARD
13	BD02		BLOCK DIAGRAM-SERVO POWER AMP BOARD
14	BD03		BLOCK DIAGRAM-HAMMER DRIVER BOARD
15	BD04		BLOCK DIAGRAM-PRINT HEAD ELECTRONICS BD
16	BD05		BLOCK DIAGRAM-PRINT HEAD ELECTRONICS BD
17	BD06		BLOCK DIAGRAM-CONTROLLER BD INPUT/PRINT (CB1)
18	BD07		BLOCK DIAGRAM-CONT. BD OSC. HOR. & VERT. MOTION
19	TD01		TIMING DIAGRAM-NORMAL POW. SEQ & FAULT MODES
20	TD02		TIMING DIAGRAM-SUBSCAN GENERATORS
21	TD03		TIMING DIAGRAM-HORIZONTAL SHIFT
22	TD04		TIMING DIAGRAM-VERTICAL ADVANCE & BAND DRIVE
23	TD05		TIMING DIAGRAM-MAJOR CONTROLLER CYCLES
24	TD06		TIMING DIAGRAM-INPUT CYCLE-CONTROL CODE 1ST CHAR
25	TD07		TIMING DIAGRAM-INPUT CYCLE-SHORT DATA LINE
26	TD08		TIMING DIAGRAM-INPUT CYCLE DATA LENGTH, COL. CAP.
27	TD09		TIMING DIAGRAM-OPTION CYCLE TIMING
28	TD10		TIMING DIAGRAM-PRINT CYCLE
29	TD11		TIMING DIAGRAM-PRINT CYCLE
30	TD12		TIMING DIAGRAM-HORIZONTAL MOTION CYCLE
31	TD13		TIMING DIAGRAM-VERTICAL ADVANCE
32	TD14		TIMING DIAGRAM-HOME PUL/SUBSCAN PUL/ TSSP TIMING
33	TD15		TIMING DIAGRAM-SYSTEM CLOCKS
34	00100	7PC1	INPUT/PRINT (O-P)
35	00101	7PC1	INPUT/PRINT (O-P)
36	00102	7PC1	INPUT/PRINT (O-P)
37	00103	7PC1	INPUT/PRINT (O-P)
38	00104	7PC1	INPUT/PRINT (O-P)
39	00105	7PC1	INPUT/PRINT (O-P)
40	00106	7PC1	INPUT/PRINT (O-P)
41	00107	7PC1	INPUT/PRINT (O-P)
42	00108	7PC1	INPUT/PRINT (O-P)
43	00109	7PC1	INPUT/PRINT (O-P)
44	00110	7PC1	INPUT/PRINT (O-P)
45	00111	7PC1	INPUT/PRINT (O-P)
46	00112	7PC1	INPUT/PRINT (O-P)
47	00113	7PC1	INPUT/PRINT (O-P)
48	00114	7PC1	INPUT/PRINT (O-P)
49	00200	7PC2	OSC. HORZ. & VERT. HOT JUMPER CHART
50	00201	7PC2	OSC. HORZ. & VERT. HOT
51	00202	7PC2	OSC. HORZ. & VERT. HOT
52	00203	7PC2	OSC. HORZ. & VERT. HOT
53	00204	7PC2	OSC. HORZ. & VERT. HOT
54	00205	7PC2	OSC. HORZ. & VERT. HOT
55	00206	7PC2	OSC. HORZ. & VERT. HOT
56	00207	7PC2	OSC. HORZ. & VERT. HOT
57	00208	7PC2	OSC. HORZ. & VERT. HOT

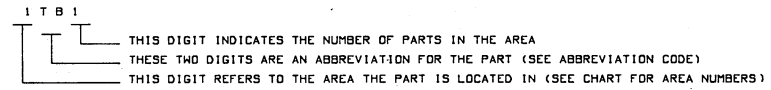


AREA	MACHINE LOCATION
1	A.C. POWER
2	D.C. POWER
3	MOTION CONTROL
4	BAND GATE
5	HAMMER POWER
6	CONTROL PANEL
7	LOGIC BOARDS
8	INPUT/OUTPUT
9	FRAME

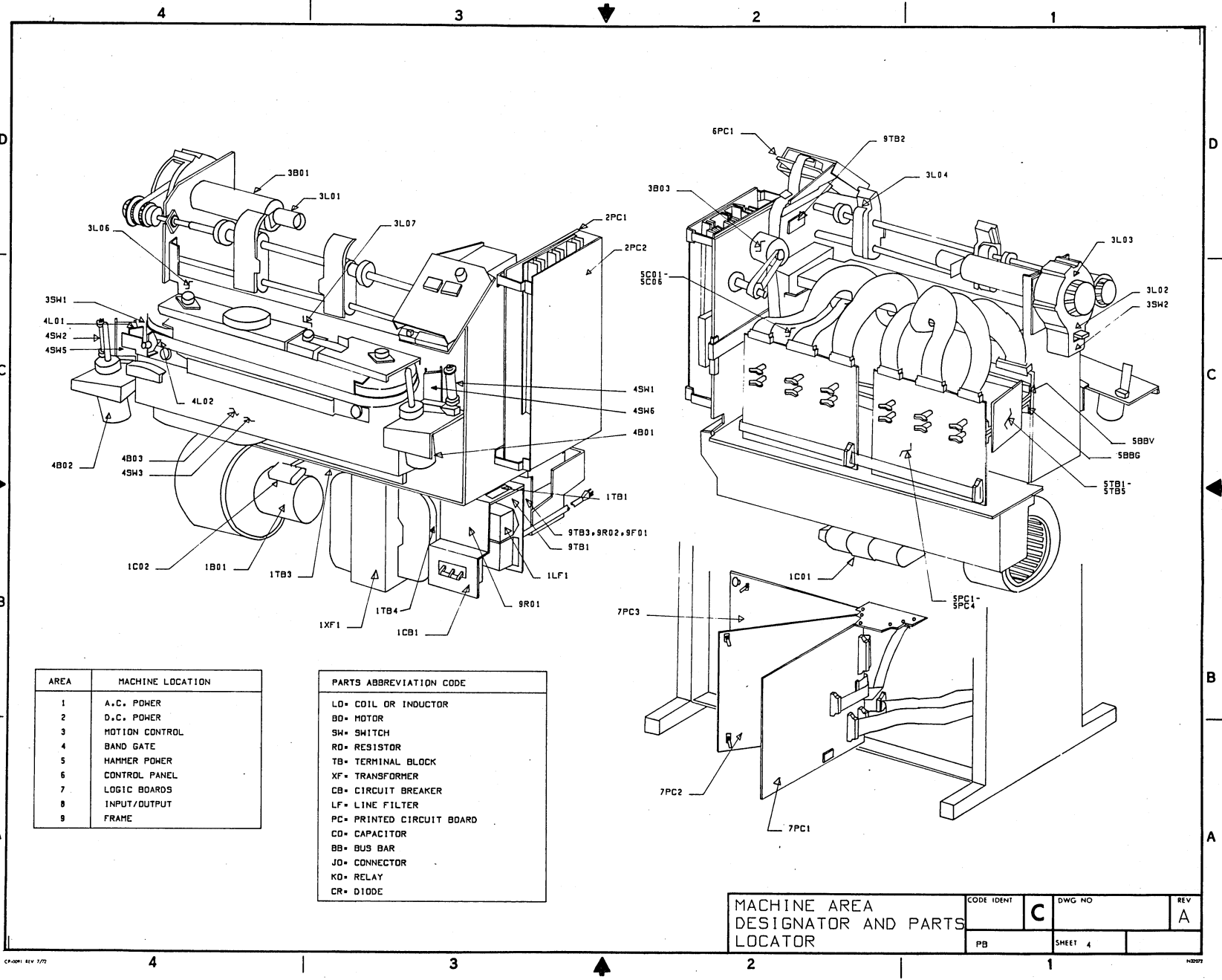
PARTS ABBREVIATION CODE
LD= COIL OR INDUCTOR
BD= MOTOR
SH= SWITCH
RD= RESISTOR
TB= TERMINAL BLOCK
XF= TRANSFORMER
CB= CIRCUIT BREAKER
LF= LINE FILTER
PC= PRINTED CIRCUIT BOARD
CO= CAPACITOR
BB= BUS BAR
JO= CONNECTOR
KD= RELAY
CR= DIODE

PARTS IDENTIFIER CODE

PARTS ARE IDENTIFIED BY A FOUR DIGIT ALPHA-NUMERIC CODE AS FOLLOWS:



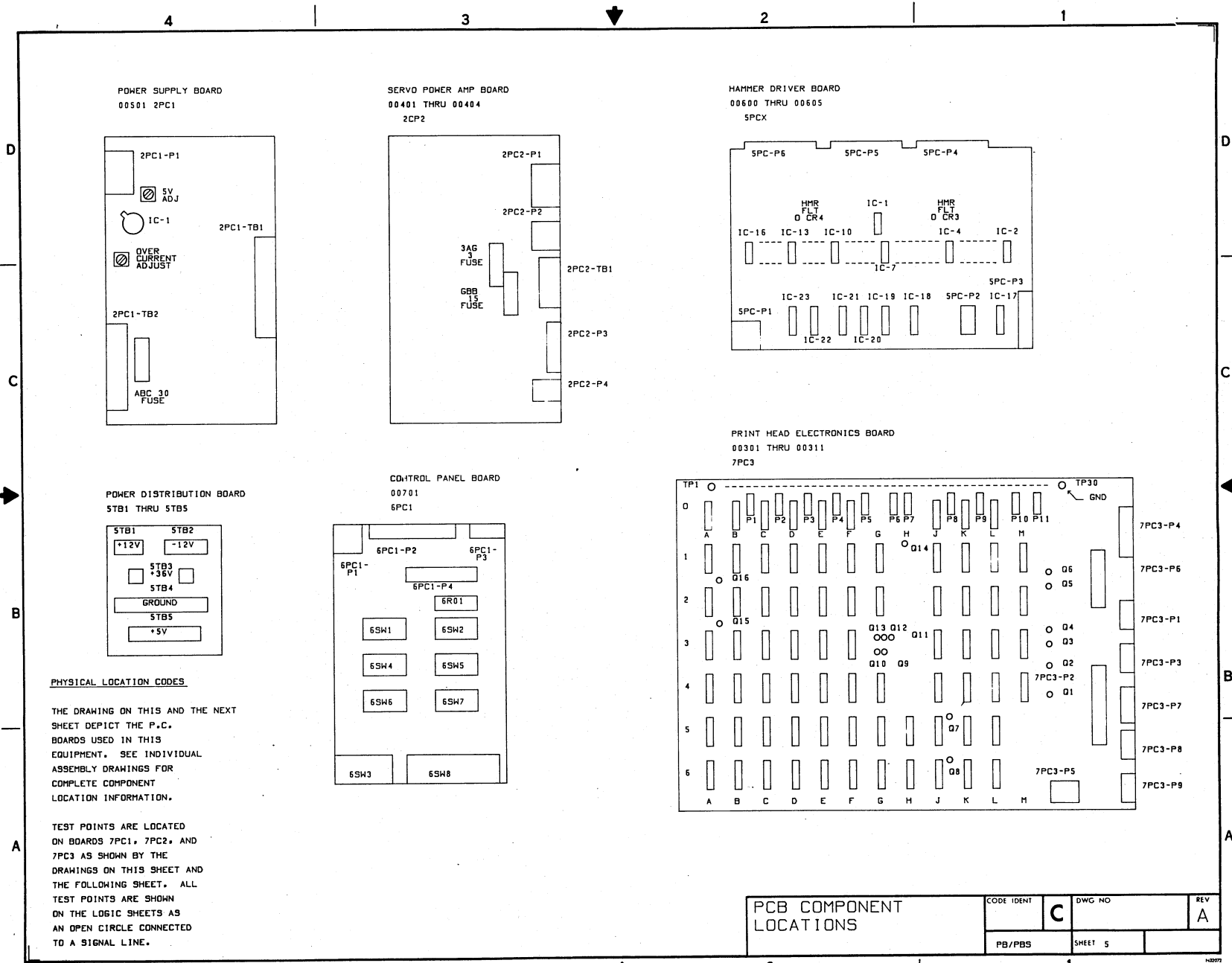
MACHINE AREA DESIGNATOR AND PARTS LOCATOR	CODE IDENT	C	DWG NO	REV	A
	PBS		SHEET 3		



AREA	MACHINE LOCATION
1	A.C. POWER
2	D.C. POWER
3	MOTION CONTROL
4	BAND GATE
5	HAMMER POWER
6	CONTROL PANEL
7	LOGIC BOARDS
8	INPUT/OUTPUT
9	FRAME

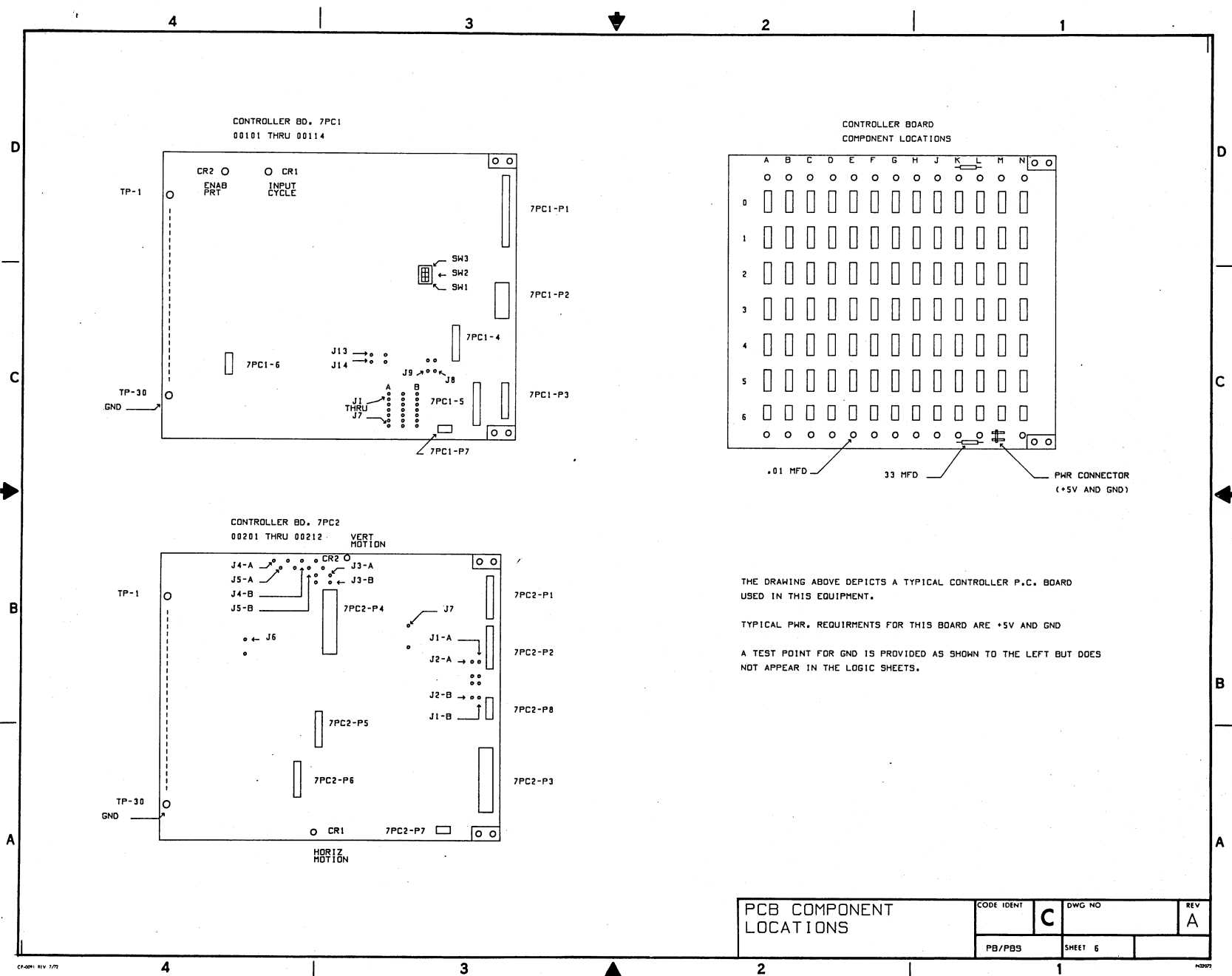
PARTS ABBREVIATION CODE
LD = COIL OR INDUCTOR
BO = MOTOR
SW = SWITCH
RO = RESISTOR
TB = TERMINAL BLOCK
XF = TRANSFORMER
CB = CIRCUIT BREAKER
LF = LINE FILTER
PC = PRINTED CIRCUIT BOARD
CO = CAPACITOR
BB = BUS BAR
JO = CONNECTOR
KO = RELAY
CR = DIODE

MACHINE AREA DESIGNATOR AND PARTS LOCATOR		CODE IDENT	DWG NO	REV
		PB	SHEET 4	A



PCB COMPONENT LOCATIONS		CODE IDENT	DWG NO	REV
		C		A
		PB/PBS	SHEET 5	

6-7



CONTROLLER BD. 7PC1
00101 THRU 00114

CONTROLLER BOARD
COMPONENT LOCATIONS

CONTROLLER BD. 7PC2
00201 THRU 00212

THE DRAWING ABOVE DEPICTS A TYPICAL CONTROLLER P.C. BOARD USED IN THIS EQUIPMENT.

TYPICAL PHR. REQUIREMENTS FOR THIS BOARD ARE +5V AND GND

A TEST POINT FOR GND IS PROVIDED AS SHOWN TO THE LEFT BUT DOES NOT APPEAR IN THE LOGIC SHEETS.

PCB COMPONENT LOCATIONS

CODE IDENT	C	DWG NO	REV
PB/PBS		SHEET 6	A

4

3

2

1

SPECIAL NOMENCLATURE

ABBREVIATION	DEFINITION	CROSS REF. NUMBER
ACK FF	ACKNOWLEDGE FLIP FLOP	00105
ADV	ADVANCE	00206
APS ACTIVE	AUTO-PERF-SKIP ACTIVE	00209
BAND CHAR CNTR	BAND CHARACTER COUNTER	00110
BAND DET REG	BAND DETECT REGISTER	00110
BAND DET RESET	BAND DETECT RESET	00202
BAND MTR FLT	BAND MOTOR FAULT	00306
BAND SYNC FLT	BAND SYNC FAULT	00306
BCC BX	BAND CHARACTER COUNTER BIT X WHERE X= NUMBER	00110
BCG CLK	BAND CODE GENERATOR CLOCK	00107
BCG	BAND CODE GENERATOR	00104
BMC	BAND MOTOR CONTROL	00202
BMC CLOCK	BAND MOTOR CONTROL CLOCK	00304
BMC FDBK	BAND MOTOR CONTROL FEEDBACK	00302
BM FLT	BAND MOTOR FAULT	00305
BM CUR FLT	BAND MOTOR CURRENT FAULT	00305
BMTD	BAND MOTOR TIME OUT	00305
BSY FF	BUSY FLIP FLOP	00105
CC 1ST CHAR	CONTROL CODE FIRST CHARACTER	00105
CE ERROR	CUSTOMER ENGINEER ERROR	00306
CE FAULT	CUSTOMER ENGINEER FAULT	00306
CHNL X	CHANNEL X WHERE X= NUMBER	00209
CLK 2	CLOCK 2	00212
CLR SR	CLEAR SHIFT REGISTER	00109
CLR	CLEAR	00201
CLR PM	CLEAR PAPER MOTION	00207
CLK 1MHZ	CLOCK 1 MEGHERTZ	00303
CHP	COMPARE	00113
CHP FF	COMPARE FLIP FLOP	00104
CNT DN	COUNT DOWN	00211
COMP PITCH	COMPRESSED PITCH	00301
CP EN	COMPRESSED PITCH ENABLE	00301
CONT CODE	CONTROL CODE	00101
DATA REG	DATA REGISTER	00101
DBX	DATA BIT X WHERE X= NUMBER	00101
ENAB ADV P	ENABLE ADVANCE PULSE	00105
ENAB FLC LD FF	ENABLE FORMS LENGTH COUNTER LOAD FLIP FLOP	00209
ENAB PRT FF	ENABLE PRINT FLIP FLOP	00106
ENAB PRT	ENABLE PRINT	00108
ENAB RDY FF	ENABLE READY FLIP FLOP	00201
END PRT 1	END PRINT 1	00108
END PRT REG	END PRINT REGISTER	00108
END PRT DET	END PRINT DETECTOR	00108
EVFU LD'ED	ELECTRONIC VERTICAL FORMAT UNIT LOADED	00201
FE	FORMS ERROR	00210
FF SW	FORM FEED SWITCH	00207
FF SW ACTIVE	FORM FEED ACTIVE	00207
FLC	FORMS LENGTH COUNTER	00209
FLC LD FF	FORMS LENGTH COUNTER LOAD FLIP FLOP	00209
FLT RESET	FAULT RESET	00306
FR B X	FORMAT REGISTER BIT X WHERE X= NUMBER	00207
FUSE FLT	FUSE FAULT	00306
FWD	FORWARD	00308

ABBREVIATION	DEFINITION	CROSS REF. NUMBER
H ADV	HORIZONTAL ADVANCE	00203
H ADV RESET ENAB	HORIZONTAL ADVANCE RESET ENABLE	00203
H DIR RT	HORIZONTAL DIRECTION RIGHT	00204
H END STOP FLT	HORIZONTAL END STOP FAULT	00306
H INH	HORIZONTAL INHIBIT	00304
H POS FDBK ACT	HORIZONTAL POSITION FEEDBACK ACTIVE	00309
H STB LT	HORIZONTAL STROBE LEFT	00309
H STB RT	HORIZONTAL STROBE RIGHT	00309
H SW FLT	HORIZONTAL SWITCH FAULT	00306
HD CLK	HAMMER DRIVER CLOCK	00212
HD CLK GEN	HAMMER DRIVER CLOCK GENERATOR	00212
HE	HORIZONTAL ERROR	00305
HEP X	HAMMER ENABLE PULSE X WHERE X=NUMBER	00111
HME	HORIZONTAL MOTION ERROR	00203
HME FLT	HORIZONTAL MOTION ERROR FAULT	00306
HMR FLT	HAMMER FAULT	00306
HMR ON	HAMMER ON	00112
HMR SETTLE CNTR	HAMMER SETTLE COUNTER	00112
H POS HOME ENAB PUL	HORIZONTAL POSITION HOME ENABLE PULSE	00310
HOME FLT	HOME FAULT	00306
HOME TRIG PULSE	HOME TRIGGER PULSE	00301
HP FF	HOME PULSE FLIP FLOP	00112
HPC 2 ^X	HORIZONTAL POSITION COUNTER 2 ^X WHERE X= NUMBER	00204
HOR END STOP FLT	HORIZONTAL END STOP FAULT	00306
HOR MOT ENABLC	HORIZONTAL MOTION ENABLE	00108
IC FF	INPUT CYCLE FLIP FLOP	00105
IDB X	INTERNAL DATA BIT X WHERE X= NUMBER	00101
INH	INHIBIT	00306
INH DEL O/S	INHIBIT DELAY ONE SHOT	00205
INP LD OPT CNTR	INPUT LOAD OPTION COUNTER	00105
INP OPT CNTR MAX	INPUT OPTION COUNTER MAXIMUM	00106
INT V STB FF	INTERNAL VERTICAL STROBE FLIP FLOP	00208
LF O/S	LINE FEED ONE SHOT	00208
LF O/S CNTR	LINE FEED ONE SHOT COUNTER	00211
LD FMT REG	LOAD FORMAT REGISTER	00105
LSE	LINE SPACE ERROR	00211
M B ^X	MEMORY BIT X WHERE X= NUMBER	00103
MC	MASTER CLEAR	00113
MEM WRITE	MEMORY WRITE	00105
M PRT CODE	MEMORY PRINTABLE	00103
NEG CLK O/S	NEGATIVE CLOCK ONE SHOT	00310
OC 2 ^X	OPTION COUNTER BIT 2 ^X WHERE X= NUMBER	00106
ODP	OUT OF PAPER	00205
OPT ADV	OPTION ADVANCE	00206
OPT CNTR	OPTION COUNTER	00106
OPT FF	OPTION FLIP FLOP	00107
OUT OPT CNTR MAX	OUTPUT OPTION COUNTER MAXIMUM	00106

8-9

D

C

B

A

D

C

B

A

SPECIAL NOMENCLATURE PAGE 1

CODE IDENT	C	DWG NO	REV
PB/PBS	SHEET 7		A

4

3

2

1

SPECIAL NOMENCLATURE

ABBREVIATION	DEFINITION	CROSS REF. NUMBERS
PAP MOT COMP	PAPER MOTION COMPLETE	00208
PAPER MOT RATE DEL	PAPER MOTION RATE DELAY	00206
PB X	PRINTER BIT X WHERE X=NUMBER	00102
PHASE ADJ X	PHASE ADJUST X WHERE X=NUMBER	00202
PHV CLR	PAPER MOTION VERIFICATION CLEAR	00301
POS CLK O/S	POSITIVE CLOCK ONE SHOT	00310
POS FDBK	POSITIONAL FEEDBACK	00311
PRT CODE	PRINTABLE CODE	00102
PRT IN/OUT	PRINT IN/OUT	00108
PRT LD OPT CNTR	PRINT LOAD OPTION COUNTER	00107
PRT X	PRINT X WHERE X=NUMBER	00108
PU	PULL UP	00104
RAMP GEN	RAMP GENERATOR	00310
RCVRS	RECEIVERS	00101
RDY FF	READY FLIP FLOP	00201
REV	REVERSE	00308
RIB ON	RIBBON ON	00305
RIB MOT CUR FLT	RIBBON MOTOR CURRENT FAULT	00401
RIB MOT FLT	RIBBON MOTOR FLT	00306
SC*255	SCAN COUNTER = 255	00108
SCAN CNTR	SCAN COUNTER	00108
SET/RESET ENAB PRT	SET/RESET ENABLE PRINT	00105
SP	STANDARD PITCH	00111
SR → HD	SHIFT REGISTER COUNTENTS TRANSFER TO HAMMER DRIVER	00109
SR STEP X	SHIFT REGISTER STEP X WHERE X=NUMBER	00107
SS PROG	SUBSCAN PROGRAMING	00303
SSP	SUBSCAN PULSE	00303
SSP FF	SUBSCAN PULSE FLIP FLOP	00112
SSR*X	SUBSCAN REGISTER* X WHERE X= NUMBER	00109
STD PITCH	STANDARD PITCH	00111
START CLR	START CLEAR	00201
STB FF X	STROBE FLIP FLOP X WHERE X= NUMBER	00208
STP ENABLE	STOP TIMING PULSE ENABLE	00207
SYNC CK	SYNC CHECK	00402
TH 2 ^X	TYPE MACHINE 2 ^X WHERE X= NUMBER	00111
TOF	TOP OF FORM	00209
TOF BUSY	TOP OF FORM BUSY	00201
TSSP X	TIMING SUBSCAN PULSE X WHERE X= NUMBER	00109
V ADV	VERTICAL ADVANCE	00206
V ALIGN	VERTICAL ALIGNMENT	00205
V ADV	VERTICAL ADVANCE	00206
VERT ADV ENAB	VERTICAL ADVANCE ENABLE	00206
V CK STB	VERTICAL CKECK STROBE	00307
V CK STB FF	VERTICAL CHECK STROBE FLIP FLOP	00211
VFU VER.	VERTICAL FORMAT UNIT VERIFIER	00307
V STB	VERTICAL STROBE	00307
V STB CK CLR	VERTICAL STROBE CHECK CLEAR	00211
V STB CNTR X	VERTICAL STROBE COUNTER X WHERE X= NUMBER	00208
VERT MOTION	VERTICAL MOTION	00208
V H O/S	VERTICAL MOTION ONE SHOT	00206
V REF	VOLTAGE REFERENCE	00309
48	48 CHARACTER BAND	00104
64	64 CHARACTER BAND	00104
96	96 CHARACTER BAND	00108
128	128 CHARACTER BAND	00108
1 POS	1 POSITION MACHINE = PB1130	00111
2 POS	2 POSITION MACHINE = PB5720 STANDARD PITCH	00111
4 POS	4 POSITION MACHINE = PB5360 STANDARD PITCH	00111
12V FLT	+12V FAULT	00306
6/8 LP1 RDR	6/8 LINES PER INCH READER	00307

LOGIC LEVELS

HIGH OUTPUT VOLTAGE = 5.5V MAX / 2.4 MIN.
LOW OUTPUT VOLTAGE = 0.4V MAX / 0V MIN.

HIGH INPUT VOLTAGE = 5.5V MAX / 2.0V MIN.
LOW INPUT VOLTAGE = 0.8V MAX / 0V MIN.

POWER SUPPLY CONNECTIONS

ALL STANDARD I.C. PACKAGES HAVE THE FOLLOWING POWER SUPPLY CONNECTIONS WHICH ARE NOT SHOWN ON THE LOGIC ELEMENT SYMBOL.

- 14 PIN DEVICE = GROUND ON PIN 7 AND +5V ON PIN 14
- 16 PIN DEVICE = GROUND ON PIN 8 AND +5V ON PIN 16

ALL NON STANDARD I.C. PACKAGES WILL HAVE THEIR NON-STANDARD GROUND AND SUPPLY CONNECTIONS SHOWN AS PART OF THE LOGIC ELEMENT SYMBOL.

REPETITIVE DETAILS

ALL LOGIC PRINTED CIRCUIT CARDS WILL HAVE FILTER CAPACITORS GENERALLY LOCATED CLOSE TO THE INPUT POWER CONNECTOR. DECOUPLING CAPACITORS FROM 33MFD TO 120 MFD ARE USED, DEPENDING ON THE BOARD.

HIGH FREQUENCY CAPACITORS (.01MFD) ARE LOCATED BETWEEN USED I.C. LOCATIONS (1 CAPACITOR/3 I.C.'S).

THESE CAPACITORS ARE NOT SHOWN ON LOGIC DRAWINGS.

ALL DIODES ARE PN 1N80300UNLESS OTHERWISE INDICATED

SQUARE PADS ON ARTWORK INDICATE:

1. PIN 1 OF ICs AND CONNECTORS.
2. CATHODE OF DIODES.
3. POSITIVE SIDE OF ELECTROLITIC CAPACITORS.

ABBREVIATION	DEFINITION	CROSS REF NO.
TOFPLS	TOP OF FORM PULSE	00101

SPECIAL NOMENCLATURE
PAGE 2

CODE IDENT DATA BASE REV #	C	DWG NO	REV
PB/PBS	SHEET 8		E

6-9

7-7-77 MJD

4

3

2

1

D

D

ELEMENT IDENTIFIER LIST

ELEMENT IDENTIFIER	GENERIC EQUIVALENT	DESCRIPTION
140	7400	QUAD 2 INPUT NAND
141	7410	TRIPLE 3 INPUT NAND
146	7404	HEX INVERTER
148	7402	QUAD 2 INPUT NOR
156	74107	DUAL J-K MASTER/SLAVE FF W/RESET
158	74161	COUNTER, SYNCHRONOUS 4-BIT BINARY
175	7474	DUAL D-TYPE FF
194	74121	MULTIVIBRATOR
195	9602	MULTIVIBRATOR, DUAL, RETRIGGERABLE, MONDSTABLE
200	7406	DRIVER, HEX INVERTER-OPEN COLLECTOR
201	7408	QUAD 2 INPUT AND
206	7430	EIGHT INPUT POSITIVE NAND
207	7425	DUAL 4 INPUT NOR W/STROBE
208	7420	DUAL 4 INPUT NAND
210	7437	QUAD 2 INPUT NAND BUFFER
213	7411	TRIPLE 3 INPUT AND
218	7432	QUAD 2 INPUT OR
227	7407	DRIVER, HEX, OPEN COLLECTOR, HIGH VOLTAGE
241	7476	DUAL J-K MASTER/SLAVE FF W/SET & CLEAR
305	LM311	VOLTAGE COMPARATOR
306	747	OPERATIONAL AMPLIFIER, DUAL
332	LM305	VOLTAGE REGULATOR
334	723	VOLTAGE REGULATOR
340A	7419	OPERATIONAL AMPLIFIER, HIGH SLEW RATE
341	LM339	VOLTAGE COMPARATOR, QUAD, LOW OFFSET
354G	LM320	VOLTAGE REGULATOR, NEG 12V
355D	LM340	VOLTAGE REGULATOR, POS 12V
500	74193	COUNTER, SYNCHRONOUS 4-BIT BINARY UP/DOWN
505	74151	8 LINE TO 1 LINE DATA SELECTOR/MULTIPLEXER W/STROBE
508	74153	MULTIPLEXER, DUAL 4 INPUT
519	74174	MONOLITHIC D TYPE FF
520	74175	MONOLITHIC D TYPE FF W/COMPLEMENTARY OUTPUT FROM EACH FF
523	74192	COUNTER, SYNCHRONOUS 4-BIT BCD UP/DOWN
527	74164	SHIFT REGISTER, 8-BIT SERIAL-IN, PARALLEL OUT
528	74194	SHIFT REGISTER, 4 BIT BIDIRECTIONAL, UNIVERSAL
582	4024	OSCILLATOR, DUAL VOLTAGE CONTROLLED
780	2111-1	256X4 STATIC RAM
916	555	TIMER
927	75453	DRIVER, DUAL OR, OPEN COLLECTOR
943	7414	HEX SCHMITT TRIGGER
3094	3094	POWER SWITCH/AMPLIFIER, PROGRAMMABLE
4741	4741	OPERATIONAL AMPLIFIER, QUAD
4044	4044	PHASE-FREQUENCY DETECTOR
4066	4066	ANALOG SWITCH, QUAD
14415	14415	TIMER DRIVER, QUAD PRECISION
74136	74136	QUAD 2 INPUT EXCLUSIVE OR
74221	74221	DUAL MONDSTABLE MULTIVIBRATOR
74LS257	74LS257	QUAD 2 INPUT MULTIPLEXER
161	9601	RETRIGGERABLE MULTIVIBRATOR ONE SHOT

GENERAL NOTES

DUE TO THE LARGE NUMBER OF CIRCUITS ON EACH BOARD, MORE THEN ONE LOGIC SHEET IS USUALLY REQUIRED FOR EACH BOARD. THE BOARD NAME, CIRCUIT MODULE LOCATION AND CROSS REFERENCE NUMBERS APPEAR ON EACH SHEET. EACH SYMBOL IN THE DIAGRAMS REFLECTS THE LOGIC FUNCTION PERFORMED, COMPONENT TYPE OR ELEMENT IDENTIFIER AND LOCATION OF ALL OR PART OF AN I/C PACKAGE OR DISCREET COMPONENT(S). FOR DETAILED INFORMATION ON SYMBOLS AND PACKAGE TYPE REFER TO CIRCUIT DESCRIPTIONS AT LEFT OF THIS SHEET, OR KEY TO LOGIC SYMBOLS # 95387500

(MANUAL # 95390100)

C

6-10

C

B

A

B

A

GENERAL NOTES &
IDENTIFIER LIST

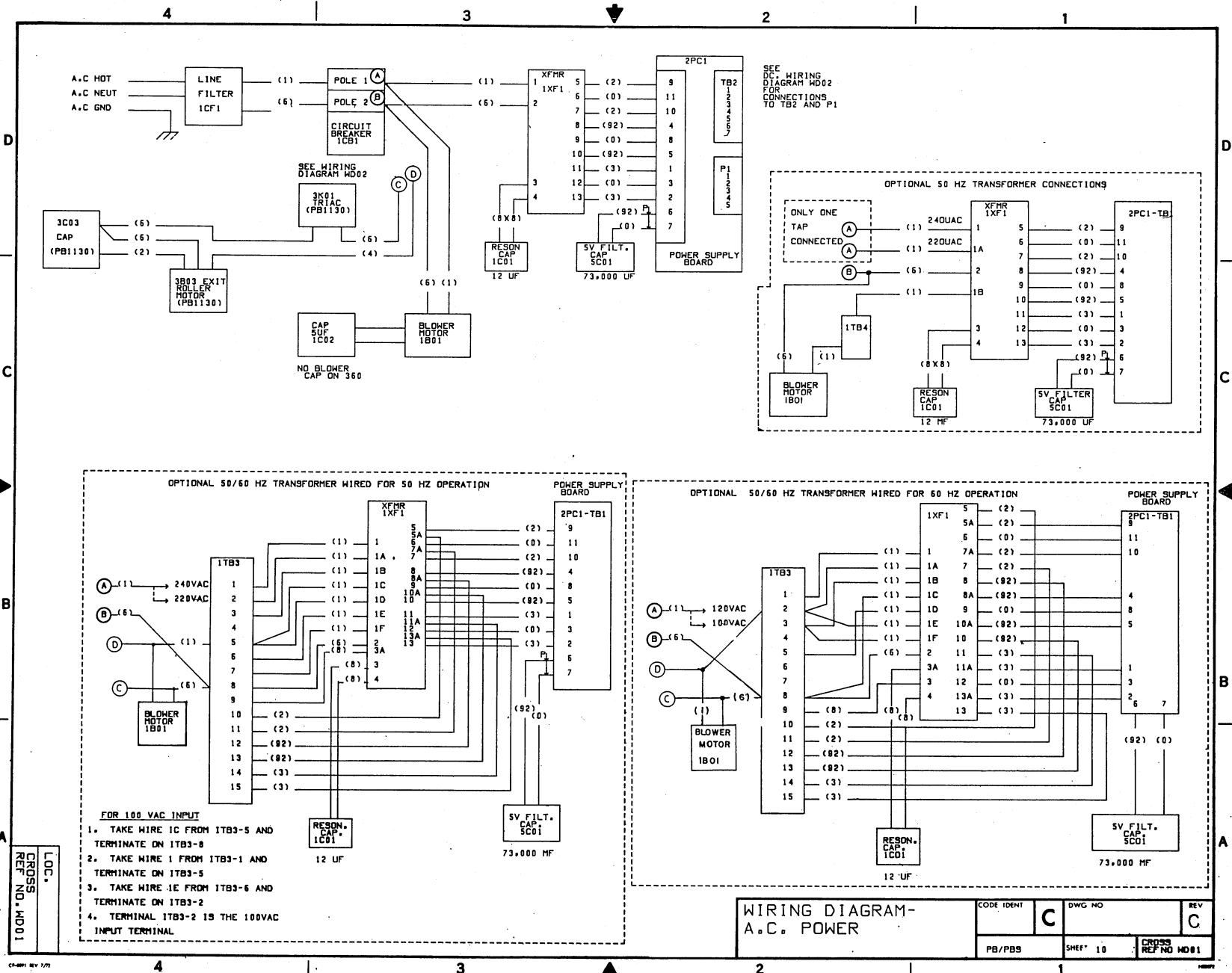
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PB/PBS		SHEET 9	C

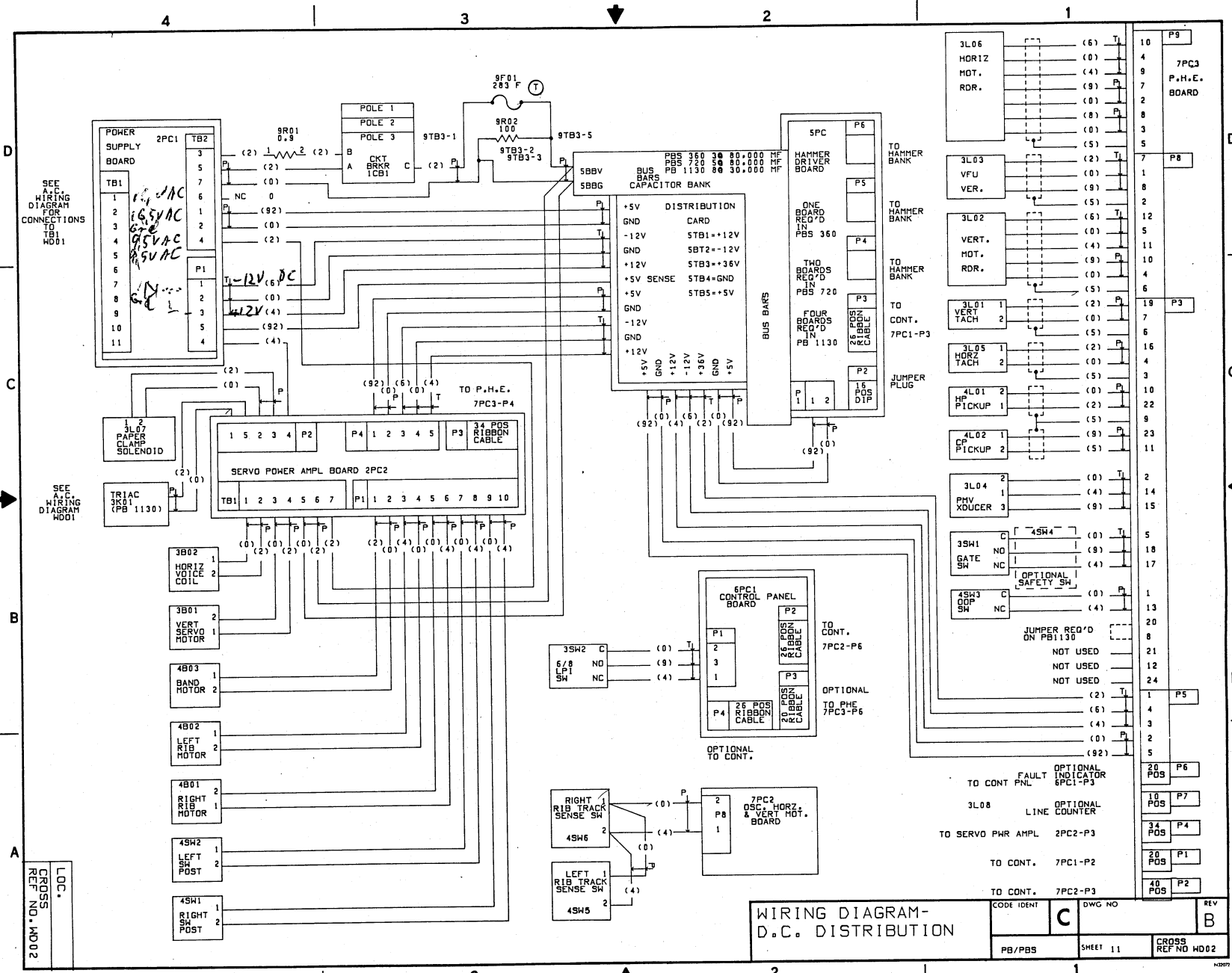
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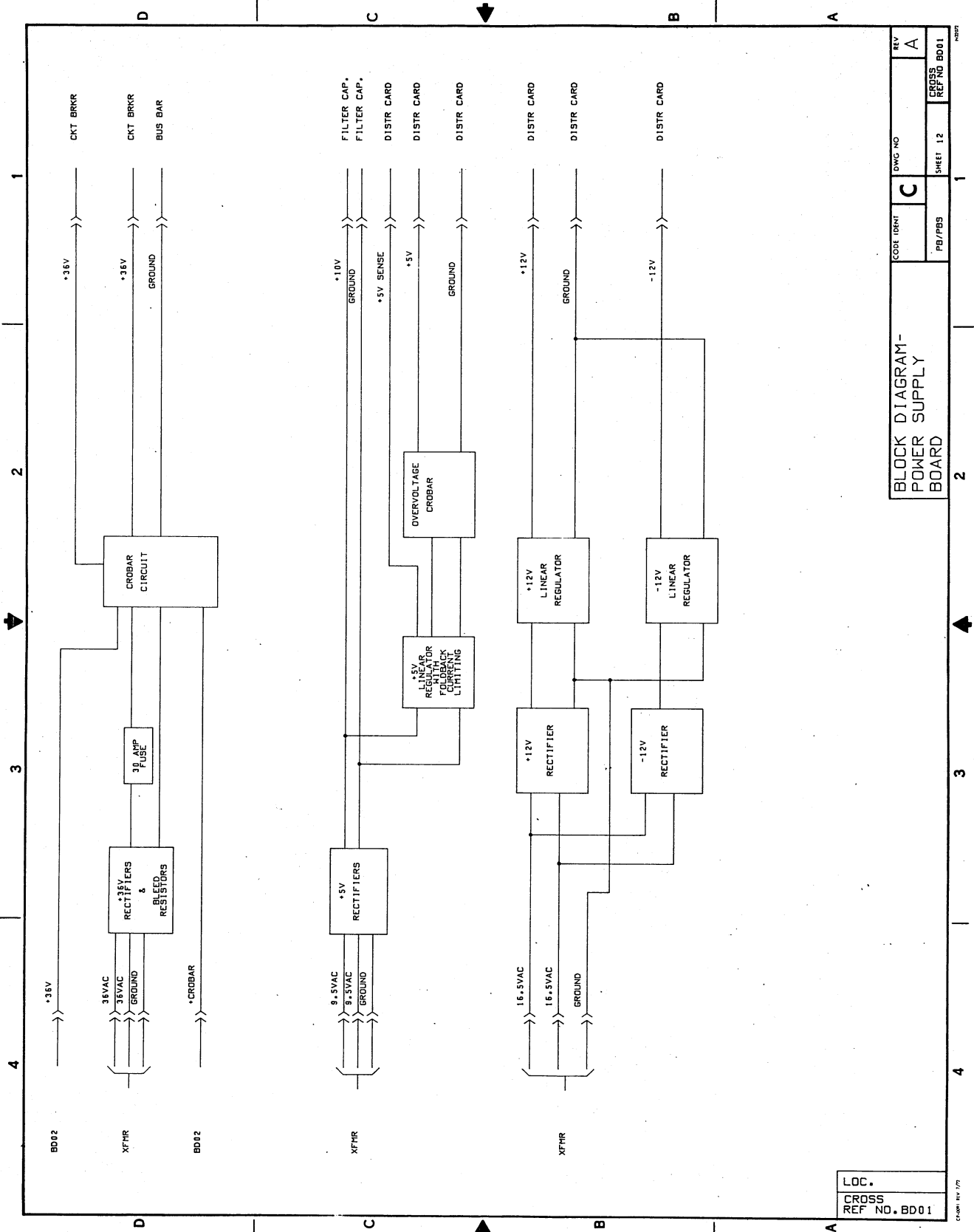
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WIRING DIAGRAM - D.C. DISTRIBUTION

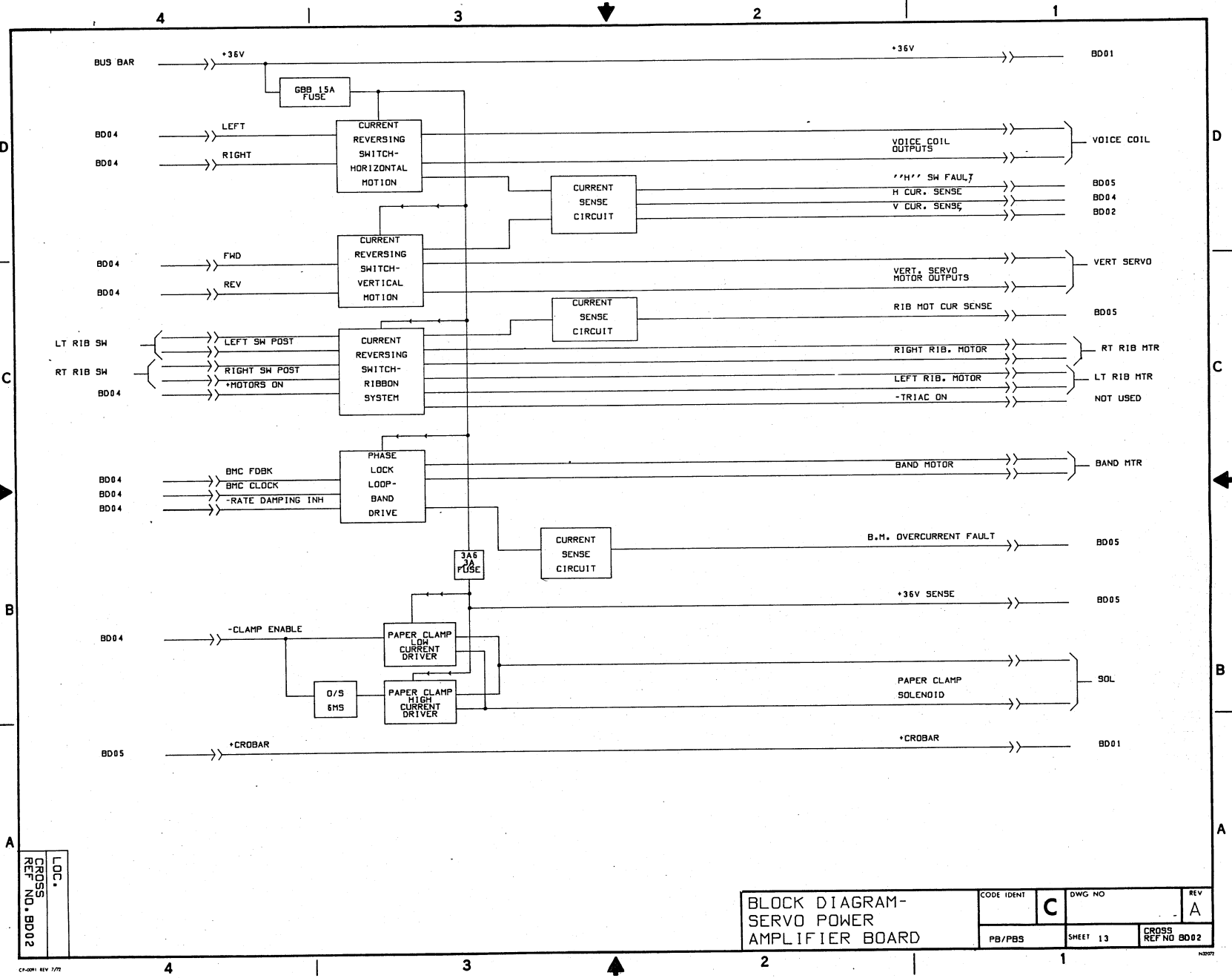
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PB/PBS		SHEET 11	CROSS REF NO HD02



BLOCK DIAGRAM- POWER SUPPLY BOARD		CODE IDENT	DWG NO	REV
		PB/PBS	SHEET 12	A
		CROSS REF NO BD01		

LDC.
CROSS
REF NO. BD01

CR-301 REV 7/79

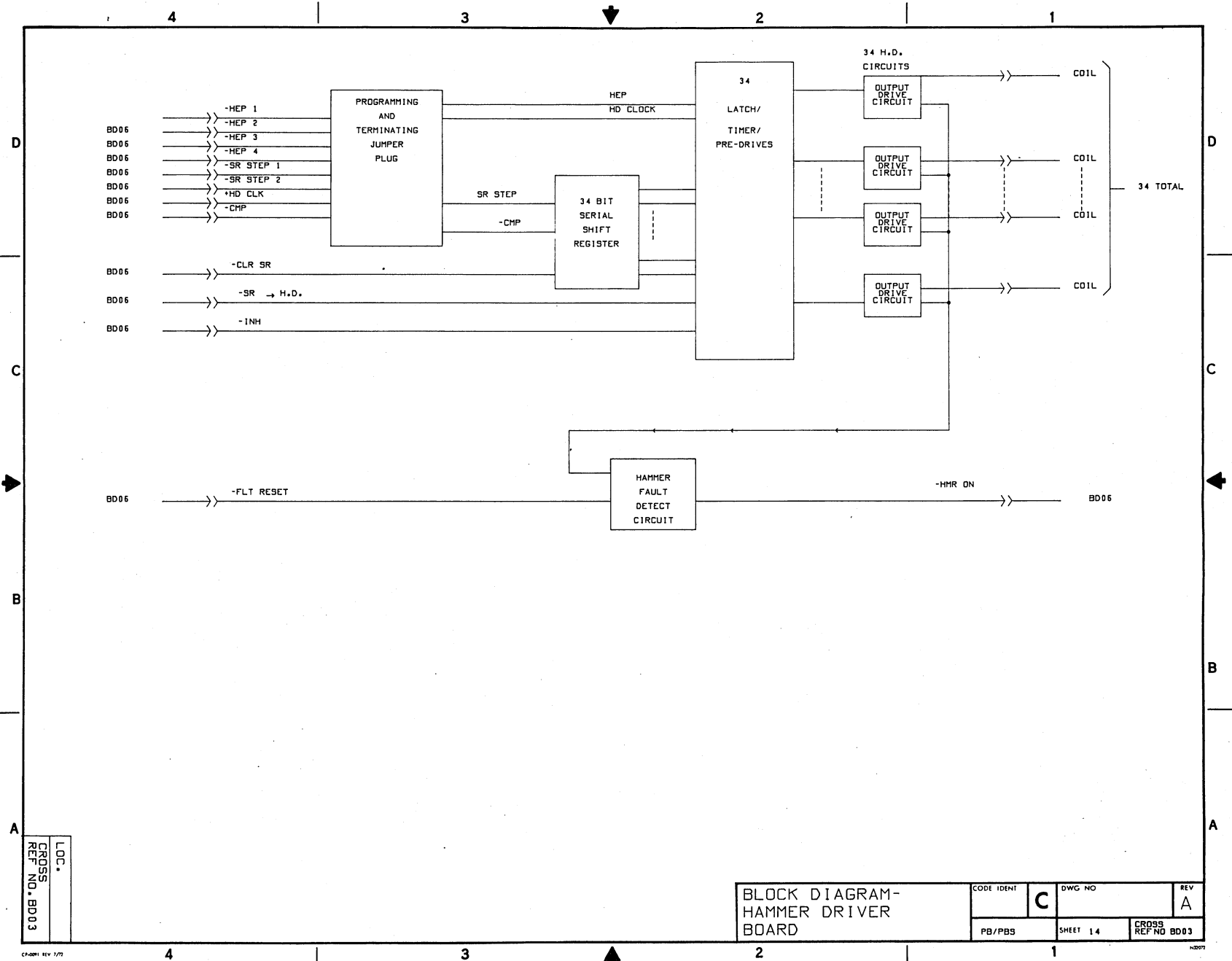


LOC.
CROSS
REF NO. BD02

BLOCK DIAGRAM-
SERVO POWER
AMPLIFIER BOARD

CODE IDENT	C	DWG NO	REV
PB/PBS	SHEET 13	CROSS REF NO BD02	A

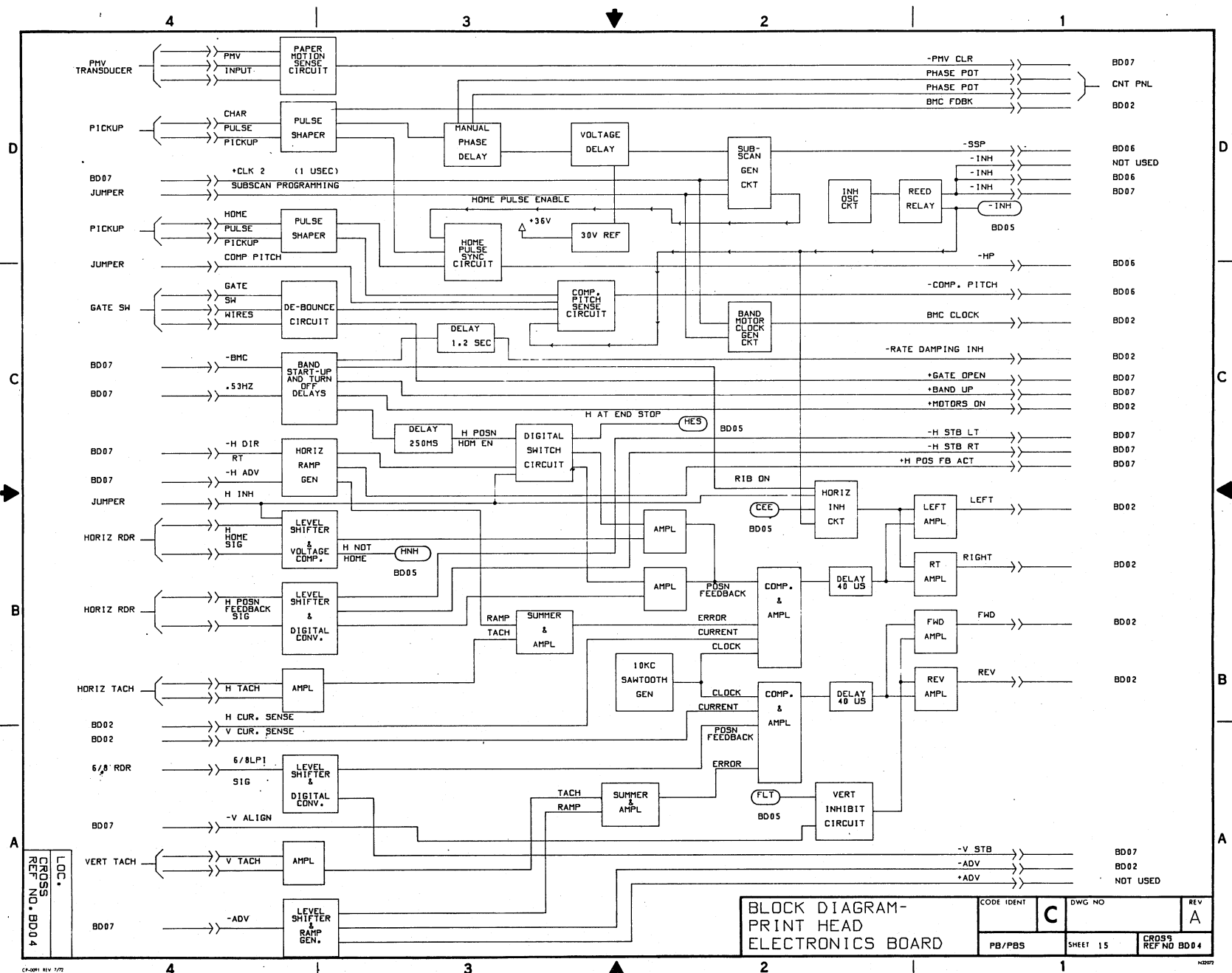
6-15



LOC.
CROSS
REF NO. BD03

BLOCK DIAGRAM-
HAMMER DRIVER
BOARD

CODE IDENT	DWG NO	REV
	C	A
PB/PBS	SHEET 14	CROSS REF NO BD03

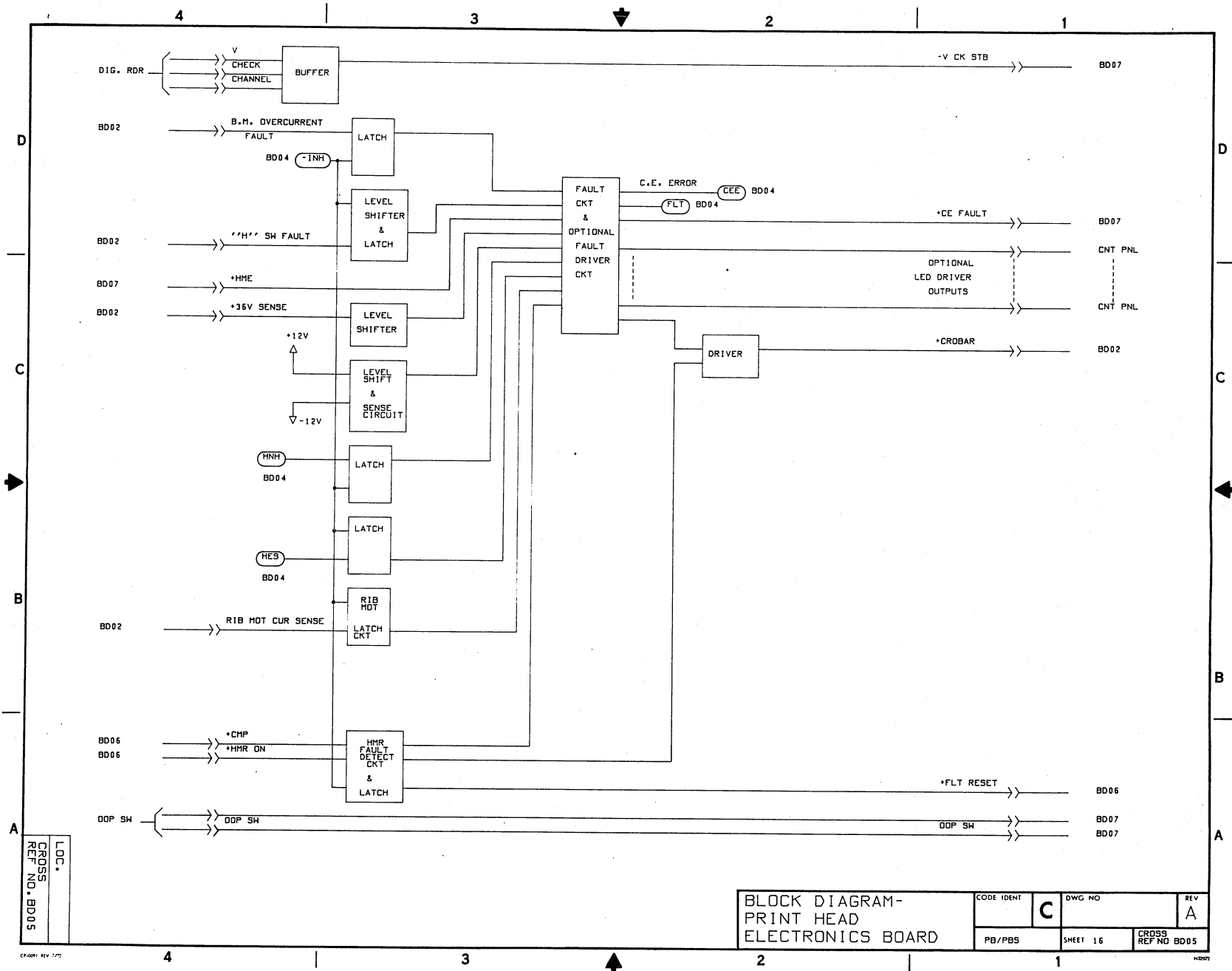


BLOCK DIAGRAM-
PRINT HEAD
ELECTRONICS BOARD

CODE IDENT	C	DWG NO	REV
PB/PBS	SHEET 15	CROSS REF NO	BD04

BD07
BD02
NOT USED

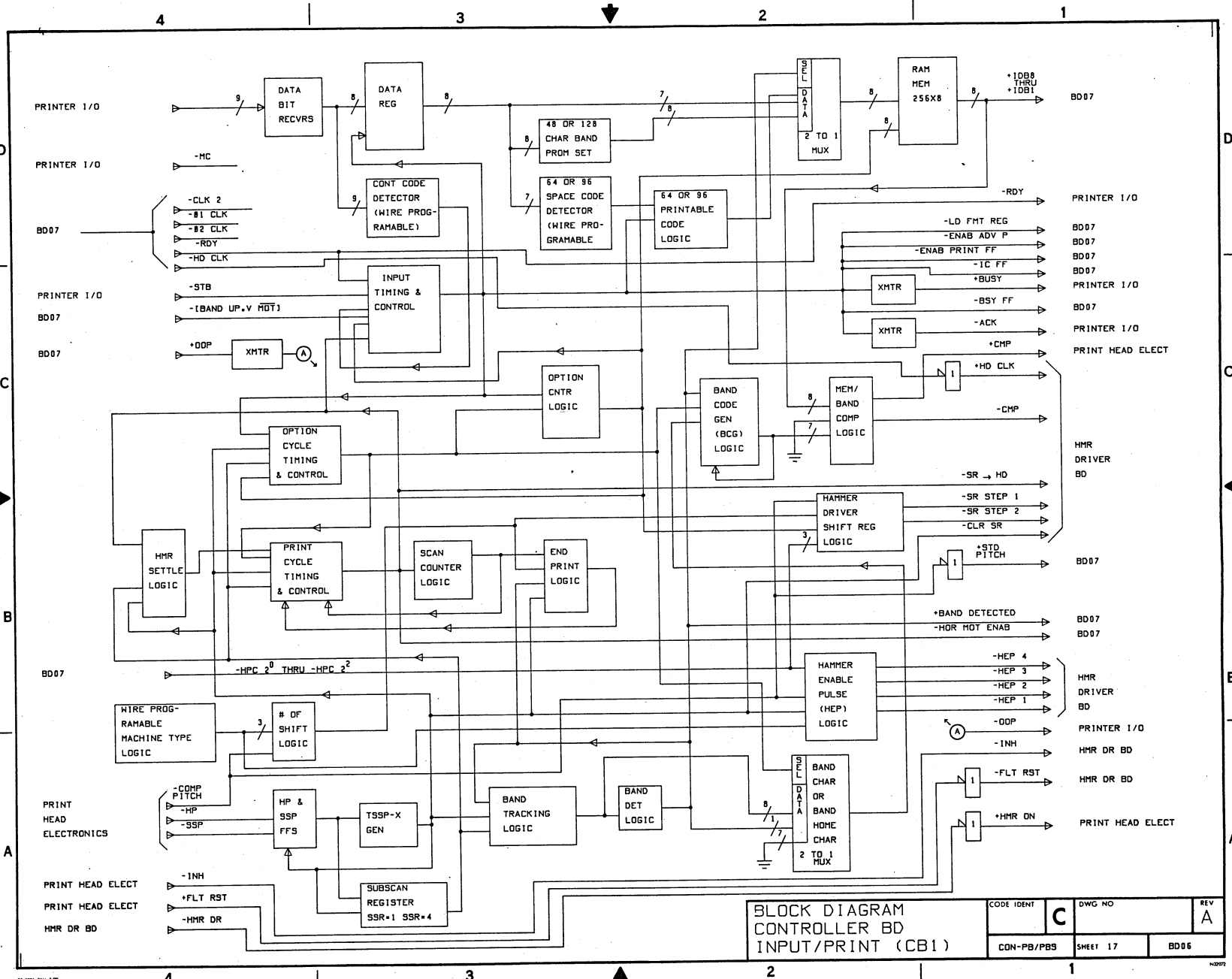
6-17



LOC.
CROSS
REF. NO. BD05

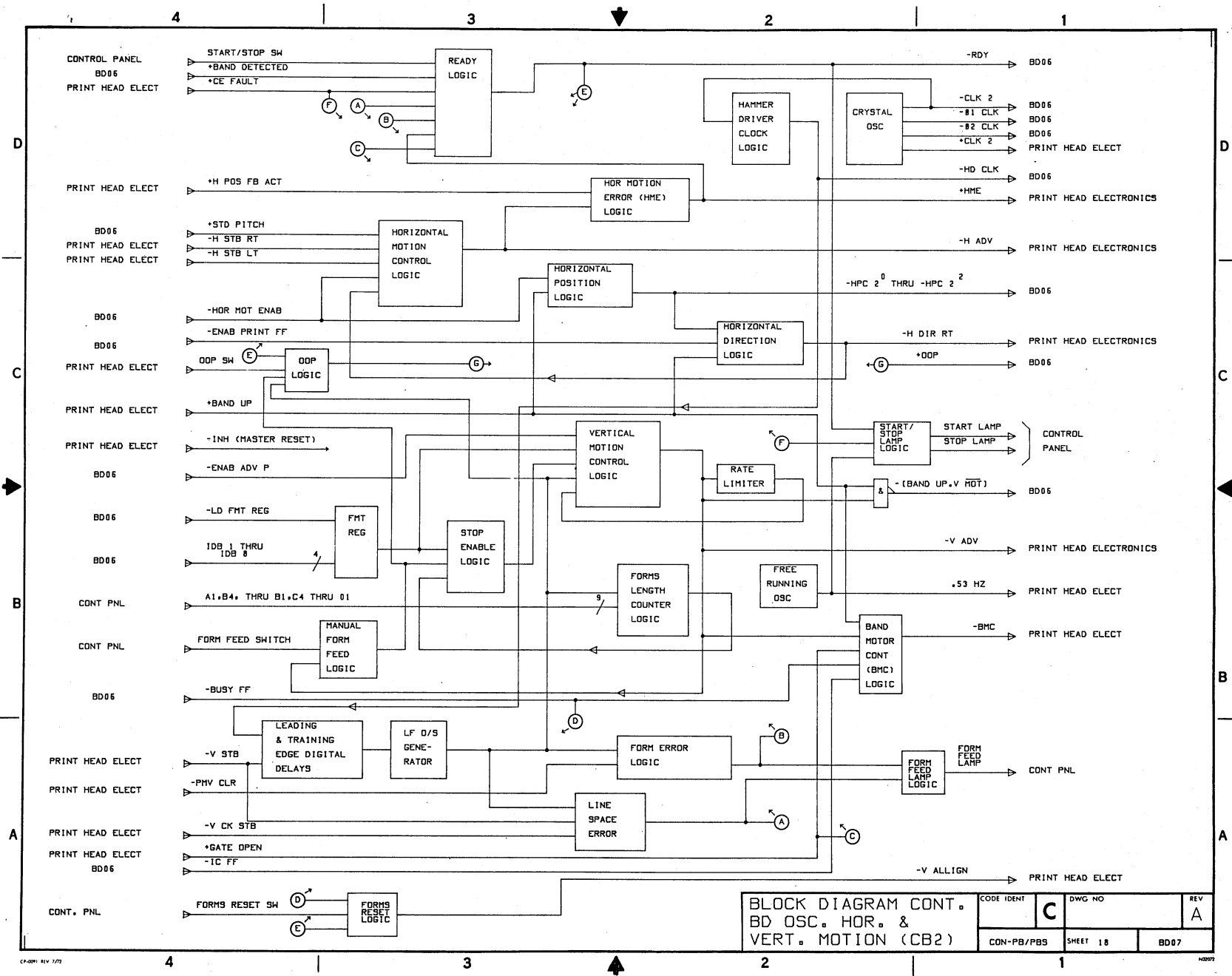
BLOCK DIAGRAM-
PRINT HEAD
ELECTRONICS BOARD

CODE IDENT	C	DWG NO	REV
PB/PBS		SHEET 16	A
		CROSS REF NO	BD05



BLOCK DIAGRAM
CONTROLLER BD
INPUT/PRINT (CB1)

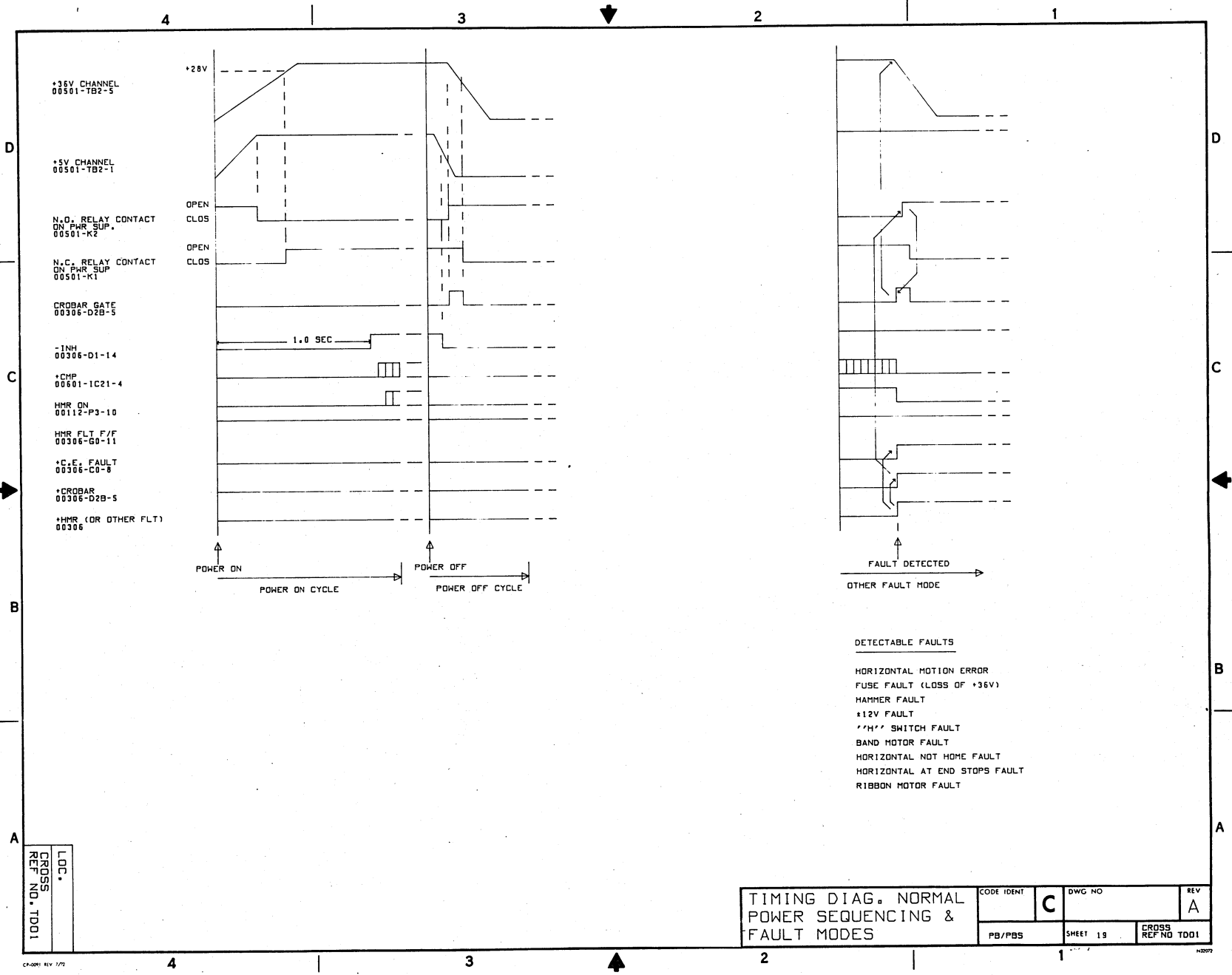
CODE IDENT	C	DWG NO	REV
CON-PB/PBS	SHEET 17	BD06	A



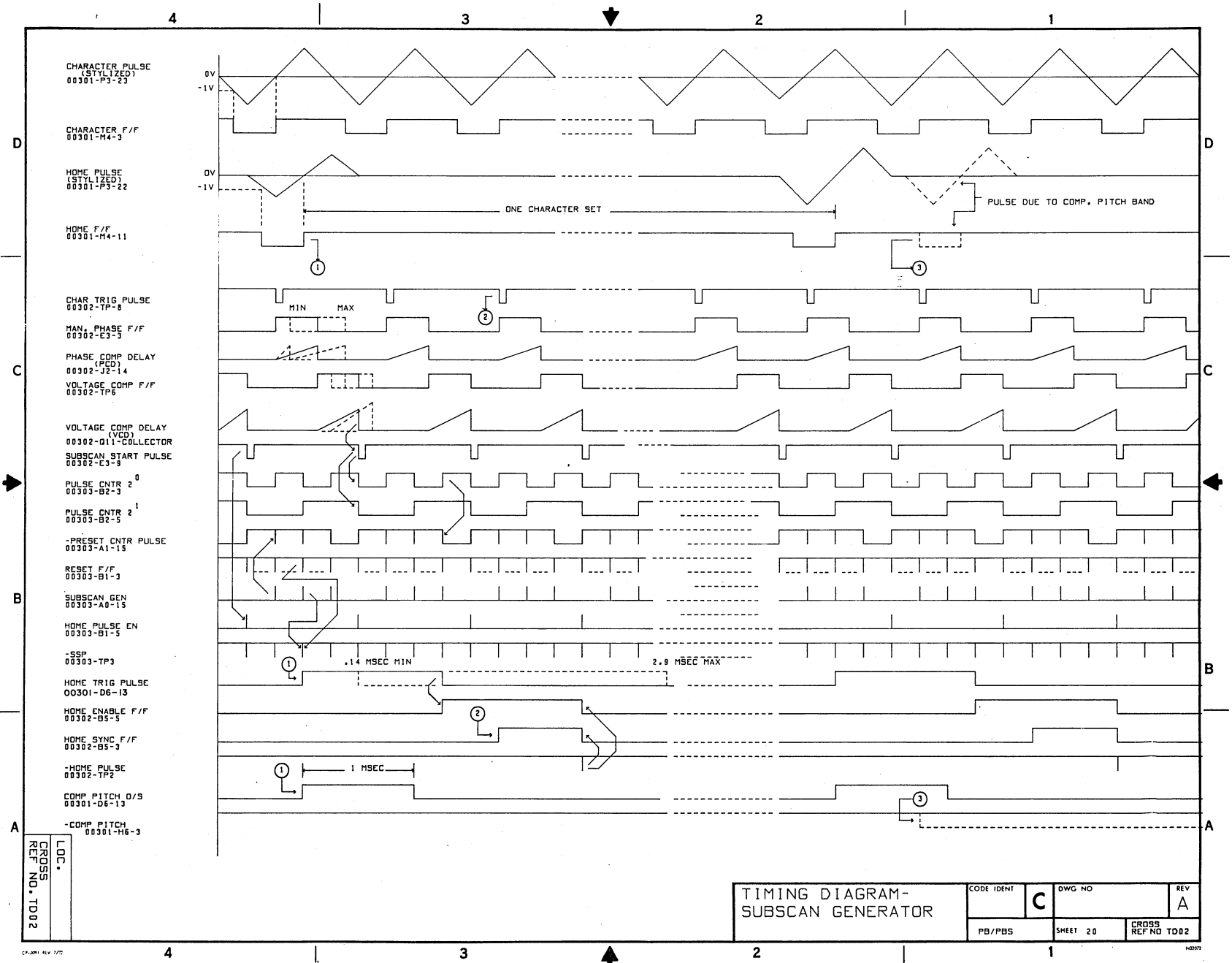
BLOCK DIAGRAM CONT.
BD OSC. HOR. &
VERT. MOTION (CB2)

CODE IDENT	C	DWG NO	REV
CON-PB/PBS	SHEET 18	BD07	

6-20



6-21

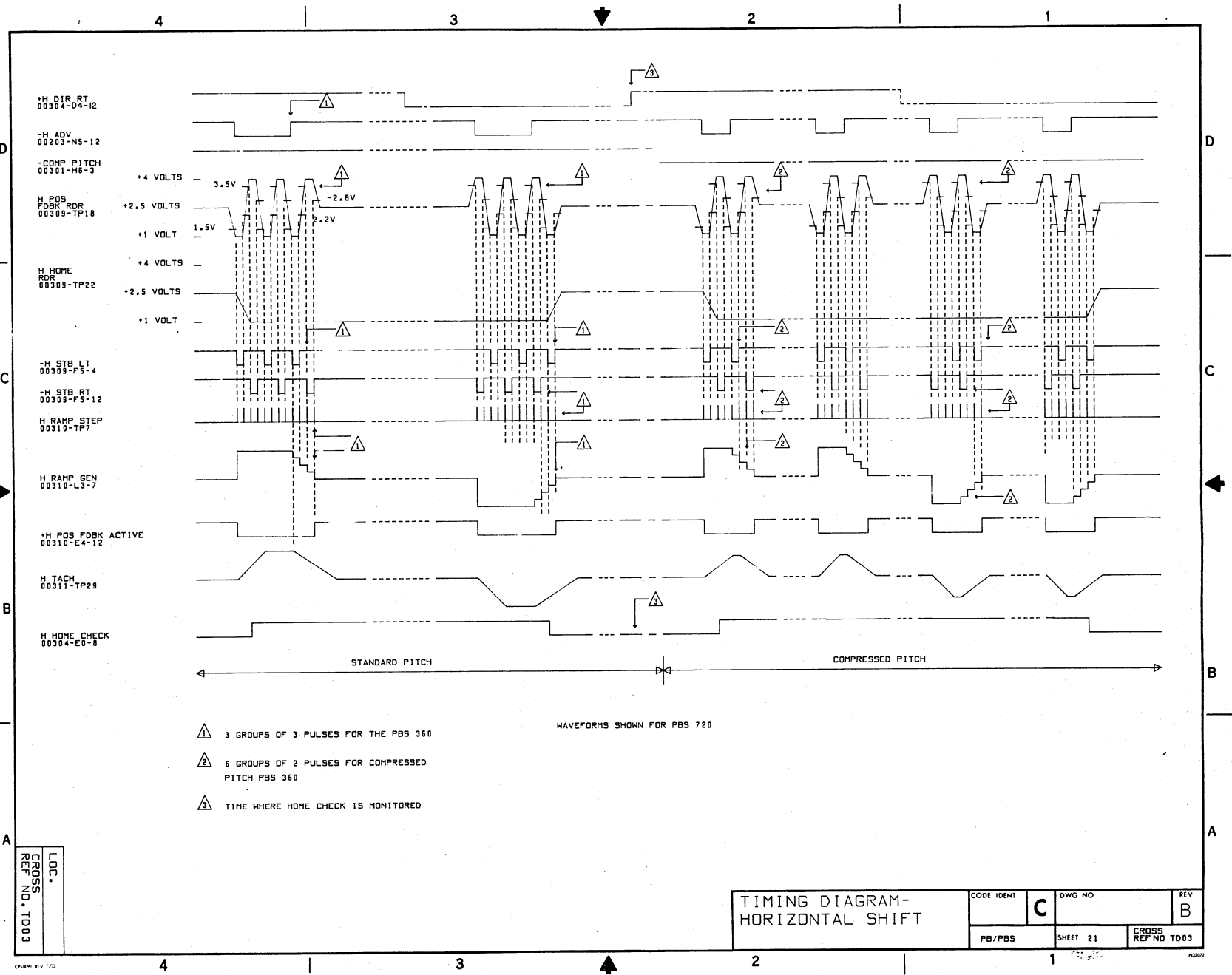


CROSS REF. NO. TD02
LOC.

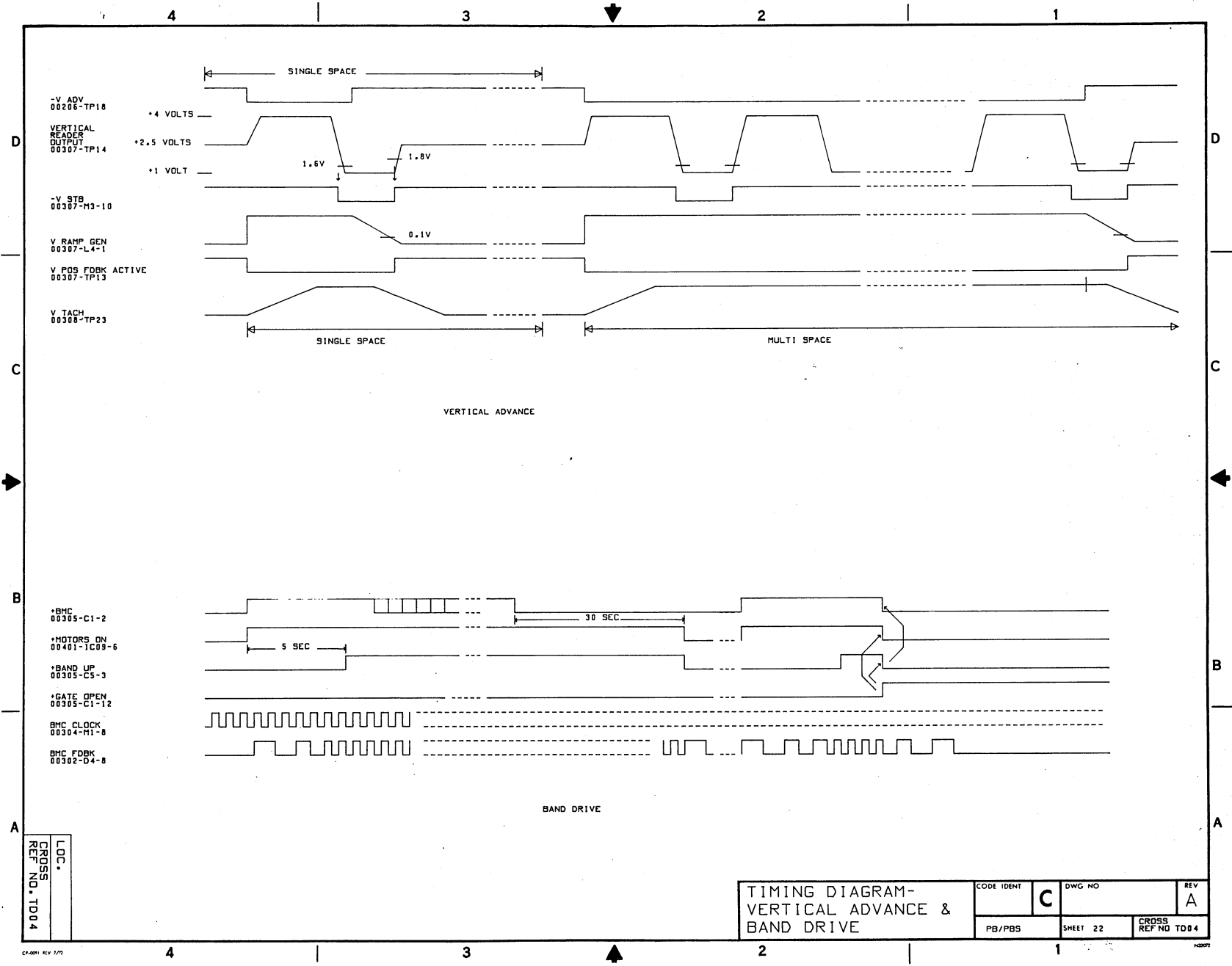
TIMING DIAGRAM-
SUBSCAN GENERATOR

CODE IDENT	C	DWG NO	REV
PB/PBS		SHEET 20	CROSS REF NO TD02

6-22



6-23

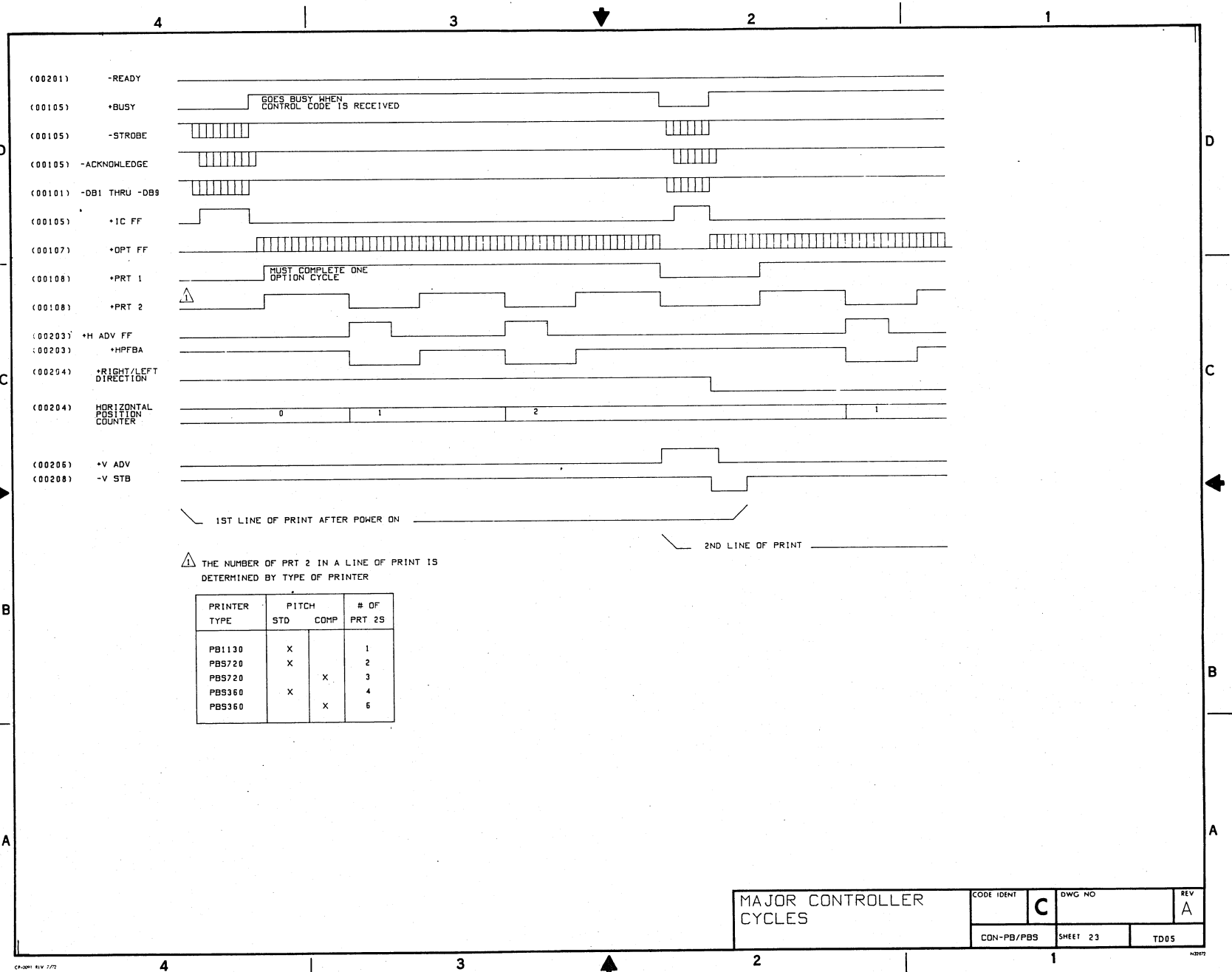


LOC.
CROSS
REF. NO. 1004

TIMING DIAGRAM-
VERTICAL ADVANCE &
BAND DRIVE

CODE IDENT	C	DWG NO	REV
PB/PBS	SHEET 22	CROSS REF NO	TD04

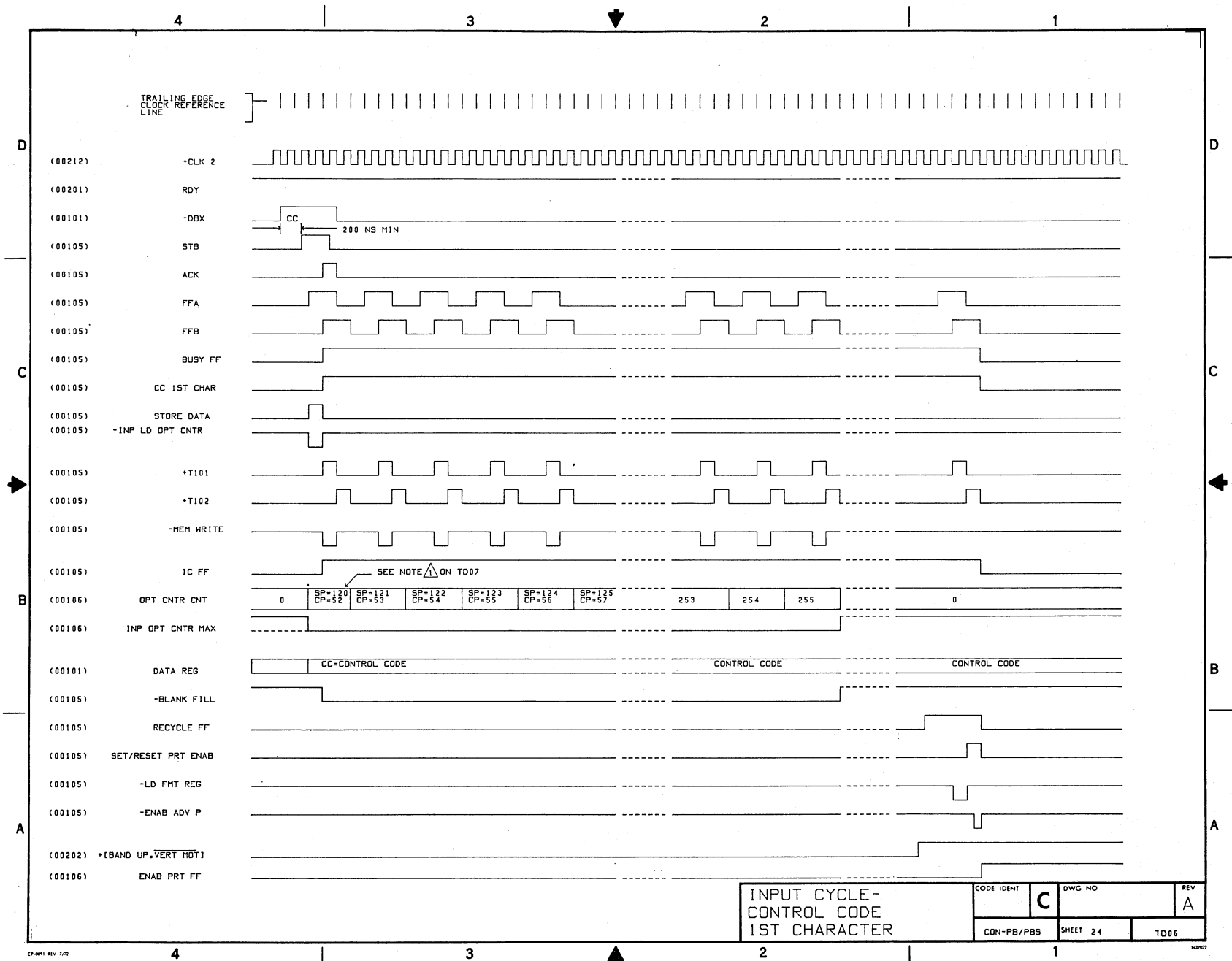
6-24



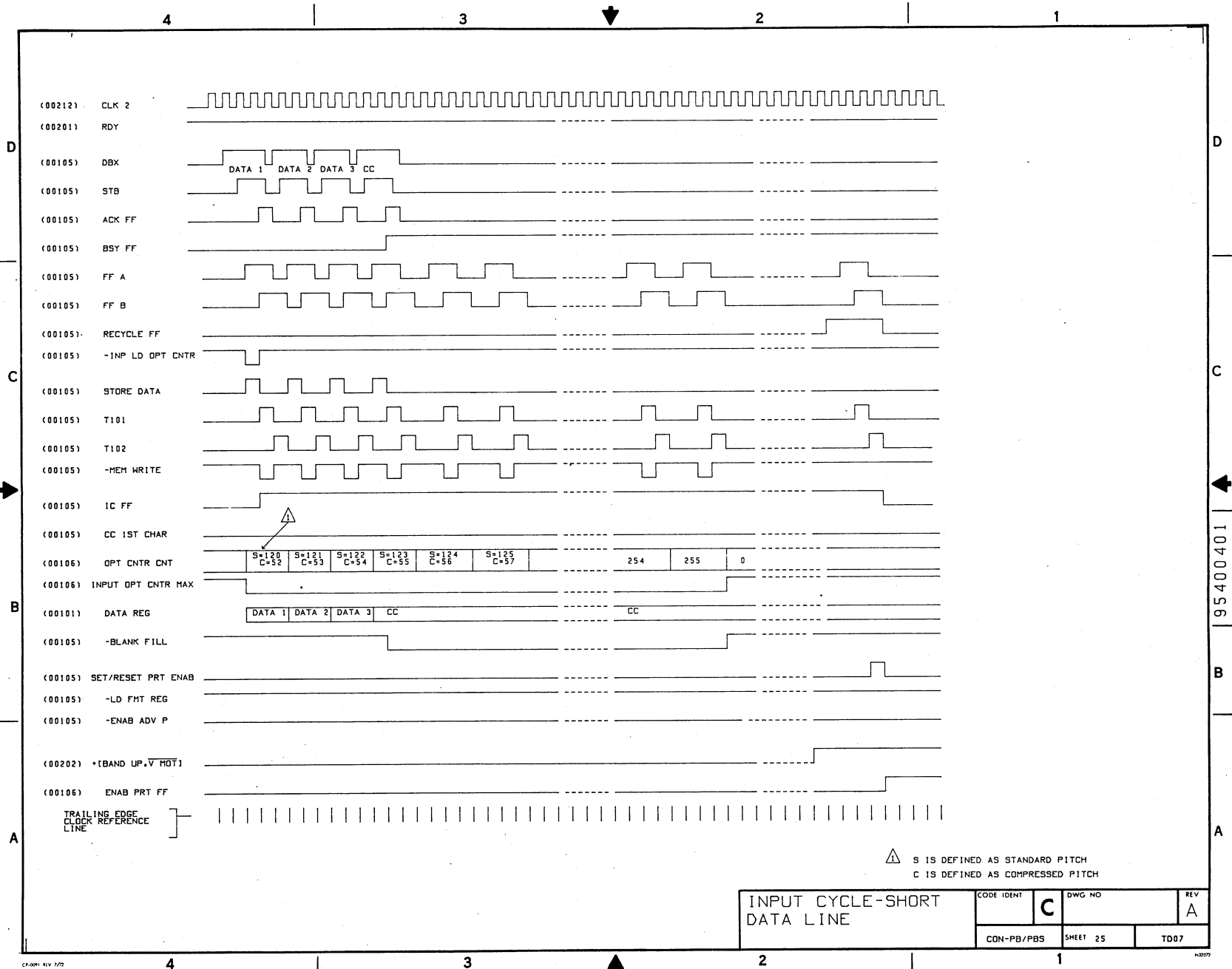
MAJOR CONTROLLER CYCLES

CODE IDENT	C	DWG NO	REV
CON-PB/PBS	SHEET 23	TD05	A

6-25



6-26

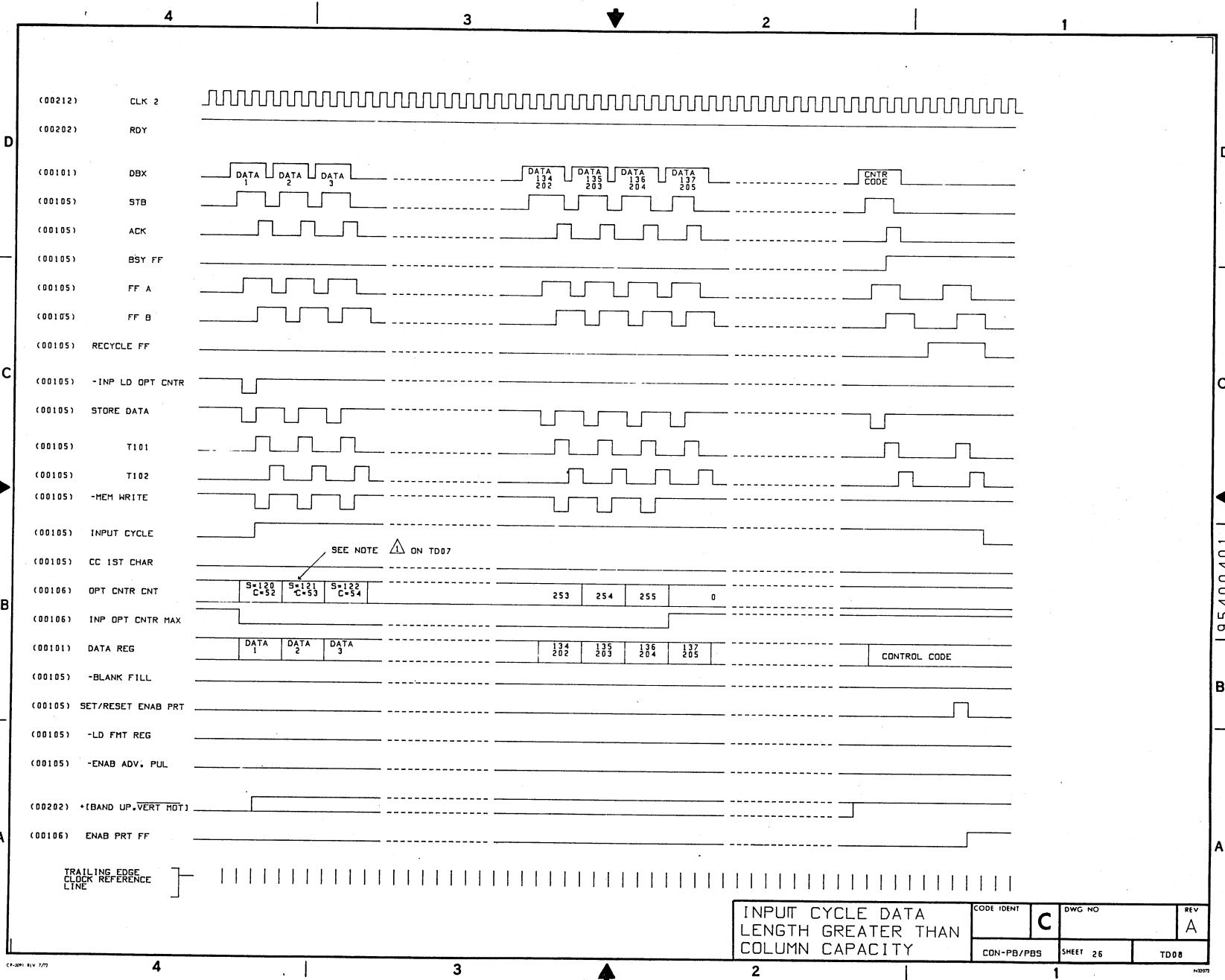


INPUT CYCLE-SHORT DATA LINE		CODE IDENT C	DWG NO	REV A
CON-PB/PBS		SHEET 25	T007	

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95400401

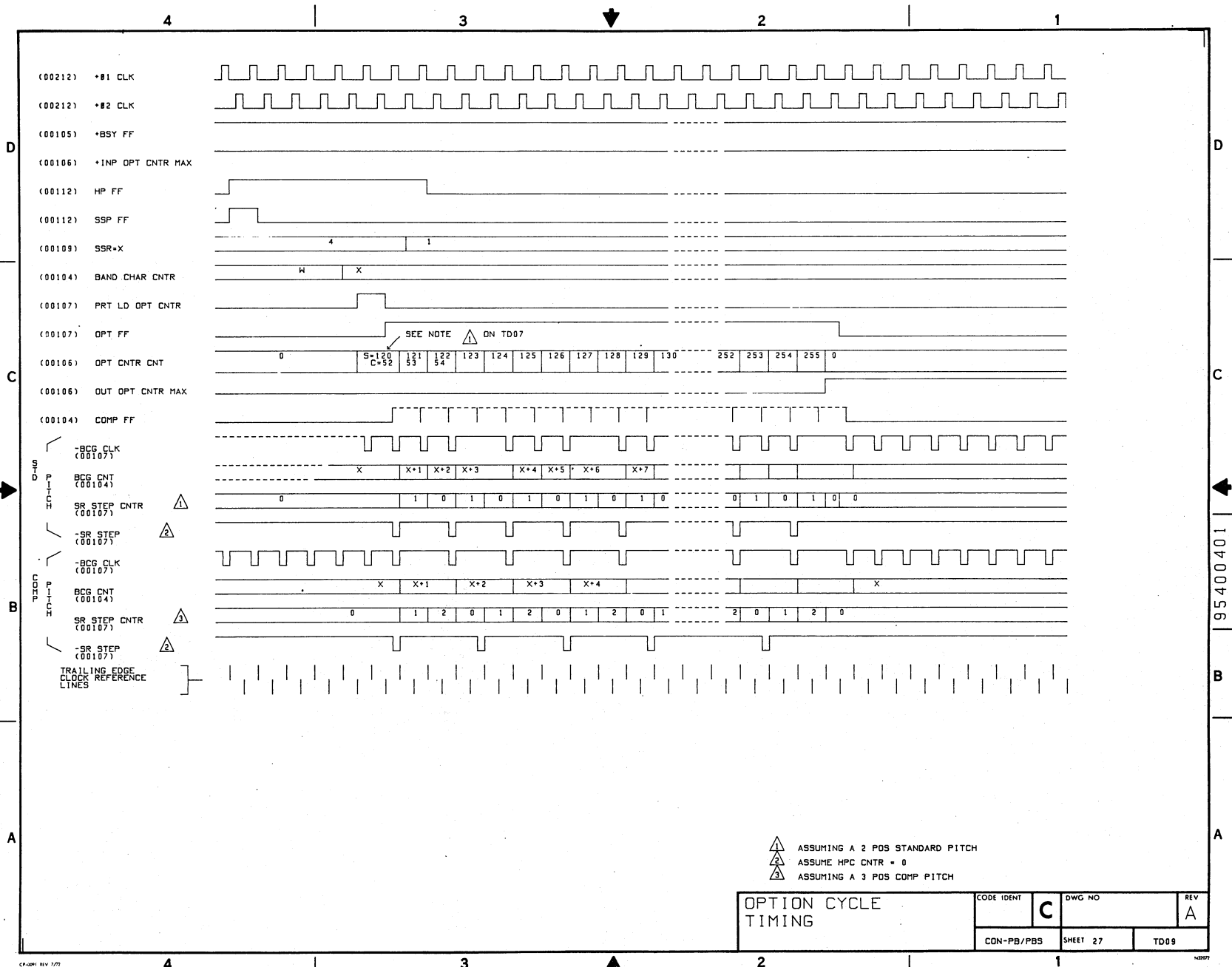
6-27



INPUT CYCLE DATA
LENGTH GREATER THAN
COLUMN CAPACITY

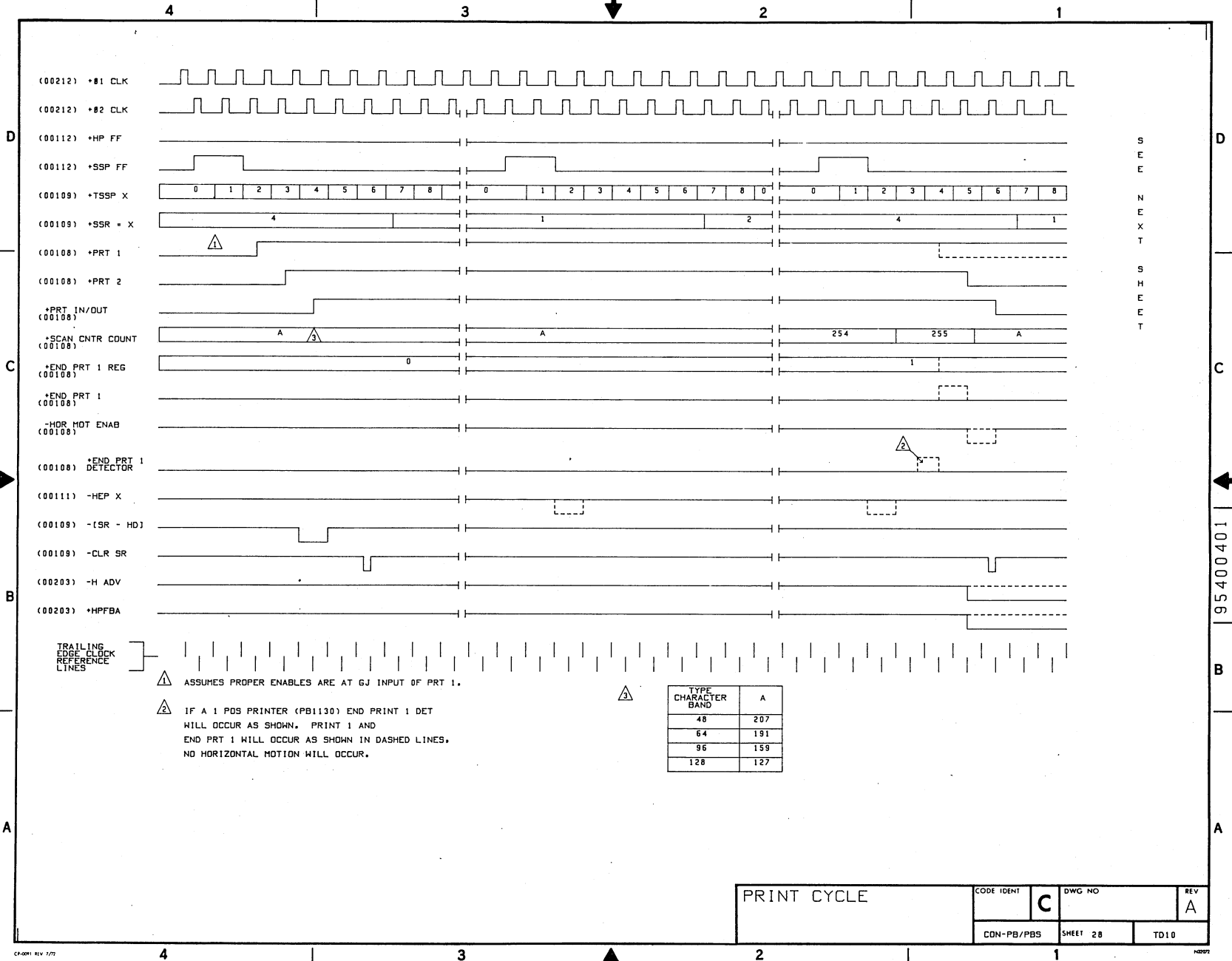
CODE IDENT	C	DWG NO	REV
CDN-PB/PBS	SHEET 26	TD08	A

6-28



OPTION CYCLE TIMING

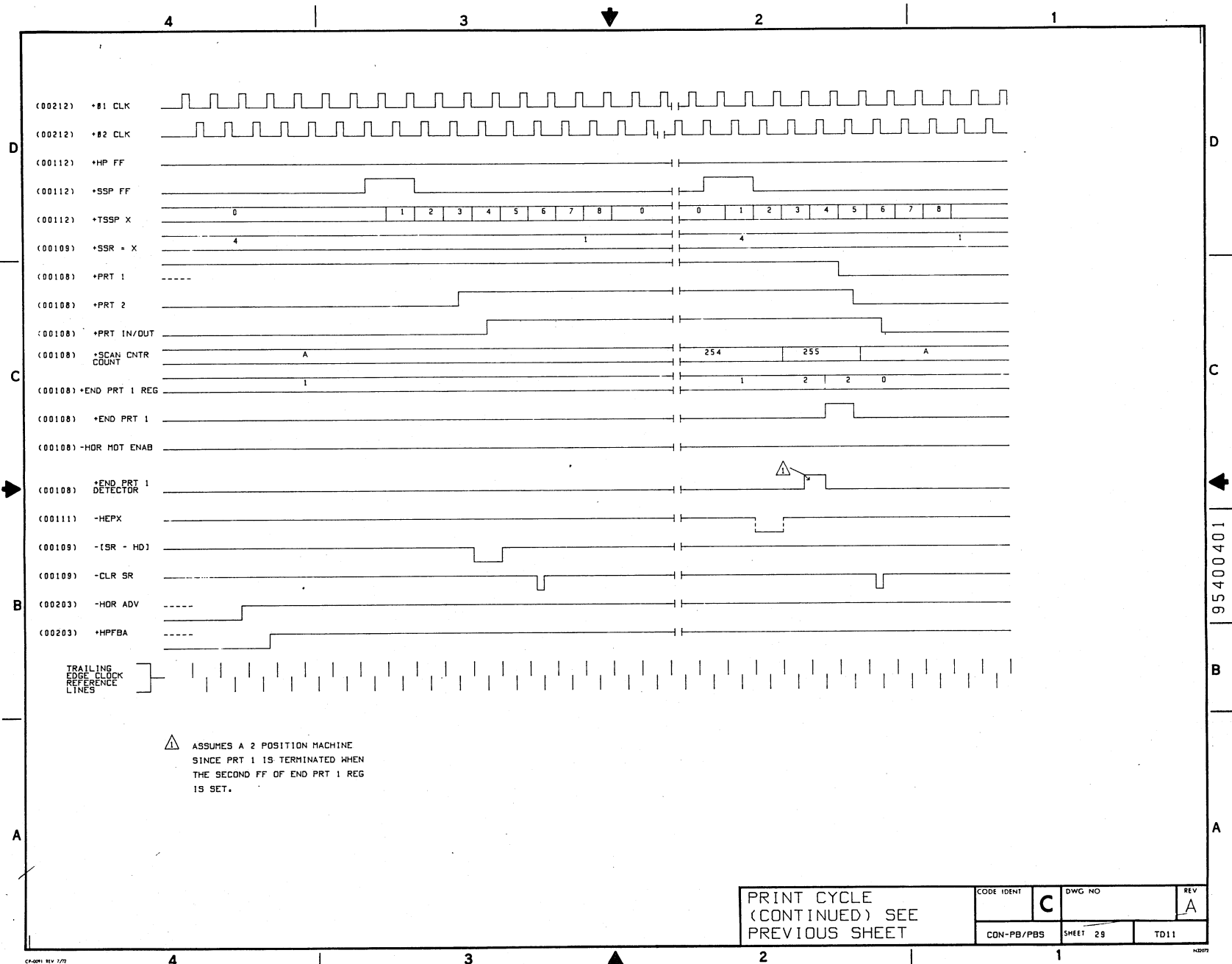
CODE IDENT	C	DWG NO	REV
CDN-PB/PBS	SHEET 27	TD09	A



SEE NEXT SHEET

95400401

6-30



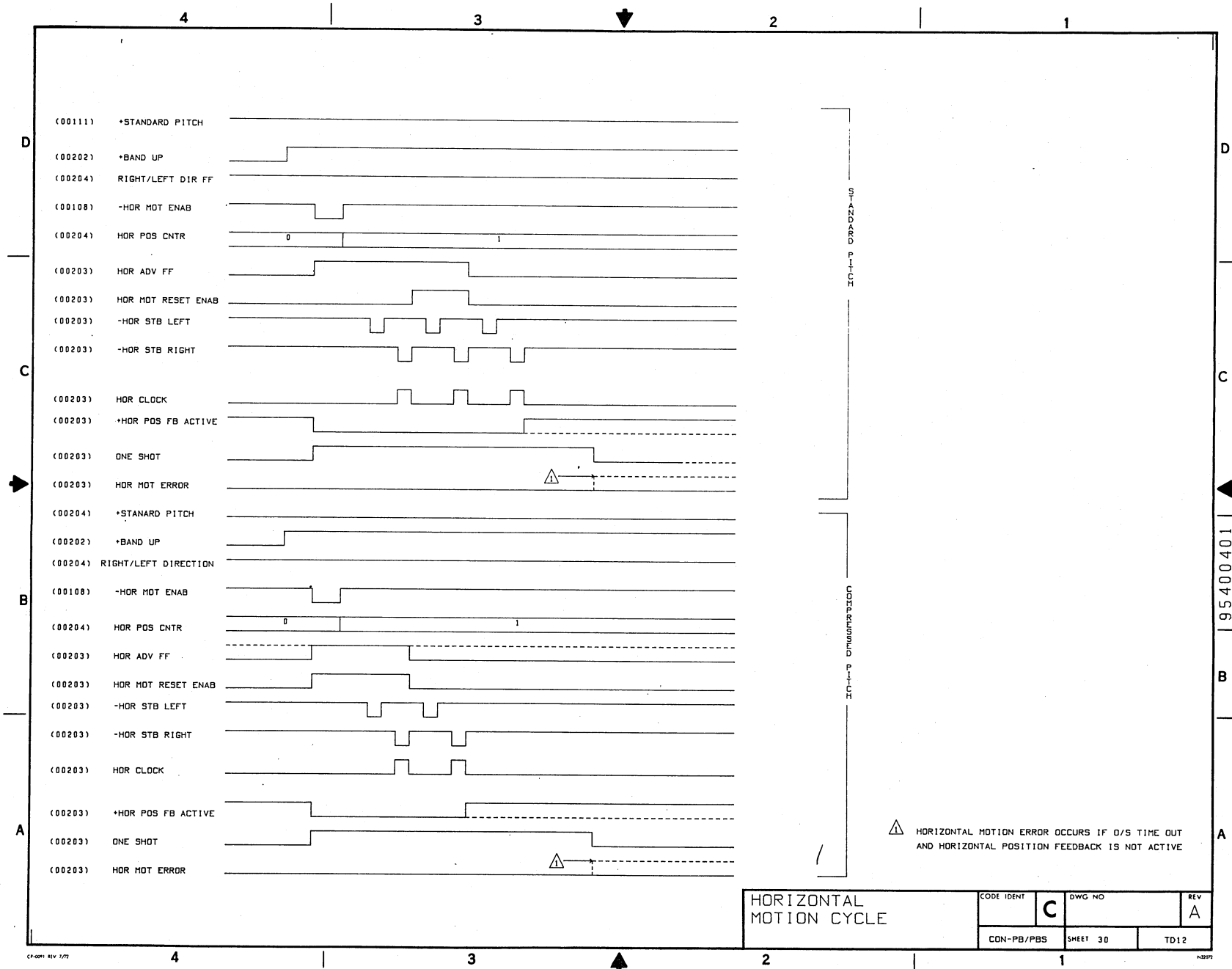
△ ASSUMES A 2 POSITION MACHINE
 SINCE PRT 1 IS TERMINATED WHEN
 THE SECOND FF OF END PRT 1 REG
 IS SET.

PRINT CYCLE
 (CONTINUED) SEE
 PREVIOUS SHEET

CODE IDENT	C	DWG NO	REV
CDN-PB/PBS	SHEET 29	TD11	A

95400401

6-31

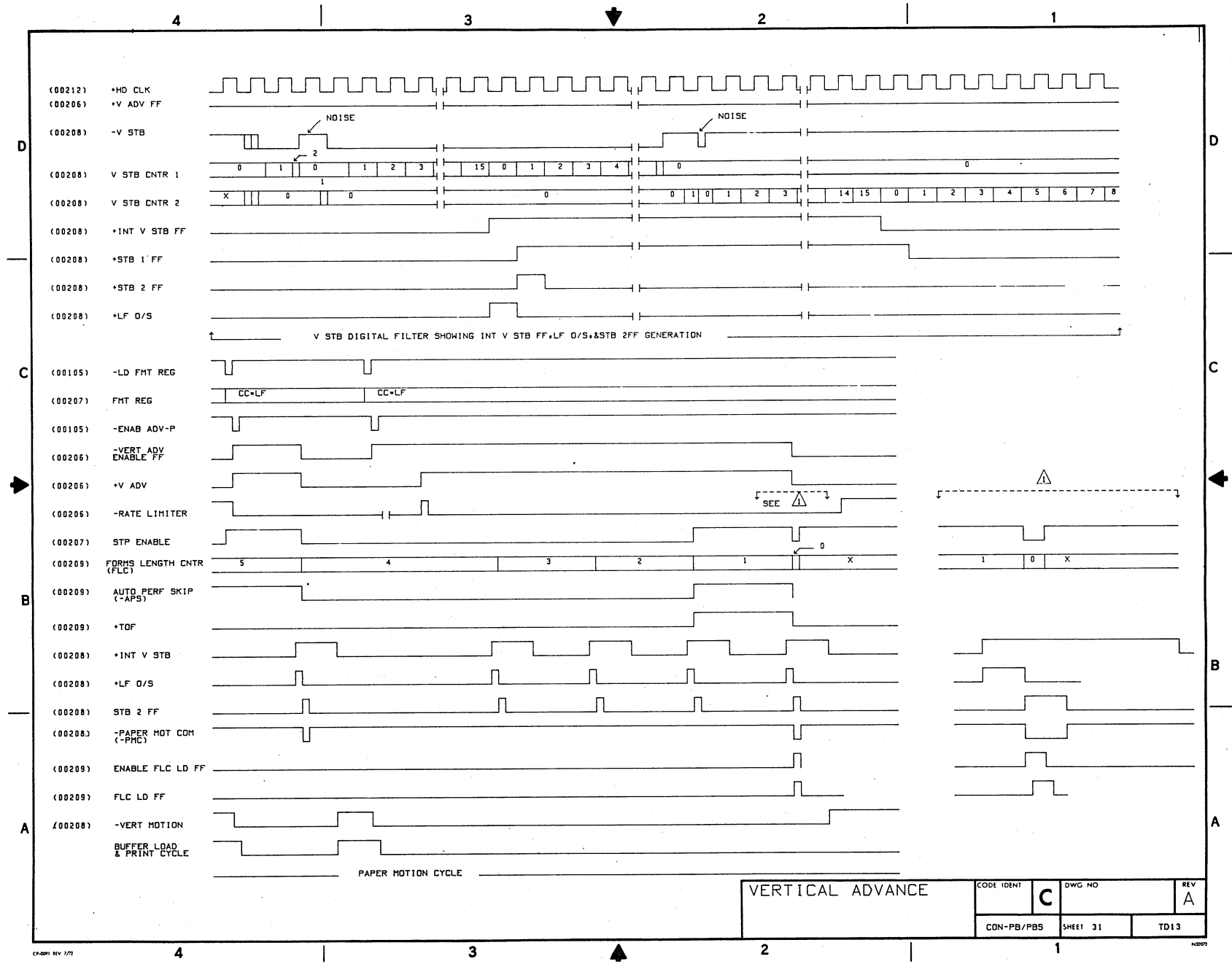


△ HORIZONTAL MOTION ERROR OCCURS IF O/S TIME OUT AND HORIZONTAL POSITION FEEDBACK IS NOT ACTIVE

HORIZONTAL MOTION CYCLE		CODE IDENT	C	DWG NO	REV
CON-PB/PBS	SHEET 30	TD12			A

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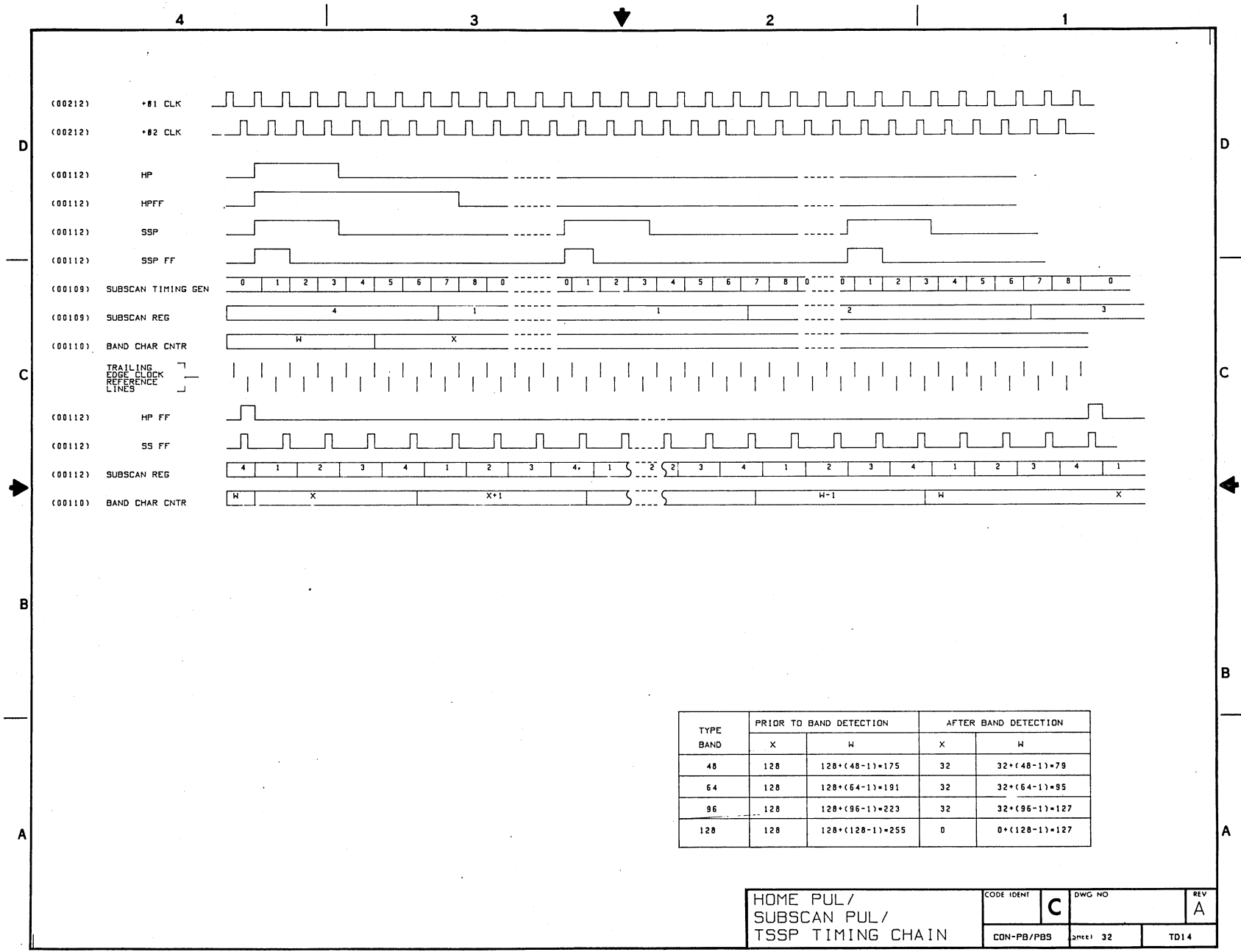
43071



VERTICAL ADVANCE

CODE IDENT	C	DWG NO	REV
CON-PB/PBS	SHEET 31	TD13	A

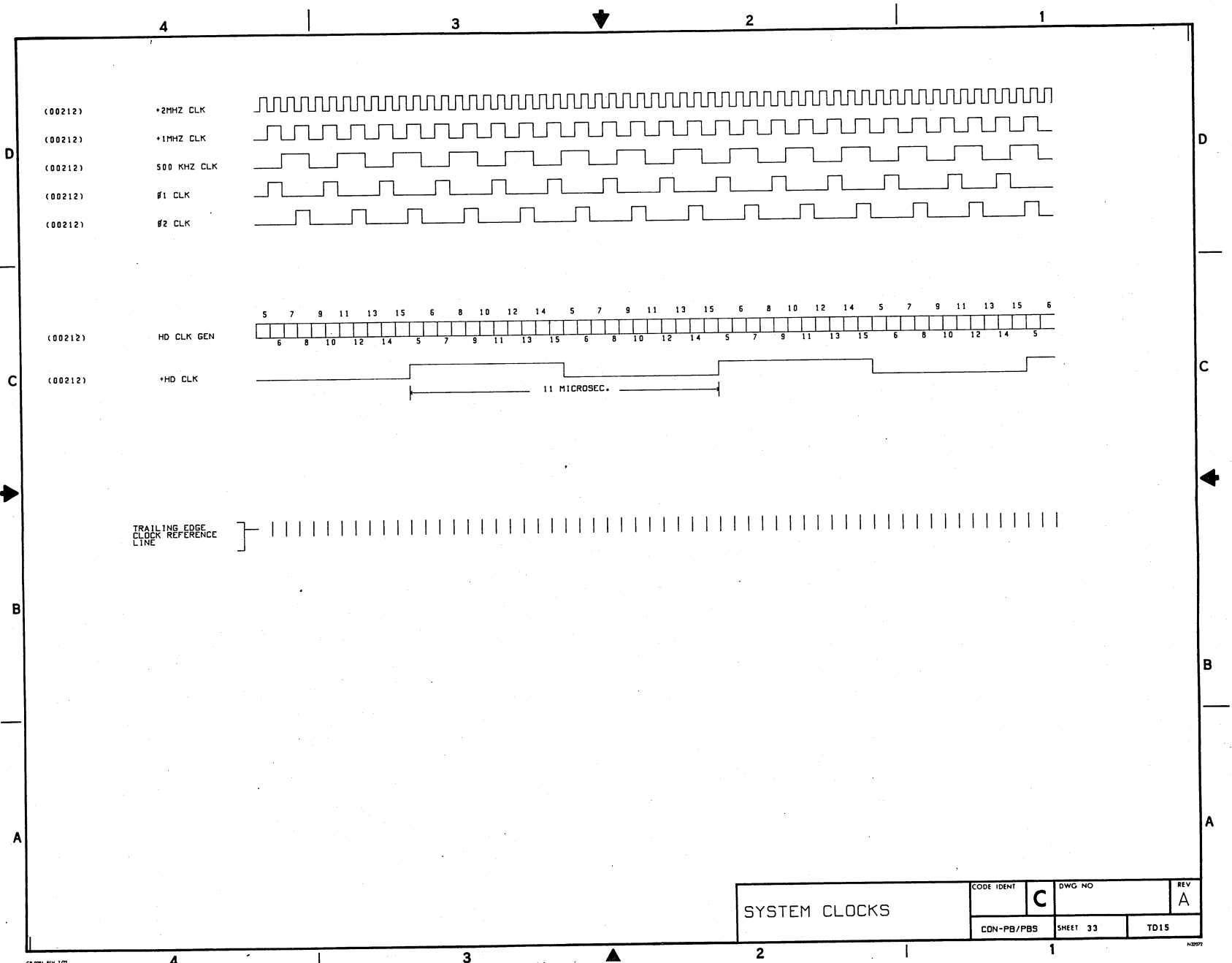
6-133



TYPE BAND	PRIOR TO BAND DETECTION		AFTER BAND DETECTION	
	X	W	X	W
48	128	$128 \cdot (48-1) = 175$	32	$32 \cdot (48-1) = 79$
64	128	$128 \cdot (64-1) = 191$	32	$32 \cdot (64-1) = 95$
96	128	$128 \cdot (96-1) = 223$	32	$32 \cdot (96-1) = 127$
128	128	$128 \cdot (128-1) = 255$	0	$0 \cdot (128-1) = 127$

HOME PUL/ SUBSCAN PUL/ TSSP TIMING CHAIN	CODE IDENT	DWG NO	REV
	C		A
CON-PB/PBS	SHEET 32	TD14	

6-34



SYSTEM CLOCKS	CODE IDENT	DWG NO	REV
	C		A
CON-PB/PBS	SHEET 33	TD15	

6-35

JUMPER NUMBER	FUNCTION															
J1A-J7A, J1B-J7B	BLANK/SPACE CODE SELECTION-- ASSEMBLED TO SELECT SPACE CODE FOR CHARACTER BANDS WHICH DO NOT USE PROMS. ALL "A" JUMPER WIRES REPRESENT LOGICAL "1"'S. THEREFORE ASSUME THAT THE BLANK/SPACE CODE = 0 100 000 = 040. THE FOLLOWING JUMPER WIRES WOULD BE ASSEMBLED-- J3B, J1A, J2A, J4A THRU J7A.															
<table border="1"> <tr> <td>J8</td> <td>J9</td> </tr> <tr> <td>IN</td> <td>OUT</td> </tr> <tr> <td>OUT</td> <td>OUT</td> </tr> <tr> <td>OUT</td> <td>IN</td> </tr> </table>	J8	J9	IN	OUT	OUT	OUT	OUT	IN	CONTROL CODE DETECTION-- ACCEPTS STANDARD ASCII CONTROL CODES OF LF, CR AND FF. ACCEPTS STANDARD ASCII CONTROL CODES OF LF, CR, VT AND FF. * ACCEPTS DB9=0 AS A CONTROL CODE FOR 12 CHNL EVFU OPTION. DOES NOT ACCEPT ASCII CONTROL CODES OF LF, CR, VT, &FF NOTE--WHENEVER DB9 IS LOW THE DATA ON THE LINES WILL BE INTERPRETED AS A CONTROL CODE, ONLY CAUSE DB9 TO GO LOW WHEN AN EVFU OPTION IS INSTALLED.							
J8	J9															
IN	OUT															
OUT	OUT															
OUT	IN															
<table border="1"> <tr> <td colspan="3">SWNS</td> </tr> <tr> <td>-1</td> <td>-2</td> <td>-3</td> </tr> <tr> <td>CLOSED</td> <td>OPEN</td> <td>CLOSED</td> </tr> <tr> <td>OPEN</td> <td>OPEN</td> <td>OPEN</td> </tr> <tr> <td>OPEN</td> <td>CLOSED</td> <td>OPEN</td> </tr> </table>	SWNS			-1	-2	-3	CLOSED	OPEN	CLOSED	OPEN	OPEN	OPEN	OPEN	CLOSED	OPEN	MACHINE TYPE DEFINITION-- PB1130 PBS720 PBS360
SWNS																
-1	-2	-3														
CLOSED	OPEN	CLOSED														
OPEN	OPEN	OPEN														
OPEN	CLOSED	OPEN														
<table border="1"> <tr> <td>J13</td> <td>J14</td> </tr> <tr> <td>OUT</td> <td>OUT</td> </tr> <tr> <td>OUT</td> <td>IN</td> </tr> <tr> <td>IN</td> <td>OUT</td> </tr> <tr> <td>IN</td> <td>IN</td> </tr> </table>	J13	J14	OUT	OUT	OUT	IN	IN	OUT	IN	IN	BAND TO PROM SELECTION-- ** 48, 64, 96, 128 48, 64, 128 48, 96, 128 48, 128					
J13	J14															
OUT	OUT															
OUT	IN															
IN	OUT															
IN	IN															

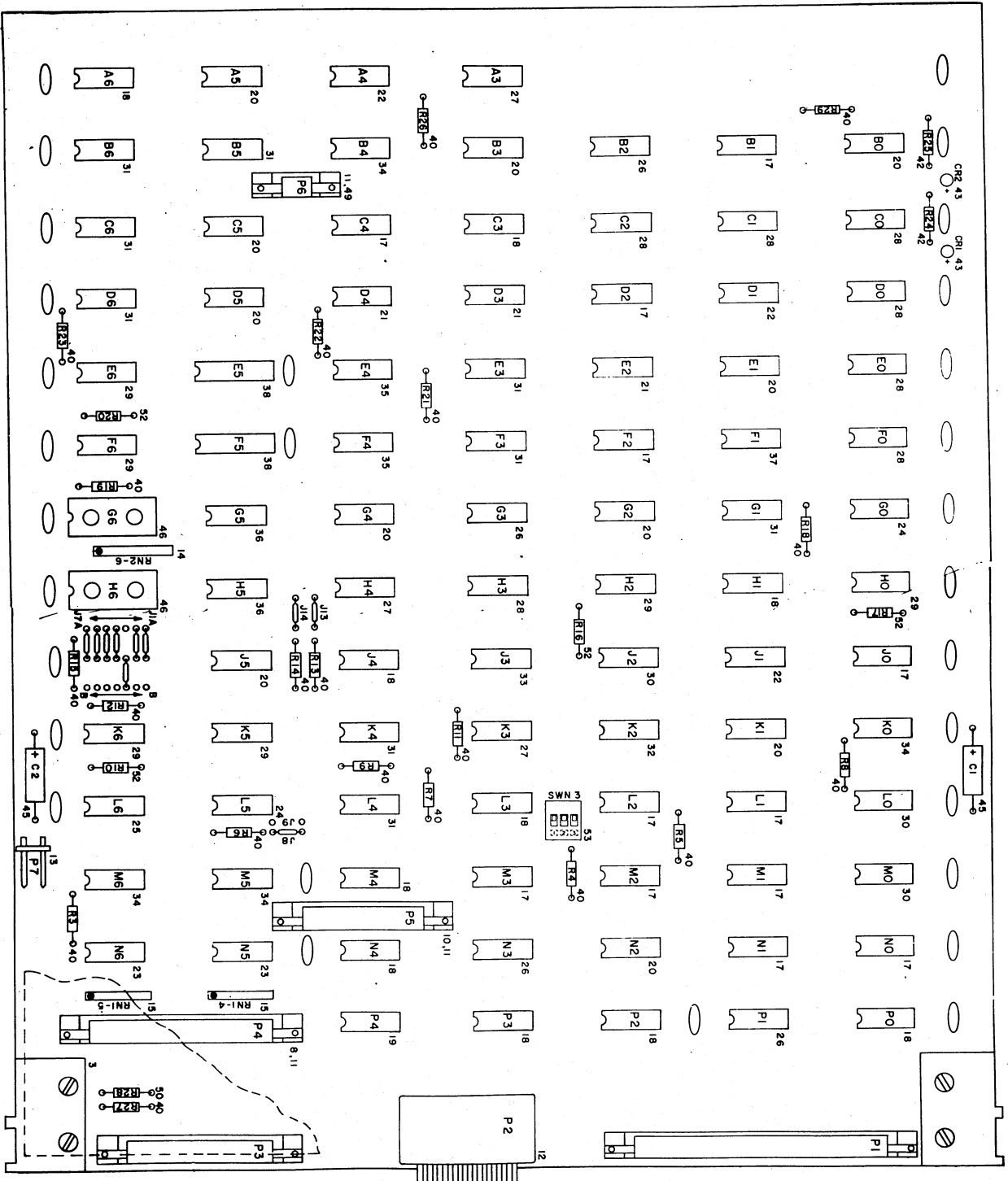
* VT IS USED TO TRUNCATE THE INPUT, HOWEVER UNCONTROLLED PAPER MOTION WILL RESULT UNLESS THE "3 CHNL EVFU" OPTION IS IMPLEMENTED.

** TYPICALLY THE PROMS MAY BE ONLY SELECTED BY ONE TYPE BAND. UNLESS CODES FOR DIFFERENT TYPE BANDS ARE SUBSETS OF ONE ANOTHER, PROMS WILL HAVE TO BE REPLACED TO OBTAIN ALL THE COMBINATIONS SHOWN ABOVE.

LOC.
CROSS
REF. NO. 00100

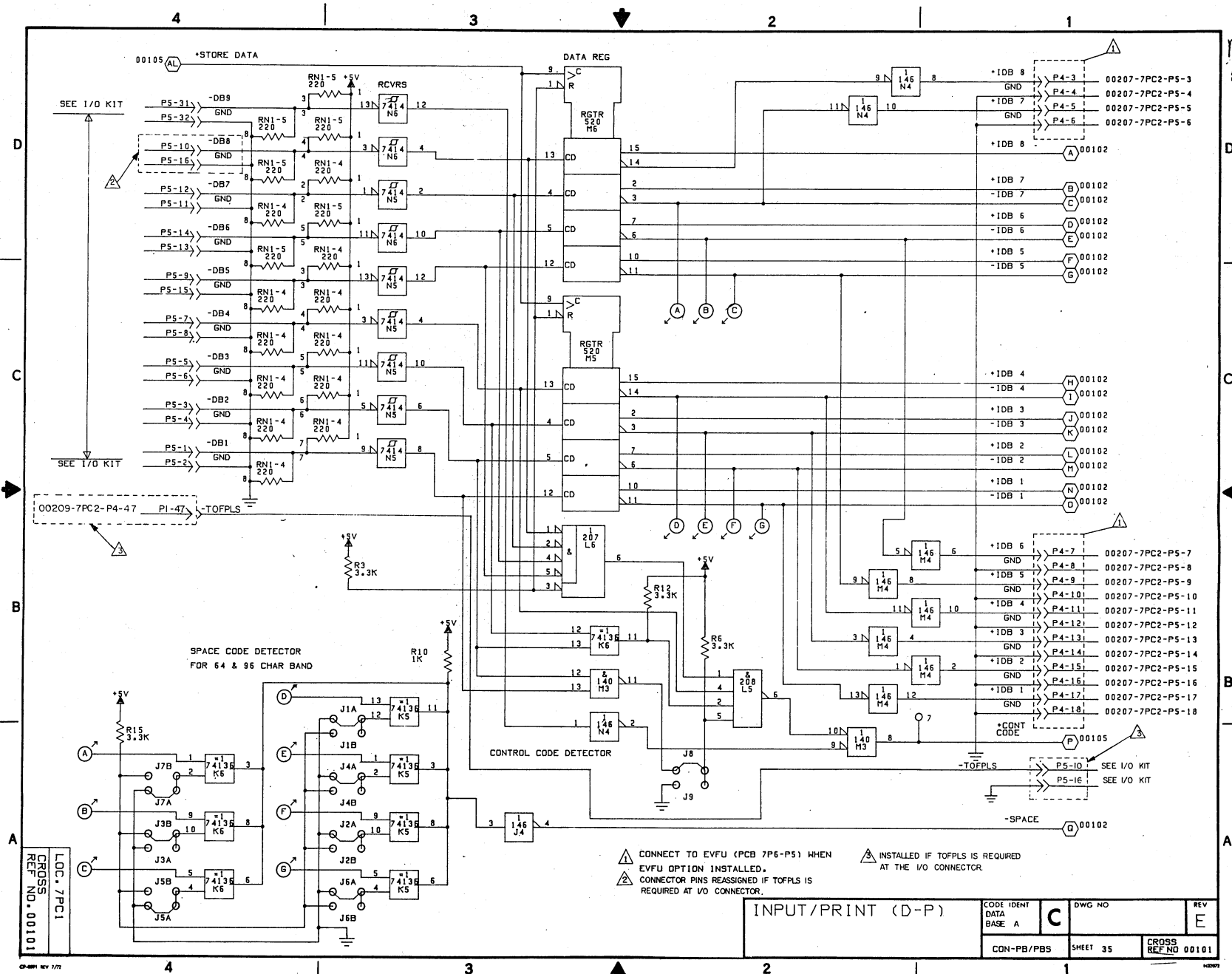
INPUT/PRINT (D-P)
JUMPER CHART

CODE IDENT	C	DWG NO	REV
CON-PB/PBS	SHEET 34	CROSS REF NO 00100	A



INPUT / PRINT (D-F)

6-37

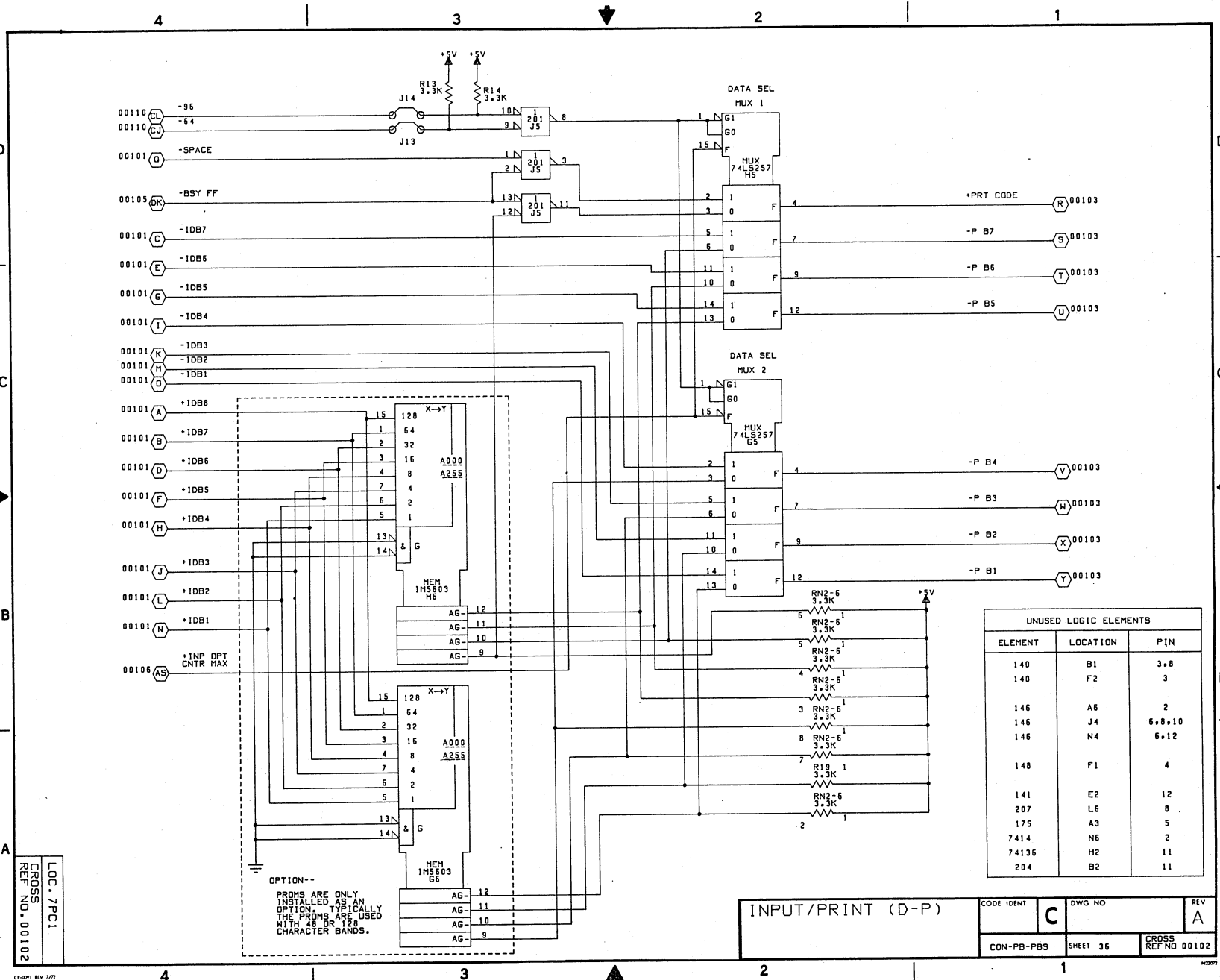


LOC. 7PC1
 CROSS REF. NO. 00101

CONNECT TO EVFU (PCB 7P6-P5) WHEN EVFU OPTION INSTALLED.
 INSTALLED IF TOFPLS IS REQUIRED AT THE I/O CONNECTOR.
 CONNECTOR PINS REASSIGNED IF TOFPLS IS REQUIRED AT I/O CONNECTOR.

INPUT/PRINT (D-P)

CODE IDENT DATA BASE A	C	DWG NO	REV E
CON-PB/PBS	SHEET 35	CROSS REF NO 00101	



LOC. 7PCI
CROSS REF NO. 00102

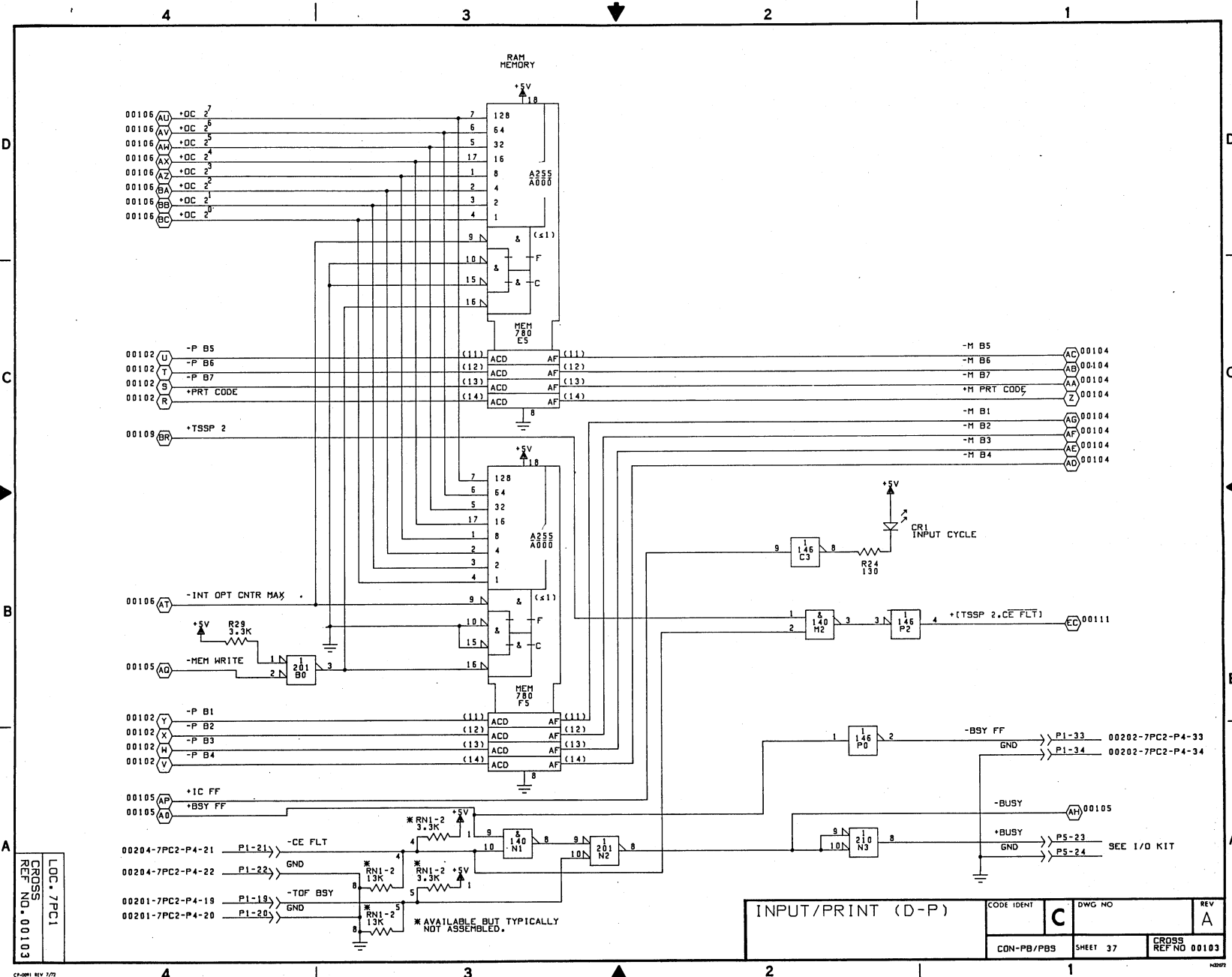
OPTION--
PRMS ARE ONLY INSTALLED AS AN OPTION. TYPICALLY THE PRMS ARE USED WITH 48 OR 128 CHARACTER BANDS.

INPUT/PRINT (D-P)

UNUSED LOGIC ELEMENTS		
ELEMENT	LOCATION	PIN
140	B1	3,8
140	F2	3
146	A6	2
146	J4	6,8,10
146	N4	6,12
148	F1	4
141	E2	12
207	L6	8
175	A3	5
7414	N6	2
74135	H2	11
204	B2	11

CODE IDENT	C	DWG NO		REV	A
CON-PB-PBS		SHEET 36	CROSS REF NO 00102		

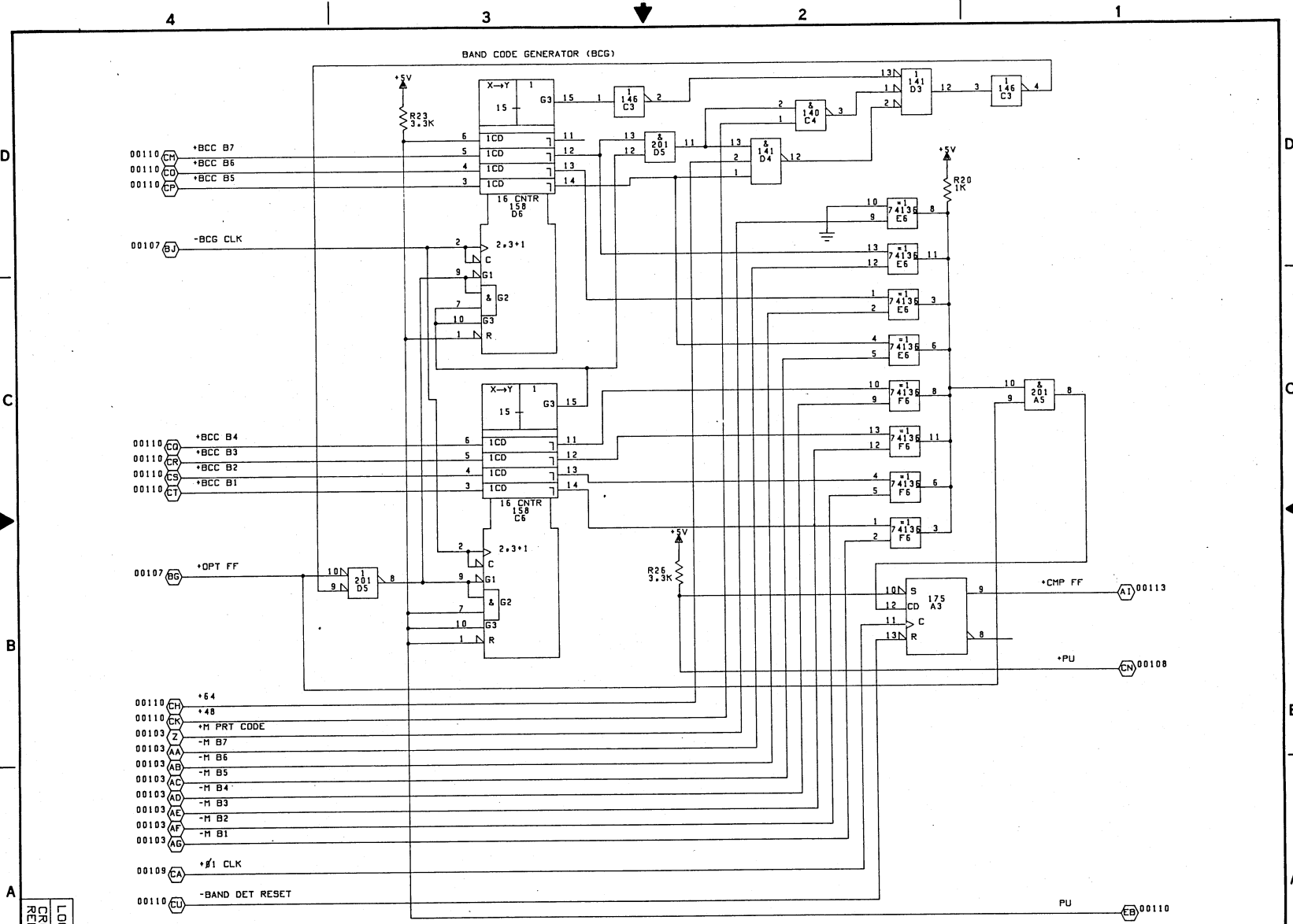
63-39



INPUT/PRINT (D-P)

CODE IDENT	C	DWG NO	REV
CDN-PB/PBS	SHEET 37	CROSS REF NO 00103	A

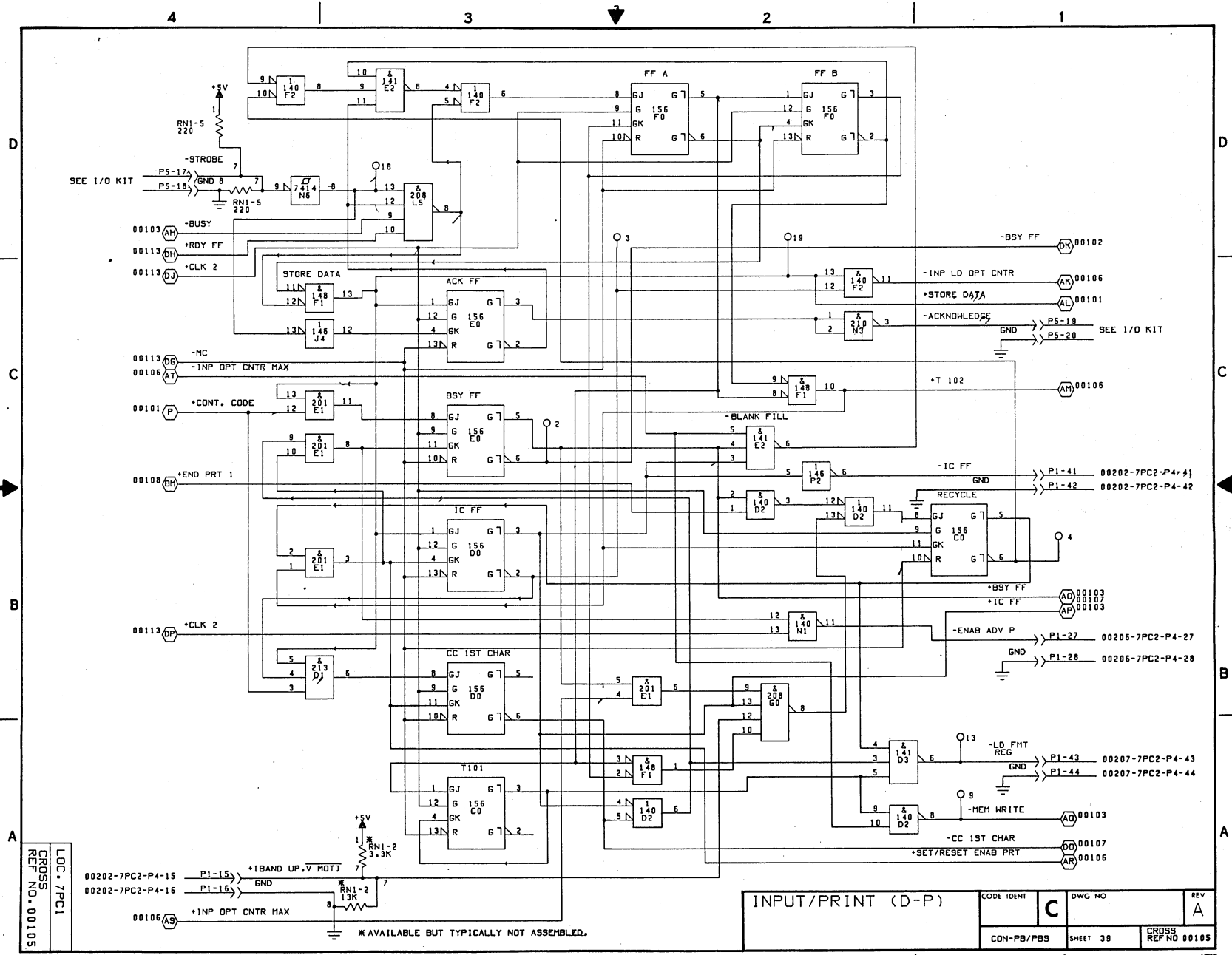
6-40



LOC. 7PC1
 CROSS
 REF. NO. 00104

INPUT/PRINT (D-P)		CODE IDENT	DWG NO	REV
		C		A
		CON-PB/PBS	SHEET 38	CROSS REF NO 00104

6-41



LOC. 7PC1
CROSS REF. NO. 00105

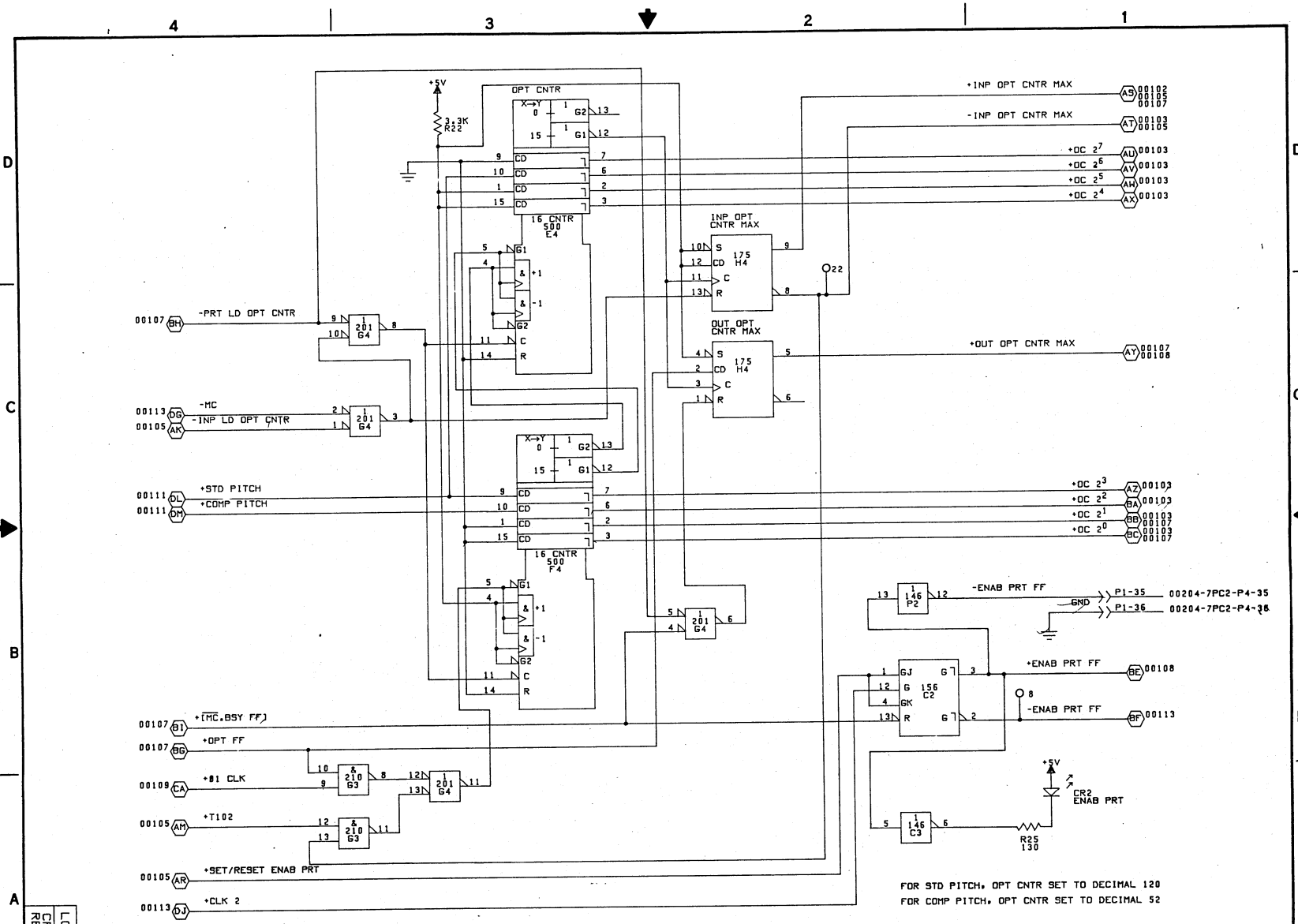
00202-7PC2-P4-15 P1-15) *(BAND UP.V MOT)
00202-7PC2-P4-16 P1-16) *RN1-2
00106(A9) *INP OPT CNTR MAX 13K

+5V
RN1-2
3.3K
* AVAILABLE BUT TYPICALLY NOT ASSEMBLED.

INPUT/PRINT (D-P)

CODE IDENT	C	DWG NO	A
CON-PB/PBS	SHEET 38	CROSS REF NO	00105

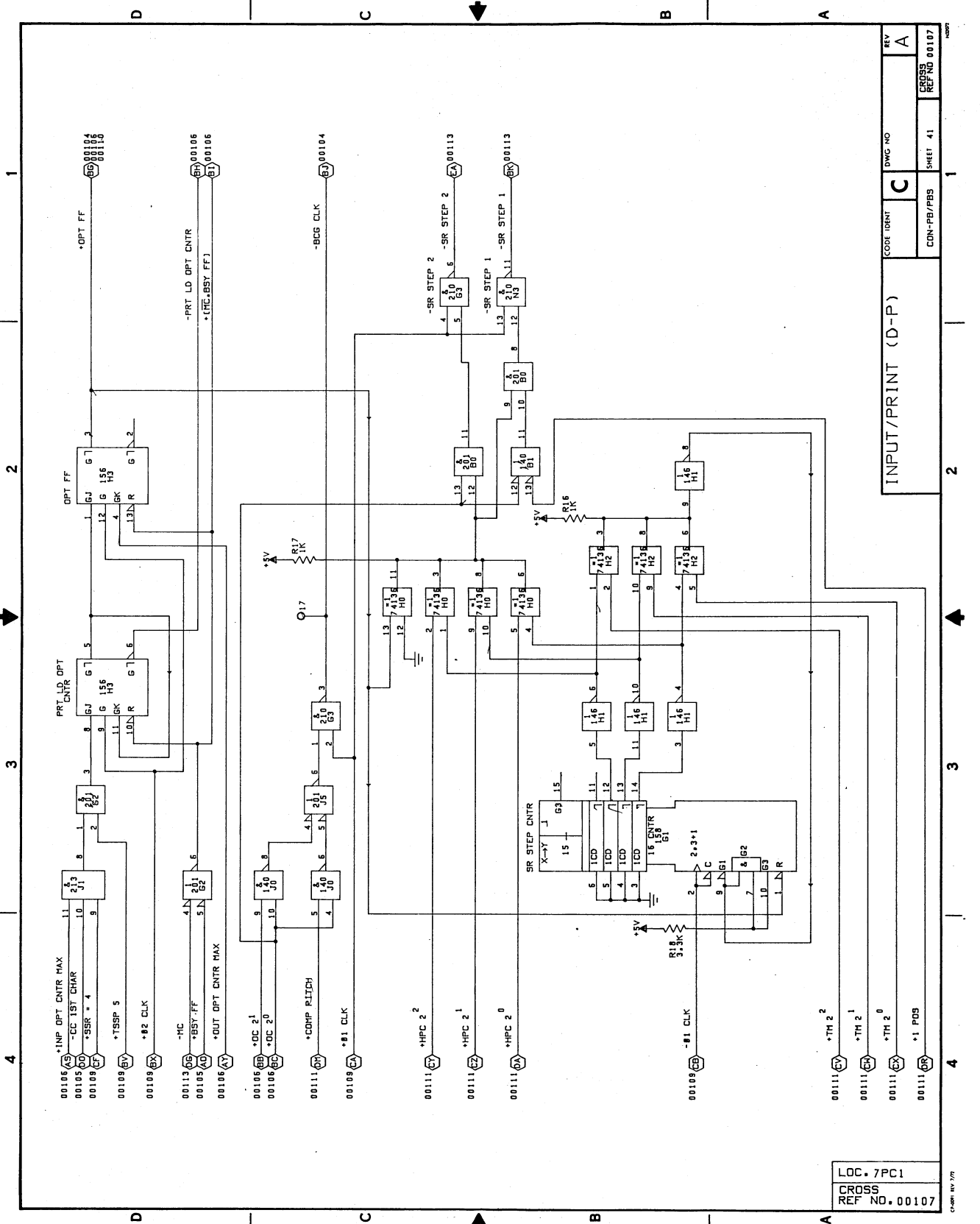
6-42



FOR STD PITCH, OPT CNTR SET TO DECIMAL 120
 FOR COMP PITCH, OPT CNTR SET TO DECIMAL 52

LOC. 7PC1
 CROSS
 REF NO. 00106

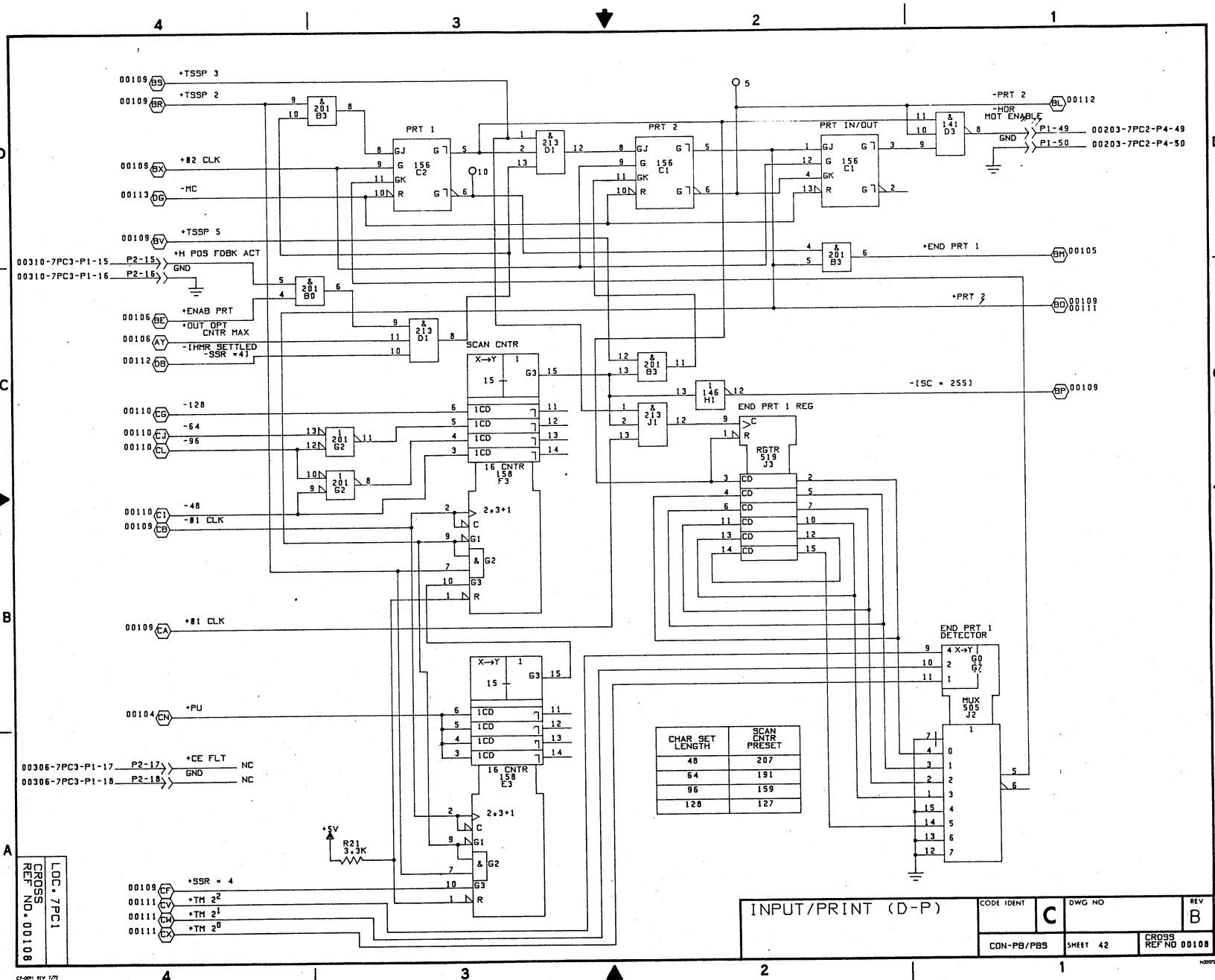
INPUT/PRINT (D-P)		CODE IDENT	DWG NO	REV
		C		A
		CON-PB/PBS	SHEET 40/	CROSS REF NO 00106



INPUT/PRINT (D-P)

LOC * 7PC1	REV A
CROSS REF NO. 00107	DWG. NO. C
	COND./P.B/S SHEET 41
	REF. NO. 00107

6-44



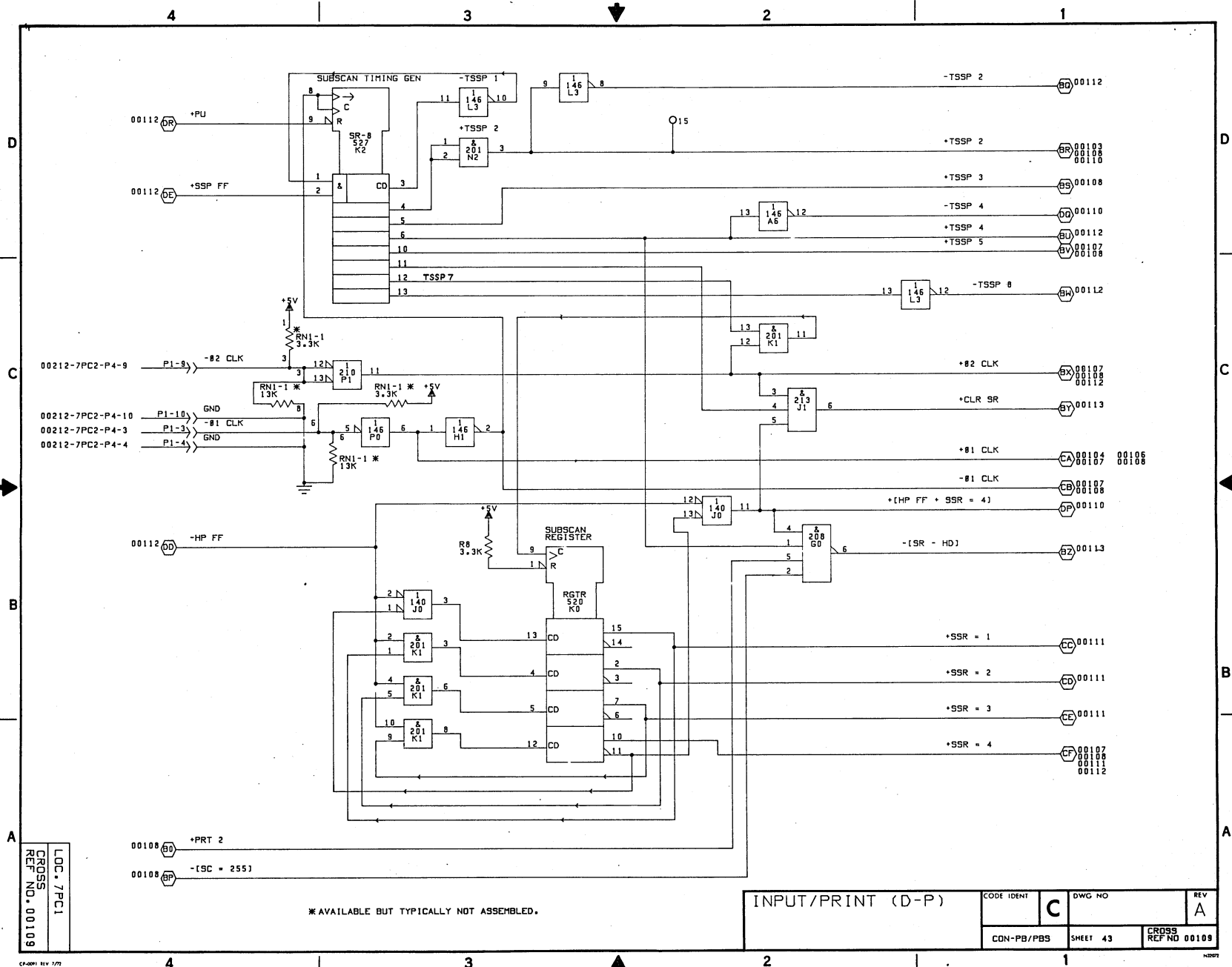
LOC. 7PC1
CROSS
REF. NO. 00108

CHAR SET LENGTH	SCAN CNTR PRESET
48	207
64	191
96	159
128	127

INPUT/PRINT (D-P)

CODE IDENT	C	DWG NO		REV	B
CDN-PB/PBS		SHEET 42	CROSS REF NO 00108		

6-45



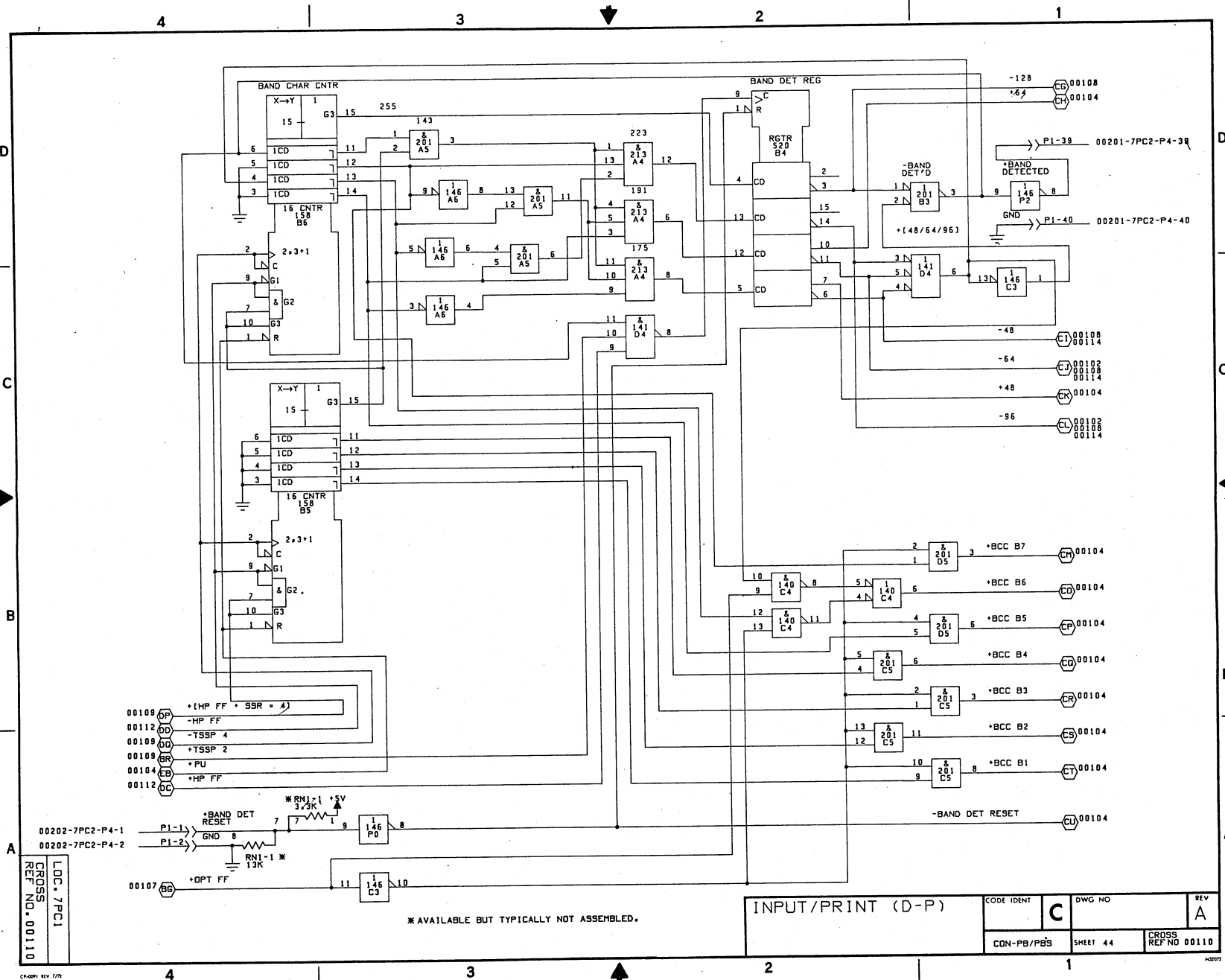
LOC. 7PCI
CROSS
REF NO. 00109

* AVAILABLE BUT TYPICALLY NOT ASSEMBLED.

INPUT/PRINT (D-P)

CODE IDENT	C	DWG NO	REV
CON-PB/PBS	SHEET 43	CROSS REF NO 00109	A

6-46

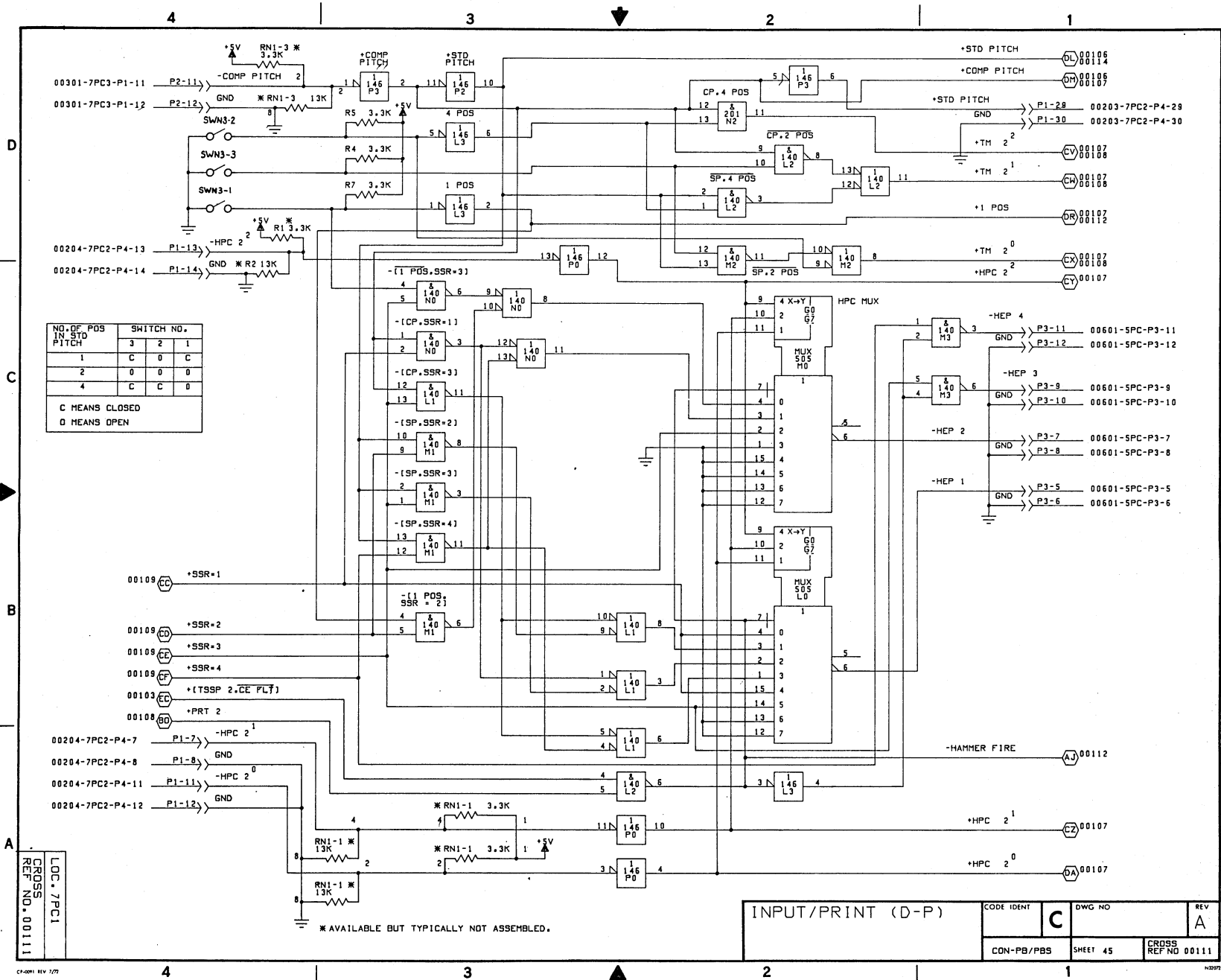


* AVAILABLE BUT TYPICALLY NOT ASSEMBLED.

LOC. 7PC1
CROSS REF. NO. 00110

INPUT/PRINT (D-P)

CODE IDENT	C	DWG NO	REV
CON-PB/PBS		SHEET 44	CROSS REF NO 00110



NO. OF POS IN STD PITCH	SWITCH NO.		
	3	2	1
1	C	0	C
2	0	0	0
4	C	C	0

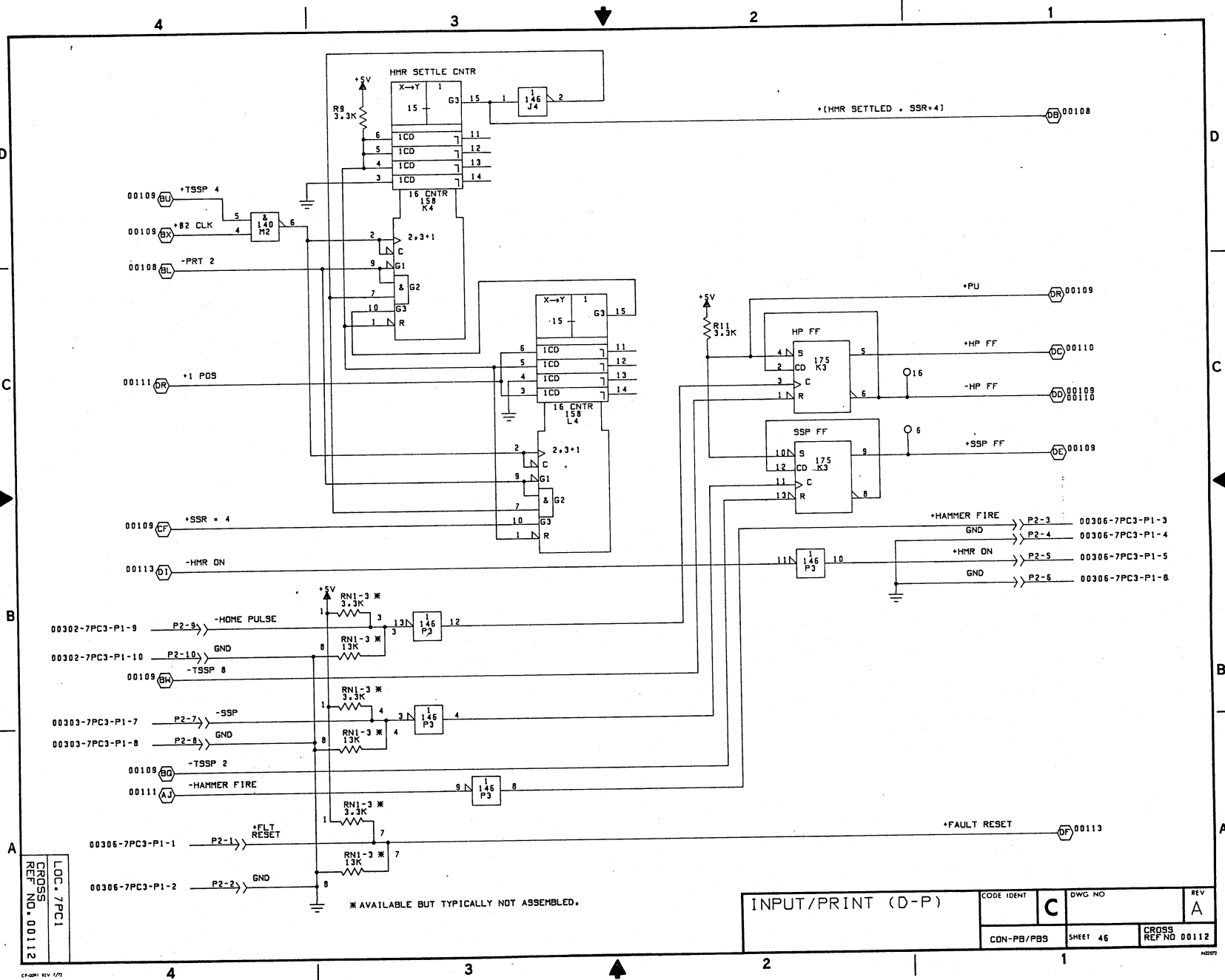
C MEANS CLOSED
O MEANS OPEN

LOC. 7PC1
CROSS REF. NO. 00111

INPUT/PRINT (D-P)

CODE IDENT	C	DWG NO	REV
CON-PB/PBS	SHEET 45	CROSS REF NO	00111

6-48



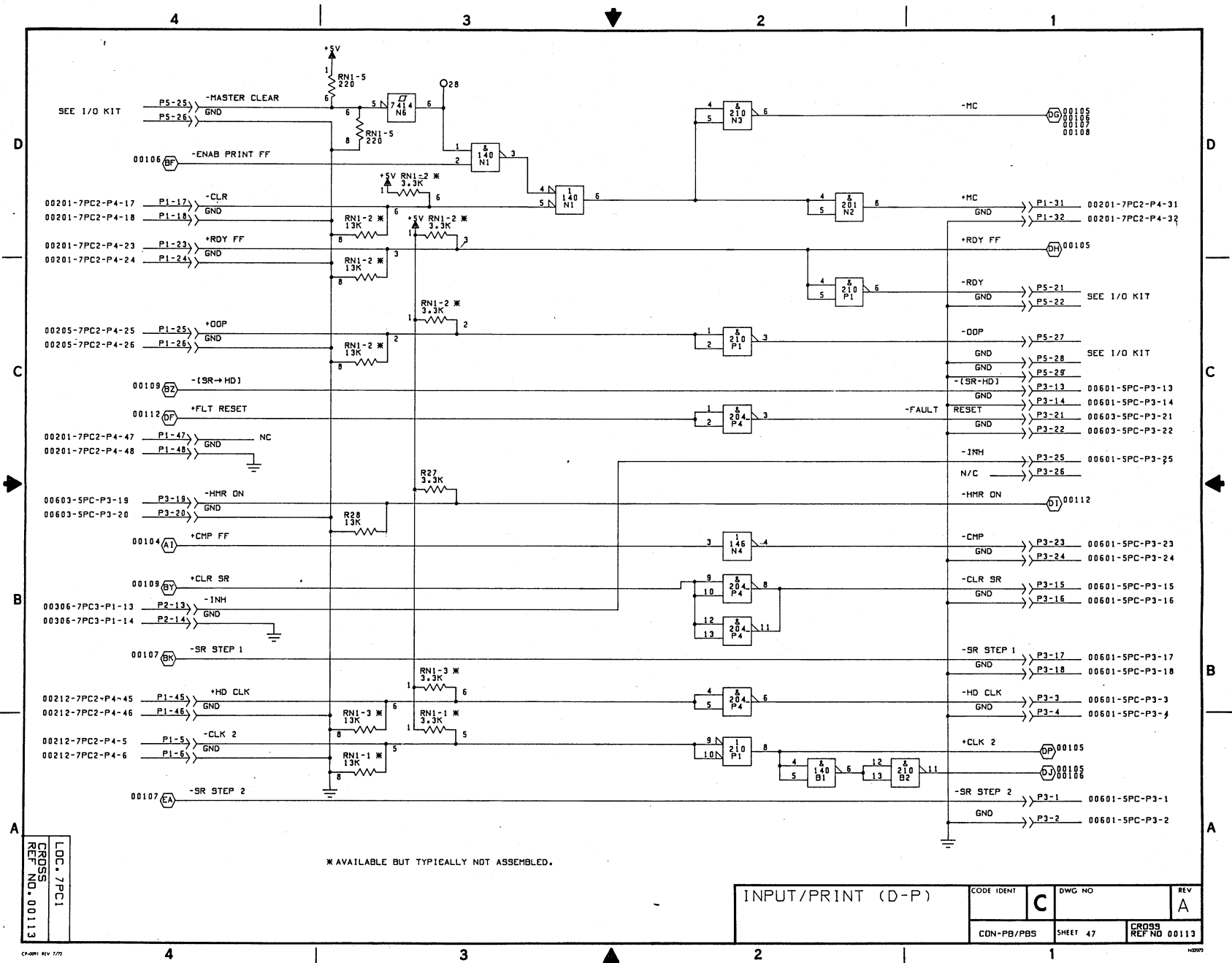
LOC. 7/PC1
 CROSS
 REF. NO. 00112

* AVAILABLE BUT TYPICALLY NOT ASSEMBLED.

INPUT/PRINT (D-P)

CODE IDENT	C	DWG NO	REV
CDN-PB/PBS	SHEET 46	CROSS REF NO	00112

6-49



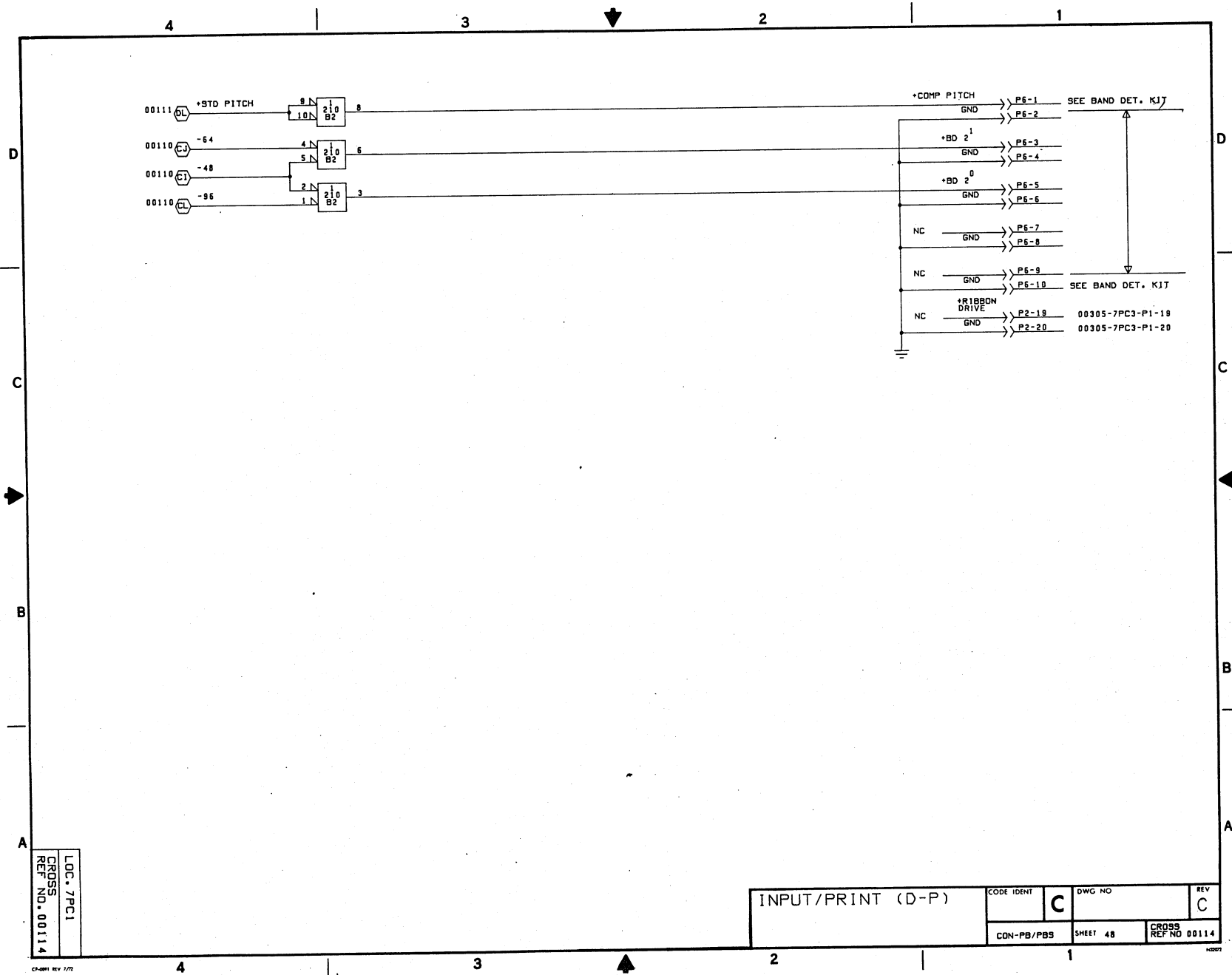
LOC. 7PC1
CROSS
REF. NO. 00113

* AVAILABLE BUT TYPICALLY NOT ASSEMBLED.

INPUT/PRINT (D-P)

CODE IDENT	C	DWG NO	REV
CON-PB/PBS	SHEET 47	CROSS REF. NO. 00113	A

6-50



LOC. 7/PC1
 CROSS
 REF. NO. 00114

INPUT/PRINT (D-P)	CODE IDENT	DWG NO	REV
	C		C
	CON-PB/PBS	SHEET 48	CROSS REF NO 00114

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4 | 3 | 2 | 1

D
C
B
A

JUMPER NUMBER		FUNCTION
<u>J1A-J2A, J1B-J2B</u> IN OUT OUT IN		START/STOP CONTROL OF READY-- STANDARD START/STOP CONTROL OF READY. EXTERNAL CONTROL OF READY VIA ADAPTORS WHICH USE "--EXT START PUL" & "--EXT STOP PUL".
<u>J3A J3B</u> IN OUT OUT IN		VERTICAL ADVANCE CONTROL-- 12 CHNL EVFU OPTION OR WHEN ASCII CONTROL CODES ARE NOT USED WITH THE EXTERNAL ADVANCE OPTION. CONTROL CODES ARE STANDARD ASCII WITHOUT EXTERNAL ADVANCE OPTION OR WHEN EXTERNAL ADVANCE OPTION IS USED IN CONJUNCTION WITH CR.
<u>J4A-J5A, J4B-J5B</u> IN OUT OUT IN		STANDARD PAPER FORMATTING NEVER USED
<u>J6</u> IN OUT		AUTO PERF SKIP (APS) SELECTION-- APS NOT ACTIVE APS ACTIVE
<u>J7</u> IN OUT		FROM FEED CONTROL NO EVFU OPTION EVFU OPTION

6-51

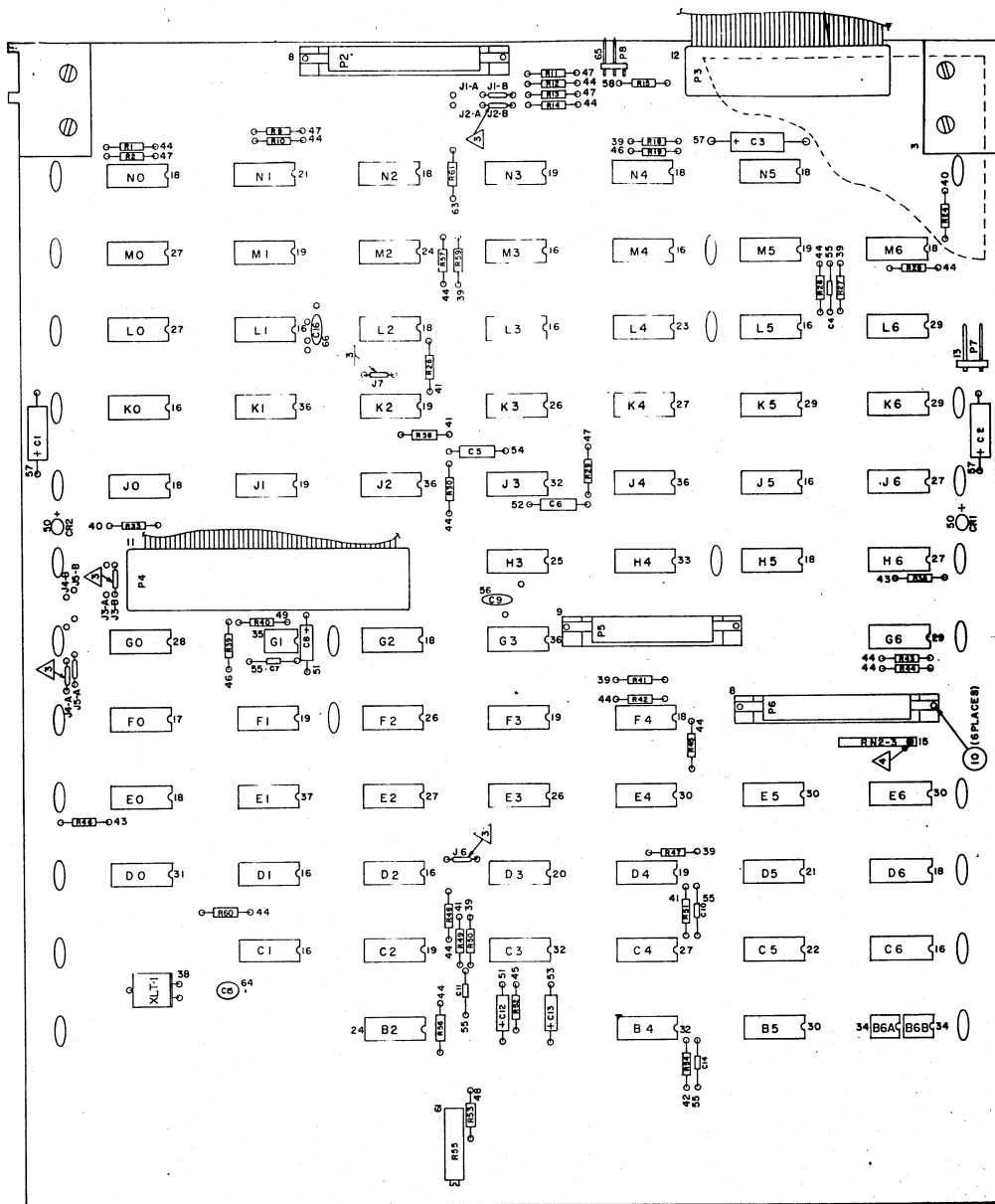
LOC.
CROSS
REF NO. 00200

OSC. HORZ. & VERT.
MOT. JUMPER
CHART

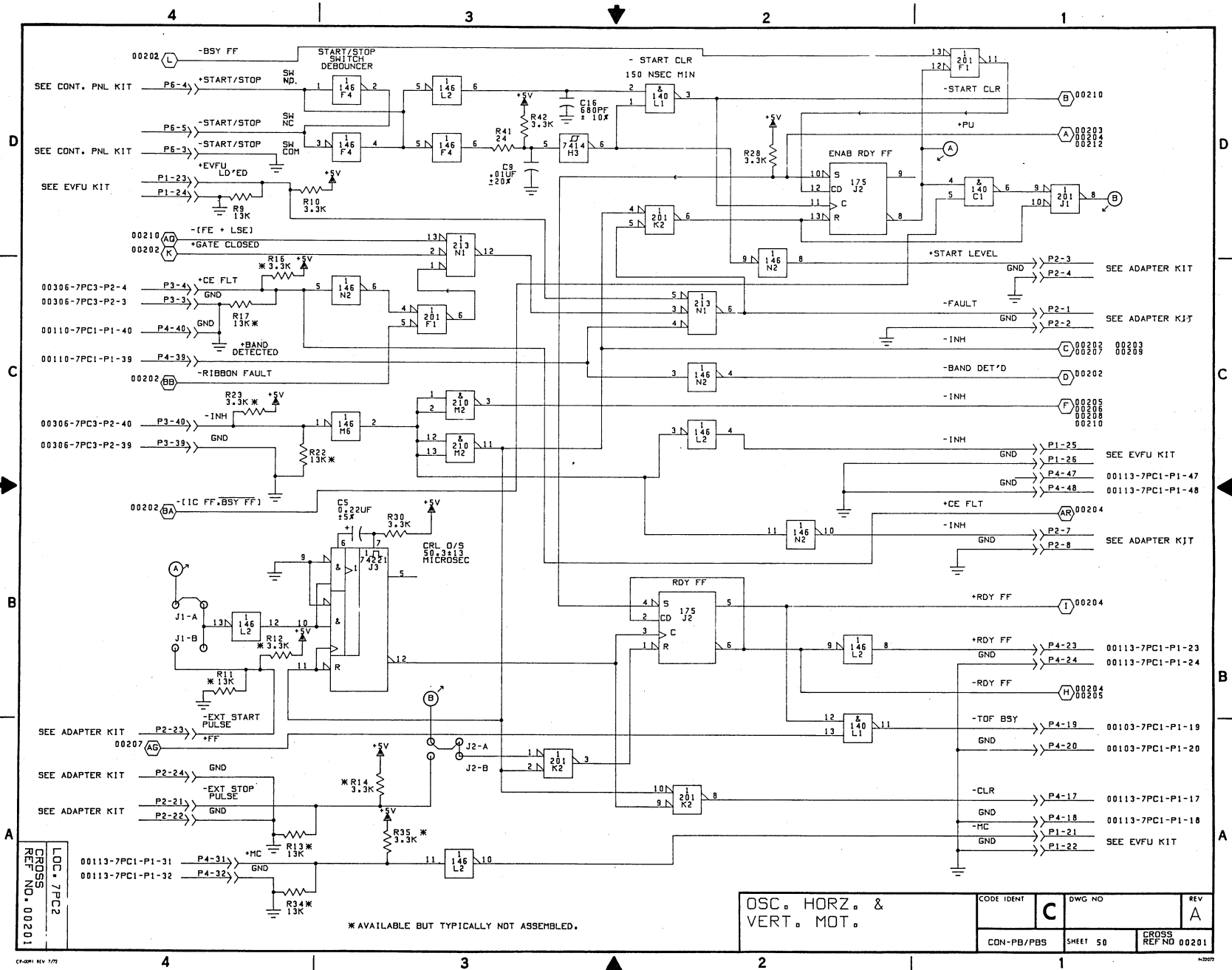
CODE IDENT	C	DWG NO	REV
CON-PB/PBS	SHEET 49	CROSS REF NO 00200	A

4 | 3 | 2 | 1

42007



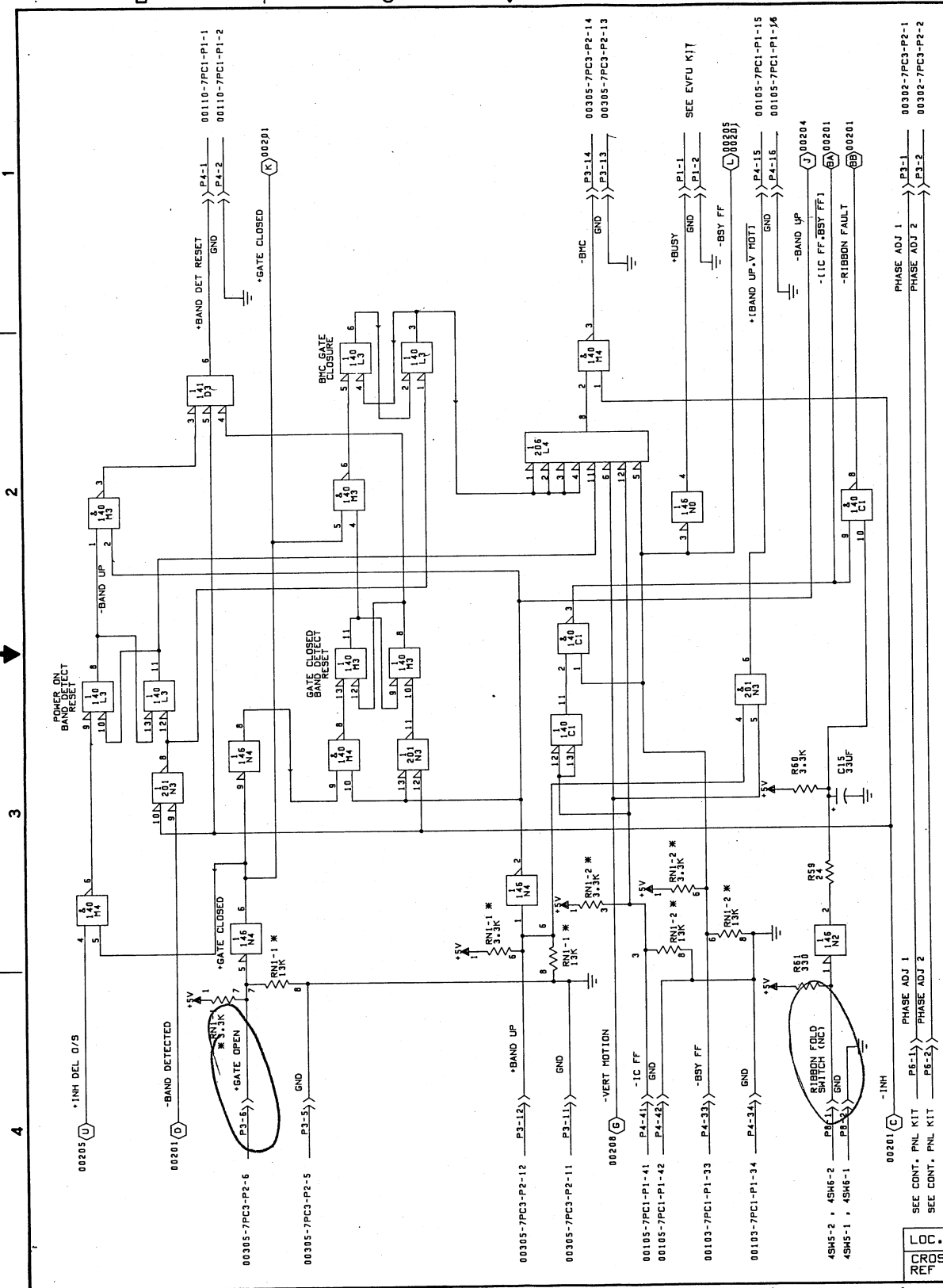
OSC. HORIZONTAL & VERT. MOTION



LOC. 7PC2
CROSS
REF. NO. 00201

OSC. HORZ. &
VERT. MOT.

CODE IDENT	C	DWG. NO	REV
CON-PB/PBS	SHEET 50	CROSS REF NO 00201	A

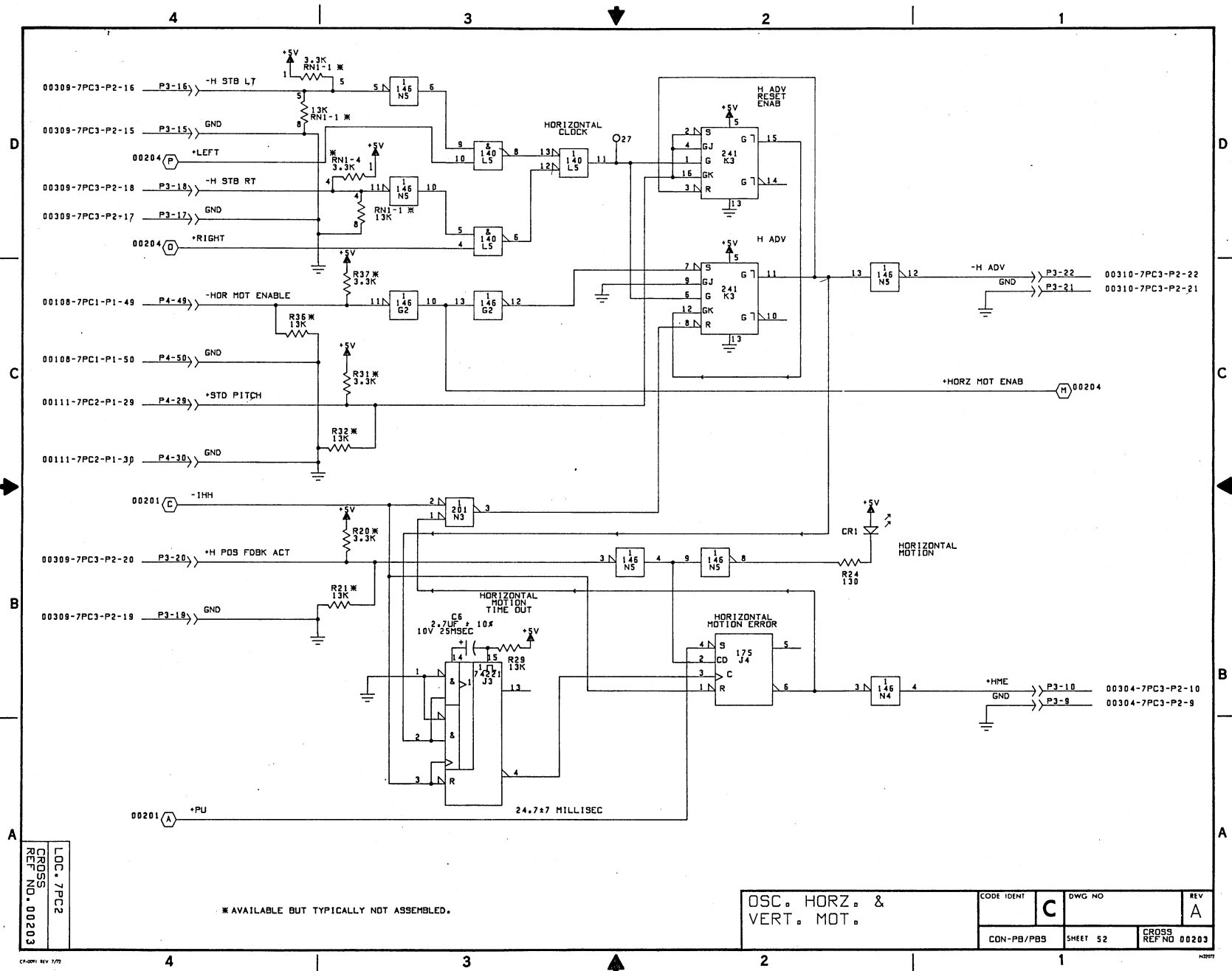


LOC. 7PC2	REV A
CROSS REF NO. 00202	DWG NO
	CON-PB/PBS
	SHEET 51
	GROSS REF NO 00202

OSC. HORZ. & VERT. MOT

* AVAILABLE BUT TYPICALLY NOT ASSEMBLED.

6-55



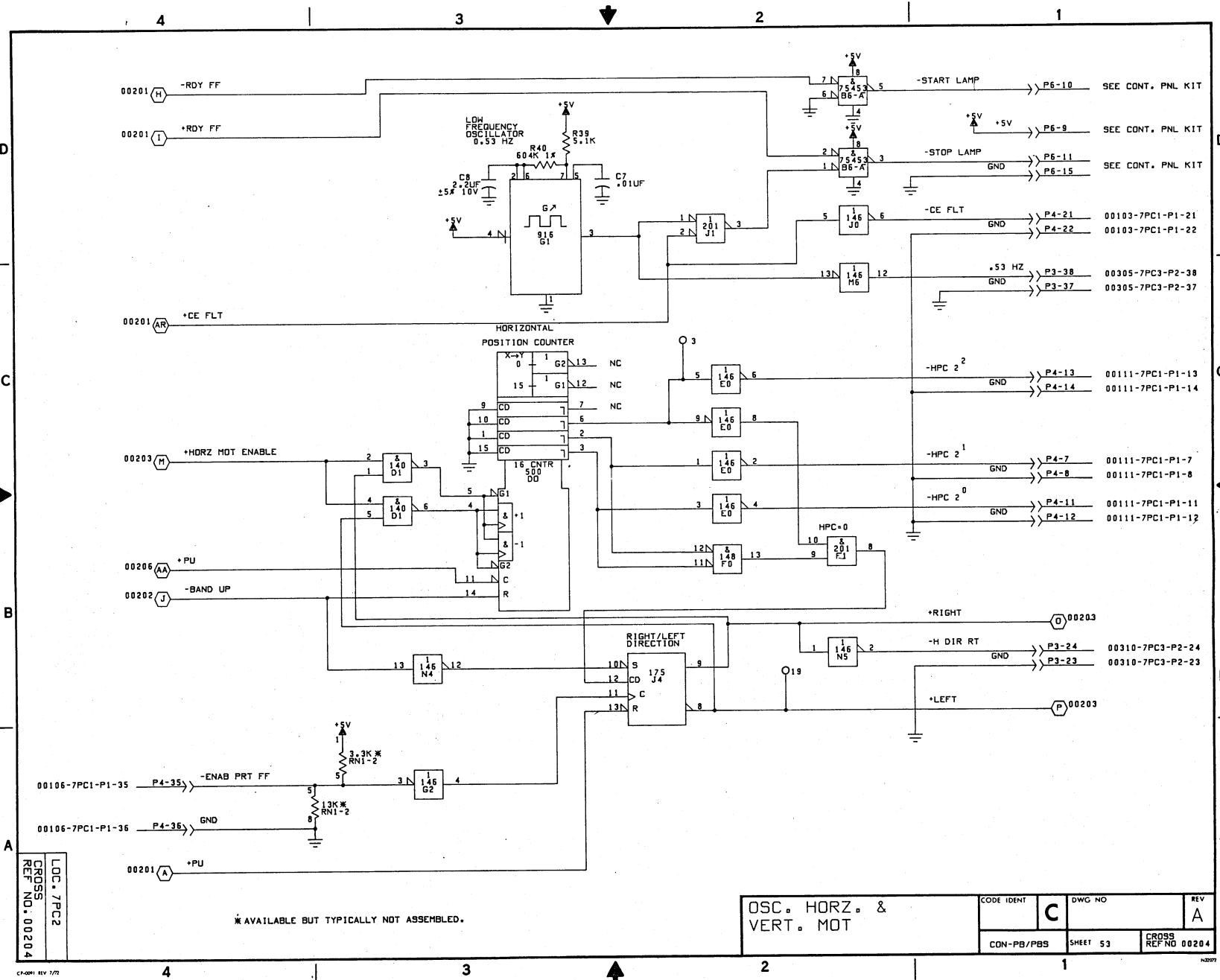
LOC. 7PC2
CROSS REF. NO. 00203

* AVAILABLE BUT TYPICALLY NOT ASSEMBLED.

OSC. HORZ. &
VERT. MOT.

CODE IDENT	C	DWG NO	REV
CON-PB/PBS	SHEET 52	CROSS REF NO 00203	A

6-56



* AVAILABLE BUT TYPICALLY NOT ASSEMBLED.

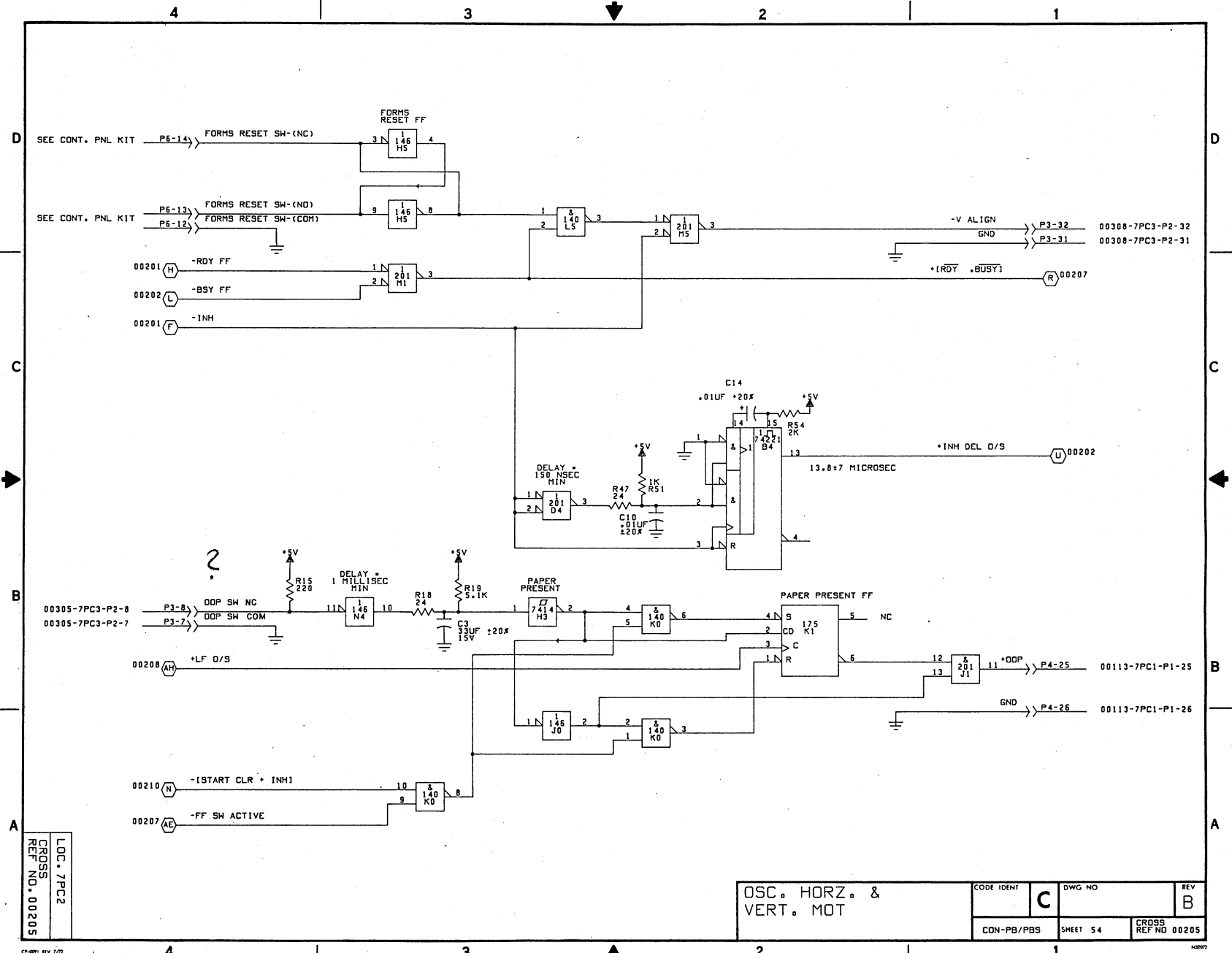
OSC. HORZ. & VERT. MOT

CODE IDENT	C	DWG NO		REV	A
CON-PB/PBS		SHEET	53	CROSS REF NO	00204

LOC. 7PC2
CROSS REF NO. 00204

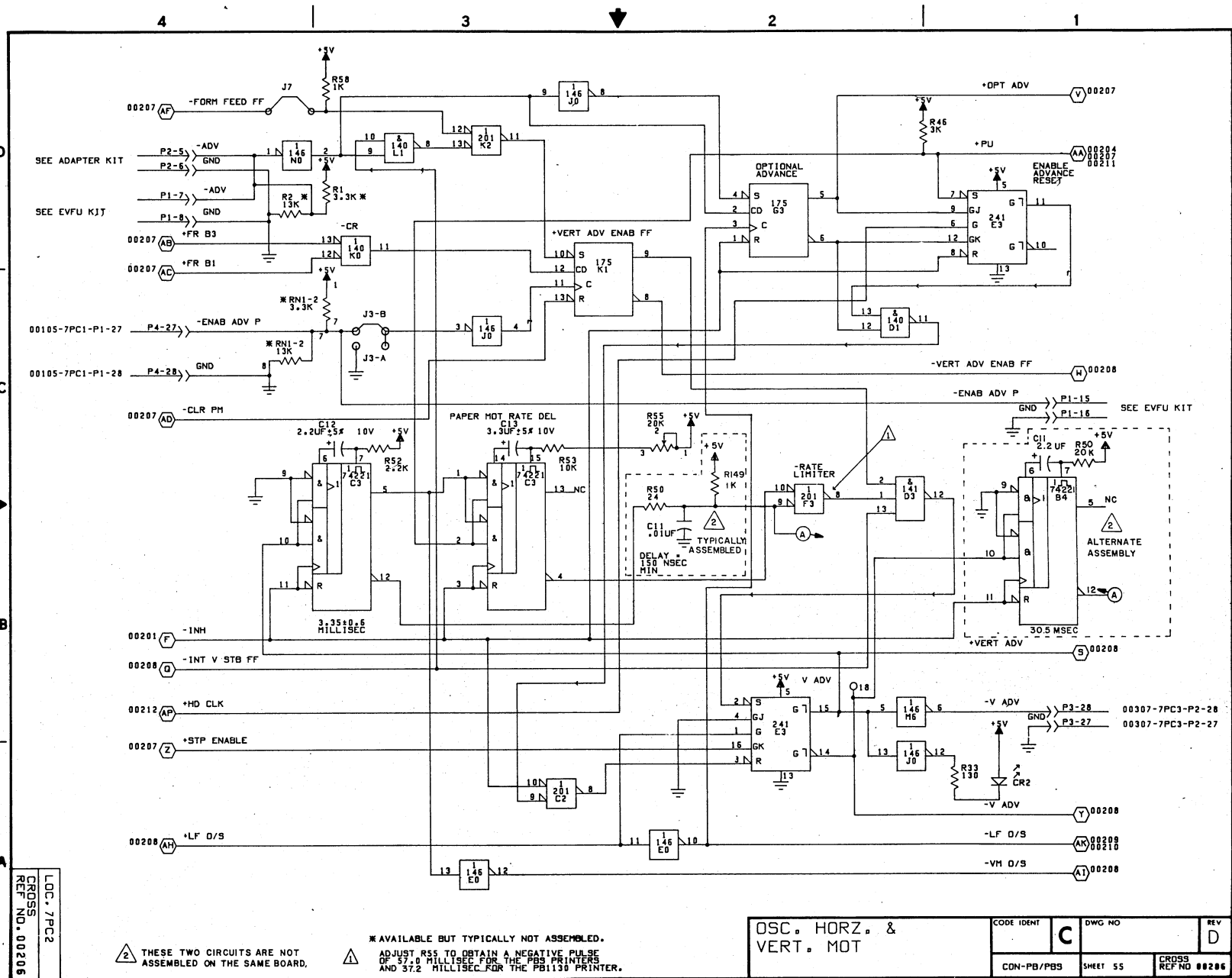
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6-57



LOC. 7PC2
 CROSS REF. NO. 00205

OSC. HORZ. & VERT. MOT		CODE IDENT	C	DWG NO	REV	B
		CON-PB/PBS	SHEET 54	CROSS REF NO	00205	



LOC. 7PC2
 CROSS
 REF. NO. 00206

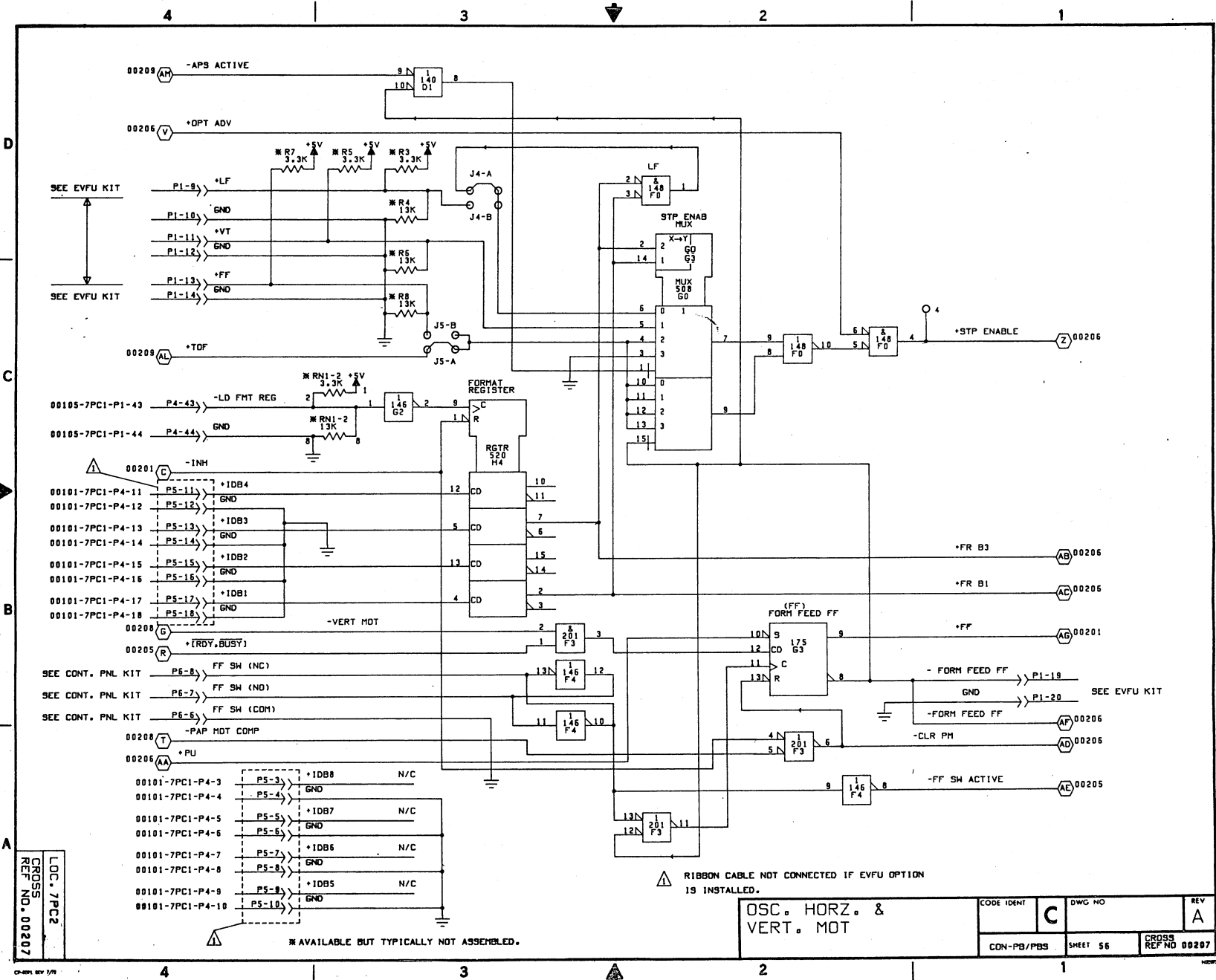
⚠ THESE TWO CIRCUITS ARE NOT ASSEMBLED ON THE SAME BOARD.

⚠ * AVAILABLE BUT TYPICALLY NOT ASSEMBLED. ADJUST R55 TO OBTAIN A NEGATIVE PULSE OF 57.0 MILLISEC FOR THE P83 PRINTERS AND 37.2 MILLISEC FOR THE P81130 PRINTER.

OSC. HORZ. & VERT. MOT

CODE IDENT	C	DWG NO	REV
CON-PB/PBS	SHEET 55	CROSS REF NO	00206

6-59



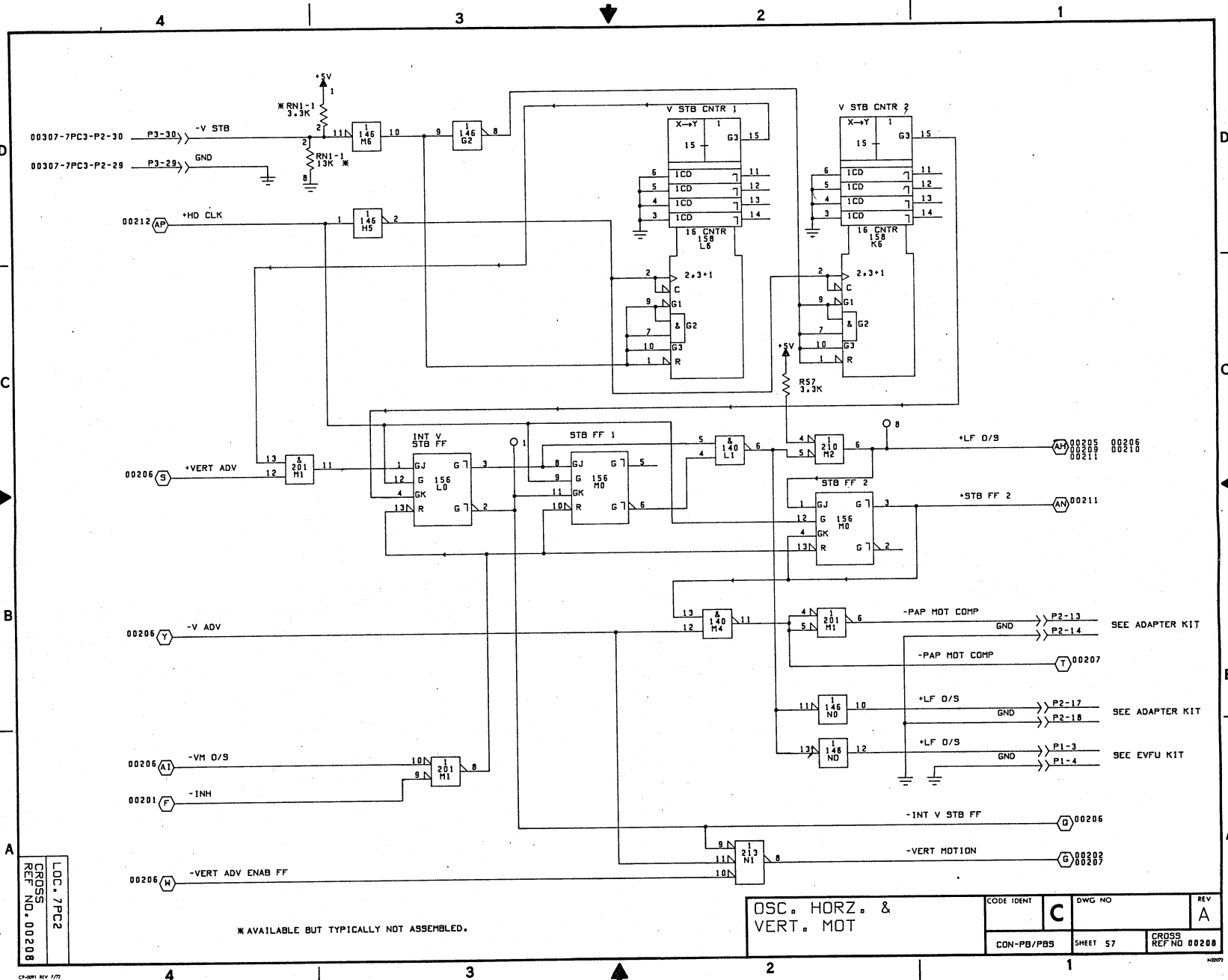
LOC. 7PC2
CROSS
REF. NO. 00207

⚠ RIBBON CABLE NOT CONNECTED IF EVFU OPTION IS INSTALLED.

OSC. HORZ. & VERT. MOT		CODE IDENT	DWG NO	REV
		C		A
		CON-PB/PBS	SHEET 56	CROSS REF NO 00207

0-201 REV 7/78

6-60



* AVAILABLE BUT TYPICALLY NOT ASSEMBLED.

OSC. HORZ. & VERT. MOT

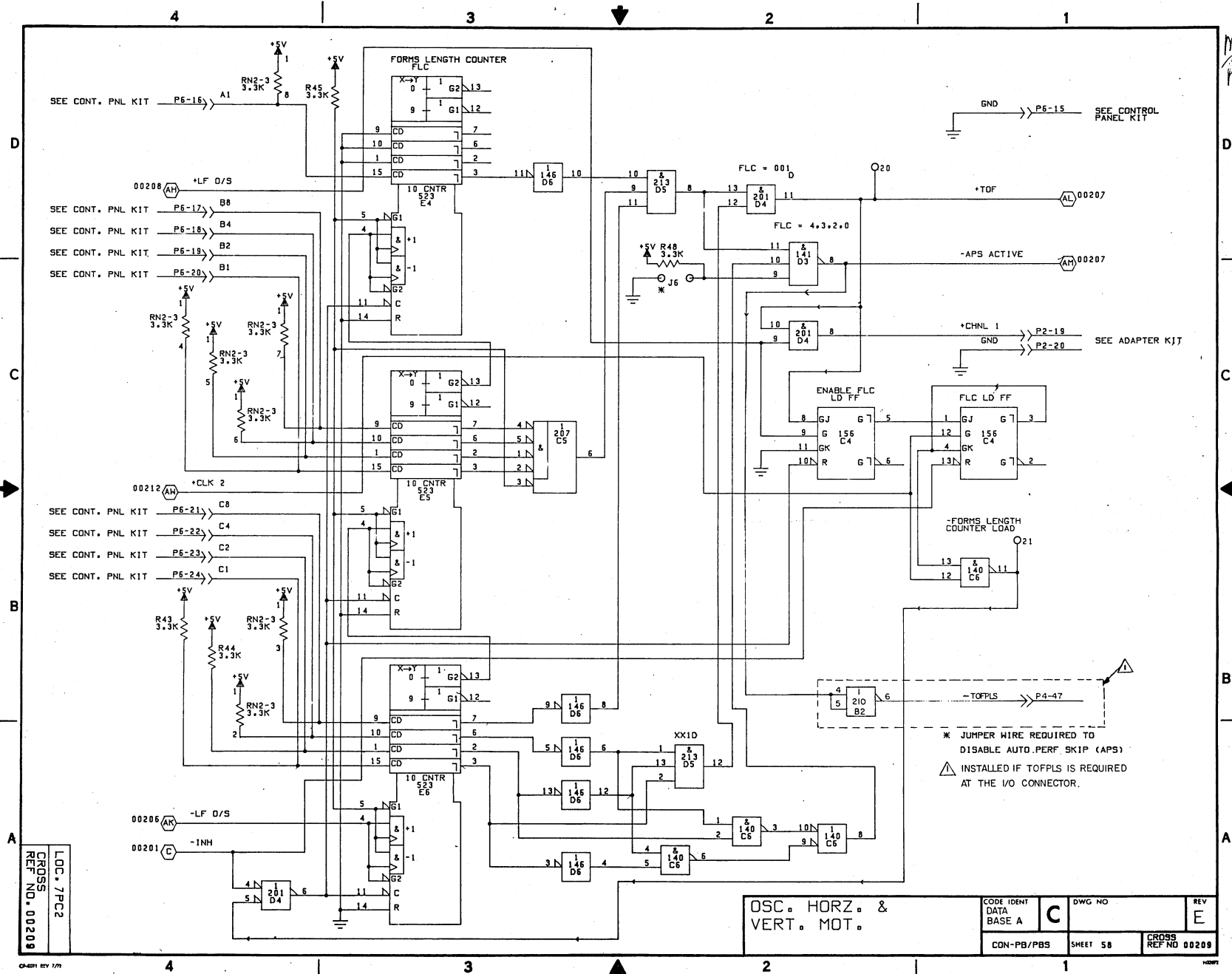
CODE IDENT	C	DWG NO		REV	A
CON-PB/PBS		SHEET 57	CROSS REF NO 00208		

LOC. 7PC2
CROSS REF. NO. 00208

CF-001 REV 1/72

MS007

6-61



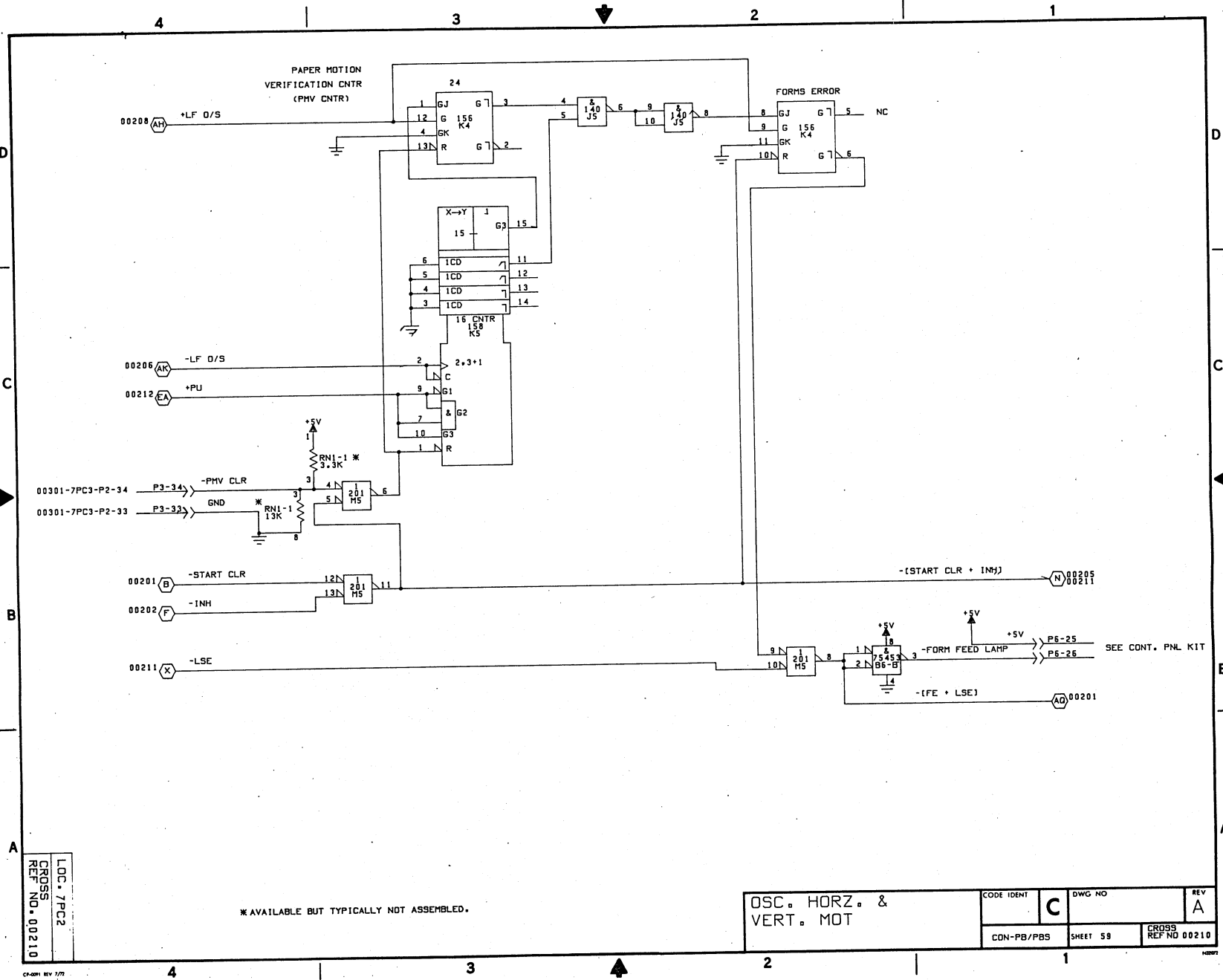
LOC. PCB2
 CROSS
 REF. NO. 00208

OSC. HORZ. &
 VERT. MOT.

CODE IDENT DATA BASE A	C	DWG NO	REV E
CON-PB/PBS	SHEET 58	CROSS REF. NO 00209	

0-001 REV 1/71

6-62



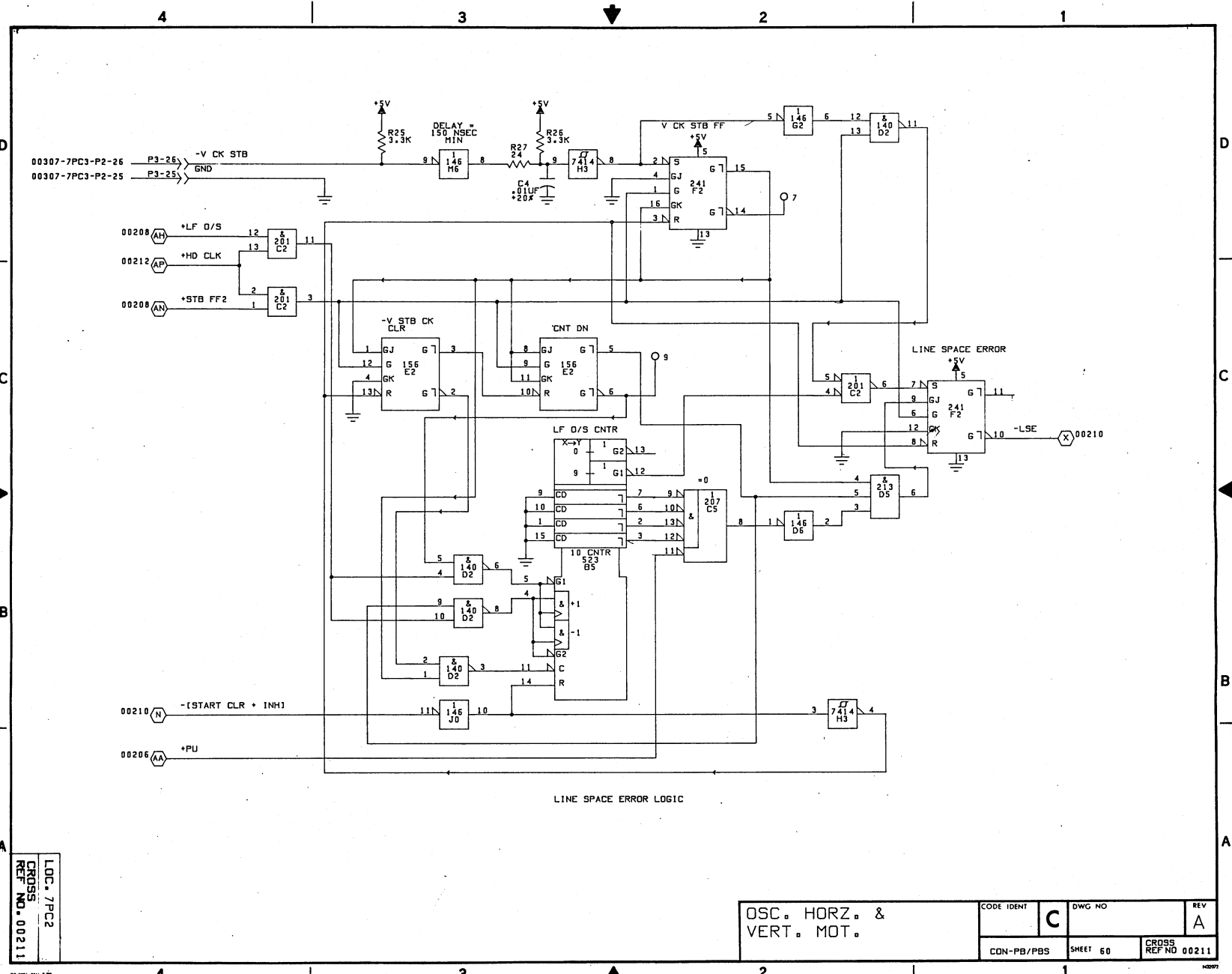
LOC. 7PC2
 CROSS REF. NO. 00210

* AVAILABLE BUT TYPICALLY NOT ASSEMBLED.

OSC. HORZ. &
 VERT. MOT

CODE IDENT	C	DWG NO	REV
CON-PB/PBS	SHEET 58	CROSS REF NO 00210	A

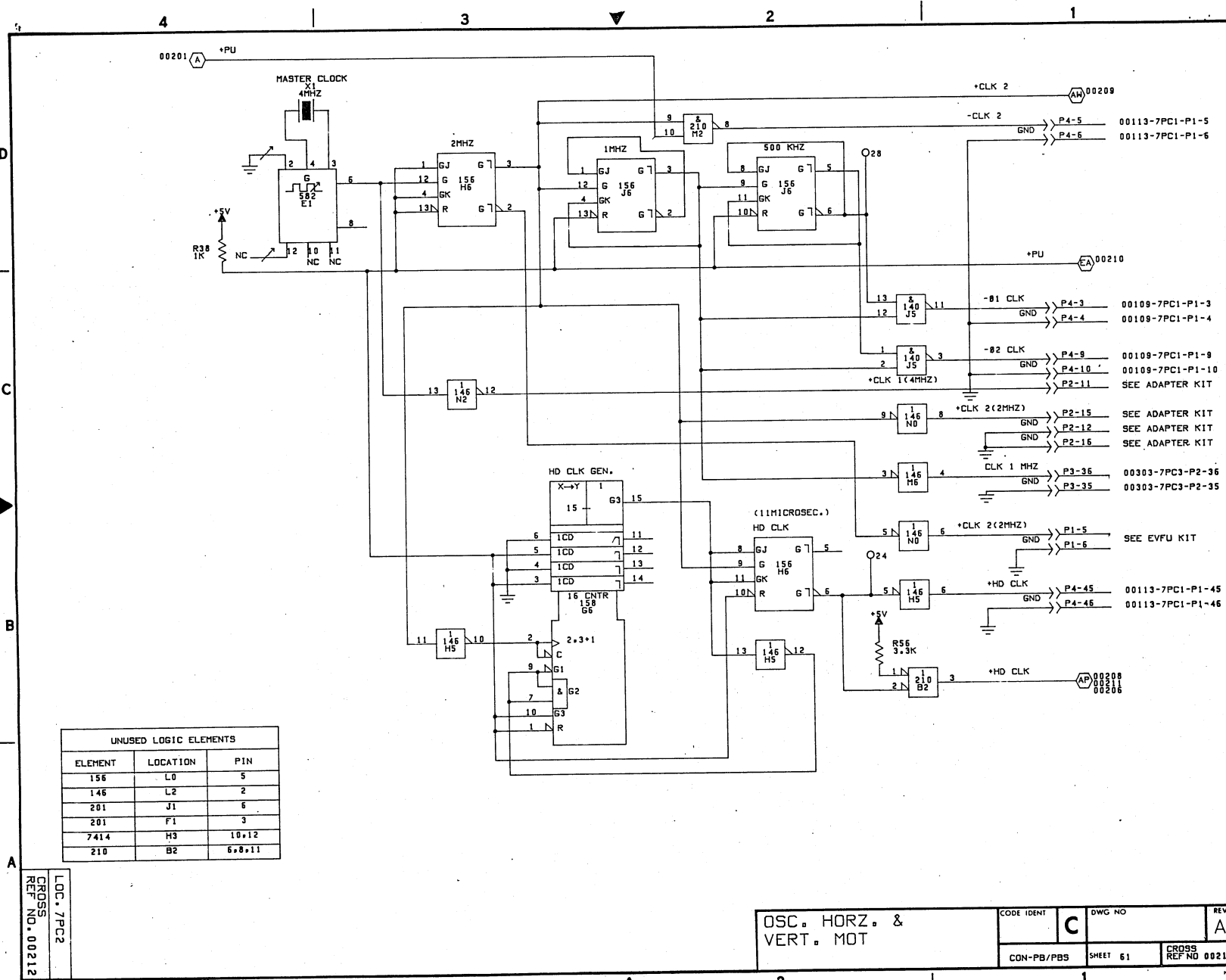
CP-601 REV 7/72



LOC. 7PC2
 CROSS
 REF NO. 00211

OSC. HORZ. &
 VERT. MOT.

CODE IDENT	C	DWG NO	REV
CON-PB/PBS	SHEET 60	CROSS REF NO 00211	A



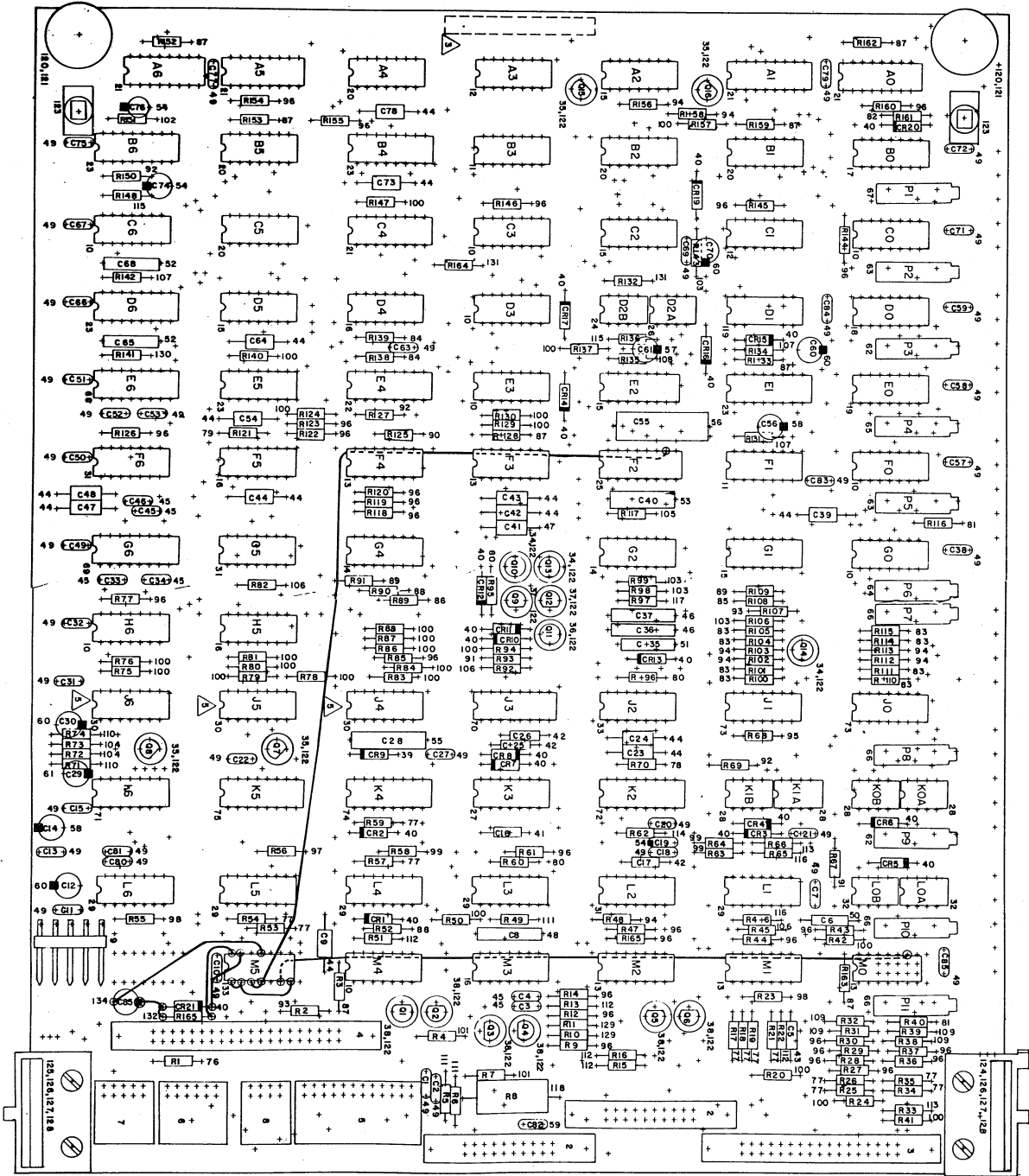
UNUSED LOGIC ELEMENTS		
ELEMENT	LOCATION	PIN
156	L0	5
146	L2	2
201	J1	6
201	F1	3
7414	H3	10,12
210	B2	6,8,11

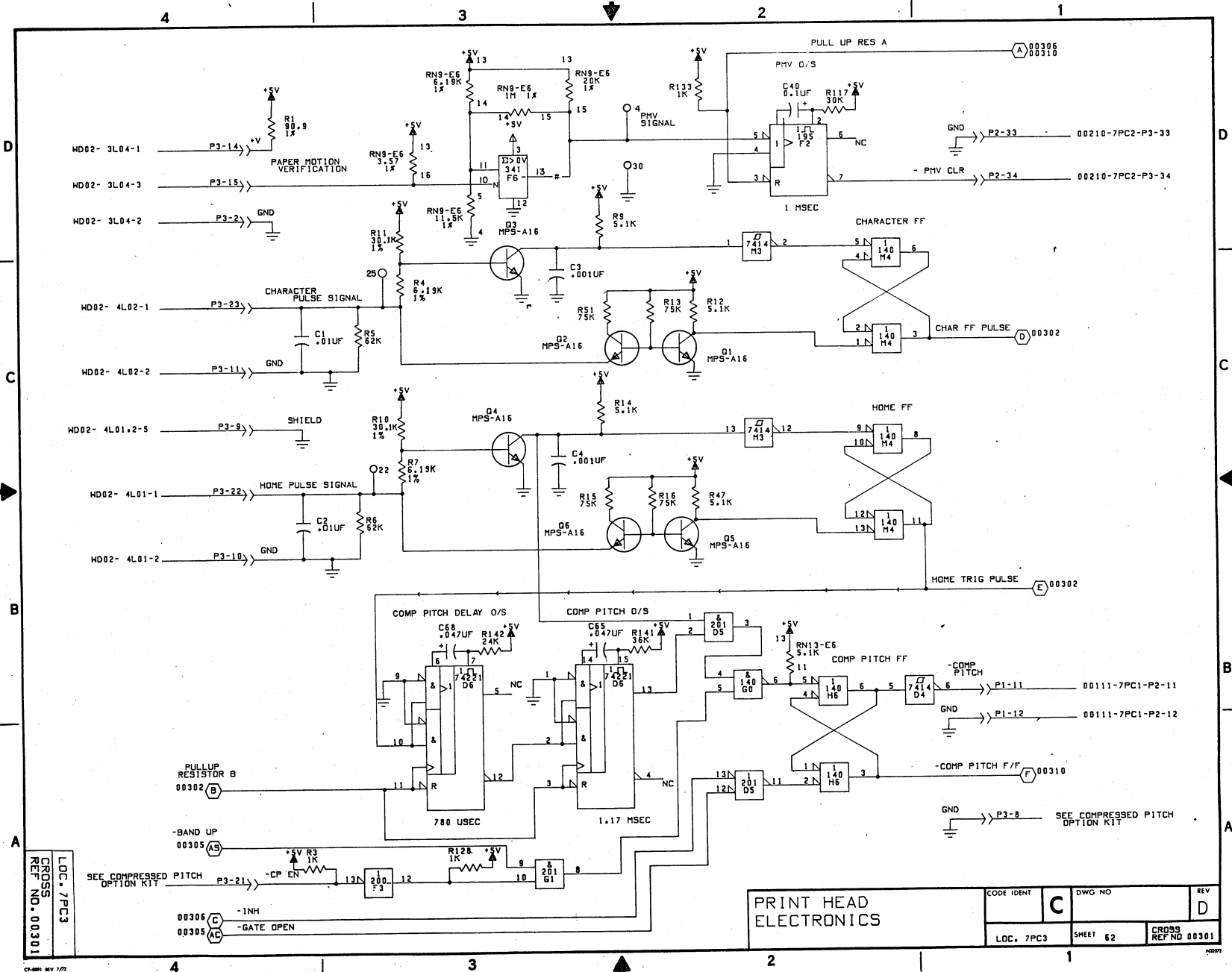
LOC. 7/PC2
CROSS
REF NO. 00212

OSC. HORZ. &
VERT. MOT

CODE IDENT	C	DWG NO	REV
CON-PB/PBS		SHEET 61	A
		CROSS REF NO 00212	

PRINT HEAD ELECTRONICS





LOC. 7PC3
 CROSS
 REF. NO. 00301

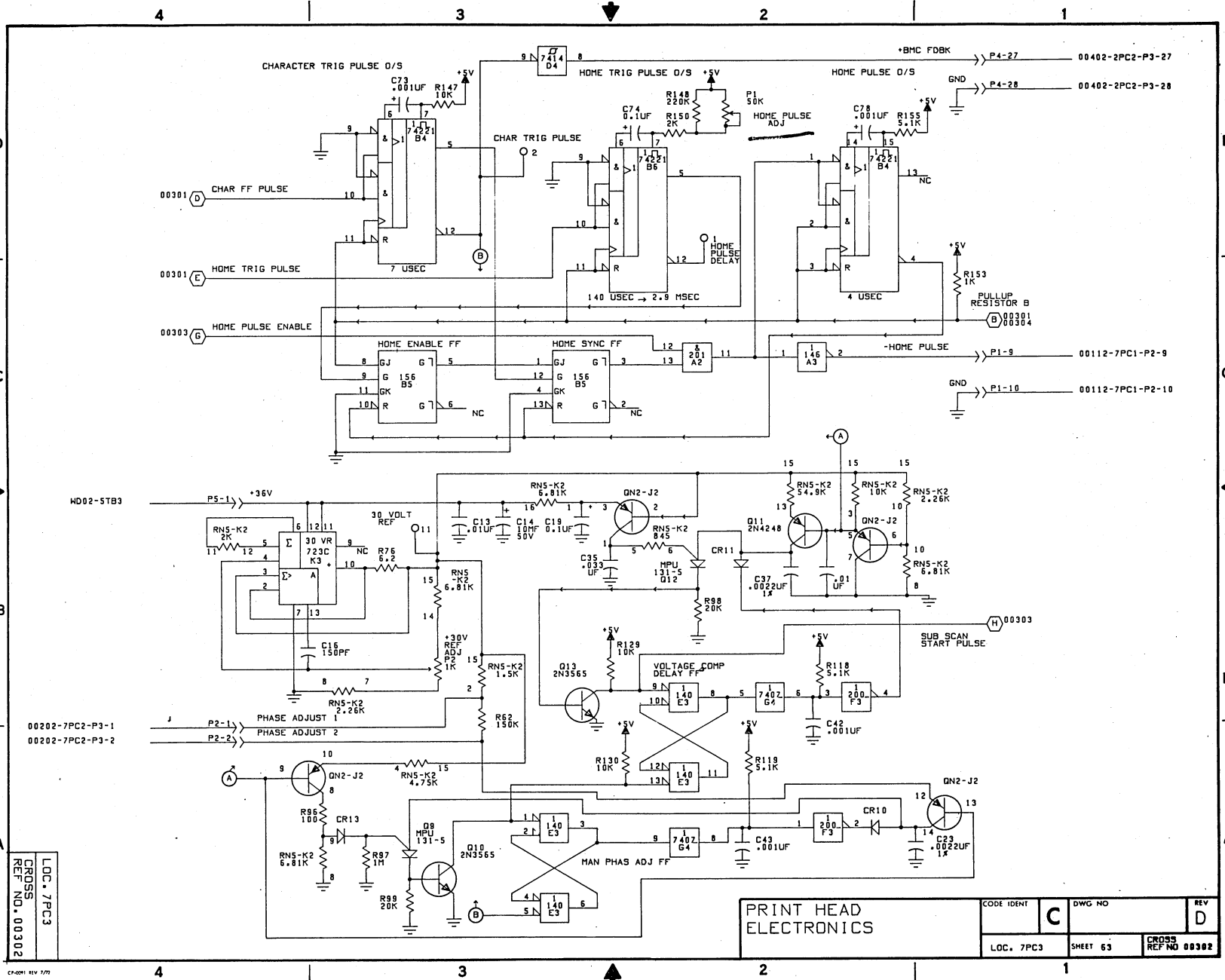
SEE COMPRESSED PITCH
 OPTION KIT

00305 C -INH
 00305 AC -GATE OPEN

PRINT HEAD
 ELECTRONICS

CODE IDENT	C	DWG NO	REV
LOC. 7PC3		SHEET 62	CROSS REF NO 00301

6-67

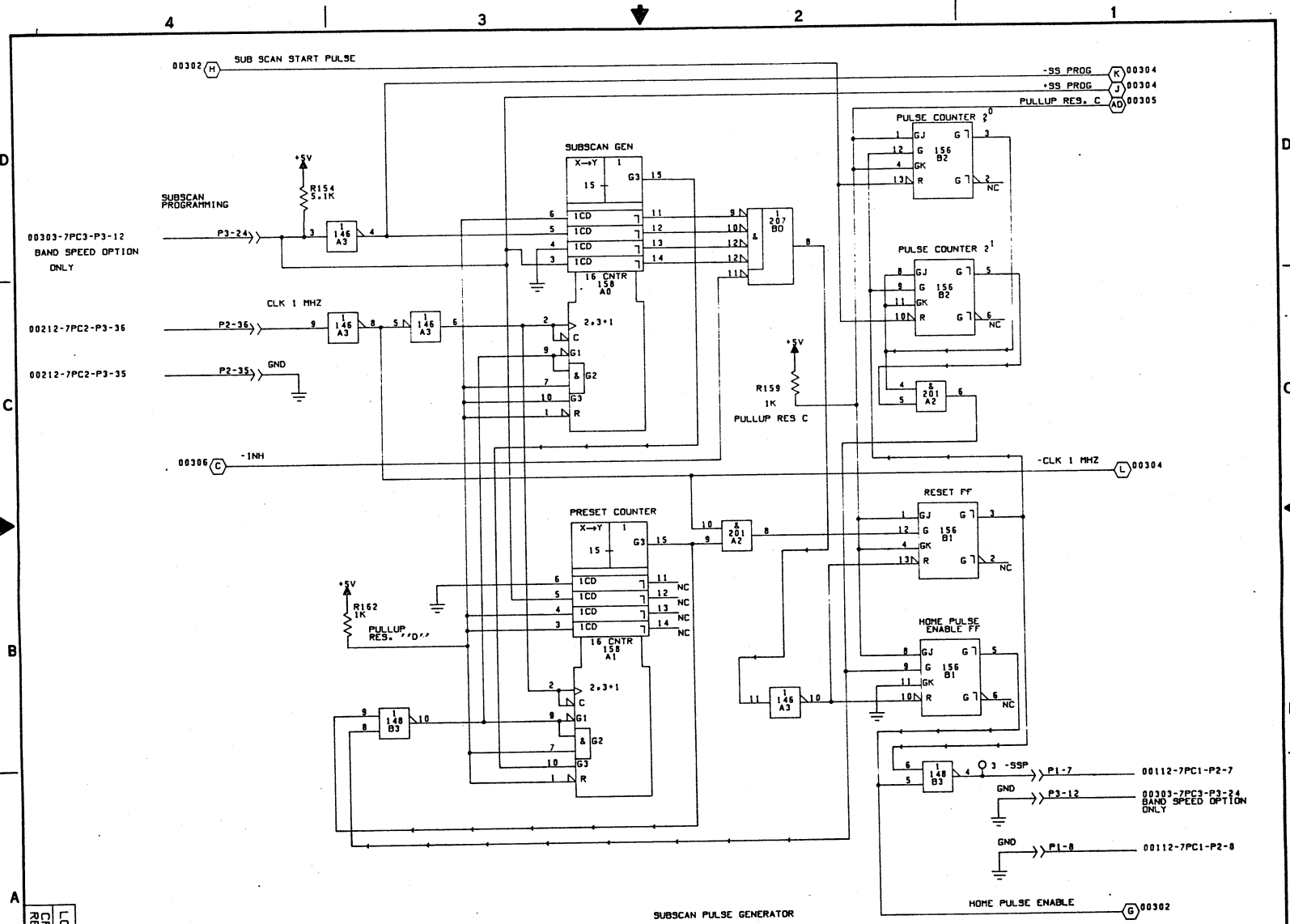


LOC. 7PC3
 CROSS REF. NO. 00302

PRINT HEAD ELECTRONICS

CODE IDENT	C	DWG NO	REV
LOC. 7PC3	SHEET 63	CROSS REF. NO 00302	D

6-68

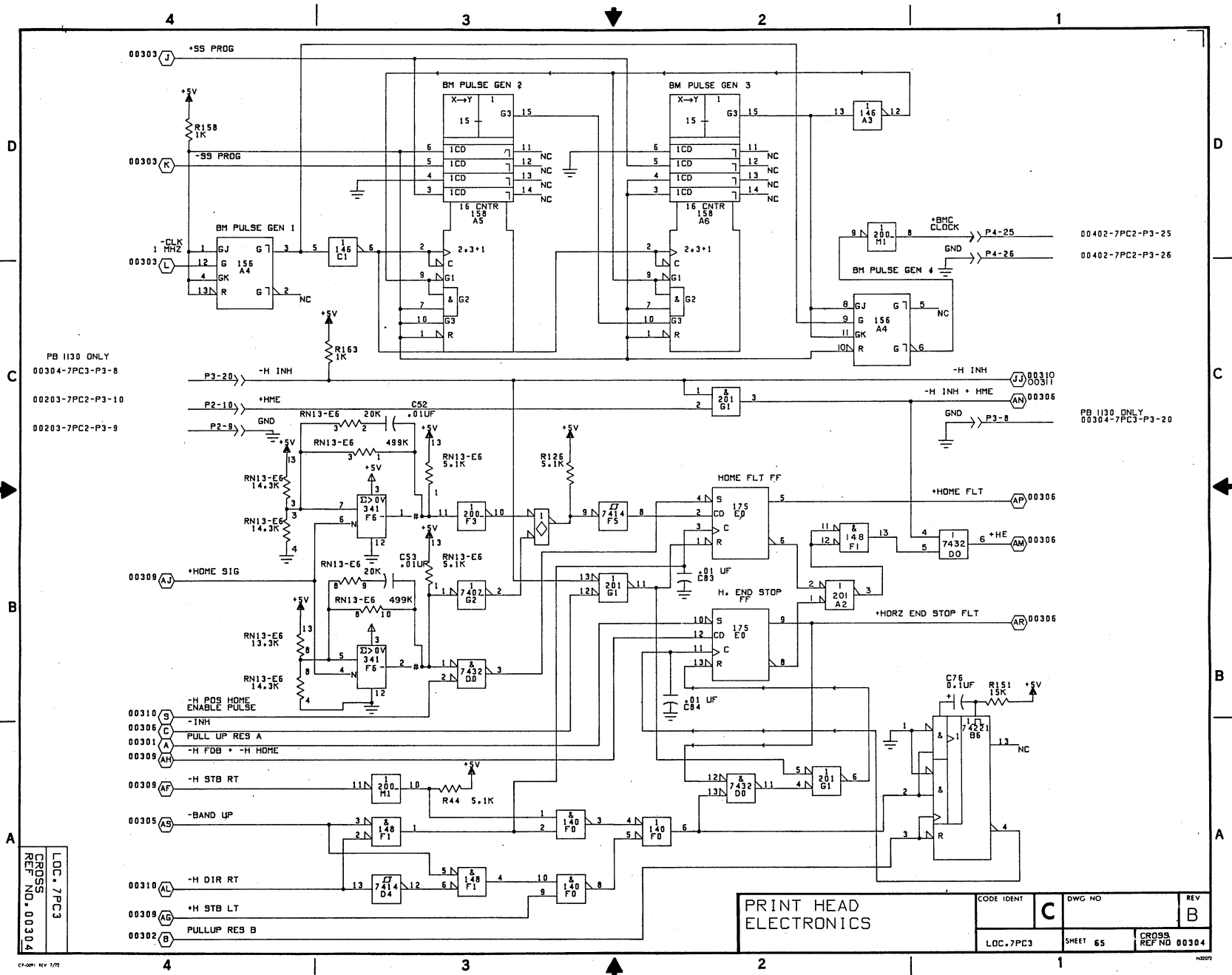


LOC. 7PC3
 CROSS REF. NO. 00303

PRINT HEAD
 ELECTRONICS

CODE IDENT	C	DWG NO	REV
LOC. 7PC3		SHEET 64	A
CROSS REF. NO. 00303			

CP-001 REV 1/77



PB 1130 ONLY
 00304-7PC3-P3-8
 00203-7PC2-P3-10
 00203-7PC2-P3-9

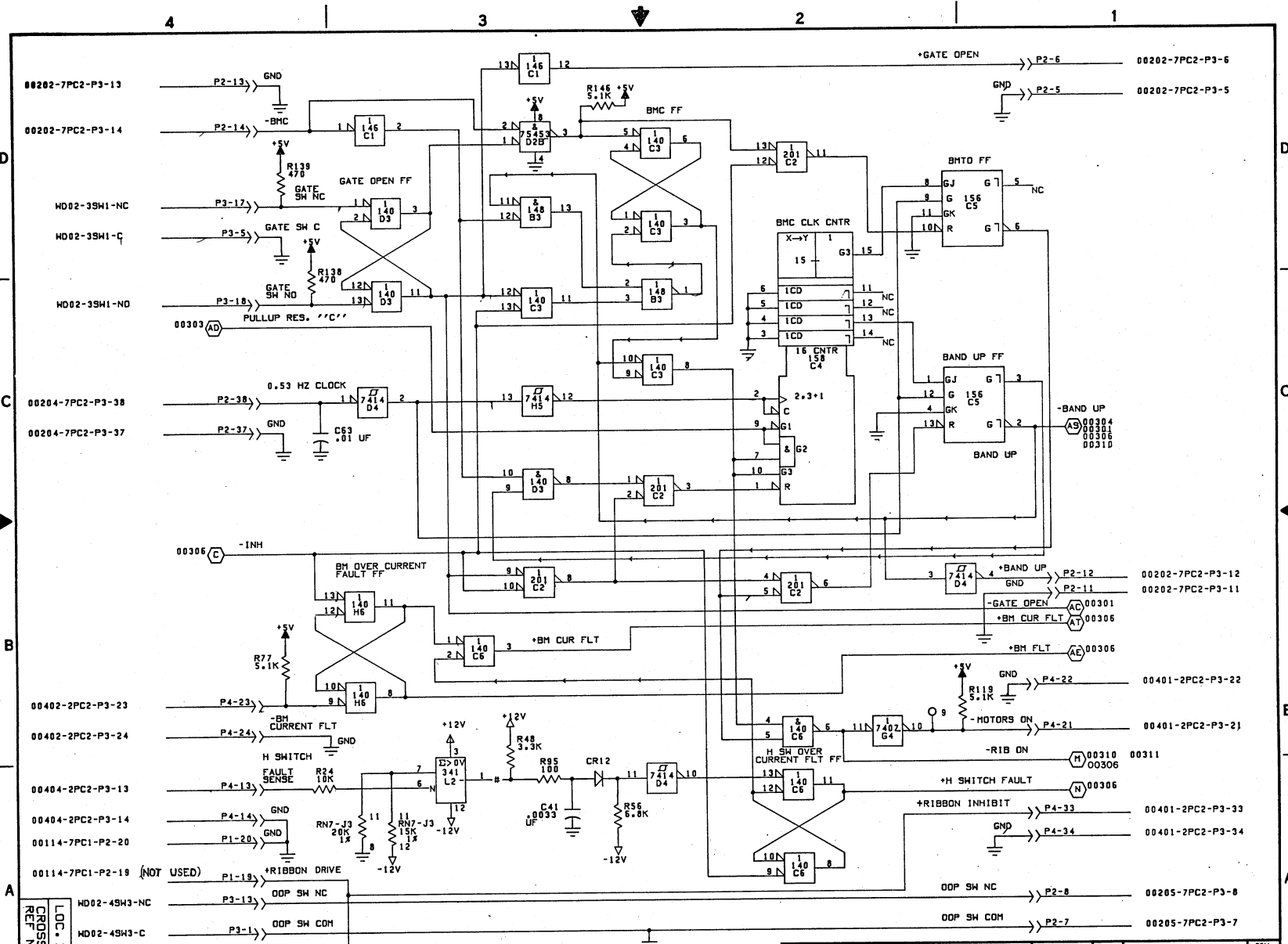
00402-7PC2-P3-25
 00402-7PC2-P3-26

PB 1130 ONLY
 00304-7PC3-P3-20

LOC. 7PC3
 CROSS REF. NO. 00304

PRINT HEAD ELECTRONICS

CODE IDENT	C	DWG NO	REV
LOC. 7PC3		SHEET 65	B
CROSS REF NO 00304			



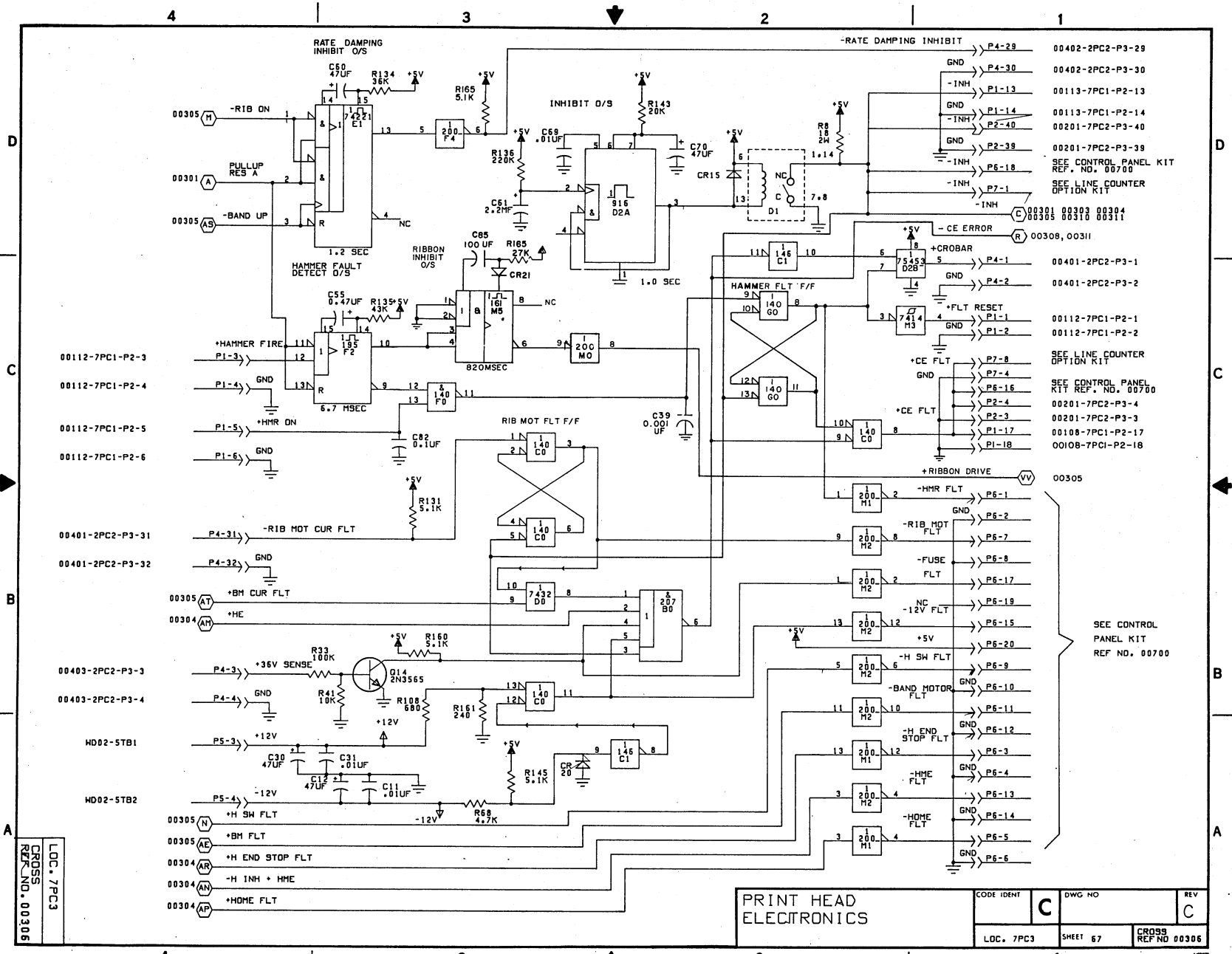
CROSS REF NO. 00305
LOC. 7PC3

00306

PRINT HEAD ELECTRONICS

CODE IDENT	C	DWG NO	REV	C
LOC. 7PC3	SHEET 66	CROSS REF NO	00305	

6-71

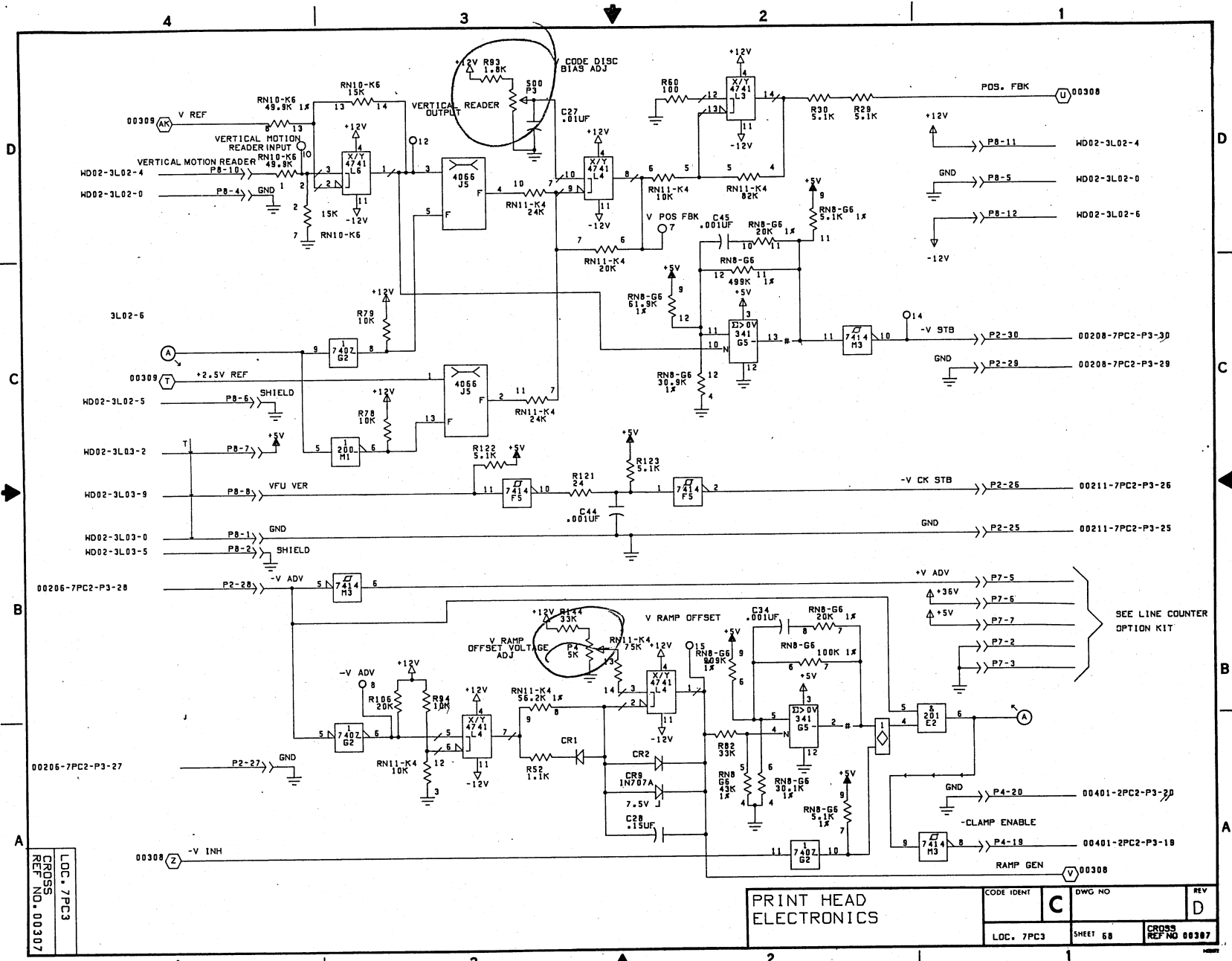


LOC. 7PC3
 CROSS REF. NO. 00306

PRINT HEAD
 ELECTRONICS

CODE IDENT	C	DWG NO	REV
LOC. 7PC3		SHEET 67	CROSS REF NO 00306

6-72



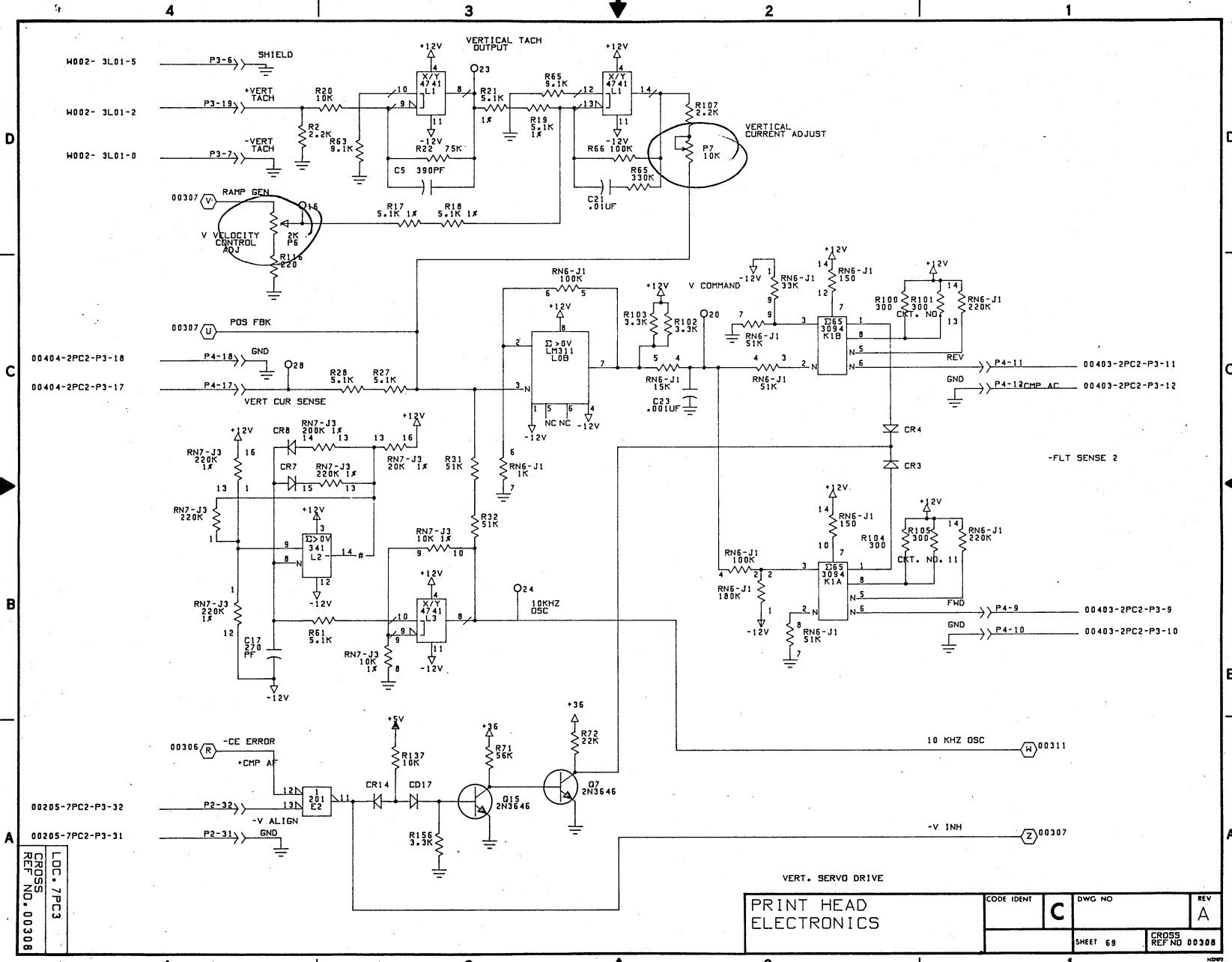
LOC. 7PC3
 CROSS REF. NO. 00307

PRINT HEAD ELECTRONICS

CODE IDENT	C	DWG NO	REV	D
LOC. 7PC3		SHEET 68	CROSS REF. NO	00307

C4001 REV 7/71

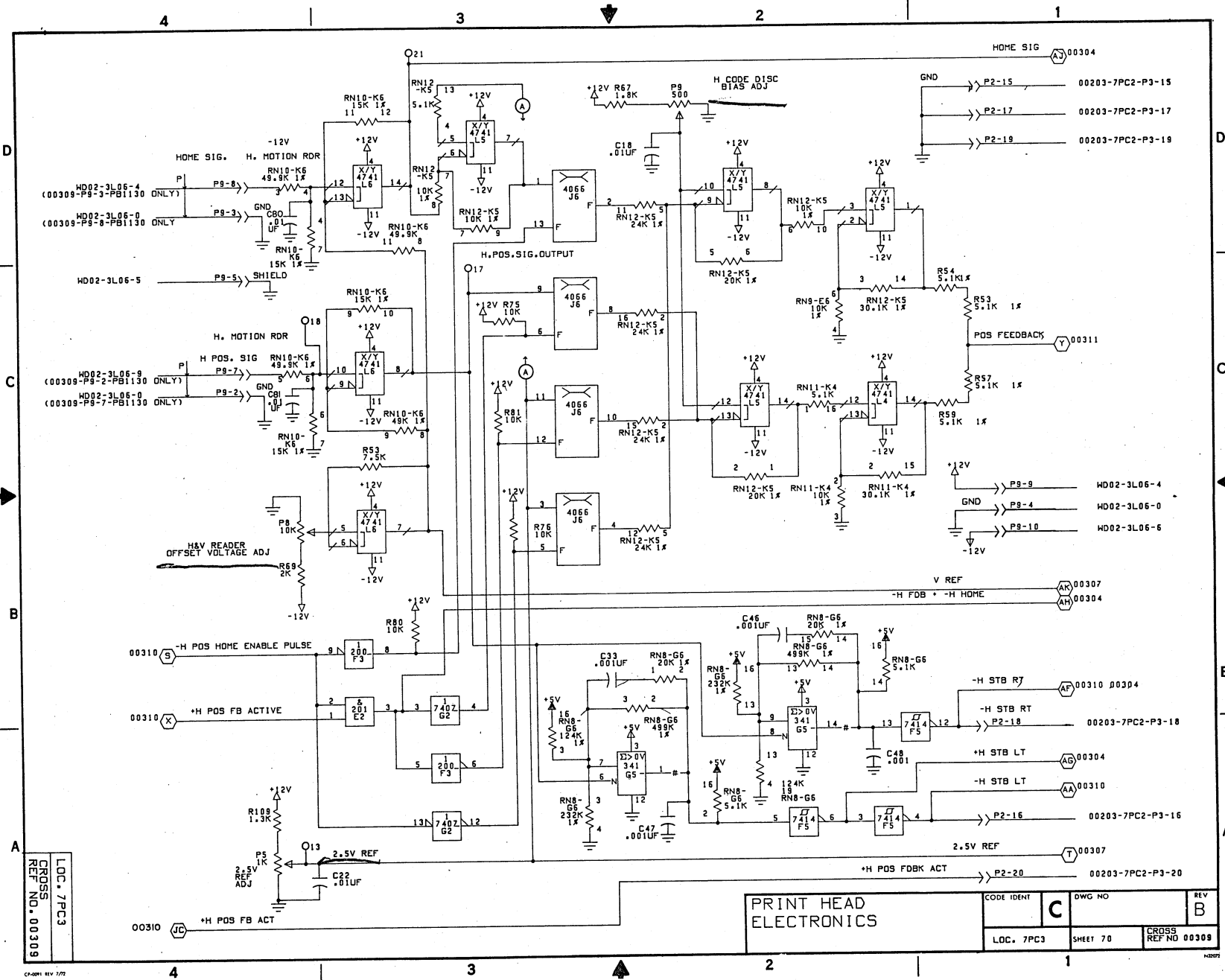
6-73



LOC. 7PC3
CROSS
REF. NO. 00308

PRINT HEAD ELECTRONICS		CODE IDENT	DWG NO	REV
		C		A
		SHEET 69	CROSS REF NO 00308	

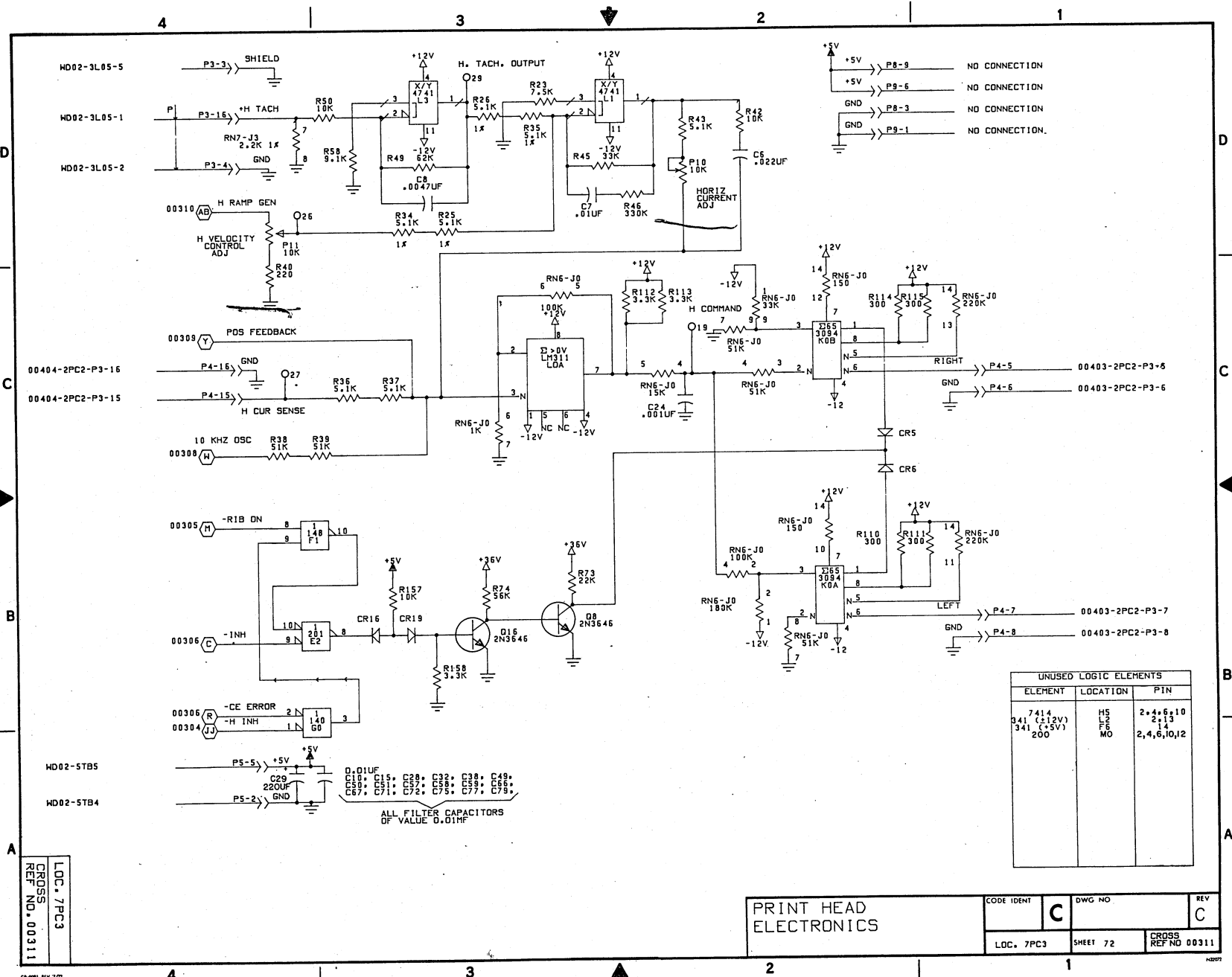
6-74

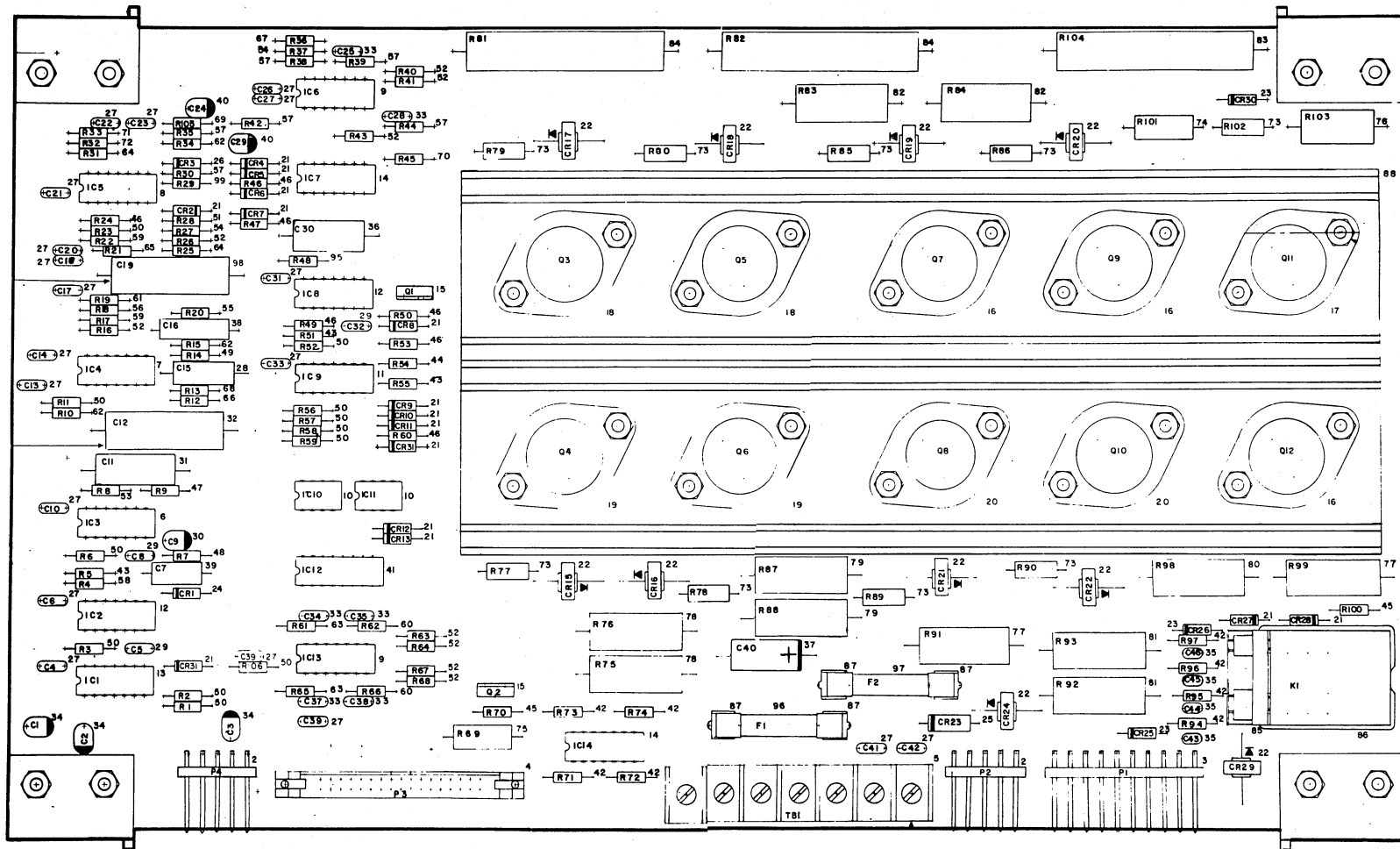


LOC. 7PC3
CROSS REF. NO. 00309

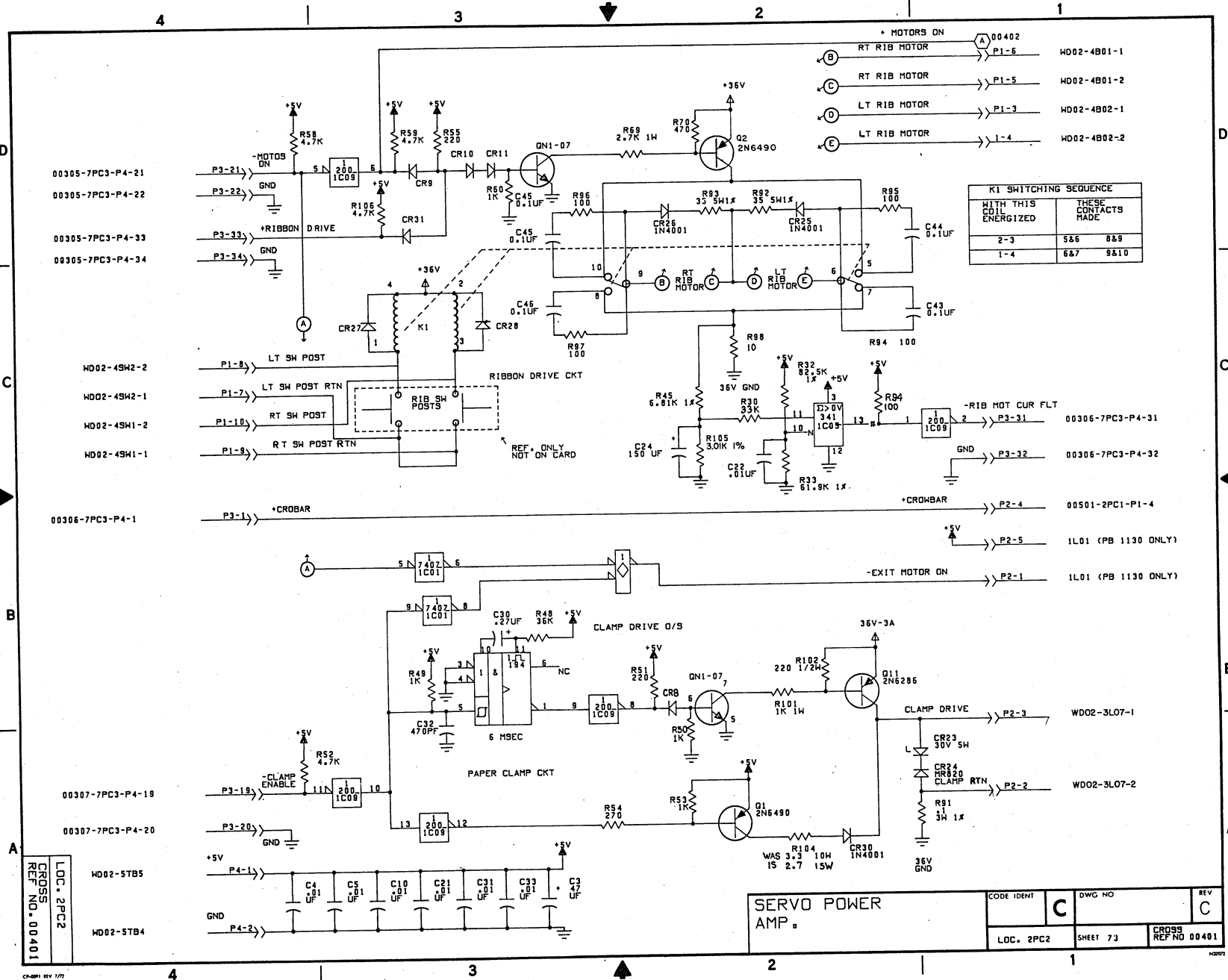
PRINT HEAD ELECTRONICS

CODE IDENT	C	DWG NO	REV
LOC. 7PC3	SHEET 70	CROSS REF NO 00309	B



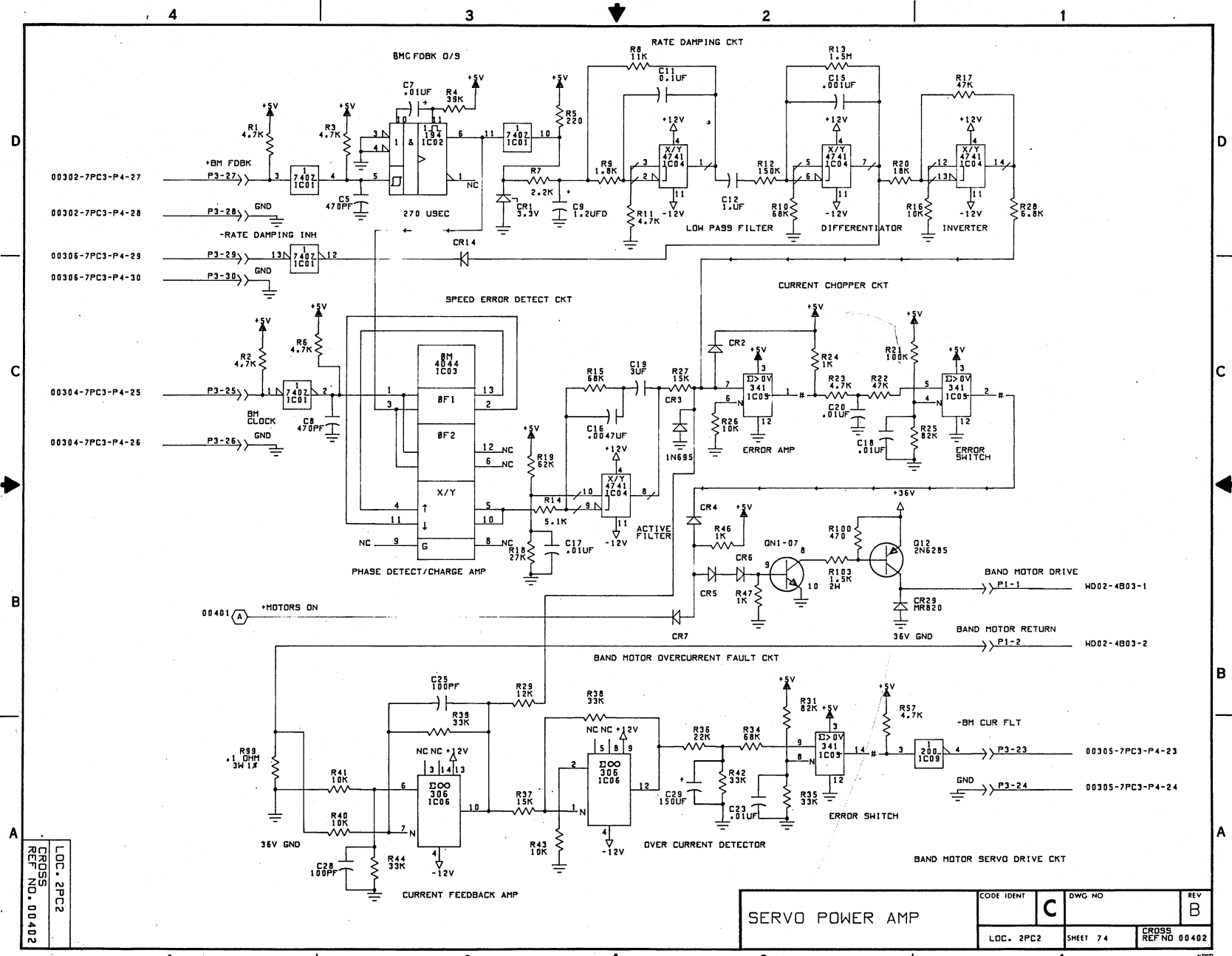


SERVO POWER AMPLIFIER



LOC. 2PC2
CROSS NO. 00401

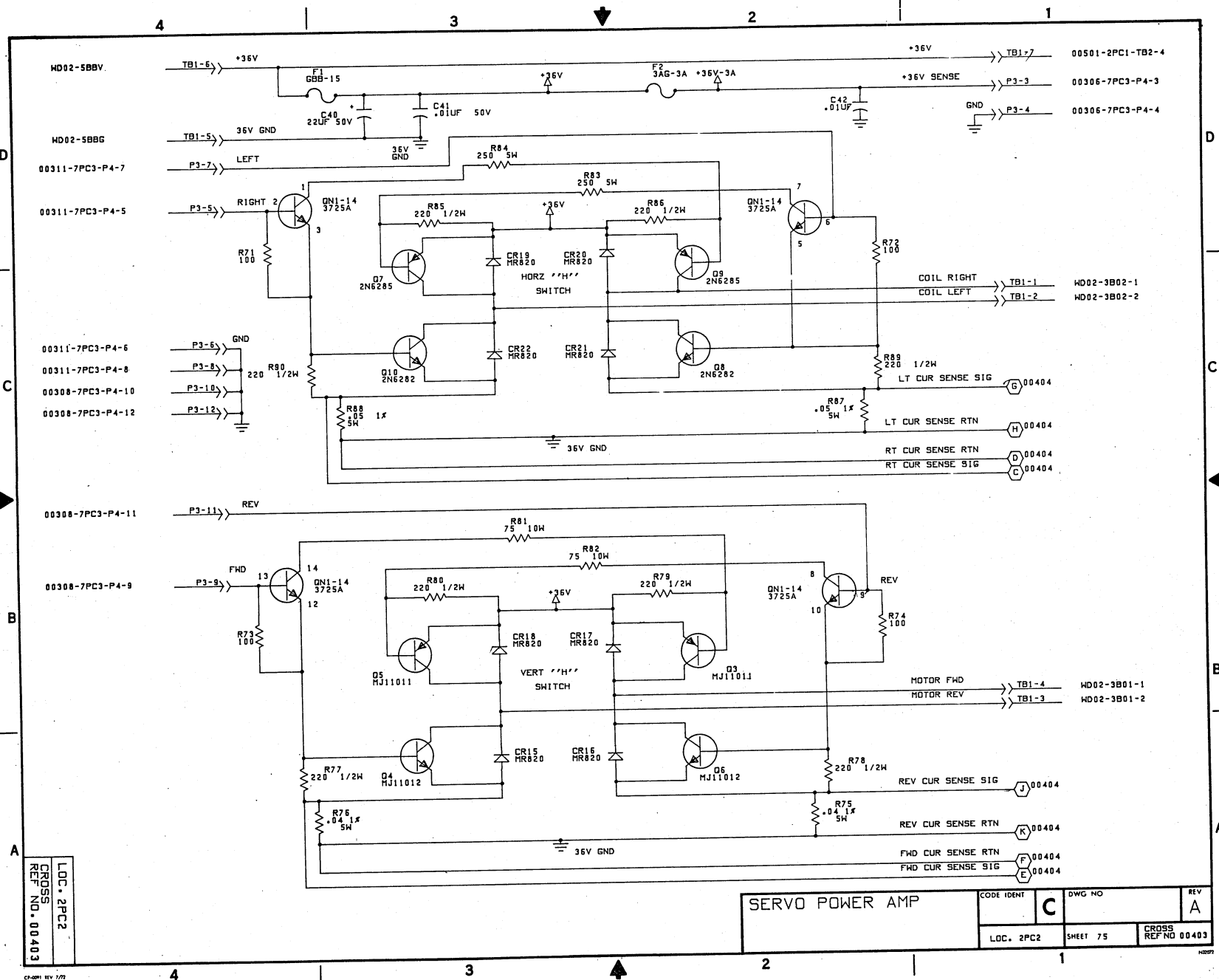
6-79



LOC. 2PC2
 CROSS REF. NO. 00402

SERVO POWER AMP		CODE IDENT	DWG NO	REV
		C		B
		LOC. 2PC2	SHEET 74	CROSS REF NO 00402

6-80

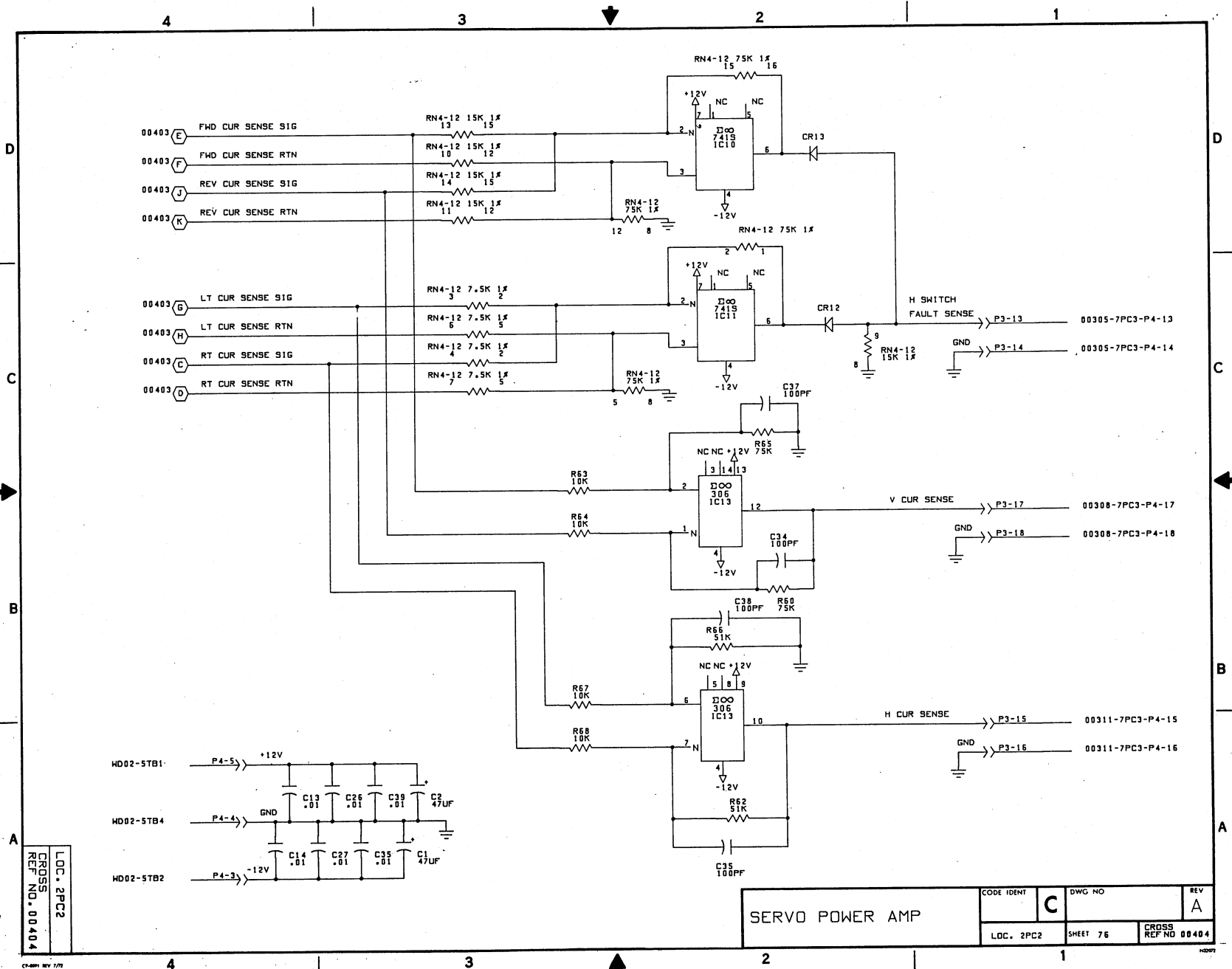


LOC. 2PC2
CROSS
REF NO. 00403

SERVO POWER AMP

CODE IDENT	C	DWG NO	REV
LOC. 2PC2	SHEET 75	CROSS REF NO 00403	A

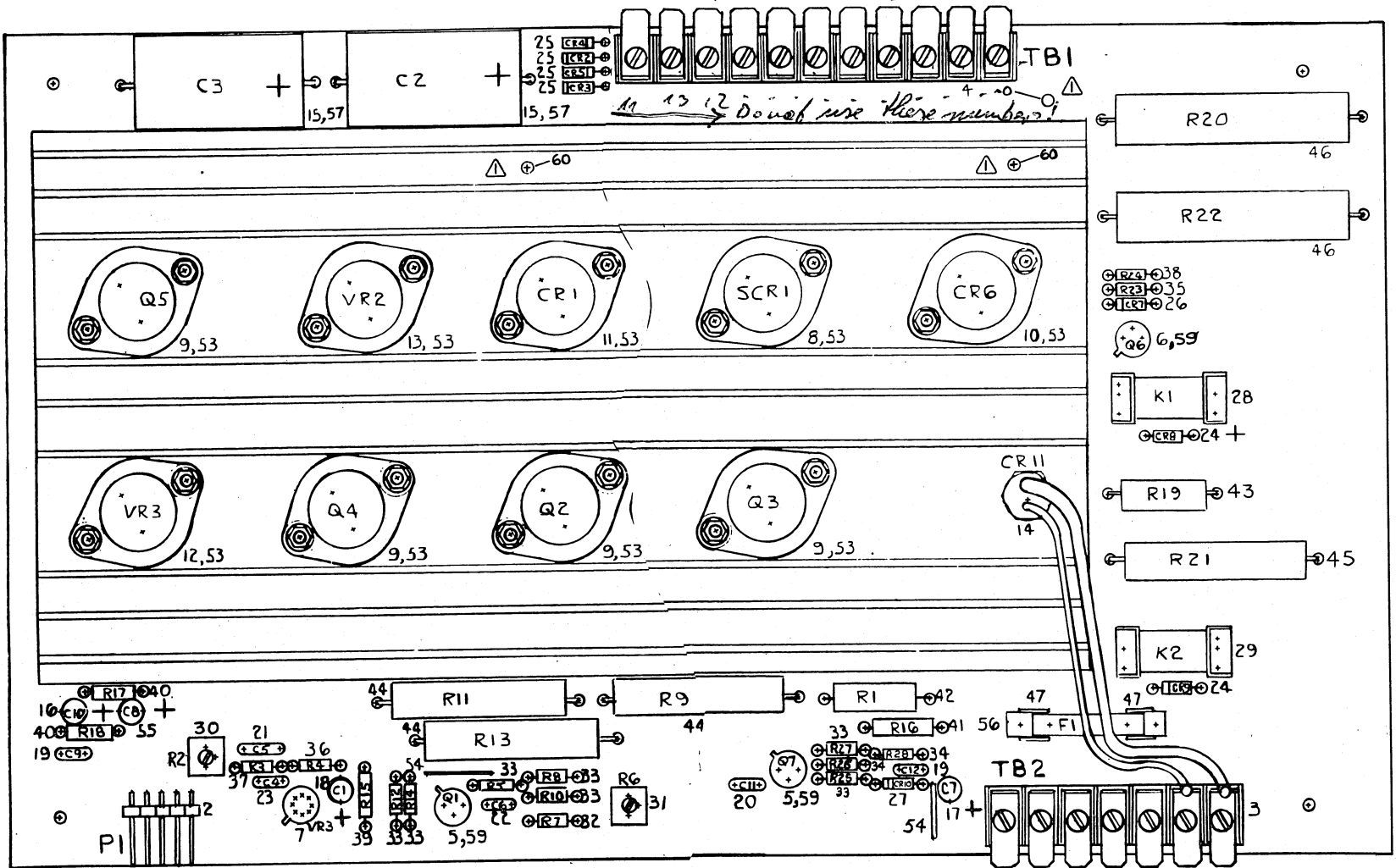
18-9



LOC. 2PC2
 CROSS REF NO. 00404

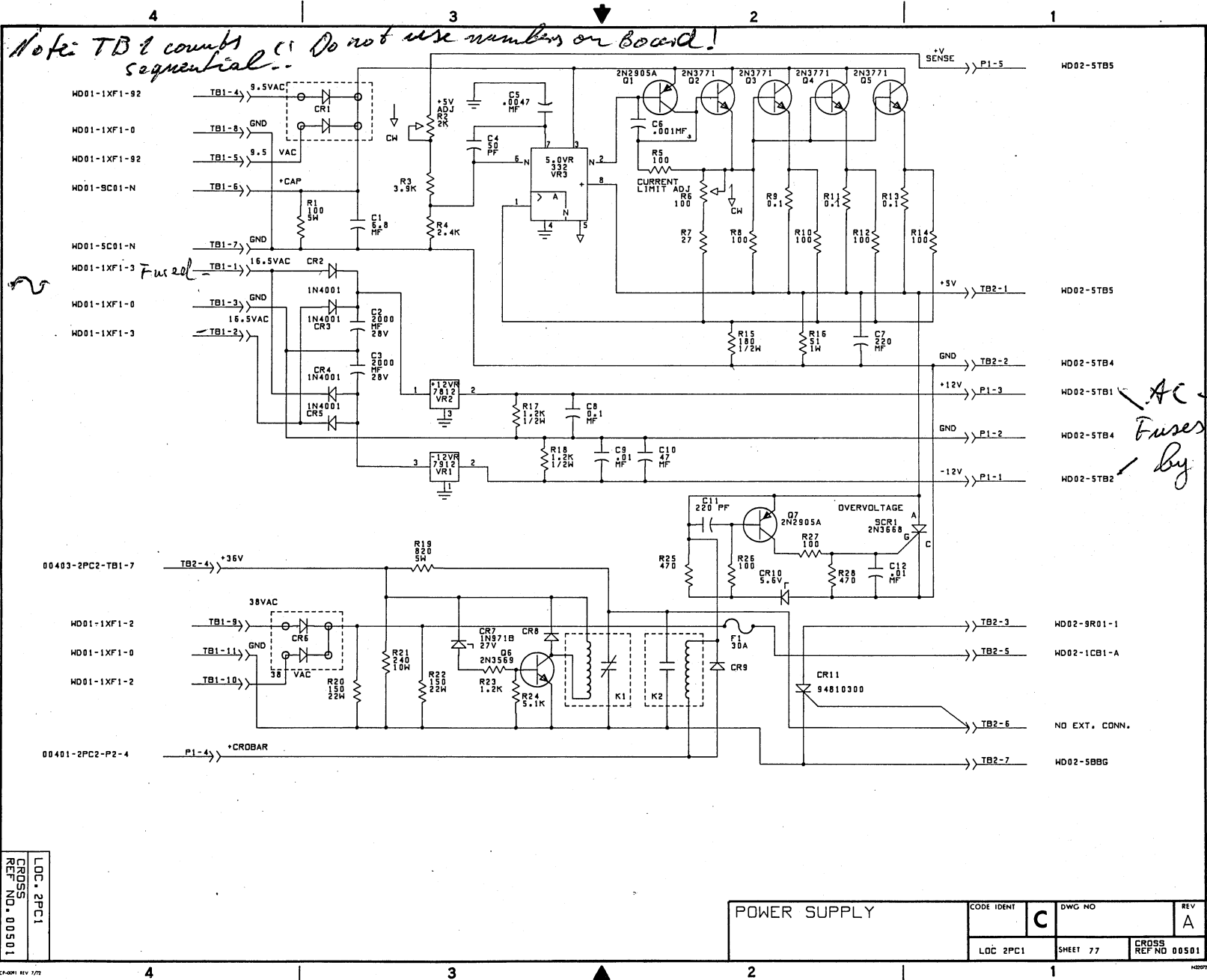
SERVO POWER AMP		CODE IDENT	DWG NO	REV
		C		A
LOC. 2PC2	SHEET 76	CROSS REF NO 00404		

1 2 3 4 5 6 7 8 9 10 11 → use these numbers!



POWER SUPPLY

Schwarz
 blank
 not hole
 not pin
 not checked
 SW
 To f. wire?



AC Input added by FCO

6-83

LOC. 2PC1
CROSS REF. NO. 00501

POWER SUPPLY		CODE IDENT	DWG NO	REV
		C		A
LOC 2PC1	SHEET 77	CROSS REF NO 00501		

CR-001 REV 7/71

42007

JUMPER/ TERMINATOR NUMBER	FUNCTION	360 LPM COLM 1-136	720 LPM COLM 1-68	720 LPM COLM 69-136	1130 LPM ODD COLM 1-67	1130 LPM EVEN COLM 2-68	1130 LPM ODD COLM 69-135	1130 LPM EVEN COLM 70-136
J1	-CMP	IN	OUT	IN	OUT	OUT	IN	IN
J2	-HEP4	OUT	OUT	OUT	OUT	IN	OUT	IN
J3	-HEP3	OUT	OUT	OUT	IN	OUT	IN	OUT
J4	-HEP2	OUT	IN	IN	OUT	OUT	OUT	OUT
J5	-HEP1	IN	IN	IN	IN	OUT	IN	OUT
J6	-SR STEP2	OUT	OUT	OUT	OUT	IN	OUT	IN
J7	-SR STEP1	IN	IN	IN	IN	OUT	IN	OUT
J8	-CMP OUT	OUT	OUT	IN	OUT	OUT	IN	IN
J9	-HEP	IN	OUT	OUT	OUT	OUT	OUT	OUT
J10	-CMP FROM SHIFT REG.	OUT	IN	OUT	IN	IN	OUT	OUT
J11	-HEP2	OUT	OUT	OUT	OUT	IN	OUT	IN
T1	CLK TERMINATOR	IN	IN	OUT	IN	OUT	OUT	OUT
T2	-SR STEP1 TERMINATOR	IN	IN	OUT	IN	OUT	OUT	OUT
T3	-SR STEP2 TERMINATOR	OUT	OUT	OUT	IN	OUT	OUT	OUT

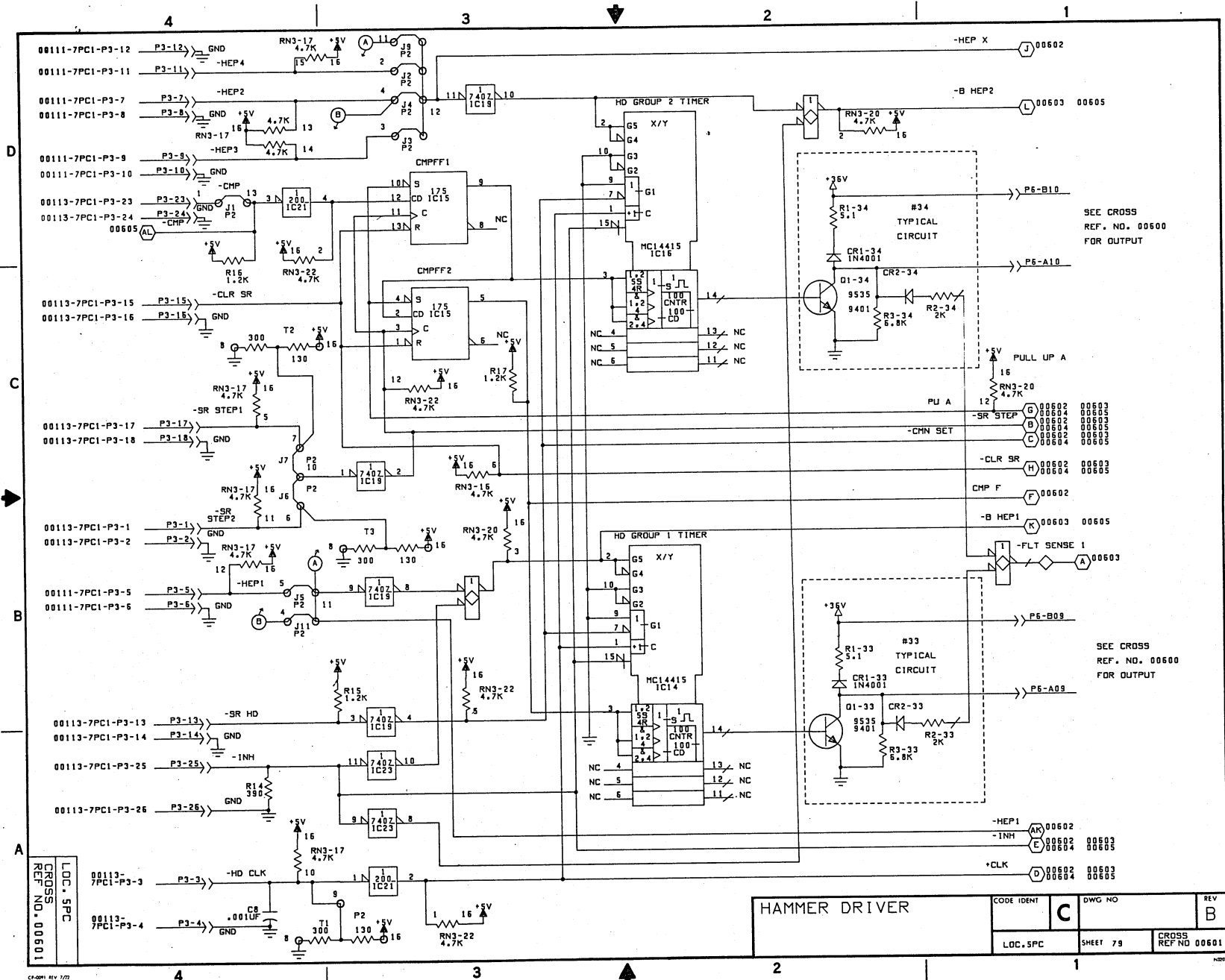
HAMMER DRIVER CKT #	300 LPM SPC1 COIL #	720 LPM SPC1 COIL #	720 LPM SPC2 COIL #	1130 LPM SPC1 COIL #	1130 LPM SPC2 COIL #	1130 LPM SPC3 COIL #	1130 LPM SPC4 COIL #
1	1	1	69	1	2	69	70
2	5	3	71	3	4	71	72
3	9	5	73	5	6	73	74
4	13	7	75	7	8	75	76
5	17	9	77	9	10	77	78
6	21	11	79	11	12	79	80
7	25	13	81	13	14	81	82
8	29	15	83	15	16	83	84
9	33	17	85	17	18	85	86
10	37	19	87	19	20	87	88
11	41	21	89	21	22	89	90
12	45	23	91	23	24	91	92
13	49	25	93	25	26	93	94
14	53	27	95	27	28	95	96
15	57	29	97	29	30	97	98
16	61	31	99	31	32	99	100
17	65	33	101	33	34	101	102
18	69	35	103	35	36	103	104
19	73	37	105	37	38	105	106
20	77	39	107	39	40	107	108
21	81	41	109	41	42	109	110
22	85	43	111	43	44	111	112
23	89	45	113	45	46	113	114
24	93	47	115	47	48	115	116
25	97	49	117	49	50	117	118
26	101	51	119	51	52	119	120
27	105	53	121	53	54	121	122
28	109	55	123	55	56	123	124
29	113	57	125	57	58	125	126
30	117	59	127	59	60	127	128
31	121	61	129	61	62	129	130
32	125	63	131	63	64	131	132
33	129	65	133	65	66	133	134
34	133	67	135	67	68	135	136

LOC. SPC
CROSS
REF NO. 00600

HAMMER DRIVER
PROGRAM CHARTS

CODE IDENT	C	DWG NO	REV	A
LOC. SPC	SHEET 78	CROSS REF NO 00600		

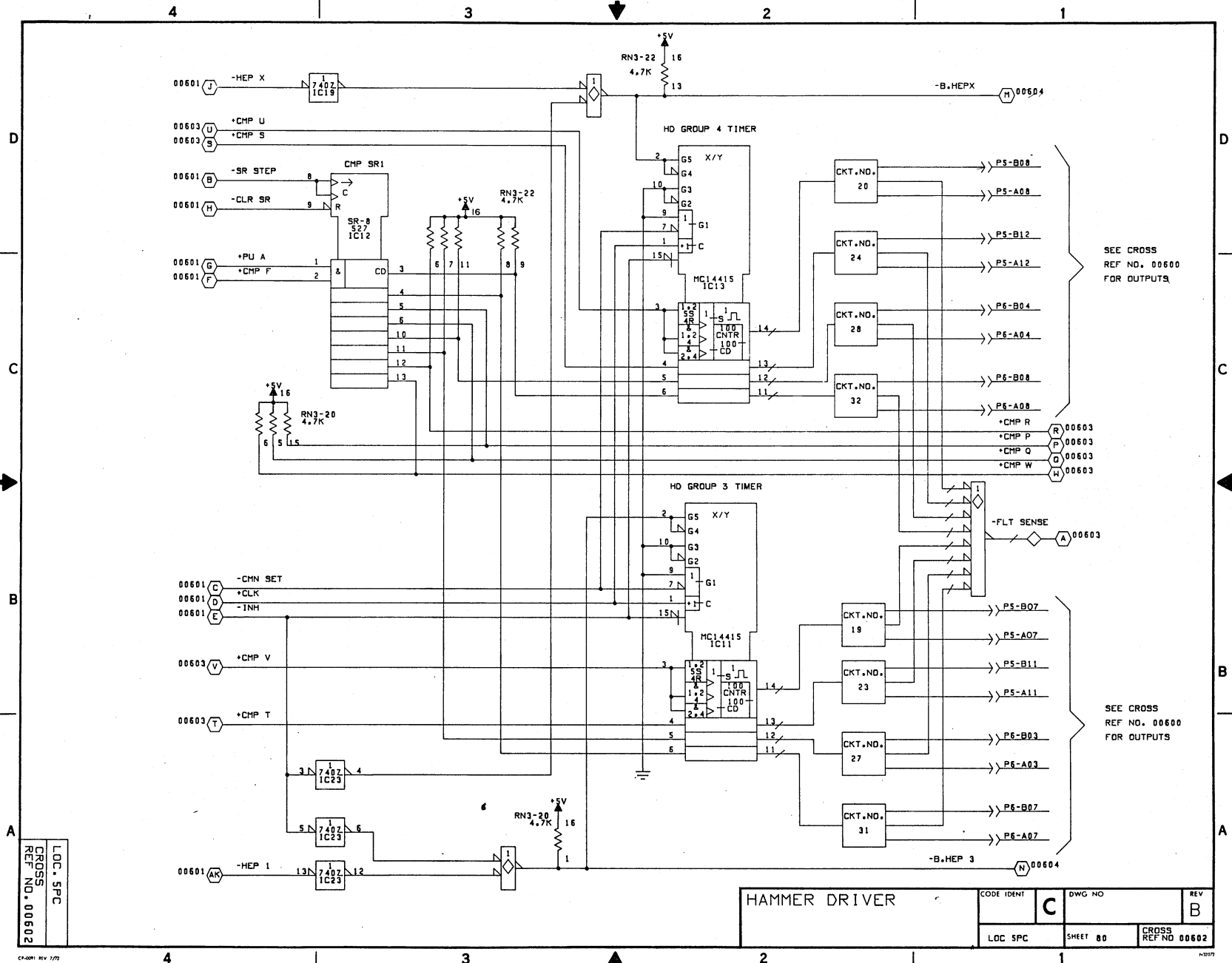
98-9



LOC. 5PC
CROSS REF. NO. 00601

CODE IDENT	C	DWG NO	REV
LOC. 5PC		SHEET 79	B
		CROSS REF NO	00601

6-87



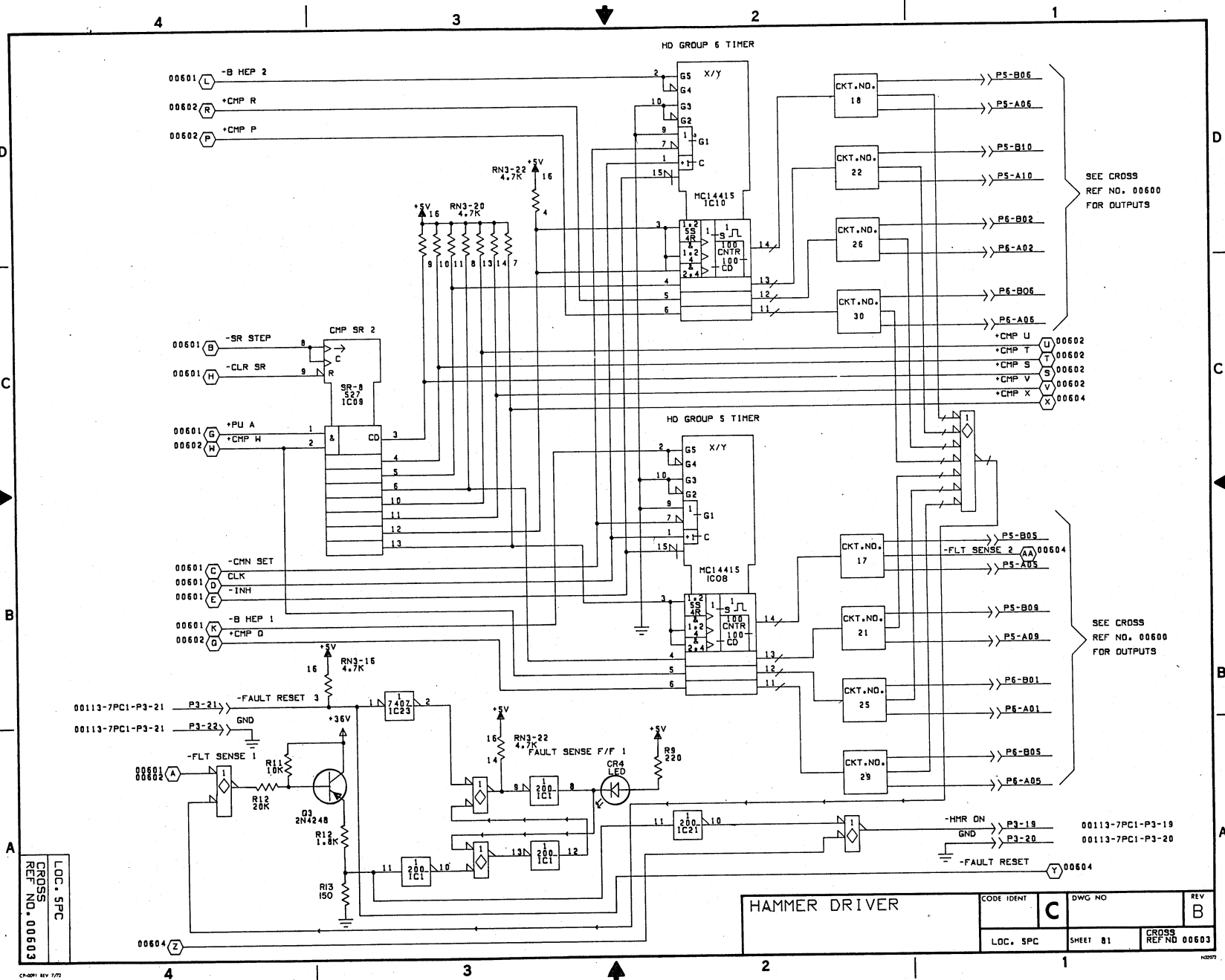
LOC. SPC
 CROSS REF NO. 00602

HAMMER DRIVER

CODE IDENT	C	DWG NO	REV
LOC SPC	SHEET 80	CROSS REF NO 00602	B

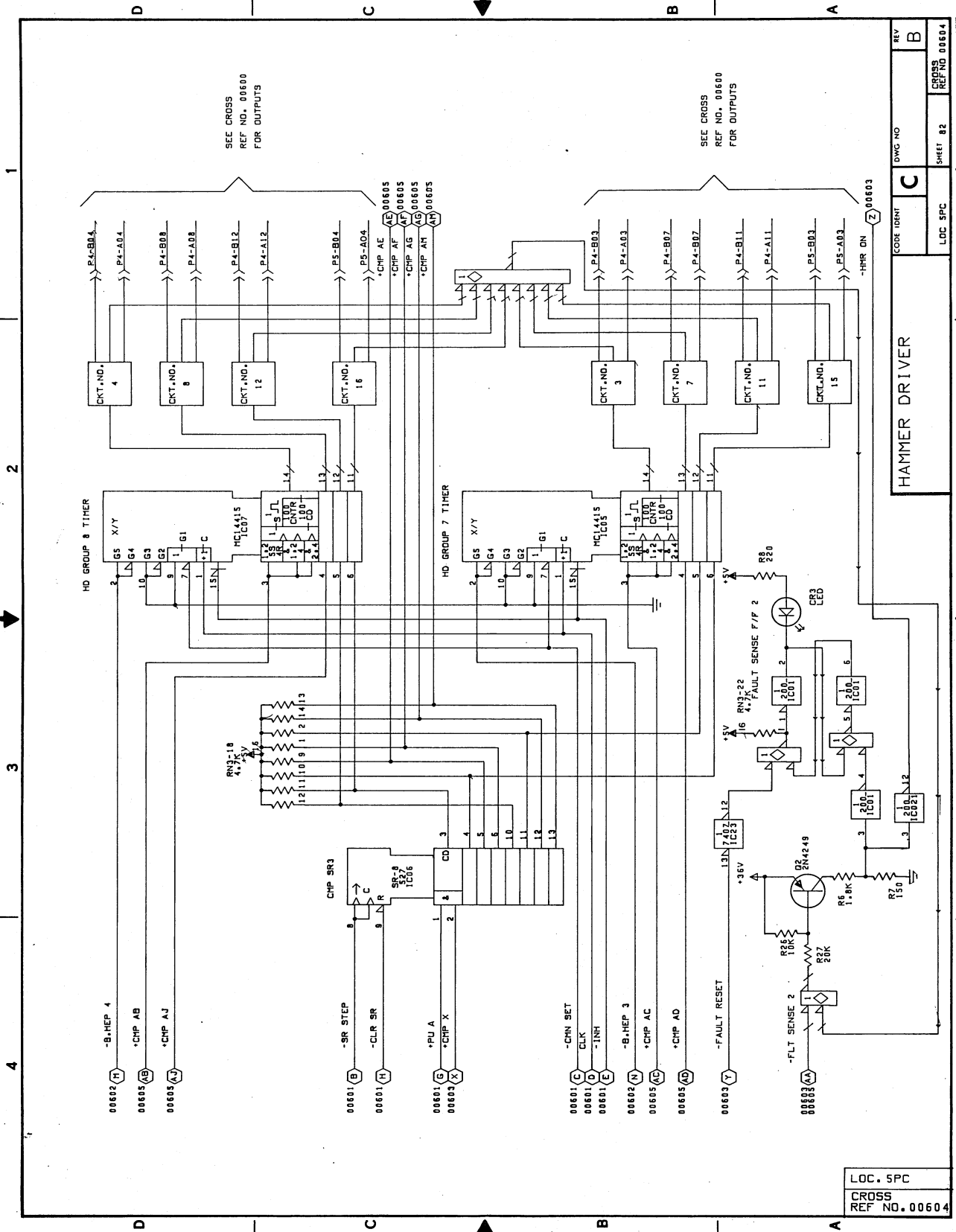
SEE CROSS REF NO. 00600 FOR OUTPUTS

SEE CROSS REF NO. 00600 FOR OUTPUTS



LOC. SPC
CROSS REF. NO. 00603

HAMMER DRIVER		CODE IDENT	C	DWG NO	REV
		LOC. SPC	SHEET 81	CROSS REF. NO. 00603	B



SEE CROSS
REF NO. 00600
FOR OUTPUTS

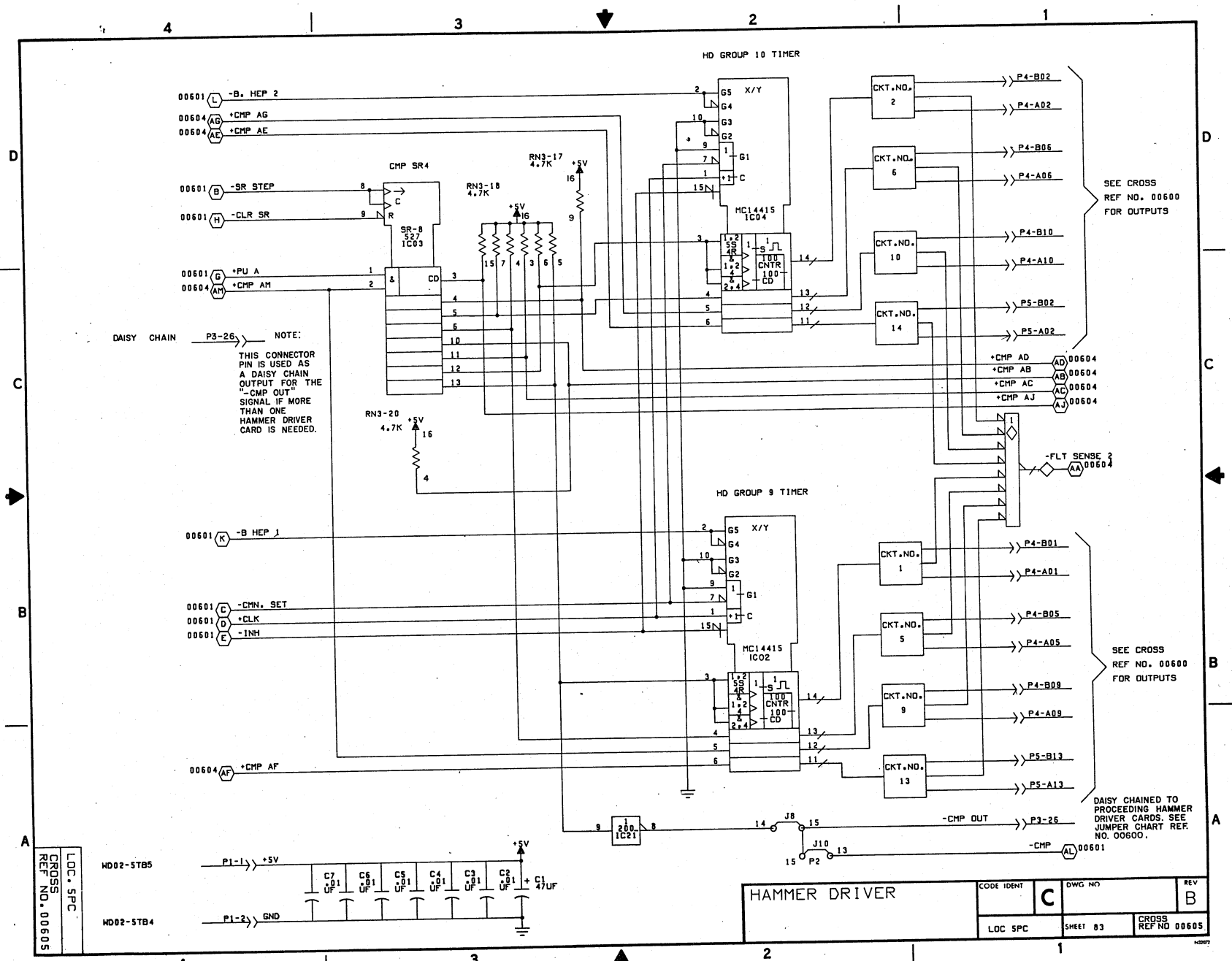
SEE CROSS
REF NO. 00600
FOR OUTPUTS

REV	B
DWG NO	C
CODE 10RNT	
LOC 5PC	
SHEET 82	
CROSS REF NO 00604	

HAMMER DRIVER

LOC. 5PC
CROSS
REF NO. 00604

06-9



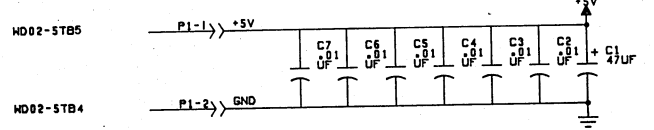
DAISY CHAIN P3-26 NOTE:
 THIS CONNECTOR PIN IS USED AS A DAISY CHAIN OUTPUT FOR THE "-CMP OUT" SIGNAL IF MORE THAN ONE HAMMER DRIVER CARD IS NEEDED.

SEE CROSS REF NO. 00600 FOR OUTPUTS

SEE CROSS REF NO. 00600 FOR OUTPUTS

DAISY CHAINED TO PRECEEDING HAMMER DRIVER CARDS. SEE JUMPER CHART REF. NO. 00600.

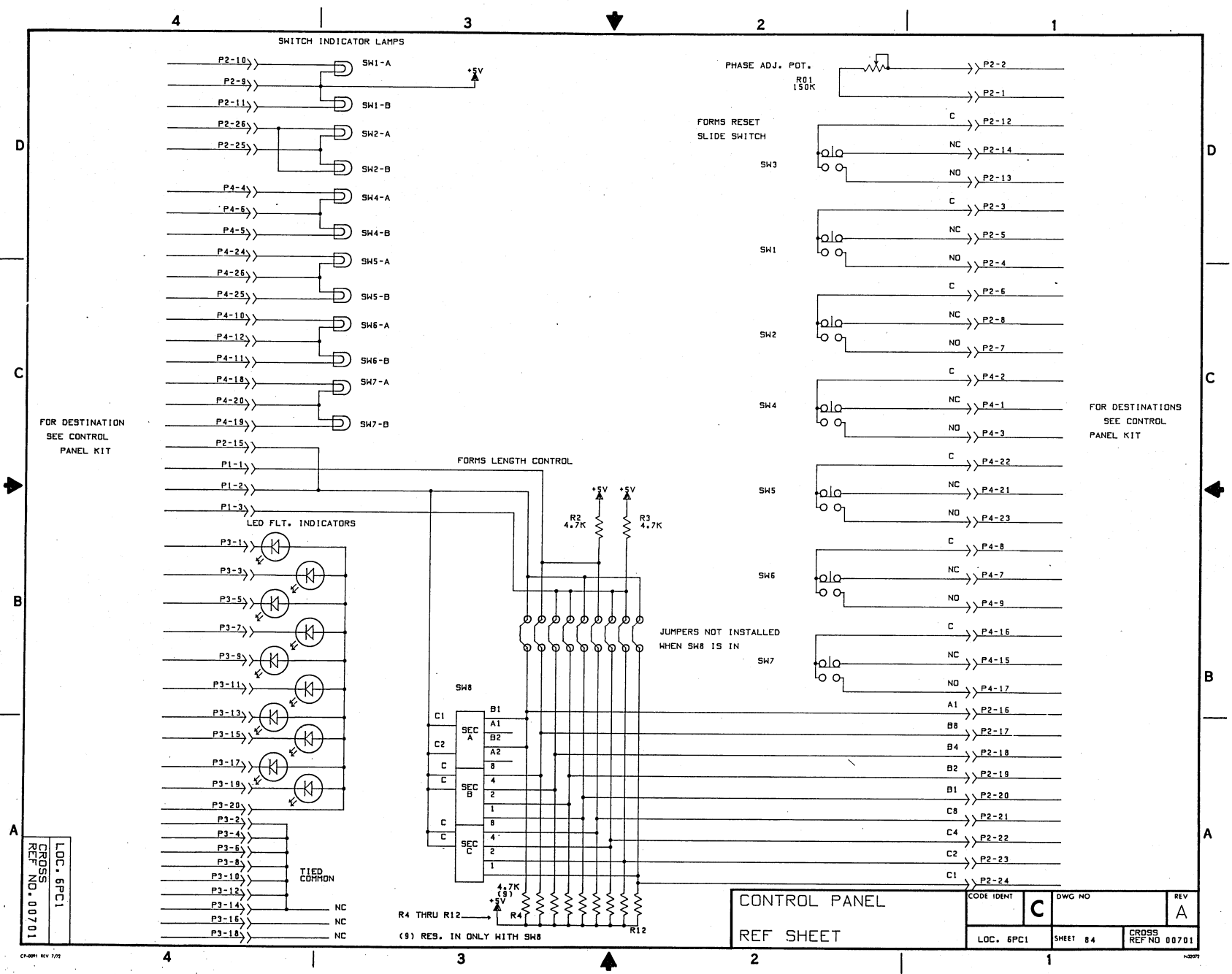
LOC. SPC
 CROSS REF NO. 00605



HAMMER DRIVER

CODE IDENT	C	DWG NO	REV
LOC SPC	SHEET 83	CROSS REF NO	00605

6-91



FOR DESTINATION
SEE CONTROL
PANEL KIT

FOR DESTINATIONS
SEE CONTROL
PANEL KIT

LOC. 6PC1
CROSS
REF NO. 00701

CONTROL PANEL
REF SHEET

CODE IDENT	C	DWG NO	REV
LOC. 6PC1	SHEET 84	CROSS REF NO 00701	A

CP-200 REV 7/72

14207

4

3

2

1

D

D

C

C

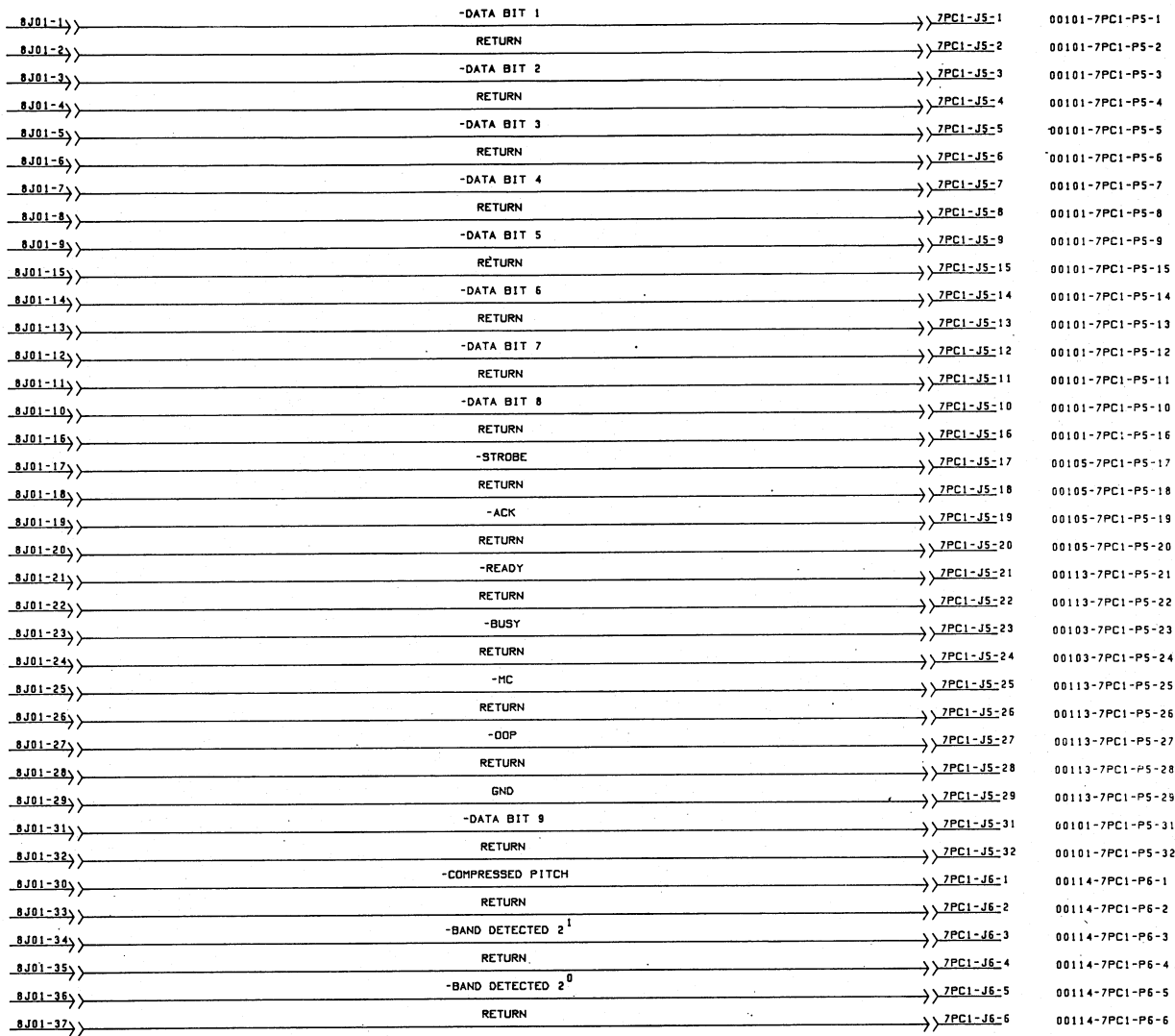
B

B

A

A

TO I/O CABLE



6-92

KIT LOGIC-
P.B.S. STD. I/O

CODE IDENT	C	DWG NO	REV
			01
SHEET 2 OF 2			

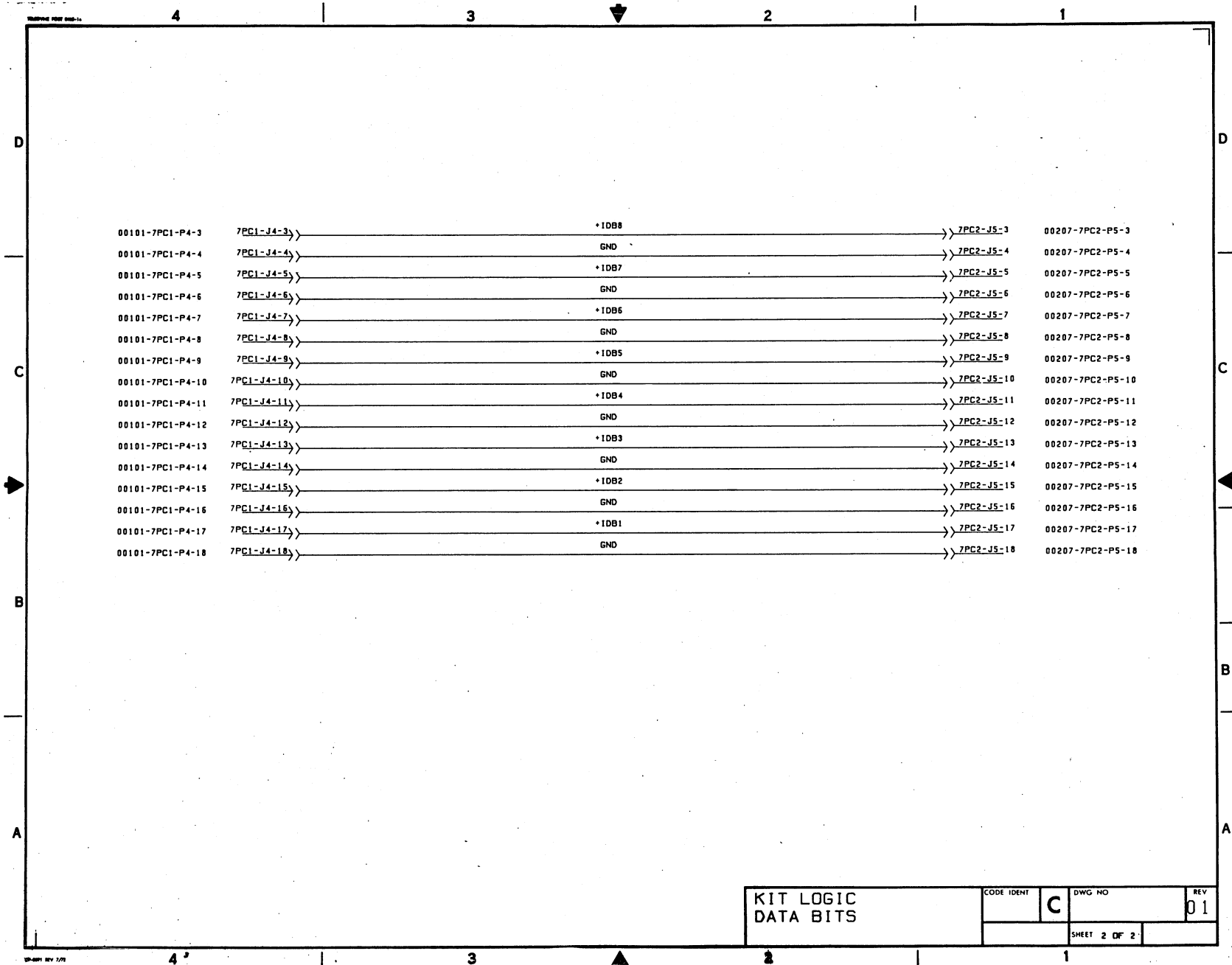
4

3

2

1

6-93



KIT LOGIC
DATA BITS

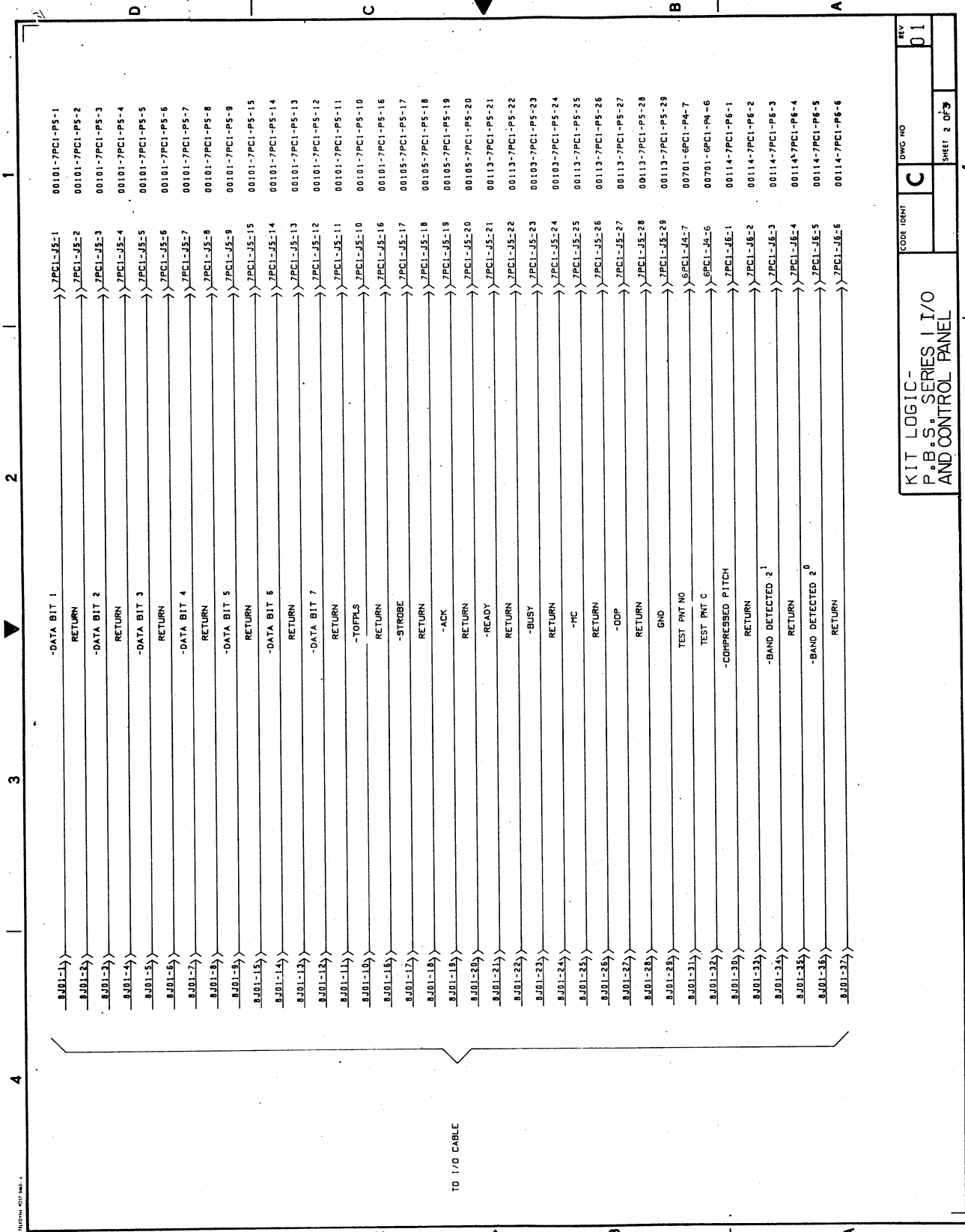
CODE IDENT

C

DWG NO

REV
01

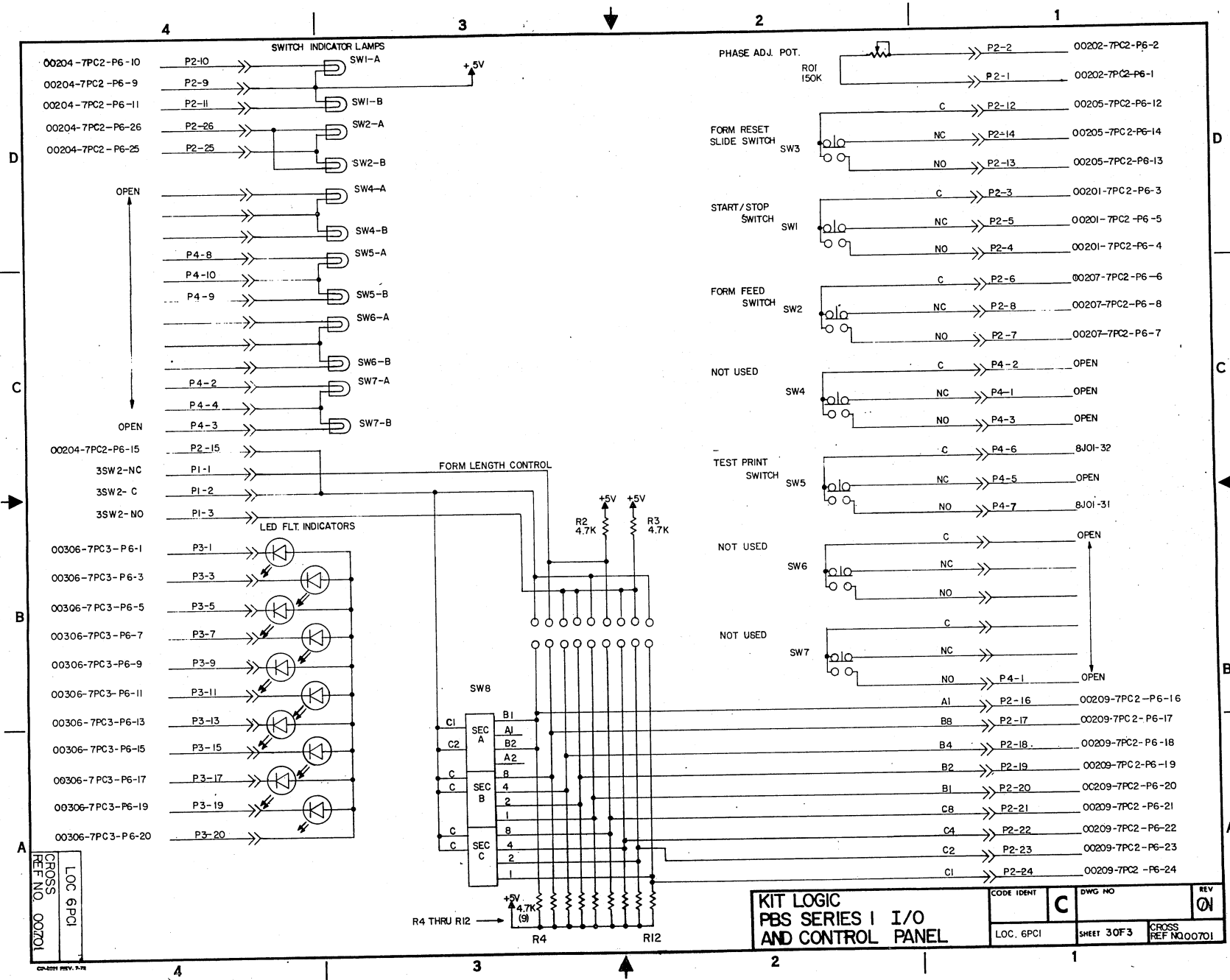
SHEET 2 OF 2



KIT LOGIC -
P.B.S. SERIES I/O
AND CONTROL PANEL

REV	DWG NO	SHEET 2 OF 3
01	C	

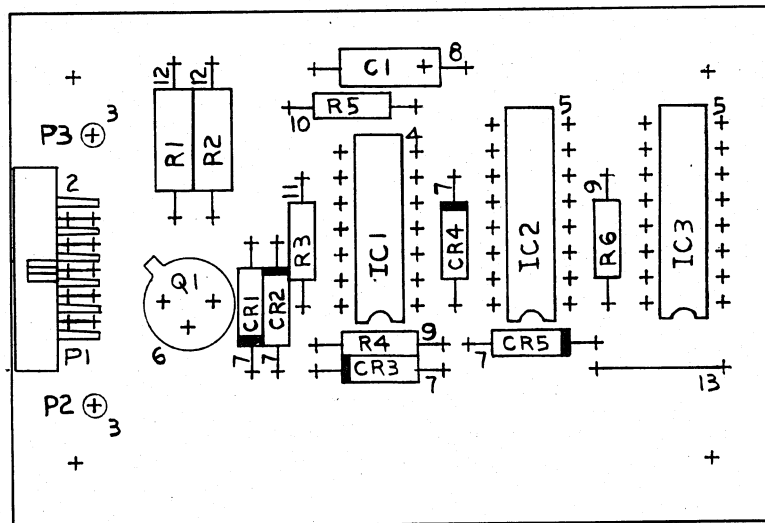
TO I/O CABLE



LOC 6PCI
 CROSS REF NO. 00701

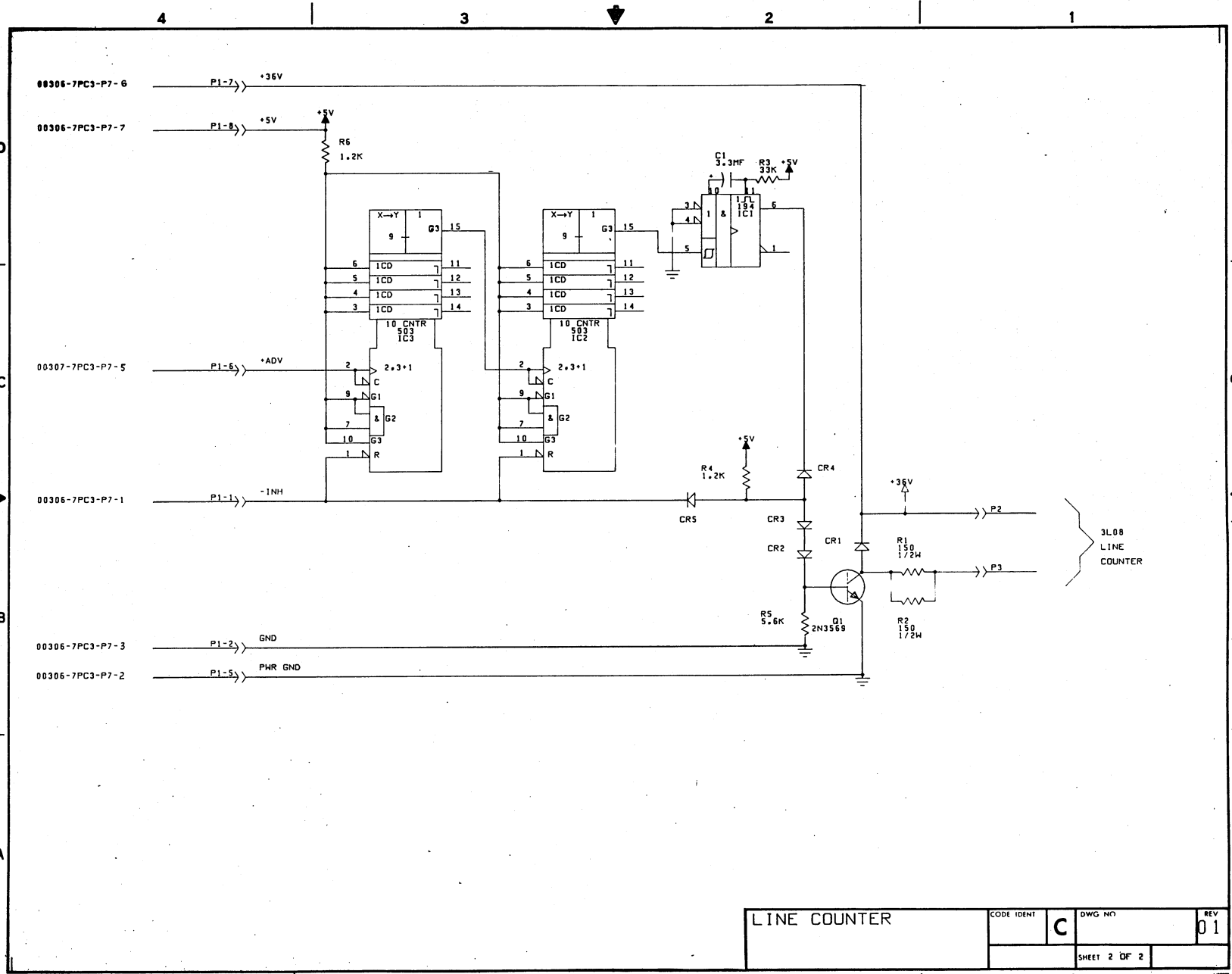
**KIT LOGIC
 PBS SERIES I I/O
 AND CONTROL PANEL**

CODE IDENT	C	DWG NO	REV
LOC. 6PCI	SHEET 30F3	CROSS REF NQ00701	ON



LINE COUNTER

6-97/6-98



LINE COUNTER	CODE IDENT	C	DWG NO	REV
	SHEET 2 OF 2			01

PART B BAND PRINTER LOGIC DIAGRAMS

CONTENTS

Input/Print (Dual Pitch) 7PC1	6-101
Oscillator Horizontal/Vertical Motion 7PC2	6-117
Print Head Electronics 7PC3	6-131
Servo Power Amplifier 2PC2	6-143

BOARD IDENTIFICATION FOR LOGIC SET 95400400

CROSS REF NO.	LOCATION	PART NUMBER	EARLIER NUMBER
401-404 100-114	2PC2 * 7PC1 ↓ 7PC1	44673133 44673075 44673076 44673077 44673078	44673132 44673071 44783072 44673073 44673074
200-212	* 7PC2 ↓ 7PC2	44674057 44673058 44673059 44673060 44673061	44673052 44673053 44673054 44673055 44673056
301-311	7PC3	95419506	95419505

* SEE PARTS MANAUAL FOR BOARD IDENTIFICATION

WARNING

NOISE LEVEL UNDER BONNET
WHILE PRINTING MAY BE
HAZARDOUS TO HEARING.
KEEP EXPOSURE TO A MINI-
MUM. REFER TO MAINTENANCE
AIDS TO QUIETLY TEST.

NOTE

THIS MANUAL COVERS THE LOGIC
BOARDS AS LISTED ON THIS PAGE
AS DOCUMENTED IN LOGIC SET
95400400. REFER TO THE PARTS
MANUAL TO IDENTIFY OTHER BOARDS.
A NEW SET OF BOARDS AND LOGIC
SET 95400401 ARE NOW DOCUMENTED
IN SECTION 6A. PRINTERS CONTAINING
A MIXTURE OF BOARDS FROM THE TWO
LOGIC SETS WILL REQUIRE THE USE OF
BOTH A AND B PARTS OF SECTION 6.

4 | 3 | 2 | 1

D

D

JUMPER NUMBER	FUNCTION												
J1A-J7A, J1B-J7B	BLANK/SPACE CODE SELECTION-- ASSEMBLED TO SELECT SPACE CODE FOR CHARACTER BANDS WHICH DO NOT USE PROMS. ALL "A" JUMPER WIRES REPRESENT LOGICAL "1"'S. THEREFORE ASSUME THAT THE BLANK/SPACE CODE $\equiv 0100000$ $\equiv 040_8$. THE FOLLOWING JUMPER WIRES WOULD BE ASSEMBLED-- J3B, J1A, J2A, J4A THRU J7A.												
<table border="1"> <tr> <td>J8</td> <td>J9</td> </tr> <tr> <td>IN</td> <td>OUT</td> </tr> <tr> <td>OUT</td> <td>OUT</td> </tr> <tr> <td>OUT</td> <td>IN</td> </tr> </table>	J8	J9	IN	OUT	OUT	OUT	OUT	IN	CONTROL CODE DETECTION-- ACCEPTS STANDARD ASCII CONTROL CODES OF LF, CR AND FF. ACCEPTS STANDARD ASCII CONTROL CODES OF LF, CR, VT AND FF. * ACCEPTS DB9=0 AS A CONTROL CODE FOR 12 CHNL EVFU OPTION.				
J8	J9												
IN	OUT												
OUT	OUT												
OUT	IN												
<table border="1"> <tr> <td>SW1</td> <td>SW2</td> <td>SW3</td> </tr> <tr> <td>CLOSED</td> <td>OPEN</td> <td>CLOSED</td> </tr> <tr> <td>OPEN</td> <td>OPEN</td> <td>OPEN</td> </tr> <tr> <td>OPEN</td> <td>CLOSED</td> <td>OPEN</td> </tr> </table>	SW1	SW2	SW3	CLOSED	OPEN	CLOSED	OPEN	OPEN	OPEN	OPEN	CLOSED	OPEN	MACHINE TYPE DEFINITION-- PB1130 PB5720 PB5360
SW1	SW2	SW3											
CLOSED	OPEN	CLOSED											
OPEN	OPEN	OPEN											
OPEN	CLOSED	OPEN											
<table border="1"> <tr> <td>J13</td> <td>J14</td> </tr> <tr> <td>OUT</td> <td>OUT</td> </tr> <tr> <td>OUT</td> <td>IN</td> </tr> <tr> <td>IN</td> <td>OUT</td> </tr> <tr> <td>IN</td> <td>IN</td> </tr> </table>	J13	J14	OUT	OUT	OUT	IN	IN	OUT	IN	IN	BAND TO PROM SELECTION-- ** 48, 64, 96, 128 48, 64, 128 48, 96, 128 48, 128		
J13	J14												
OUT	OUT												
OUT	IN												
IN	OUT												
IN	IN												

C

C

B

B

A

A

* VT IS USED TO TRUNCATE THE INPUT, HOWEVER UNCONTROLLED PAPER MOTION WILL RESULT UNLESS THE "3 CHNL EVFU" OPTION IS IMPLICATED.

** TYPICALLY THE PROMS MAY BE ONLY SELECTED BY ONE TYPE BAND. UNLESS CODES FOR DIFFERENT TYPE BANDS ARE SUBSETS OF ONE ANOTHER, PROMS WILL HAVE TO BE REPLACED TO OBTAIN ALL THE COMBINATIONS SHOWN ABOVE.

LOC.
CROSS
REF NO. 00100

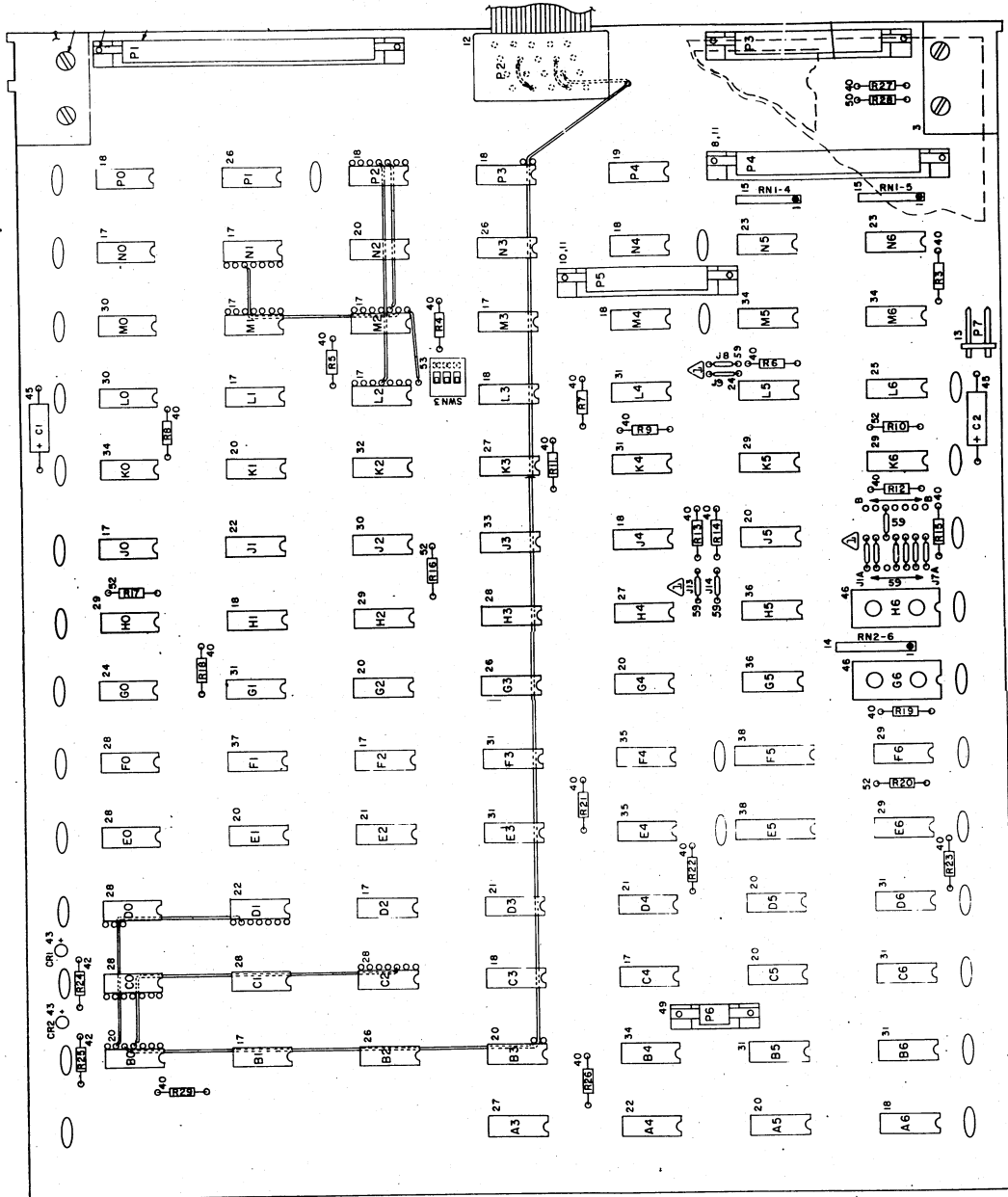
INPUT/PRINT (D-P)
JUMPER CHART

CODE IDENT	C	DWG NO	REV	A
CON-PB/PBS	SHEET 34	CROSS REF NO 00100		

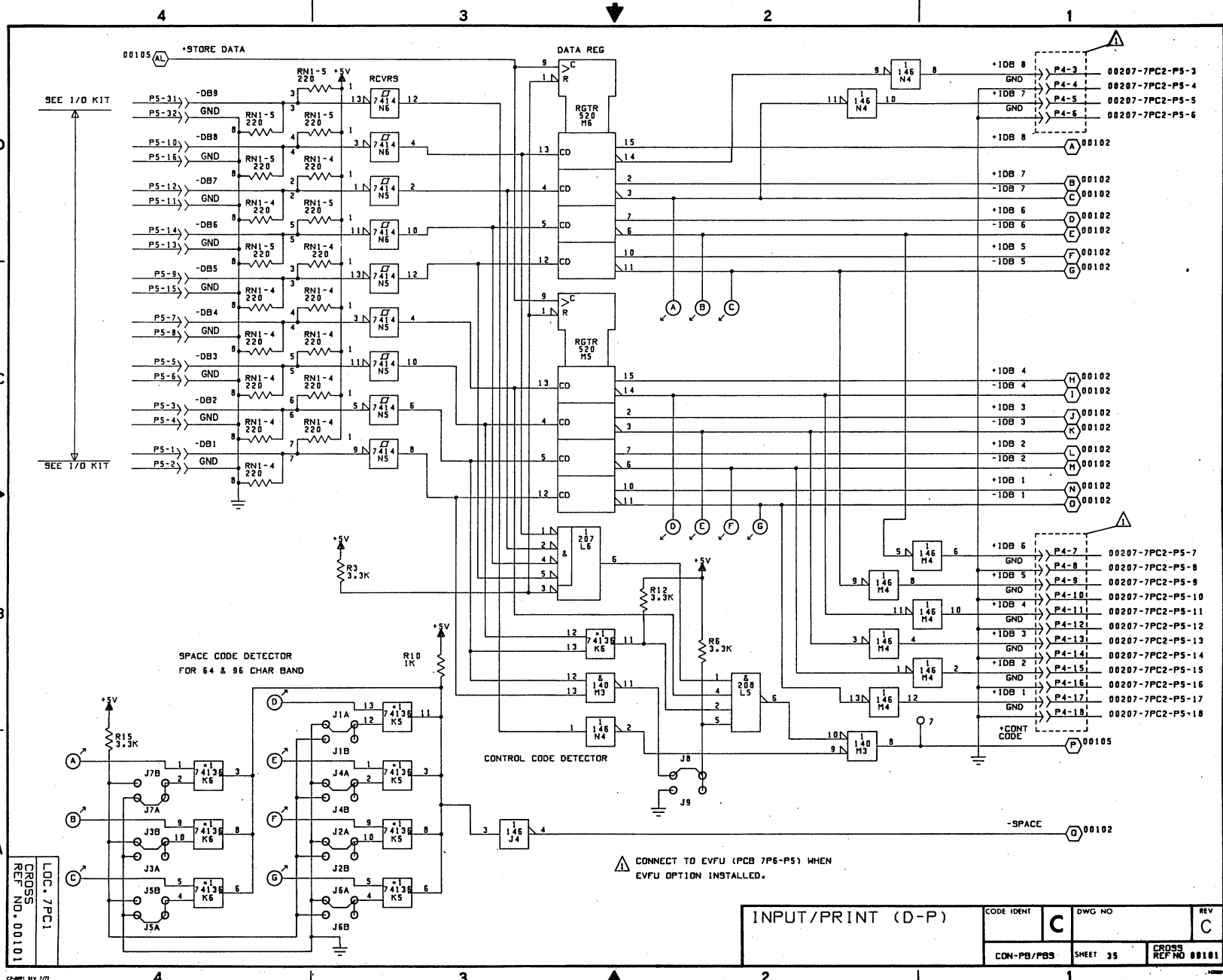
PART
B

6-101

4 | 3 | 2 | 1



INPUT/PRINT (D-P)



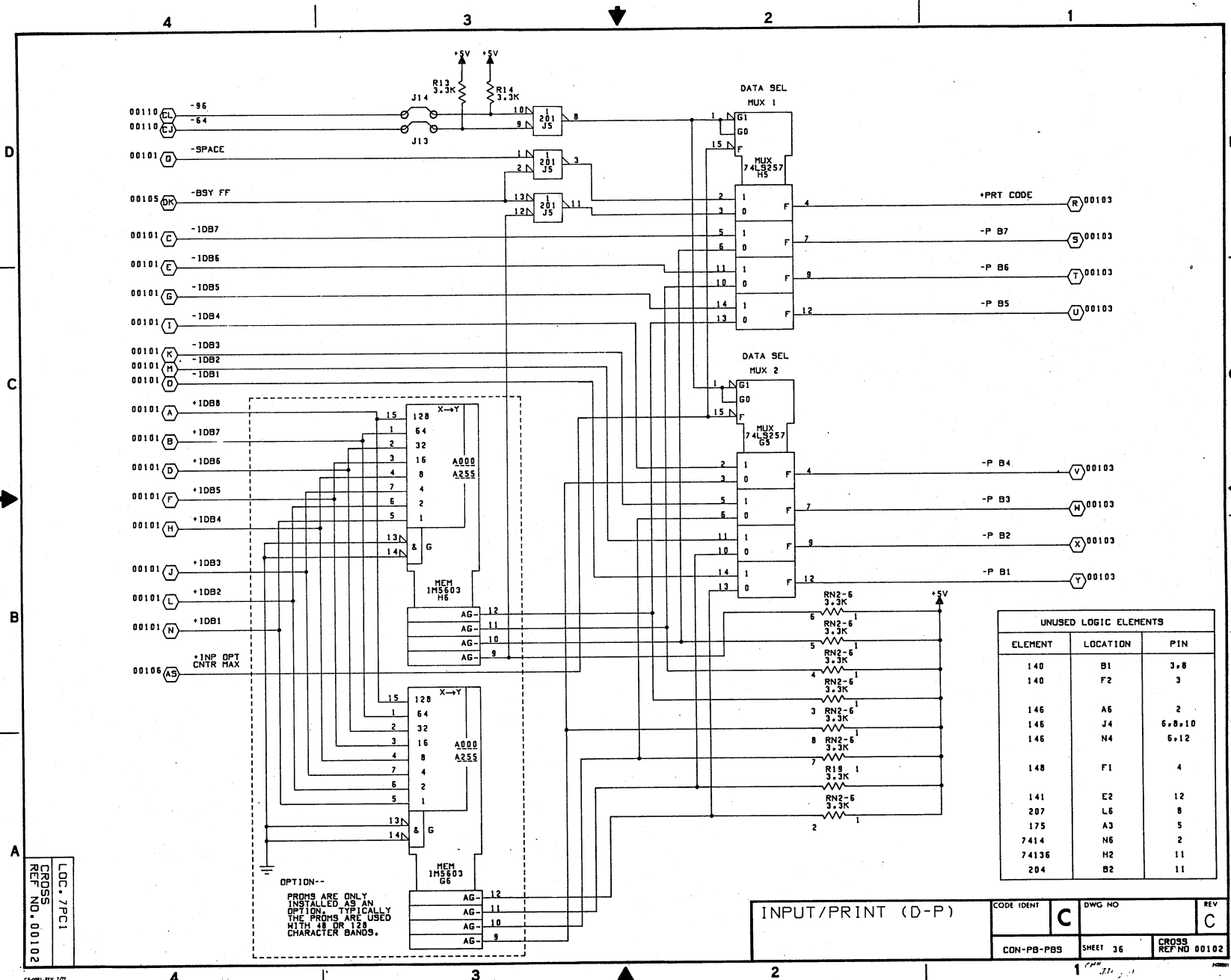
LOC. 7PC1
CROSS
REF. NO. 00101

INPUT/PRINT (D-P)

CODE IDENT	C	DWG NO	REV
CON-PB/PBS	SHEET 35	CROSS REF NO 00101	C

PART
B

6-104



UNUSED LOGIC ELEMENTS		
ELEMENT	LOCATION	PIN
140	B1	3,8
140	F2	3
146	A6	2
146	J4	6,8,10
146	N4	5,12
148	F1	4
141	E2	12
207	L6	8
175	A3	5
7414	N6	2
74136	H2	11
204	B2	11

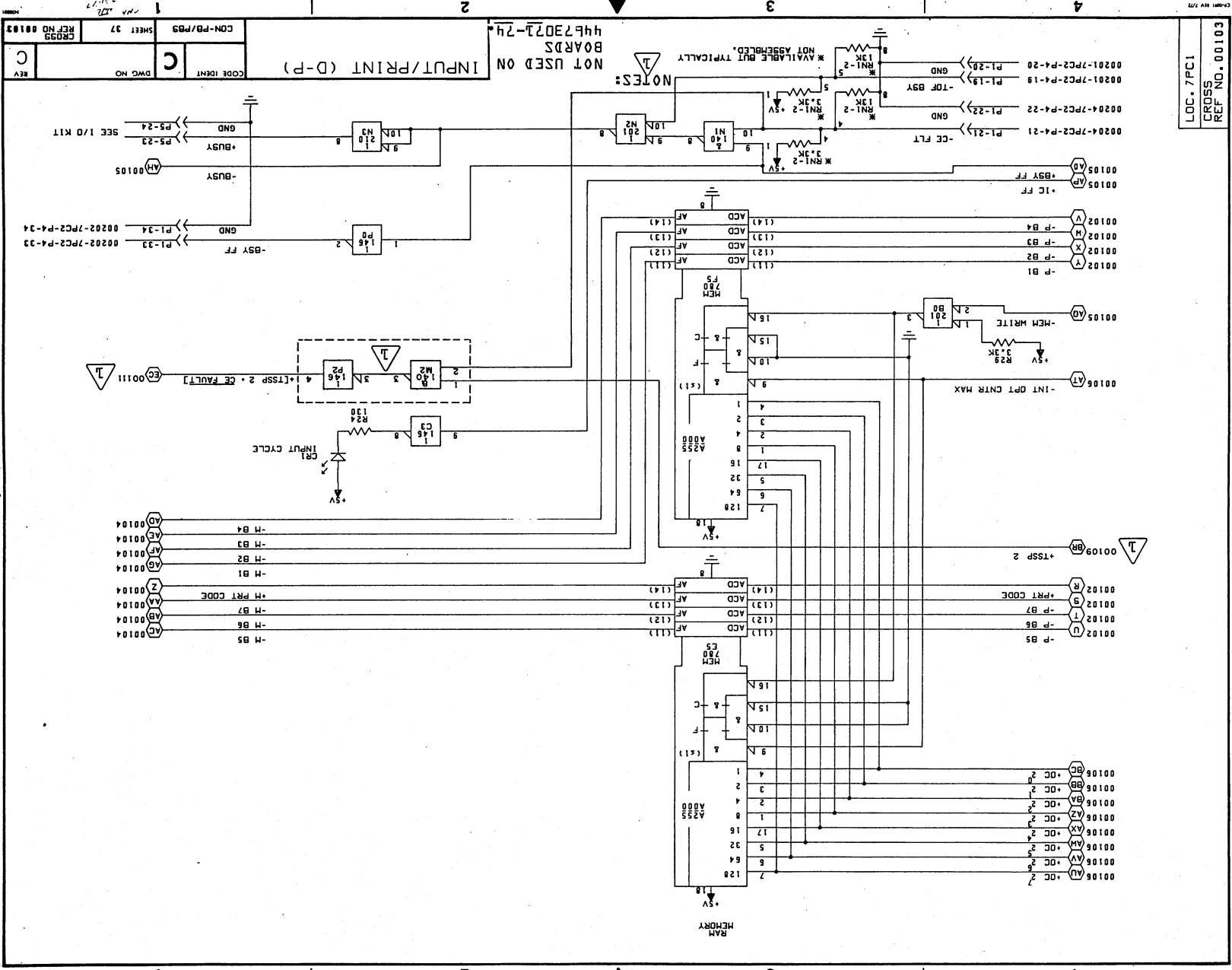
OPTION--
 PROMS ARE ONLY INSTALLED AS AN OPTION. TYPICALLY THE PROMS ARE USED WITH 48 OR 128 CHARACTER BANDS.

INPUT/PRINT (D-P)

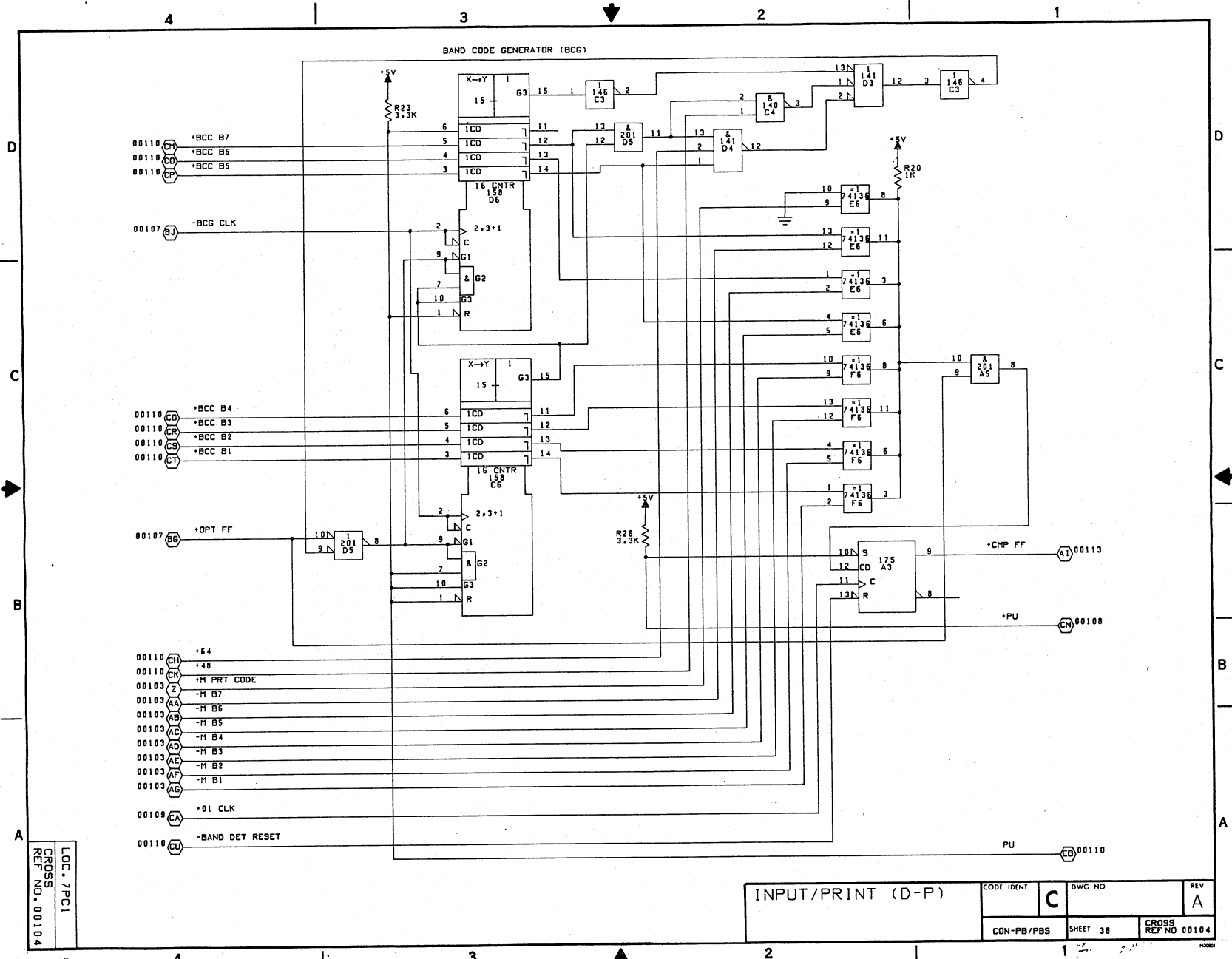
CODE IDENT	C	DWG NO	REV	C
CON-PB-PBS	SHEET 36	CROSS REF NO	00102	

PART B

PART B



6-1-106

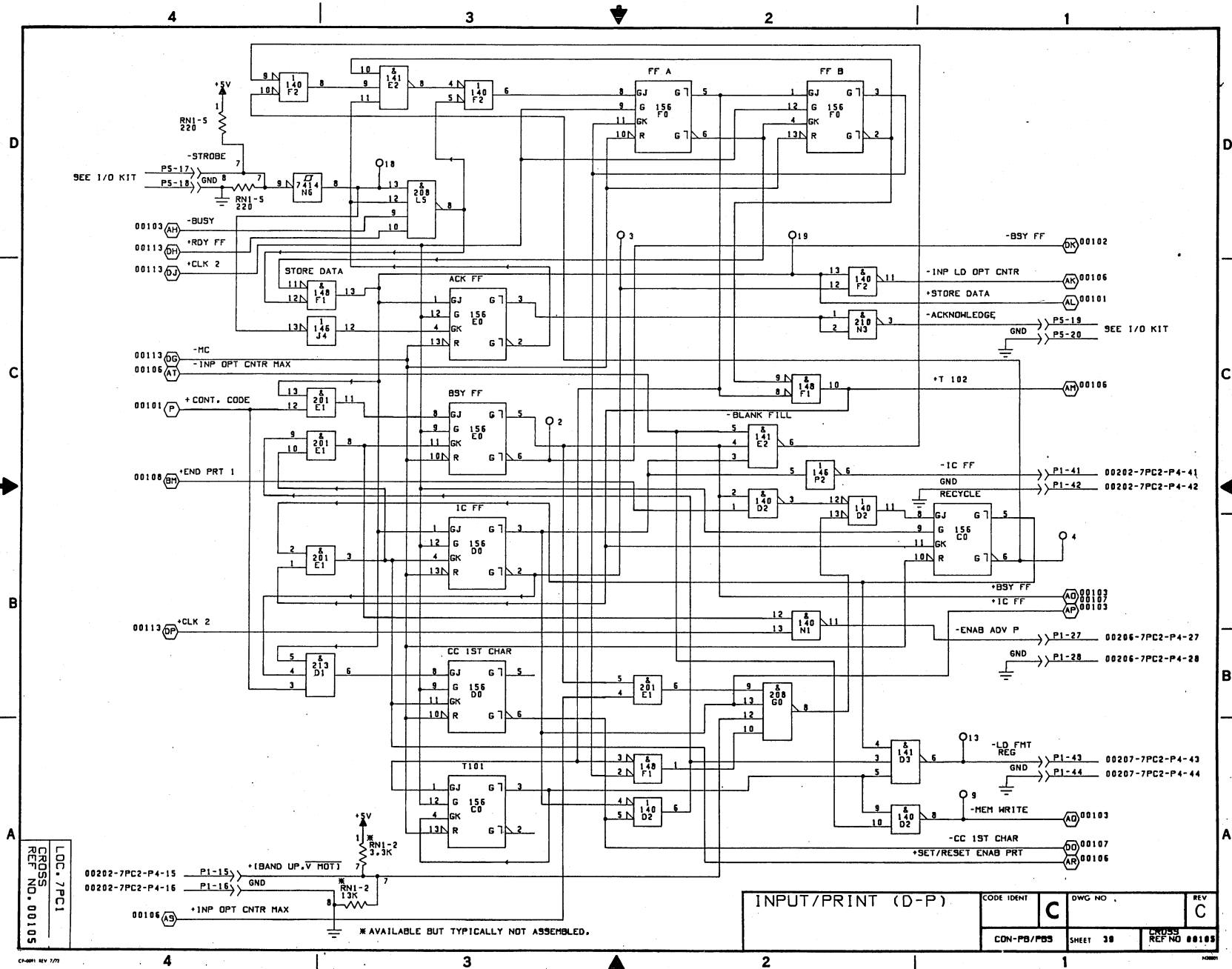


LOC. 7PC1
 CROSS
 REF NO. 00104

INPUT/PRINT (D-P)

CODE IDENT	C	DWG NO	REV
CON+PB/PBS	SHEET 38	CROSS REF NO 00104	A

PART B



LOC. 7PC1
CROSS
REF. NO. 00105

00202-7PC2-P4-15 P1-15 +IBAND UP.V MOTJ
00202-7PC2-P4-16 P1-16 GND
00106 +INP OPT CNTR MAX

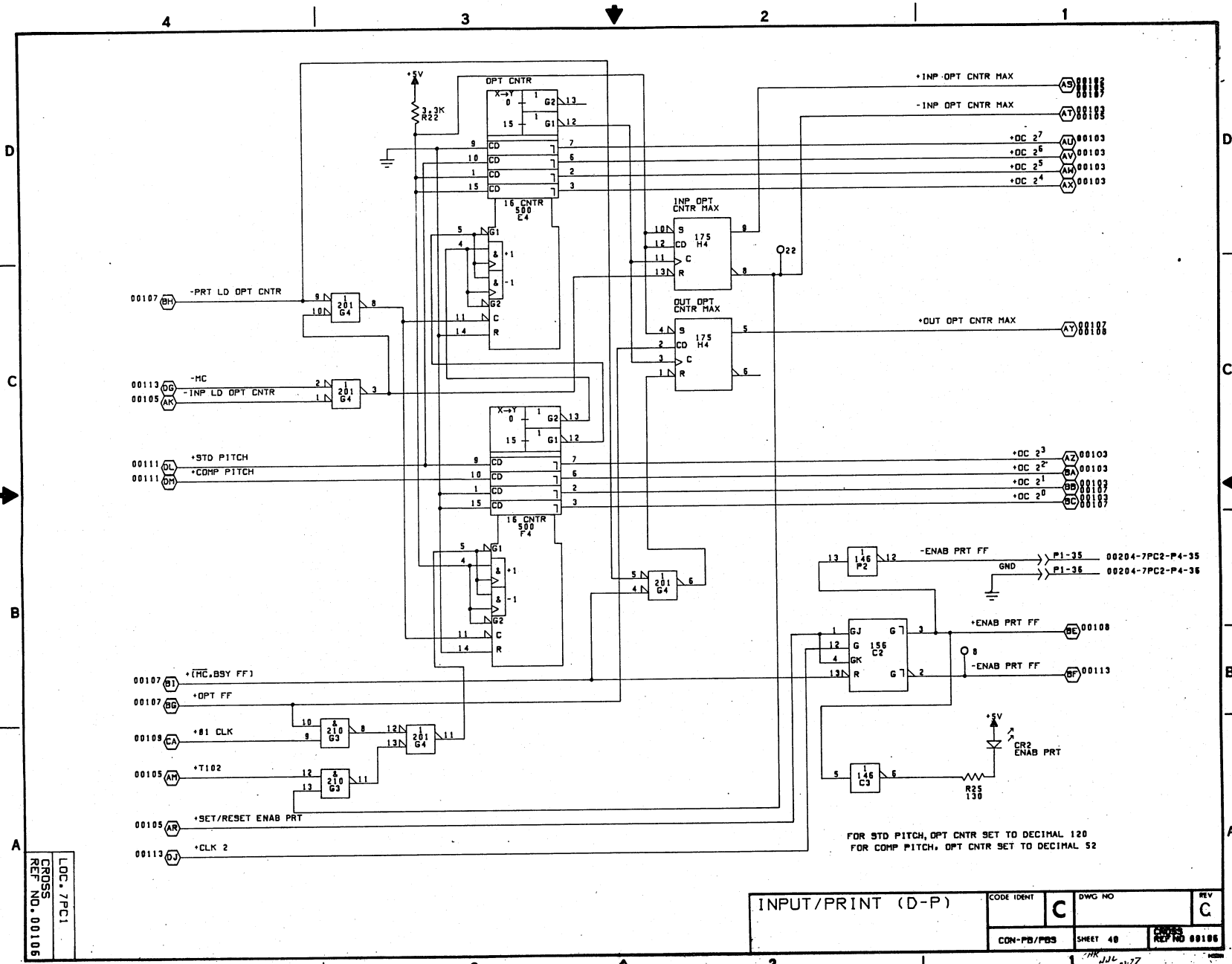
* AVAILABLE BUT TYPICALLY NOT ASSEMBLED.

INPUT/PRINT (D-P)

CODE IDENT	C	DWG NO.	REV	C
CON-PB/PBS	SHEET 38	CROSS REF NO 00105		

PART B

6-108



LOC. 7FC1
 CROSS
 REF NO. 00106

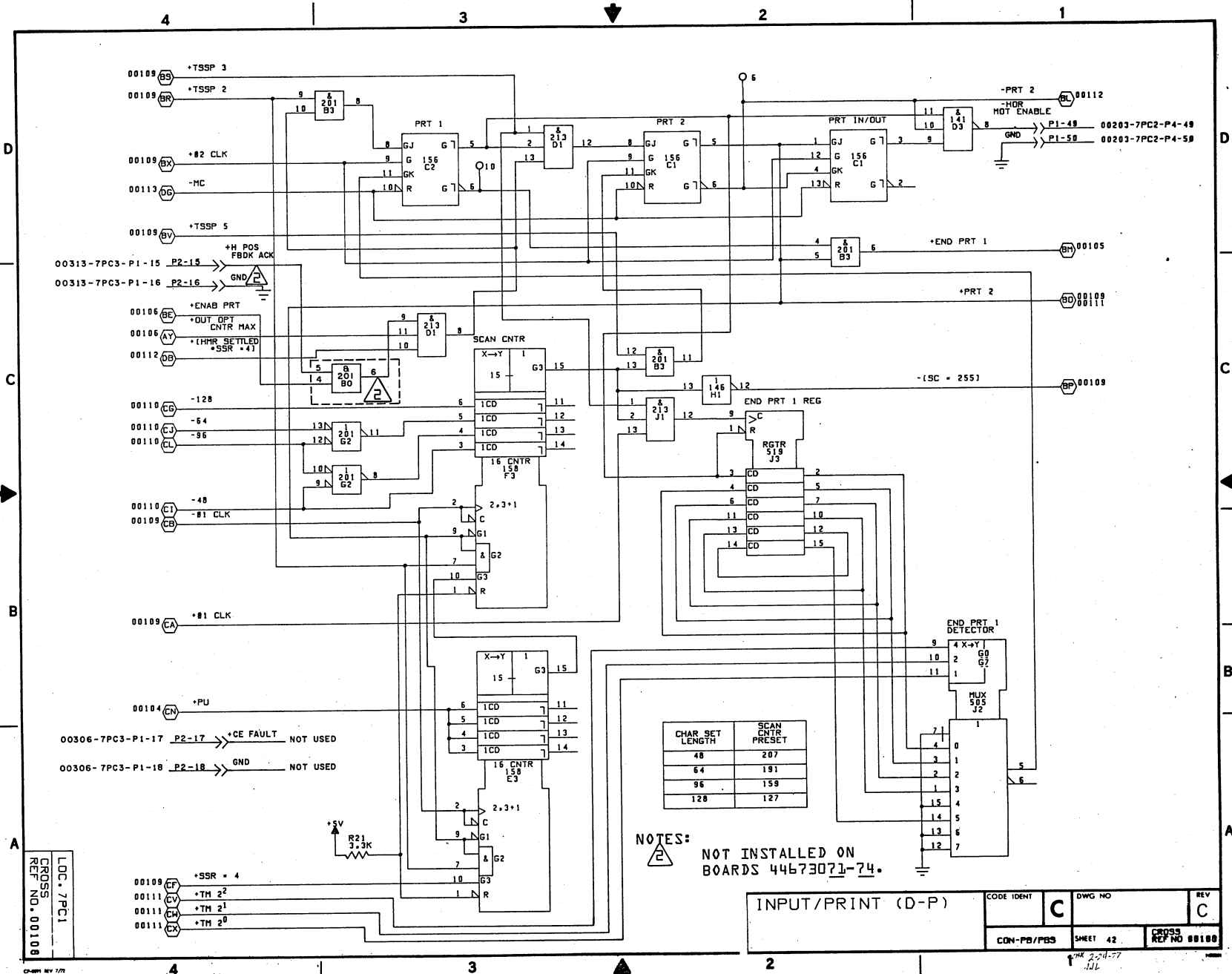
INPUT/PRINT (D-P)		CODE IDENT	DWG NO	REV
		C		C
CON-PB/PBS	SHEET 48	CROSS REF NO 00106		

PART
B

CH-881 REV 1/76

CHK JLL 2-21-77

6-110



LOC. 7PC1
 CROSS REF. NO. 00108

CHAR SET LENGTH	SCAN CNTR PRESET
48	207
64	191
96	159
128	127

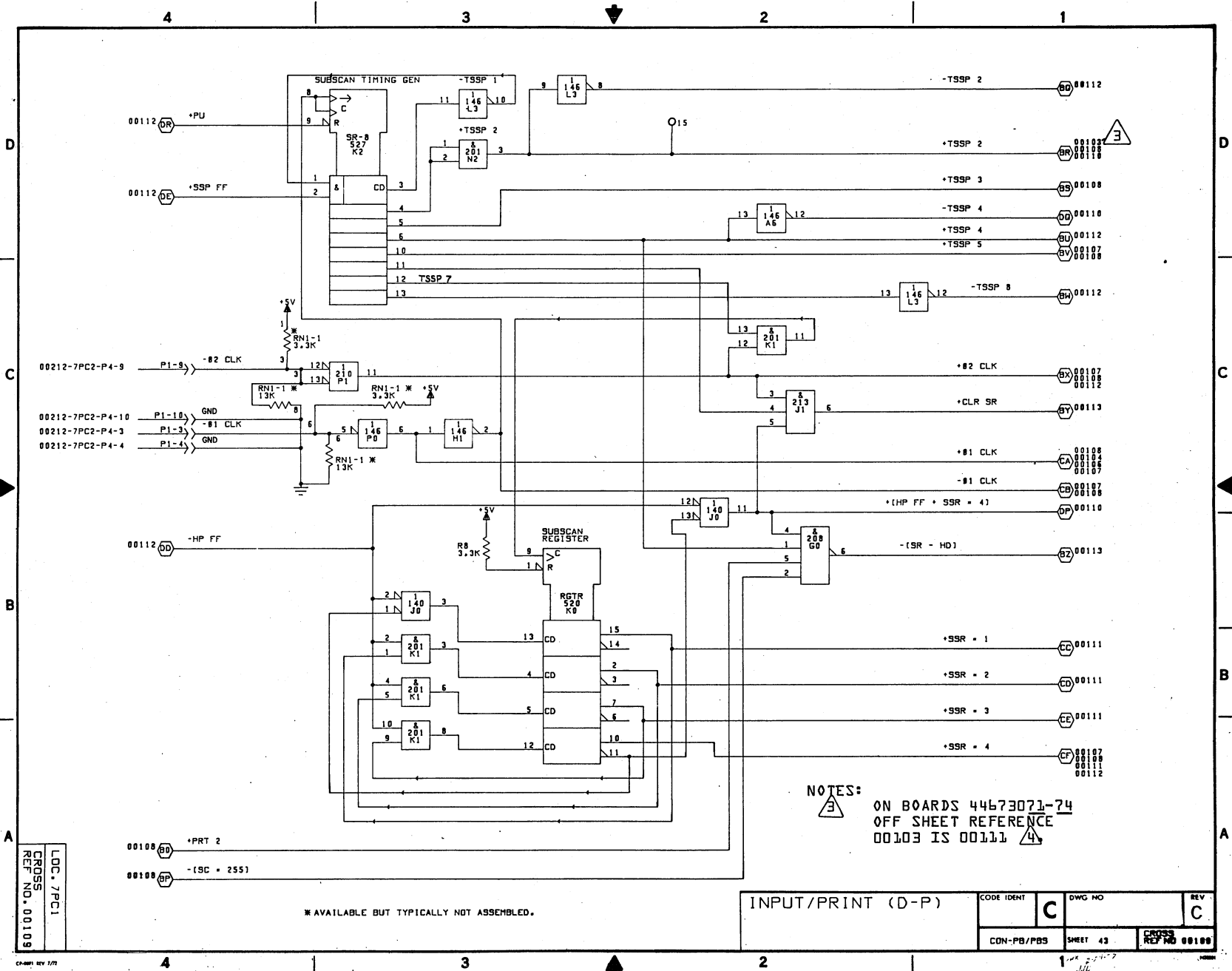
NOTES:
 NOT INSTALLED ON
 BOARDS 44673071-74.

INPUT/PRINT (D-P)

CODE IDENT	C	DWG NO	REV	C
CON-PB/PBS	SHEET 42	CROSS REF NO 00108		

PART B

6-111



NOTES:
 3 ON BOARDS 44673071-74
 OFF SHEET REFERENCE
 00103 IS 00111 4

LDC, 7PC1
 CROSS
 REF. NO. 00109

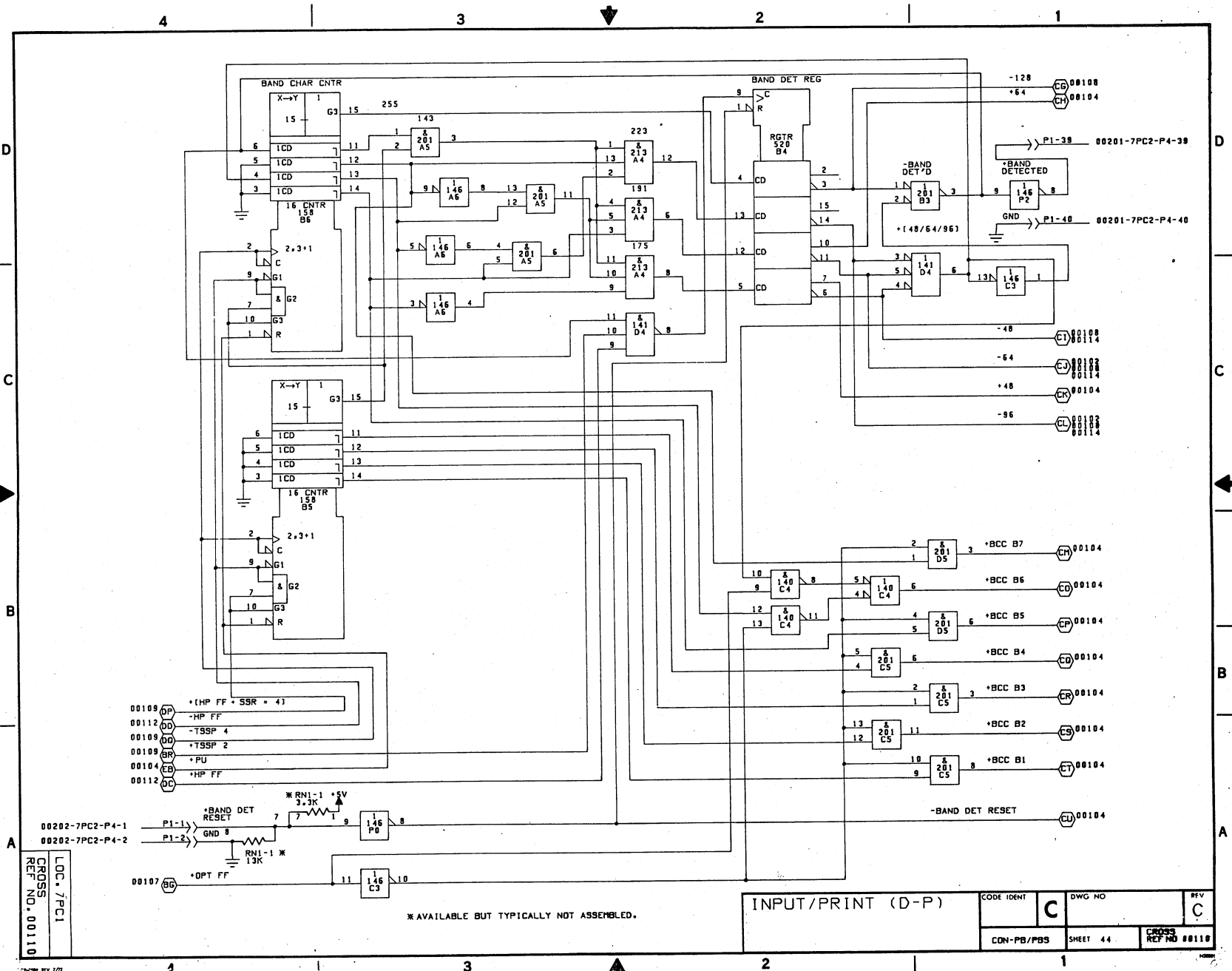
* AVAILABLE BUT TYPICALLY NOT ASSEMBLED.

INPUT/PRINT (D-P)

CODE IDENT	C	DWG NO		REV	C
CON-PB/PBS		SHEET 43		REF NO	00109

PART B

6-112



LOC. 7/PC1
 CROSS
 REF. NO. 00110

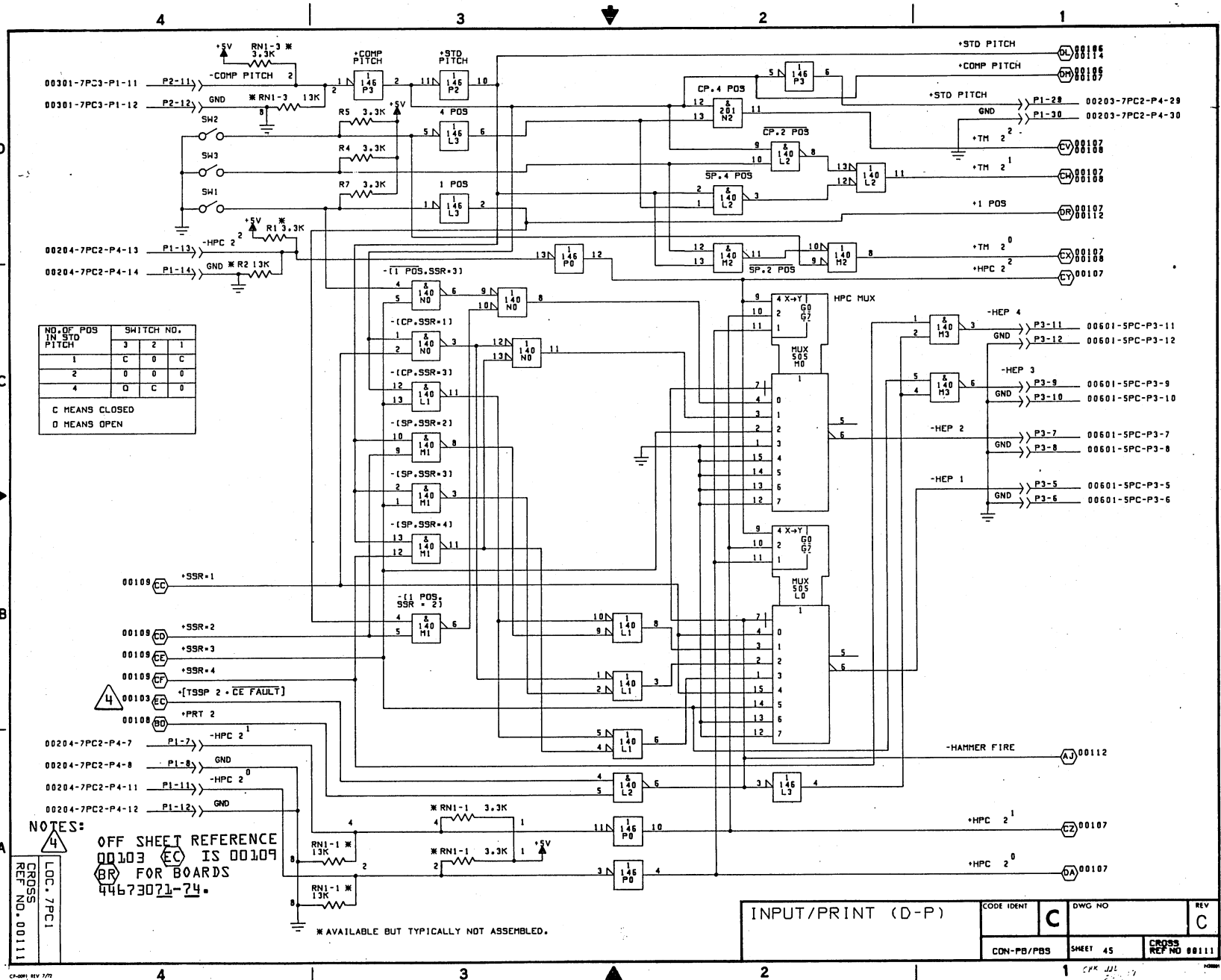
* AVAILABLE BUT TYPICALLY NOT ASSEMBLED.

INPUT/PRINT (D-P)

CODE IDENT	DWG NO	REV
C		C
CON-PB/PBS	SHEET 44	CROSS REF NO 00110

PART B

6-113



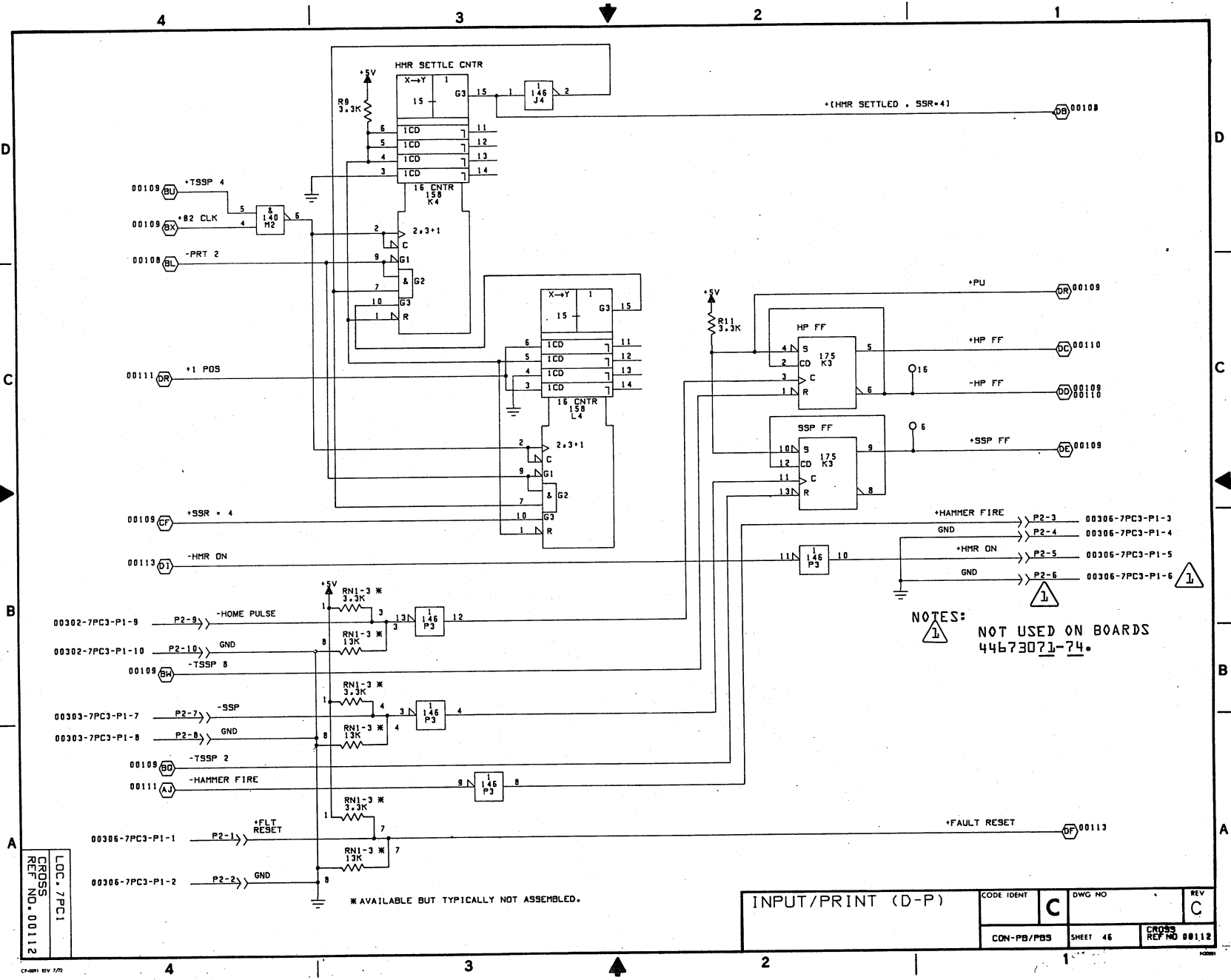
NOTES:
OFF SHEET REFERENCE
00103 (EC) IS 00109
(BR) FOR BOARDS
44673071-74.

CROSS
REF. NO. 00111
LOC. 7PC1

INPUT/PRINT (D-P)		CODE IDENT	C	DWG NO	REV	C
CON-PB/PBS	SHEET 45	CROSS REF NO 00111				

PART B

6-114



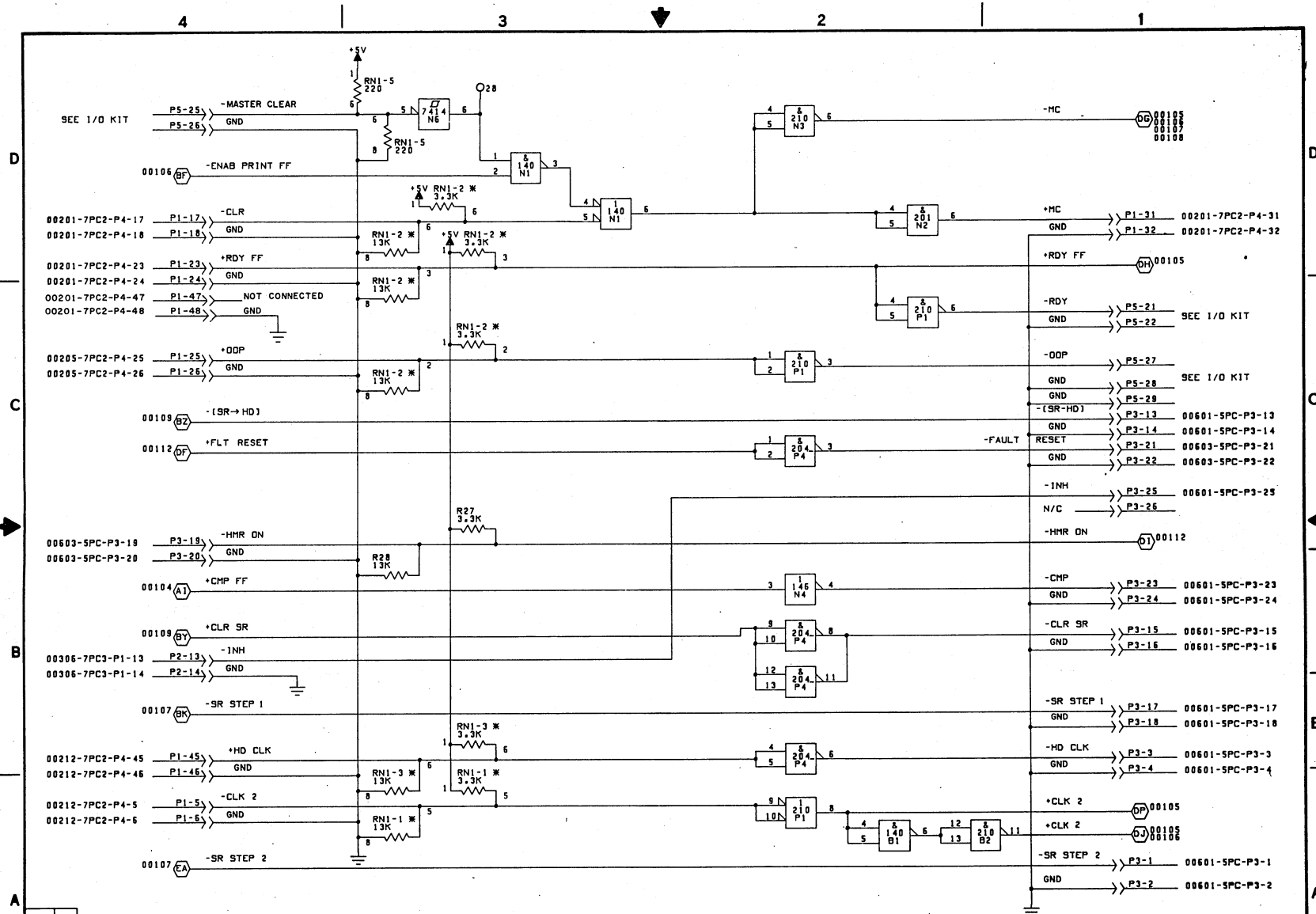
NOTES:
 NOT USED ON BOARDS
 44673071-74.

* AVAILABLE BUT TYPICALLY NOT ASSEMBLED.

LOC. 7PC1
 CROSS
 REF. NO. 00112

INPUT/PRINT (D-P)		CODE IDENT	DWG NO	REV
		C		C
		CON-PB/PBS	SHEET 46	CROSS REF NO 00112

PART
B



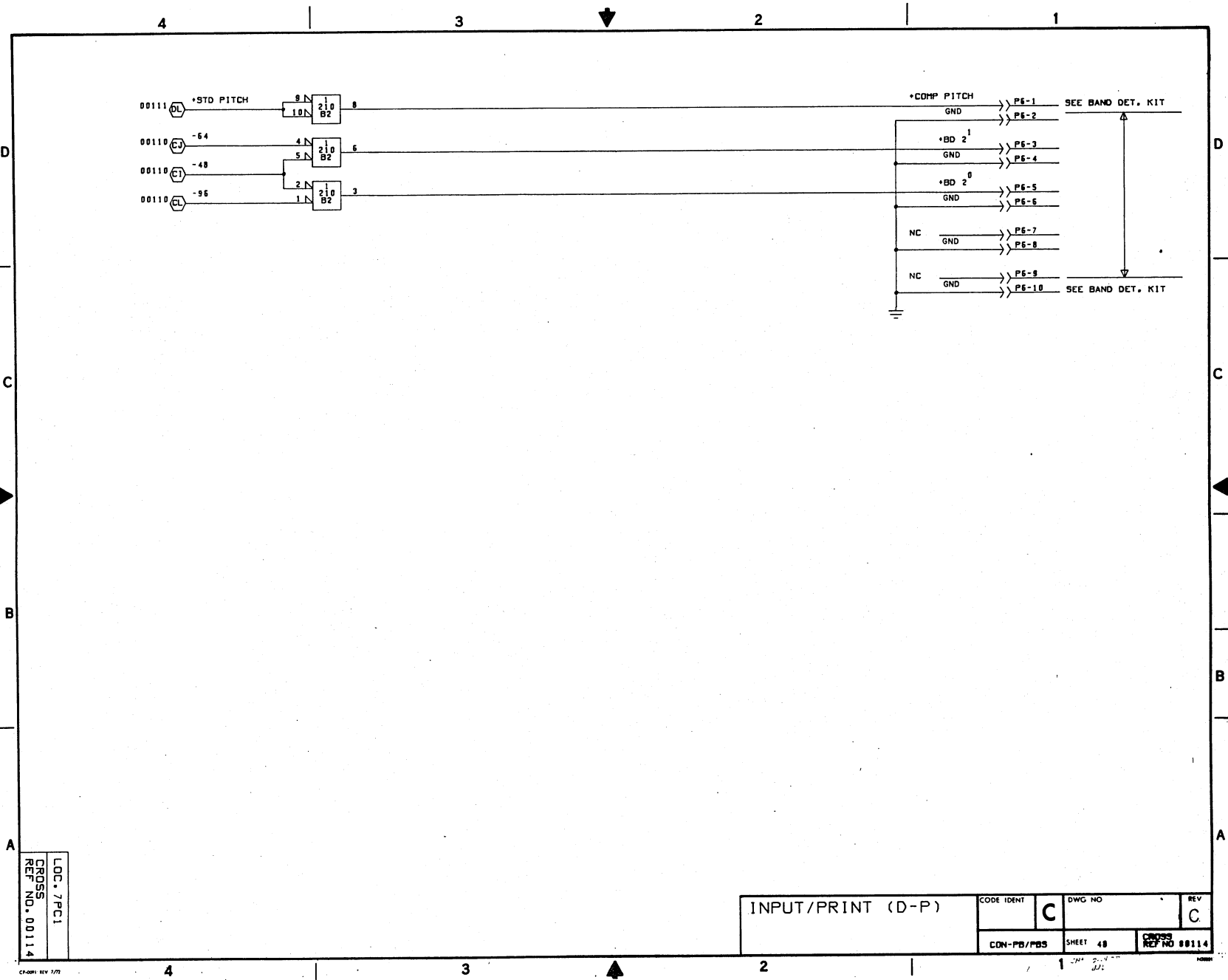
LOC: 7PC1
 CROSS
 REF NO: 00113

* AVAILABLE BUT TYPICALLY NOT ASSEMBLED.

INPUT/PRINT (D-P)		CODE IDENT	OWG MO	REV
		C		C
CON-P8/P8S	SHEET 47	REV 00113		

PART B

6-116



LOC. 7/PC1
 CROSS
 REF. NO. 00114

INPUT/PRINT (D-P)

CODE IDENT	C	DWG NO	REV
CON-PB/PBS	SHEET 48	CROSS REF NO 00114	C

PART
B

4 | 3 | 2 | 1

D
C
B
A

JUMPER NUMBER	FUNCTION						
<table border="1"> <tr> <td colspan="2">J1A-J2A, J1B-J2B</td> </tr> <tr> <td>IN</td> <td>OUT</td> </tr> <tr> <td>OUT</td> <td>IN</td> </tr> </table>	J1A-J2A, J1B-J2B		IN	OUT	OUT	IN	START/STOP CONTROL OF READY-- STANDARD START/STOP CONTROL OF READY. EXTERNAL CONTROL OF READY VIA ADAPTORS WHICH USE "--EXT START PUL" & "--EXT STOP PUL".
J1A-J2A, J1B-J2B							
IN	OUT						
OUT	IN						
<table border="1"> <tr> <td colspan="2">J3A J3B</td> </tr> <tr> <td>IN</td> <td>OUT</td> </tr> <tr> <td>OUT</td> <td>IN</td> </tr> </table>	J3A J3B		IN	OUT	OUT	IN	VERTICAL ADVANCE CONTROL-- 12 CHNL EVFU OPTION OR WHEN ASCII CONTROL CODES ARE NOT USED WITH THE EXTERNAL ADVANCE OPTION. CONTROL CODES ARE STANDARD ASCII WITHOUT EXTERNAL ADVANCE OPTION OR WHEN EXTERNAL ADVANCE OPTION IS USED IN CONJUNCTION WITH CR.
J3A J3B							
IN	OUT						
OUT	IN						
<table border="1"> <tr> <td colspan="2">J4A-J5A, J4B-J5B</td> </tr> <tr> <td>IN</td> <td>OUT</td> </tr> <tr> <td>OUT</td> <td>IN</td> </tr> </table>	J4A-J5A, J4B-J5B		IN	OUT	OUT	IN	STANDARD PAPER FORMATTING NEVER USED
J4A-J5A, J4B-J5B							
IN	OUT						
OUT	IN						
<table border="1"> <tr> <td colspan="2">J6</td> </tr> <tr> <td>IN</td> <td>OUT</td> </tr> </table>	J6		IN	OUT	AUTO PERF SKIP (APS) SELECTION-- APS NOT ACTIVE APS ACTIVE		
J6							
IN	OUT						
<table border="1"> <tr> <td colspan="2">J7</td> </tr> <tr> <td>IN</td> <td>OUT</td> </tr> </table>	J7		IN	OUT	FROM FEED CONTROL NO EVFU OPTION EVFU OPTION		
J7							
IN	OUT						

D
C
B
A

6-117

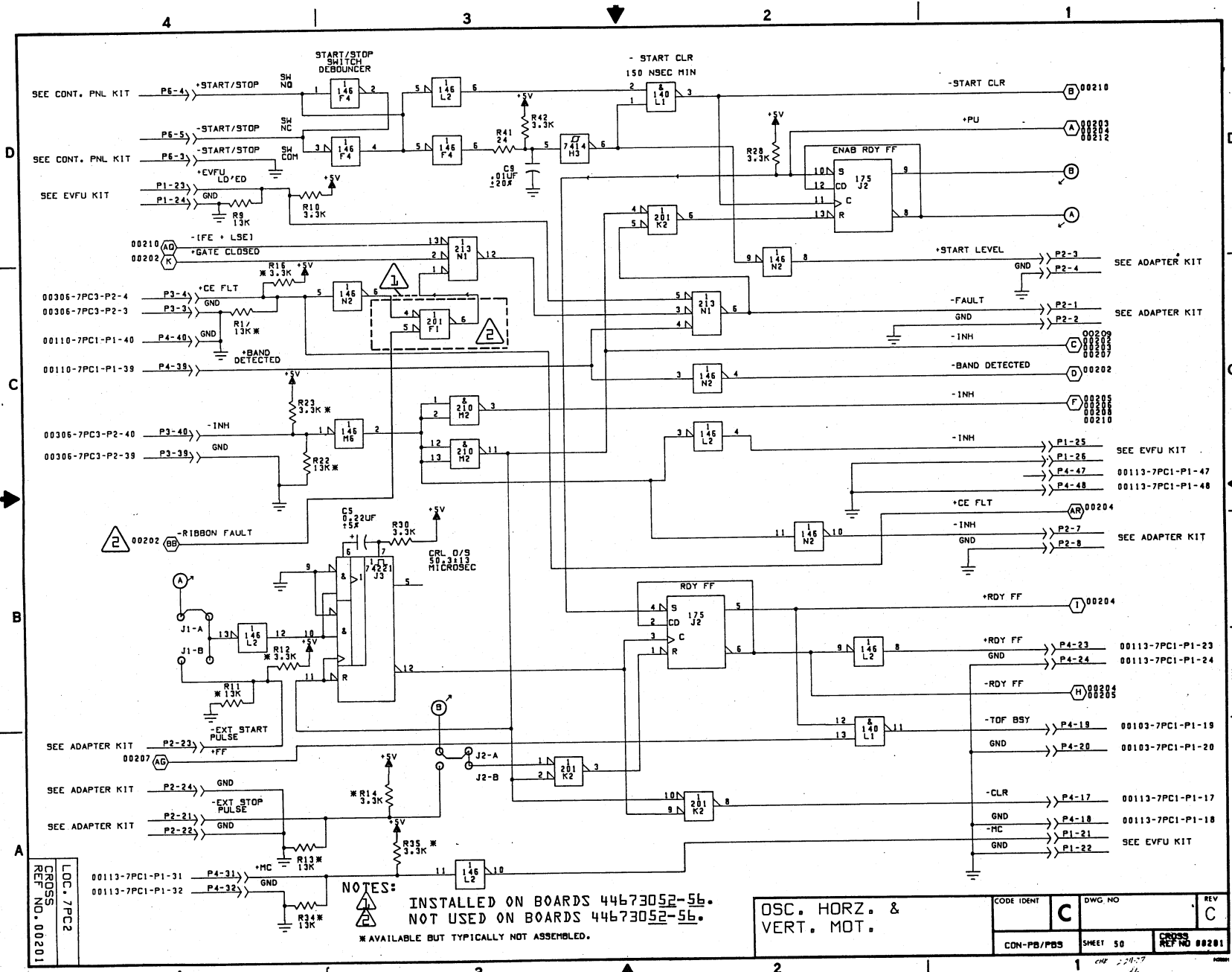
LOC.
CROSS
REF. NO. 00200

OSC. HORZ. & VERT.
MOT. JUMPER
CHART


CODE IDENT	C	DWG NO	REV
CON-PB/PBS	SHEET 49	CROSS REF NO 00200	A

PART
B

4 | 3 | 2 | 1



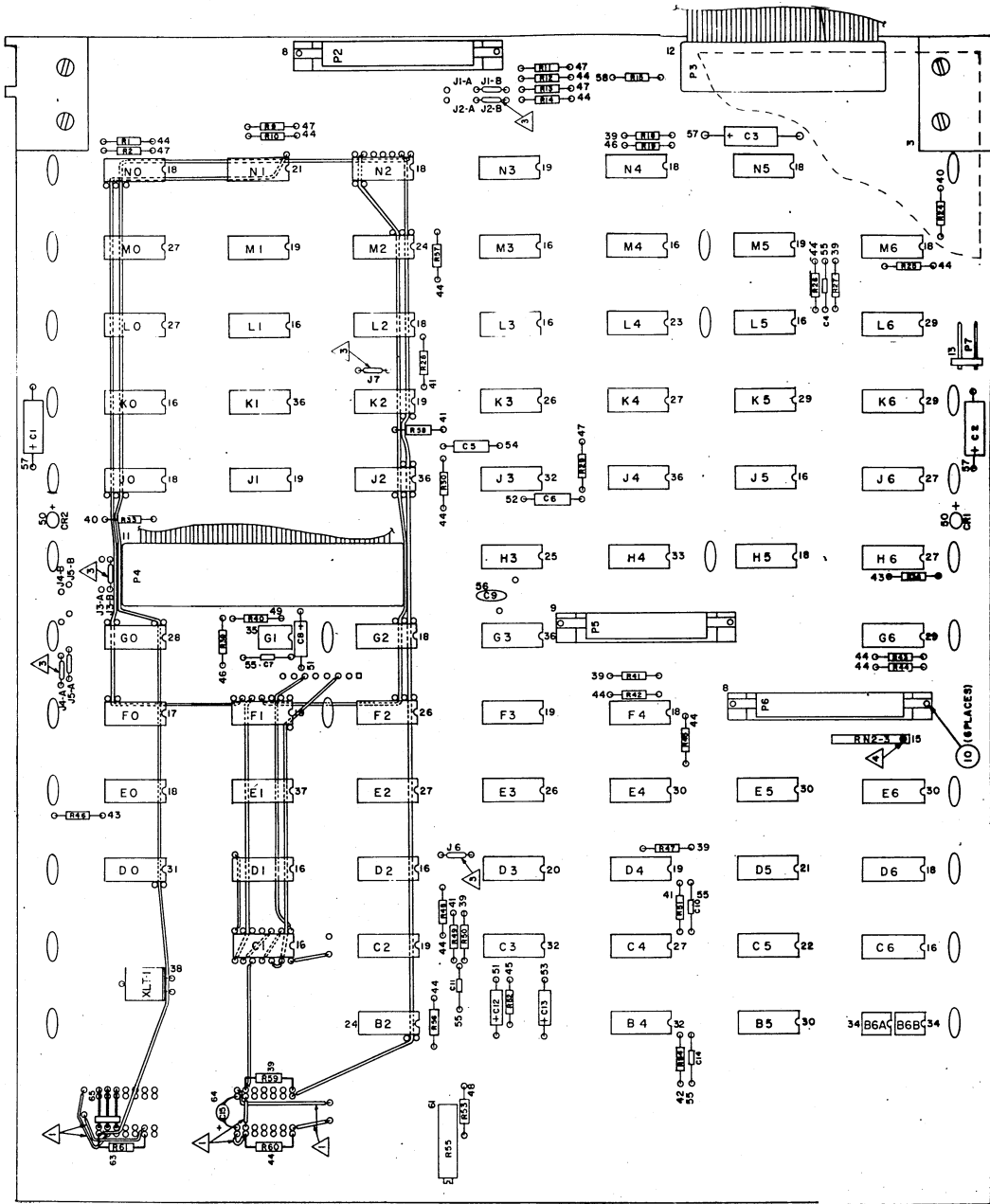
LOC. 7PC2
CROSS REF. NO. 00201

NOTES:
 **INSTALLED ON BOARDS 44673052-56.**
NOT USED ON BOARDS 44673052-56.
 * AVAILABLE BUT TYPICALLY NOT ASSEMBLED.

OSC. HORIZ. &
VERT. MOT.

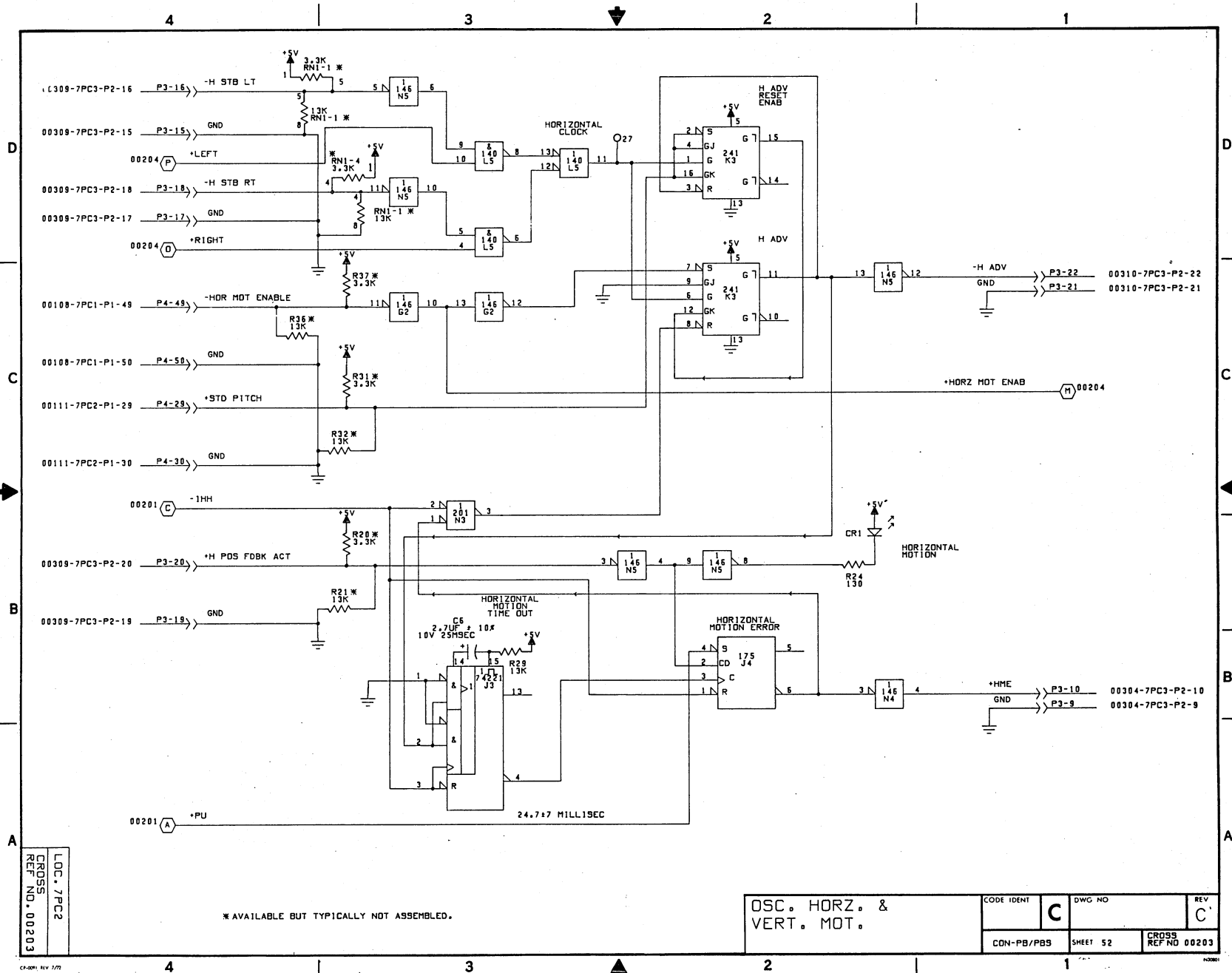
CODE IDENT	C	DWG NO		REV	C
CDN-PB/PBS		SHEET 50	CROSS REF NO 00201		

PART B



OSC. HORZ. & VERTICAL MOTION

6-121



LOC. 7PC2
 CROSS
 REF. NO. 00203

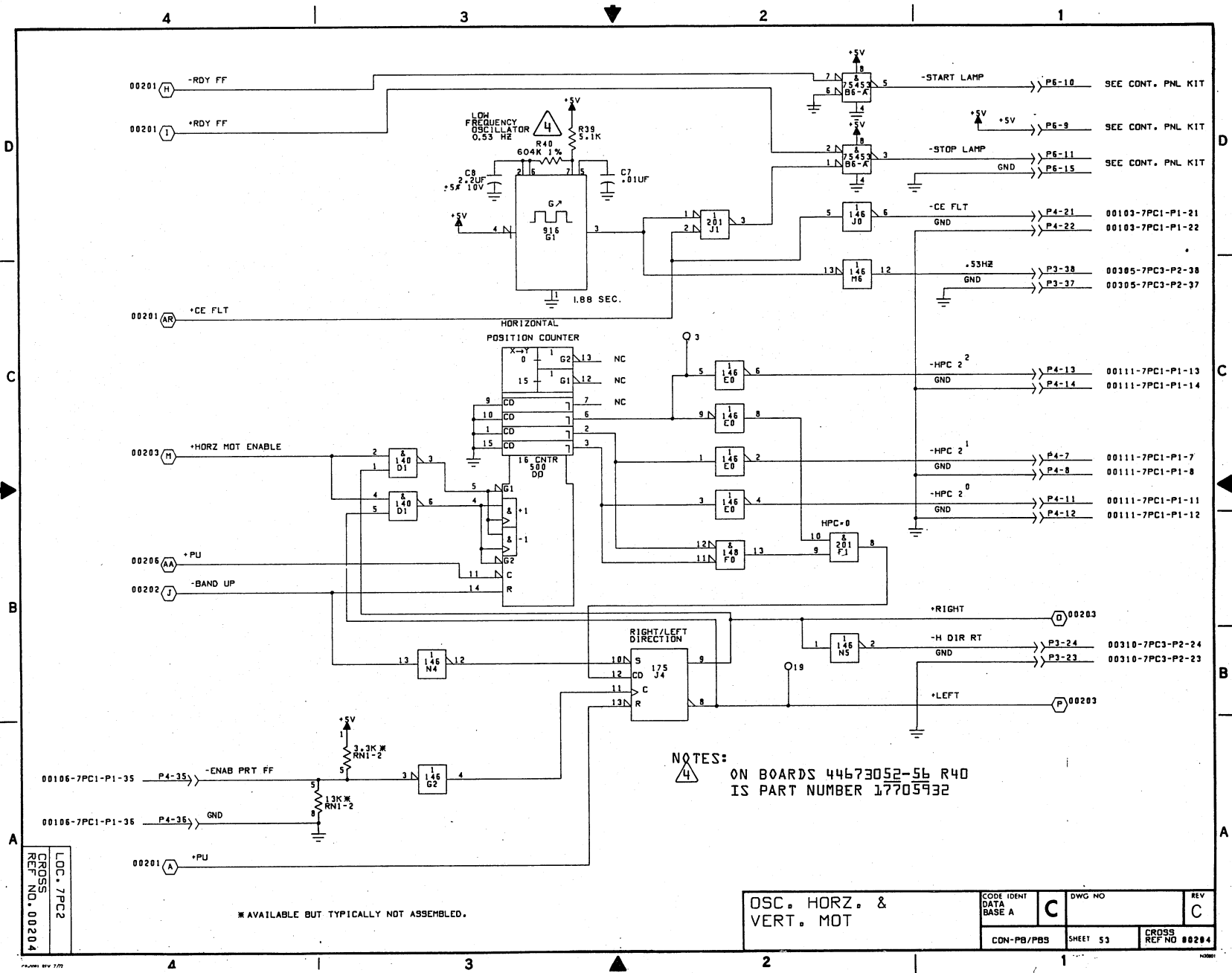
* AVAILABLE BUT TYPICALLY NOT ASSEMBLED.

OSC. HORZ. &
 VERT. MOT.

CODE IDENT	C	DWG NO	C
CON-PB/PBS	SHEET 52	CROSS REF NO	00203

PART
 B

6-122



NOTES:
 ON BOARDS 44673052-56 R40
 IS PART NUMBER 17705932

LOC. 7PC2
 CROSS REF. NO. 00204

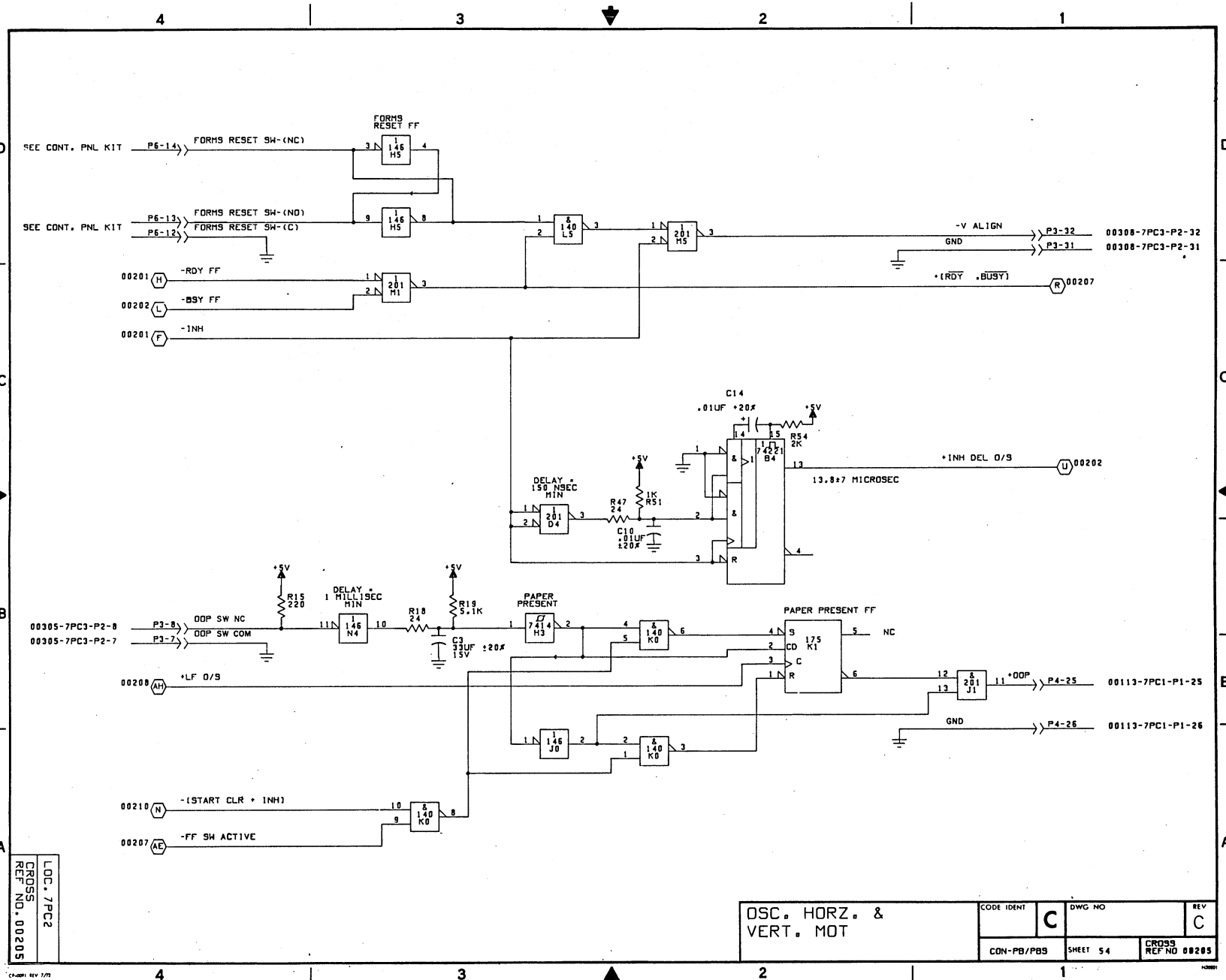
* AVAILABLE BUT TYPICALLY NOT ASSEMBLED.

OSC. HORZ. &
 VERT. MOT

CODE IDENT DATA BASE A	C	DWG NO	REV
CDN-PB/PBS	SHEET 53	CROSS REF NO 00204	

PART B

6-123

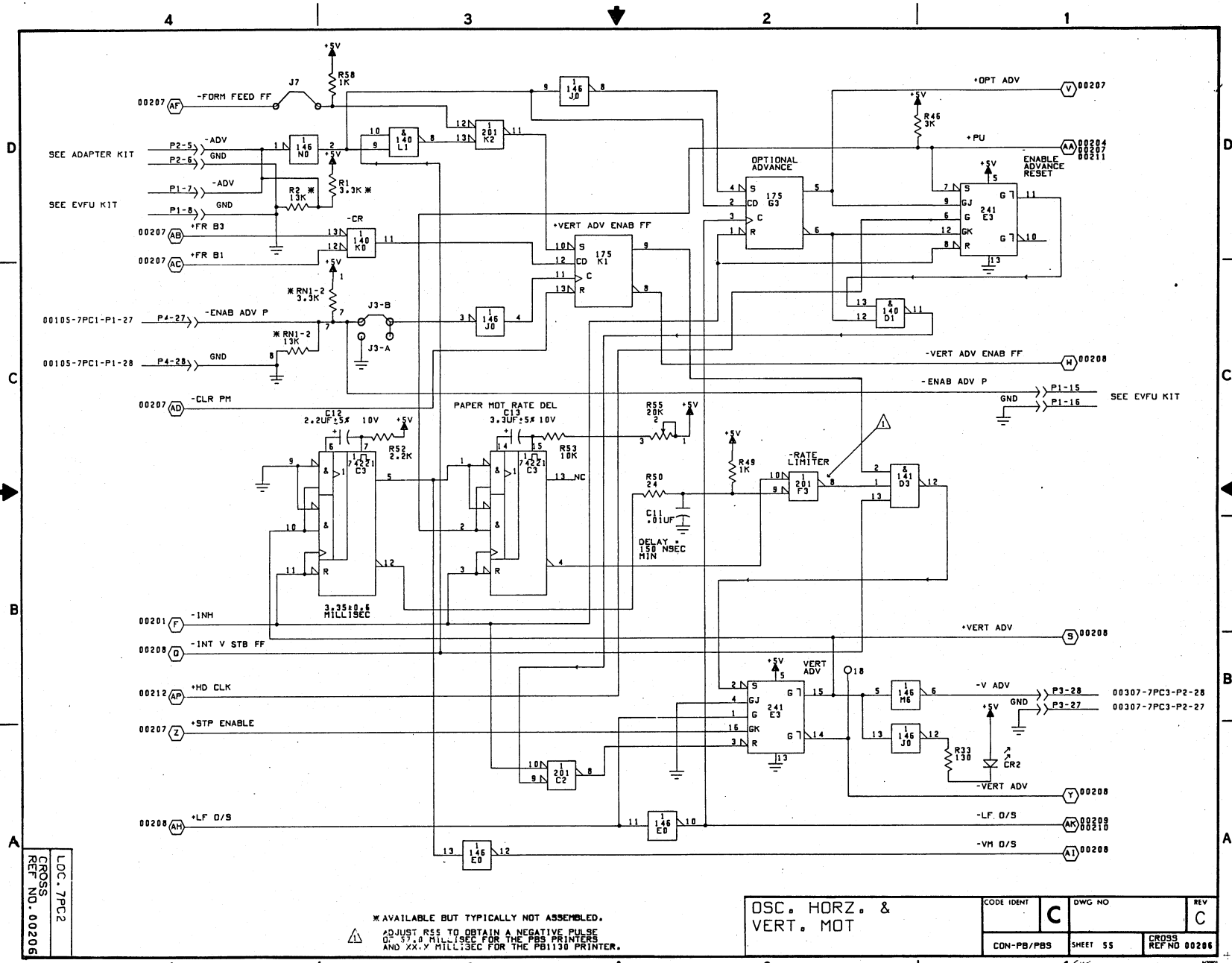


LOC. 7PC2
 CROSS
 REF. NO. 00205

OSC. HORZ. &
 VERT. MOT

CODE IDENT	C	DWG NO		REV	C
CON-PB/PBS		SHEET 54	CROSS REF NO 00205		

PART
 B



LDC-7PC2
CROSS REF NO. 00206

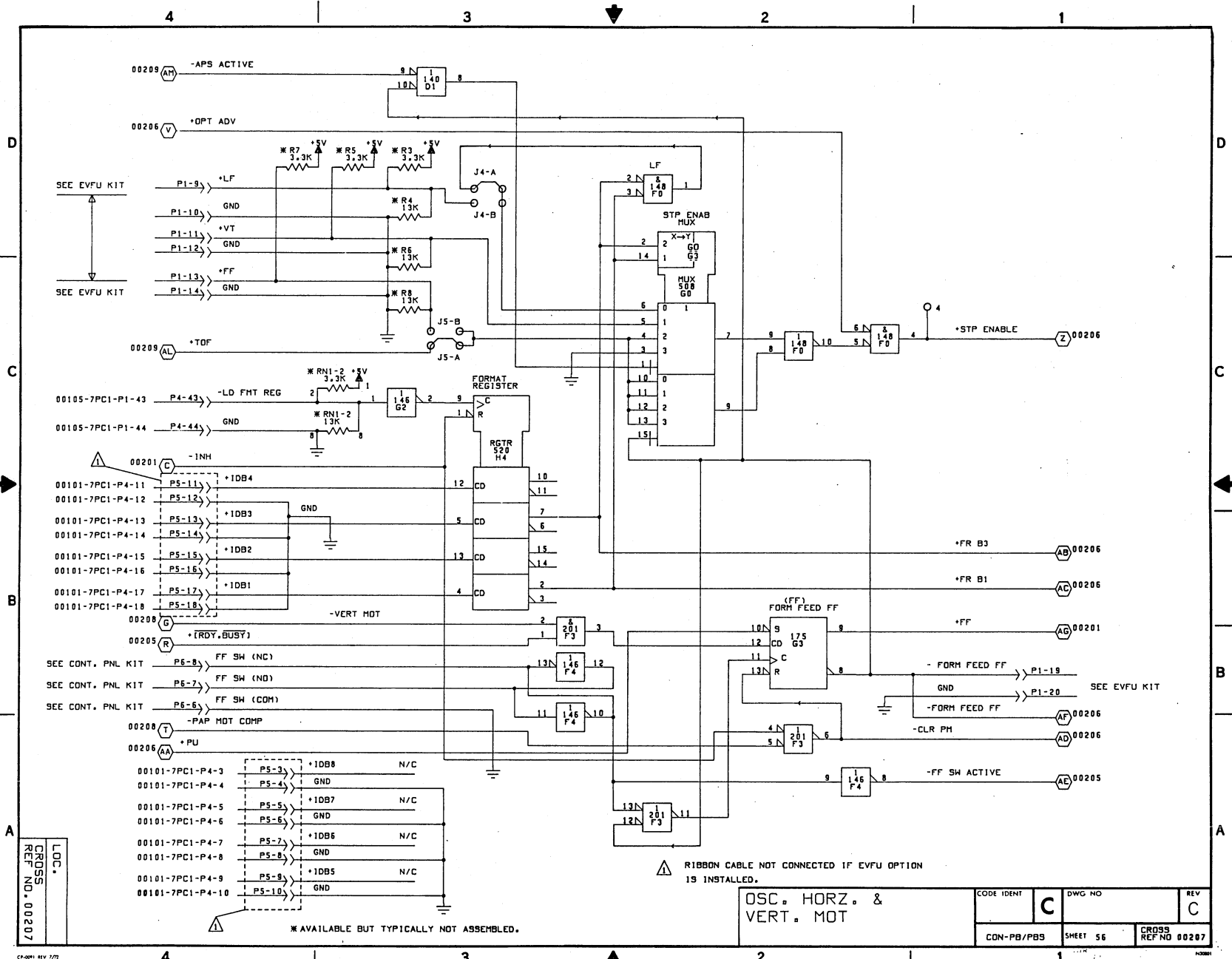
*AVAILABLE BUT TYPICALLY NOT ASSEMBLED.
 ⚠️ ADJUST R55 TO OBTAIN A NEGATIVE PULSE
 OF 37.0 MILLISEC FOR THE PBS PRINTERS
 AND XX.Y MILLISEC FOR THE PB1130 PRINTER.

OSC. HORZ. &
VERT. MOT

CODE IDENT	C	DWG NO	REV
CON-PB/PBS	SHEET 55	CROSS REF NO 00206	

PART B

6-125



LOC.
CROSS
REF NO. 00207

CP-0011 REV 7/72

* AVAILABLE BUT TYPICALLY NOT ASSEMBLED.

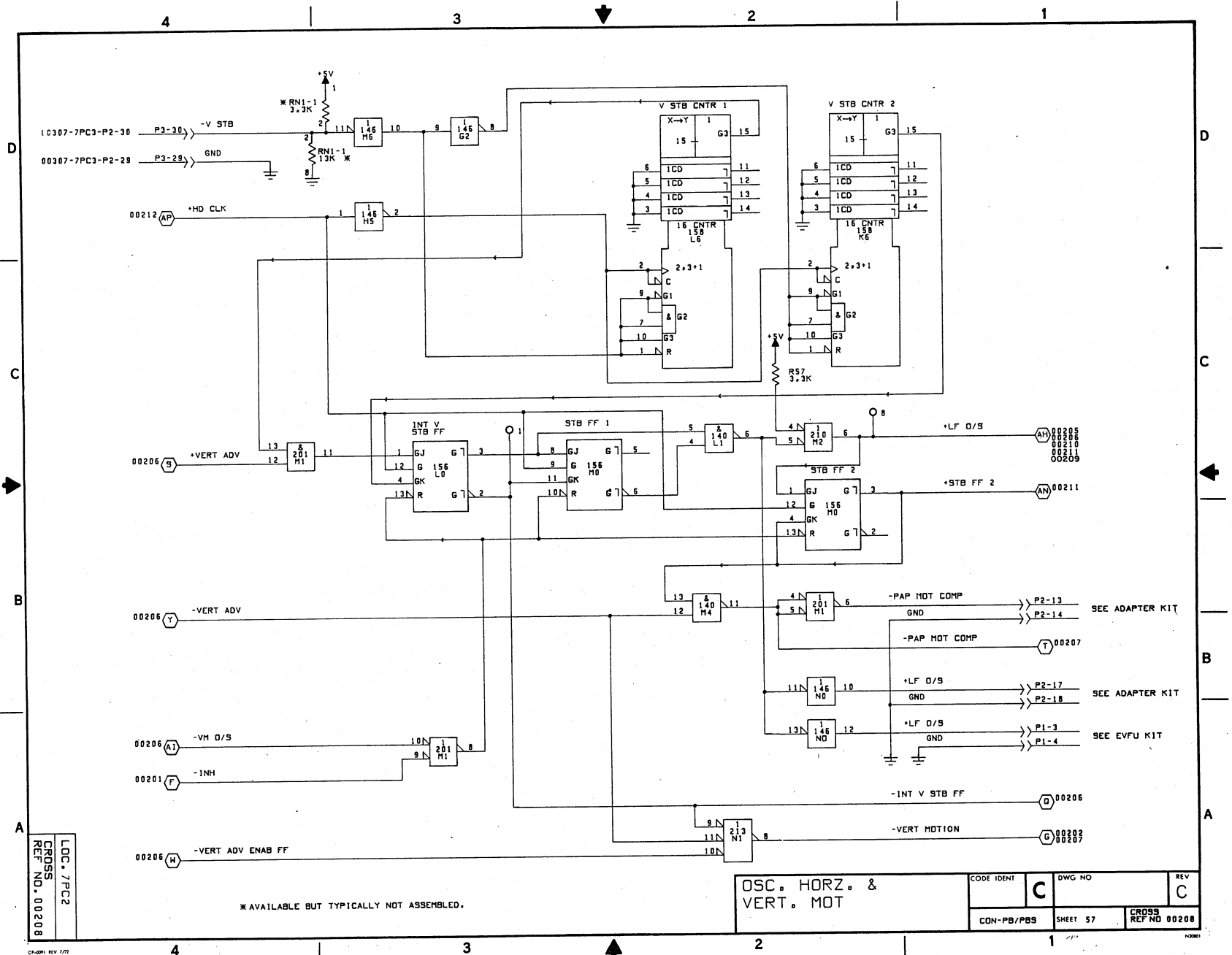
⚠ RIBBON CABLE NOT CONNECTED IF EVFU OPTION IS INSTALLED.

OSC. HORZ. &
VERT. MOT

CODE IDENT	C	DWG NO	REV
CON-PB/PB9		SHEET 56	C
		CROSS REF NO 00207	

PART
B

6-126



LOC. 7PC2
 CROSS REF NO. 00208

* AVAILABLE BUT TYPICALLY NOT ASSEMBLED.

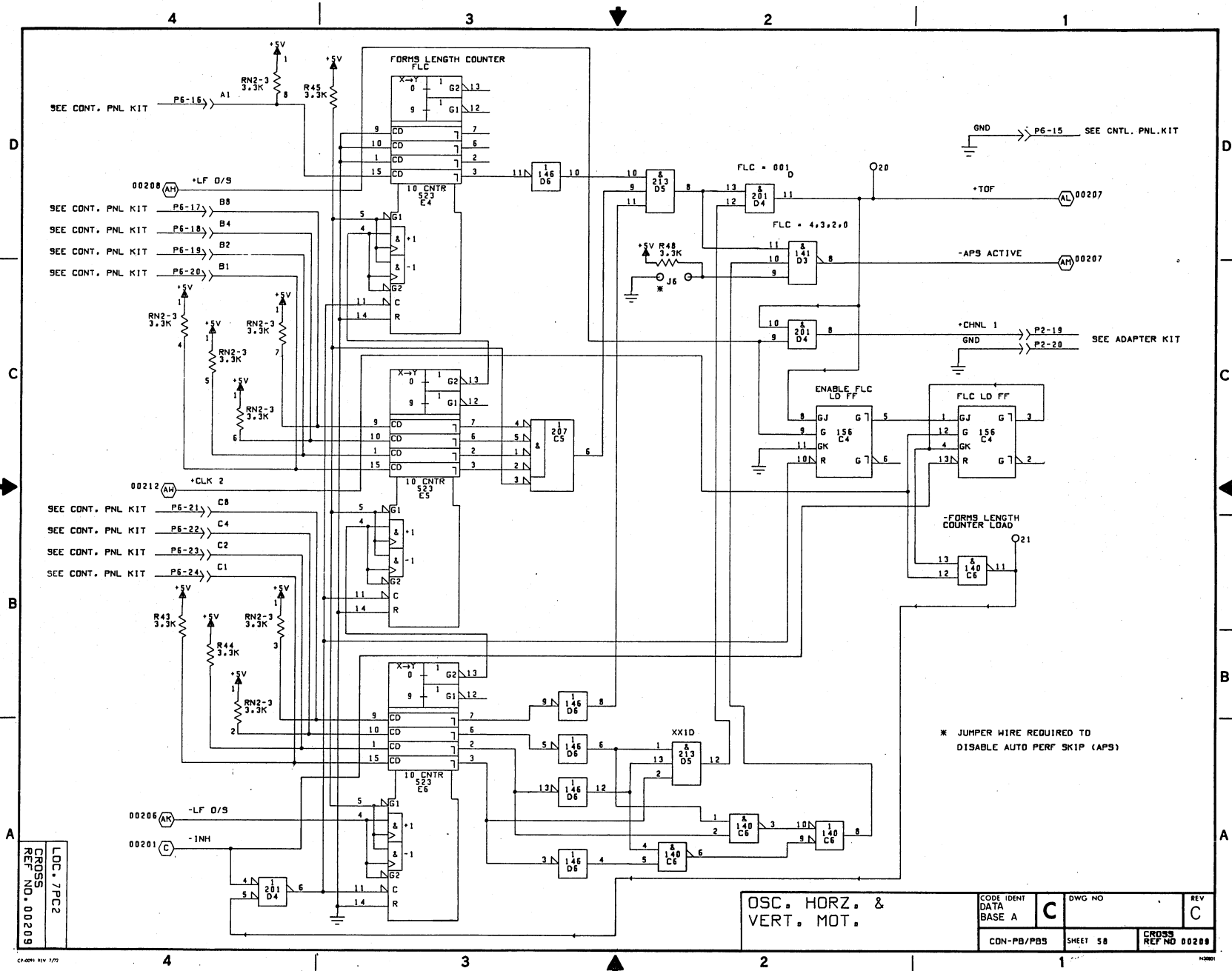
OSC. HORZ. &
 VERT. MOT

CODE IDENT	C	DWG NO	C	REV	C
CON-PB/PBS	SHEET 57	CROSS REF NO	00208		

PART B

CP-001 REV 7/77

6-127



LDC - 7PC2
 CROSS
 REF. NO. 00209

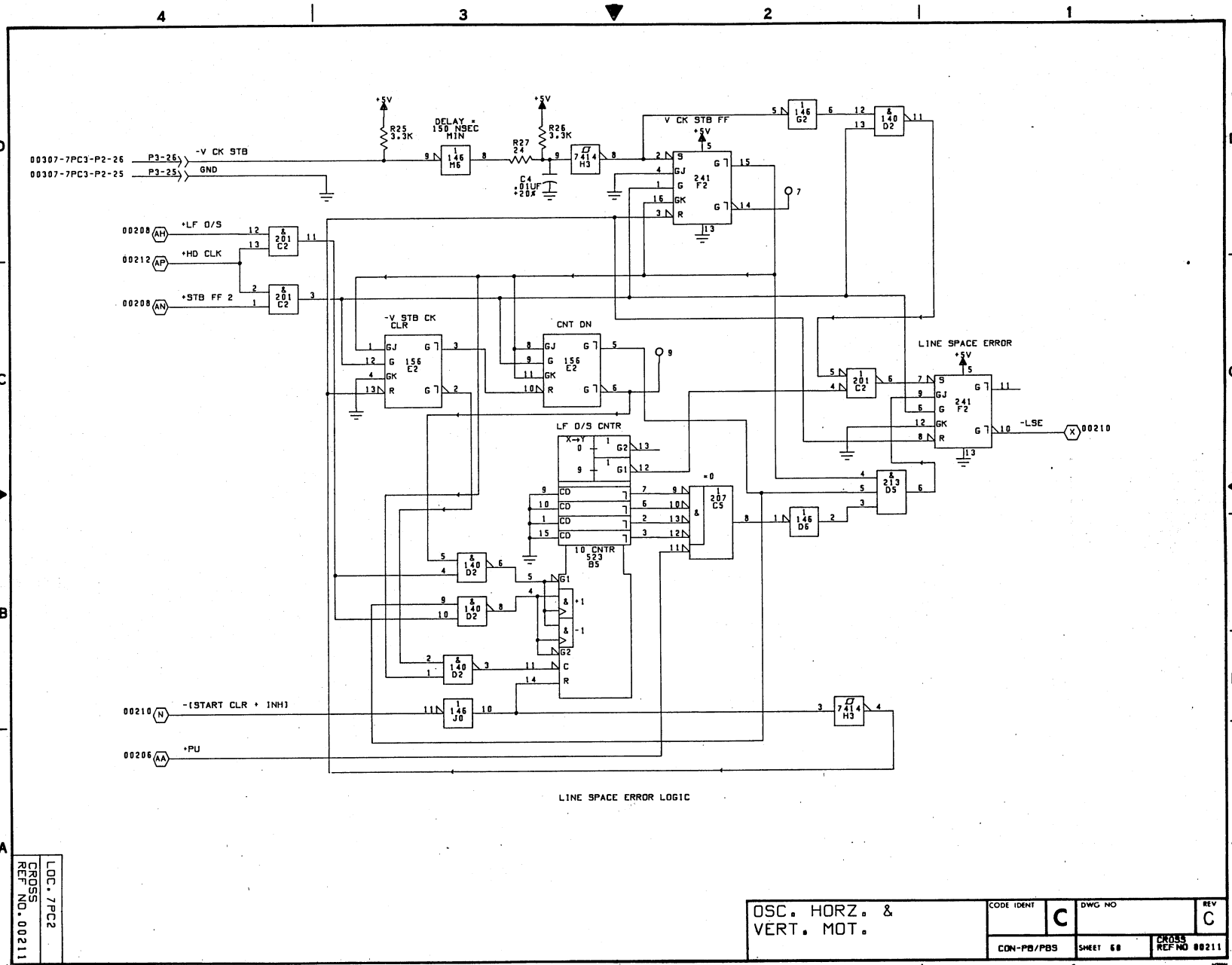
OSC. HORZ. &
 VERT. MOT.

* JUMPER WIRE REQUIRED TO
 DISABLE AUTO PERF SKIP (APS)

CODE IDENT DATA BASE A	C	DWG NO	REV C
CON-PB/PBS	SHEET 58	CROSS REF NO 00209	

PART
 B

6-129

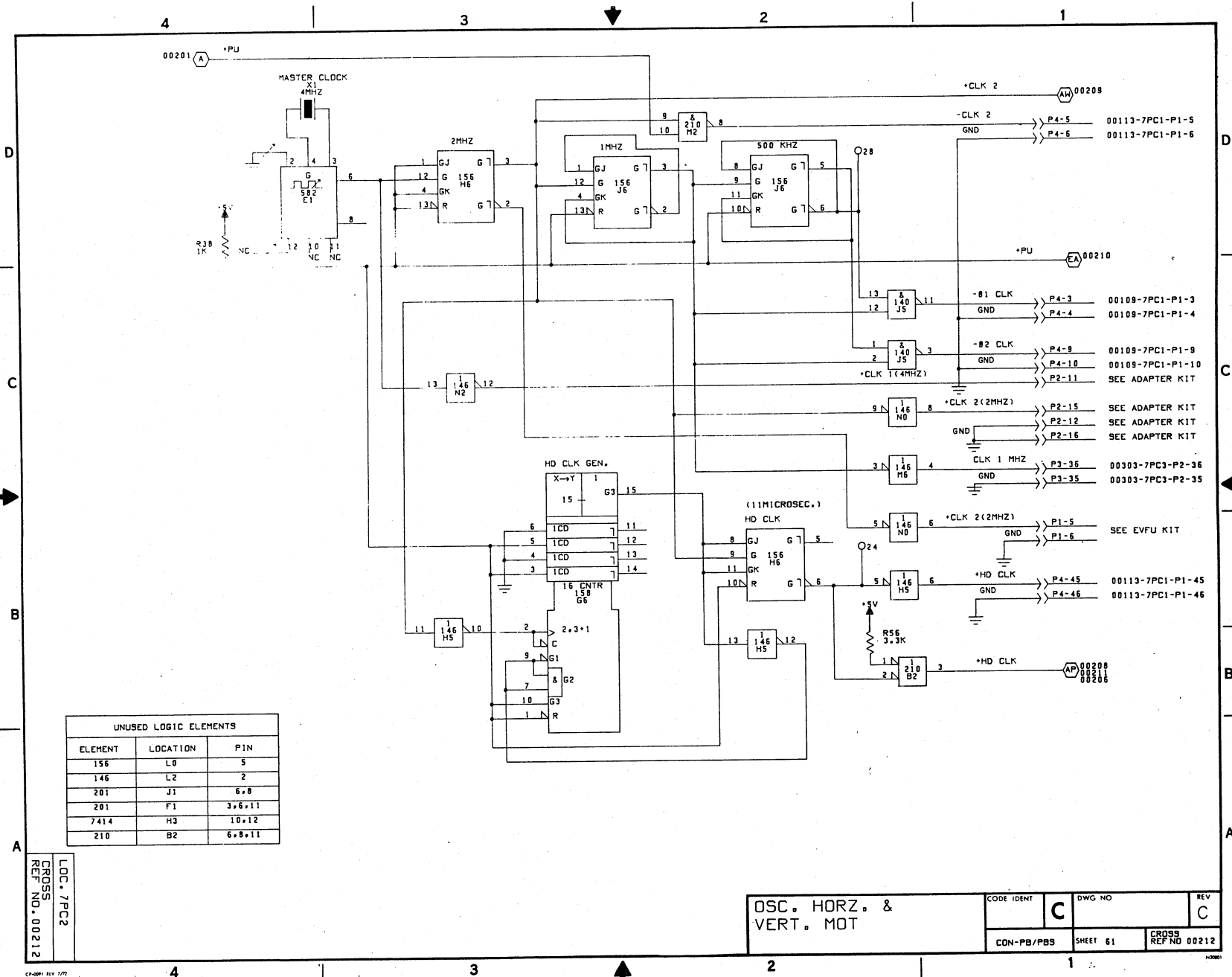


LOC. / F/C2
 CROSS
 REF. NO. 00211

OSC. HORZ. & VERT. MOT.		CODE IDENT	DWG NO	REV
		C		C
CON-PB/PBS		SHEET 60	CROSS REF NO 00211	

PART B

6-130



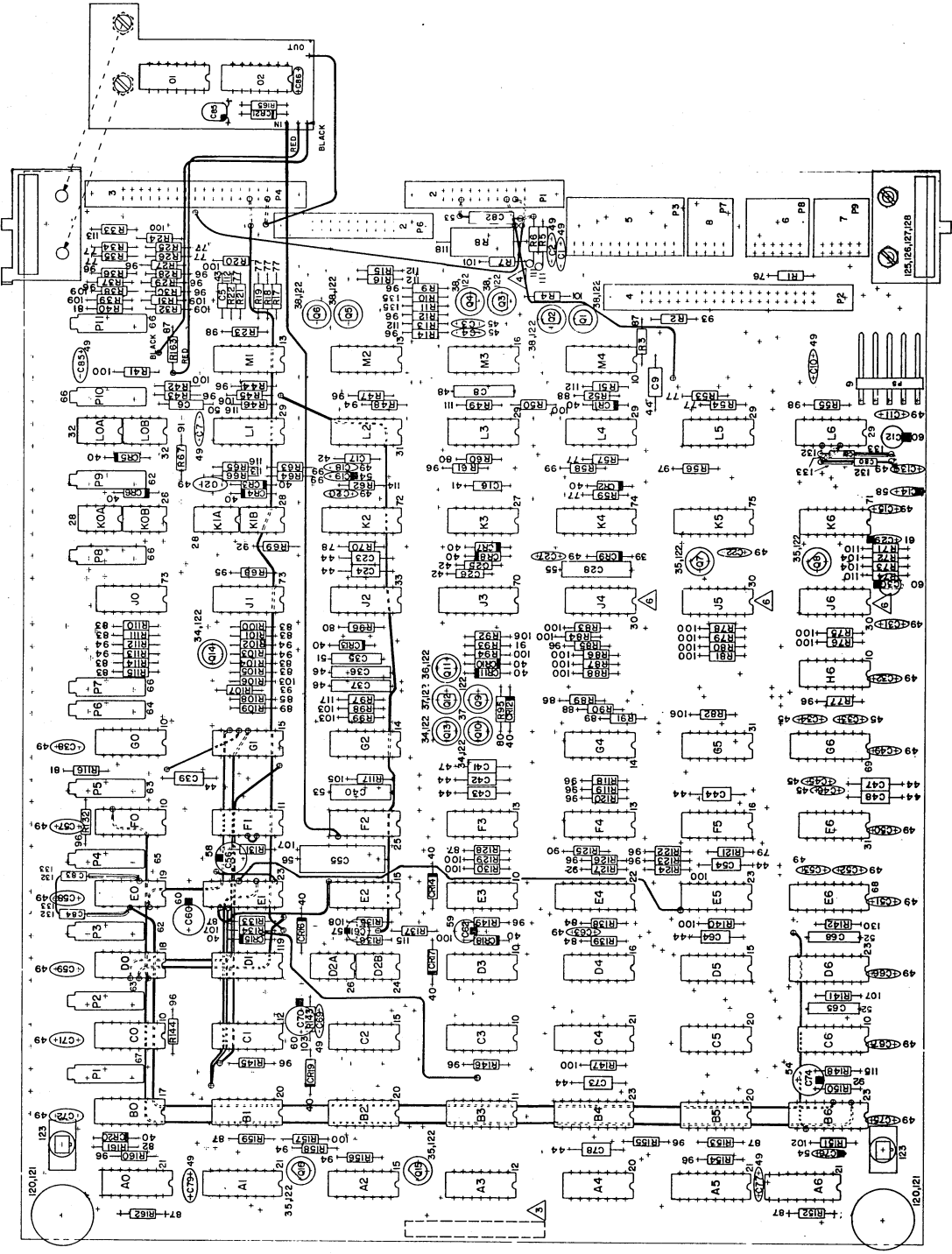
UNUSED LOGIC ELEMENTS		
ELEMENT	LOCATION	PIN
156	L0	5
146	L2	2
201	J1	6,8
201	F1	3,6,11
7414	H3	10,12
210	B2	6,8,11

LOC. 7PC2
 CROSS REF NO. 00212

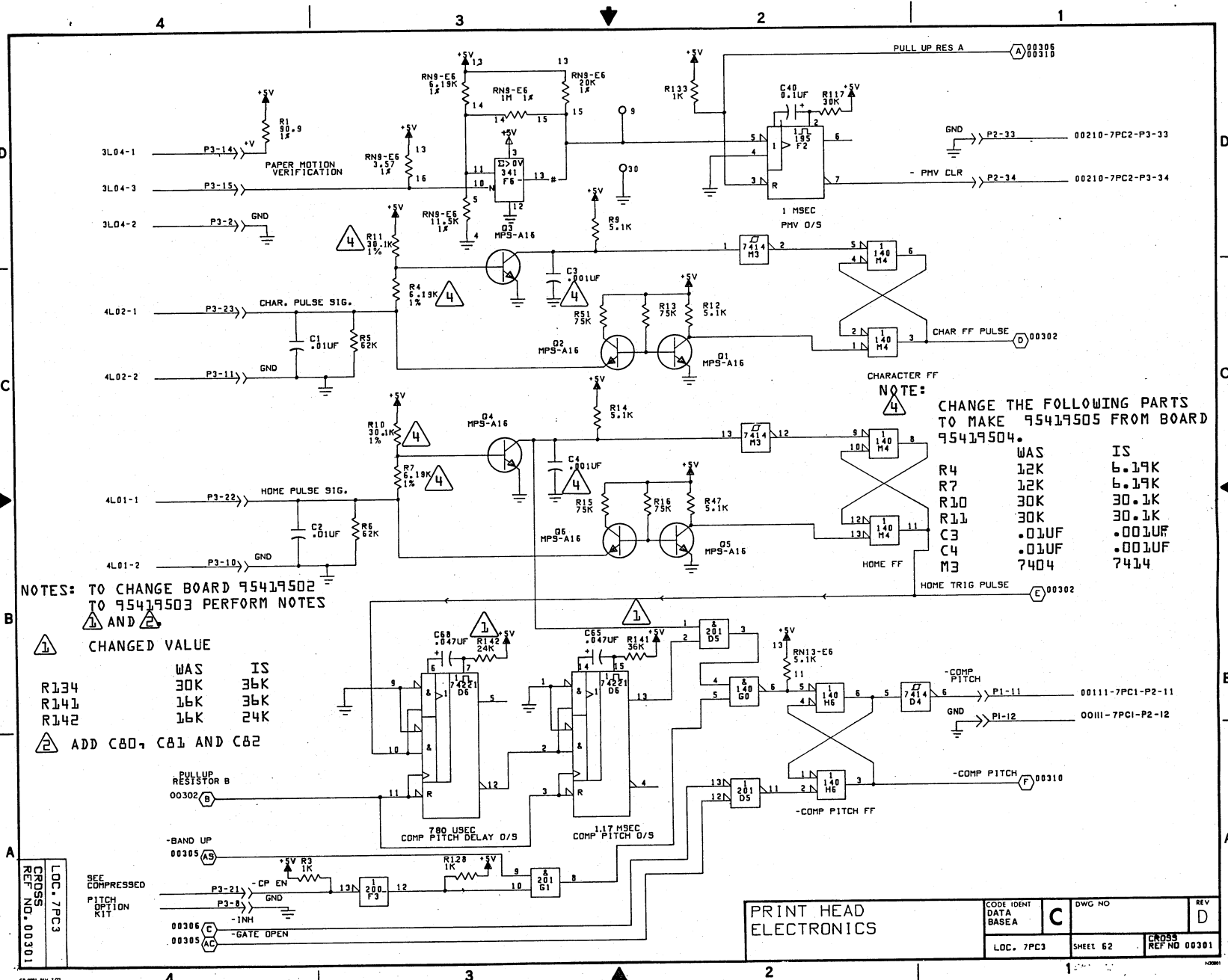
OSC. HORZ. &
 VERT. MOT

CODE IDENT	C	DWG NO		REV	C
CON-PB/PBS		SHEET	61	CROSS REF NO	00212

PART B



PRINT HEAD ELECTRONICS



NOTES: TO CHANGE BOARD 95419502 TO 95419503 PERFORM NOTES AND

CHANGED VALUE

R134	WAS 30K	IS 36K
R141	16K	36K
R142	16K	24K

ADD C80, C81 AND C82

NOTE: CHANGE THE FOLLOWING PARTS TO MAKE 95419505 FROM BOARD 95419504.

R4	WAS 12K	IS 6.19K
R7	12K	6.19K
R10	30K	30.1K
R11	30K	30.1K
C3	.01UF	.001UF
C4	.01UF	.001UF
M3	7404	7414

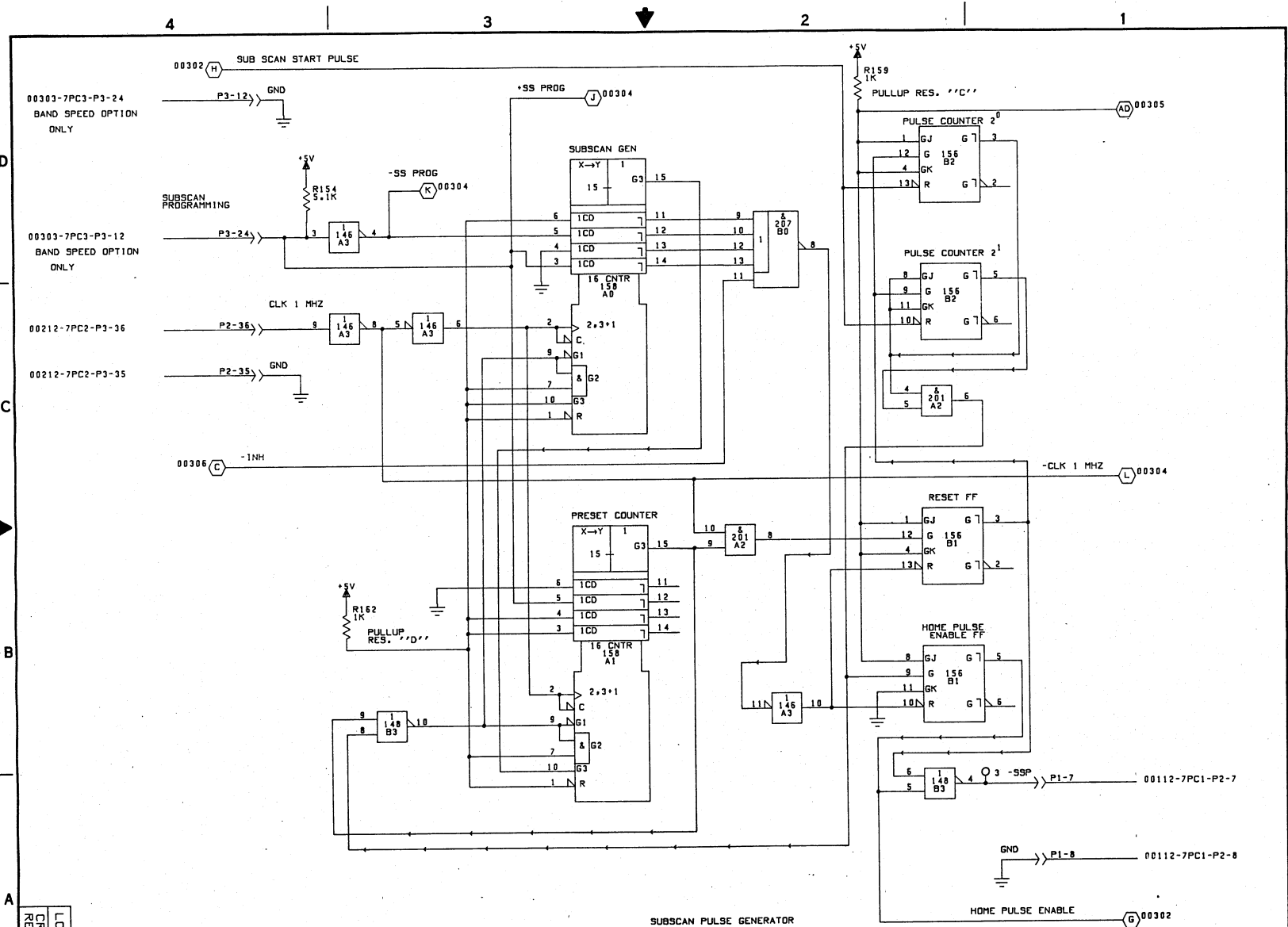
LOC. 7PC3
CROSS REF. NO. 00301

SEE COMPRESSED PITCH OPTION KIT

PRINT HEAD ELECTRONICS

CODE IDENT DATA BASEA	C	DWG NO	D
LOC. 7PC3	SHEET 62	CROSS REF. NO. 00301	

PART B



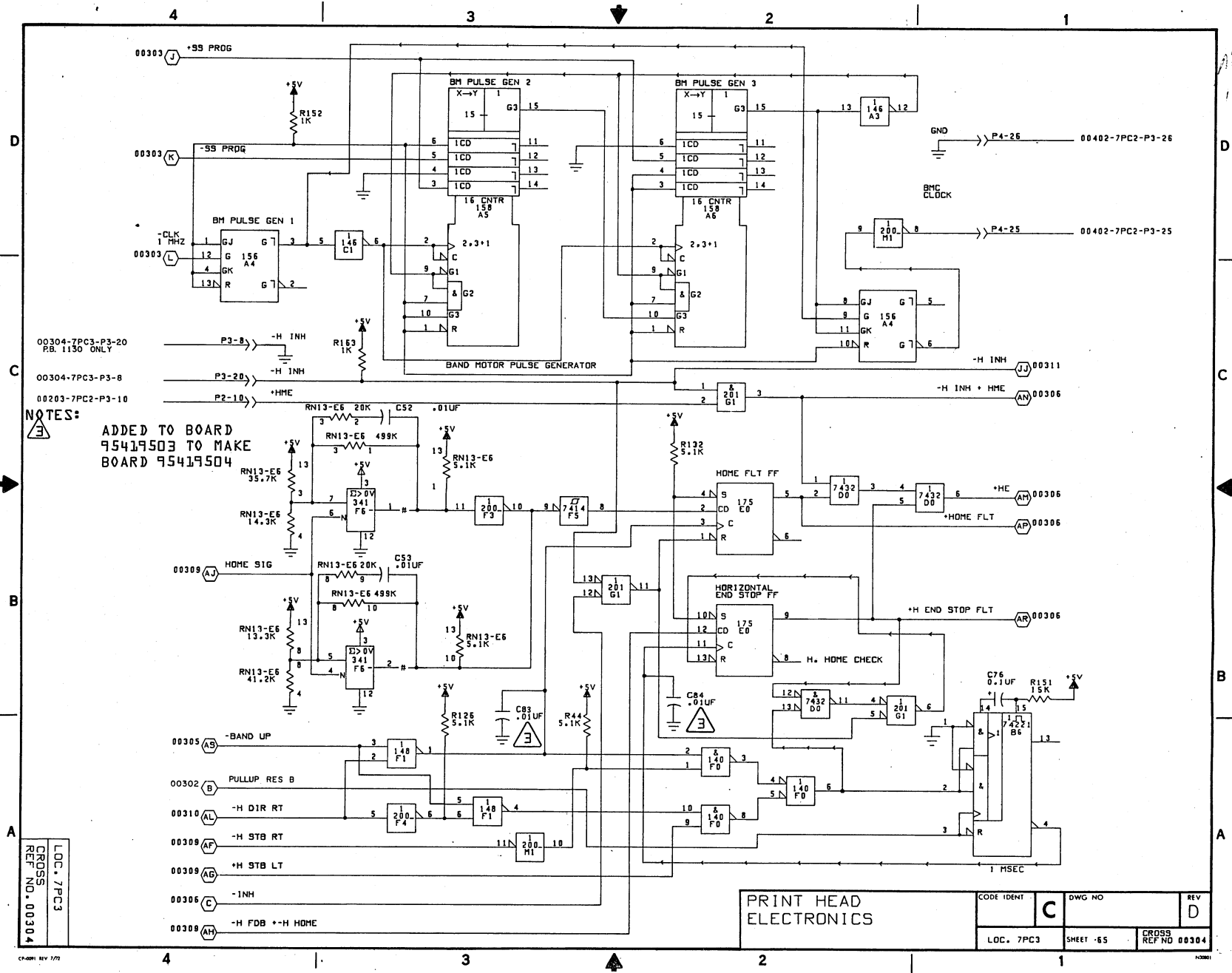
LOC. 7PC3
CROSS
REF. NO. 00303

PRINT HEAD
ELECTRONICS

CODE IDENT	C	DWG NO	REV	A
LOC. 7PC3	SHEET 64	CROSS REF NO 00303		

PART
B

6-135



NOTES:
 ⚠️ ADDED TO BOARD
 95419503 TO MAKE
 BOARD 95419504

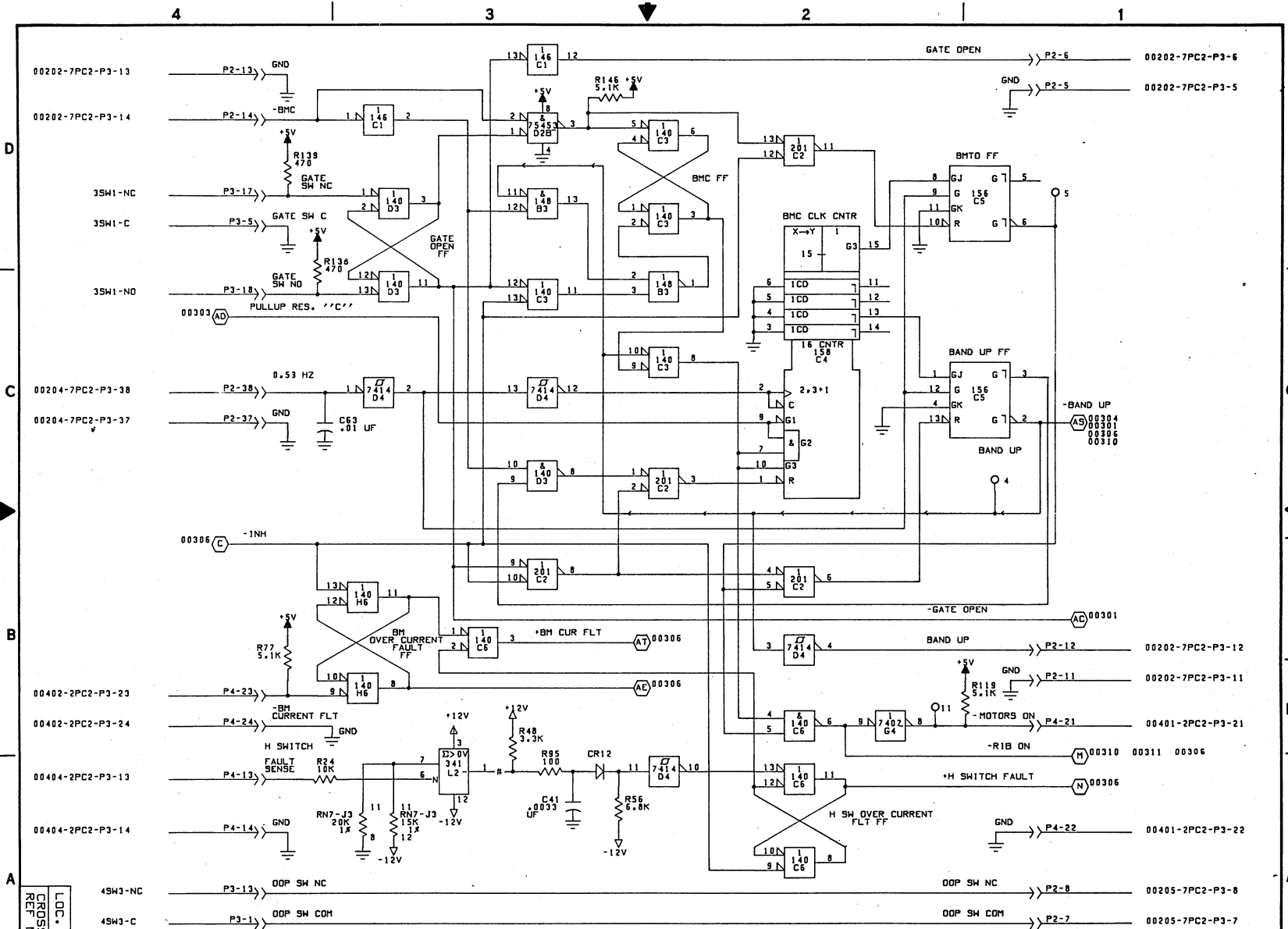
LOC. 7PC3
 CROSS REF. NO. 00304

PRINT HEAD
 ELECTRONICS

CODE IDENT	C	DWG NO	REV
LOC. 7PC3		SHEET 65	CROSS REF NO 00304

PART
 B

6-136

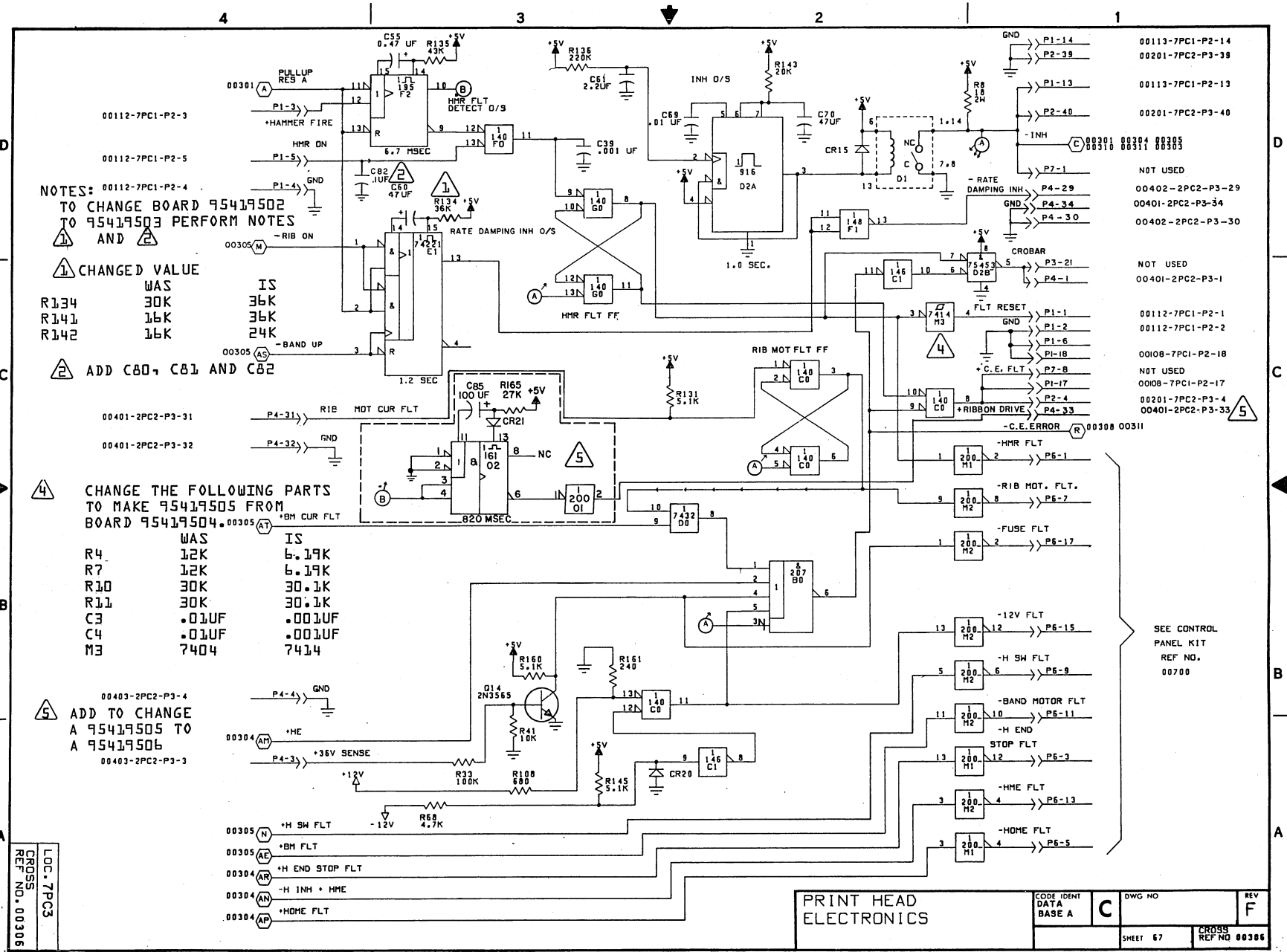


LOC. 7PC3
 CROSS REF. NO. 00305

PRINT HEAD ELECTRONICS

CODE IDENT	C	DWG NO	C
LOC. 7PC3	SHEET 66	CROSS REF. NO. 00305	

PART B



NOTES: 00112-7PC1-P2-4
 TO CHANGE BOARD 95419502
 TO 95419503 PERFORM NOTES
 AND

1 CHANGED VALUE
 WAS IS
 R134 30K 36K
 R141 16K 36K
 R142 16K 24K

2 ADD C80, C81 AND C82

4 CHANGE THE FOLLOWING PARTS
 TO MAKE 95419505 FROM
 BOARD 95419504

R4	12K	6.19K
R7	12K	6.19K
R10	30K	30.1K
R11	30K	30.1K
C3	.01UF	.001UF
C4	.01UF	.001UF
M3	7404	7414

5 ADD TO CHANGE
 A 95419505 TO
 A 95419506

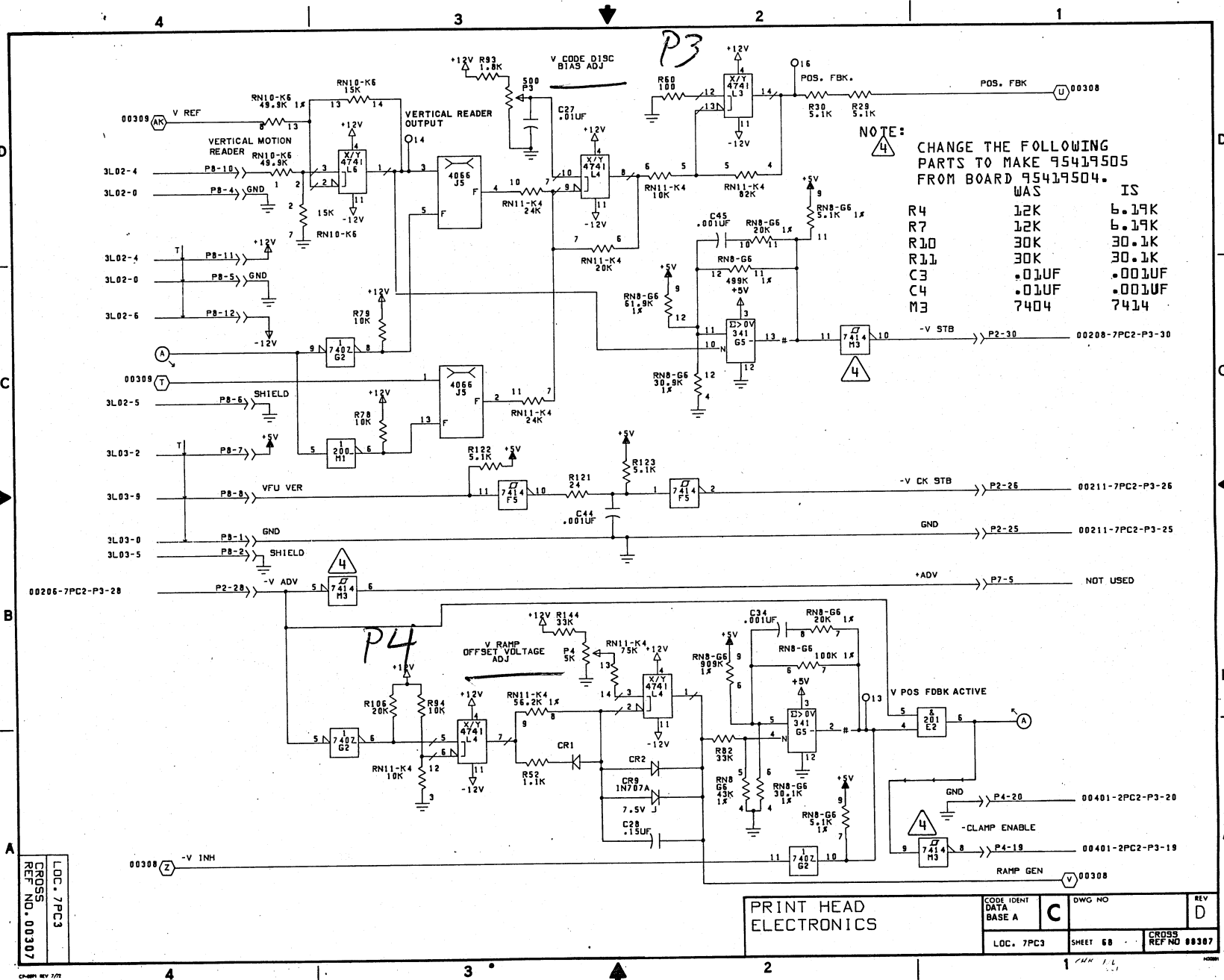
LOC. 7PC3
 CROSS
 REF. NO. 00306

PRINT HEAD
 ELECTRONICS

CODE IDENT DATA BASE A	C	DWG NO	REV F
SHEET 57		CROSS REF NO 00306	

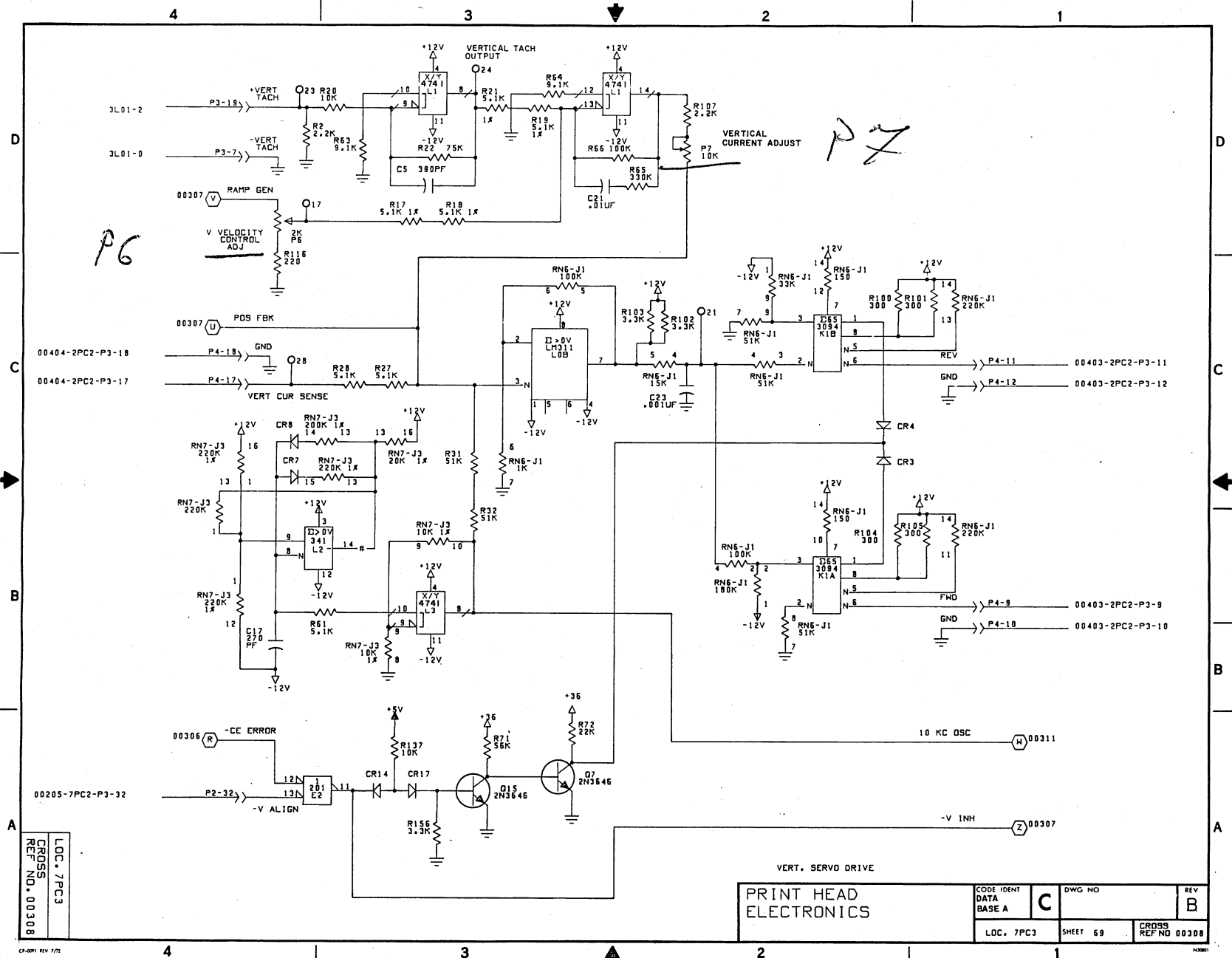
PART
 B

6-138



PART B

6-139



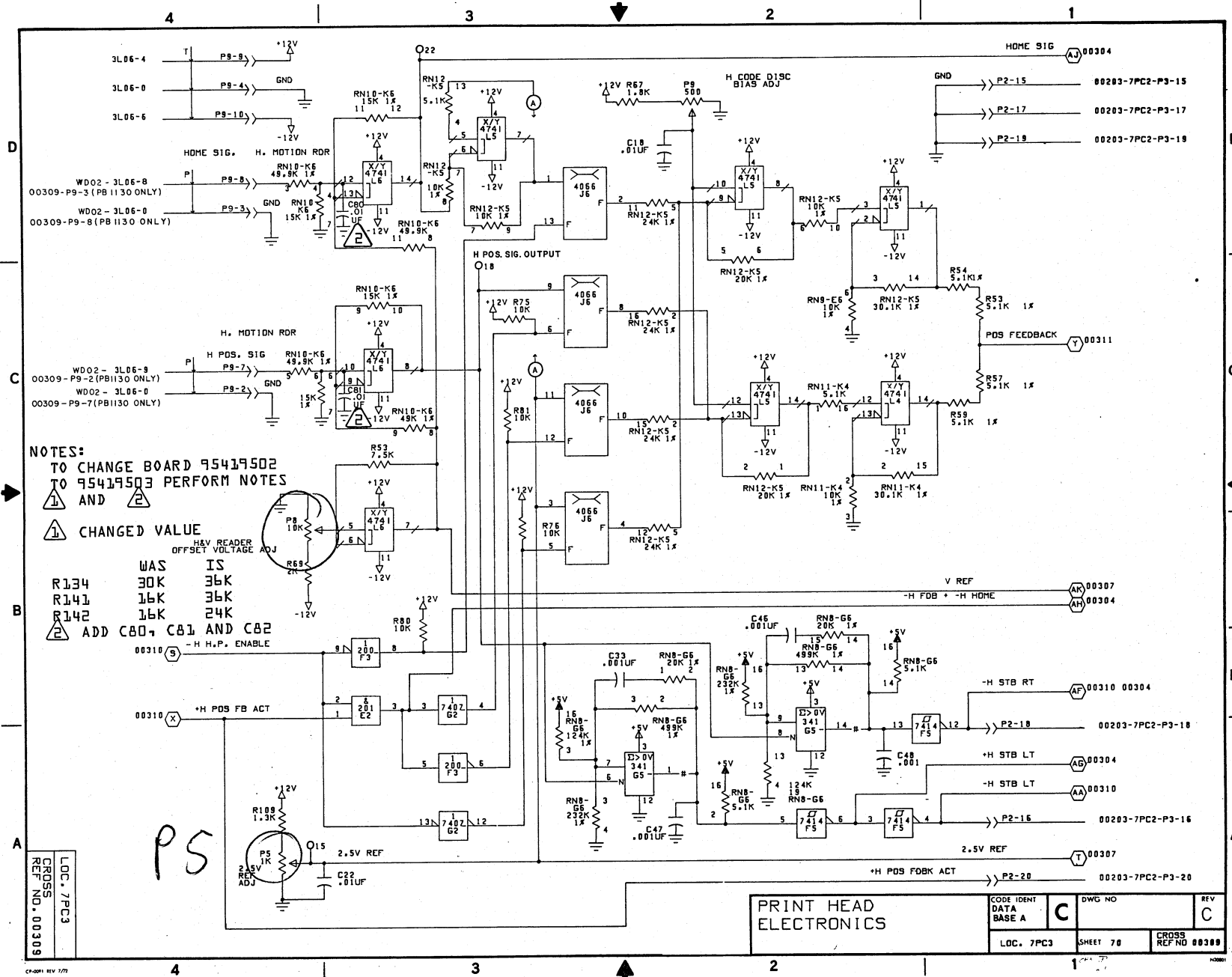
LOC. 7PC3
 CROSS
 REF. NO. 00308

PRINT HEAD
 ELECTRONICS

CODE IDENT DATA BASE A	C	DWG NO	REV B
LOC. 7PC3	SHEET 69	CROSS REF NO 00308	

PART
 B

6-140



NOTES:
 TO CHANGE BOARD 95419502
 TO 95419503 PERFORM NOTES
 AND
 CHANGED VALUE
 HAV READER OFFSET VOLTAGE ADJ

WAS	IS
R134 30K	36K
R141 16K	36K
R142 16K	24K

 ADD C80, C81 AND C82
 00310 -H H.P. ENABLE

LOC. 7PC3
 CROSS REF. NO. 00309

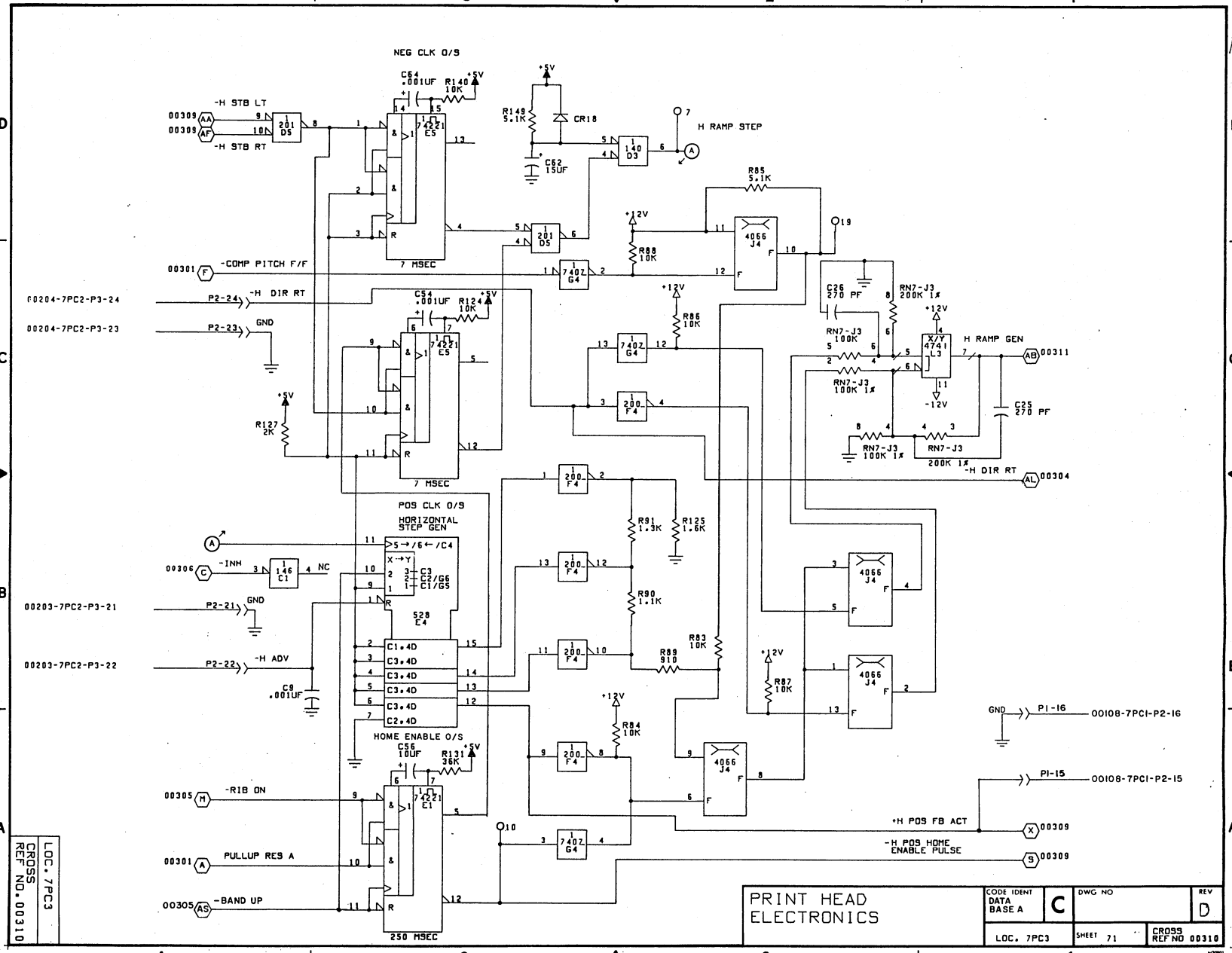
PS

PRINT HEAD ELECTRONICS

CODE IDENT DATA BASE A	C	DWG NO	REV C
LOC. 7PC3	SHEET 70	CROSS REF NO 00308	

PART B

6-141



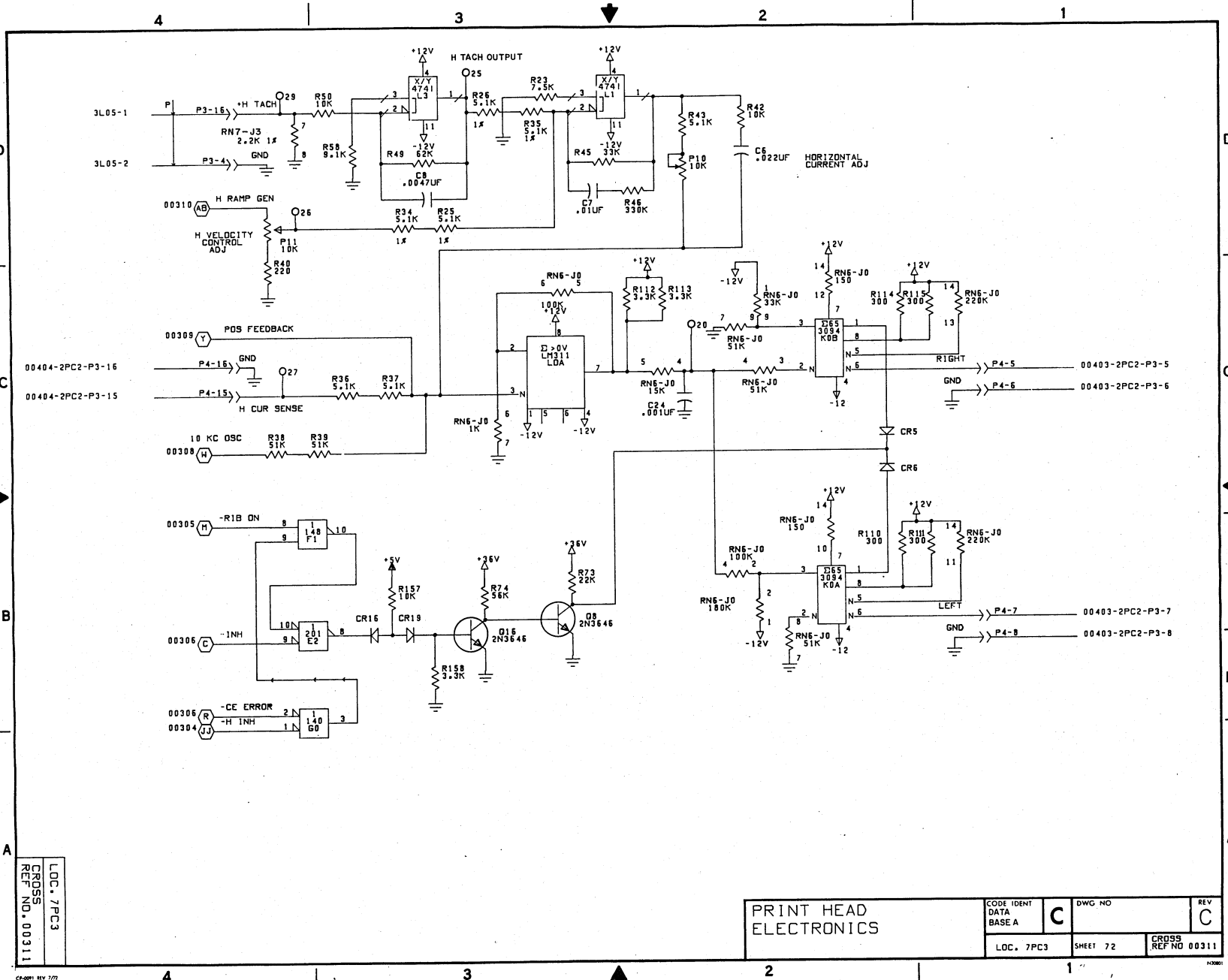
LOC. 7PC3
 CROSS REF. NO. 00310

PRINT HEAD ELECTRONICS

CODE IDENT DATA BASE A	C	DWG NO	REV D
LOC. 7PC3	SHEET 71	CROSS REF NO 00310	

PART B

6-142



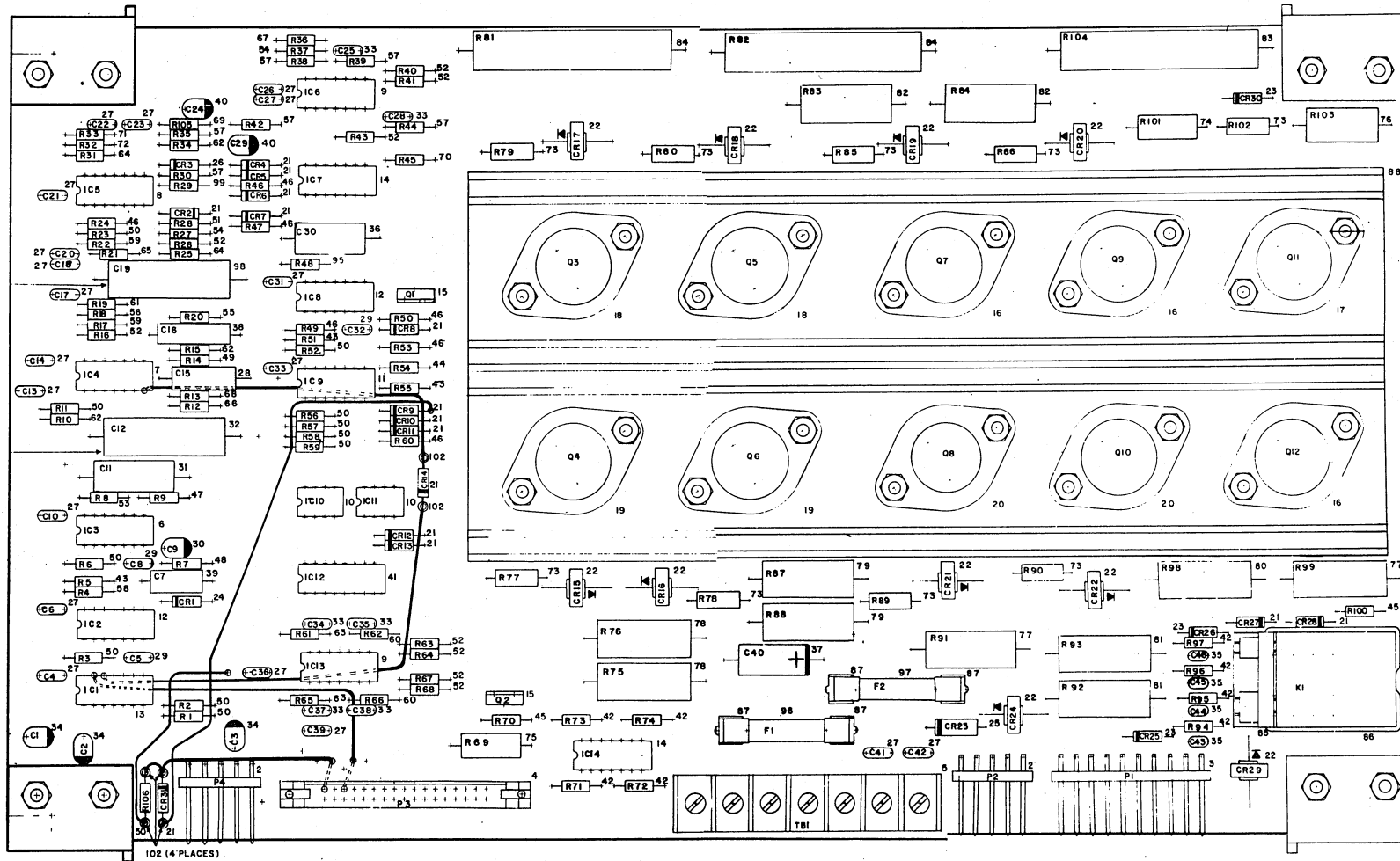
LOC. 7PC3
 CROSS REF. NO. 00311

PRINT HEAD ELECTRONICS

CODE IDENT DATA BASE A	C	DWG NO	REV C
LOC. 7PC3	SHEET 72	CROSS REF NO 00311	

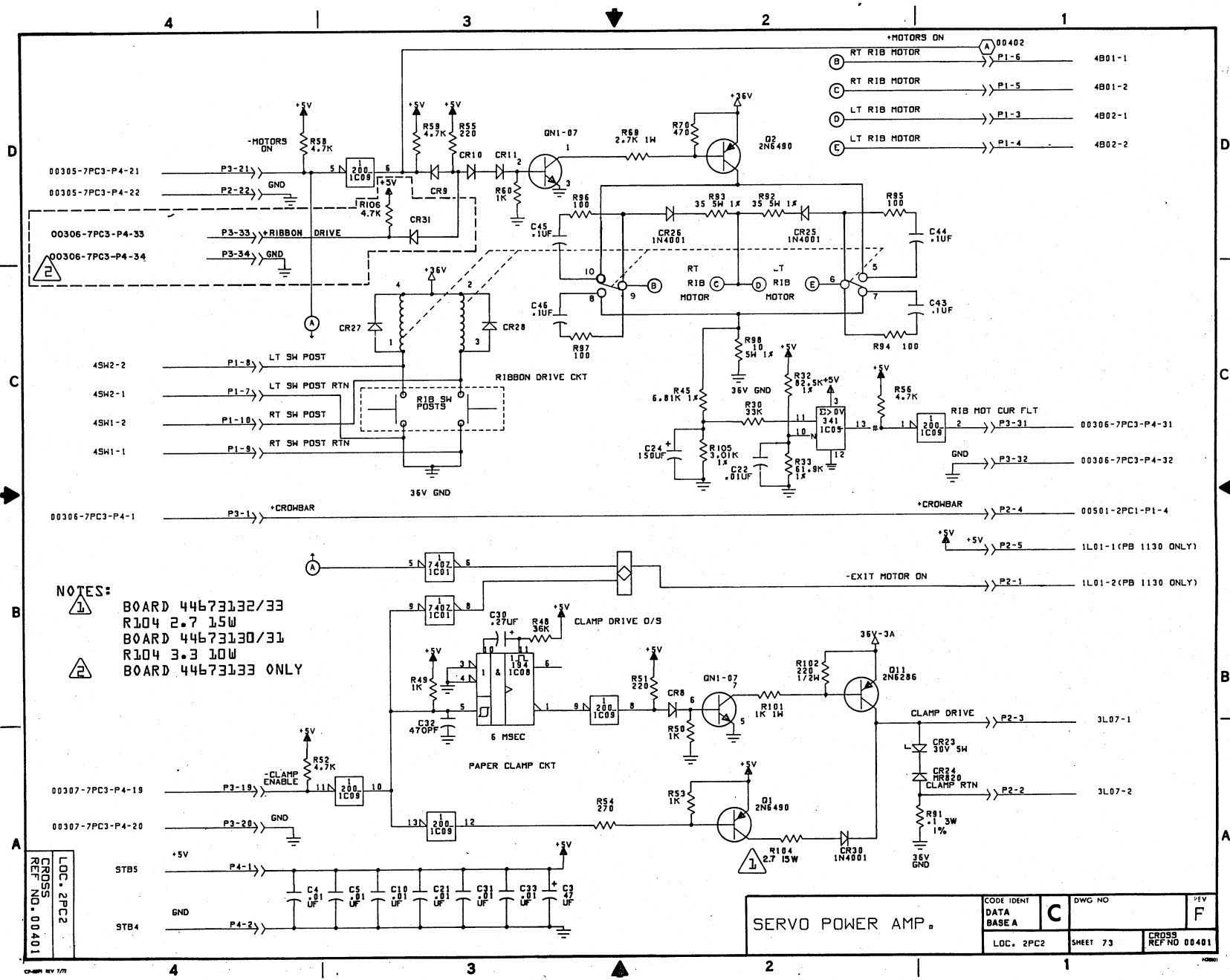
PART B

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PART B

SERVO POWER AMPLIFIER



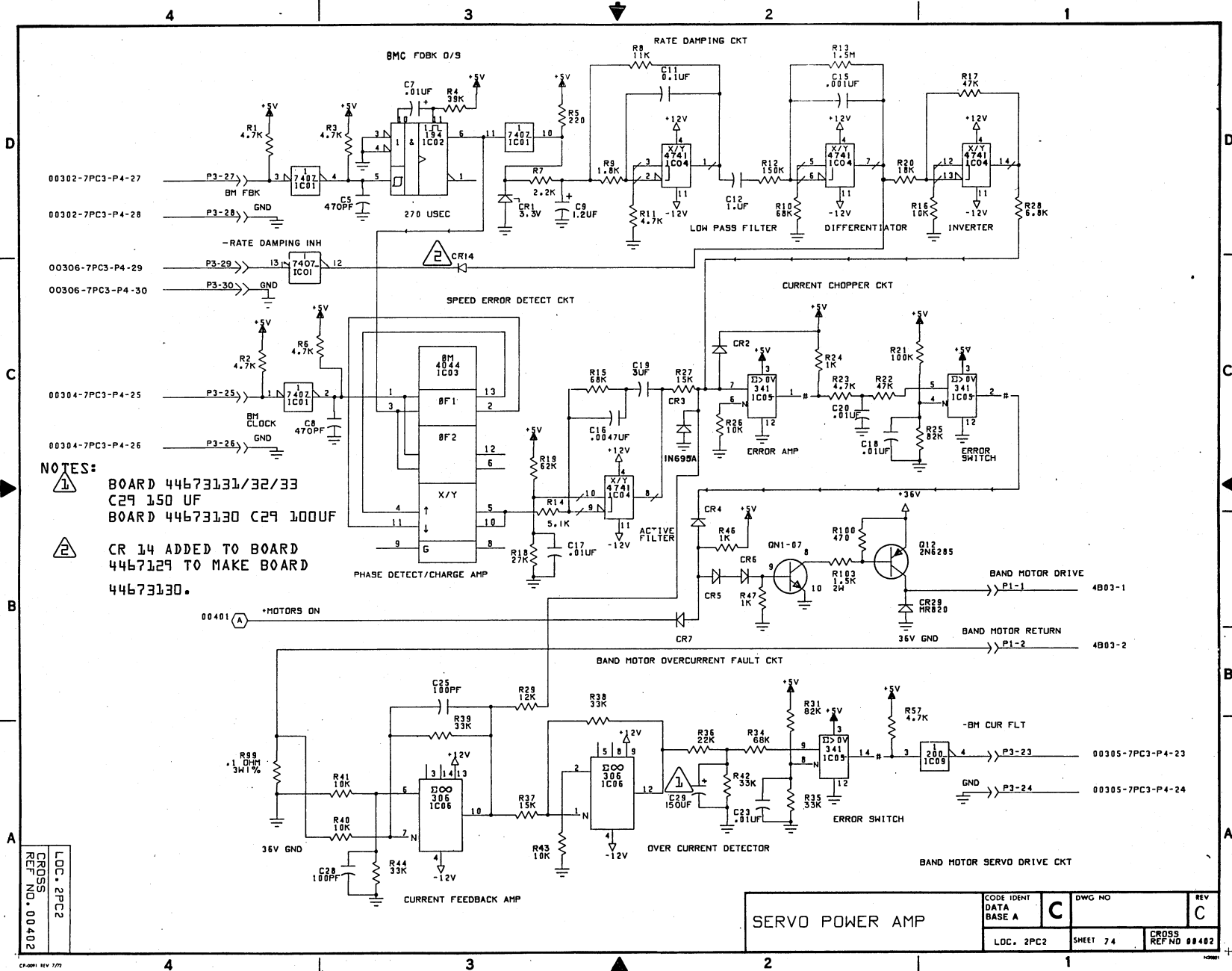
NOTES:
 ⚠ R104 2.7 1.5W
 BOARD 44673132/33
 BOARD 44673130/31
 R104 3.3 10W
 BOARD 44673133 ONLY

LOC. 2PC2
 CROSS REF. NO. 00401

SERVO POWER AMP.		CODE IDENT DATA BASE A	C	DWG NO	REV F
		LOC. 2PC2		SHEET 73	CROSS REF NO 00401

PART B

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NOTES:

- BOARD 44673131/32/33
C29 150 UF
BOARD 44673130 C29 100UF
- CR 14 ADDED TO BOARD
44673129 TO MAKE BOARD
44673130.

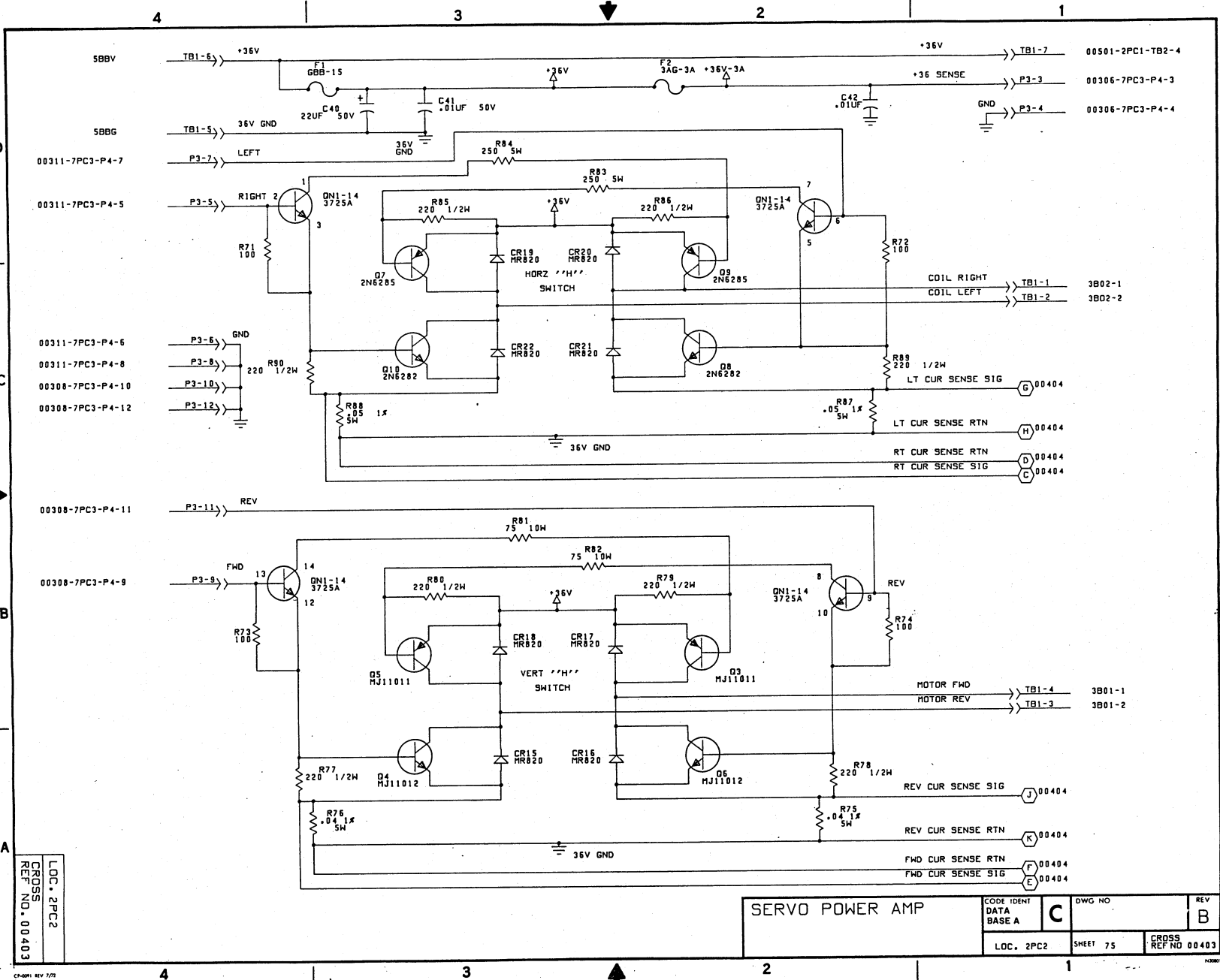
LOC. 2PC2
CROSS
REF. NO. 00402

SERVO POWER AMP

CODE IDENT DATA BASE A	C	DWG NO	REV C
LOC. 2PC2	SHEET 74	CROSS REF. NO. 00402	

PART
B

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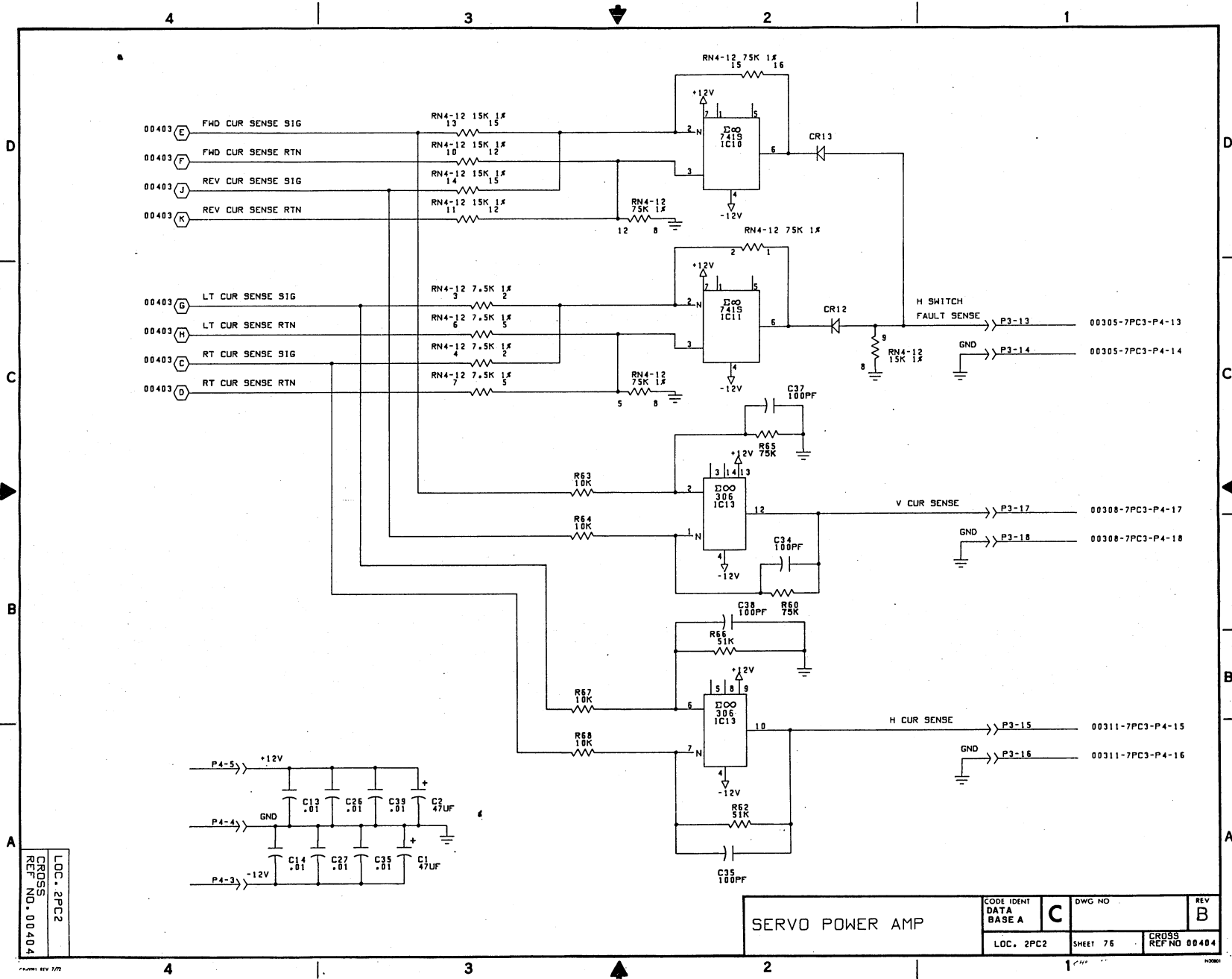
LOC. 2PC2
CROSS
REF NO. 00403

SERVO POWER AMP

CODE IDENT DATA BASE A	C	DWG NO	REV B
LOC. 2PC2	SHEET 75	CROSS REF NO 00403	

PART B

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LOC. 2PC2
 CROSS REF. NO. 00404

SERVO POWER AMP

CODE IDENT DATA BASE A	C	DWG NO	REV B
LOC. 2PC2	SHEET 76	CROSS REF NO 00404	

PART
B

UNIQUE CDC LOGIC

UNIQUE LOGIC

These printers include some standard and some unique features above and beyond the common printer covered in this manual. This section contains the unique logic to be used in conjunction with the common logic.

CONTENTS

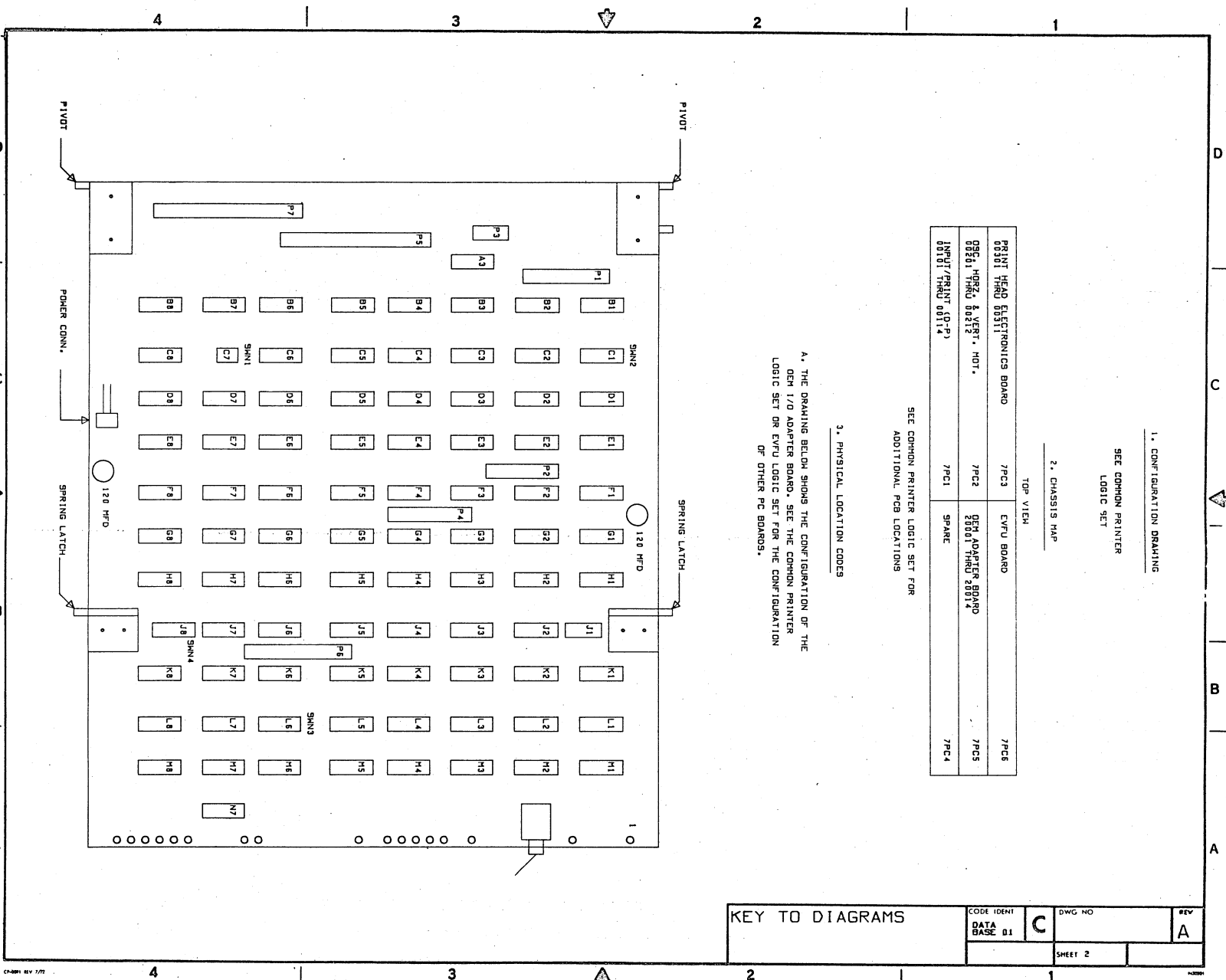
<u>Description</u>	<u>Page</u>
UNIQUE CDC LOGIC	7-1
LOGIC SET	7-3
Contents	7-3
Key to Diagrams	7-4
Block Diagrams	7-10
Timing Diagrams	7-12
Control Panel	7-17
Interface Board	7-18
I/O Connector (Short Line Drivers)	7-32
I/O Connector (Long Line Drivers)	7-33

BOARD IDENTIFICATION

<u>LOCATION</u>	<u>PART NUMBER</u>	<u>OLD NUMBER</u>
7PC5	*44675721	44674997 *44672593

*With Data Strobe Delay option

SHEET NO.	CROSS REF NO.	MODULE LOCATION	REV	LOGIC DIAGRAM TITLE
1			A	LOGIC DIAGRAM CONTENTS SHEET
2			A	KEY TO DIAGRAMS
3			A	KEY TO DIAGRAMS
4			A	KEY TO DIAGRAMS
5			A	KEY TO DIAGRAMS
6			A	KEY TO DIAGRAMS
7			A	KEY TO DIAGRAMS
8			A	BLOCK DIAGRAM
9			A	BLOCK DIAGRAM
10			A	TIMING DIAGRAM
11			A	TIMING DIAGRAM
12			A	TIMING DIAGRAM
13			A	TIMING DIAGRAM
14			A	TIMING DIAGRAM
15	00701	8PC1	A	TIMING DIAGRAM
16	20001	7PC5	A	CONTROL PANEL
17	20002	7PC5	A	DEM INTERFACE
18	20003	7PC5	A	DEM INTERFACE
19	20004	7PC5	A	DEM INTERFACE
20	20005	7PC5	A	DEM INTERFACE
21	20006	7PC5	A	DEM INTERFACE
22	20007	7PC5	A	DEM INTERFACE
23	20008	7PC5	A	DEM INTERFACE
24	20009	7PC5	A	DEM INTERFACE
25	20010	7PC5	A	DEM INTERFACE
26	20011	7PC5	A	DEM INTERFACE
27	20012	7PC5	A	DEM INTERFACE
28	20013	7PC5	A	DEM INTERFACE
29	20014	7PC5	A	DEM INTERFACE
30	20101	8PC1	A	I/O CONNECTOR BOARD (SHORT LINE)
31	20102	8PC1	A	I/O CONNECTOR BOARD (LONG LINE)



TOP VIEW	
PRINT HEAD ELECTRONICS BOARD 00301 THRU 00311	7PC3
05A1 HORIZ. & VERT. HOT. 05B1 THRU 0021E	7PC2
INPUT/PRINT (O-P) 00101 THRU 00114	7PC1
GEN ADAPTER BOARD E0001 THRU E0019	7PC5
GEN ADAPTER BOARD E0001 THRU E0019	7PC4
	7PC6

1. CONFIGURATION DRAWING
SEE COMMON PRINTER
LOGIC SET

2. CHASSIS MAP

SEE COMMON PRINTER LOGIC SET FOR
ADDITIONAL PCB LOCATIONS

3. PHYSICAL LOCATION CODES

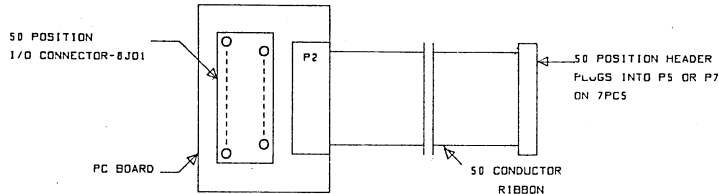
A1. THE DRAWING BELOW SHOWS THE CONFIGURATION OF THE
GEN I/O ADAPTER BOARD. SEE THE COMMON PRINTER
LOGIC SET OR EVFU LOGIC SET FOR THE CONFIGURATION
OF OTHER PC BOARDS.

KEY TO DIAGRAMS

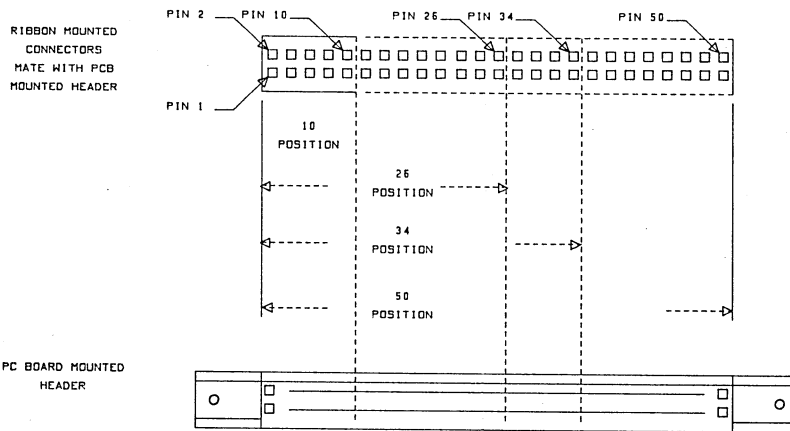
CODE IDENT	DWG NO	REV
DATA BASE	C	A
01	SHEET 2	

3. PHYSICAL LOCATION CODES CON'T

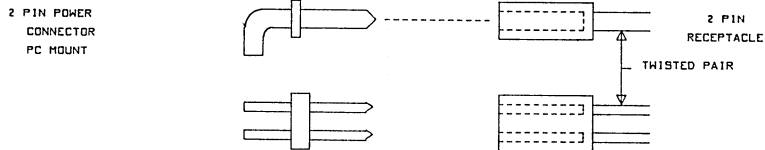
B. I/O CONNECTOR & PC BOARD



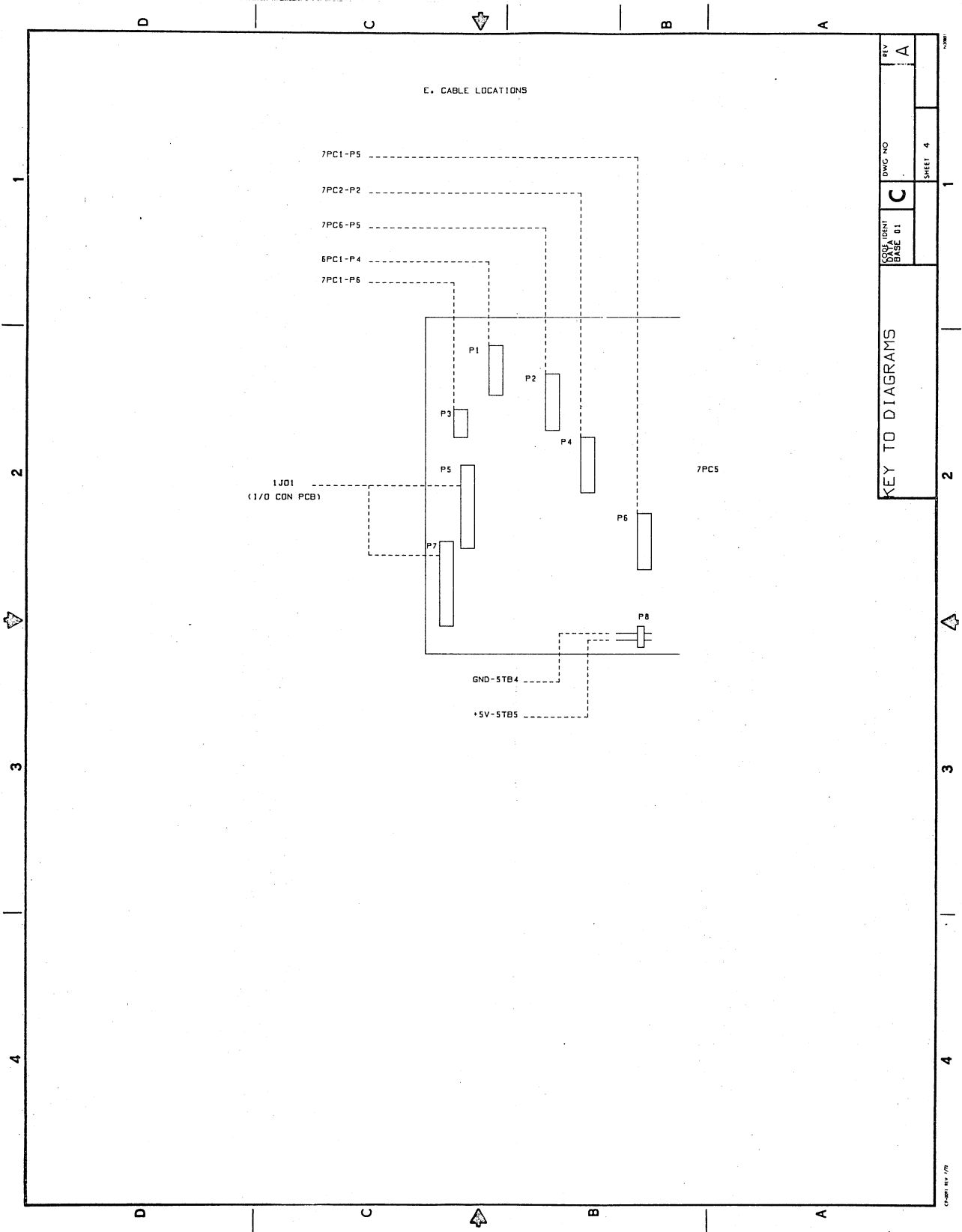
C. FLAT CABLE CONNECTORS



D. POWER CONNECTORS



CORE IDENT DATA BASE 01	C	DWG NO	SHEET 3
		A	
KEY TO DIAGRAMS			



4. SPECIAL NOMENCLATURE

THE ABBREVIATIONS LISTED BELOW ARE UNIQUE TO THIS ADAPTER
OR ARE NOT COMMONLY USED IN STANDARD NOMENCLATURE.

ACK	* ACKNOWLEDGE	MC	* MASTER CLEAR
BC	* BUFFER CLEAR	HUX	* MULTIPLEXER
BOF	* BOTTOM OF FORM	NC	* NO CONNECTION
BUF	* BUFFER	N.C.	* NORMALLY CLOSED
C.	* COMMON	N.O.	* NORMALLY OPEN
CC	* CONTROL CODE	ODP	* OUT OF PAPER
CHAR	* CHARACTER	D/S	* ONE SHOT
CLK	* CLOCK	PBS	* BAND PRINTER
CLR	* CLEAR	RCV	* RECEIVED
COMP	* COMPRESSED	RCVRS	* RECEIVERS
CNTR	* COUNTER	RDY	* READY
CTRL	* CONTROL	REG	* REGISTER
DBX	* DATA BIT X	REQ	* REQUEST
DET	* DETECT	RNX	* RESISTOR NETWORK X
DLY	* DELAY	RST	* RESET
ENAB	* ENABLE	RTN	* RETURN
EVFU	* ELECTRONIC VERTICAL FORMAT UNIT	SEL	* SELECT LINE
EXT	* EXTERNAL	SEQ	* SEQUENCING
FF	* FLIP-FLOP	SR	* SHIFT REGISTER
FMT	* FORMAT	SS	* SINGLE SPACE
GND	* GROUND	STB	* STROBE
INH	* INHIBIT	SW	* SWITCH
I/O	* INPUT/OUTPUT	SWX-Y	* DIP SWITCH X-SECTION Y
LC	* LINE COUNTER	TP	* TEST PRINT
LD	* LOAD	TX	* TIMING PULSE X
LF	* LINE FEED	VFU	* VERTICAL FORMAT UNIT
LR	* LINE READY	XMTR	* TRANSMITTER

5. LOGIC LEVELS

HIGH OUTPUT VOLTAGE = 5.5V MAX/2.4V MIN
LOW OUTPUT VOLTAGE = 0.4V MAX/0V MIN

HIGH INPUT VOLTAGE = 5.5V MAX/2.0V MIN
LOW INPUT VOLTAGE = 0.8V MAX/0V MIN

6. POWER SUPPLY CONNECTIONS

ALL STANDARD IC PACKAGES HAVE THE FOLLOWING POWER SUPPLY CONNECTIONS
WHICH ARE NOT SHOWN ON THE LOGIC ELEMENT SYMBOL

14 PIN DEVICE = GROUND ON PIN 7 AND +5V ON PIN 14
16 PIN DEVICE = GROUND ON PIN 8 AND +5V ON PIN 16

ALL NON-STANDARD IC PACKAGES WILL HAVE THEIR NON-STANDARD
GROUND AND SUPPLY CONNECTIONS SHOWN AS PART OF THE LOGIC ELEMENT SYMBOL

7. REPETITIVE DETAILS

THE LOGIC PRINTED CIRCUIT CARD WILL HAVE FILTER CAPACITORS GENERALLY LOCATED
AS SHOWN ON THE MODULE DRAWING (SHEET 2) PER THE FOLLOWING GUIDE-

DECOUPLING CAPACITORS (120 MFD) LOCATED ALONG THE
UPPER AND LOWER EDGE OF THE PC BOARD

HIGH FREQUENCY CAPACITORS (0.01 MFD) LOCATED
BETWEEN USED IC LOCATIONS (APPROX. 1 CAP PER 3 IC'S)

THESE CAPACITORS ARE NOT SHOWN ON THE LOGIC DRAWINGS

REV	A
DWG NO	
KEY TO DIAGRAMS	
REV	C
BASE 01	
SHEET 5	

8. GENERAL NOTES

- A. DUE TO THE LARGE NUMBER OF CIRCUITS LOCATED ON EACH MODULE, MORE THAN ONE SHEET IS USUALLY REQUIRED FOR EACH MODULE. THE BOARD'S FUNCTIONAL NAME, CIRCUIT MODULE LOCATION, AND CROSS REFERENCE NUMBER APPEAR ON EACH SHEET. EACH SYMBOL IN THE DIAGRAMS REFLECTS THE LOGIC FUNCTION PERFORMED. COMPONENT TYPE OR ELEMENT IDENTIFIER, AND LOCATION OF ALL OR PART OF AN INTEGRATED CIRCUIT PACKAGE OR DISCREET COMPONENT(S). FOR DETAILED INFORMATION ON SYMBOLS, PART NUMBER, AND PACKAGE TYPE REFER TO CIRCUIT DESCRIPTIONS.
- B. CERTAIN OPTIONAL FUNCTIONS ON THE OEM ADAPTER ARE PROGRAMMED BY DUAL-IN-LINE SWITCH MODULES. THE TABLE BELOW SHOWS THE FUNCTIONS WHICH CAN BE PROGRAMMED, AND THE REQUIRED SWITCH SETTINGS. NOTE THAT THE PHYSICAL SWITCHES MAY BE LABELED EITHER ON/OFF OR OPEN/CLOSED, WITH ON = CLOSED AND OFF = OPEN.

FUNCTION	SWITCH SETTINGS REQUIRED AND NOTES			CROSS REF. NO.
6 DATA BIT I/O	SW1-4 OFF			20001
7 DATA BIT I/O	SW1-4 ON			20001
NO PARITY CHECKING	SW1-1 OFF	SW1-2 OFF	SW1-3 OFF	20001 20007
ODD PARITY CHECKING	SW1-1 ON	SW1-2 ON	SW1-3 OFF	20001 20007
EVEN PARITY CHECKING	SW1-1 ON	SW1-2 OFF	SW1-3 ON	20001 20007
NO VFU CHANNELS	SW3-1 OFF SW3-3 OFF	SW3-4 OFF	SW3-7 ON	20003 20004 20005
4 VFU CHANNELS	SW3-1 ON SW3-3 OFF	SW3-4 OFF	SW3-7 OFF	20003 20004 20005
8 VFU CHANNELS	SW3-1 ON SW3-3 OFF	SW3-4 ON	SW3-7 OFF	20003 20004 20005
12 VFU CHANNELS	SW3-1 ON SW3-3 ON	SW3-4 ON	SW3-7 OFF	20003 20004 20005
2 BIT LINE COUNTER	SW3-2 OFF	SW3-5 OFF		20005
4 BIT LINE COUNTER	SW3-2 OFF	SW3-5 ON		20005
6 BIT LINE COUNTER	SW3-2 ON	SW3-5 ON		20005
	NOTE THAT IF ANY VFU OPTION IS SELECTED TOGETHER WITH THE 6 BIT LINE COUNTER, THE 7 DATA BIT I/O MUST BE USED			
NO CONTROL PANEL TEST MODE SWITCH	SW2-1 ON			20013
CONTROL PANEL TEST MODE SWITCH	SW2-1 OFF			20013
TEST MODE PRINTED CHARACTER	SW4-7 ON SW4-6 OFF SW4-5 OFF SW4-4 ON SW4-3 ON SW4-2 OFF SW4-1 ON	NOTE THAT STANDARD TEST PRINT CHARACTER IS AN 'M' (OCTAL 115 ASCII). OTHER CODES MAY BE PROGRAMMED WITH A LOGIC 1 = ON AND A LOGIC 0 = OFF.		20004
NO CONTROL PANEL SINGLE SPACE SWITCH	SW2-9 ON			20006
CONTROL PANEL SINGLE SPACE SWITCH	SW2-9 OFF			20006
NO OUT OF PAPER STATUS	SW2-6 OFF			20006
OUT OF PAPER STATUS	SW2-6 ON			20006
NO BUFFER OVERFLOW STATUS	SW2-5 OFF			20006
BUFFER OVERFLOW STATUS	SW2-5 ON			20006
MAXIMUM LINE LENGTH 132 ONLY	SW3-8 OFF	SW3-9 ON		20011
MAXIMUM LINE LENGTH 136 ONLY	SW3-8 OFF	SW3-9 OFF		20011
MAXIMUM LINE LENGTH 132 STD. PITCH, 198 COMP. PITCH.	SW3-8 ON	SW3-9 ON		20011
MAXIMUM LINE LENGTH 136 STD. PITCH, 204 COMP. PITCH.	SW3-8 ON	SW3-9 OFF		20011
NO COMPRESSED PITCH STATUS	SW2-4 OFF			20008

KEY TO DIAGRAMS

REF. A

DWG. NO. C

DATA BASE 01

SHEET 6

8. GENERAL NOTES CONTINUED

FUNCTION	SWITCH SETTINGS REQUIRED AND NOTES	CROSS REF NO
COMPRESSED PITCH STATUS	SW2-4 ON	20008
NO BAND DETECT STATUS	SW2-2 OFF SW2-3 OFF	20008
BAND DETECT STATUS	SW2-2 ON SW2-3 ON	20008
CHARACTER REQUEST/ DATA STROBE HANDSHAKING	SW2-8 ON	20009
INFORMATION READY/ OUTPUT RESUME HANDSHAKING	SW2-8 OFF	20009
STANDARD DATA SEQUENCING	SW2-7 OFF	20010
OPTIONAL DATA SEQUENCING	SW2-7 ON NOTE THAT OPTIONAL DATA SEQUENCING CAN NOT BE USED WITH PRE-PRINT PAPER MOTION	20010
POST PRINT PAPER MOTION	SW3-5 ON	20010
PRE-PRINT PAPER MOTION	SW3-6 OFF NOTE THAT PRE-PRINT PAPER MOTION CAN NOT BE USED WITH OPTIONAL DATA SEQUENCING	20010

9. IDENTIFIER LIST

ELEMENT IDENTIFIER	CLOSEST GENERIC EQUIVALENT	DESCRIPTION
140	7400	QUAD 2 INPUT NAND
141	7410	TRIPLE 3 INPUT NAND
146	7404	HEX INVERTER
148	7402	QUAD 2 INPUT NOR
156	74107	DUAL J-K MASTER/SLAVE FF WITH RESET
158	74161/9316	COUNTER, SYNCHRONOUS 4 BIT BINARY
175	7474	DUAL D-TYPE FF
189	74157/9322	MULTIPLEXER, QUAD 2 INPUT
201	7408	QUAD 2 INPUT AND
208	7420	DUAL 4 INPUT NAND
210	7437	QUAD 2 INPUT NAND BUFFER
213	7411	TRIPLE 3 INPUT AND
224	7427	TRIPLE 3 INPUT NOR
241	7476	DUAL J-K MASTER/SLAVE FF WITH SET AND CLEAR
502	74180	8 BIT PARITY CHECKER
505	74151	MULTIPLEXER, 8 INPUT
520	74175	LATCH, 4 BIT WITH TRUE & COMPLEMENT OUTPUTS
527	74164	SHIFT REGISTER, 8 BIT SERIAL IN, PARALLEL OUT
7414	7414	HEX SCHMITT TRIGGER
7432	7432	QUAD 2 INPUT OR
74221	74221	DUAL MONOSTABLE MULTIVIBRATOR
75453	75453	DRIVER, DUAL OR WITH OPEN COLLECTOR OUTPUTS
8820	8820	DUAL DIFFERENTIAL LINE RECEIVER
8830	8830	DUAL DIFFERENTIAL LINE DRIVER
1M5603	1M5603	READ ONLY MEMORY, 256 X 4

REV A

DWG NO

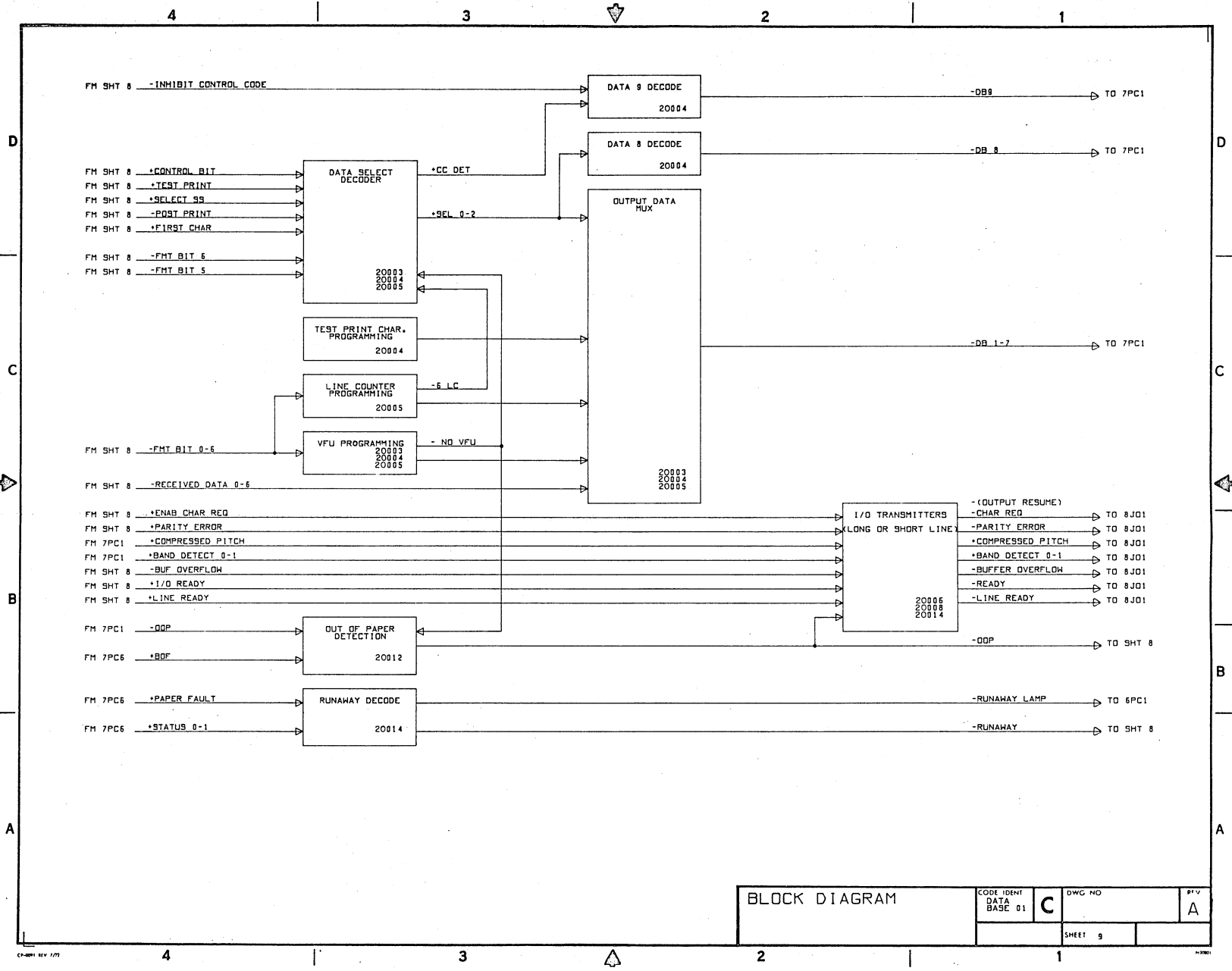
SHEET 7

CODE IDENT DATA BASE 01 C

KEY TO DIAGRAMS

DATE: 11/1/79

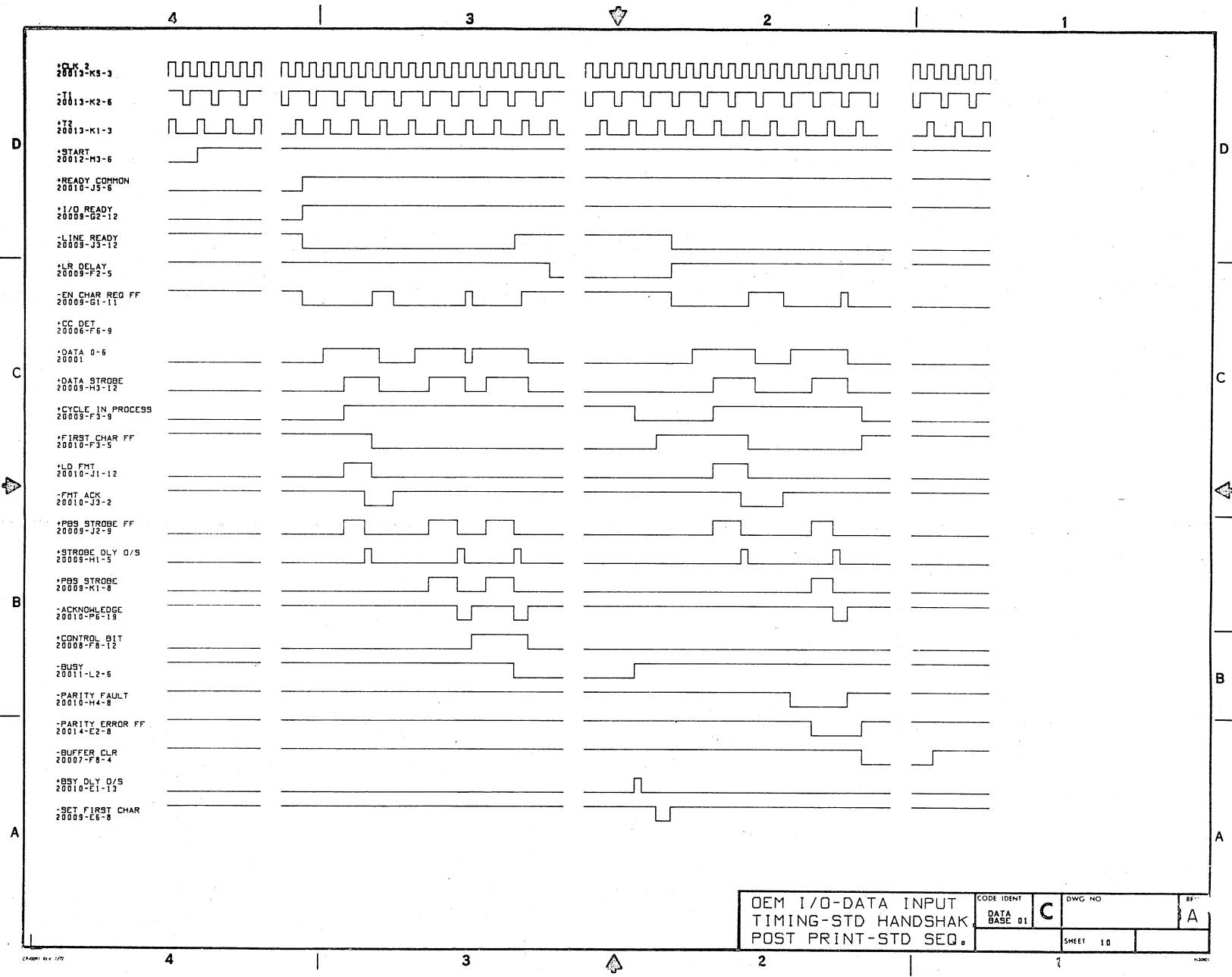
7-11



BLOCK DIAGRAM

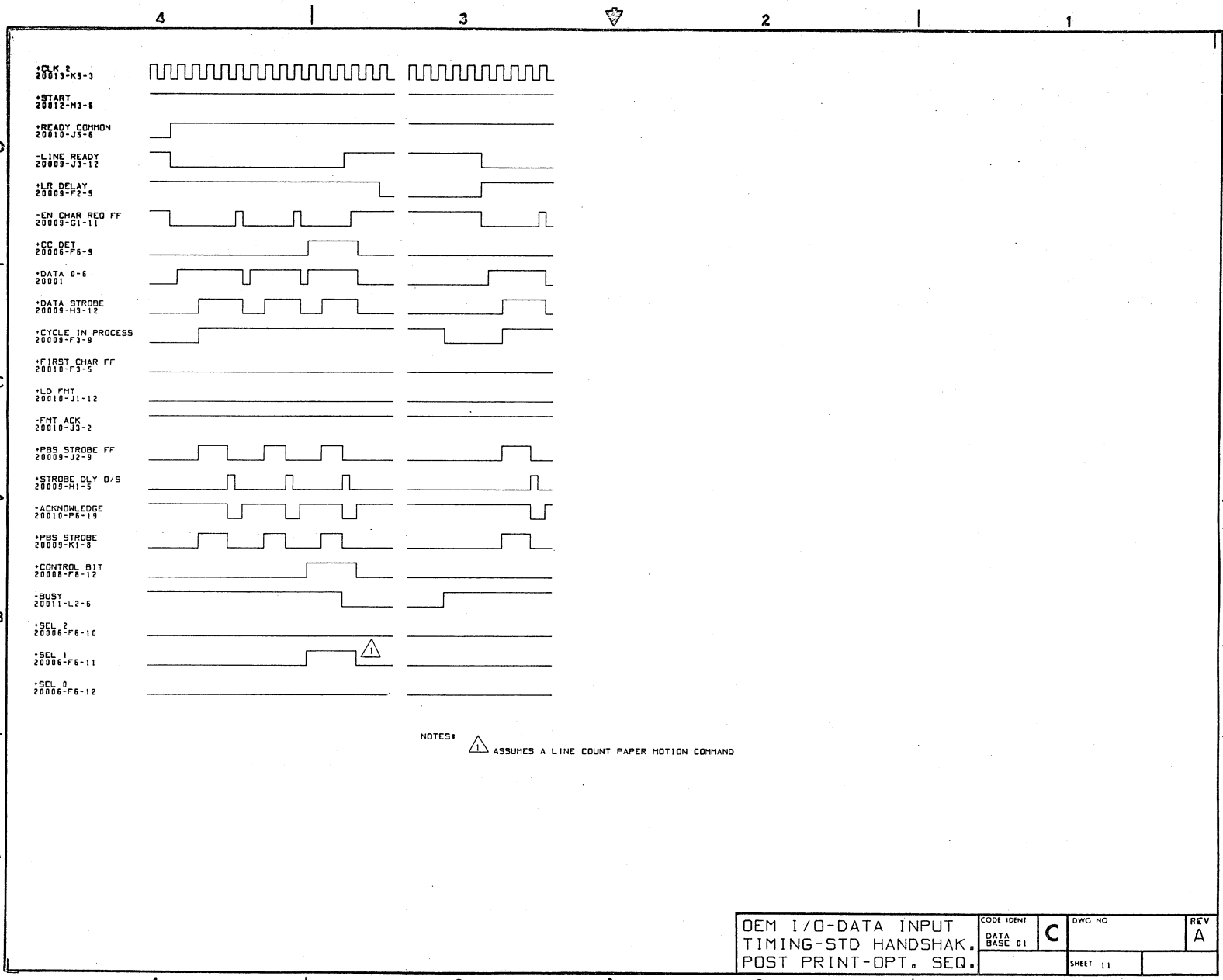
CODE IDENT DATA BASE 01	C	DWG NO	REV A
SHEET 9			


7-12



OEM I/O-DATA INPUT TIMING-STD HANDSHAK POST PRINT-STD SEQ.		CODE IDENT DATA BASE 01	C	DWG NO	REF A
		SHEET 10			

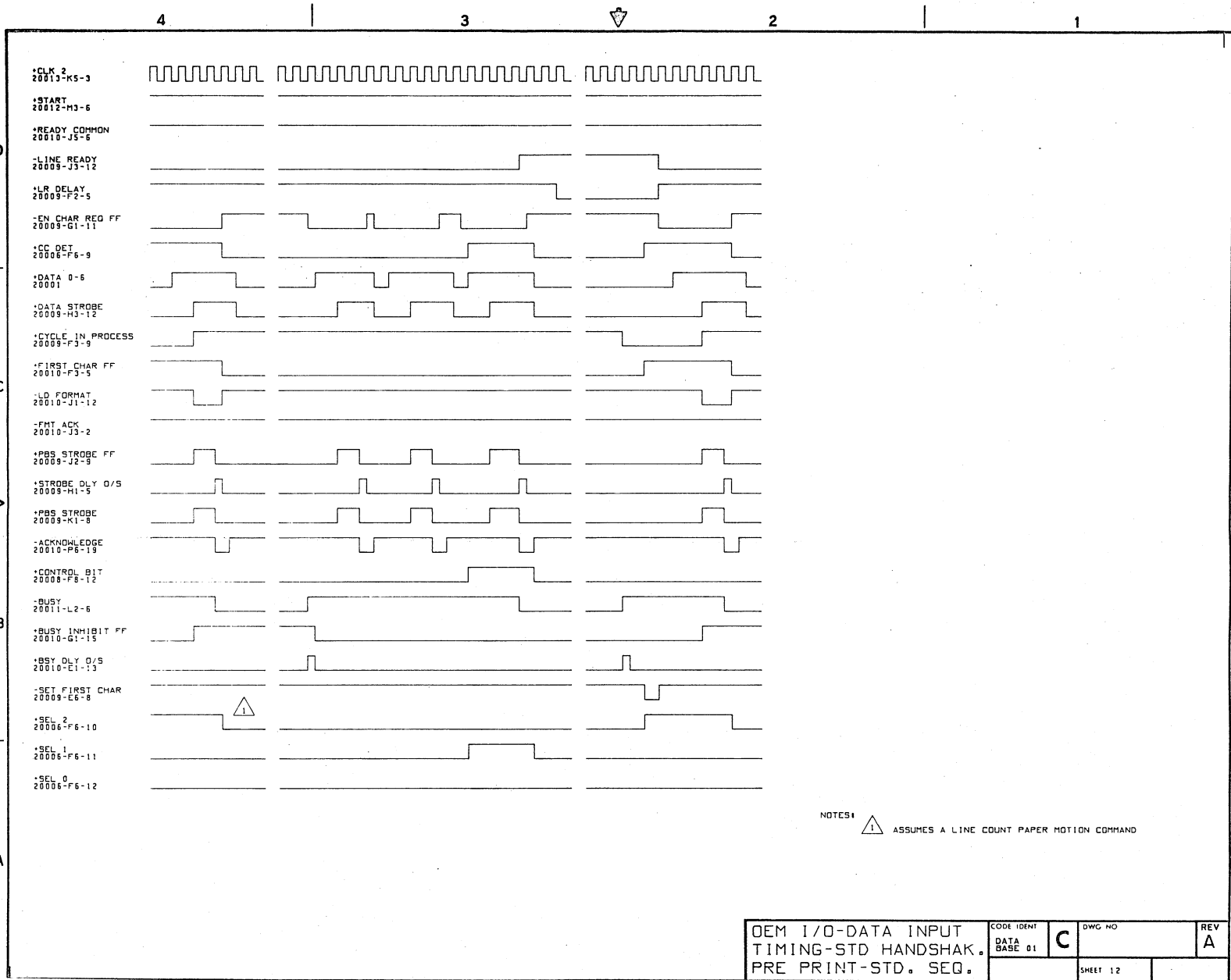
7-13



NOTES:  ASSUMES A LINE COUNT PAPER MOTION COMMAND

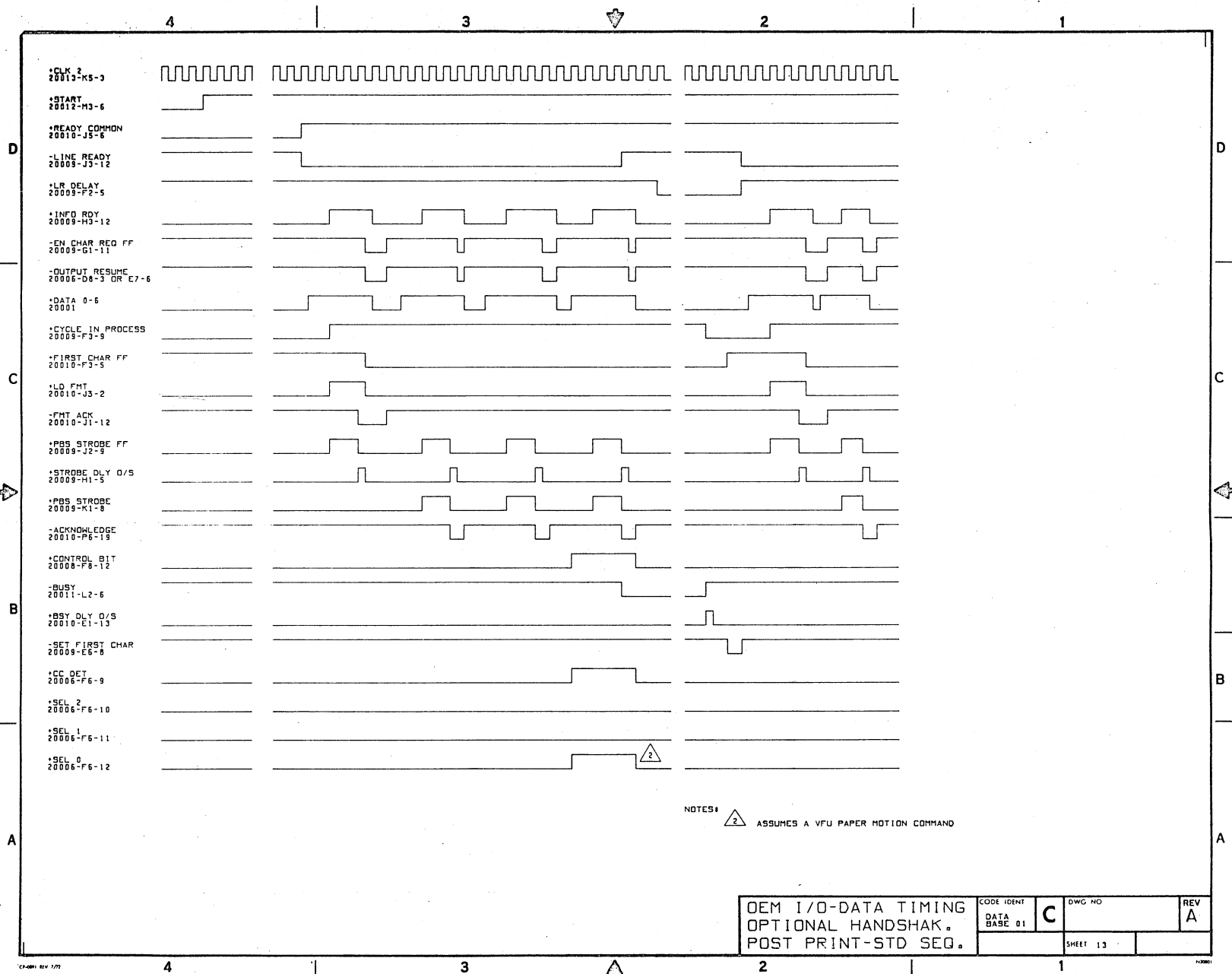
DEM I/O-DATA INPUT TIMING-STD HANDSHAK. POST PRINT-OPT. SEQ.		CODE IDENT DATA BASE 01	C	DWG NO	REV A
			SHEET 11		

7-14



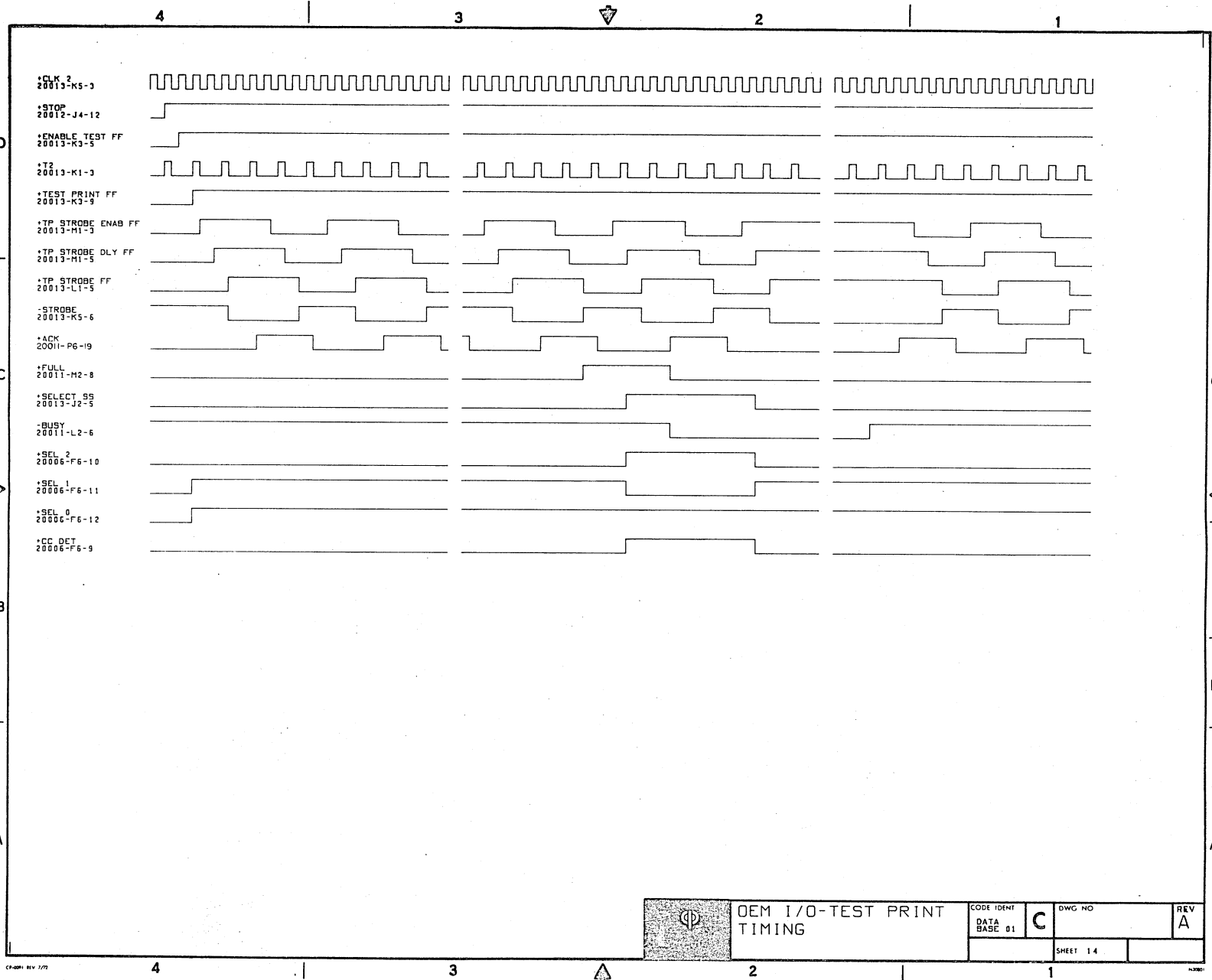
NOTES: ASSUMES A LINE COUNT PAPER MOTION COMMAND


OEM I/O-DATA INPUT TIMING-STD HANDSHAK. PRE PRINT-STD. SEQ.		CODE IDENT DATA BASE 01	C	DWG NO	REV A
				SHEET 12	



DEM I/O-DATA TIMING		CODE IDENT	DWG NO	REV
OPTIONAL HANDSHAK.		DATA BASE 01	C	A
POST PRINT-STD SEQ.			SHEET 13	

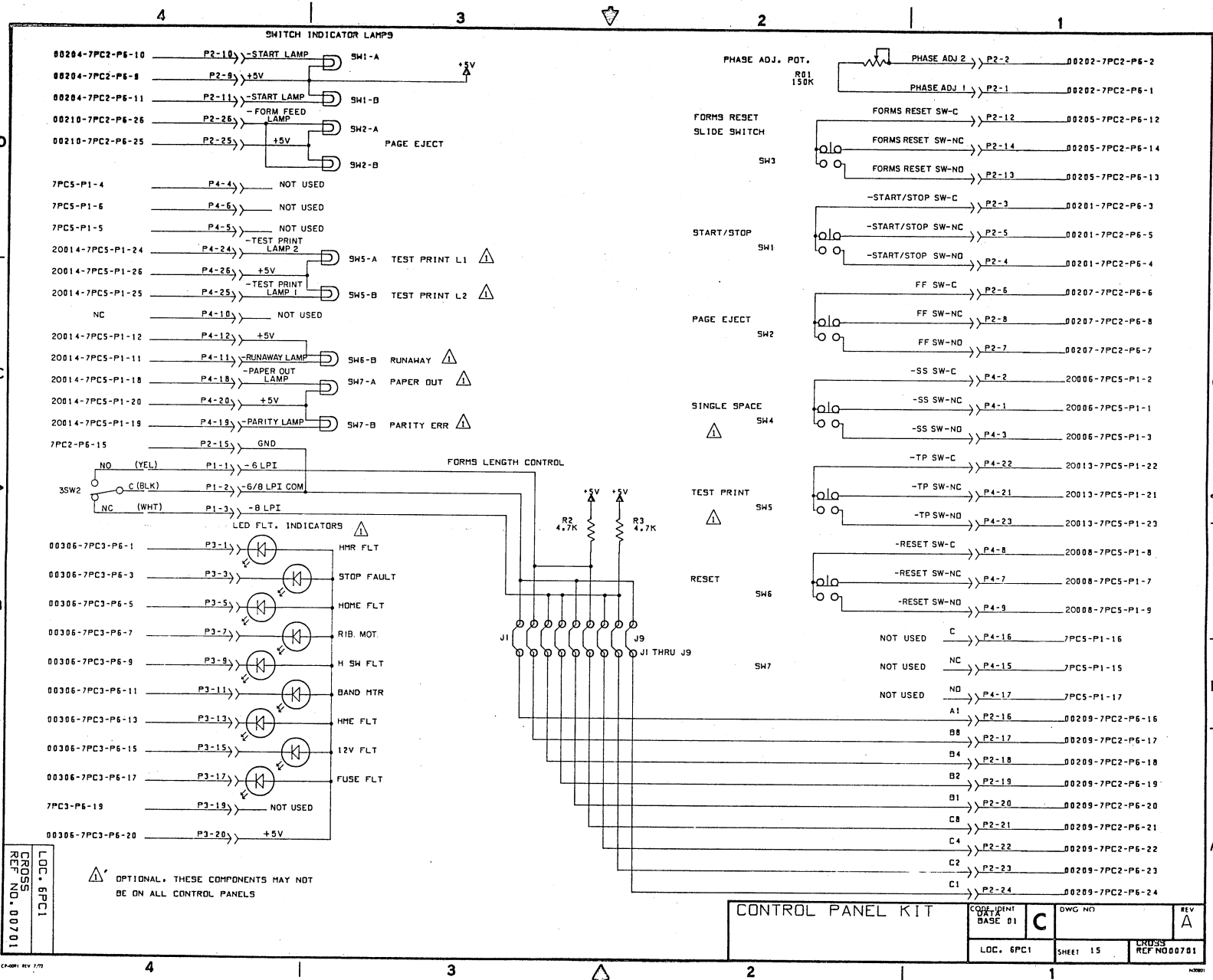
7-16



	OEM I/O-TEST PRINT TIMING		CODE IDENT DATA BASE 01	C	DWG NO	REV A
				SHEET 14		

CD-001 REV 1/72

48001



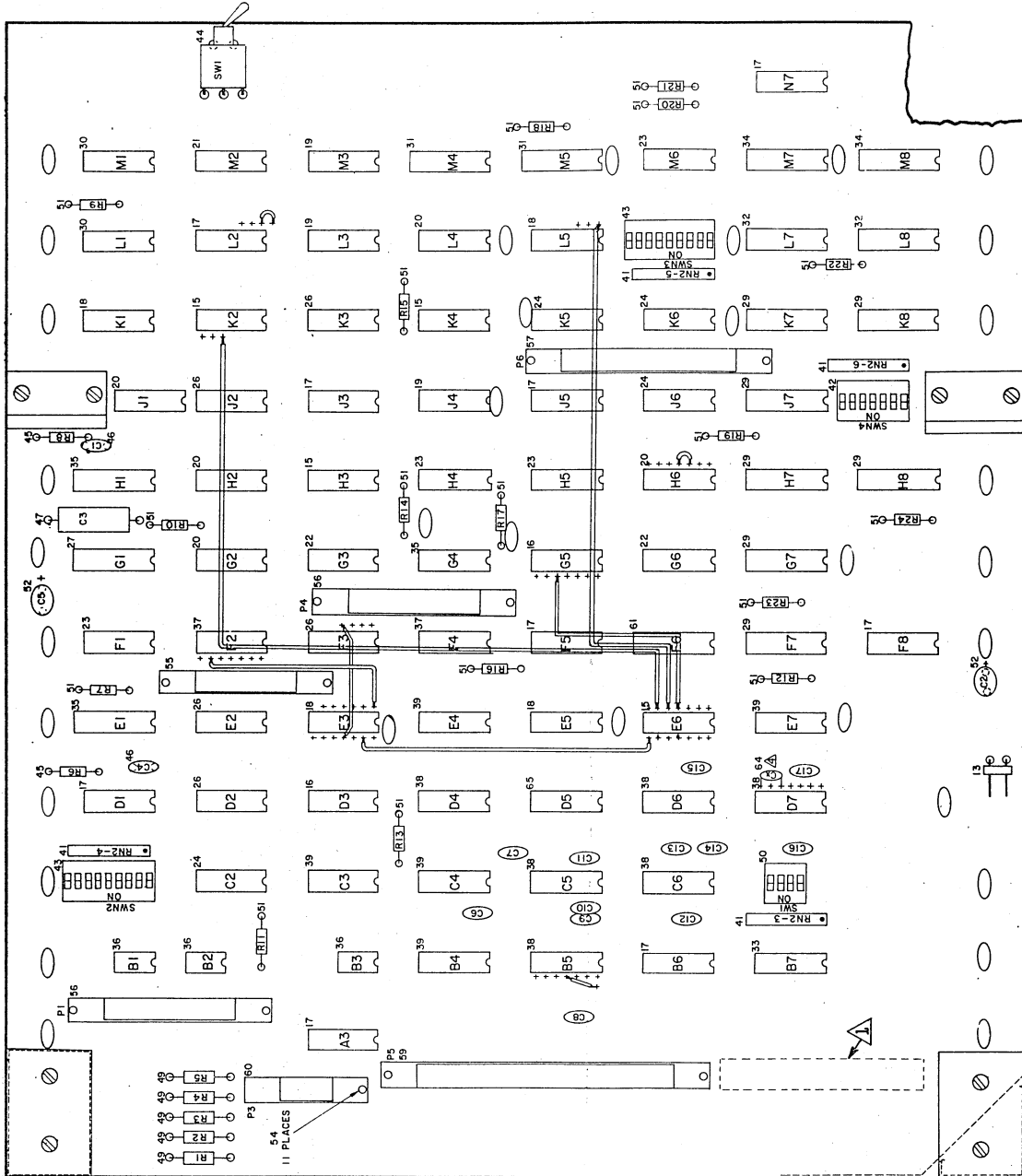
7-17


LOC. 6PC1
CROSS
REF NO. 00701

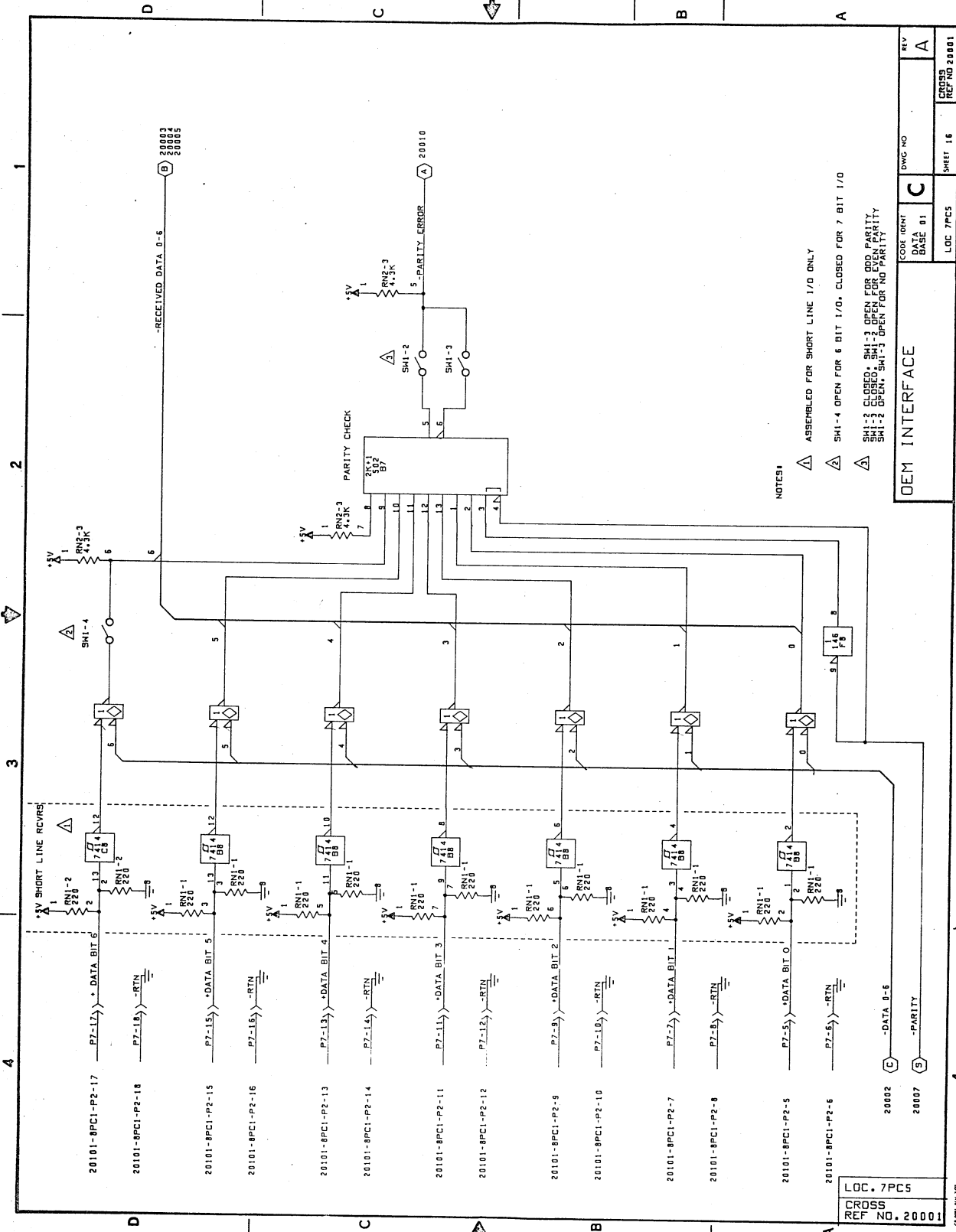
OPTIONAL. THESE COMPONENTS MAY NOT
BE ON ALL CONTROL PANELS

CONTROL PANEL KIT

CONT. PRINT BASE 01	C	DWG NO	REV A
LOC. 6PC1	SHEET 15	CROSS REF NO 00701	



NOTES:
 LABEL

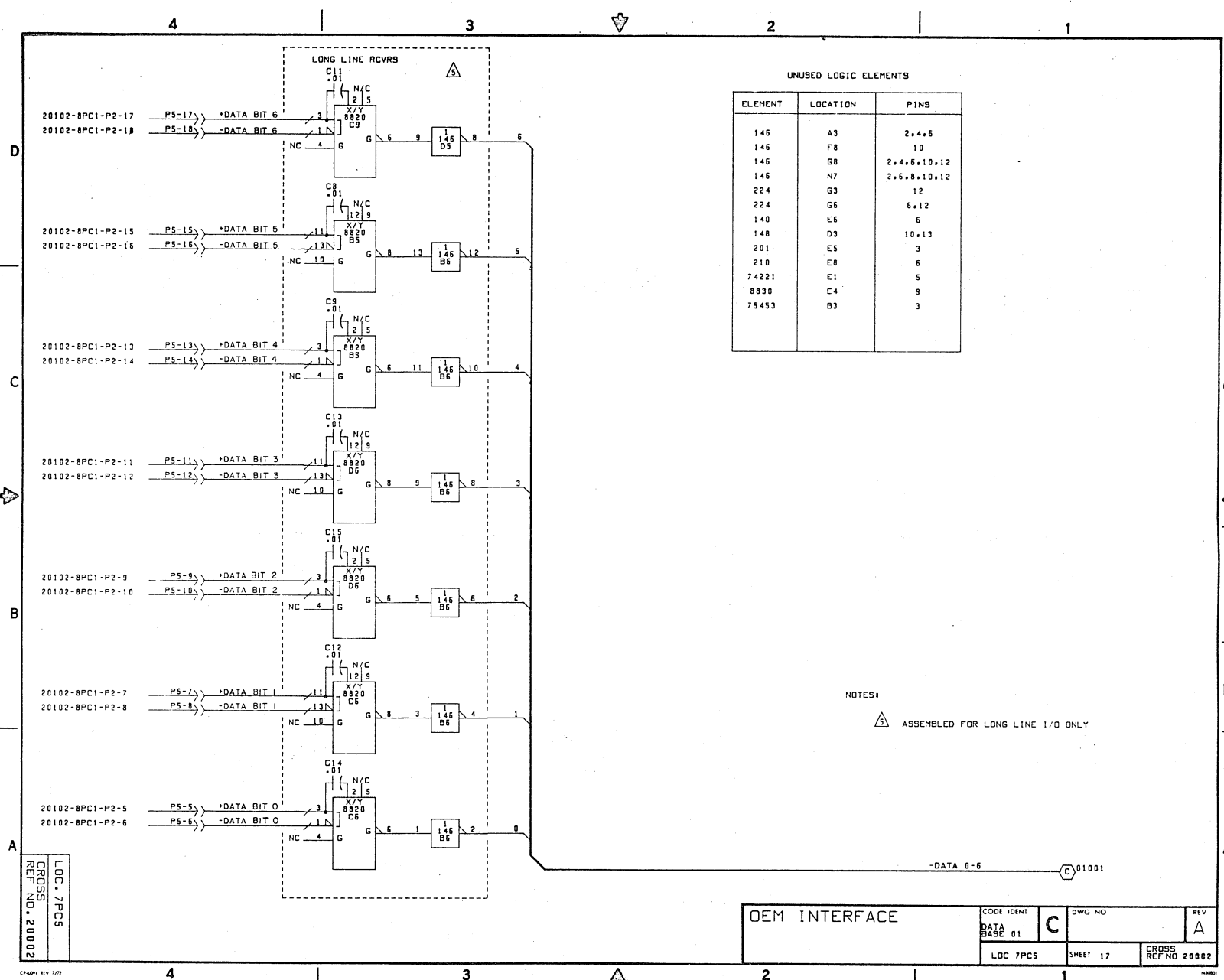


- NOTES:
- ▲ ASSEMBLED FOR SHORT LINE I/O ONLY
 - ▲ SH1-4 OPEN FOR 6 BIT I/O, CLOSED FOR 7 BIT I/O
 - ▲ SH1-5 CLOSED, SH1-2 OPEN FOR ODD PARITY
SH1-5 OPEN, SH1-2 CLOSED FOR EVEN PARITY
SH1-2 OPEN, SH1-3 OPEN FOR NO PARITY

OEM INTERFACE		CODE IDENT	DWG NO	REV
20002	20007	BASE 01	C	A
LOC 7PCS	SHEET 16	CROSS REF NO 20001		

LOC. 7PCS
CROSS REF NO. 20001

7-20



UNUSED LOGIC ELEMENTS

ELEMENT	LOCATION	PINS
146	A3	2,4,6
146	F8	10
146	G8	2,4,6,10,12
146	N7	2,6,8,10,12
224	G3	12
224	G6	6,12
140	E6	6
148	D3	10,13
201	E5	3
210	E8	6
74221	E1	5
8830	E4	9
75453	B3	3

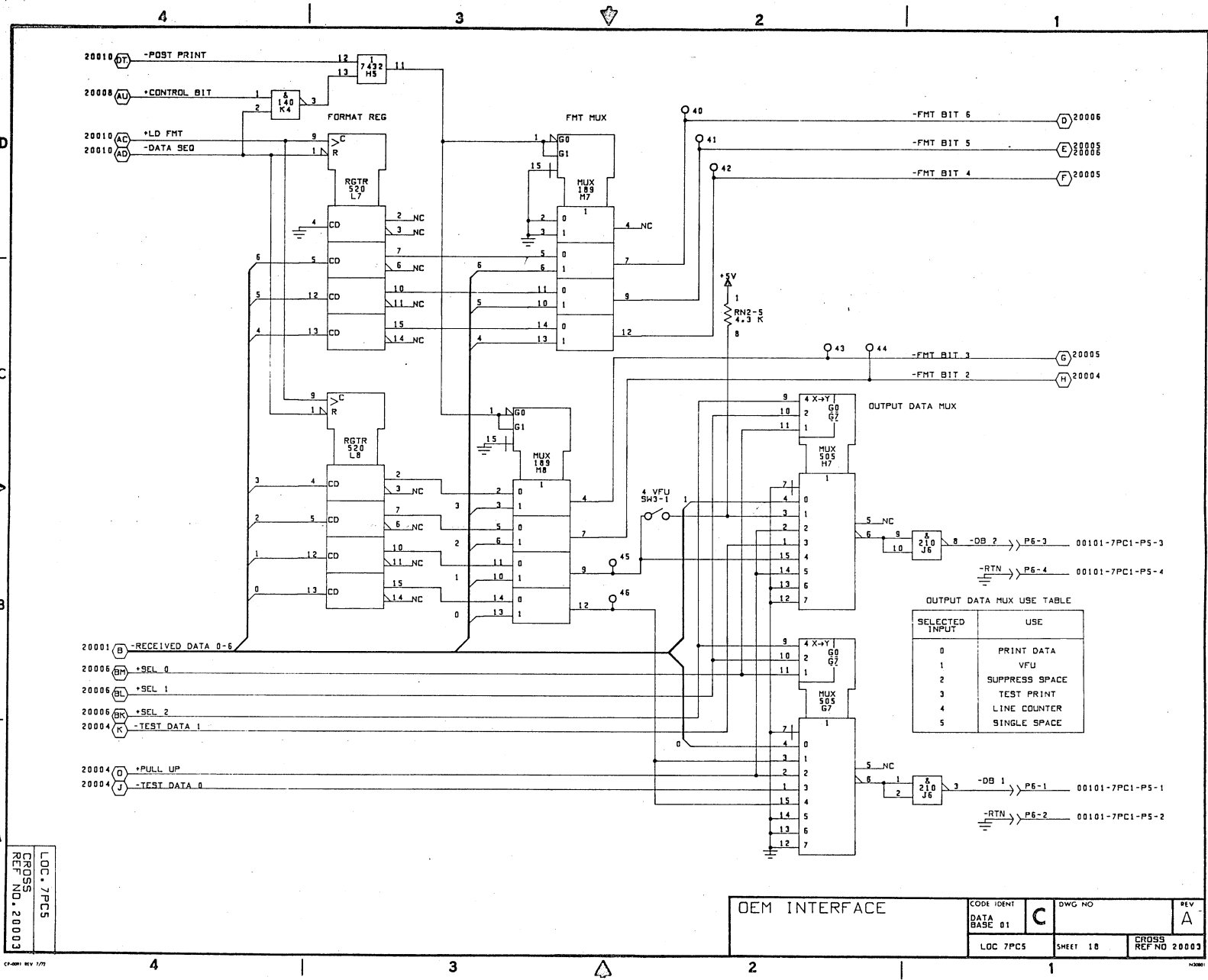
NOTES:
 △ ASSEMBLED FOR LONG LINE I/O ONLY

LOC. 7PCS
 CROSS REF. NO. 20002

OEM INTERFACE

CODE IDENT DATA BASE 01	C	DWG NO.	REV A
LOC 7PCS	SHEET 17	CROSS REF NO 20002	

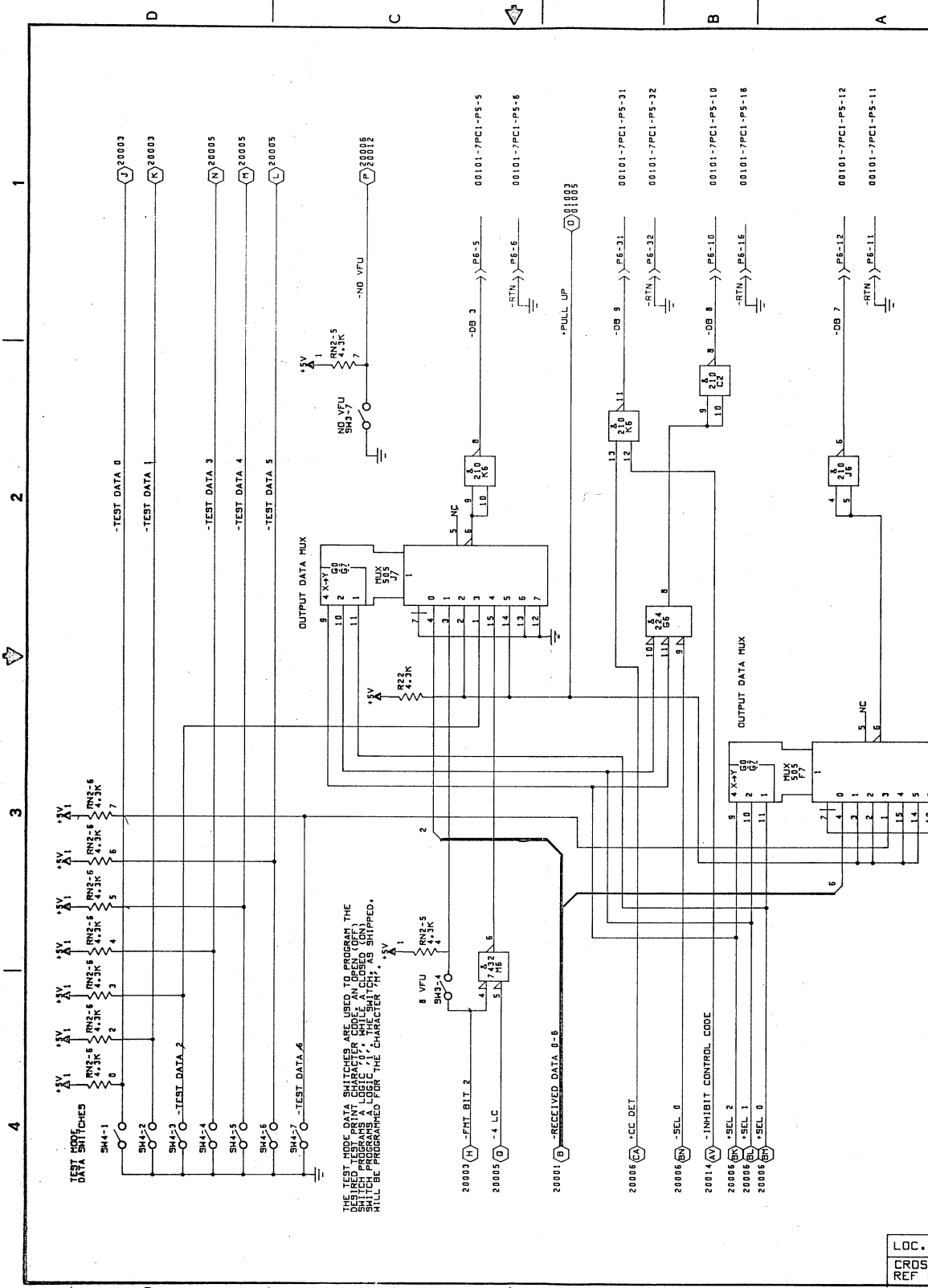
7-21



LOC. 7/PC5
 CROSS REF. NO. 20003

OEM INTERFACE

CODE IDENT DATA BASE 01	C	DWG NO	REV A
LOC 7PC5	SHEET 10	CROSS REF NO 20003	

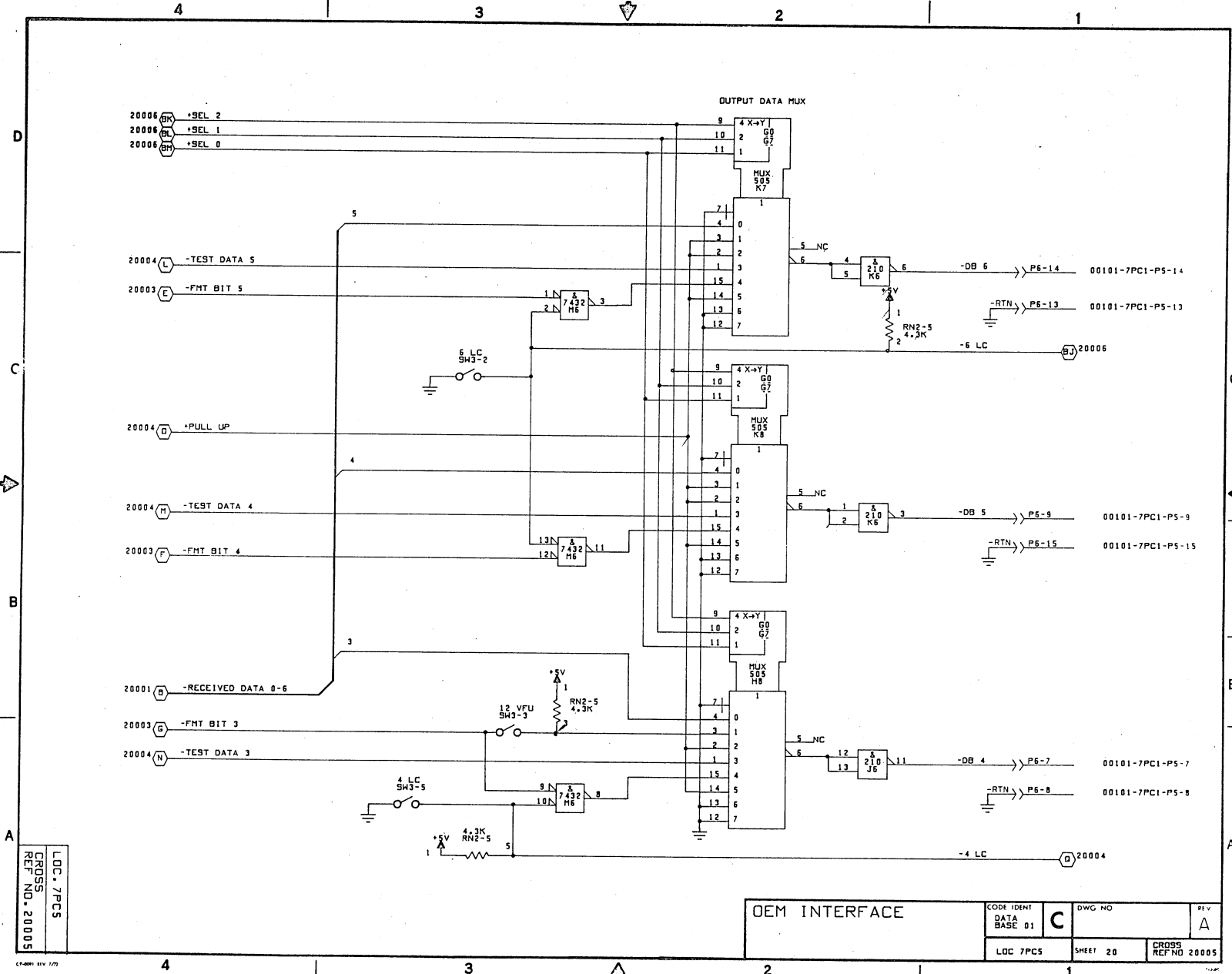


THE TEST MODE DATA SWITCHES ARE USED TO PROGRAM THE DESIRED TEST PRINT CHARACTER CODES. AN OPEN OPERATOR SWITCH PROGRAMS A LOGIC '1'. THE SWITCHES AS SHIPPED, WILL BE PROGRAMMED FOR THE CHARACTER 'H'.

CODE IDENT	DWG NO	REV
DATA		A
BASE 01	C	
LOC 7PCS	SHEET 18	CROSS REF NO 20004

LOC. 7PCS	CROSS REF NO. 20004
-----------	---------------------

7-23

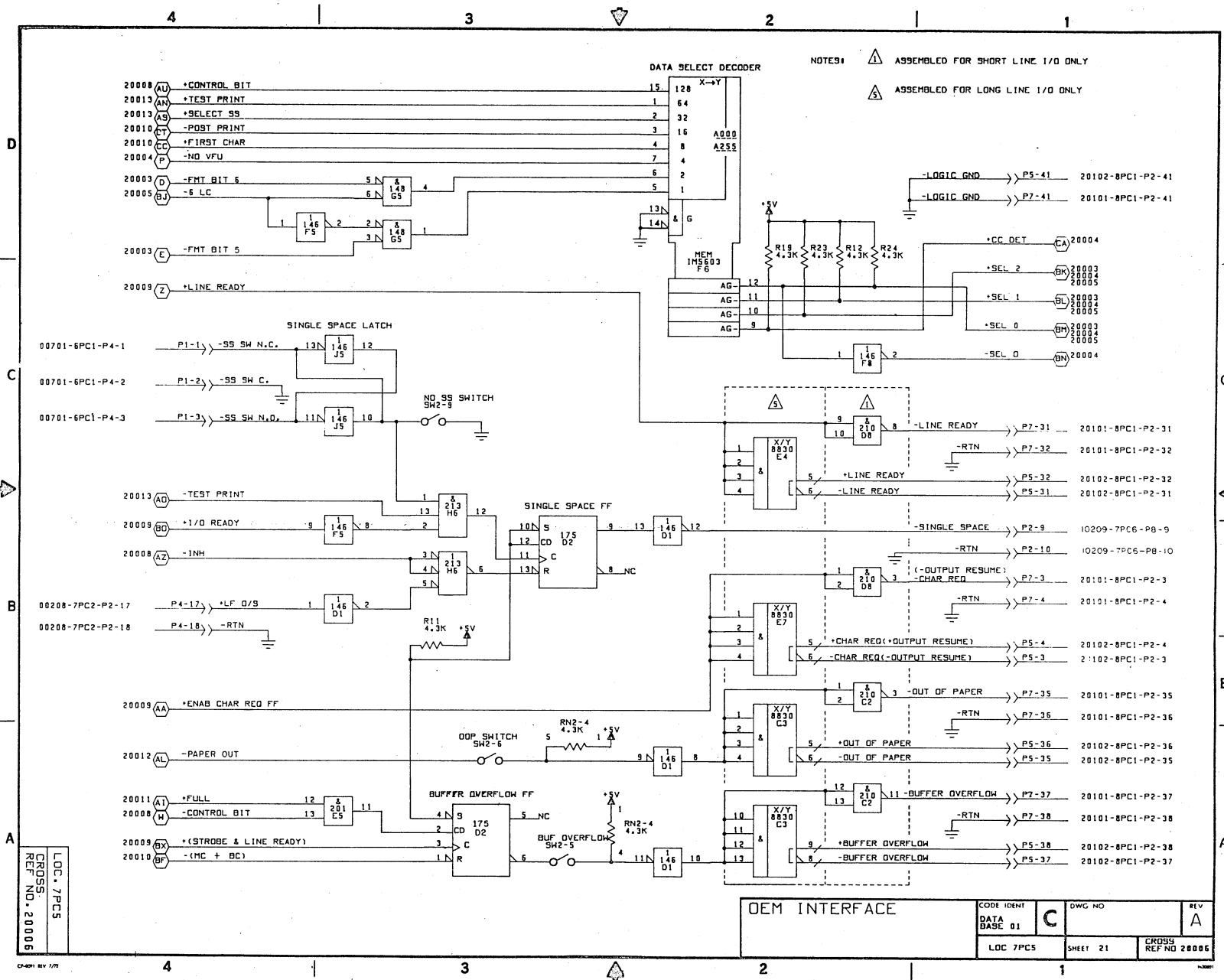


LOC. 7PCS
 CROSS
 REF. NO. 20005

OEM INTERFACE

CODE IDENT DATA BASE 01	C	DWG NO	REV A
LOC 7PCS	SHEET 20	CROSS REF NO 20005	

7-24

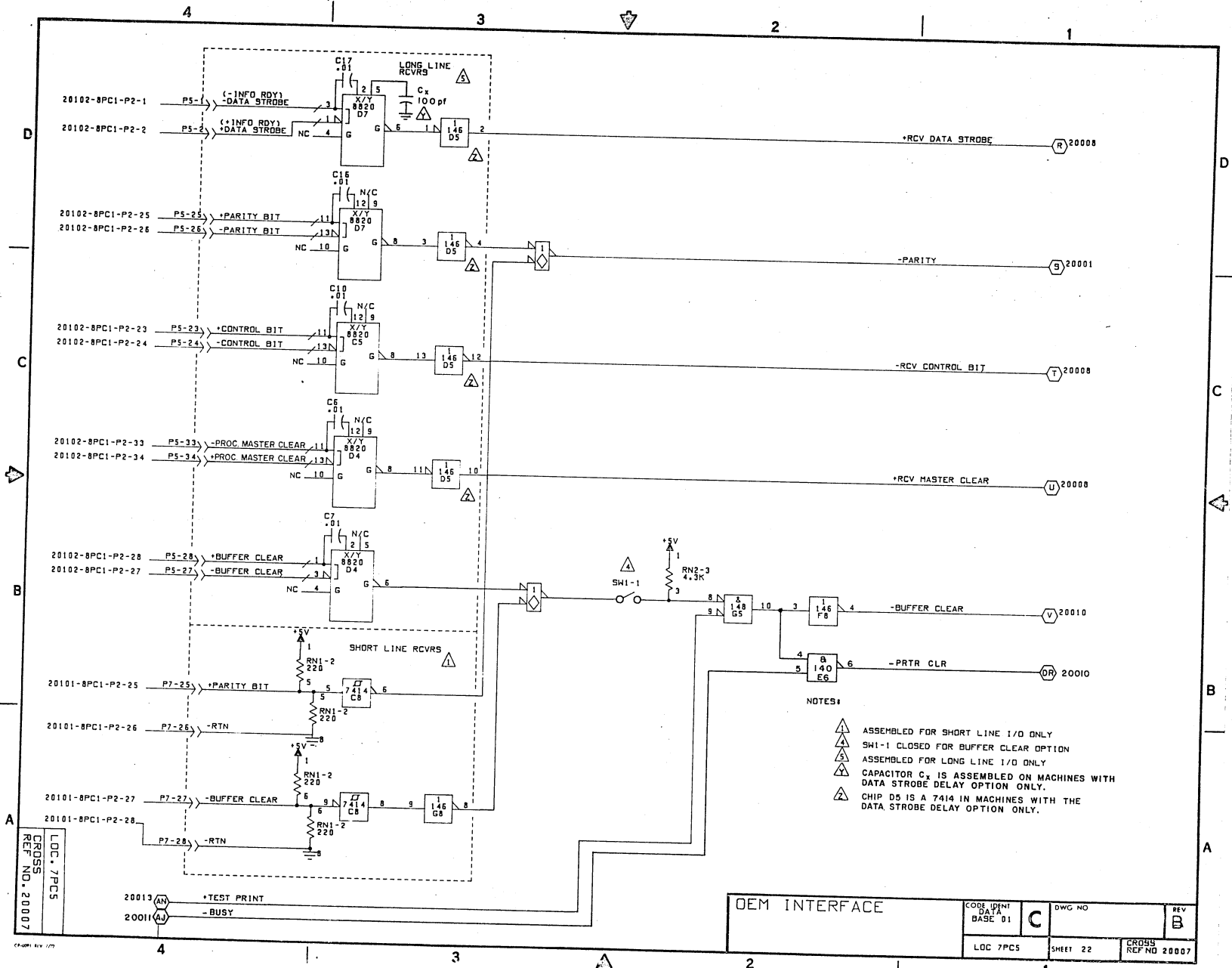


LOC 7PC5
 CROSS
 REF NO. 20006

OEM INTERFACE

CODE IDENT	C	DWG NO	A
DATA BASE 01		SHEET 21	CROSS REF NO 20005
LOC 7PC5			

7-25

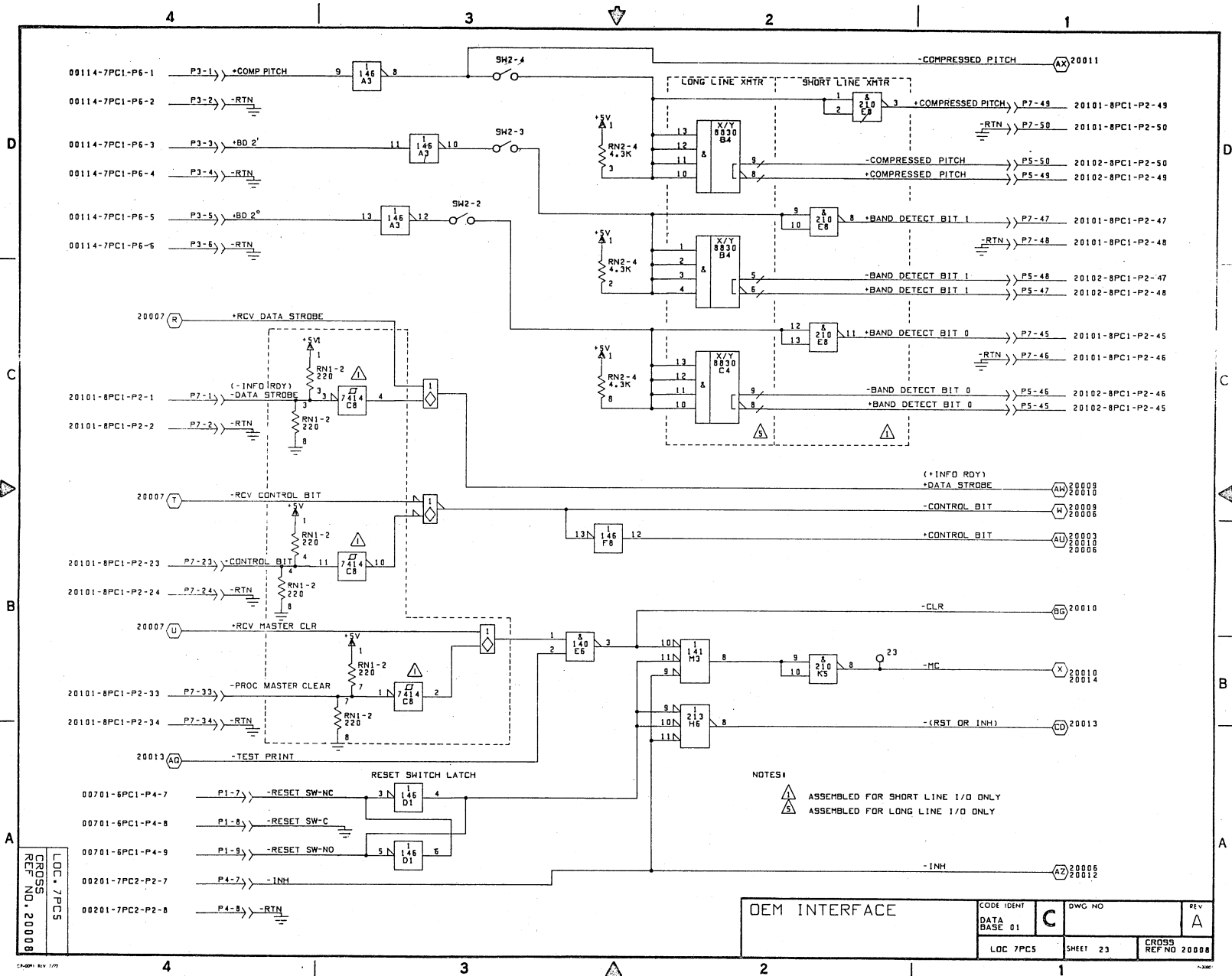


NOTES:

- ▲ ASSEMBLED FOR SHORT LINE I/O ONLY
- ▲ SW1-1 CLOSED FOR BUFFER CLEAR OPTION
- ▲ ASSEMBLED FOR LONG LINE I/O ONLY
- ▲ CAPACITOR C_x IS ASSEMBLED ON MACHINES WITH DATA STROBE DELAY OPTION ONLY.
- ▲ CHIP D5 IS A 7414 IN MACHINES WITH THE DATA STROBE DELAY OPTION ONLY.

LOC. 7PCS
GROSS REF. NO. 20007

OEM INTERFACE		CODE IDENT DATA BASE 01	C	DWG NO	REV B
		LOC 7PCS	SHEET 22	GROSS REF NO 20007	

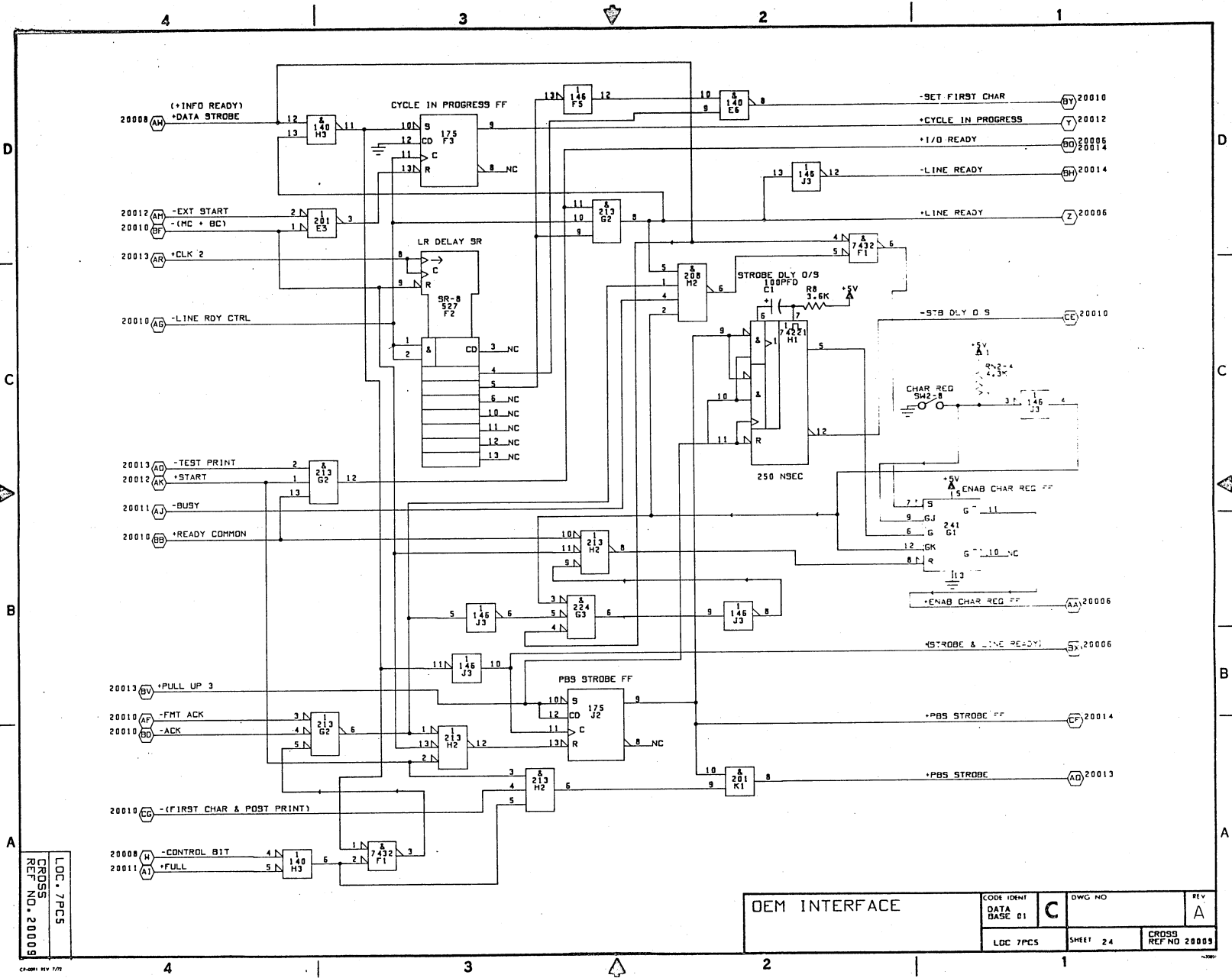


LOC 7PCS
CROSS
REF NO. 20008

OEM INTERFACE

CODE IDENT	C	DWG NO		REV	A
DATA BASE 01		LOC 7PCS	SHEET 23	CROSS REF NO	20008

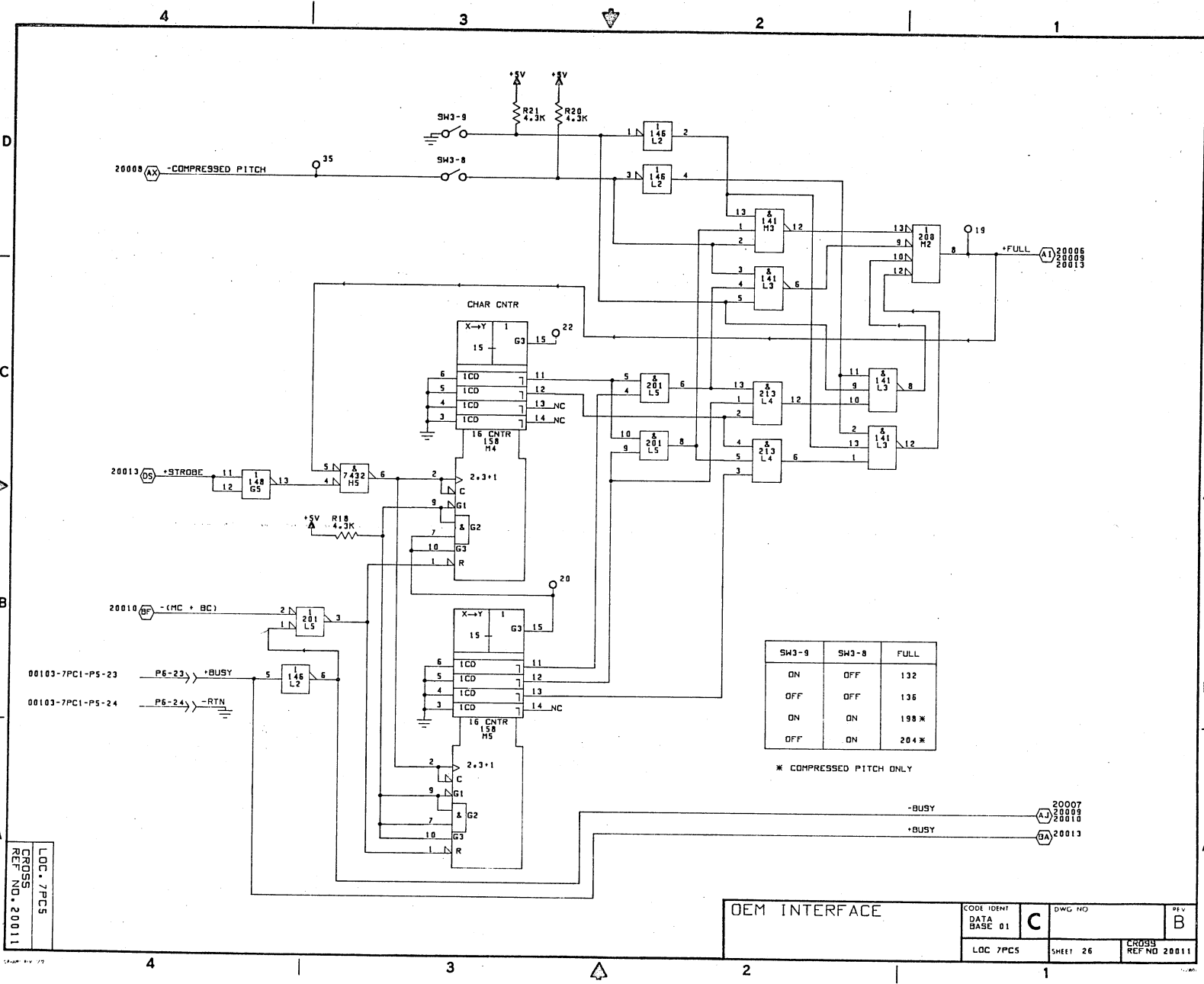
7-27



LOC. 7PCS
 CROSS REF. NO. 20009

OEM INTERFACE		CODE IDENT DATA BASE 01	DWG NO C	REV A
		LDC 7PCS	SHEET 24	CROSS REF NO 20009

7-29



SW3-9	SW3-8	FULL
ON	OFF	132
OFF	OFF	136
ON	ON	198 *
OFF	ON	204 *

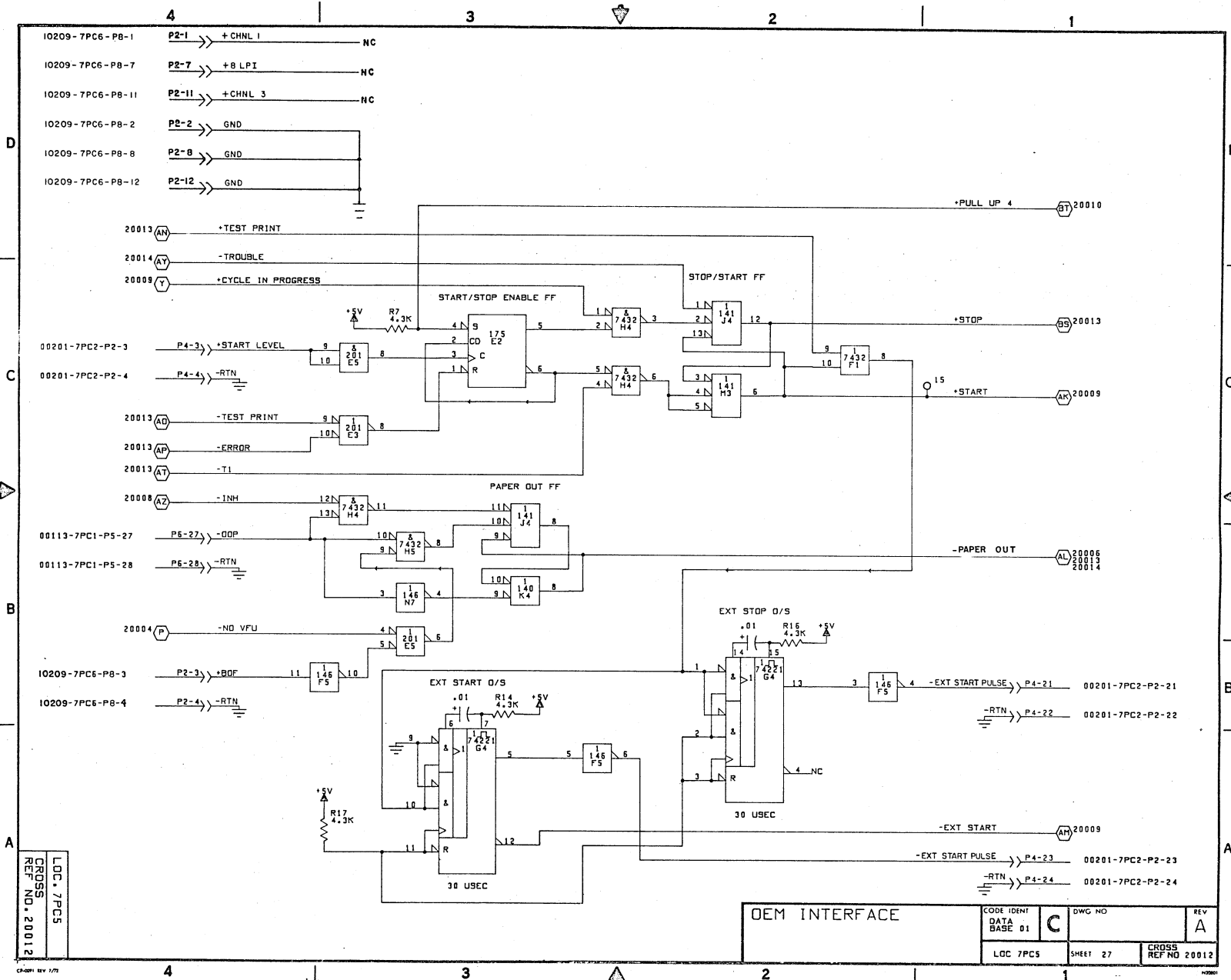
* COMPRESSED PITCH ONLY

LOC 7/PCS
CROSS
REF NO 20011

OEM INTERFACE

CODE IDENT DATA BASE 01	C	DWG NO	REV B
LOC 7PCS	SHEET 26	CROSS REF NO 20011	

7-30

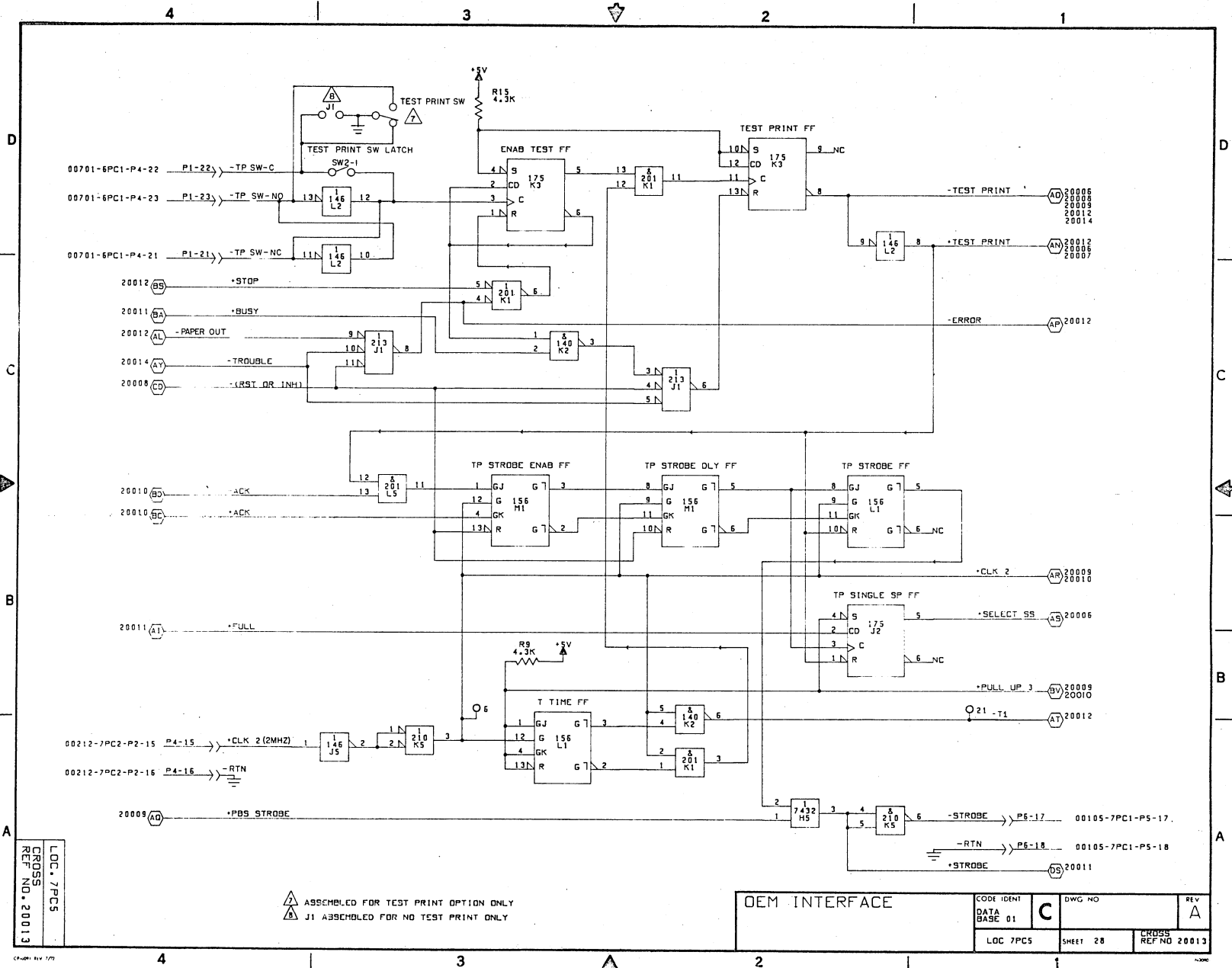


LOC. 7PC5
 CROSS
 REF NO. 20012

DEM INTERFACE

CODE IDENT DATA BASE 01	C	DWG NO	REV A
LOC 7PC5	SHEET 27	CROSS REF NO 20012	

7-31

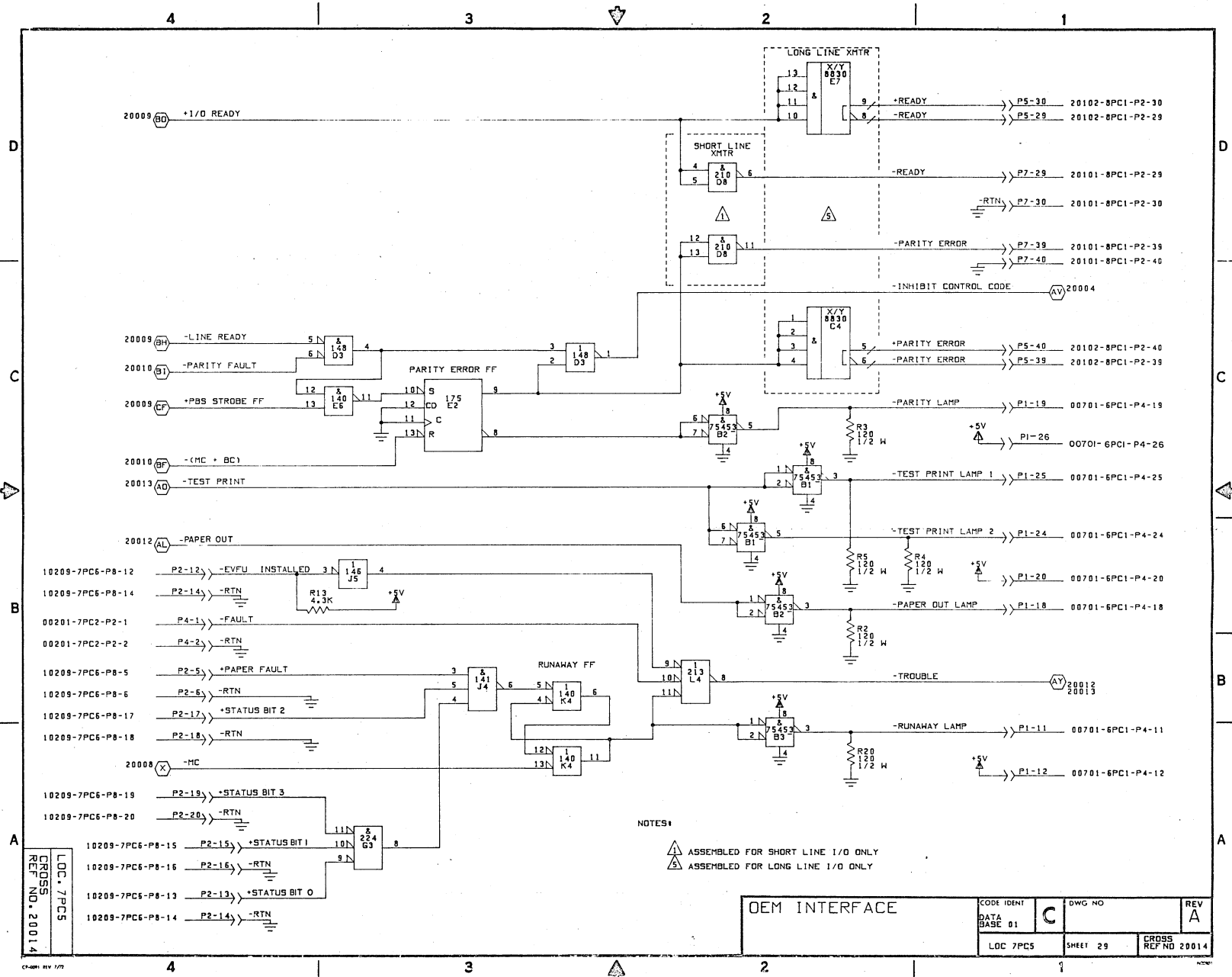


▲ ASSEMBLED FOR TEST PRINT OPTION ONLY
 ▲ J1 ASSEMBLED FOR NO TEST PRINT ONLY

OEM INTERFACE

CODE IDENT	C	DWG NO	REV
DATA BASE 01			A
LOC 7PCS	SHEET 28	CROSS REF NO 20013	

LOC 7PCS
 CROSS REF NO 20013



NOTES:
 ⚠ ASSEMBLED FOR SHORT LINE I/O ONLY
 ⚡ ASSEMBLED FOR LONG LINE I/O ONLY

OEM INTERFACE		CODE IDENT DATA BASE 01	DWG NO C	REV A
		LOC 7PCS	SHEET 29	CROSS REF NO 20014

INPUT LINES		FROM I/O CABLE	
BJ01-A	-DATA STROBE (-INFO READY)	P2-1	20008-7PCS-P7-1
BJ01-B	-RTN	P2-2	20008-7PCS-P7-2
BJ01-C	+DATA BIT 6	P2-17	20001-7PCS-P7-17
BJ01-D	-RTN	P2-18	20001-7PCS-P7-18
BJ01-E	+DATA BIT 5	P2-15	20001-7PCS-P7-15
BJ01-F	-RTN	P2-16	20001-7PCS-P7-16
BJ01-G	+DATA BIT 4	P2-13	20001-7PCS-P7-13
BJ01-H	-RTN	P2-14	20001-7PCS-P7-14
BJ01-I	+DATA BIT 3	P2-11	20001-7PCS-P7-11
BJ01-J	-RTN	P2-12	20001-7PCS-P7-12
BJ01-K	+DATA BIT 2	P2-9	20001-7PCS-P7-9
BJ01-L	-RTN	P2-10	20001-7PCS-P7-10
BJ01-M	+DATA BIT 1	P2-7	20001-7PCS-P7-7
BJ01-N	-RTN	P2-8	20001-7PCS-P7-8
BJ01-O	+DATA BIT 0	P2-5	20001-7PCS-P7-5
BJ01-P	-RTN	P2-6	20001-7PCS-P7-6
BJ01-Q	+PARITY BIT	P2-25	20007-7PCS-P7-25
BJ01-R	-RTN	P2-26	20007-7PCS-P7-26
BJ01-S	+CONTROL BIT	P2-23	20008-7PCS-P7-23
BJ01-T	-RTN	P2-24	20008-7PCS-P7-24
BJ01-U	+BUFFER CLEAR	P2-27	20007-7PCS-P7-27
BJ01-V	-RTN	P2-28	20007-7PCS-P7-28
BJ01-W	+PROC MASTER CLEAR	P2-33	20008-7PCS-P7-33
BJ01-X	-RTN	P2-34	20008-7PCS-P7-34

OUTPUT LINES		TO I/O CABLE	
P2-29	-READY	BJ01-GH	
P2-30	-RTN	BJ01-IJ	
P2-31	-LINE READY	BJ01-K	
P2-32	-RTN	BJ01-M	
P2-35	-OUT OF PAPER	BJ01-GR	
P2-36	-RTN	BJ01-LS	
P2-37	+BUFFER OVERFLOW	BJ01-LT	
P2-38	-RTN	BJ01-LU	
P2-39	+PARITY ERROR	BJ01-LV	
P2-40	-RTN	BJ01-LX	
P2-46	+COMPRESSED PITCH	BJ01-FF	
P2-50	-RTN	BJ01-HH	
P2-47	+BAND DETECT 1	BJ01-OD	
P2-48	-RTN	BJ01-EE	
P2-45	+BAND DETECT 0	BJ01-BB	
P2-46	-RTN	BJ01-CC	
P2-3	+CHAR REQ (-OUTPUT RESUME)	BJ01-C	
P2-4	-RTN	BJ01-D	
P2-41	-LOGIC GND	BJ01-LX	

SPARES	
BJ01-H	NC
BJ01-X	NC
BJ01-Y	NC
BJ01-Z	NC
BJ01-VY	NC
BJ01-VZ	NC
BJ01-VX	NC
BJ01-VW	NC

NOTES: 1. CONNECTOR DESIGNATOR LETTERS ENCLOSED IN PARENTHESES () ARE LOWER CASE.
 2. THIS SHEET REPRESENTS THE SHORT LINE I/O CONFIGURATION.

OEM I/O CONNECTOR BOARD		REV	A
CORPORATE DATA BASE 01	DWG NO	CROSS REF NO 20101	
LOC 8PCI	SHEET 30		

LOC 8PCI
 CROSS REF NO 20101

INPUT LINES

△	8J01-A	-DATA STROBE (-INFO READY)	-DATA STROBE (-INFO READY)	P2-1	20007-7PCS-P5-1
	8J01-B	*DATA STROBE (*INFO READY)	*DATA STROBE (*INFO READY)	P2-2	20007-7PCS-P5-2
	8J01-U	*DATA BIT 6	*DATA BIT 6	P2-17	20002-7PCS-P5-17
	8J01-V	-DATA BIT 6	-DATA BIT 6	P2-18	20002-7PCS-P5-18
	8J01-S	*DATA BIT 5	*DATA BIT 5	P2-15	20002-7PCS-P5-15
	8J01-T	-DATA BIT 5	-DATA BIT 5	P2-16	20002-7PCS-P5-16
	8J01-P	*DATA BIT 4	*DATA BIT 4	P2-13	20002-7PCS-P5-13
	8J01-R	-DATA BIT 4	-DATA BIT 4	P2-14	20002-7PCS-P5-14
	8J01-H	*DATA BIT 3	*DATA BIT 3	P2-11	20002-7PCS-P5-11
	8J01-N	-DATA BIT 3	-DATA BIT 3	P2-12	20002-7PCS-P5-12
	8J01-M	*DATA BIT 2	*DATA BIT 2	P2-9	20002-7PCS-P5-9
	8J01-L	-DATA BIT 2	-DATA BIT 2	P2-10	20002-7PCS-P5-10
	8J01-K	*DATA BIT 1	*DATA BIT 1	P2-7	20002-7PCS-P5-7
	8J01-J	-DATA BIT 1	-DATA BIT 1	P2-8	20002-7PCS-P5-8
	8J01-I	*DATA BIT 0	*DATA BIT 0	P2-5	20002-7PCS-P5-5
	8J01-E	-DATA BIT 0	-DATA BIT 0	P2-6	20002-7PCS-P5-6
	8J01-F	*PARITY BIT	*PARITY BIT	P2-25	20007-7PCS-P5-25
	8J01-C	-PARITY BIT	-PARITY BIT	P2-26	20007-7PCS-P5-26
	8J01-D	*CONTROL BIT	*CONTROL BIT	P2-23	20007-7PCS-P5-23
	8J01-A	-CONTROL BIT	-CONTROL BIT	P2-24	20007-7PCS-P5-24
	8J01-B	*BUFFER CLEAR	*BUFFER CLEAR	P2-27	20007-7PCS-P5-27
	8J01-E	-BUFFER CLEAR	-BUFFER CLEAR	P2-28	20007-7PCS-P5-28
	8J01-F	*PROC. MASTER CLEAR	*PROC. MASTER CLEAR	P2-33	20007-7PCS-P5-33
	8J01-N	-PROC. MASTER CLEAR	-PROC. MASTER CLEAR	P2-34	20007-7PCS-P5-34
	8J01-P	*PROC. MASTER CLEAR			

FROM I/O CABLE

OUTPUT LINES

20014-7PCS-P5-29	P2-23	-READY	-READY	8J01-LH	
20014-7PCS-P5-30	P2-30	*READY	*READY	8J01-LJ	
20006-7PCS-P5-31	P2-31	-LINE READY	-LINE READY	8J01-LK	
20006-7PCS-P5-32	P2-32	*LINE READY	*LINE READY	8J01-LM	
20006-7PCS-P5-35	P2-35	-OUT OF PAPER	-OUT OF PAPER	8J01-LR	
20006-7PCS-P5-36	P2-36	*OUT OF PAPER	*OUT OF PAPER	8J01-LS	
20006-7PCS-P5-37	P2-37	-BUFFER OVERFLOW	-BUFFER OVERFLOW	8J01-LT	
20006-7PCS-P5-38	P2-38	*BUFFER OVERFLOW	*BUFFER OVERFLOW	8J01-LU	
20014-7PCS-P5-39	P2-39	-PARITY ERROR	-PARITY ERROR	8J01-LV	
20014-7PCS-P5-40	P2-40	*PARITY ERROR	*PARITY ERROR	8J01-LW	
20008-7PCS-P5-49	P2-49	-COMPRESSED PITCH	-COMPRESSED PITCH	8J01-LH	
20008-7PCS-P5-50	P2-50	*COMPRESSED PITCH	*COMPRESSED PITCH	8J01-LI	
20008-7PCS-P5-47	P2-47	-BAND DETECT 1	-BAND DETECT 1	8J01-OD	
20008-7PCS-P5-48	P2-48	*BAND DETECT 1	*BAND DETECT 1	8J01-OE	
20008-7PCS-P5-45	P2-45	-BAND DETECT 0	-BAND DETECT 0	8J01-OB	
20008-7PCS-P5-46	P2-46	*BAND DETECT 0	*BAND DETECT 0	8J01-OC	
20006-7PCS-P5-3	P2-3	-CHAR REQ (-OUTPUT RESUME)	-CHAR REQ (-OUTPUT RESUME)	8J01-C	
20006-7PCS-P5-4	P2-4	*CHAR REQ (*OUTPUT RESUME)	*CHAR REQ (*OUTPUT RESUME)	8J01-D	
20006-7PCS-P5-41	P2-41	-LOGIC GND	-LOGIC GND	8J01-XI	

TO I/O CABLE

SPARES

8J01-W	NC
8J01-X	NC
8J01-Y	NC
8J01-Z	NC
8J01-YY	NC
8J01-ZZ	NC
8J01-AA	NC

NOTES:

1 △ CONNECTOR DESIGNATOR LETTERS ENCLOSED IN PARENTHESIS () ARE LOWER CASE.

2 THIS SHEET REPRESENTS THE LONG LINE I/O CONFIGURATION.

DEM I/O CONNECTOR BOARD

CON IDENT	REV
DATA PAGE 01	C
LOC 8PC1	SHEET 31
CROSS REF NO 20102	A

LOC 8PC1
CROSS
REF NO 20102