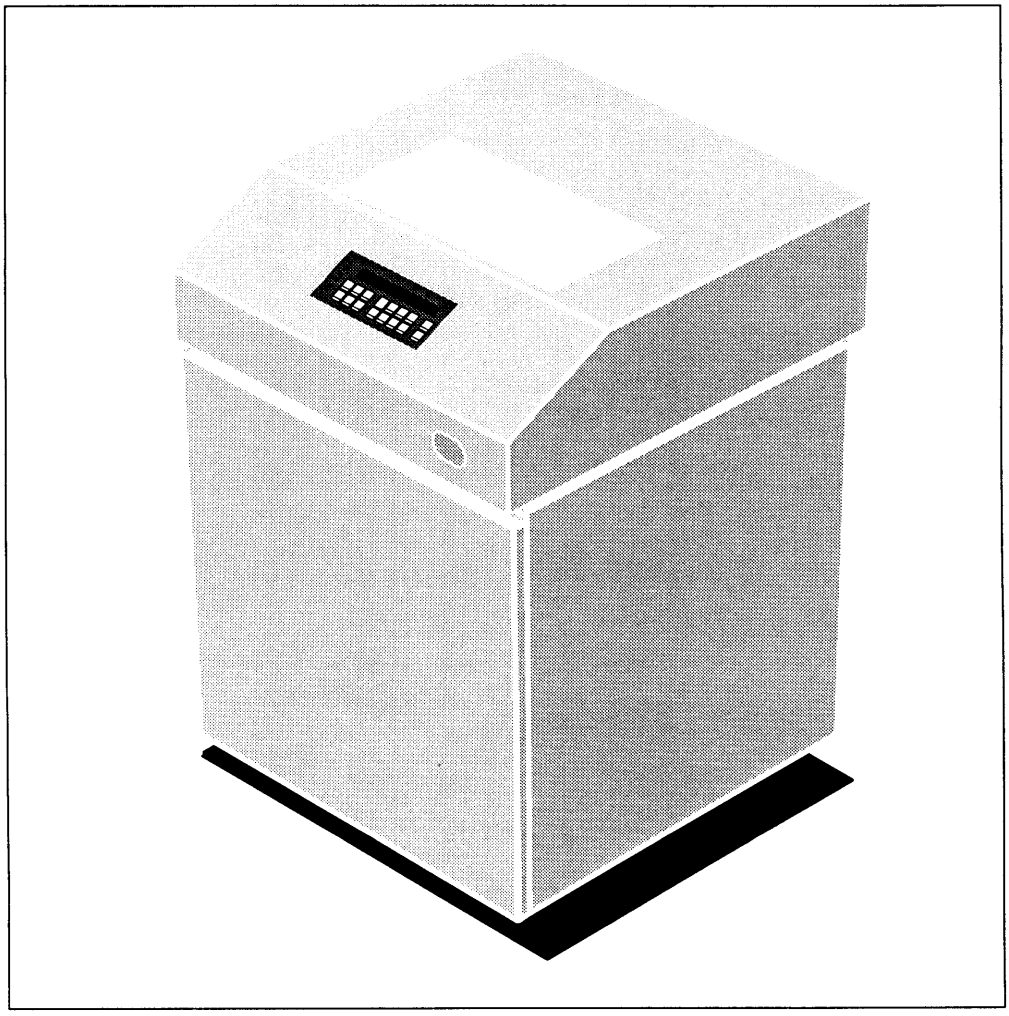
6408 Line Matrix Printer

G246–0014–00

Maintenance Information Manual



6408 Line Matrix Printer

G246-0014-00

Maintenance Information Manual

Note!

Before using the information and the product it works with, ensure that you read the general information under "Notices" on page vi.

First Edition (September 1993)

This edition applies to the IBM* 6408 Line Matrix Printer, models A00 and CT0.

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Fluke	John Fluke Manufacturing Co., Inc.
IGP	Printronix, Inc.
Printronix	Printronix, Inc.
RibbonMinder	Printronix, Inc.

Safety Notices

DANGER

To prevent serious personal injury from electrical shock when connecting or disconnecting the signal cable, set the printer power switch to the off position and unplug the power cable.

DANGER

Always disconnect the AC power cord from the power source before performing any maintenance procedure. Failure to remove power could result in injury to persons or damage to equipment. If you must apply power during maintenance, you will be instructed to do so in the maintenance procedure.

DANGER

Always disconnect the AC power cord before cleaning the printer.

DANGER

To prevent injury from electric shock, wait at least one minute after shutting off power before removing the power supply circuit board. Wear a properly grounded static wrist strap when handling the power supply board. Handle the board by the ejection levers and the sides. Do not touch components or flex the board during removal/installation.

CAUTION

Over time, the upper edge of the paper ironer can become sharp. To avoid cutting yourself, handle the paper ironer on the sides.

CAUTION

Hold the printer cover securely while disengaging the gas spring assembly.

DANGER

Exercise caution when configuring the printer. Exposed moving parts can cause injury, and electrical currents are shock hazards.

Sikkerhedsinstruktioner

DANISH

FARE

Hver gang De vil sætte ledningen, der forbinder computeren og printeren, i eller tage den ud, skal De først slukke for printeren og tage stikket ud af stikkontakten for at forebygge alvorlig personskade der forvoldes af elektriske stød.

FARE

Afbryd altid strømmen ved at tage stikket ud af kontakten inden De foretager nogen form for vedligeholdelsesprocedure. Undlader man at afbryde strømmen kan det føre til maskin- eller personskade. Dersom der skal bruges strøm under vedligeholdelseseftersyn, vil De blive instrueret om at slutte den til i vedligeholdelsesvejledningen.

FARE

Tag stikket ud af kontakten inden De gør printeren ren.

FARE

Til at forebygge skader, der forvoldes af elektriske stød, skal De vente mindst eet minut efter strømmen er blevet afbrudt med at udtage spændingslederpladen. Bær en antistatisk håndledsrem, der er korrekt jordforbundet, mens De håndterer spændingslederpladen. Tag kun på pladen ved udskydningsbeslagene og på siderne. Rør ikke ved komponenterne og vrid ikke pladen ved udtagning eller isætning.

FORSIGTIG

Med tiden kan overkanten af papirudglatteren blive skarp, så for ikke at skære sig, skal man kun holde papirudglatteren på siderne.

FORSIGTIG

Sørg for at printerdækslet holdes fast mens dækselpumpen frigøres.

FARE

Udvis forsigtighed mens printeren konfigureres. Blottede bevægelige dele kan forvolde skade og tændt strøm udgør risiko for stød.

Veiligheidsaanwijzingen

DUTCH

GEVAARLIJK

Om zwaar letsel door elektrische schok te voorkomen bij het aansluiten of loskoppelen van de signaalkabel, dient u de printer uit te schakelen en het netsnoer uit het stopcontact te nemen.

GEVAARLIJK

Neem het netsnoer altijd uit het stopcontact voordat u onderhoudswerkzaamheden gaat uitvoeren. Het niet afsluiten van de stroom kan persoonlijk letsel of beschadiging van de apparatuur tot gevolg hebben. Mocht u tijdens onderhoudswerkzaamheden toch netvoeding nodig hebben, dan worden daarover in de beschrijving van het onderhoud aanwijzingen gegeven.

GEVAARLIJK

Neem het netsnoer uit het stopcontact voordat u de printer gaat schoonmaken.

GEVAARLIJK

Om letsel door elektrische schok te voorkomen, dient u na het uitschakelen van de printer minstens één minuut te wachten voordat u de printplaat voor de voeding verwijdert. Maak gebruik van een op juiste wijze geaarde statische polsband als u de printplaat voor de voeding moet aanraken. Pak de plaat aan de zijkanten beet bij de daarvoor bestemde hendeltjes. Tijdens het demonteren/installeren geen onderdelen aanraken en de plaat niet verbuigen.

VOORZICHTIG

Na verloop van tijd kan de bovenkant van de papierstrijker scherp worden. Om te voorkomen dat u zich snijdt, dient u de papierstrijker bij de zijkanten beet te pakken.

VOORZICHTIG

Houd de printerkap goed op zijn plaats als u de gasveerconstructie loszet.

GEVAARLIJK

Ga bij het configureren van de printer voorzichtig te werk. Onbedekte bewegende onderdelen kunnen letsel veroorzaken en sommige onderdelen kunnen onder spanning staan.

Huomautuksia Turvallisuudesta

FINNISH

VAARA

Sähköisku voi aiheuttaa vakavia henkilövahinkoja. Tästä syystä täytyy kirjoittimesta aina katkaista virta ja irrottaa virtakaapeli, kun signaalikaapeli liitetään tai irrotetaan.

VAARA

Irrota aina vaihtovirtajohto virtalähteestä ennen huoltotoimenpiteitä. Laiminlyönti voi aiheuttaa henkilö– tai laitevahinkoja. Jos virtaa tarvitaan huollon aikana, huoltotoimenpiteiden ohjeissa on sitä koskevia neuvoja.

VAARA

Irrota vaihtovirtajohto ennen kirjoittimen puhdistamista.

VAARA

Sähköiskun estämiseksi odota ainakin yksi minuutti virran katkaisun jälkeen ennen kuin poistat virtapiirilevyn. Käytä oikein maadoitettua staattista ranneketta, kun käsittelet virtapiirilevyä. Tartu levyyn sen poistovivuista ja reunoista. Älä koske komponentteja tai taivuta levyä poiston tai asennuksen aikana.

VAROITUS

Ajan myötä voi paperinsilittäjän yläreuna terävöityä. Välttääksesi haavoja käsittele paperinsilittäjää sen reunoista.

VAROITUS

Tartu kirjoittimen kannesta tukevasti kiinni, kun irrotat kaasujousilaitetta.

VAARA

Noudata varovaisuutta kirjoitinta asennettaessa. Paljaat liikkuvat osat voivat aiheuttaa vahinkoja, ja sähköisissä osissa on sähköiskun vaara.

Consignes de Sécurité

FRENCH

DANGER

Afin d'éviter tout risque de blessure par électrocution lors du branchement ou du débranchement du câble de signal, mettre l'imprimante hors tension et débrancher le câble d'alimentation.

DANGER

Toujours débrancher le cordon d'alimentation en courant alternatif de la source d'alimentation avant d'effectuer toute opération d'entretien. Le fait de laisser le cordon branché peut provoquer des blessures ou endommager l'équipement. Si l'alimentation électrique est nécessaire durant l'entretien, les instructions à suivre vous renseigneront à ce sujet.

DANGER

Débrancher le cordon d'alimentation en courant alternatif avant de nettoyer l'imprimante.

DANGER

Afin d'éviter tout risque d'électrocution, attendre au moins une minute après avoir coupé l'alimentation pour retirer la carte d'alimentation électrique. Porter un bracelet statique correctement mis à la terre lors de la manipulation de la carte d'alimentation électrique. Manipuler la carte par les leviers d'éjection et les bords. Ne pas toucher les composants ou plier la carte pendant son retrait ou son installation.

ATTENTION

Après un certain temps, le bord supérieur du lisseur de papier peut devenir tranchant. Afin de ne pas se couper, manipuler le lisseur de papier par ses côtés.

ATTENTION

Bien tenir le couvercle de l'imprimante tout en désenclenchant le bloc–ressort à gaz.

DANGER

Prendre toutes les précautions nécessaires lors de la configuration de l'imprimante. Les pièces mobiles découvertes peuvent provoquer des blessures et les courants électriques présentent des dangers d'électrocution.

Hinweise zur Sicherheit

GERMAN

GEFAHR!

Um ernstliche körperliche Verletzungen durch Stromschlag beim Anschließen oder Trennen des Signalton-Kabels zu vermeiden, muß der Drucker auf jeden Fall ausgeschaltet und der Netzstecker herausgezogen werden.

GEFAHR

Bevor Sie anfällige Wartungsarbeiten durchführen, müssen Sie zuerst immer das Netzkabel aus der Steckdose ziehen. Wird das Netzkabel nicht herausgezogen, können Verletzungen oder Geräteschäden entstehen. Falls die Wartungsarbeit Stromzufuhr erfordert, wird im Wartungsablauf darauf hingewiesen.

GEFAHR

Ziehen Sie das Netzkabel aus der Steckdose, bevor Sie den Drucker reinigen.

GEFAHR

Um Verletzungen durch Elektroschocks zu vermeiden, warten Sie mindestens eine Minute nach Stromausschaltung, bevor Sie die elektrische Schaltkarte entfernen. Bitte immer einen geerdeten, statischen Handgelenkriemen tragen, wenn Sie die elektrische Schaltkarte handhaben. Halten Sie die Karte nur an den seitlichen Auswurfshebeln. Während des Herausnehmens/Installierens dürfen die Komponenten der Karte nicht berührt oder gebogen werden.

VORSICHT

Die obere Kante der Papierschiene wird mit der Zeit scharf. Halten Sie die Schiene deshalb an den Seiten, damit Sie sich nicht schneiden.

VORSICHT

Behalten Sie die Druckerabdeckung sicher im Griff, wenn Sie das Gasfederpaket entfernen.

GEFAHR

Beim Konfigurieren des Druckers ist Vorsicht geboten. Hervorstehende, bewegliche Teile können Verletzungen und Elektroschocks verursachen.

Avvisi di sicurezza

ITALIAN

PERICOLO

Durante la connessione o la disconnesione del cavo dei segnali, spegnere la stampante e scollegare il cavo di potenza, in modo da prevenire seri infortuni causati da scosse elettriche.

PERICOLO

Per evitare danni alle persone o alle apparecchiature, disconnettere sempre l'alimentazione prima di eseguire le operazioni di manutenzione. Se sarà necessario alimentare le apparecchiature durante la manutenzione, questo sarà indicato nella procedura di manutenzione.

PERICOLO

Disconnettere l'alimentazione prima di pulire la stampante.

PERICOLO

Per prevenire incidenti a causa di scosse elettriche, dopo aver tolto l'alimentazione attendere almeno un minuto prima di rimuovere la scheda dell'alimentatore. Prima di maneggiare quest'ultima, indossare un bracciale antistatico; tenere la scheda dalle leve di espulsione e dai lati. Non toccare i componenti o flettere la scheda durante la rimozione o l'installazione.

ATTENZIONE

Col tempo la parte superiore della barra che fa pressione sulla carta può diventare tagliente. Per evitare di tagliarsi, maneggiare la barra tenendola dai lati.

ATTENZIONE

Tenere il coperchio della stampante ben saldo quando si smonta il dispositivo di ammortizzazione.

PERICOLO

Prestare attenzione durante la configurazione della stampante. Le parti mobili esposte possono causare danni alle persone e le correnti elettriche possono causare scosse elettriche.

安全上の注意点

JAPANESE

危険

保守作業を行なう前に、必ずAC電源ケーブルを抜いて、電源から切り離しておいてください。身体、または機器に損傷を与える場合があります。保守作業中に電源を必要とする場合は、その旨、保守作業操作手順に指示があります。

危険

プリンタを清掃する前に、AC電源ケーブルを抜いてください。

危険

感電事故を防ぐために、電気回路基盤を取り外す前に電源を切ってから少なくとも1分間待ってください。電気回路基盤を取り扱う際は、帯電防止リストストラップを着用してください。ボードを取り扱う際は、インジェクションレバーと両側面以外には触らないでください。また、ボードを着脱する際は、ボード上の部品に触ったり、ボードを曲げたりしないでください。

注意

時間が経つにつれて、用紙抑えの上端が鋭利になってくることがありますので、取り扱いには、十分に注意してください。

注意

ガススプリングアセンブリを取り外す際は、プリンタカバーをしっかりと抑えてください。

危険

プリンタの環境設定時は、必ず注意事項を守ってください。露出した部品によりケガをしたり、感電する危険があります。

危険

感電しないよう、シグナルケーブルを接続、または取りはずす際は、必ずプリンタの電源を切り、電源コードを抜いてください。

Sikkerhetsinformasjon

NORWEGIAN

ADVARSEL

Slå av skriveren og trekk ut strømledningens støpsel fra stikkontakten når du skal koble signalkabelen til eller fra, slik at alvorlige personskader unngås som følge av elektrisk støt.

ADVARSEL

Trekk alltid ut strømledningens støpsel fra stikkontakten før vedlikeholdsarbeid utføres på skriveren. Hvis man ikke bryter strømforbindelsen til lysnettet, kan det føre til skader på personer og utstyr. Hvis strømmen må stå på under vedlikeholdet, vil dette fremgå av vedlikeholdsprosedyren.

ADVARSEL

Trekk alltid ut strømledningens støpsel fra stikkontakten før skriveren rengjøres.

ADVARSEL

Vent i minst ett minutt etter at strømtilførselen er frakoplet før kretskortet med strømforsyningen tas ut, slik at personskader unngås. Man må ha en jordet stropp rundt håndleddet når man skal ta i strømforsyningskortet. Hold kortet i utløserarmene på sidene. Man må ikke berøre komponentene eller bøye kortet når det skal ut eller installeres.

OBS!

Med tiden kan den øvre kanten av papirutretteren bli skarp. Derfor må man ta tak i papirutretterens sider for ikke å skjære seg.

OBS!

Hold skriverdekslet på plass når den gassbaserte fjæropphengningen frigjøres.

ADVARSEL

Utvis forsiktighet under konfigureringen av skriveren. Bevegelige deler kan forårsake skader og elektrisk strøm kan gi støt.

Normas de Segurança

PERIGO

Quando ligar ou desligar o cabo de sinal, a fim de evitar ferimentos graves devido a choque eléctrico, desligue sempre a impressora e remova o cabo de energia da tomada.

PERIGO

Desligue sempre o fio de corrente alternada da tomada, antes de executar qualquer trabalho de manutenção a fim de evitar a ocorrência de acidentes pessoais ou danificar o equipamento. Se fôr absolutamente necessário utilizar corrente durante o trabalho de manutenção, ser–lhe–ão dadas instruções específicas para os procedimentos dessa manutenção.

PERIGO

Antes de começar a limpar a impressora, desligue sempre o fio de corrente alternada da tomada.

PERIGO

A fim de evitar a ocorrência de choques eléctricos, depois de desligar a corrente, espere pelo menos um minuto para remover a unidade de fornecimento de energia da placa de circuito impresso. Ao manusear a placa de fornecimento de energia, use sempre uma correia de pulso com isolamento estático. Toque apenas nos lados e nas alavancas de ejecção da placa. Não dobre nem toque nos componentes da placa durante a sua remoção ou instalação.

ATENÇÃO

Com o tempo, a parte superior do engomador de papel, pode tornar–se aguçada. Para não se cortar, manuseie o engomador de papel pelas partes laterais.

ATENÇÃO

Ao desmontar o conjunto de peças da mola de gás, agarre sempre na cobertura da impressora.

PERIGO

Preste atenção sempre que reconfigurar a sua impressora. Quando expostas, algumas das partes da impressora podem causar ferimentos e lembre–se de que componentes eléctricos constituem perigo de choque.

Avisos de seguridad

SPANISH

PELIGRO

Para evitar daños personales causados por descarga eléctrica al conectar o desconectar el cable de señal, apague la impresora y desenchufe el cable de alimentación.

PELIGRO

Desconecte siempre el cable del enchufe antes de realizar cualquier operación de mantenimiento. El no cumplimiento de esta condición puede derivar en lesiones personales o daños en el equipo. Si tiene que utilizar la corriente durante el mantenimiento, el procedimiento se lo indicará.

PELIGRO

Desenchufe el cable antes de limpiar la impresora.

PELIGRO

Para evitar una descarga eléctrica, espere por lo menos un minuto después que desconecte la corriente y antes que desmonte la tarjeta del circuito de alimentación eléctrica. Utilice una pulsera antiestática con toma de tierra, cuando manipule la tarjeta de alimentación. Sujete la tarjeta por las palancas de expulsión o por los lados. No toque sus componentes ni la doble, durante la operación de desmontaje/instalación.

PRECAUCION

Con el tiempo, el borde superior de la plancha de papel, puede hacerse afilado. Para evitar cortarse, manipule la plancha por los lados.

PRECAUCION

Sujete firmemente la cubierta de la impresora cuando desmonte los muelles de suspensión.

PELIGRO

Tenga cuidado al configurar la impresora. Las partes móviles, cuando quedan al descubierto, pueden provocar lesiones y provocar descargas eléctricas.

Säkerhetsföreskrifter

SWEDISH

FARA

Undvik allvarliga personskador från elektriska stötar när du ansluter eller kopplar loss signalkablen, genom att stänga av strömmen till skrivaren och koppla loss nätkabeln.

FARA

Koppla alltid loss nätkabeln från strömkällan innan du utför underhåll. Om strömmen inte är avstängd kan det uppstå personskador eller skador på utrustning. Om strömmen måste vara påkopplad vid underhållsarbete anges detta i underhållsanvisningarna.

FARA

Koppla loss nätkabeln innan du rengör skrivaren.

FARA

Undvik skador från elektriska stötar genom att vänta minst en minut efter att strömmen stängts av, innan du tar ut kretskortet med strömförsörjningen. Använd ett antistatiskt armband, som är rätt jordat, när du hanterar kretskortet med strömförsörjningen. Håll endast i kortets låshandtag och i dess sidor. Vidrör ej komponenter och böj ej kortet när du tar bort eller sätter in det.

VARNING

Efter längre tids användning kan papperspressen bli vass. Undvik skärsår genom att endast hålla i papperspressens sidor.

VARNING

Håll ordentligt i skrivarhuven när du kopplar loss gasfjädringsenheten.

FARA

Var försiktig när du utför ändringar på skrivaren. Rörliga delar som frilagts kan orsaka personskador. Dessutom kan elström ge upphov till elektriska stötar.

1 Maintenance Overview

Chapter Contents

About the Printer

The IBM 6408 Line Matrix Printer is a high speed impact line printer. It is designed to perform a wide variety of high–volume printing tasks with minimum maintenance and maximum reliability.

The IBM 6408 printer incorporates the latest refinements in line matrix printing technology, yet is durable and easy to use. The operator can select every printer function at the operator panel or by sending commands from the host computer.

The IBM 6408 Line Matrix Printer comes in two models:

- IBM 6408–A00 is an ASCII printer.
- IBM 6408–CT0 is a coax/twinax SCS printer.

About This Manual

This is a field service maintenance manual for the IBM 6408 Line Matrix Printer. This manual is designed so that you can quickly locate maintenance information.

How to Use This Manual

You can locate information three ways:

- Use the **Table of Contents** at the front of the manual.
- Use the **Chapter Contents** listed at the front each chapter.
- Use the **Index** at the back of the manual.

Before you do a maintenance procedure, read through the entire procedure. Make sure you understand all safety notices, and have the parts and tools you need before performing a task. Notes and safety notices are defined below.

Notes and Notices

For your safety and to protect valuable equipment, it is very important that you read and comply with all information highlighted under notes and notices:

DANGER

A danger notice calls attention to a situation that is potentially lethal or extremely hazardous to people.

CAUTION

A caution notice calls attention to a situation that is extremely hazardous to people because of some existing condition.

WARNING

A warning notice indicates the possibility of damage to a program, device, system, or data.

IMPORTANT

Important draws your attention to information vital to proper operation of the printer.

NOTE: A note gives you helpful tips about printer operation and maintenance.

Related Documents

This manual does not explain how to operate or configure the printer. For that information, refer to the *Operator's Guide* and *Setup Guide* that accompany each model:

- *6408–A00 Operator's Guide* (IBM Form Number G246–0017)
- *6408–A00 Setup Guide* (IBM Form Number G246–0023)
- *6408–CT0 Operator's Guide* (IBM Form Number G246–0030)
- *6408–CT0 Setup Guide* (IBM Form Number G246–0036)

Information pertaining to printer control languages, emulations, and codes is in the applicable *Programmer's Reference Manual*:

- *6408–A00 Programmer's Reference Manual* (IBM Form Number G246–0029)
- *6408–CT0 Programmer's Reference Manual* (IBM Form Number G246–0042)

Information pertaining to the IGP** is in the *IGP User's Reference Manual*:

- *IGP** Printronix** Emulation Reference Manual* (IBM Form Number G246–0015)
- *Code V** Printronix Emulation Reference Manual* (IBM Form Number G246–0016)

Printing Conventions in This Manual

- **Operator panel keys and indicators** — highlighted in bold.

  Example: Press the **Clear** key, then press the **Start** key.

- "Liquid Crystal Display (LCD) messages" — set off by quotation marks.

  Example: Press the **Stop** key. "NOT READY" appears on the LCD.

- Key combinations — denoted by the + (plus) symbol.

  Example: 'Press **Scroll**↑ + **Scroll**↓ ' means to press the **Scroll**↑ key and the **Scroll**↓ key at the same time.

Controls and Indicators

Electrical Controls and Indicators: IBM 6408–A00 (Figure 1–1)

Key or Indicator	Function
Power Indicator	Lit when the printer is on.
Ready Indicator	Lit when the printer is in READY mode (on–line), no errors are pending, and the printer is ready to process data. Off when the printer is in NOT READY mode (off–line).
Processing Indicator	Flashes when the printer is receiving data from the host.
Attention Indicator	Lit when an error occurs. After correcting the error, press Clear to turn off this LED.
Power Switch	Applies power to the printer: (1 = on, 0 = off.) This switch is also a circuit breaker.
LCD	The Liquid Crystal Display (LCD) displays printer status messages.
Start	Puts the printer in the READY (on–line) mode. This key also clears fault conditions, exits program mode menus, and moves paper back to print position after View is pressed.
Stop	Puts the printer in the NOT READY (off–line) mode. This key also silences the audible alarm, and stops a Printer Test. Stop + Enter resets the printer.
Form Feed	Advances paper to next Top–Of–Form, as defined by the current page length.
Set Top Of Form	Sets TOF and moves paper downward from the tractor alignment notches to the print position.
Line Feed	Moves paper up one line, as determined by current line spacing.
View	Press to move the current print position up to the tractor area for viewing. Press again to return paper to original print position.
Clear	Clears a fault condition and moves printer to NOT READY mode.
Test	Enters the PROGRAM mode and jumps to the "Printer Tests" menu.
Menu	If in the NOT READY mode, this key puts the printer in the PROGRAM mode. If the configuration menus are locked, the LCD indicates the control panel is locked.
Enter	Selects the option displayed on the LCD. This action either sets a value, moves to the next lower level of configuration, or starts a self–test. Stop + Enter resets the printer.
Return	Returns to the next higher level of a configuration menu.
Micro▲	In the NOT READY mode, moves the paper upward 1/72 inch ("micro–step" function).
Micro▼	In the NOT READY mode, moves the paper downward 1/72 inch ("micro–step" function).
Scroll▲	In the PROGRAM mode, this key moves to the next menu ("Scroll" function).
Scroll▼	In the PROGRAM mode, this key moves to the previous menu ("Scroll" function).
Printer Configuration	Prints the current configuration.
Stop + Enter	Resets printer to last saved configuration, regardless of operational mode.
Scroll▲ + Scroll▼	Toggles the lock on the configuration menus.

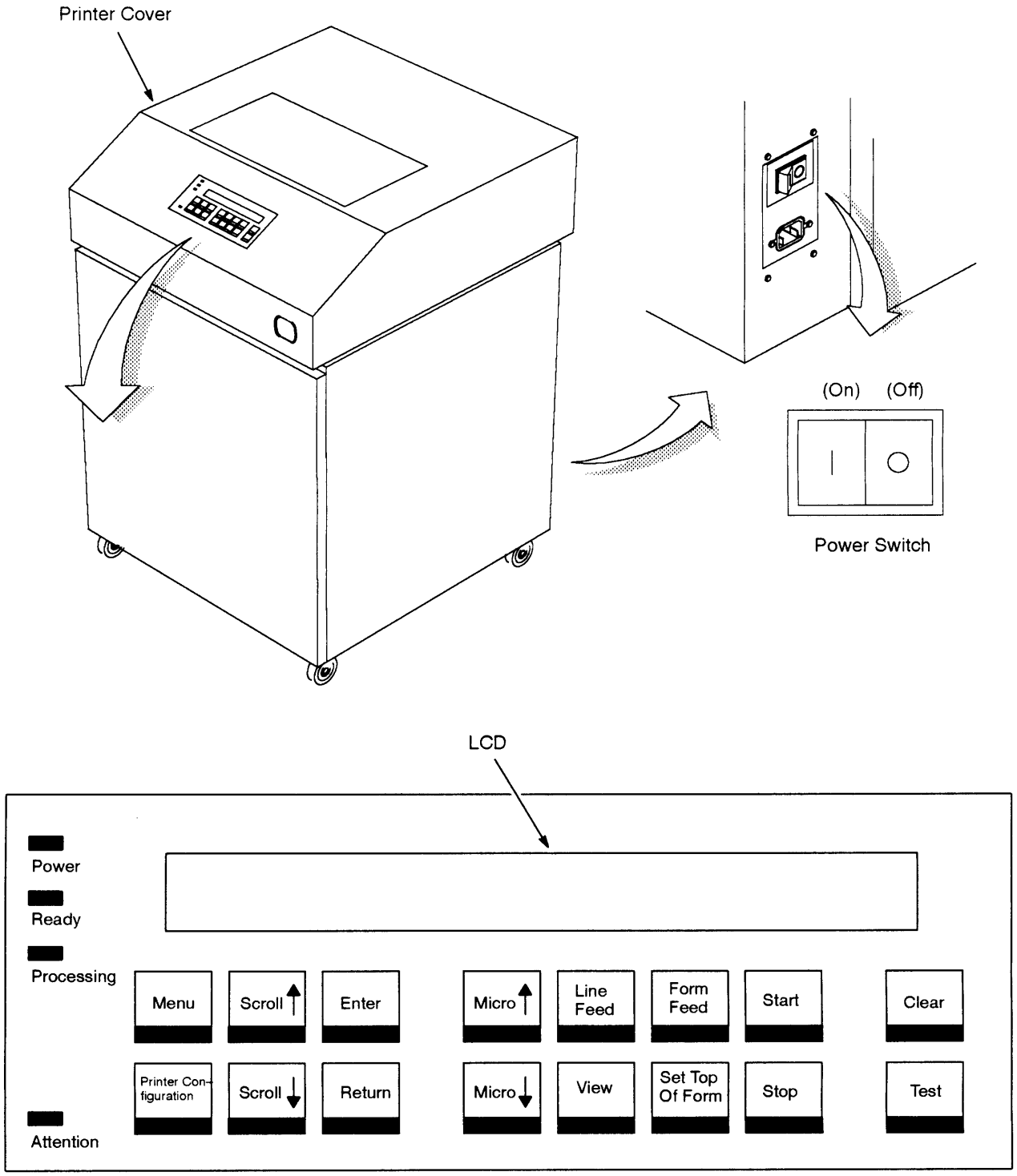


Figure 1–1. Electrical Controls and Indicators: IBM 6408–A00

Electrical Controls and Indicators: IBM 6408–CT0 (Figure 1–2)

Key or Indicator	Function
Power Indicator	Lit when the printer is on.
Ready Indicator	When lit, the printer is on–line, no errors are pending, and the printer is ready to process data. Off when the printer is off–line.
Processing Indicator	Lit when the printer is receiving data from the host.
Format Indicator	Coax only: lit when the printer is set to SCS mode. When on, the Cancel Print, PA1, and PA2 keys are active.
Online Indicator	Twinax only: lit when the host computer communicates with the printer.
Attention Indicator	Lit when an error occurs. After correcting the error, press Stop to turn off this LED.
Power Switch	Applies power to the printer. (1 = on, 0 = off) This switch is also a circuit breaker.
LCD	The Liquid Crystal Display (LCD) displays printer status messages.
Start	Puts the printer in the READY (on–line) mode. This key also exits program mode menus.
Stop	Puts the printer in the NOT READY (off–line) mode. Stops printer tests. This key also clears a fault and moves the printer from the FAULT mode to the NOT READY mode.
Form Feed	Advances paper to next Top–Of–Form, as defined by the current page length.
Set Top Of Form	Sets TOF and moves paper downward from the tractor alignment notches to the print position.
Line Feed	Moves paper up one line, as determined by current line spacing.
View	Press to move the current print position up to the tractor area for viewing. Press again to return paper to original print position.
Cancel Print	Cancels a print job.
Test	Enters the PROGRAM mode and jumps to the "Printer Tests" menu.
Menu	If in the NOT READY mode, this key puts the printer in the PROGRAM mode. If the configuration menus are locked, the LCD indicates the control panel is locked.
Enter	Selects the option displayed on the LCD. This action either sets a value, moves to the next lower level of configuration, or starts a self–test.
Return	Returns to the next higher level of a configuration menu.
Micro ▲ Scroll ▲	In the PROGRAM mode, advances to the next menu ("Scroll" function). In the NOT READY mode, advances the paper upward 1/72 inch ("micro–step" function).
Micro ▼ Scroll ▼	In the PROGRAM mode, advances to the previous menu ("Scroll" function). In the NOT READY mode, advances the paper downward 1/72 inch ("micro–step" function).
Printer Configuration	Prints the current configuration.
PA1	In SCS mode, sends "PROGRAM ATTENTION 1" to the host. First, a message is placed on the LCD requesting the operator to verify choice to send program attention. NOTE: This key valid only in Coax.
PA2	In SCS mode, sends "PROGRAM ATTENTION 2" to the host. First, a message is placed on the LCD requesting the operator to verify choice to send program attention. NOTE: This key valid only in Coax.
Stop + Enter	Resets printer to last saved configuration, regardless of operational mode.
Micro ▲ Scroll ▲ + Micro ▼ Scroll ▼	Toggles the lock on the configuration menus.

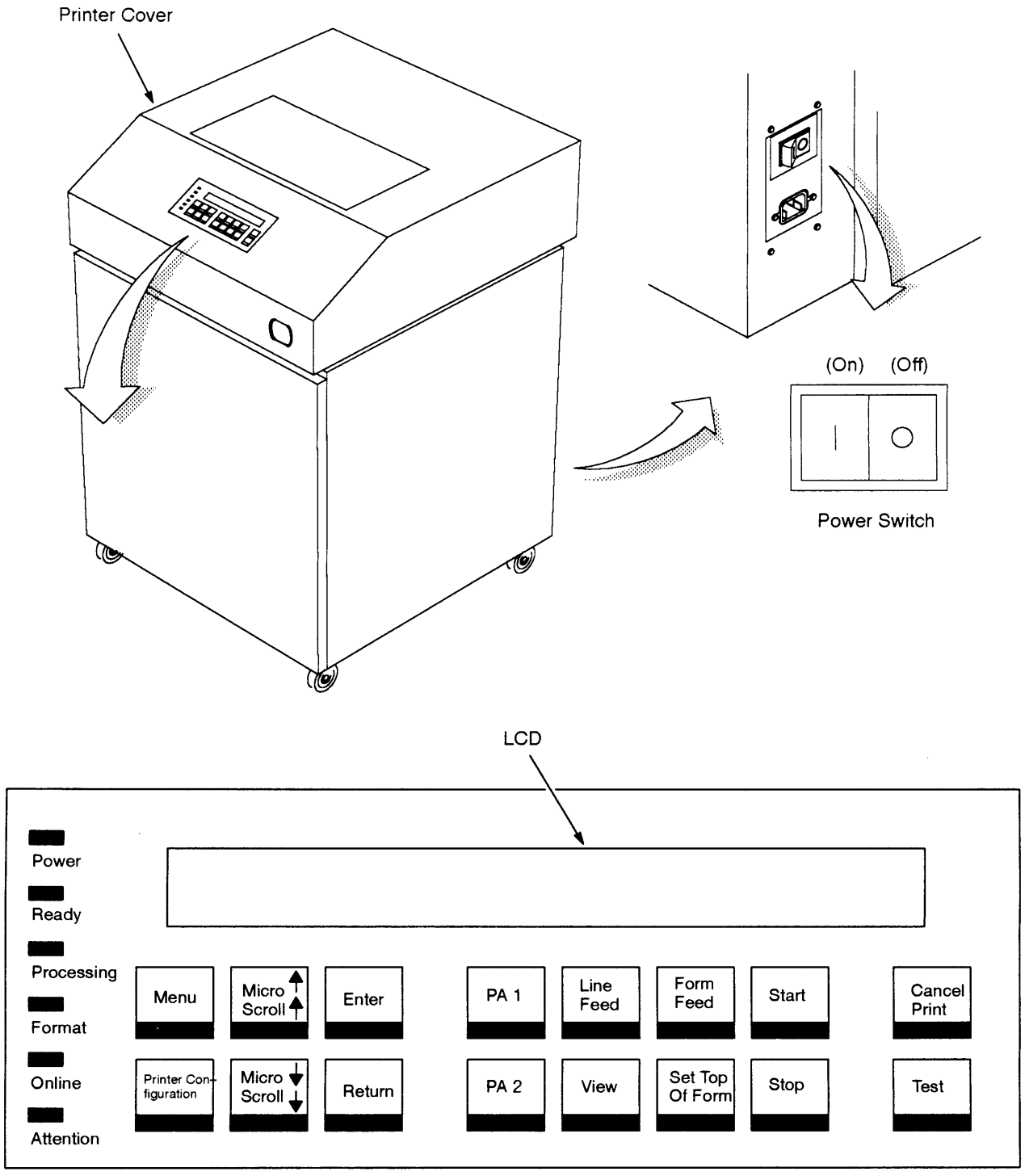
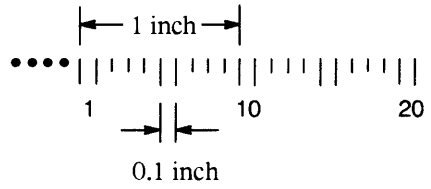


Figure 1–2. Electrical Controls and Indicators: IBM 6408–CT0

Mechanical Controls and Indicators: All Models (Figure 1–3)

Control or Indicator	Function
Forms Thickness Lever	Sets platen for paper and forms of different thicknesses. Lever must be fully opened (raised) to load or unload paper.
Forms Thickness Pointer and Scale	Indicates *relative* thickness of forms or paper. Set the forms thickness lever at A for thin (single–part) forms, B for thicker forms, and so on.
Tractors (2)	Hold and feed paper. Used to set side margin.
Tractor locks (2)	Lock tractors in position.
Horizontal Adjustment Knob	Allows fine positioning of left print margins. Moves paper and tractors left or right.
Vertical Position Knob	Used to set top of form or first line to be printed. Rotate to move paper vertically.
Ribbon Loading Path Diagram	A diagram that helps the user load the ribbon correctly.
Paper Scale	A horizontal scale graduated in tenths of an inch, useful for setting paper margins and counting text columns. (See below.) 

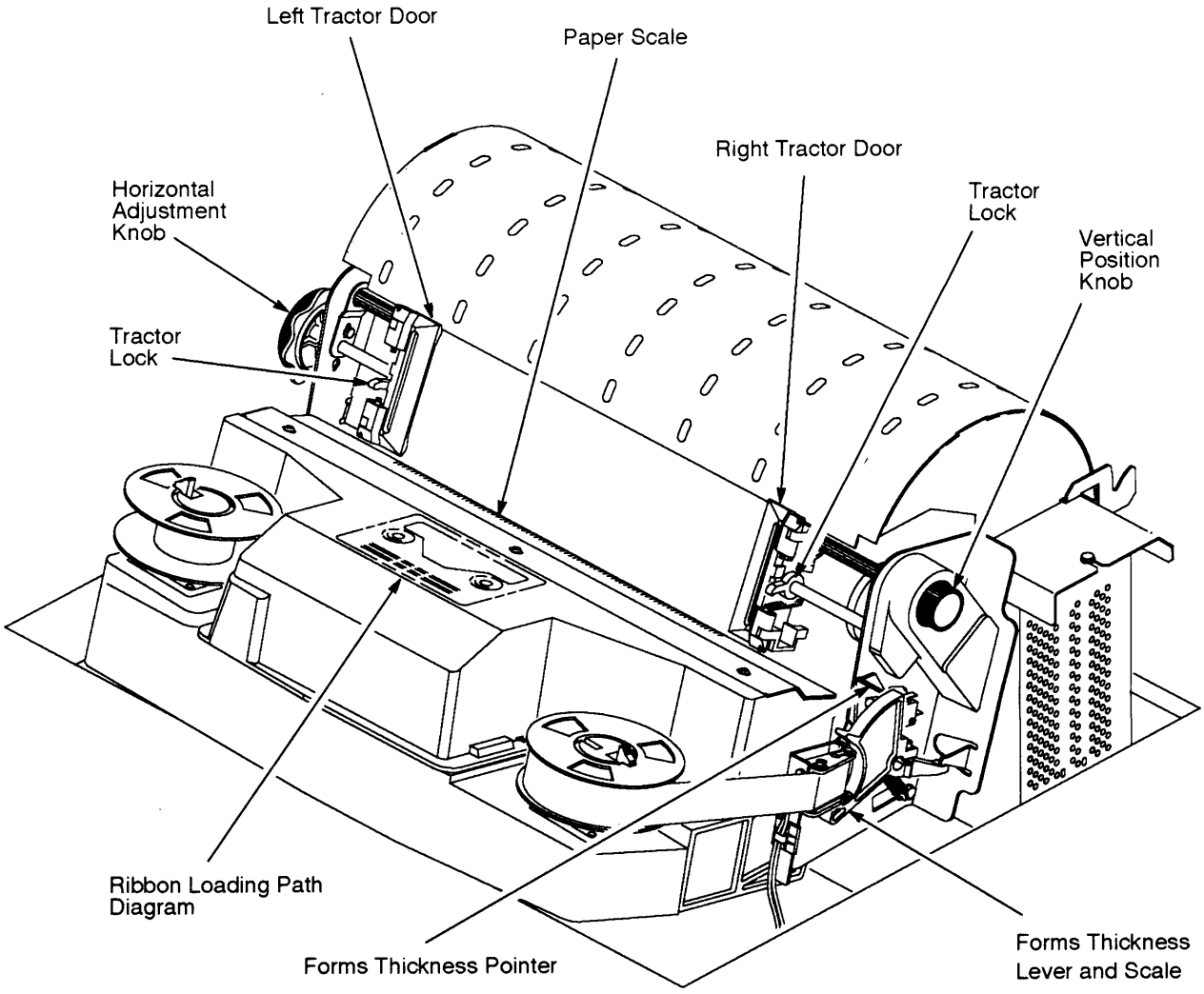


Figure 1–3. Mechanical Controls and Indicators: All Models

Tools, Test Equipment, and Supplies

The tools and equipment required for field level maintenance of IBM 6408 printers are listed below.

Item	Part No.
1–30 Inch–pound Torque Screwdriver	16F1661
Alcohol	2200200
EDS Wrist Strap	6405959
Grip Ring Pliers	9900317
Lubricant, Bearing	IBM #20
Module Extracting Tool	9900764
Platen Position Gauge	57G1505
Tie Wraps	75X5972
Torque Screwdriver Adapter	39F8449
Torque Screwdriver Hex Adapter 3/32 inch	39F8451
Torque Screwdriver Hex Adapter 5/32 inch	39F8450
Torque Screwdriver Hex Adapter 3/16 inch	1650831
Torque Screwdriver Hex Adapter 5/64 inch	16F1662

2 Installation

Installation of the IBM 6408 printer is covered in the *Setup Guide*. Refer to the following documents:

- *IBM 6408–A00 Setup Guide* (IBM Form Number G246–0023)
- *IBM 6408–CT0 Setup Guide* (IBM Form Number G246–0036)

3 Preventive Maintenance

Chapter Contents

Preventive Maintenance

The IBM 6408 printer requires no preventive maintenance beyond normal replenishment of paper and ribbons and periodic cleaning.

Operating conditions vary widely; therefore, the user must determine how often to clean the printer.

Since there is no guarantee that the user will clean the printer regularly, you should clean the printer whenever you are called to service it.

DANGER

Always disconnect the AC power cord before cleaning the printer.

Cleaning the Printer

WARNING

Do not use abrasive cleaners, particularly on the window. Do not drip water into the printer. Damage to the equipment will result. When using spray solutions, do not spray directly onto the printer; spray the cloth, then apply the dampened cloth to the printer.

Cleaning the Cabinet Exterior

1. Wipe the cabinet with a clean, lint–free cloth dampened (not wet) with water and mild detergent or window cleaning solution.
2. Dry the cabinet with a clean, lint–free cloth.
3. Clean the inside of the cabinet (page 3–4).

Cleaning the Cabinet Interior (Figure 3–1)

1. Power off the printer.
2. Disconnect the AC power cord from the power source and the printer.
3. Open the printer cover.
4. Open the forms thickness lever.
5. Remove paper from the printer.
6. Remove the ribbon.
7. Using a soft–bristled, non–metallic brush, wipe off paper dust and ribbon lint. Vacuum up the residue. Pay particular attention to the tractors, shuttle cover assembly, and base casting.
8. Wipe the splined shaft with a soft cloth.

WARNING

To avoid corrosion damage, use only alcohol when cleaning printer mechanical elements. Make sure the cleaning solution contains no water.

9. Using a cloth dampened with alcohol, clean the ribbon guides.
10. Vacuum up dust or residue that has accumulated inside the lower cabinet.
11. Wipe the lower cabinet interior with a clean, lint–free cloth dampened with water and mild detergent or window cleaning solution.
12. Dry the cabinet interior with a clean, lint–free cloth.
13. Clean the shuttle frame assembly (page 3–6).

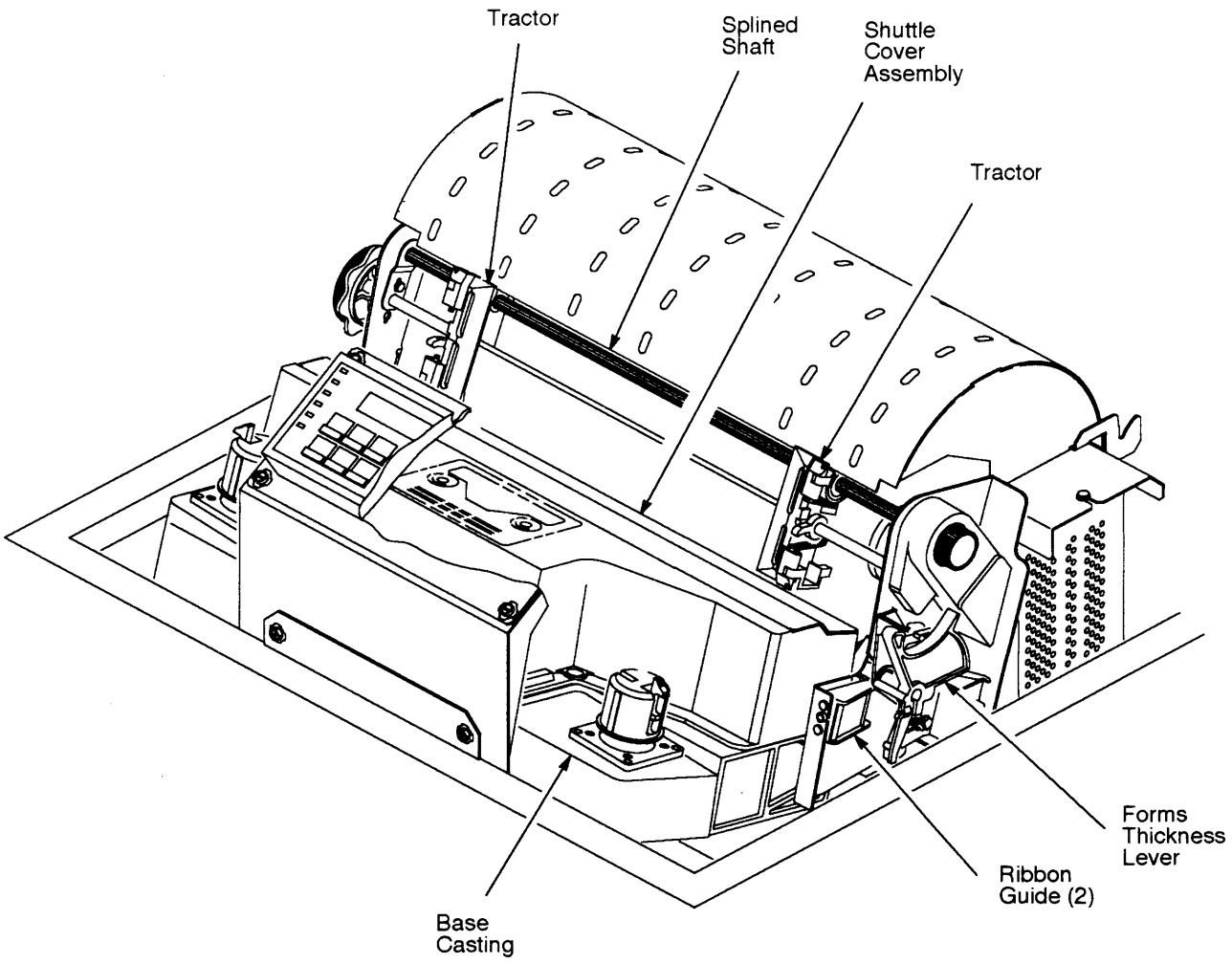


Figure 3–1. Cleaning Inside the Cabinet

Cleaning the Shuttle Frame Assembly (Figure 3–2)

1. Remove the shuttle cover assembly (page 6–42).
2. Remove the shuttle frame assembly (page 6–118).
3. Remove the paper ironer (page 6–68).

CAUTION

Over time, the upper edge of the paper ironer can become sharp. To avoid cutting yourself, handle the paper ironer on the sides.

4. Moisten a clean, soft cloth with alcohol. Wipe the paper ironer to remove lint, ink, and paper residue.
5. Install the paper ironer (page 6–68).
6. Remove the hammer bank cover assembly (page 6–38).
7. Moisten a clean, soft cloth with alcohol. Wipe the hammer bank cover assembly to remove lint, ink, and paper residue. Clean the holes in the cover strips.

WARNING

Do not use any solvents to clean the hammer tips, and clean the hammer tips gently. Use of excessive force can chip hammer tips.

8. Using a stiff, non–metallic brush (such as a toothbrush), carefully brush the hammer tips to remove lint and ink accumulations. Vacuum up any residue.

WARNING

The hammer bank contains a strong magnet. To prevent damage to the hammer tips, do not let the hammer bank cover assembly snap into place as the hammer bank magnet attracts it. Any impact of the cover against the hammer bank can break hammer tips.

9. Install the hammer bank cover assembly (page 6–38).
10. Install the shuttle frame assembly (page 6–118).
11. Install the shuttle cover assembly (page 6–42).
12. Clean the card cage fan assembly (page 3–8).

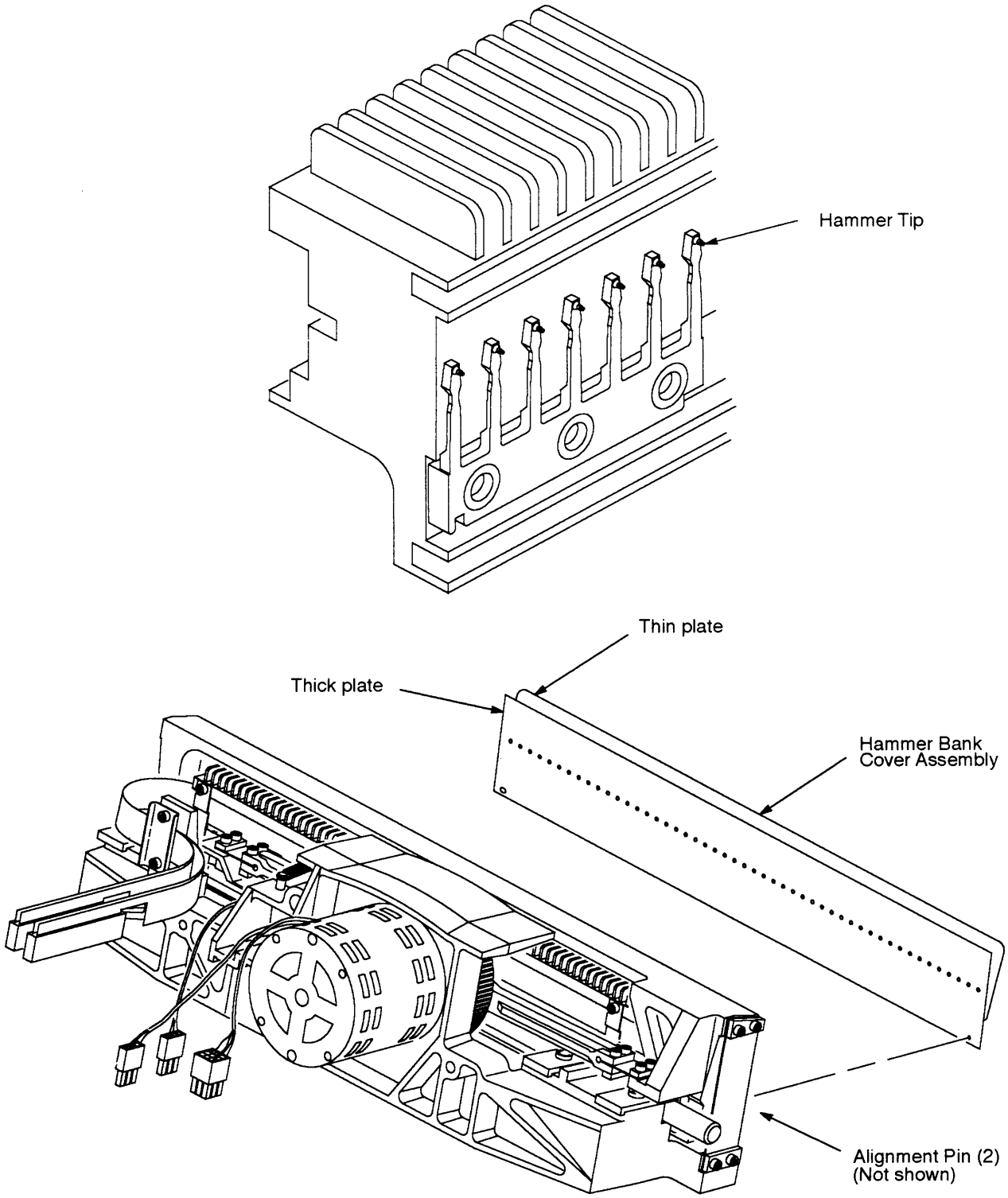


Figure 3–2. Cleaning the Shuttle Frame Assembly

Cleaning the Card Cage Fan Assembly (Figure 3–3)

1. Remove the paper guide assembly (page 6–66).
2. Vacuum the card cage fan assembly and surrounding areas to remove paper particles, dust, and lint.
3. Install the paper guide assembly (page 6–66).
4. Close the printer cover.
5. Connect the AC power cord to the printer.

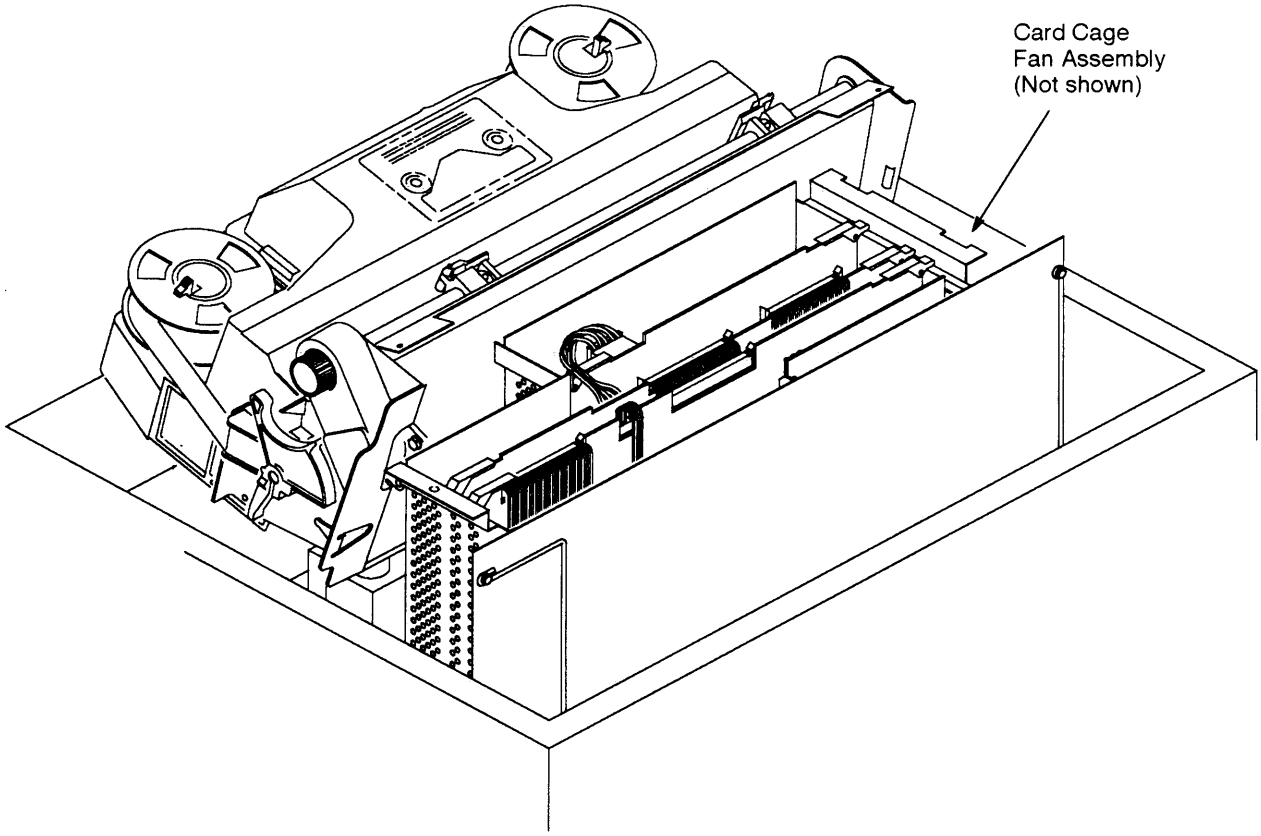


Figure 3–3. Cleaning the Card Cage Fan Assembly

4 Troubleshooting

Chapter Contents

Introduction

This chapter contains procedures for troubleshooting printer malfunctions.

Operator panel keys, configuration menus, and diagnostic tests are different for IBM 6408–A00 and IBM 6408–CT0 printers. For this reason, and because you must operate the printer to check its performance, have the *Operator's Guide* and the *Setup Guide* at the printer site.

Fault Messages: IBM 6408–A00 (ASCII) Printer

DANGER

Always disconnect the AC power cord from the power source before performing any maintenance procedure. Failure to remove power could result in injury to persons or damage to equipment. If you must apply power during maintenance, you will be instructed to so in the maintenance procedure.

If a fault condition occurs in the A00 printer, the following occur:

- The **Attention** indicator on the operator panel lights.
- If enabled, an alarm sounds. (Press **Stop** to silence the alarm.)
- The operator panel message display indicates "ATTENTION" on the first line and the specific fault message on the second line.

Displayed faults fall into one of two categories:

- Operator correctable.
- IBM service representative required—indicated by an asterisk [*] after the fault message.

Clearing Errors

Refer to Table 4–1 and follow the instructions. After correcting an error, press **Start** to clear the message and place the printer in READY mode. Press **Clear** to clear the message and place the printer in NOT READY mode.

If an error is not cleared, the printer will try to print again but will display another error message until the error is finally cleared.

Table 4–1. IBM 6408–A00 Fault Messages

Fault Message	Explanation	Solution
DCU RAM	RAM on CCB failed initialization test.	Page 4–11.
Font PROM	Font PROM failure on CCB.	Replace font PROMs on CCB. If message recurs, replace CCB.
001 Out of Forms	Printer out of paper.	Page 4–23.
002 Forms Jammed	No paper motion.	Page 4–21
051 Hammer Driver Short*	Electrical malfunction of hammer driver system.	Page 4–16
052 Mechanism Driver Hot*	Mechanism driver board is overheating.	Page 4–17
053 48 Volt Failed*	Internal power failure.	Page 4–8
054 Hammer Coil Short*	Electrical malfunction of one or more hammer coils.	Page 4–15
055 Mechanism Driver Link Down*	Electronic fault between controller board and mechanism driver board.	Page 4–18
056 Hammer Coil Open*	Electrical malfunction of one or more hammer coils.	Page 4–14
057 Platen Open	Forms thickness lever is raised to open position.	Page 4–23
058 Shuttle Jammed	No shuttle movement or shuttle moving at wrong speed.	Page 4–26
059 Hammer Bank Hot*	One or more hammer coils are overheating.	Page 4–13
060 Shuttle Fan Failure*	Shuttle is overheating.	Page 4–11
076 Printer Board Failure*	Failure in printer's operational software.	Replace the CT board. Write down the logged error code(s) and send them back with the old board.
089 Ribbon Jammed	No ribbon movement.	Page 4–24
090 Shuttle Cover Open*	Shuttle cover open.	Page 4–25

DANGER

Always disconnect the AC power cord from the power source before performing any maintenance procedure. Failure to remove power could result in injury to persons or damage to equipment. If you must apply power during maintenance, you will be instructed to so in the maintenance procedure.

If a fault condition occurs in the CT0 printer, the following occurs:

- The **Attention** indicator on the operator panel lights.
- If enabled, an alarm sounds. (Press **Stop** to silence the alarm.)
- The error log buffer automatically logs the error.
- The operator panel message display indicates "ATTENTION" on the first line and the specific fault message on the second line.

The message display shows only one error at a time. If multiple errors occur simultaneously, the errors are prioritized to determine which error is displayed on the operator panel.

The CT0 printer has four categories of errors:

- **Fatal Errors:** electromechanical problems detected by built–in test equipment. Printing stops and the printer requires repair.
- **Correctable Errors:** errors requiring the user to perform some action to clear the error.
- **Overrideable Errors:** errors informing the user that printer performance has decreased for some reason. The user can override the error and continue printing.
- **Non–Intervention Errors:** host system errors cleared by the host. These are logged in the error log. In some, but not all cases, the user is informed that they have occurred.

Clearing Errors

Refer to Table 4–2 and follow the instructions. After correcting an error, press **Stop** to clear the error. Press **Start** to resume printing.

If an error is not cleared, the printer will try to print again but will display another error message until the error is finally cleared.

Table 4–2. IBM 6408–CT0 Fault Messages

Error Log Code	Fault Message	Explanation	Solution
	DCU RAM	RAM on CCB failed initialization test.	Page 4–11.
	FONT PROM	Font PROM failure on CCB.	Replace font PROMs on CCB. If message recurs, replace CCB.
	INVALID KEYPRESS	Appears briefly if an inactive key is pressed.	Re–enter the value, or press the correct key.
01–04	076 PRINTER BOARD FAILURE	01—System comm. error 02—Illegal protocol communication 03—Illegal function request 04—Initialization error	Replace the CT board (page 6–72). Write down the logged error code(s) and send them back with the old board.
05	999 NVRAM ERROR	Non–volatile memory fault.	Page 4–19.
06–15	076 PRINTER BOARD FAILURE	Internal error message.	Replace the CT board (page 6–72). Write down the logged error code(s) and send them back with the old board.
16	HAMMER DRIVER ERROR	Electronic fault in mechanism driver system.	Page 4–16.
17		Not Used	
18	COOLING ERROR	Circuit boards are overheating.	Page 4–11.
19	001 END OF FORMS	Twinax printer out of paper.	Load paper. See also page 4–23.
20	PLATEN OPEN	Forms thickness lever is raised to open position. (Twinax)	Page 4–23.
21	090 COVER/DOOR OPEN	The shuttle cover is not in place.	Page 4–25.
22	089 RIBBON JAM	No ribbon movement or ribbon moving at wrong speed.	Page 4–24.
23	SHUTTLE STALL	No shuttle movement or shuttle moving at wrong speed.	Page 4–26.
24	002 FORMS JAMMED	No paper motion. (Twinax)	Page 4–21.

Continued on next page.

Table 4–2. IBM 6408–CT0 Fault Messages (Continued)

Error Log Code	Fault Message	Explanation	Solution
25	002 FORMS JAMMED	No paper motion. (Coax)	Page 4–21.
26	PLATEN OPEN	Forms thickness lever is raised to open position. (Coax)	Page 4–23.
27	001 END OF FORMS	Coax printer out of paper.	Load paper. See also page 4–23.
28	RIBBON OUT	RibbonMinder** message indicating it is time to change the ribbon.	Replace old ribbon with new one and configure the ribbon life to 100%. See the *Setup Guide*.
29		Not Used	
30		Not Used	
31–33	076 PRINTER BOARD FAILURE	Internal error message.	Replace the CT board (page 6–72). Write down the logged error code(s) and send them with the old board.
34	024 PARITY ERROR	Parity error on the twinax line.	The printer reports the error: host clears the error. See also page 4–9.
35	076 PRINTER BOARD FAILURE	Internal error message.	Replace the CT board (page 6–72). Write down the logged error code(s) and send them with the old board.
36	02X ACTIVATE LOST	Twinax protocol communication errors.	The printer reports the error. See also page 4–9.
37	02X INVALID ACTIVATE	Twinax protocol communication errors.	The printer reports the error. See also page 4–9.
38	02X INVALID COMMAND	Twinax protocol communication errors.	The printer reports the error. See also page 4–9.
39	02X INPUT QUERY OVERRUN	Data byte limit exceeded on twinax printer.	Have the system operator rerun the print job. See also page 4–9.
40	A97 UNDEFINED CHARACTER	Twinax printer has received a non–printable character.	Press **Start**.
41	02X SCS CODE ERROR	Printer received undefined control character (hex 40).	The printer clears the error. See also page 4–25.

Continued on next page.

Table 4–2. IBM 6408–CT0 Fault Messages (Continued)

Error Log Code	Fault Message	Explanation	Solution
42	02X SCS PARAMETER ERROR	Illegal parameter value received in command code.	Press Stop to clear fault. Press **Start** to go on–line. See also page 4–25.
43	BELL CHARACTER	See the *Operator's Guide*.	Press **Start**.
44–47	076 PRINTER BOARD FAILURE	Internal error message.	Replace the CT board (page 6–72). Write down the logged error code(s) and send them with the old board.
48	CU NOT ENABLE	Host has not communicated with the coax printer for approximately one minute.	Correct host communication problem. See the *Programmer's Reference Manual*.
49–51	076 PRINTER BOARD FAILURE	Internal error message.	Replace the CT board (page 6–72). Write down the logged error code(s) and send them with the old board.
52		Not Used	
53	MECH DRV LINK	Electronic fault between controller board and mechanism driver board.	Page 4–18.
54	MECH DRV HOT	Mechanism driver board is overheating.	Page 4–17.
55	48 VOLT FAILED	Internal power failure.	Page 4–8.
56	054 HAMMER COIL SHORT	Electrical malfunction of one or more hammer coils.	Page 4–15.
57	056 HAMMER COIL OPEN	Electrical malfunction of one or more hammer coils.	Page 4–14.
58	051 HAMMER DRV SHORT	Electrical malfunction of hammer driver system.	Page 4–16.
59	059 HAMMER BANK HOT	One or more hammer coils are overheating.	Page 4–13.
60	SHUTTL FAN FAULT	Shuttle assembly is overheating.	Page 4–11.

053 48 Volt Failed *
48 VOLT FAILED

Instruction	Indication	Yes	No
1. Cycle power: Power off printer. Wait 15 seconds. Power on printer.	"48 Volt Failed * " message.	Go to step 2.	Return printer to normal operation.
2. Press the switch that clears fault messages.	"48 Volt Failed * " message.	Go to step 3.	Return printer to normal operation.
3. Power off printer. Remove the paper guide assembly. Disconnect cable assembly W1, CCB/Mech Driver, from connector J2 on the CCB and connector J6 on the Mech Driver board. (See Appendix A.) Power on the printer.	Card cage fan comes on.	Power off printer. Replace the common controller board. Go to step 4.	Power off printer. Replace the Mech Driver board. Go to step 4.
4. Cycle power: Power off printer. Wait 15 seconds. Power on printer.	"48 Volt Failed * " message.	Replace the power supply board. Go to step 5.	Return printer to normal operation.
5. Cycle power and check for the fault message.	"48 Volt Failed * " message.	Replace cable assembly W2, +5V. (See Appendix A.) Go to step 6.	Return printer to normal operation.
6. Cycle power and check for the fault message.	"48 Volt Failed * " message.	Replace cable assembly W3, Hi Voltage. (See Appendix A.) Go to step 7.	Return printer to normal operation.
7. Cycle power and check for the fault message.	"48 Volt Failed * " message.	Replace cable assembly W6, Main Wire Harness. (See Appendix A.)	Return printer to normal operation.

02X ACTIVATE LOST
02X INPUT QUERY OVERRUN
02X INVALID ACTIVATE
INVALID COMMAND
024 PARITY ERROR

DANGER

To prevent serious personal injury from electrical shock when connecting or disconnecting the signal cable, power the printer off and unplug the power cable.

Instruction	Indication	Yes	No
1. Print the Error Log, which is under the CT Internal Test menu. (Ref: *Setup Guide.*) A few parity errors are acceptable.	Host communication error message display logged.	Go to step 2.	Return printer to normal operation.
2. Power printer off and disconnect the power cord. Check coax/twinax cable termination.	Coax/twinax cable is properly attached.	Go to step 3.	Attach cable correctly.
3. Check coax/twinax I/O cable grounding and connection to PCBA.	Cable is grounded and attached to CT board correctly.	Go to step 4.	Attach cable correctly.
4. Check that coax/twinax cable is undamaged and is not longer than 4921.5 feet (1500 meters).	Cable is OK.	Go to step 5.	Replace cable.
5. Power printer on and send data from host.	Error message displays.	Power printer off. Replace one at a time until message is gone: a) CT board b) CCB board c) coax or twinax cable.	Return printer to normal operation.

CCB to Mech Err.

Instruction	Indication	Yes	No
1. Cycle power: Power off printer. Wait 15 seconds. Power on printer.	"CCB TO MECH ERR." message.	Go to step 2.	Return printer to normal operation.
2. Press the operator panel switch that clears fault indications.	"CCB TO MECH ERR." message.	Go to step 3.	Return printer to normal operation.
3. Run a diagnostic print test.	"CCB TO MECH ERR." message.	Go to step 4.	Return printer to normal operation.
4. Power the printer off. Remove the paper guide assembly and card cage cover. Check ribbon cable connectors between controller board and mechanism driver board.	Connectors are attached properly.	Go to step 5.	Connect and latch ribbon connectors. Go to step 5.
5. Check installation of the controller board and mechanism driver board.	Boards are installed correctly.	Go to step 6.	Reseat controller and mechanism driver boards in their edge connectors at back of card cage. Go to step 7.
6. Check for correct installation of EPROMs and microprocessors for the RTPU on the controller board and RSP on the mechanism driver board.	RTPU and RSP EPROMs and microprocessors are installed correctly.	Go to step 7.	Install correct RTPU and RSP EPROMs and microprocessors. Go to step 7.
7. Power on printer and check for fault message.	"CCB TO MECH ERR." message.	Replace the controller board, then go to step 8.	Return printer to normal operation.
8. Power on printer and check for fault message.	"CCB TO MECH ERR." message.	Replace the mechanism driver board, then go to step 9.	Return printer to normal operation.
9. Power on printer and check for fault message.	"CCB TO MECH ERR." message.	Replace CCB/Mech. Dr. cable. (See Appendix A.)	Return printer to normal operation.

060 Shuttle Fan Failure
SHUTTL FAN FAULT
COOLING ERROR

Instruction	Indication	Yes	No
1. Remove the shuttle cover. Install a magnet across the hole in the base casting where the cover open sensor is mounted. Check for inoperative hammer bank or card cage fan, or obstructed airflow.	"COOLING ERROR" or "Shuttle Fan Failure" message.	Replace one at at time until message is gone: a) inoperative fan(s) b) mech driver PCBA c) CCB PCBA.	Return printer to normal operation.

DCU RAM

Instruction	Indication	Yes	No
1. Cycle power: Power off printer. Wait 15 seconds. Power on printer.	"DCU RAM" message.	Go to step 2.	Return printer to normal operation.
2. Press the operator panel switch that clears fault indications.	"DCU RAM" message.	Replace DPU and RTPU on common controller board. Go to step 3.	Return printer to normal operation.
3. Run a diagnostic print test.	"DCU RAM" message.	Replace all RAM on common controller board. Go to step 4.	Return printer to normal operation.
4. Run a diagnostic print test.	"DCU RAM" message.	Replace CCB.	Return printer to normal operation.

Dynamic RAM Fault *

DANGER

To prevent serious personal injury from electrical shock when connecting or disconnecting the signal cable, power the printer off and unplug the power cable.

	Instruction	Indication	Yes	No
1.	Cycle power: Power off printer. Wait 15 seconds. Power on printer.	"Dynamic RAM Fault * " message.	Go to step 2.	Return printer to normal operation.
2.	Take the printer off–line. Power printer off. Disconnect the power cord. Disconnect the input data line from the host computer. Power the printer off. Wait 15 seconds. Power the printer on.	"Dynamic RAM Fault * " message.	Make a CCB Diagnostic Check (page 4–32). If any problems are found on the CCB, replace the board.	Return printer to normal operation.

Graphic Check

	Instruction	Indication	Yes	No
1.	Run a buffer print. (Ref: *Setup Guide*.) Run the same job that generated the error message.	GRAPHIC CHECK message.	Go to step 2.	Return printer to normal operation.
2.	Have the system operator verify: a) host data are correct, b) there are no invalid characters, and c) the printer's World Trade Language is correct.	Host data contain no invalid characters and World Trade Language correct.	Go to step 3.	Have the system operator make the necessary corrections to data or configuration.
3.	Run the Translation Table in CT internal test menu and check characters.	GRAPHIC CHECK message.	Replace one at a time until message is gone: a) CT board b) CCB board c) coax or twinax cable.	Return printer to normal operation.

059 Hammer Bank Hot *
Hmr Coil Too Hot

NOTE: The printer has protective circuits designed to sense conditions that can lead to overheating. When such conditions are sensed, print speed is reduced 50%. If the printer consistently prints at half speed, it may be printing long jobs of very dense graphics or operating in a severe environment. A severe environment is consistently above 90° Fahrenheit (32° Celsius) or is dirty enough to create blockage of the blower ducts. If the printer is located in such an environment, consider relocating it to a cooler, cleaner area or reducing the size and duration of the print jobs.

	Instruction	Indication	Yes	No
1.	Cycle power: Power off printer. Wait 15 seconds. Power on printer.	"Ham. Bank Hot * " message.	Go to step 2.	Return printer to normal operation.
2.	Press the switch that clears fault messages.	"Ham. Bank Hot * " message.	Go to step 3.	Return printer to normal operation.
3.	Run diagnostic self–test "All Black" for 1/4 page.	"Ham. Bank Hot * " message.	Go to step 4.	Return printer to normal operation.
4.	Remove the shuttle cover. Install a magnet across the hole in the base casting where the cover open sensor is mounted. Run a diagnostic print test.	Hammer bank fan operates.	Replace shuttle frame assembly.	Replace hammer bank fan assembly.

056 Hammer Coil Open *

Instruction	Indication	Yes	No
1. Cycle power: Power off printer. Wait 15 seconds. Power on printer.	"Ham. Coil Open * " message.	Go to step 2.	Return printer to normal operation.
2. Press the switch that clears fault messages.	"Ham. Coil Open * " message.	Go to step 3.	Return printer to normal operation.
3. Run a diagnostic print test.	"Ham. Coil Open * " message.	Go to step 4.	Return printer to normal operation.
4. Remove the shuttle cover.	—	Go to step 5.	—
5. Install a magnet across the hole in the base casting where the cover open sensor is mounted.	—	Go to step 6.	—
6. Run a diagnostic print test and observe where the non–printing hammer is located.	—	Go to step 7.	—
7. Reverse the hammer bank flex circuit cables in the connectors on the base casting.	—	Go to step 8.	—
8. Run a diagnostic print test. Observe where the non–printing hammer is located. (NOTE: Hammer number 48 is a permanently non–printing hammer. Keep this is mind when reversing cables.)	Position of the non–printing hammer remains the same.	Replace the shuttle frame assembly, then go to step 9.	If the non–printing hammer is now on the other side of the hammer bank, replace the mechanism driver PCBA, then go to step 9.
9. Return the hammer bank flex circuit cables to their correct connectors on the base casting. Run a diagnostic print test.	"Ham. Coil Open * " message.	Replace both hammer bank cable assemblies.	Return printer to normal operation.

054 Hammer Coil Short *

Instruction	Indication	Yes	No
1. Cycle power: Power off printer. Wait 15 seconds. Power on printer.	"Ham. Coil Short * " message.	Go to step 2.	Return printer to normal operation.
2. Press the CLEAR switch.	"Ham. Coil Short * " message.	Go to step 3.	Return printer to normal operation.
3. Run a diagnostic print test.	"Ham. Coil Short * " message.	Go to step 4.	Return printer to normal operation.
4. Remove the shuttle cover. Install a magnet across the hole in the base casting where the cover open sensor is mounted. Disconnect the hammer bank flex circuit cables from the connectors on the base casting. Run a diagnostic print test.	"Ham. Coil Short * " message.	Replace the mechanism driver PCBA, then go to step 5.	Replace the shuttle frame assembly .
5. Run a diagnostic print test.	"Ham. Coil Short * " message.	Replace both hammer bank cable assemblies.	Return printer to normal operation.

HAMMER DRIVER ERROR

Instruction	Indication	Yes	No
1. Cycle power: Power off printer. Wait 15 seconds. Power on printer.	HAMMER DRV ERROR message.	Go to step 2.	Return printer to normal operation.
2. Press the ENABLE/HOLD switch.	HAMMER DRV ERROR message.	Go to step 3.	Return printer to normal operation.
3. Run a diagnostic print test.	HAMMER DRV ERROR message.	Replace the mech. driver PCBA and check for error message. Go to step 4.	Return printer to normal operation.
4. Run a diagnostic print test.	HAMMER DRV ERROR message.	Replace one at a time until message is gone: power supply PCBA, shuttle frame assembly.	Return printer to normal operation.

051 Hammer Driver Short

Instruction	Indication	Yes	No
1. Cycle power: Power off printer. Wait 15 seconds. Power on printer.	"Ham. Drv. Short * " message.	Go to step 2.	Return printer to normal operation.
2. Press the switch that clears fault messages.	"Ham. Drv. Short * " message.	Go to step 3.	Return printer to normal operation.
3. Run a diagnostic print test.	"Ham. Drv. Short * " message.	Replace the mechanism driver PCBA.	Return printer to normal operation.

Internal Error

Instruction	Indication	Yes	No
1. Cycle power: Power off printer. Wait 15 seconds. Power on printer.	"Internal Error" message.	Go to step 2.	Return printer to normal operation.
2. Press the operator panel switch that clears fault messages.	"Internal Error" message.	Go to step 3.	Return printer to normal operation.
3. This message indicates a software bug. Use your local support procedure to request assistance.	—	—	—

052 Mechanism Driver Hot *
MECH DRV HOT

Instruction	Indication	Yes	No
1. Cycle power: Power off printer. Wait 15 seconds. Power on printer.	"Mechanism Driver Hot * " message.	Go to step 2.	Return printer to normal operation.
2. Press the CLEAR switch.	"Mechanism Driver Hot * " message.	Go to step 3.	Return printer to normal operation.
3. Run a diagnostic print test.	"Mechanism Driver Hot * " message.	Go to step 4.	Return printer to normal operation.
4. Open printer cover and observe card cage fan.	Card cage fan operates.	Replace mechanism driver PCBA.	Replace card cage fan assembly.

055 Mechanism Driver Link Down *
MECH DRV LINK

	Instruction	Indication	Yes	No
1.	Cycle power: Power off printer. Wait 15 seconds. Power on printer.	"Mechanism Driver Link Down * " message.	Go to step 2.	Return printer to normal operation.
2.	Press the CLEAR switch.	"Mechanism Driver Link Down * " message.	Go to step 3.	Return printer to normal operation.
3.	Power on printer and check for fault message.	"Mechanism Driver Link Down * " message.	Go to step 4.	Return printer to normal operation.
4.	Power off printer. Remove paper guide assembly. Check ribbon cable connectors between common controller board (CCB) and mechanism driver board.	Connectors are attached properly.	Go to step 5.	Connect and latch ribbon connectors. Go to step 5.
5.	Check installation of common controller board (CCB) and mechanism driver board.	Boards are installed correctly.	Go to step 6.	Reseat CCB and mechanism driver boards in their edge connectors at bottom of card cage. Go to step 6.
6.	Power on printer and check for fault message.	"Mechanism Driver Link Down * " message.	Replace the common controller PCBA then go to step 7.	Return printer to normal operation.
7.	Power on printer and check for fault message.	"Mechanism Driver Link Down * " message.	Replace the mechanism driver PCBA, then go to step 8.	Return printer to normal operation.
8.	Power on printer and check for fault message.	"Mechanism Driver Link Down * " message.	Replace cable assembly W1, CCB/Mech. Dr. (See Appendix A.)	Return printer to normal operation.

NVRAM
999 NVRAM ERROR

Instruction	Indication	Yes	No
1. Cycle power: Power off printer. Wait 15 seconds. Power on printer.	"NVRAM" message.	Go to step 2.	Return printer to normal operation.
2. Press the operator panel key that clears fault indications.	"NVRAM" message.	Replace NVRAM on CT Board.	Return printer to normal operation.

Off Line
Line Check Par.

DANGER

To prevent serious personal injury from electrical shock when connecting or disconnecting the signal cable, power the printer off and unplug the power cable.

Instruction	Indication	Yes	No
1. Wait a few seconds.	"OFF LINE LINE CHECK PAR." message.	Go to step 2.	Return printer to normal operation.
2. Cycle power: Power off printer. Wait 15 seconds. Power on printer.	"OFF LINE LINE CHECK PAR." message.	Go to step 3.	Return printer to normal operation.
3. Power off printer. Disconnect the power cord. Communications problem. Check lines, controller, etc.	—	—	—

On Line
Line Check Par.

DANGER

To prevent serious personal injury from electrical shock when connecting or disconnecting the signal cable, power the printer off and unplug the power cable.

Instruction	Indication	Yes	No
1. Wait a few seconds.	"ON LINE LINE CHECK PAR." message.	Go to step 2.	Return printer to normal operation.
2. Cycle power: Power off printer. Wait 15 seconds. Power on printer.	"ON LINE LINE CHECK PAR." message.	Go to step 3.	Return printer to normal operation.
3. Power off printer. Disconnect the power cord. Communications problem. Check lines, controller, etc.	—	—	—

Paper Jam
002 FORMS JAMMED

Instruction	Indication	Yes	No
1. Check for a failure to sense End of Forms.	End of Forms (last form) is past the hammer area.	Do one at a time until the problem is gone: a) Clean the paper detector sensor with a cotton swab and alcohol. b) Replace the common controller board. c) Replace intermediate cable assembly (W5).	Go to step 2.
2. Inspect paper path for bunched, torn, folded paper or labels.	Paper path is clear.	Go to step 3.	Remove paper and go to step 3.
3. Inspect the narrow passageway between the face of the platen and the ribbon mask for bits of torn paper or ribbon lint. Check the holes in the ribbon mask surrounding each hammer tip.	Debris found.	Gently remove paper or lint particles with a wooden stick or pair of tweezers. WARNING: Do not pry on or apply force to the hammer tips. Go to step 4.	Go to step 4.
4. Load paper. Press the Form Feed key several times.	Forms feed without erratic motion, noise, or pin–hole damage.	Go to step 5.	If pin holes are damaged, go to step 7. For erratic motion or noise, go to step 9.
5. Press the View key twice.	Forms move correctly in both directions, without jamming, tearing, or folding.	Suspect a false indication. Go to step 13.	Go to step 6.
6. Check the platen motor belt.	Platen motor belt OK.	Replace one at a time until message goes away: a) platen motor b) mech driver board	Replace platen motor belt.
7. Check that the ribbon mask has not been deformed in such a way as to block the paper path.	Ribbon mask damaged or bent.	Replace the hammer bank cover assembly.	Go to step 8.
8. Check to platen gap adjustment.	Plate gap incorrect.	Adjust platen gap. Go to step 9.	Go to step 9.

Instruction	Indication	Yes	No
9. Check for damage to the paper feed belt.	Paper feed or belt damaged.	Replace the paper feed belt. Go to step 10.	Go to step 10.
10. Check the tractors and tractor door springs for damage or excessive wear.	Tractors are OK.	Replace mech driver board. Go to step 11.	Replace defective tractor.
11. Run a diagnostic print test.	"Paper Jam" message.	Replace paper feed motor. Go to step 12.	Return printer to normal operation.
12. Run a diagnostic print test.	"Paper Jam" message.	Replace cable assembly W6. Go to step 13.	Return printer to normal operation.
13. Load paper. Do some line feeds and run a diagnostic print test.	"Paper Jam" message.	Clean the paper motion detector with cotton swab and alcohol. Go to step 14.	Return printer to normal operation.
14. Set the paper motion detector fault setting to DISABLE (Ref: *Setup Guide*). Run a print test and check paper feeding as the printer prints.	"Paper Jam" message.	Replace the mech driver board. Go to step 15.	Return printer to normal operation.
15. Run a diagnostic print test.	"Paper Jam" message.	Replace paper detector switch assembly. Go to step 16.	Return printer to normal operation.
16. Run a diagnostic print test.	"Paper Jam" message.	Replace the common controller board. Go to step 17.	Return printer to normal operation.
17. Run a diagnostic print test.	"Paper Jam" message.	Replace the intermediate cable assembly (W5).	Return printer to normal operation.

001 END OF FORMS
001 OUT OF FORMS
Paper Out

Instruction	Indication	Yes	No
1. Load paper. Run a diagnostic print test.	"Paper Out" message.	Replace paper detector switch assembly. Go to step 2.	Return printer to normal operation.
2. Run a diagnostic print test.	"Paper Out" message.	Replace the common controller PCBA. Go to step 3.	Return printer to normal operation.
3. Run a diagnostic print test.	"Paper Out" message.	Replace the intermediate cable assembly (W5).	Return printer to normal operation.

057 Platen Open
PLATEN OPEN

Instruction	Indication	Yes	No
1. Load paper. Close the forms thickness lever. Run a diagnostic print test.	"Platen Open" message.	Go to step 2.	Return printer to normal operation.
2. Power off the printer. Disconnect the platen interlock switch connector. Check the switch with a meter.	Switch is bad.	Replace platen interlock switch assembly.	Replace one at a time until the message is gone: a) common controller board b) intermediate cable assembly (W5)

089 Ribbon Jammed
089 RIBBON JAM

Instruction	Indication	Yes	No
1. Using a screwdriver, short across the ribbon guide screws to reverse ribbon hub motion. Check for ribbon failing to reverse motion.	Ribbon fails to reverse.	Go to step 2.	Go to step 3.
2. Check for missing foil strip at end of ribbon.	Foil strip missing.	Replace the ribbon.	Go to step 8.
3. Check that forms thickness lever is not closed too tightly; this can jam the ribbon and shuttle.	Forms thickness lever is set correctly.	Go to step 4.	Readjust the setting of the forms thickness lever. Go to step 4.
4. Run a ribbon and shuttle test and check for shuttle obstruction.	Ribbon fault message.	Go to step 5.	Return printer to normal operation.
5. Check ribbon path for blockage or obstruction.	Ribbon path is clear	Go to step 6.	Remove obstructions from ribbon path and go to step 6.
6. Wind ribbon by hand and inspect for folds, tears, holes, fraying.	Ribbon is OK.	Rewind and reinstall ribbon. Go to step 7.	Replace ribbon, if damaged. Unfold and rewind ribbon if it was folded. Go to step 7.
7. Run the "Ribbon and Shuttle" self–test and check the alignment of the ribbon guides and hubs if the ribbon was folded.	Ribbon tracks OK.	Go to step 8.	Align ribbon guides. Go to step 8.
8. Using a screwdriver, short across the ribbon guide screws to reverse ribbon hub motion. Check for a ribbon drive motor that will not wind ribbon.	Both motors wind the ribbon.	Replace the mechanism driver PCBA.	Replace one at a time until message is gone: a) defective ribbon drive motor b) mechanism driver board c) main wire harness W6

SCS CODE ERROR
SCS PARAMETER ERROR

Instruction	Indication	Yes	No
1. Run a buffer print. Run the same job that generated the error message.	SCS CODE or SCS PARAMETER ERROR message.	Verify host data are correct and there are no invalid characters.	Return printer to normal operation.
2. Ask the system operator to verify printer's Device ID is set to the correct emulation with respect to the host configuration.	SCS CODE or SCS PARAMETER ERROR message.	Replace one at a time until message is gone: a) CT board b) CCB board c) coax or twinax cable.	Return printer to normal operation.

090 Shuttle Cover Open
090 COVER/DOOR OPEN

Instruction	Indication	Yes	No
1. Inspect shuttle cover for warping, damage, or missing magnet. (The magnet covers the sensor housing when the cover is installed.)	Shuttle cover damaged.	Replace the shuttle cover assembly.	Go to step 2.
2. Check shuttle cover installation.	Shuttle cover installed correctly.	Go to step 3.	Install cover correctly. Make sure the cover lies flat and the two captive screws are fully seated. Go to step 3.
3. Run a diagnostic print test.	"Shttl Cover Open" or "Cover/Door Open" message.	Replace the cover open switch assembly.	Replace one at a time until message is gone: a) common controller board b) intermediate cable assembly W5

058 Shuttle Jammed
SHUTTLE STALL

Instruction	Indication	Yes	No
1. Check the forms thickness lever: if it is set too tightly, it can slow the shuttle enough to trigger the fault message.	Forms thickness lever set correctly.	Go to step 2.	Set forms thickness lever for thicker paper. Go to step 2.
2. Run a diagnostic print test and check for shuttle obstruction.	"Shuttle Jam" or "Shuttle Stall" message.	Go to step 3.	Return printer to normal operation.
3. Remove shuttle cover and inspect shuttle area and mechanism for obstruction.	Shuttle movement blocked.	Remove obstruction. Go to step 4.	Install shuttle cover. Go to step 4.
4. Run a diagnostic print test and observe the shuttle.	Shuttle moves.	Go to step 5.	Go to step 7.
5. Check MPU adjustment.	MPU adjustment OK.	Go to step 6.	Return printer to normal operation.
6. Run a diagnostic print test.	"Shuttle Jam" or "Shuttle Stall" message.	Replace the MPU. Go to step 5.	Return printer to normal operation.
7. Run a diagnostic print test.	"Shuttle Jam" or "Shuttle Stall" message.	Replace mechanism driver PCBA. Go to step 8.	Return printer to normal operation.
8. Run a diagnostic print test.	"Shuttle Jam" or "Shuttle Stall" message.	Replace shuttle frame assembly.	Replace main wire harness W6.

Symptoms Not Indicated by Fault Messages

Use standard fault–isolation techniques to troubleshoot malfunctions not indicated by fault messages:

1. Ask the operator to describe the problem.
2. Verify the fault by running diagnostic self–tests or replicating conditions reported by the user.
3. Look for a match in the "Symptoms Not Indicated by Fault Messages Troubleshooting Table" (page 4–28), and follow the instructions given.
4. Locate the malfunction using the half–split method:
   a. Start at a general level and work down to details.
   b. Isolate faults to half the remaining system at a time, until the final half is a field–replaceable part or assembly. (Troubleshooting aids are listed on page 4–30.)
5. Replace the defective part or assembly.

IMPORTANT

Do NOT attempt field repairs of electronic components or assemblies. Replace a malfunctioning electronic assembly with an operational spare. Most electronic problems are corrected by replacing the printed circuit board assembly (PCBA), sensor, or cable that causes the fault indication. The same is true of failures traced to the hammer bank: replace the entire shuttle frame assembly. It is not field repairable.

6. Test printer operation after every corrective action.
7. Stop troubleshooting and return the printer to normal operation when the reported symptoms disappear.

Symptoms Not Indicated by Fault Messages Troubleshooting Table

Symptom	Instruction
Power on hang condition.	1. Perform a diagnostic check of the microprocessors: a) CCB Diagnostic Check—page 4–32 b) CT Diagnostic Check—page 4–38 (CT0 model only)
Blank or single line of black squares across top row of operator panel LCD.	1. Perform the CCB Diagnostic Check (page 4–32).
Operator Panel key failure.	1. Replace one at a time until the problem is fixed: a) operator panel assembly b) common controller board c) operator panel cable assembly
Ribbon folding or feed problems.	1. Clean the shuttle frame assembly (page 3–3). 2. Check the left and right ribbon guide alignment (page 5–18).
Printer appears normal, but does not print data sent from the host.	1. Perform the CCB Diagnostic Check (page 4–32).
Printer prints data sent from the host, but occasionally prints double characters or loses blocks of data.	1. Perform the CCB Diagnostic Check (page 4–32).
Print Quality Problems	
Missing, light, or smeared characters or dots:	1. Check the forms thickness lever setting. 2. Check the ribbon for folds or tears. 3. Clean the shuttle frame assembly (page 3–3). 4. Check the platen gap adjustment (page 5–14). 5. Reverse the hammer bank flex circuit cables in the connectors on the base casting. NOTE: Hammer number 48 is a permanently non–printing hammer. Keep this in mind when reversing cables. 6. Run a diagnostic print test. If the failing position(s) move, replace the mechanism driver board (page 6–88). 7. Return the hammer bank flex cables to the original positions. 8. Swap hammer spring assemblies for the failing position(s) with one from working position(s). 9. Run a diagnostic print test. If the failing position(s) move, replace the hammer spring assembly. 10. Replace the shuttle frame assembly (page 6–118).

Print Quality Problems	
All characters or dots are too light or too dark.	1. Check the forms thickness lever setting. 2. Clean the shuttle frame assembly (page 3–3). 3. Check the platen gap adjustment (page 5–14). 4. Install a new ribbon. 5. Replace one at a time until problem is fixed: a) mechanism driver board (page 6–88) b) shuttle frame assembly (page 6–118)
Horizontal misalignment. (Dots or characters move left or right from dot row to dot row or line to line.)	1. If all dots between alternate rows are misaligned, check hammer phasing (page 5–25). 2. Clean the shuttle frame assembly (page 3–3). 3. Check the MPU gap adjustment (Ref: page 6–56). 4. Replace one at a time until problem is fixed: a) MPU (page 6–56) b) mechanism driver board (page 6–88) c) shuttle frame assembly (page 6–118)
Vertical misalignment: 1. Dots or characters move up or down from dot row to dot row or line to line. 2. Incorrect spacing from dot row to dot row or line to line.	1. Check paper feed motor belt (page 5–4). 2. Check platen gap adjustment (page 5–14). 3. Replace one at a time until problem is fixed: a) tractors (page 6–132) b) mechanism driver board (page 6–88) c) paper feed motor (page 6–60) d) common controller board (page 6–74) e) power supply board (page 6–92)
Randomly misplaced dots.	1. Check platen gap adjustment (page 5–14). 2. Check printer grounding. 3. Replace one at a time until problem is fixed: a) common controller board (page 6–74) b) power supply board (page 6–92) c) shuttle frame assembly (page 6–118)
Garbled print.	1. Perform the CCB Diagnostic Check (page 4–32).

Troubleshooting Aids

- **Printer Confidence Check** — page 4–31

  A systematic check of printer operation. Use it to establish basic printer status or for troubleshooting imprecise or intermittent symptoms.

- **CCB Diagnostic Check** — page 4–32

  Checks the operation of the microprocessors and IC chips on the Common Controller (CCB) and Mechanism Driver boards.

- **CT Board Diagnostic Check** — page 4–38

  Checks initialization of the coax/twinax integrated interface board in the IBM 6408–CT0 printer.

- **IBM 6408–A00 Self–Tests** — Page 4–39

  A suite of printer tests stored in ROM. Use the tests to check the print quality and operation of the model A00 (ASCII) printer.

- **IBM 6408–CT0 Self–Tests** — Page 4–45

  A suite of printer tests stored in ROM. Use the tests to check the print quality and operation of the model CT0 (SCS) printer. Error log explained.

- **Hex Code Printout** — Page 4–50

  Prints data streams in hexadecimal format. Use to troubleshoot printer data reception problems.

- **Wire Data — Appendix A**

  Interconnect diagrams, pin–outs, and diagrams of the cable assemblies. Use as source material for tracing electrical problems.

Printer Confidence Check

DANGER

To prevent serious personal injury from electrical shock when connecting or disconnecting the signal cable, switch off the printer power and unplug the power cable.

	Instruction	Indication	Yes	No
1.	Check that printer is plugged into correct power source.	Power cable installed correctly to proper source.	Set power switch to O (off). Go to step 2.	Set power switch to O (off). Connect printer to correct power source.
2.	Take printer off–line. Power printer off. Disconnect printer power cord. Disconnect the interface (data) cable from the host computer to isolate the printer. Power on printer and run a diagnostic print test.	Printer operates correctly.	Fault is not in the printer. Check host computer, applications software, cabling, etc.	Go to step 3.
3.	Power off printer. Connect the interface (data) cable to host and printer. Power on printer. Make a configuration printout. (Ref.: *Setup Guide*)	a) Configuration is correct for the user's application. b) Host computer and printer use the same protocol (emulation). c) Configuration has not been inadvertently changed by the user.	Go to step 4.	Reconfigure the printer. (Ref.: *Setup Guide*)
4.	Power off printer. Check alignments and adjustments. (Chapter 5.)	Assemblies and components adjusted in accordance with Chapter 5.	Go to step 5.	Adjust all assemblies that are out of spec.
5.	Power off printer. Remove paper guide assembly. Check all electrical connectors.	Connections are clean and tight. Wires are not stripped, frayed, or out of connectors.	Go to step 6.	Replace stripped, frayed, or broken wires.
6.	Check that all printed circuit boards are seated correctly and cable connections are correct. (Ref.: Appendix A)	Printed circuit boards are firmly seated and all cables are correctly attached.	Go to step 7.	Unseat and reseat each board, one board at a time. Check and correct the cable attachments.
7.	Inspect for debris that could cause short circuits (loose fasteners, foil, etc.).	Metallic debris.	Remove debris. Clean the printer (page 3–3).	Go to step 8.
8.	Install paper guide assembly. Power on printer.	Printer powers up and initializes properly.	Return printer to normal operation.	Troubleshoot the fault message.

CCB Diagnostic Check

This procedure checks the operation of the microprocessors and IC chips on the Common Controller (CCB) and Mechanism Driver boards. Do the steps in the order presented.

1. Power off the printer.
2. Remove the paper guide assembly (page 6–66).
3. Reseat the CCB and Mech Driver boards in the card cage.
4. Power on the printer. Wait at least 15 seconds; while you are waiting watch the 68010 DPU LED at location A2 on the CCB (some boards may be silk–screened as "68000") and watch the display on the operator panel. (NOTE: See page 6–100 for IC locations on the CCB.)

   a. When the CCB is operating correctly, the operator panel displays "Diagnostic Tests in Progress," and the 68010 DPU LED turns on for 1 to 15 seconds, then turns off. The 68010 DPU LED turns off after the 68010 successfully tests itself, RAM, 68010 ROM, and communication with the 64180 CPU. The more RAM or ROM installed in the printer, the longer the LED is on, but it *always* turns on then off when the CCB is functioning correctly. If the printer turns on normally, the CCB is okay. Turn power off. Install the paper guide assembly (page 6–66) and return the printer to normal operation.

      If the 68010 DPU LED turns on and off as described above, but the printer does work properly, or fails later, go to step 5.

      ("Dynamic RAM Fault" on the display can mean the 64180 has waited 15–20 seconds without getting its handshake from the 68010. The following substeps use the 68010 DPU LED to fault isolate this message.)

   b. **If the 68010 DPU LED never turns on**, it means the 68010 did not execute the first software instruction in its ROM. Go to step 6.

   c. **If the 68010 DPU LED stays on for 30 seconds but never blinks**, it means RAM and ROM for the 68010 are okay, but the 64180 is not executing instructions. Go to step 7.

d. **If the 68010 DPU LED blinks steadily at 1 blink per second**, it means that the 68010 ROMs are bad. Power off the printer, remove the CCB (page 6–74), and check that all ROM chips are inserted in the correct position and with all pins inserted correctly (page 6–100).

   This check will catch out–of–order ROMs and all single and multiple bit failures of floating–gate EPROMs (the type with the window, that erase with ultraviolet light).

   If a ROM chip was inserted backwards, discard it. Even if it operates properly, a high current flowed through the backwards–biased transistors, and its service life is probably shortened due to thermal damage.

   If ROMs appear correctly inserted, they may still be defective. Sometimes zero bits "fade" to ones when internal floating gates discharge. This can occur from over–voltage programming, radiation damage, too many EPROM erasures, etc. Install new program PROMs (page 6–100).

e. **If the 68010 DPU LED blinks steadily 5 times per second**, it means CCB RAM has failed. The most common cause of this failure during maintenance is turning off the printer too briefly for the 64180 to reset. The 64180 shares memory with the 68010, and writes to RAM if it is not completely reset. Power off the printer, wait at least 15 seconds, then power on the printer again before accepting this indication of CCB RAM failure.

   The RAM chips are at board coordinates N9 and P9. The sockets at N8 and P8 are normally empty; this will not cause a RAM failure. Inspect the RAM chips, sockets and traces for shorts or missing chips. Damaged traces or sockets require replacement of the CCB.

   A remote possibility is failure of the 64180 in the start–up handshake or in the code that programs the memory controller. Try changing the 64180 RTPU PROM (page 6–100).

5. The 68010 DPU LED turns on, then off, but the printer doesn't work. Look at the operator panel display:

a. **If the display is blank, or has a single line of black squares across the top**, the connector to the operator panel probably needs to be plugged in or reseated. Turn off the printer, plug in the panel cable to connector J3 on the CCB, and start over at step 1. If the display is still blank, or has a black line, and the 68010 DPU LED lights and turns off, the operator panel or its cable are defective.

b. **If the display reads "Mech Driver Link,"** the 8032 at location J12 on the CCB may have failed. Check the 8032 and its PROM at location J10 for bent pins, misalignment, or backwards insertion. Also, make sure the clock–test jumper E2 at location J14 is installed. If everything appears okay, try reseating the PROM at location J10, the 8032 at J12, the clock jumper at J14, and connector J2—sometimes this message is caused by a failure to communicate with the 8032 on the Mech Driver board.

   If the problem persists, check the Mech Driver 8032, its clock jumper (E2), and the PROM. Look for backwards insertion, misalignment, etc., and try reseating the parts. (NOTE: On some Mech Driver boards, the 8032 PROM correct orientation may be *reversed* in relation to the rest of the board. On these boards, the silk–screen will show the correct orientation.) Always replace PROMs and parts that were oriented incorrectly.

   If the problem persists, replace the 8032 PROMs on the CCB and Mech Driver boards. If the problem persists, replace the interconnect cable assembly W1. (See Appendix A.)

c. **If the printer appears normal, but does not print from the host**, check the data cable to the host and reseat the cable that attaches to J1 of the CCB at location A12. Then make sure the correct interface is selected and configured from the operator panel. (Refer to the *Setup Guide*.) Save the configuration and reset the printer.

   If the printer interface is RS–232, interchange the wires to pins 2 and 3. This is the most common cause of a completely inoperative RS–232 cable. Make sure the printer and host have the same baud rate, number of data bits, number of stop bits, and parity. In RS–232, configure the host for XON/XOFF if possible; this requires the least complex cable.

d. **If the printer prints from the host, but occasionally loses blocks of data**, the most likely cause is the host not responding to "send no more data" signals from the printer. With a PC Parallel interface, this means the host is ignoring BUSY; in RS–232, the host is ignoring the XOFF character or "Data Terminal Ready" signal (pin 20). Sometimes the cable is not conveying the necessary signals. Test this by using a serial line analyzer and software or test equipment that displays the data and handshake lines of the printer. A breakout box works, but will not debug XON/XOFF or other RS–232 data protocols. If the printer is sending XOFF with one stop bit, the host may not be receiving it if the host requires 1.5 or 2 stop bits.

e. **If the printer prints from the host, but occasionally prints double characters**, there is probably a noise problem at the interface or the host computer is sending an inverted strobe. This problem can occur on PC Parallel or Dataproducts interfaces, never on RS–232. What happens is that the strobe signal registers logic 1 more than once for a certain character. To fix this, change the strobe to trailing edge or invert the strobe polarity. (Refer to the *Setup Guide*.)

   Also check that the terminating resistors are present at locations C12 and D12 on the CCB. You can correct some noise problems by using a shielded data cable or by changing the terminating resistors. (See page 6–108.) The standard terminating resistors are optimized for high speed data transfer for cables between 1 and 5 meters long; you can change them for slower operation, which will provide slightly more noise immunity.

   Noise is caused by static, floating logic ground, unshielded cable, changes in ground voltage from nearby equipment, or capacitively– or magnetically–induced noise. On very long cables, capacitively–induced noise from the other signals of the cable (especially PC Parallel "ACK" or Dataproducts "DEMAND") can cause false strobes. Unshielded and flat ribbon cables are much more prone to problems due to increased length. The best solution is to shorten cable, shield it, and reduce local electromagnetic noise. Also, make sure that both the printer and the host computer are properly grounded.

f. **If the printer prints garbled data or slews uncontrollably**, put the printer into hex dump mode and analyze the binary data. One cause of garble is the host interface or cable not transmitting all 8 data bits. When this occurs, the PC Parallel or Dataproducts interface receives a 1 on every unconnected data line. Uncontrolled slewing is often caused by enabling PI (Paper Instruction) in the printer when the host lacks a PI signal. (PI shows as "p" on the hex dump.) Some RS–232 and Dataproducts interfaces only send 7 data bits. In this case, the eighth bit will be received as a one.

   In RS–232, a common cause of garble is to set the interface to the wrong baud rate or parity. Sometimes the host sends 1.5 or 2 stop bits; in this case, the printer's "1–stop–bit" setting will accept both 1.5 and 2 stop bit data. Sometimes the data may "fade" or "persist" from one character to the next. This reveals a problem with Centronics or Dataproducts terminating resistors on the CCB at C12 and D12, especially if they are absent. Garble also can result from failed termination resistors or parallel logic, but this is rare.

6. The 68010 DPU LED never lights. The 68010 has not run its first instruction.

   a. The first two programs PROMs may be malfunctioning or inserted wrong. Do the corrective actions listed in step 4.d.

   b. Look at the operator panel display. If it is not blank, the logic power supply is okay. If the display is blank, power off the printer. Reseat the power supply cable on the Mech Driver board and the CCB/Mech Driver cable assembly W1. Power on the printer. If that does not correct the problem, check for logic supply voltage on the CCB board: DC voltage between the positive end of capacitor C4 (location A5) and TP1 (GND, location A1) should be +4.8 or higher. If the voltage is less than +4.8 VDC, suspect a failed power supply, interconnect cabling, and the CCB, in that order.

   c. On the CCB, inspect the PROM sockets, the 68010 socket (if installed), and the oscillator module at location P6. Remove any obvious dirt or conductive dust.

   d. Test for voltage supplied to the 68010 DPU LED. The LED may have failed.

   e. If the failure persists, replace the common controller board (CCB).

7. The 68010 DPU LED lights, but never turns off. Look at the operator panel display:

   a. **If the top line of the display is blank**, the operator panel is probably unplugged or defective. Do the corrective actions listed in step 5.a.

   b. **If the display has a single line of black squares on the top line,** the 64180 has failed. Turn off the printer, remove the CCB, and check the 64180 RTPU PROM at location H8 for bent pins, pins not inserted, or backwards insertion. Discard any PROMs that were inserted backwards. Their transistors were reverse biased, and even if they work their service life has been shortened by thermal damage. Replace the 64180 RTPU PROM. Check that the 64180 is correctly inserted and completely seated in its socket.

   c. **If the display reads "Diagnostic Test in Progress" and 68010 DPU LED has been on for 20 seconds or more but is not blinking**, it means the 64180 cannot communicate with the 8032 on the Mech Driver board. Turn off the printer, reseat the cable in J2 of the CCB and in J6 on the Mech Driver board. Check the 8032 on the Mech Driver, its PROM, and its clock jumper (E2) for correct insertion, bent pins, etc. (See page 6–103.) Reseat the jumper and socketed parts. If the problem persists, replace the Mech Driver's PROM and the CCB/Mech. Driver cable assembly W1.

CT Board Diagnostic Check

This procedure is a quick check of the Coaxial/Twinaxial Integrated Interface (CT) board on the IBM 6408–CT0 printer. You check CT operation by monitoring three diagnostic LEDs as the printer powers up. (LED locations are shown in Figure 6–40, page 6–105.)

What the LEDs Do

CT LEDs indicate successful communications between devices:

- LED 1 lights to indicate successful communication between CT processor 8344 and CT processor 80186.
- LED 2 lights to indicate successful communication between the CT and the controller board DCU.
- LED 3 lights to indicate a successful boot–up and initialization.

How to Test the CT Board

1. Power off the printer.
2. Remove the paper guide assembly (page 6–66).
3. Make sure all cable connections to the CT board are correct.
4. Power the printer on. As the printer initializes, watch the three diagnostic LEDs:
   a. If all three LEDs come on sequentially, the CT board is operational. Go to step 5.
   b. If any LED does *not* come on, or comes on then goes out, power off the printer, remove the CT board, and install new PROMs on the CT. Run the power–up check again. If all LEDs come on, go to step 5. If any LED does not come on, replace the CT board.
5. Power off the printer.
6. Install the paper guide assembly (page 6–66).
7. Return the printer to normal operation.

IBM 6408–A00 Self–Tests

A suite of self–tests is stored in ROM for use as diagnostic tools. Use these self–tests to check the print quality and operation of the A00 (ASCII) printer.

The self–tests are summarized below.

NOTE: Under the description of each diagnostic test is a list of items that may require replacement or adjustment if the test produces a bad print pattern. Items are listed in the order you should check them: simplest items first, complex items last.

- **Ripple Print** A "sliding" alphanumeric pattern useful for identifying missing or malformed characters, improper vertical alignment, or vertical compression.

  Hammer bank cover
  Hammer spring
  Shuttle frame assembly

- **All E's** A pattern of all uppercase letter E's useful for identifying missing characters, misplaced dots, smeared characters, improper phasing, or light/dark character variations.

  Ribbon
  Splined shaft skew adjustment
  Hammer bank cover
  MPU sensor
  Hammer spring
  Hammer coil (shuttle frame assembly)

- **E's + TOF** A pattern of all E's repeated for ten lines and followed by a form feed to the next page top of form, useful for identifying paper motion or feeding problems.

  Hammer bank cover
  Power supply PCBA
  Mechanism Driver PCBA
  Paper motion sensor or cable
  Paper feed belt or motor
  Splined shaft bearings
  Tractors or tractor belts

- **All H's** A pattern of all uppercase letter H's useful for detecting missing characters or dots, smeared characters, or improper phasing.

  Ribbon
  Hammer bank cover
  MPU sensor
  Hammer spring
  Hammer coil (shuttle frame assembly)

- **All Underlines** An underline pattern useful for identifying hammer bank misalignment.

  Mechanism Driver PCBA
  Hammer bank cover
  Hammer tips
  Paper feed belt or motor
  Splined shaft bearings
  Tractor bearings or belts

- **All Black** All dot positions are printed, creating a solid black band. Exercises shuttle and hammer bank at maximum capacity.

  Mechanism Driver PCBA
  Power Supply PCBA
  Hammer bank cover
  Hammer spring
  Hammer coil (shuttle frame assembly)

- **Slow Shuttle Test** Verifies proper operation by exercising shuttle motion at low speed. You can also use this test to check ribbon tracking and reversing.
- **Fast Shuttle Test** Verifies proper operation by exercising shuttle motion at high speed. You can also use this test to check ribbon tracking and reversing.
- **Phasing** A hammer timing parameter that permits you to adjust the vertical alignment of dots in character printing.
- **End of Forms** A vertical comb pattern used to determine the number of dot rows from the completion of a paper out fault to the end of the paper.
- **Burn In** This test is used by the factory to burn in the printer. Its use is not recommended.
- **Test Width** Selects the width to print the self–test, either 8.0 or 13.2 inches.

Running IBM 6408–A00 Printer Tests

To run a self–test, you do three things:

- Select the Printer Tests emulation
- Select and run the test(s).
- Return the printer to normal operation.

Select the Printer Tests Emulation:

Step	Key	Displayed Result	Notes
1.	Make sure the printer is powered on, a ribbon is installed, and paper is loaded.		
2.	Press: Stop	Not Ready	Take the printer off-line before running printer tests.
3.	Press: Scroll ↑ + Scroll ↓	Unlocked	Press both keys at the same time. Unlocking the **Enter** key allows you to test the printer.
4.	Press: Menu	Printer Configuration Emulation	The first of the series of configuration menus displays.
5.	Press: Enter	Emulation Proprinter III XL *	Moves down to the currently selected emulation. (Proprinter III XL, the factory default is shown in this example.)
6.	Press: Scroll ↑ UNTIL	Emulation Printer Tests	Advance to the Printer Tests selection.
7.	Press: Enter	Emulation Printer Tests *	Selects the Printer Tests emulation.
8.	Press: Clear	Not Ready	Returns the printer to the Not Ready state.

Run the Printer Test:

Step	Key		Displayed Result	Notes
1. Press:	Menu		Printer Configuration Emulation	First of the series of configuration menus.
2. Press:	↑ Scroll		Printer Configuration Emulation Parameters	Advances from the Emulation submenu to the Emulation Parameters submenu.
3. Press:	Enter		Emulation Parameters Proprinter III XL	Moves down to the Proprinter III XL option value for the emulation parameter.
4. Press:	↑ Scroll		Emulation Parameters Printer Tests	Advances from the Proprinter III XL submenu to the Printer Tests submenu.
5. Press:	Enter	UNTIL	Printer Tests [Printer Test Name]	Moves down to one of the printer tests.
6. Press:	↑ Scroll	UNTIL	Printer Tests Test Width: n	Advances to the Test Width option, which is either 8.0 or 13.2.
7. Press:	Enter		Printer Tests Test Width: n *	Enters the Test Width options submenu.
8. Press:	↑ Scroll	UNTIL	Printer Tests Test Width: 13.2	Advances to a test width of 13.2 inches wide (132 columns) for testing.
9. If you loaded 132–column paper in the printer, go to the next step. If you loaded paper narrower than 132 columns, skip to step 12.				
10. Press:	Enter		Printer Tests Test Width: 13.2 *	Selects the Printer Tests and sets full width (132 columns) for testing.

Step	Key		Displayed Result	Notes
11. Skip to step 14.				
12. Press:	↑ Scroll	UNTIL	Printer Tests Test Width: 8.0	Advances to a test width of 8 inches wide (80 columns) for testing.
13. Press:	Enter		Printer Tests Test Width: 8.0 *	Selects a test width of 8 inches wide (80 columns) for testing.
14. Press:	Return	UNTIL	Printer Tests Test Width: n	Return to the Printer Tests submenu (n is 8.0 or 13.2).
15. Press:	↑ Scroll	UNTIL	Printer Tests [Test Name]	Cycles through the list of Printer Tests. Stop when the name of the test you wish to run is displayed (will print at either 80 or 132 columns, as specified).
16. Press:	Enter		Running [Test Name]	The printer starts printing.
17. Press:	Stop		Printer Tests [Test Name]	The printer stops printing.
18. Examine the print quality of the characters. They should be fully formed and of uniform density.				
19. Press:	Clear		Not Ready	Returns the printer to the Not Ready state.

Return the Printer to Normal Operation:

Step	Key	Displayed Result	Notes
1. Press:	Menu	Printer Configuration Emulation	First of the series of configuration menus.
2. Press:	Enter	Emulation Printer Tests *	Moves down to the Printer Tests menu, the currently selected emulation.
3. Press:	↑ Scroll UNTIL	Emulation Proprinter III XL	Advances to the desired emulation.
4. Press:	Enter	Emulation Proprinter III XL	Selects the desired emulation. (Proprinter III XL shown in example.)
5. Press:	Clear	Not Ready	Returns the printer to not–ready mode.
6. Press:	Scroll↑ + Scroll↓	Locked	Pressing these keys at the same time locks the **Enter** key.
7. Press:	Start	Ready	Puts the printer on–line.

IBM 6408–CT0 Self–Tests

The IBM 6408–CT0 emulates IBM model 5225, 3287, and 4234 printers by using a coaxial/twinaxial integrated interface, designated the "CT." The printer has a suite of self–tests stored in ROM, and accessed in the Program mode. Use these self–tests to check the print quality and operation of the CT0 (SCS) printer.

The self–tests for this model are summarized below. (See also Figure 4–1.)

DCU Tests

Test	Function
DCU Hex Print	Prints out all of the hex codes that the CT sends to the DCU. This test must be terminated before running any other tests.
Printer Demonstration	Demonstrates all the functions and features available on the printer.
All E's All H's All E's + FF Underlines Ripple Print	Produces tests designed to run the printer benchmark, which tests the phasing, form feeding, and hammer banks.
Plot Test	All dot positions are printed, creating a solid black band. Exercises shuttle and hammer bank at maximum capacity.
Ribbon and Shuttle	Tests the ribbon and shuttle mechanisms.
Hammer Phasing	Verifies the adjustment of the hammer phasing. This test provides the following LCD message: PHASE ADJUSTMENT XX NOTE: In the Hammer Phasing test, the up and down arrow keys are used to raise and lower the phasing. This test prints 132 H's. The phasing value is adjusted until the phasing quality of the H's is acceptable.
End of Forms Adjust	Prints a vertical comb pattern used to determine the number of dot rows from the completion of a paper out fault to the end of the paper. (See Chapter 5.)

Test	Function
Printer Configuration	Prints out the host and the CT internal parameter settings.
Print Custom Sets	Prints out the parameters set in all four NVRAM blocks.
Translation Table	Prints out an EBCDIC hex character map of the currently selected IBM character set.
Print Error Log	Prints a log of errors that have occurred in the printer.
Clear Error Log	Clears the error log, except for POWER ON HOURS and LINES PRINTED.

Running IBM 6408–CT0 Printer Tests

To run self–tests on the IBM 6408–CT0, perform the following steps. (DCU Tests is used as an example.)

The Printer Tests menu is the same for coax and twinax emulations. (See Figure 4–1.)

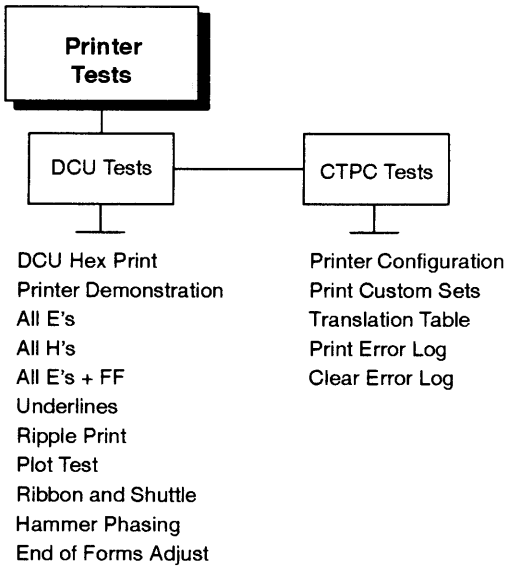


Figure 4–1. IBM 6408–CT0 Printer Tests

NOTE: After unlocking the operator panel, pressing the **Test** key goes directly to the Program mode and jumps to the Printer Tests menu.

Step	Key	LCD Message	Notes
1.	If you are in the top level of the configuration menu, scroll through the menu options until you reach Printer Tests, and press **Enter**. Go to Step 5. If you have been using the printer for normal printing operations and you now want to run one or more tests, follow the next steps.		
2.	Press: [Stop]	NOT READY	The printer is off–line.
3.	[Micro Scroll ↑] + [Micro Scroll ↓]	NOT READY Configuration Menu Unlocked	"Unlocked" permits configuration changes.
4.	[Test]	Printer Tests DCU Tests	TEST goes directly to the Printer Tests menu.
5.	[Enter]	DCU Tests DCU Hex Print	
6.	[Micro Scroll ↑]	DCU Tests Printer Demonstration	Cycle through the tests. (See Figure 4–1.)
7.	To start the test, press [Enter]	Printer Demonstration Running	
8.	To stop the test, press [Stop]	Printer Demonstration Stopped	

Step	Key	LCD Message	Notes
9.	You may continue running this test (using **Enter** to start and and **Stop** to stop), or you may select another test to run. If you are running tests that check print quality, characters should be horizontally and vertically aligned and correctly formed.		
10.	To exit tests, press Start	NOT READY	
11.	Micro ↑ Scroll ↑ + Micro ↓ Scroll ↓	NOT READY Configuration Menu Locked	Prevents settings from being changed by locking the configuration menu.
12.	Start	READY	Printer is ready for normal operation.

The Error Log

The "Print Error Log" option on the CTPC Tests menu prints a record of the number of times a coded error occurred in the printer since the last time the error log was cleared. (See Figure 4–2 and Figure 4–3.)

Errors are stored in the error log as two–digit codes. For each error that has occurred, the error log lists the two–digit code, the error message, and the number of occurrences of the error.

The error log codes are listed on page 4–5.

The "Clear Error Log" option on the CTPC Tests menu clears the error log.

NOTE: If you clear the Error Log, the values of the POWER ON HOURS and LINES PRINTED will not be cleared.

ERROR LOG

POWER ON HOURS 3308
LINES PRINTED 746

ERROR CODE	NAME	COUNT
21	090 COVER/DOOR OPEN	1
25	002 FORMS JAMMED	1
26	PLATEN OPEN	5
48	02X CU NOT ENABLE	6

Figure 4–2. Coax Error Log

ERROR LOG

POWER ON HOURS 3602
LINES PRINTED 543

ERROR CODE	NAME	COUNT
21	090 COVER/DOOR OPEN	1
24	002 FORMS JAMMED	3
20	PLATEN OPEN	1

Figure 4–3. Twinax Error Log

Hex Code Printout

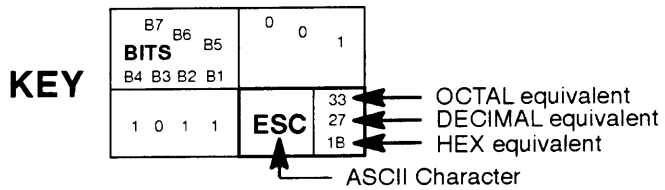
A hex code printout (or "hex dump") lists all ASCII character data received from the host computer with their corresponding two–digit hexadecimal codes. (The ASCII character set is provided for your convenience on page 4–51.) You can use hex dumps to troubleshoot some types of printer data reception problems.

Printable characters print as the assigned symbol; nonprintable characters are indicated by the period symbol [.]. The letter p before a hex code indicates an active Paper Instruction (PI) line. A blank space before a hex code indicates an inactive PI line.

NOTE: Operator panel keys and menu arrangements vary according to printer model. For the menu structure and keys used to make a hex code printout, refer to the *Operator's* and *Setup Guides* for the model you are servicing. The general procedure is summarized below.

1. Take the printer off–line.
2. On the operator panel, unlock the **Enter** key:
   on the IBM 6408–A00, press **Scroll↑ + Scroll↓**
   on the IBM 6408–CT0, press **Micro↑Scroll↑ + Micro↓Scroll↓**
3. Using the directional keys, access the hex printout menu:
   on the IBM 6408–A00, select "Hex Dump" emulation
   on the IBM 6408–CT0, select "DCU Hex Print" from the DCU Tests submenu running under Printer Tests
4. Place the printer on–line. The display will indicate the printer is on–line in hex dump mode: "On–Line Hex Dump"
5. Send data from the host—the data print in hex dump format. (Any data remaining in the buffer will print before the hex code printout starts.)
6. To stop a hex dump, take the printer off–line.
7. Press the key that exits configuration and hex dump mode.

ASCII Character Set



B7 B6 B5 / BITS B4 B3 B2 B1	ROW	0 0 0 COLUMN 0		0 0 1 1		0 1 0 2		0 1 1 3		1 0 0 4		1 0 1 5		1 1 0 6		1 1 1 7	
0 0 0 0	0	NUL	0 0 0	DLE	20 16 10	SP	40 32 20	0	60 48 30	@	100 64 40	P	120 80 50	`	140 96 60	p	160 112 70
0 0 0 1	1	SOH	1 1 1	DC1 (XON)	21 17 11	!	41 33 21	1	61 49 31	A	101 65 41	Q	121 81 51	a	141 97 61	q	161 113 71
0 0 1 0	2	STX	2 2 2	DC2	22 18 12	"	42 34 22	2	62 50 32	B	102 66 42	R	122 82 52	b	142 98 62	r	162 114 72
0 0 1 1	3	ETX	3 3 3	DC3 (XOFF)	23 19 13	#	43 35 23	3	63 51 33	C	103 67 43	S	123 83 53	c	143 99 63	s	163 115 73
0 1 0 0	4	EOT	4 4 4	DC4	24 20 14	$	44 36 24	4	64 52 34	D	104 68 44	T	124 84 54	d	144 100 64	t	164 116 74
0 1 0 1	5	ENQ	5 5 5	NAK	25 21 15	%	45 37 25	5	65 53 35	E	105 69 45	U	125 85 55	e	145 101 65	u	165 117 75
0 1 1 0	6	ACK	6 6 6	SYN	26 22 16	&	46 38 26	6	66 54 36	F	106 70 46	V	126 86 56	f	146 102 66	v	166 118 76
0 1 1 1	7	BEL	7 7 7	ETB	27 23 17	'	47 39 27	7	67 55 37	G	107 71 47	W	127 87 57	g	147 103 67	w	167 119 77
1 0 0 0	8	BS	10 8 8	CAN	30 24 18	(	50 40 28	8	70 56 38	H	110 72 48	X	130 88 58	h	150 104 68	x	170 120 78
1 0 0 1	9	HT	11 9 9	EM	31 25 19	)	51 41 29	9	71 57 39	I	111 73 49	Y	131 89 59	i	151 105 69	y	171 121 79
1 0 1 0	10	LF	12 10 0 A	SUB	32 26 1A	*	52 42 2A	:	72 58 3A	J	112 74 4A	Z	132 90 5A	j	152 106 6A	z	172 122 7A
1 0 1 1	11	VT	13 11 0 B	ESC	33 27 1B	+	53 43 2B	;	73 59 3B	K	113 75 4B	[	133 91 5B	k	153 107 6B	{	173 123 7B
1 1 0 0	12	FF	14 12 0 C	FS	34 28 1C	,	54 44 2C	<	74 60 3C	L	114 76 4C	\	134 92 5C	l	154 108 6C	|	174 124 7C
1 1 0 1	13	CR	15 13 0 D	GS	35 29 1D	–	55 45 2D	=	75 61 3D	M	115 77 4D	]	135 93 5D	m	155 109 6D	}	175 125 7D
1 1 1 0	14	SO	16 14 0 E	RS	36 30 1E	.	56 46 2E	>	76 62 3E	N	116 78 4E	^	136 94 5E	n	156 110 6E	~	176 126 7E
1 1 1 1	15	SI	17 15 0 F	US	37 31 1F	/	57 47 2F	?	77 63 3F	O	117 79 4F	_	137 95 5F	o	157 111 6F	DEL	177 127 7F

5 Adjustment Procedures

Chapter Contents

Preparing the Printer for Maintenance

DANGER

Always disconnect the AC power cord from the power source before performing any maintenance procedure. Failure to remove power could result in injury to persons or damage to equipment. If you must apply power during maintenance, you will be instructed to so in the maintenance procedure.

The procedures in this chapter are written assuming the printer has been prepared for maintenance.

To prepare the printer for maintenance, do the following steps *before* making an adjustment:

1. Power off the printer.
2. Disconnect the power cord from the AC power source.
3. Unload paper.
4. Read the entire adjustment procedure before you begin working on the printer.
5. Gather the necessary parts before you begin working on the printer.

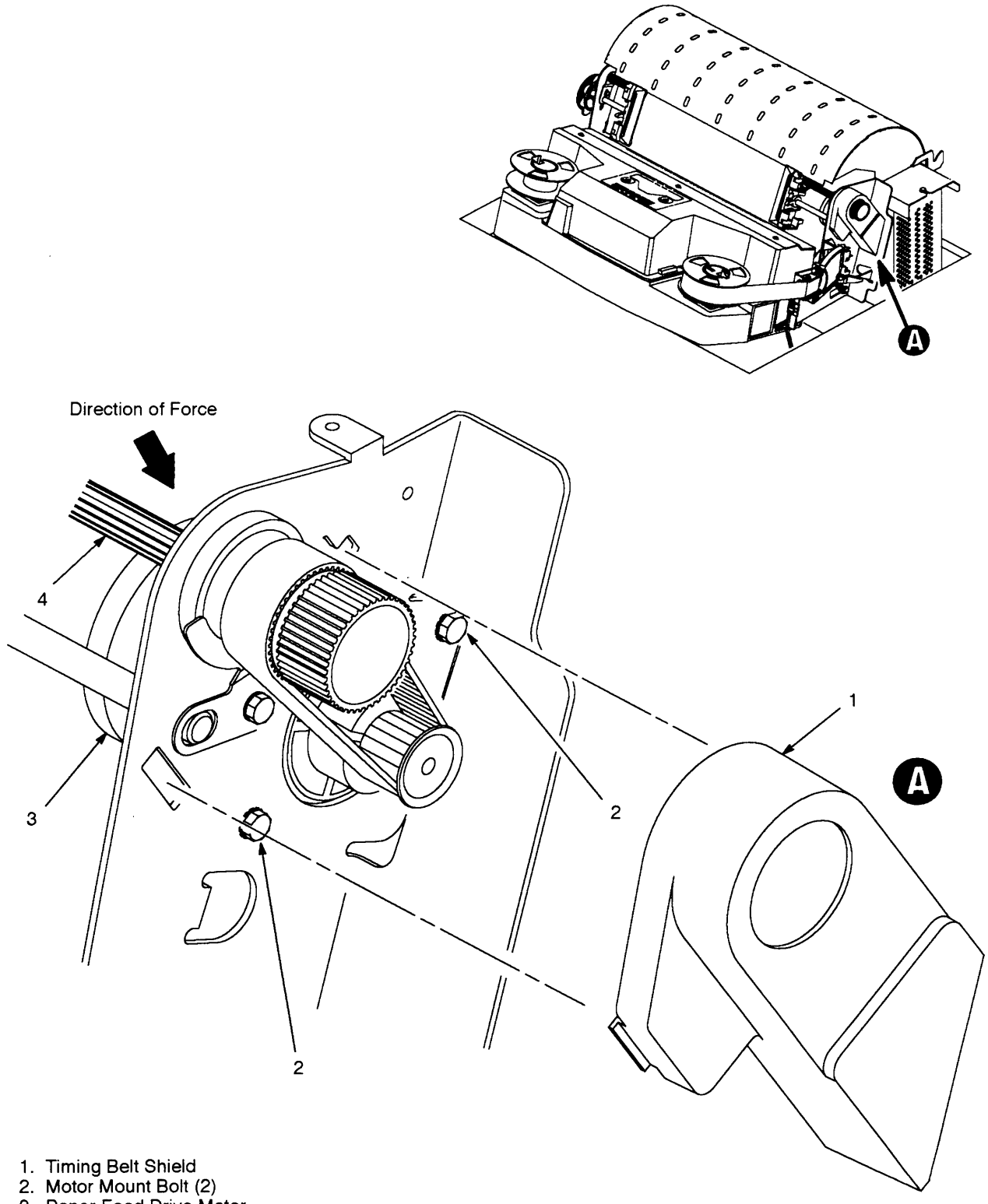
Returning the Printer to Normal Operation

When you are finished servicing the printer, restore it to operation by following the steps below:

1. Install the ribbon.
2. Connect the AC power cord to the printer and the power source.
3. Power on the printer.
4. Load paper.
5. Close the cabinet doors and the printer cover.
6. Test printer operation by selecting and running one of the diagnostic self–tests. (See Chapter 4.)
7. Select the desire emulation. (Refer to the *Setup Guide*.)
8. Set the top–of–form. (Refer to the *Operator's Guide*.)

Belt, Paper Feed Timing, Adjustment (Figure 5–1)

1. Prepare the printer for maintenance (see above).
2. Open the printer cover.
3. Remove the paper guide assembly (page 6–66).
4. Remove four screws and the barrier shield. (Refer to Figure 6–51.)
5. Remove the timing belt cover (1) by squeezing the top and bottom to release the plastic tabs from the slots in the side plate.
6. Loosen (do not remove) the motor mount bolts (2).
7. Using the straight end of a force gauge, apply 12 pounds (53.4 N) of pressure to the paper feed drive motor (3). Use the splined shaft (4) to steady the gauge.
8. Reduce tension to 9 pounds (40.0 N) and torque the paper feed motor mount bolts (2) to 18 ± 2 inch–pounds (2.03 ± 0.23 N•m).
9. Snap the timing belt cover (1) into the slots in the side plate.
10. Install the barrier shield and four screws. (Refer to Figure 6–51.)
11. Install the paper guide assembly (page 6–66).
12. Return the printer to normal operation (page 5–3).



1. Timing Belt Shield
2. Motor Mount Bolt (2)
3. Paper Feed Drive Motor

Figure 5–1. Paper Feed Timing Belt Adjustment

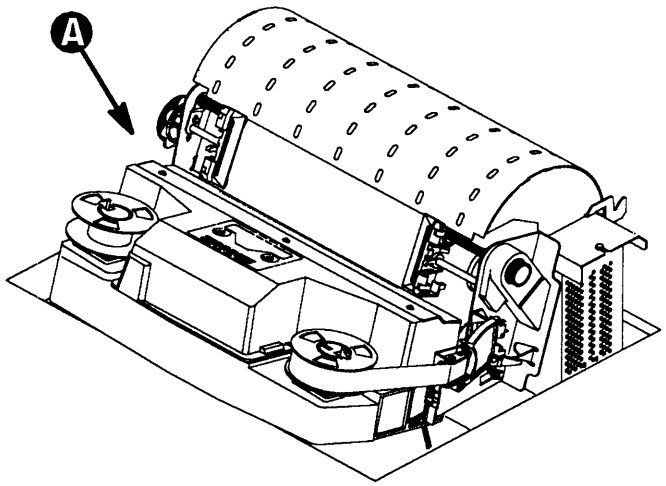
Belt, Platen Open, Adjustment (Figure 5–2)

1. Prepare the printer for maintenance (page 5–2).
2. Open the printer cover.
3. Remove the platen open belt cover (1) by squeezing the top and bottom to release the plastic tabs from the slots in the side plate.
4. Loosen the motor mount screws (2).
5. Close the forms thickness lever all the way.

WARNING

Too much tension on the platen open belt can cause the platen gap to change, which can lead to premature wear of the platen, damaged hammer tips, and poor print quality.

6. Using a force gauge, apply 10 ± 1 pounds (44.48 ± 4.45 N) of tension to the platen open motor shaft (3), pulling away from the large platen pulley.
7. Reduce tension to 5 ± 1 pounds (22.24 ± 4.45 N) and torque the motor mount screws (2) to 11 ± 2 inch–pounds (1.24 ± 0.23 N•m).
8. Check the platen gap (page 5–14). Loosen the belt and readjust the gap if necessary.
9. Snap the platen open belt cover (1) into the slots in the side plate.
10. Return the printer to normal operation (page 5–3).



1. Belt Cover
2. Motor Mount Screw
3. Platen Open Motor Shaft

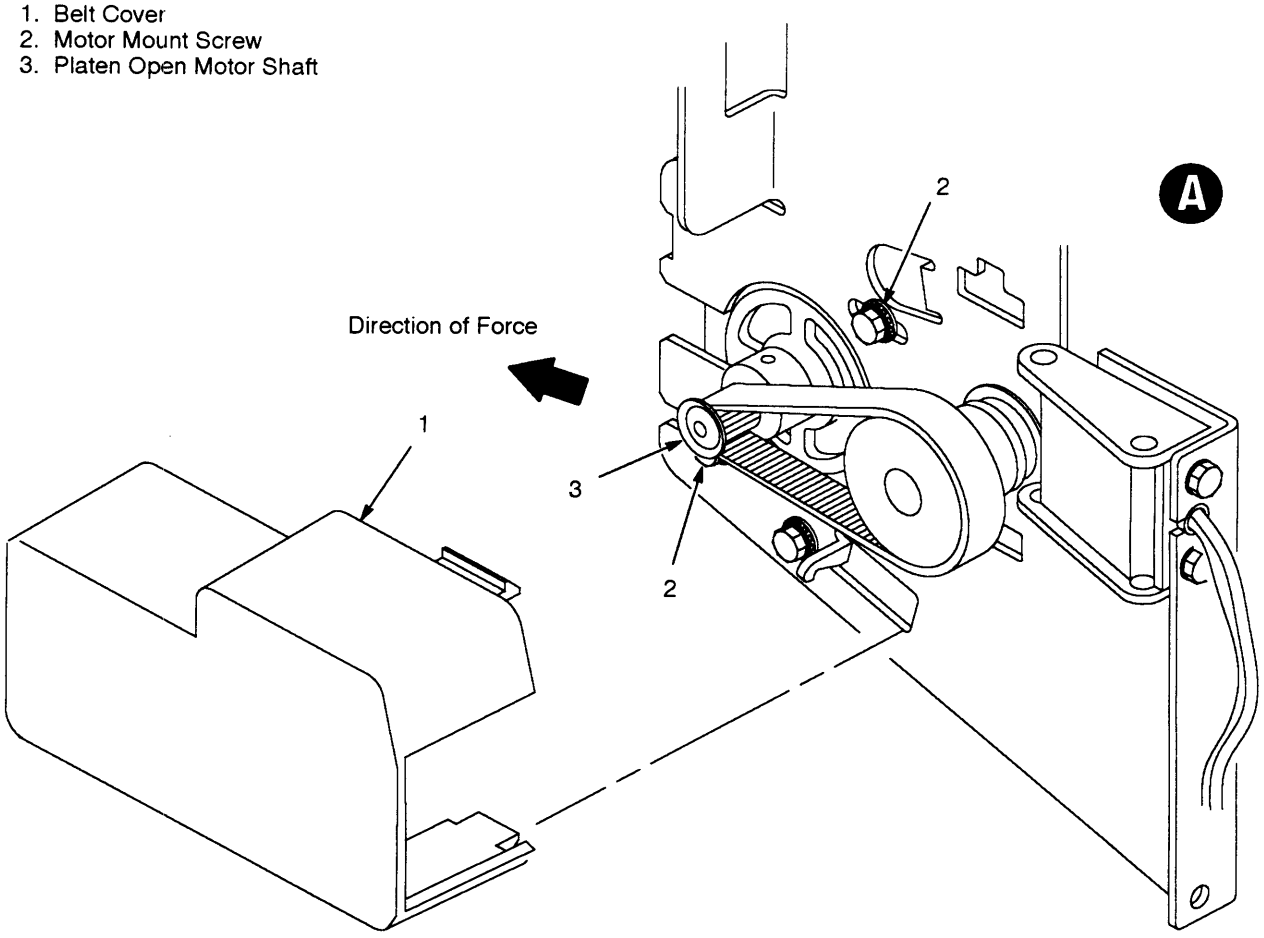


Figure 5–2. Platen Open Belt Adjustment

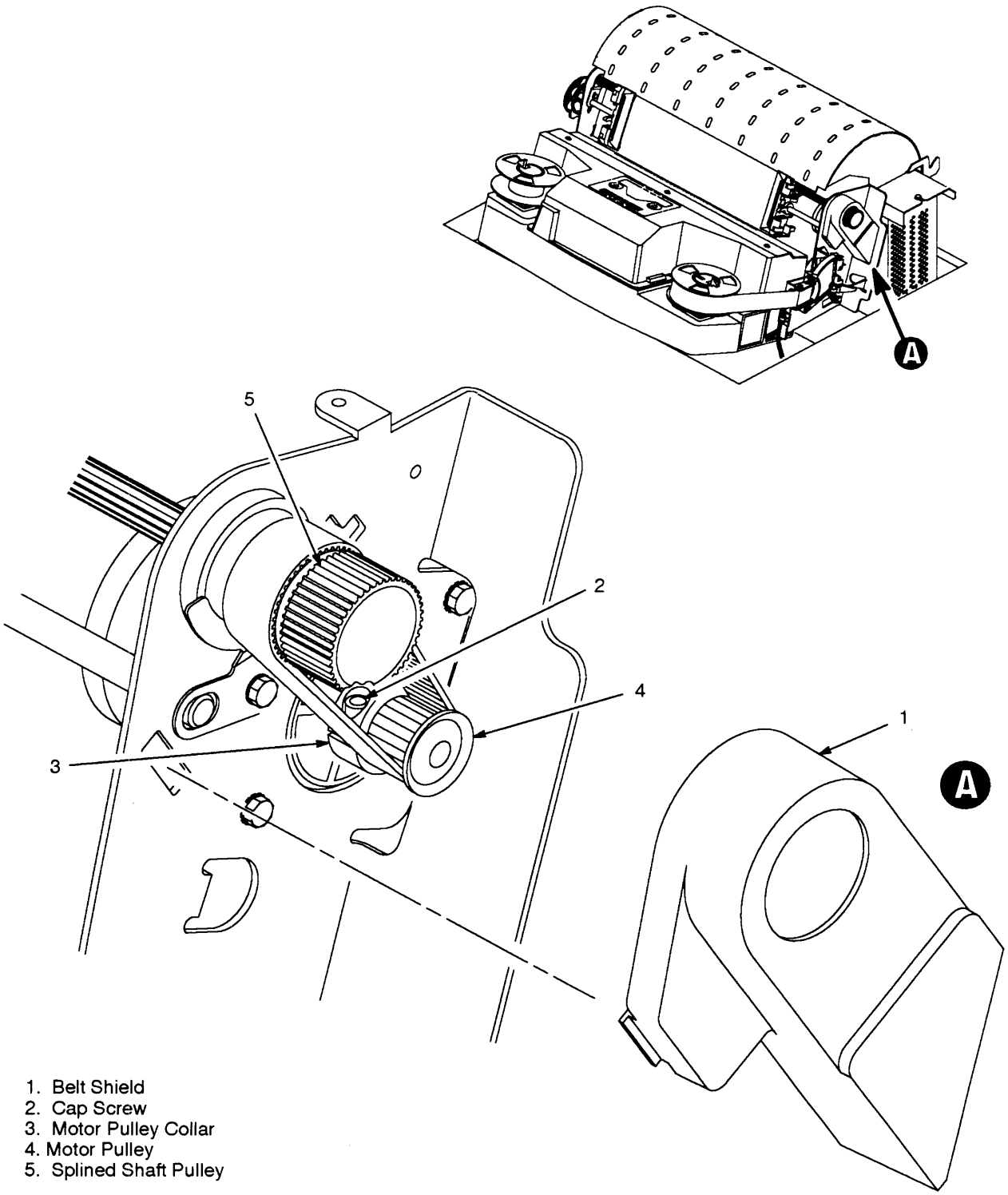
Paper Drive Motor Pulley Alignment (Figure 5–3)

1. Prepare the printer for maintenance (page 5–2).
2. Open the printer cover.
3. Remove the timing belt cover (1) by squeezing the top and bottom to release the plastic tabs from the slots in the side plate.
4. Loosen the set screw (2) in the motor pulley collar (3).
5. Align the paper drive motor pulley (4) with the splined shaft pulley (5).

WARNING

Make sure there is at least 0.010 inches (0.25 mm) of clearance between the collar/pulley and the motor face plate.

6. Hold the collar (3) flush against the motor pulley (4) and tighten the set screw (2):
   a. If the pulley (4) is black (aluminum), torque the set screw to 11 ± 2 inch–pounds (1.24 ± 0.23 N•m).
   b. If the pulley (4) is silver (steel), torque the set screw to 25 ± 2 inch–pounds (2.82 ± 0.23 N•m).
7. Check for correct tension on the paper feed timing belt (page 5–4). Adjust if necessary.
8. Snap the timing belt cover (1) into the slots in the side plate.
9. Return the printer to normal operation (page 5–3).

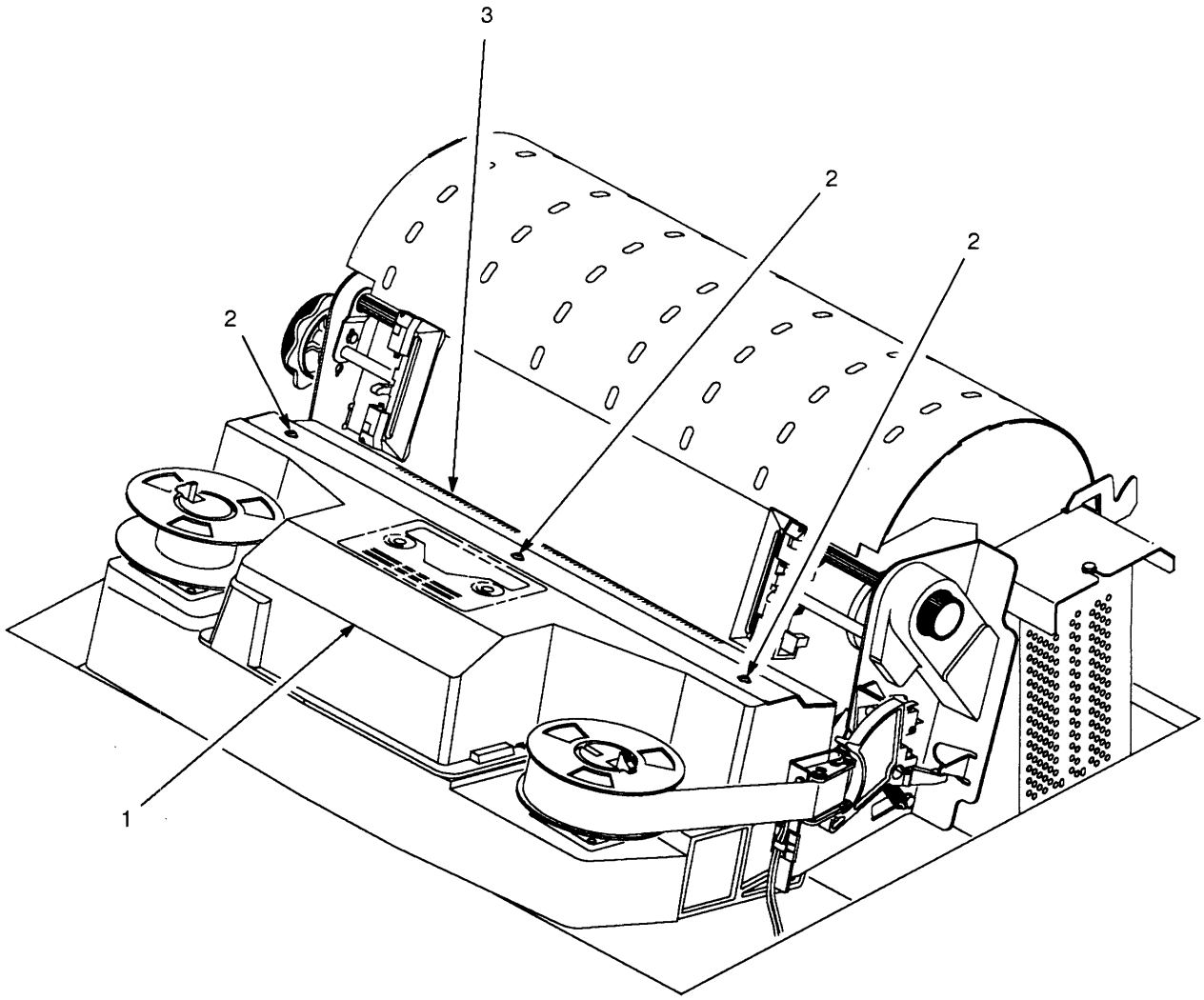


1. Belt Shield
2. Cap Screw
3. Motor Pulley Collar
4. Motor Pulley
5. Splined Shaft Pulley

Figure 5–3. Paper Drive Motor Pulley Alignment

Paper Scale Alignment (Figure 5–4)

1. Load paper and ribbon.
2. Connect the power cord to the AC power source.
3. Set the printer power switch to 1 (on).
4. Open the printer cover.
5. Verify that the shuttle cover (1) is properly installed (page 6–42).
6. Print a full 132 column line by selecting and running one of the diagnostic self–tests. (See Chapter 4.)
7. Check alignment of the scale to the print at column positions 1 and 132.
8. If adjustment is necessary, loosen the three button–head 5/64 inch hex screws (2).
9. Position the scale (3) so that column positions 1 and 132 line up with the first and last characters on the 132 character printout.
10. Tighten the button–head screws (2).
11. Close the printer cover.

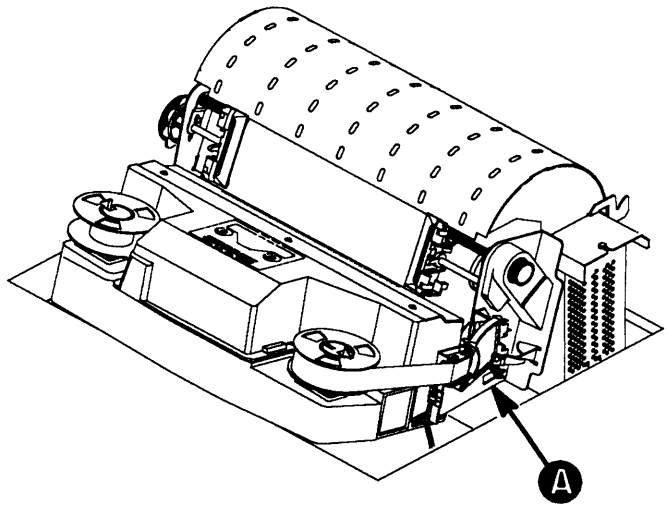


1. Shuttle Cover
2. Screw, Button–Head, 5/64 inch hex (3)
3. Paper Scale

Figure 5–4. Paper Scale Alignment

Platen Angle Adjustment (Figure 5–5)

1. Prepare the printer for maintenance (page 5–2).
2. Remove the shuttle cover (page 6–42).
3. Close the forms thickness lever (1) all the way. (Position 'A' on the scale.)
4. Install the platen position gauge (P/N 57G1505) (2) and check the angle of the platen (3): The forms thickness lever should be against the platen stop, the flat surface of the platen flush with the position gauge, and the position gauge flat on the mechanism base.
   a. If the angle is correct, no adjustment is necessary. Go to step 7.
   b. If the angle is incorrect, loosen the clamp screw (4) and set screw (5).
5. Position the platen (3) the at the correct angle.
6. Slide the platen (3) to the right and the forms thickness lever (1) to the left to remove end play. Ensure that the forms thickness lever is fully closed. Tighten the clamp screw (4), then tighten the setscrew (5).
7. Remove the platen position gauge (2).
8. Install the shuttle cover (page 6–42).
9. Return the printer to normal operation (page 5–3).



1. Forms Thickness Lever
2. Platen Position Gauge (P/N 57G1505)
3. Platen
4. Clamp Screw
5. Setscrew

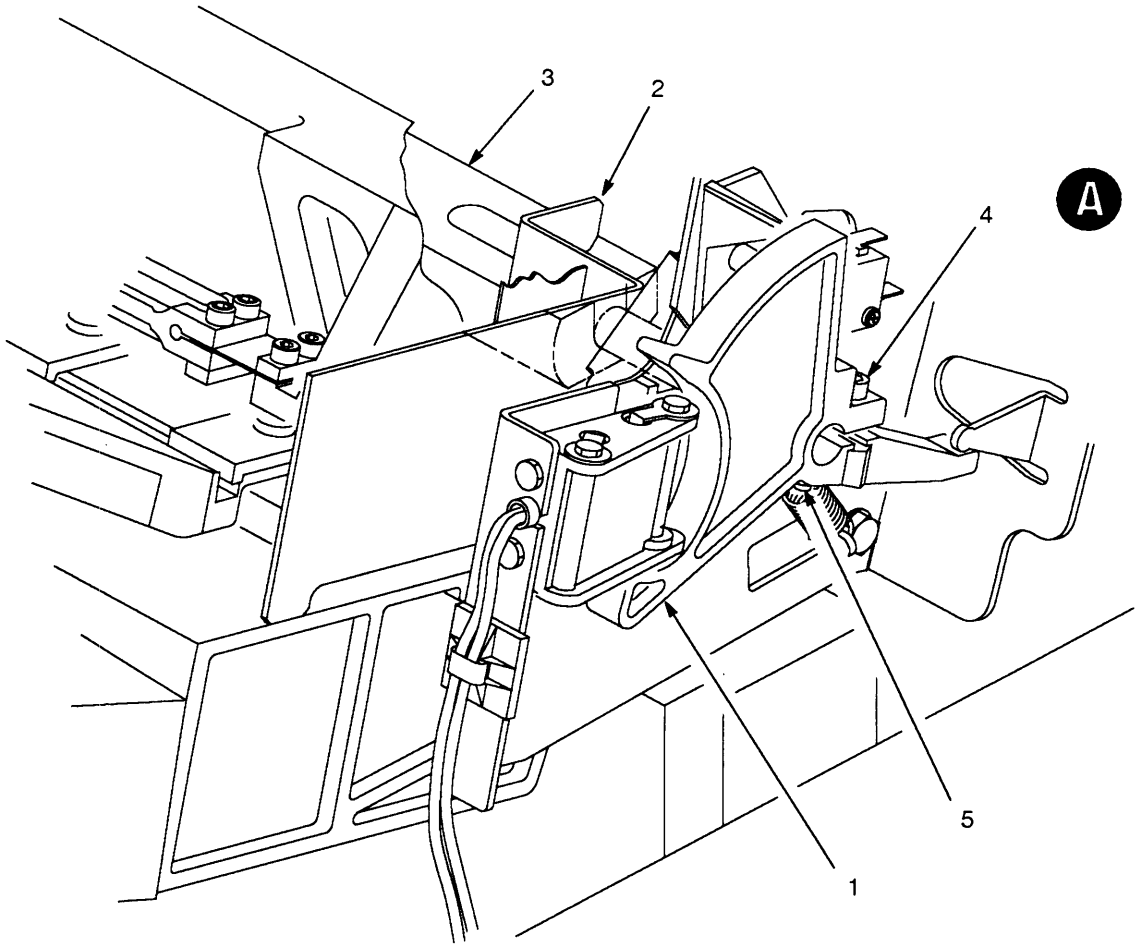


Figure 5–5. Platen Angle Adjustment

Platen Gap Adjustment (Figure 5–6)

1. Prepare the printer for maintenance (page 5–2).
2. Open the printer cover.
3. Remove the shuttle cover assembly (page 6–42).
4. Remove the ribbon.
5. Loosen the platen open belt (page 5–6, steps 3. and 4.).
6. Raise the forms thickness lever (1) to the fully open position.

WARNING

Do not force the platen against the feeler gauge. Damage to the printer will result.

7. Insert a 0.010 inch (0.25 mm) flat feeler gauge (2) straight down between the hammer bank cover plate (3) and ribbon mask (4), within four hammer positions of the left end of the hammer bank.
8. Gently close the forms thickness lever (1). As the platen is closing, gently slide the feeler gauge up and down, keeping it between the hammer tip and ribbon mask. If the feel is too tight when the platen is being closed, adjust the set screw (5) at the end of the platen counterclockwise. If the feel is too loose, adjust the set screw clockwise. With the forms thickness lever closed all the way, the feeler gauge should contact both the tips and the ribbon mask and move with light friction. Shift the gauge slightly to verify.
9. Repeat steps 6. through 8. at the right end of the hammer bank.
10. After adjusting both sides, check the gap again at both ends. Readjust if necessary.
11. When the platen gap is correct at both ends of the platen, adjust the platen open belt (page 5–6).
12. Install the shuttle cover assembly (page 6–42).
13. Return the printer to normal operation (page 5–3).

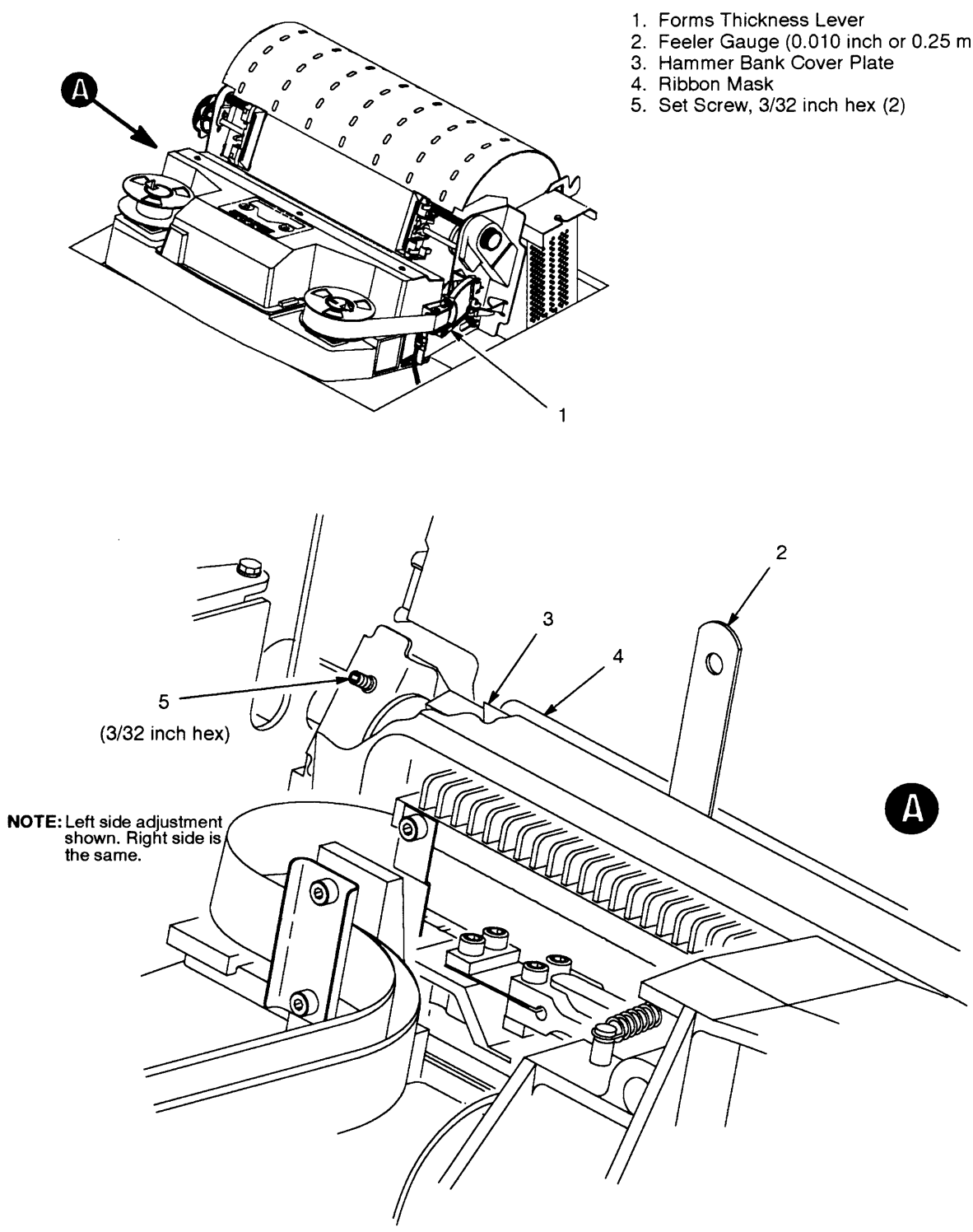


Figure 5–6. Platen Gap Adjustment

Platen Open Motor Pulley Alignment (Figure 5–7)

1. Prepare the printer for maintenance (page 5–2).
2. Open the printer cover.
3. Remove the platen open belt cover (1) by squeezing the top and bottom to release the plastic tabs from the slots in the side plate.
4. Loosen the set screw (2) in the motor pulley.
5. Align the platen open motor pulley (3) with the platen shaft pulley (4) and tighten the set screw (2) to 9 ± 2 inch–pounds (1.02 ± 0.23 N•m).
6. Check the platen open belt tension (page 5–6). Adjust if necessary.
7. Snap the platen open belt cover (1) into the slots in the side plate.
8. Return the printer to normal operation (page 5–3).

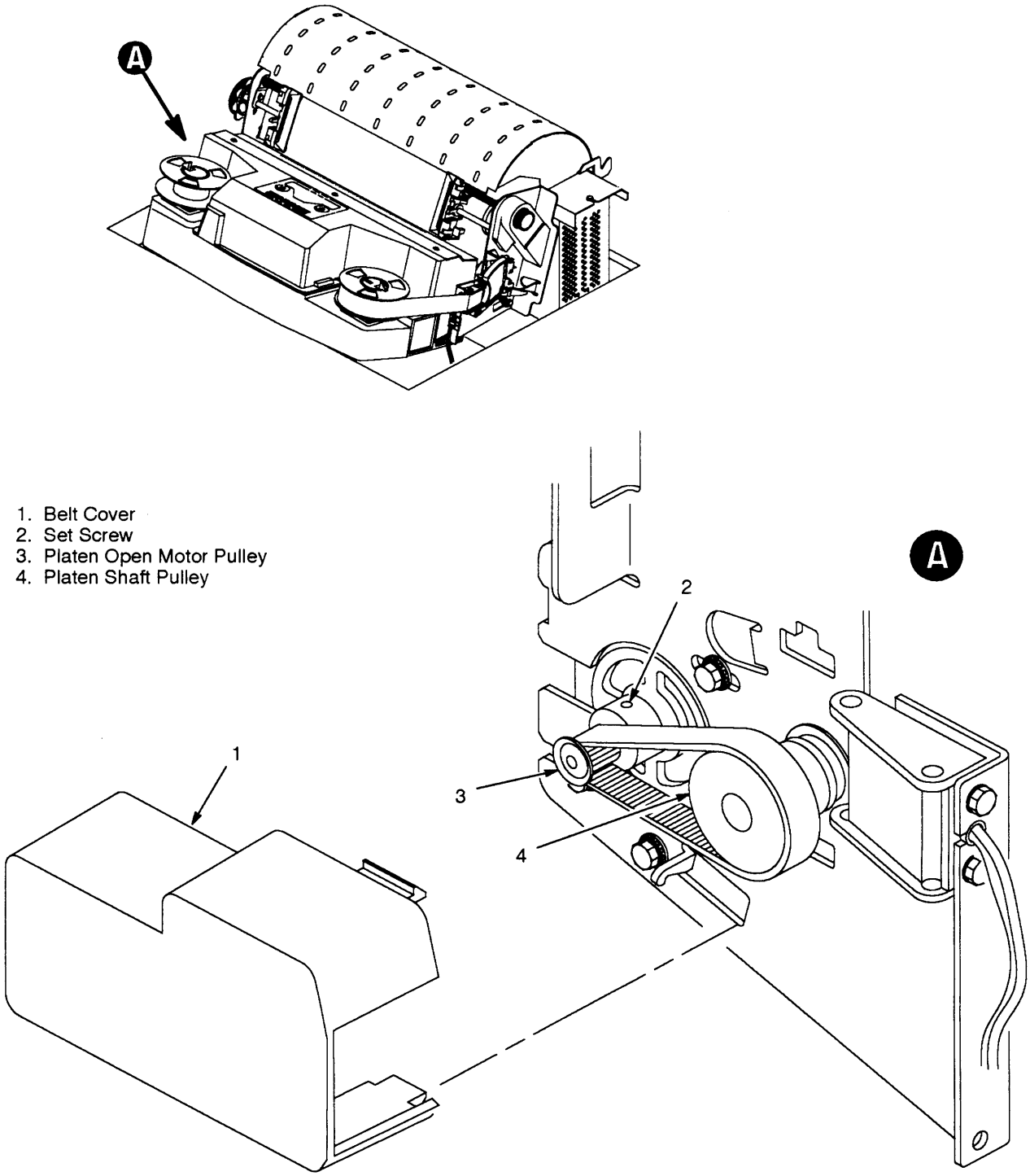
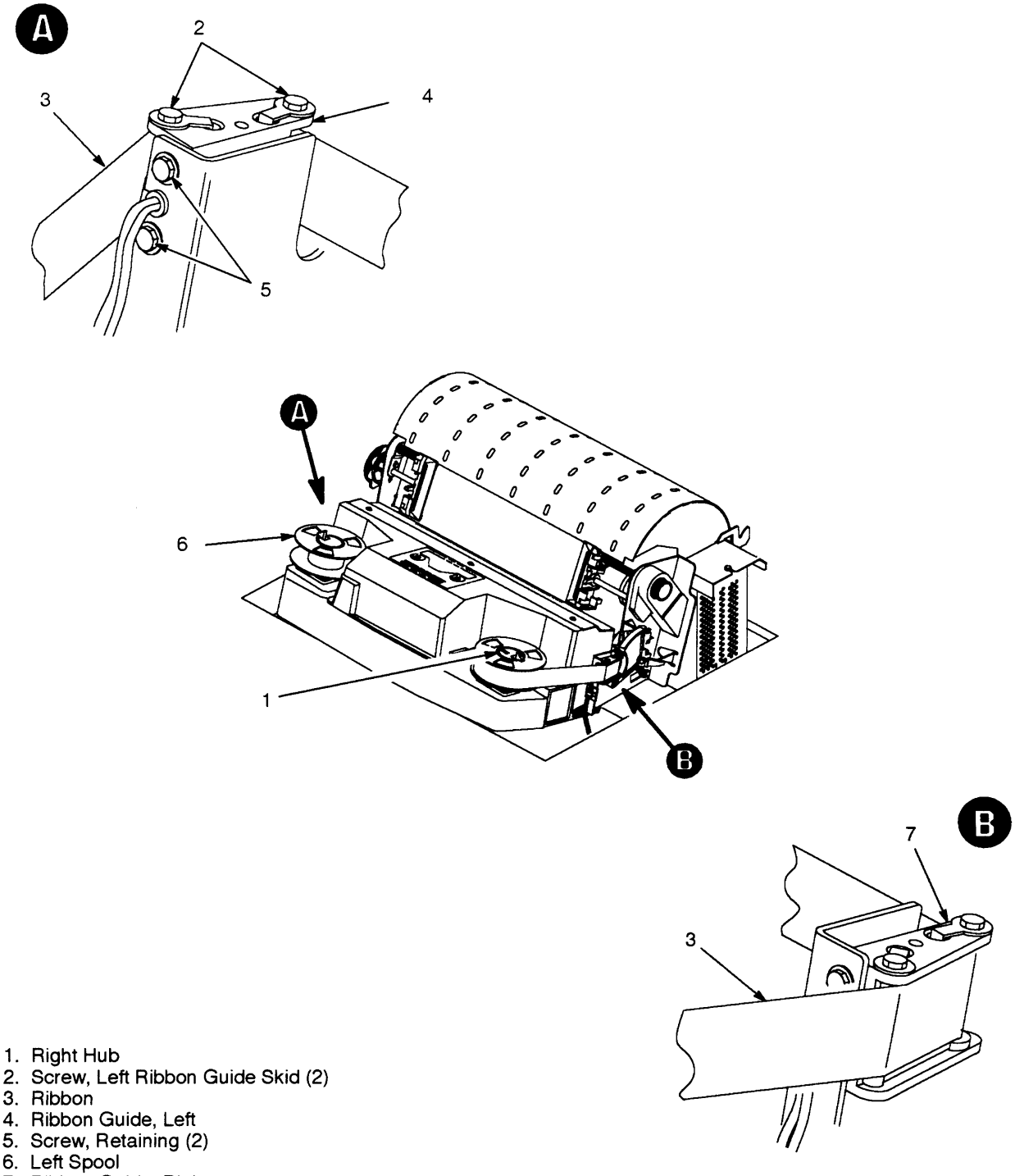


Figure 5–7. Platen Open Motor Pulley Alignment

Ribbon Guide Alignment (Figure 5–8)

1. Open the printer cover.
2. Load paper and install the ribbon. To adjust the left ribbon guide, the ribbon should have a full spool on the right hub (1).
3. Run a ribbon and shuttle diagnostic self–test. (See Chapter 4.)
4. To adjust the left ribbon guide, momentarily short between the left ribbon guide skid screws (2) to assure right to left motion of the ribbon.
5. Observe how the ribbon (3) is passing around the left ribbon guide (4). It should be centered and not folding against either of the two white nylon washers.
6. If the ribbon is not centered, loosen the retaining screws (5) just enough so that the ribbon guide (4) can be rotated to new positions, but remains in place once moved.
7. Rotate the ribbon guide (4) as necessary to center the ribbon (3).
8. Observe how the ribbon (3) is winding on the left spool (6). If the ribbon is interfering with the flange of the spool, make sure the ribbon hub and spool are mounted correctly.
9. Tighten the screws (5).
10. Allow most of the ribbon to accumulate on the left spool (6). Repeat steps 3 through 9 for the right ribbon guide (7).



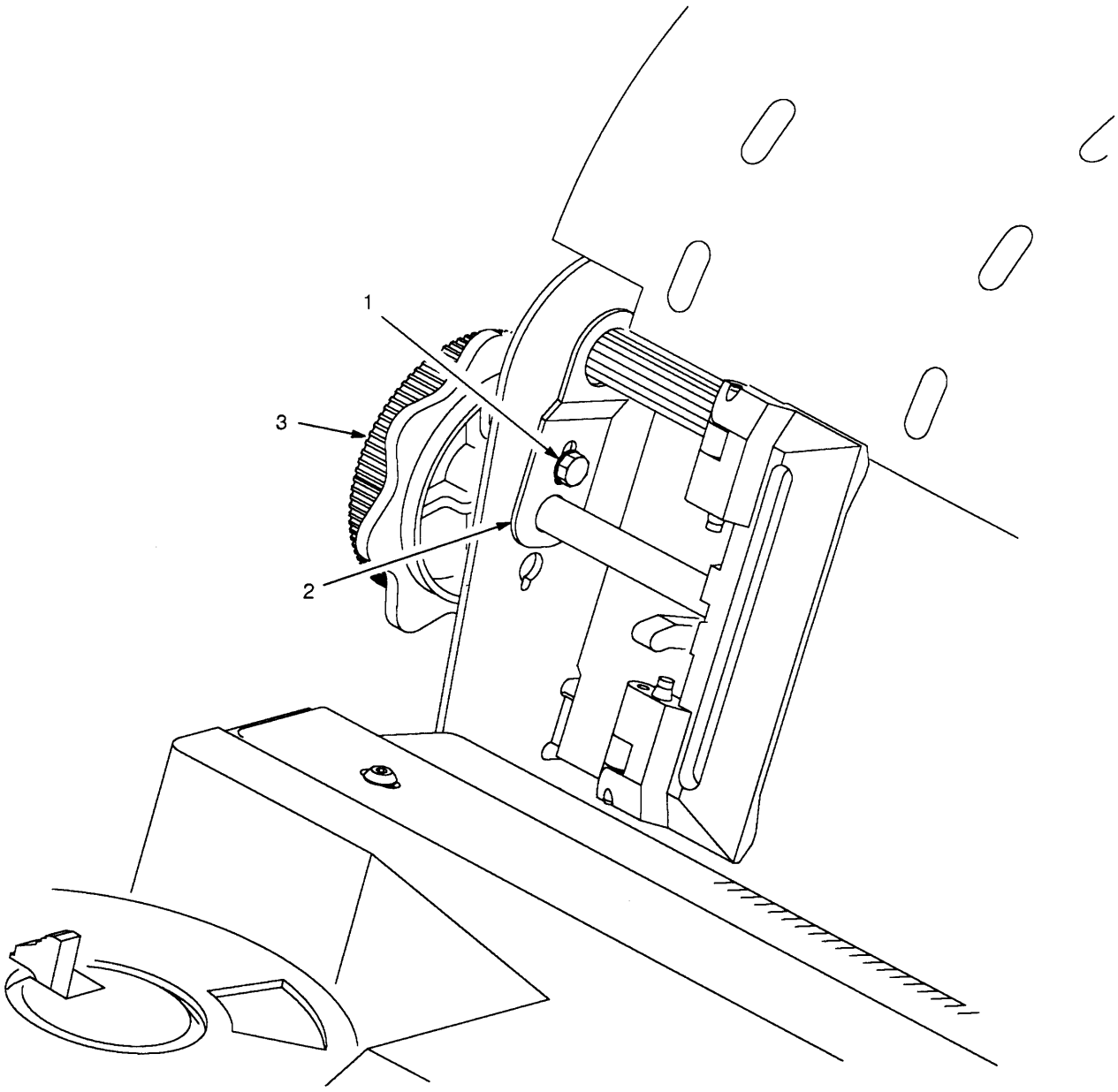
1. Right Hub
2. Screw, Left Ribbon Guide Skid (2)
3. Ribbon
4. Ribbon Guide, Left
5. Screw, Retaining (2)
6. Left Spool
7. Ribbon Guide, Right

Figure 5–8. Ribbon Guide Alignment

Splined Shaft Skew Adjustment (Figure 5–9)

If lines of print are not parallel with the edge perforations on the paper, perform the following adjustment.

1. Prepare the printer for maintenance (page 5–2).
2. Loosen the screw (1) securing the adjusting link (2).
3. Adjust the link (2) by raising or lowering the horizontal adjustment knob (3) to obtain print parallel with paper perforations. Tighten the screw (1).
4. Return the printer to normal operation (page 5–3).



1. Screw
2. Adjusting Link
3. Horizontal Adjustment Knob

Figure 5–9. Splined Shaft Skew Adjustment

Adjusting the End of Forms Distance

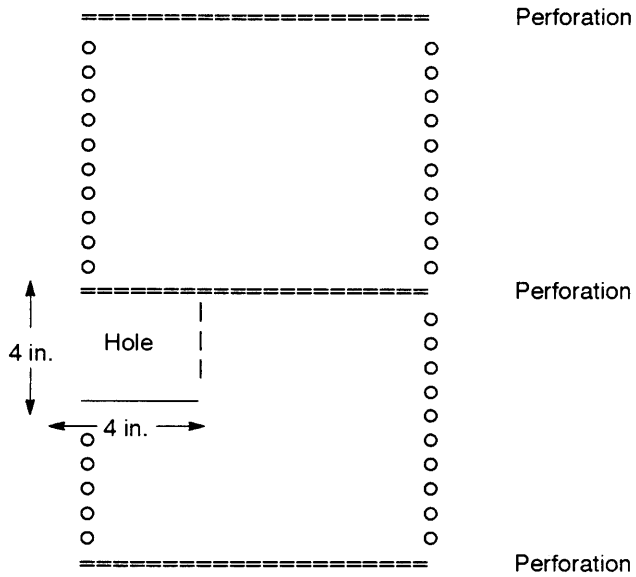
This procedure tests and sets the distance from the page perforation at which an End of Forms fault message is triggered. This adjustment prevents printing on the platen when the printer runs out of paper. The measurement units are dot rows.

You will use the dot row patterns printed by the End of Forms Adjust self–test to verify that this parameter is set correctly.

NOTE: Do this procedure only if a new paper detector switch assembly has been installed, or if you are sure that the end of forms adjustment is incorrect. An End of Forms triggering distance of 1 or 2 dot rows from the perforation is acceptable; 5 to 7 dot rows off indicates adjustment is required.

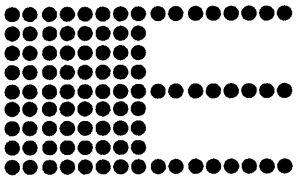
The following procedure describes how to run the End of Forms Adjust printer test and modify the End of Forms adjustment value.

1. Power on the printer.
2. Load paper and make sure the forms adjustment lever is closed. Open the cabinet front door.
3. On the paper just below the paper entrance slot, tear a four–inch square on the left side, immediately below the perforation. (See below.) This creates a hole that will trigger an End of Forms condition, but allows printing to the right of the hole (which would normally be on the platen).



4. Tear 8 to 10 holes in the manner described above, on every third sheet.
5. Unlock the **Enter** key:
   on the IBM 6408–A00 printer, press **Scroll↑** + **Scroll↓**
   on the IBM 6408–CT0 printer, press **Micro↑Scroll↑** + **Micro↓Scroll↓**
6. Select the End of Forms printer test:
   for the IBM 6408–A00, see page 4–41
   for the IBM 6408–CT0, see page 4–46

   This test prints a vertical "comb" pattern at column 70, each long bar separated by 4 dot rows. (See the enlarged example below.)



7. Press **Enter** to start the test. When the End of Forms condition occurs, remove the paper from the tractors and examine the area of the page perforation.

   If the comb pattern just meets the perforation, the end of forms adjustment distance is correct. (1 or 2 dot rows off is OK; 5 to 7 dot rows off is too much.) You may stop the test here, unless you wish to restart the procedure with 6–part paper. (See step 15.)

   If the comb pattern stops short of the perforation or prints beyond the perforation, go to step 8.
8. Open the forms thickness lever. Open the tractor doors and remove the paper from the tractors.
9. Measure how short or long the comb pattern has printed by counting the number of dot rows needed to reach the perforation, or the number of dot rows that have printed beyond the perforation.

NOTE: Use the long bars for counting the dot rows quickly. There are three dot rows between each long bar, so each long bar increases the number of dot rows by four.

You can also tear off a small piece of the comb pattern from the beginning of the pattern and use it as a ruler to help you measure the dot rows required either to reach the perforation or back up to it.

10. On the IBM 6408–A00, press these keys at the same time:
    Scroll↑ + Scroll↓ + Enter + Return.
    On the IBM 6408–CT0, press these keys at the same time:
    Micro↑Scroll↑ + Micro↓Scroll↓ + Enter + Return.

    The LCD will show "Maintenance / End of Forms Adjust."

    a. Press **Enter**. The LCD shows "End of Forms Adjust / *nn* dots".

    b. Press **Enter** again.
    The LCD shows "End of Forms Adjust / *nn* dots* ".

    c. Use the **Scroll↑** and **Scroll↓** keys to increase or decrease *nn* by the number of dot–rows you counted in Step 9.

    d. Press **Enter** to select the new value as the active value.

    e. Exit the test and maintenance menus:
    on the IBM 6408–A00 printer, press **Clear**
    on the IBM 6408–CT0 printer, press **Start**

11. Lock the **Enter** key:
    on the IBM 6408–A00 printer, press **Scroll↑ + Scroll↓**
    on the IBM 6408–CT0 printer, press **Micro↑Scroll↑ + Micro↓Scroll↓**

12. Load the paper on the tractors and close the forms thickness lever.

13. Reset the printer:
    on the IBM 6408–A00 printer, press **Stop + Enter**
    on the IBM 6408–CT0 printer, press **Stop + Cancel**

14. Verify that the End of Forms adjustment is correct by repeating the End of Forms Adjust test, starting at Step 6.

15. Although not required, it is advisable to test the End of Forms distance with 6–part paper, in order to verify correct printing with multi–part forms.

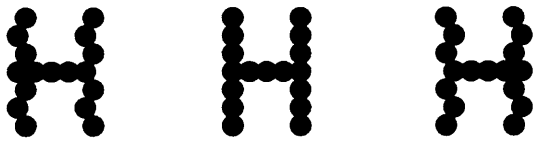
Hammer Phasing Adjustment

Hammer phasing must be checked and adjusted if PROMs on the common controller board are replaced.

Phasing should be adjusted with the printer printing at full paper width.

The procedure is summarized below.

1. Open the printer cover.
2. Load full width (132 column) paper and install the ribbon.
3. Power on the printer.
4. Press the **Stop** key to put the printer in the NOT READY mode (off–line).
5. Unlock the **Enter** key:
   on the IBM 6408–A00, press **Scroll↑** + **Scroll↓**
   on the IBM 6408–CT0, press **Micro↑Scroll↑** + **Micro↓Scroll↓**
6. Using the directional switches on the operator panel, access the "Hammer Phasing" menu:
   for the IBM 6408–A00, see page 4–41
   for the IBM 6408–CT0, see page 4–46
7. Press the **Enter** key. "Phase Adjustment" and the current phasing index number display. The printer begins printing all Hs, each line preceded by the phasing index number.
8. Press the directional switches to increase or decrease the phasing index until the pattern of Hs appears as shown below:



Needs Adjustment | **Correct** | Needs Adjustment

9. When the print pattern is acceptable, press **Enter**. Printing stops, and the current phase index value is entered into nonvolatile memory.

10. Exit the configuration menus:
    on the IBM 6408–A00 printer, press **Clear**
    on the IBM 6408–CT0 printer, press **Start**, then press **Stop.**

11. Lock the **Enter** key:
    on the IBM 6408–A00 printer, press **Scroll↑** + **Scroll↓**
    on the IBM 6408–CT0 printer, press **Micro↑Scroll↑** + **Micro↓Scroll↓**

12. Close the printer cover and place the printer in the READY mode (on–line).

6 Replacement Procedures

Chapter Contents

Replacement Procedures

WARNING

The components specified in this chapter are replaced in the field, but must be repaired at the factory. Do not attempt field repair of these items.

This chapter contains illustrated removal/installation procedures for components replaceable at the field service level of maintenance. The procedures are listed on pages 6–1 and 6–2.

Part Numbers

Part numbers for assemblies are on the removal/installation illustration, next to the name of the assembly. On the illustrations, *P/N* means "part number," *p/o* means "part of," and *Ref* means "shown for reference only."

Preparing the Printer for Maintenance

DANGER

Always disconnect the AC power cord from the power source before performing any maintenance procedure. Failure to remove power could result in injury to persons or damage to equipment. If you must apply power during maintenance, you will be instructed to so in the maintenance procedure.

The procedures in this chapter are written assuming the printer has been prepared for maintenance. To prepare the printer for maintenance, do the following steps *before* performing a replacement task:

1. Power off the printer.
2. Disconnect the power cord from the AC power source.
3. Unload paper.
4. Read the entire maintenance procedure before you begin working on the printer.
5. Gather the necessary replacement parts before you begin working on the printer.

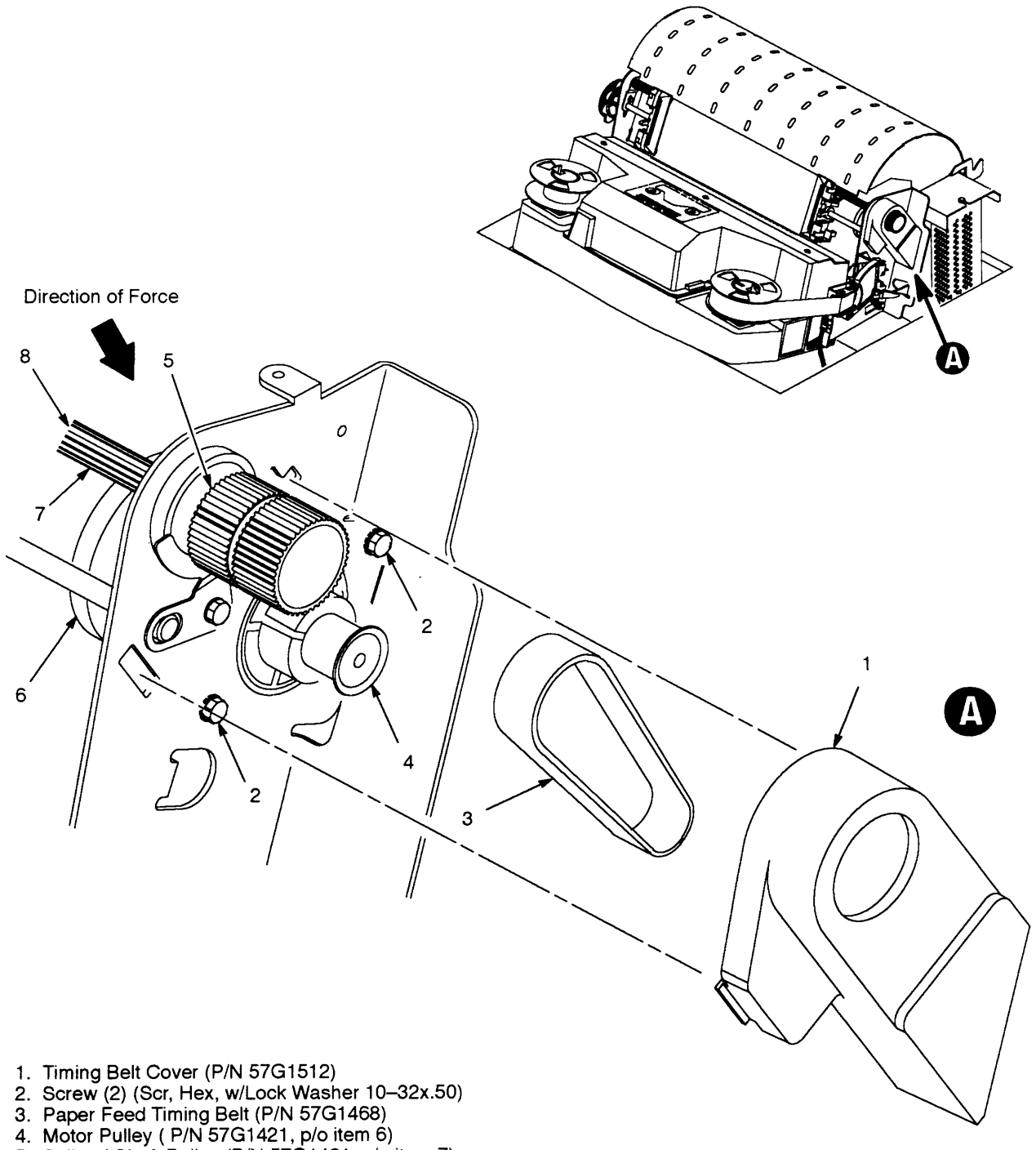
Belt, Paper Feed Timing (Figure 6–1)

Removal

1. Prepare the printer for maintenance (page 6–3).
2. Open the printer cover.
3. Remove the paper guide assembly (page 6–66).
4. Remove four screws and the barrier shield. (See Figure 6–51, page 6–129.)
5. Remove the timing belt cover (1) by squeezing the top and bottom to release the plastic tabs from the slots in the side plate.
6. Loosen (do not remove) the paper feed motor mount screws (2).
7. Remove the paper feed timing belt (3) by working the side of the belt onto the lip of the motor pulley (4) and rotating the pulleys until the belt rolls off.

Installation

1. Install the paper feed timing belt (3) over the splined shaft pulley (5) and the lip of the motor pulley (4) and rotate the pulleys until the belt rolls onto the motor pulley.
2. Using the straight end of a force gauge, apply 12 pounds (53.38 N) of pressure to the paper feed drive motor (6). Use the splined shaft (7) to steady the gauge.
3. Reduce pressure to 9 pounds (40.03 N) and torque the paper feed motor mount screws (2) to 18 ± 2 inch–pounds (2.03 ± 0.23 N•m).
4. Snap the timing belt cover (1) into the slots in the side plate.
5. Install the barrier shield and four screws. (See Figure 6–51.)
6. Install the paper guide assembly (page 6–66).
7. Return the printer to normal operation (page 6–132).



1. Timing Belt Cover (P/N 57G1512)
2. Screw (2) (Scr, Hex, w/Lock Washer 10–32x.50)
3. Paper Feed Timing Belt (P/N 57G1468)
4. Motor Pulley (P/N 57G1421, p/o item 6)
5. Splined Shaft Pulley (P/N 57G1461; p/o item 7)
6. Paper Feed Drive Motor (P/N 57G1463)
7. Splined Shaft Assy, w/Pulley (P/N 57G1460; includes items 5 and 8)
8. Splined Shaft (P/N 57G1570, p/o item 7)

Figure 6–1. Belt, Paper Feed Timing, Removal/Installation

Belt, Platen Open (Figure 6–2)

Removal

1. Prepare the printer for maintenance (page 6–3).
2. Open the printer cover.
3. Remove the platen open belt cover (1) by squeezing the top and bottom to release the plastic tabs from the slots in the side plate.
4. Loosen (do not remove) the two motor mount screws (2).
5. Push the motor toward the front of the printer to loosen the platen open belt (3).
6. Remove the platen open belt (3) from the motor pulley (4) and platen pulley (5).

Installation

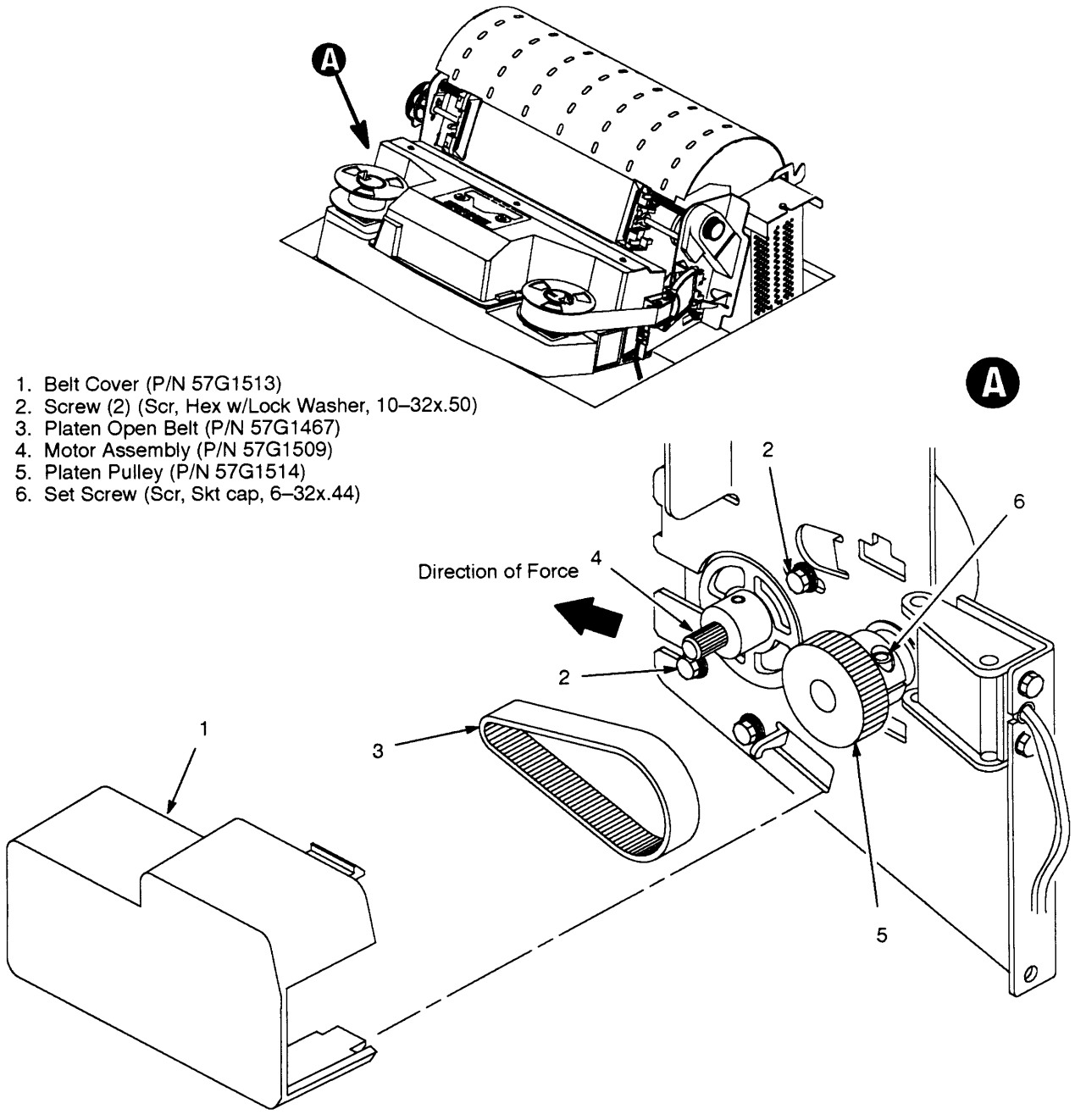
1. Slide the platen open belt (3) over the motor pulley (4) and platen pulley (5).
2. Close the forms thickness lever all the way.
3. Make sure the collar of the platen pulley (5) clears the left ribbon guide with the platen fully closed.
   a. If not, rotate the platen pulley (5) until the collar clears the left ribbon guide and tighten the set screw (6) to 11 ± 2 inch–pounds (1.24 ± 0.23 N•m). Go to step 4.
   b. If the collar clears the ribbon guide with the forms thickness lever closed, go to step 4.

WARNING

Too much tension on the platen open belt can cause the platen gap to change, which can lead to premature wear of the platen, damaged hammer tips, and poor print quality.

4. Using a force gauge, apply 10 pounds (44.48 N) of tension to the motor shaft (4), pulling away from the large platen pulley.
5. Reduce tension to 5 pounds (22.24 N) and torque the motor mount screws (2) to 11 ± 2 inch–pounds (1.24 ± 0.23 N•m).

6. Check the platen gap (page 5–14), Loosen the belt and readjust if necessary.
7. Snap the platen open belt cover (1) into the slots in the side plate.
8. Return the printer to normal operation (page 6–132).



1. Belt Cover (P/N 57G1513)
2. Screw (2) (Scr, Hex w/Lock Washer, 10–32x.50)
3. Platen Open Belt (P/N 57G1467)
4. Motor Assembly (P/N 57G1509)
5. Platen Pulley (P/N 57G1514)
6. Set Screw (Scr, Skt cap, 6–32x.44)

Figure 6–2. Belt, Platen Open, Removal/Installation

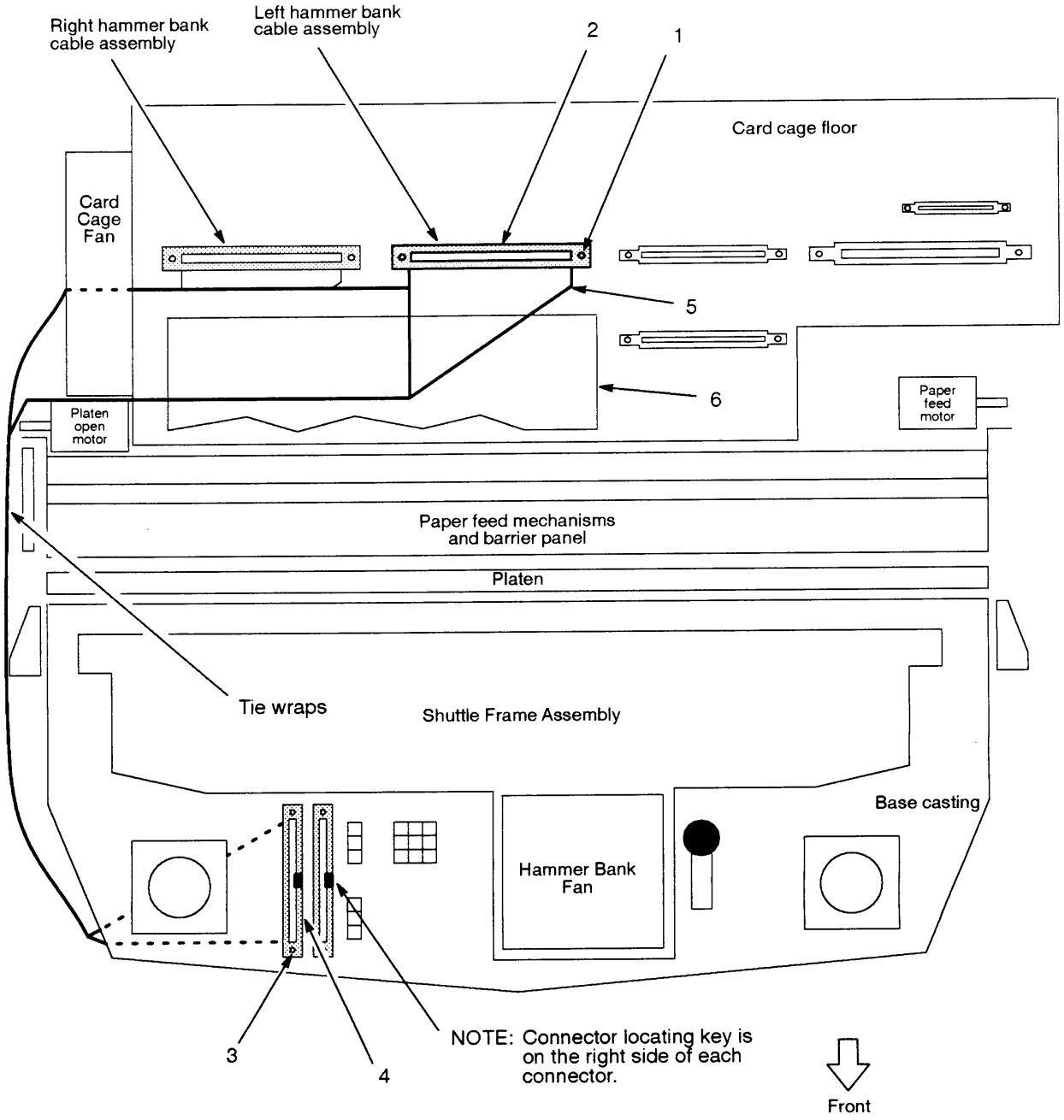
Cable Assembly (W4), Hammer Bank (Figure 6–3)

Removal

NOTE: This procedure removes the left hammer bank cable assembly. The procedure for removing the right cable assembly is the same.

1. Prepare the printer for maintenance (page 6–3).
2. Open the printer cover.
3. Remove the shuttle cover assembly (page 6–42).
4. Remove the paper guide assembly (page 6–66).
5. Remove the common controller PCBA (page 6–74).
6. Remove the mechanism driver PCBA (page 6–88).
7. Remove the power supply PCBA (page 6–92).
8. Remove two screws (1) securing the connector (2) to the bottom of the card cage.
9. Remove two screws (3) securing the connector (4) to the base casting.
10. Note the location and number of tie wraps, then remove them.
11. Feed the hammer bank cable assembly (5) down through the base casting, then out of the card cage.

Printer viewed from above, PCBAs removed.



1. Screw (2) (Scr, w/Lock Washer, 4–40x.75; and #4 flat washer)
2. Connector (p/o item 5.)
3. Screw (2) (Same as item 1.)
4. Connector (p/o item 5.)
5. Hammer Bank Cable Assembly (P/N 57G1448)
6. Protective Barrier (Ref)

Figure 6–3. Cable Assembly, Hammer Bank, Removal

Installation

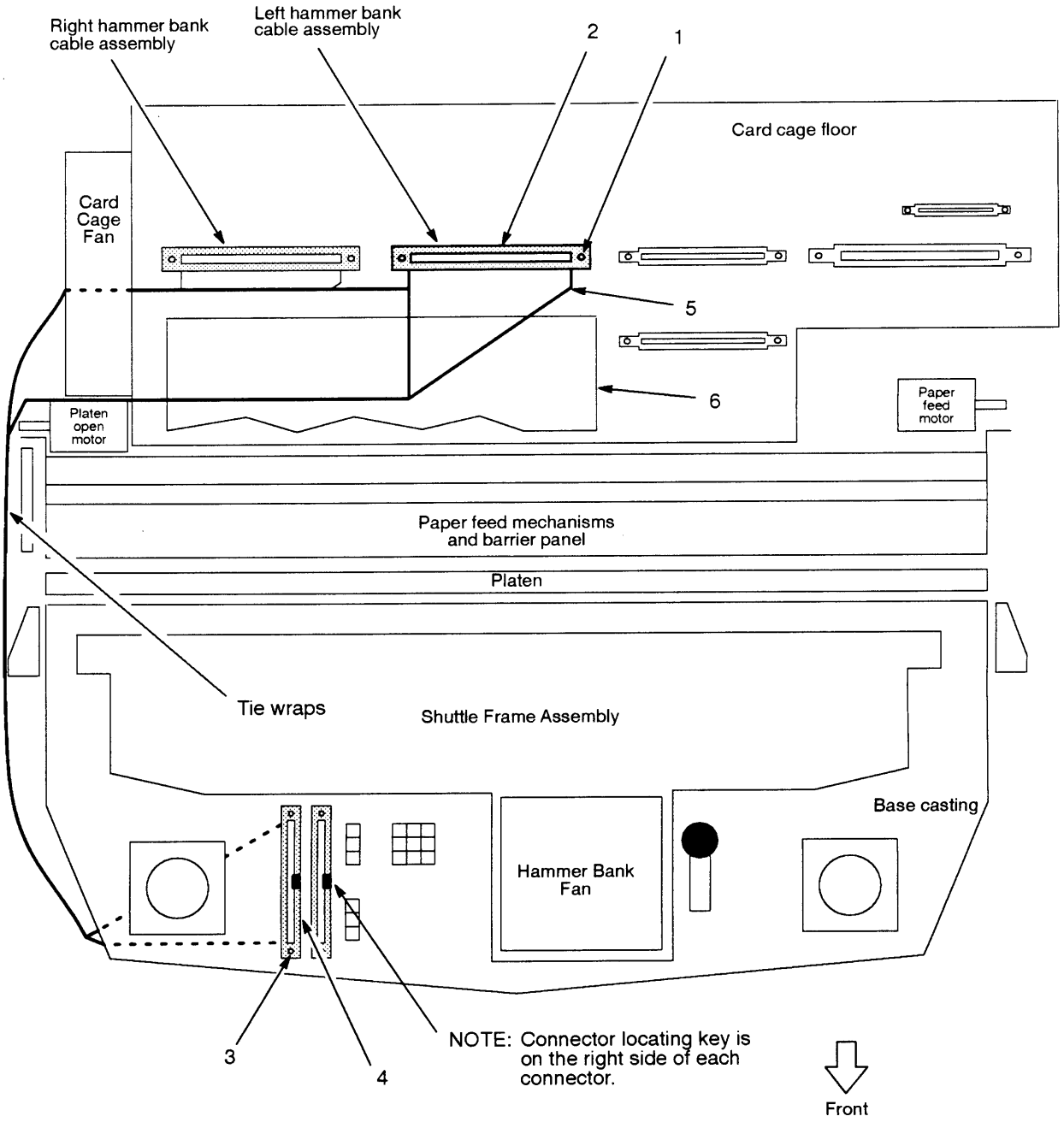
WARNING

Be careful not to damage the ribbon cable on the card cage or base casting. Make sure the protective barrier is on top of the ribbon cables at the card cage bottom.

NOTE: This procedure installs the left hammer bank cable assembly. The procedure for installing the right cable assembly is the same.

1. Feed the hammer bank cable assembly (5) down through card cage, around the printer, then up through the base casting.
2. Install two screws (3) securing the connector (4) to the base casting.
3. Install two screws (1) securing the connector (2) to the bottom of the card cage.
4. Install tie wraps to join left and right hammer bank cable assemblies. (See Removal step 10.)
5. Install the power supply PCBA (page 6–92).
6. Install the mechanism driver PCBA (page 6–88).
7. Install the common controller PCBA (page 6–74).
8. Install the paper guide assembly (page 6–66).
9. Install the shuttle cover assembly (page 6–42).
10. Return the printer to normal operation (page 6–132).

Printer viewed from above, PCBAs removed.



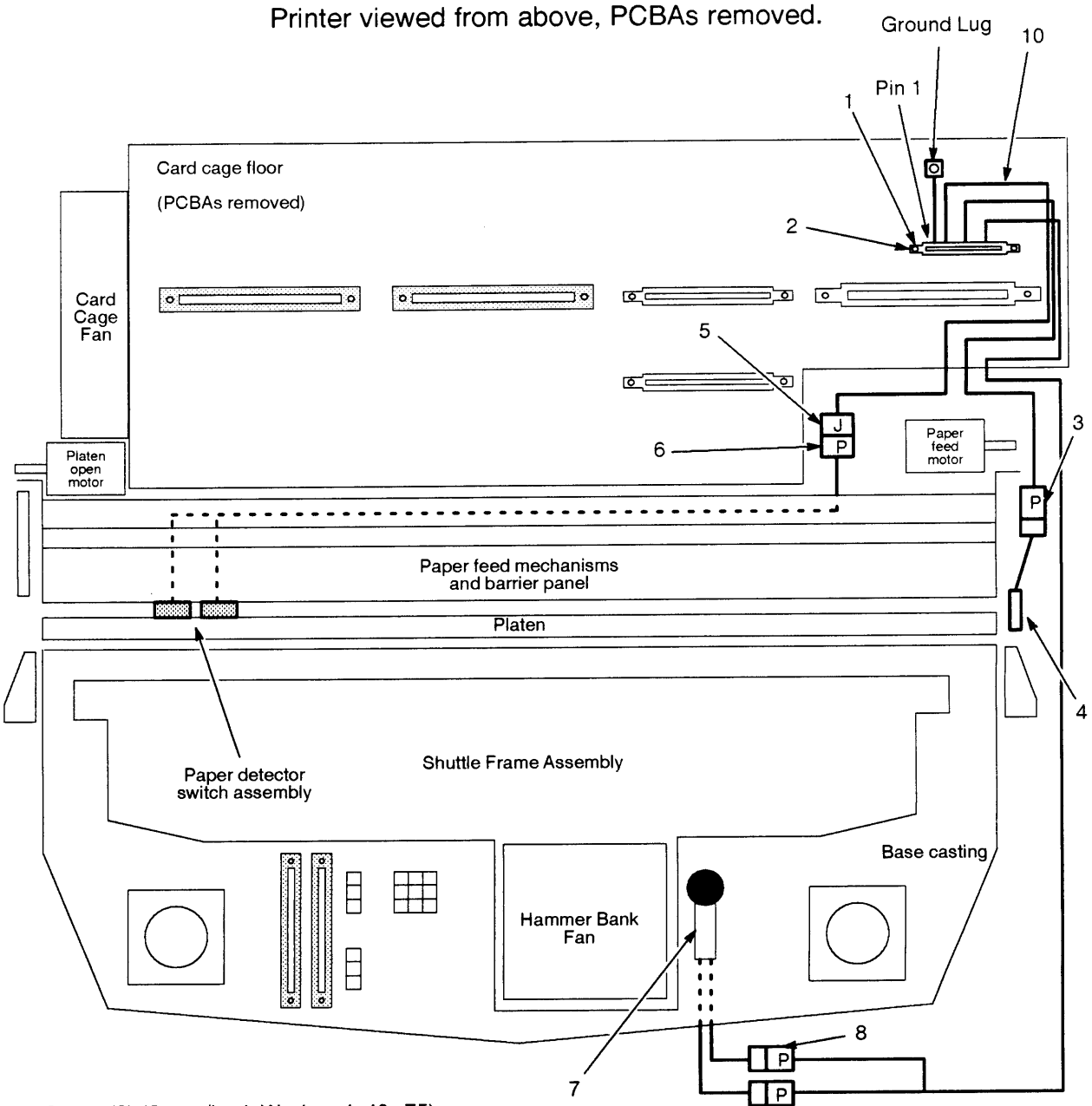
1. Screw (2) (Scr, w/Lock Washer, 4–40x.75; and #4 flat washer)
2. Connector (p/o item 5.)
3. Screw (2) (Same as item 1.)
4. Connector (p/o item 5.)
5. Hammer Bank Cable Assembly (P/N 57G1448)
6. Protective Barrier (Ref)

Figure 6–3. Cable Assembly, Hammer Bank, Installation

Cable Assembly W5, Intermediate (Figure 6–4)

Removal

1. Prepare the printer for maintenance (page 6–3).
2. Open the printer cover.
3. Remove the paper guide assembly (page 6–66).
4. Remove the common controller PCBA (page 6–74).
5. Remove the mechanism driver PCBA (page 6–88).
6. Remove screws (1) securing the intermediate cable assembly connector P1 (2) to the bottom of the card cage. Loosen the screw securing the ground lug, and remove the ground lug.
7. Disconnect connector P1(P) (3) from platen interlock switch assembly (4).
8. Disconnect connector PMD (5) from paper detector switch assembly connector PMD(P) (6).
9. Remove the cover open switch assembly (7) and disconnect connectors CO+ and CO– (8 and 9). (See page 6–126.)
10. Note the location of cable runs and restraints, cut the tie wraps, and remove the intermediate cable assembly (10) through the card cage.

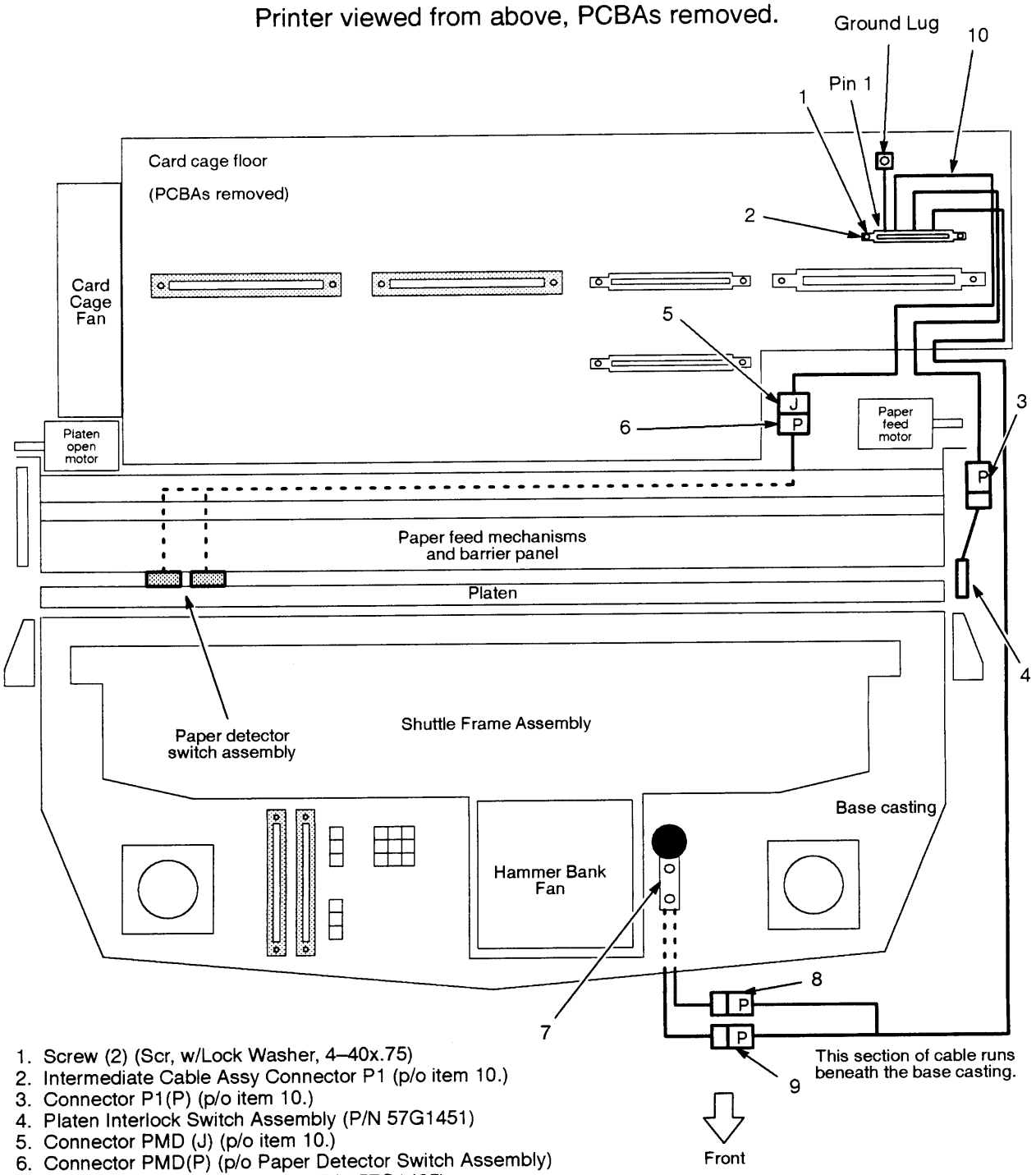


1. Screw (2) (Scr, w/Lock Washer, 4–40x.75)
2. Intermediate Cable Assy Connector P1 (p/o item 10.)
3. Connector P1(P) (p/o item 10.)
4. Platen Interlock Switch Assembly (P/N 57G1451)
5. Connector PMD (J) (p/o item 10.)
6. Connector PMD(P) (p/o Paper Detector Switch Assembly)
7. Cover Open Switch Assembly (P/N 57G1465)
8. Connector CO+ (p/o item 10.)
9. Connector CO– (p/o item 10.)
10. Intermediate Cable Assembly (P/N 57G1452)

Figure 6–4. Cable Assembly, Intermediate, Removal

Installation

1. Feed the intermediate cable assembly (10) through the card cage opening and install tie wraps and cable restraints.
2. Connect connectors CO+ and CO– (8 and 9) and install the cover open switch assembly (7). (See page 6–126.)
3. Connect connector PMD (5) to paper detector switch assembly connector PMD(P) (6).
4. Connect connector P1(P) (3) to the platen interlock switch assembly (4).
5. Install the screws (1) securing the intermediate cable assembly connector P1 (2) to the bottom of the card cage.
6. Insert the ground lug under the screw and tighten the screw.
7. Install the mechanism driver PCBA (page 6–88).
8. Install the common controller PCBA (page 6–74).
9. Install the paper guide assembly (page 6–66).
10. Return the printer to normal operation (page 6–132).



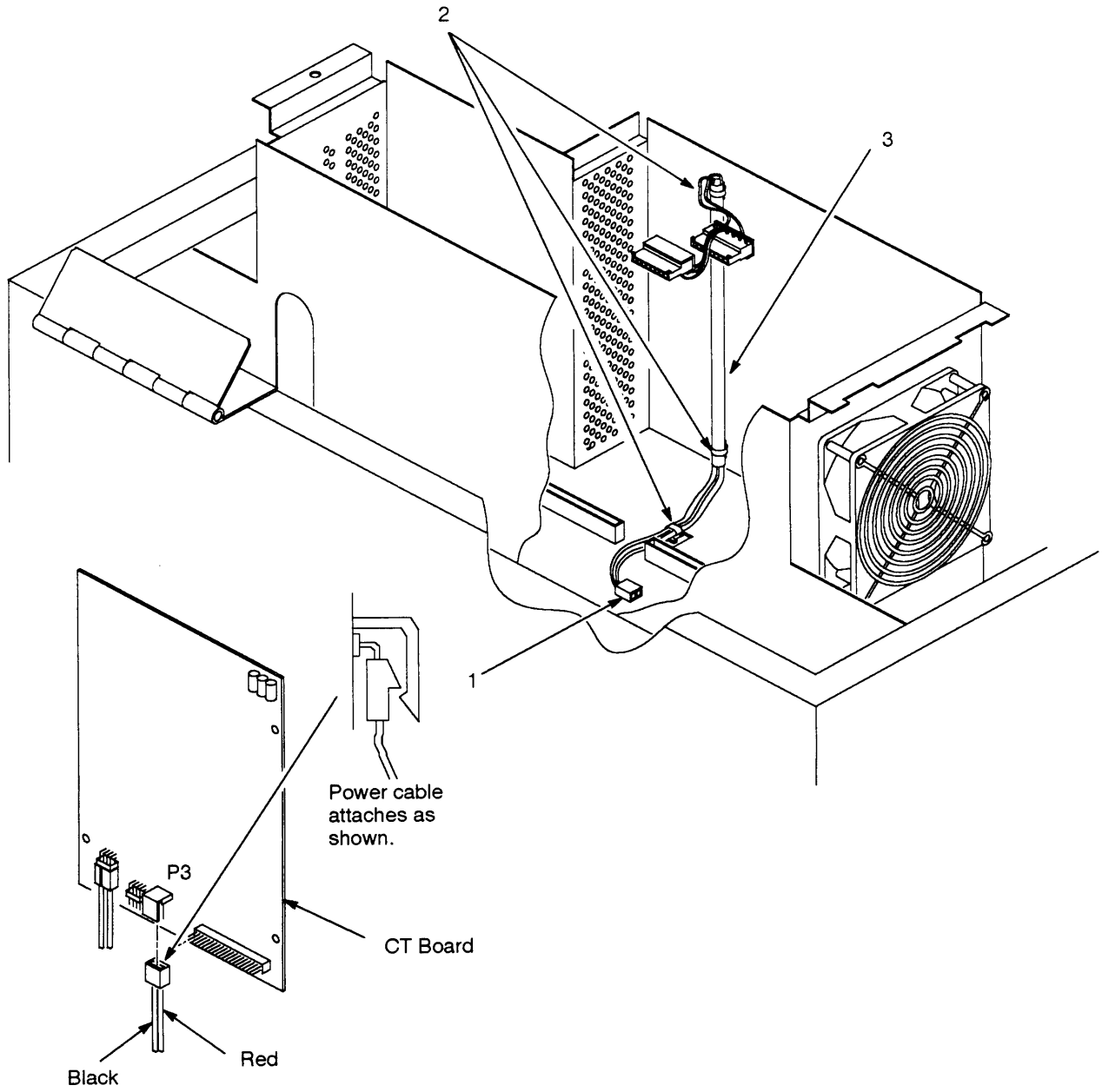
1. Screw (2) (Scr, w/Lock Washer, 4–40x.75)
2. Intermediate Cable Assy Connector P1 (p/o item 10.)
3. Connector P1(P) (p/o item 10.)
4. Platen Interlock Switch Assembly (P/N 57G1451)
5. Connector PMD (J) (p/o item 10.)
6. Connector PMD(P) (p/o Paper Detector Switch Assembly)
7. Cover Open Switch Assembly (P/N 57G1465)
8. Connector CO+ (p/o item 10.)
9. Connector CO– (p/o item 10.)
10. Intermediate Cable Assembly (P/N 57G1452)

Figure 6–4. Cable Assembly, Intermediate, Installation

Cable Assembly, Coaxial/Twinaxial Power (Figure 6–5)

Removal

1. Prepare the printer for maintenance (page 6–3).
2. Open the printer cover.
3. Remove the paper guide assembly (page 6–66).
4. Remove the common controller PCBA (page 6–74).
5. Remove the mechanism driver PCBA (page 6–88).
6. Remove the power supply PCBA (page 6–92).
7. If the printer does not have an IGP board, go to step 8. If the printer has an IGP board, remove it (page 6–78), then go to step 9.
8. Disconnect the power cable connector (1) from P3 on the CT board. (See Figure 6–5.)
9. Cut the tie wraps (2) securing the power cable to the card cage floor and rear wall and remove the coaxial/twinaxial power cable assembly (3)

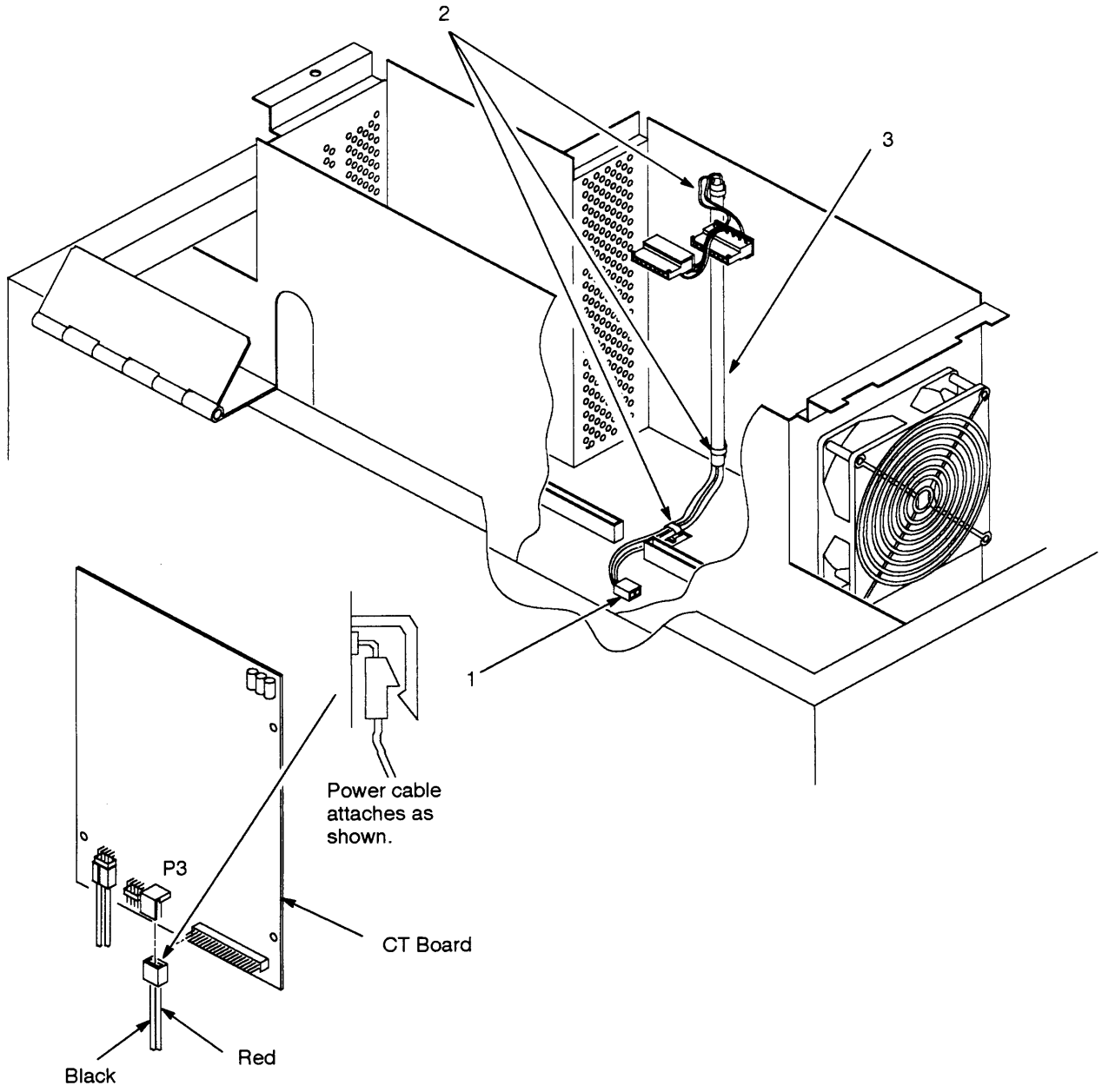


1. Power Cable Connector (Ref)
2. Tie Wraps (3) (P/N 75X5972)
3. Coaxial/Twinaxial Power Cable Assembly (P/N 57G1412)

Figure 6–5. Cable Assy, Coaxial/Twinaxial Power, Removal

Installation

1. Lay the coaxial/twinaxial power cable (3) in the card cage so the part covered by heat–shrink tubing runs straight up the front wall of the card cage. (See Figure 6–5.)
2. Install tie wraps (2) securing the cable to the front wall of the card cage. Make sure the part of the cable covered by the heat–shrink tubing is under the tie wraps on the front wall.
3. Pull the the power cable straight across the bottom of the card cage, remove the slack, and install a tie wrap; this leaves enough slack at both ends of the cable.
4. If the printer does not have an IGP board, go to step 5. If the printer has an IGP board, install it (page 6–78), then go to step 6.
5. Connect the power cable connector (1) to P3 on the CT board.
6. Install the power supply PCBA (page 6–92).
7. Install the mechanism driver PCBA (page 6–88).
8. Install the common controller PCBA (page 6–74).
9. Install the paper guide assembly (page 6–66).
10. Return the printer to normal operation (page 6–132).



1. Power Cable Connector (Ref)
2. Tie Wraps (3) (P/N 75X5972)
3. Coaxial/Twinaxial Power Cable Assembly (P/N 57G1412)

Figure 6–5. Cable Assy, Coaxial/Twinaxial Power, Installation

Removal

1. Prepare the printer for maintenance (page 6–3).
2. Remove the paper guide assembly (page 6–66).
3. If the printer has an IGP board, the CT is mounted to the IGP, otherwise it is mounted on the back wall of the card cage. Disconnect the orange (1) and gray (2) CT I/O cable connectors from connector P2 on the CT board. (See Figure 6–6.)
4. Open the rear cabinet door. Remove the paper stacker tray assembly (page 6–70).
5. Remove six screws (3) and the service panel (4). (See Figure 6–7.)
6. Remove the coax/twinax I/O cable assembly (5) from the cable restraints along the cable path.
7. Remove four screws (6) and the coax/twinax I/O interface connector plate (7) from the cutout above the power switch.

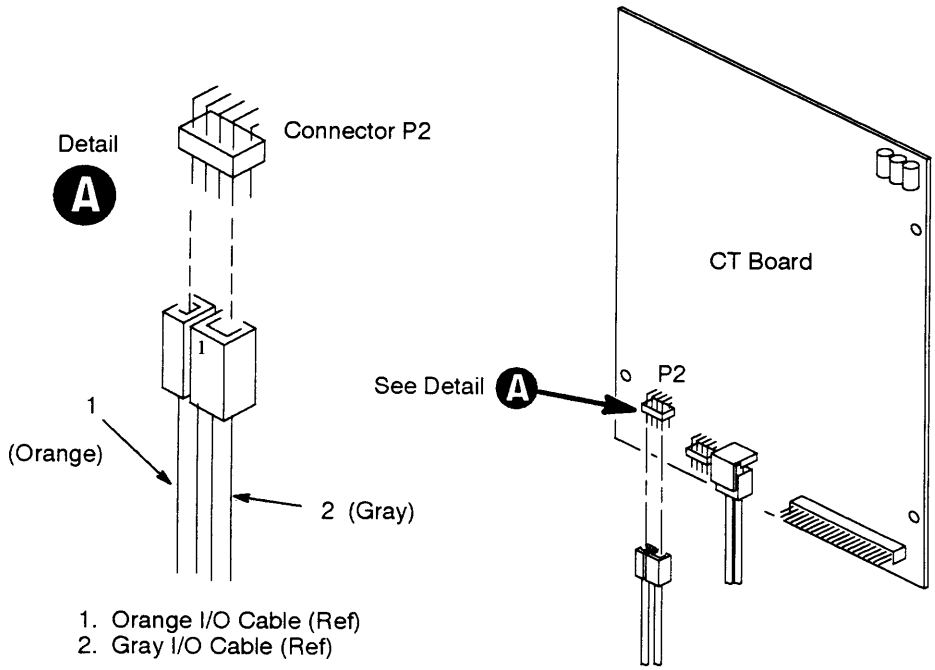
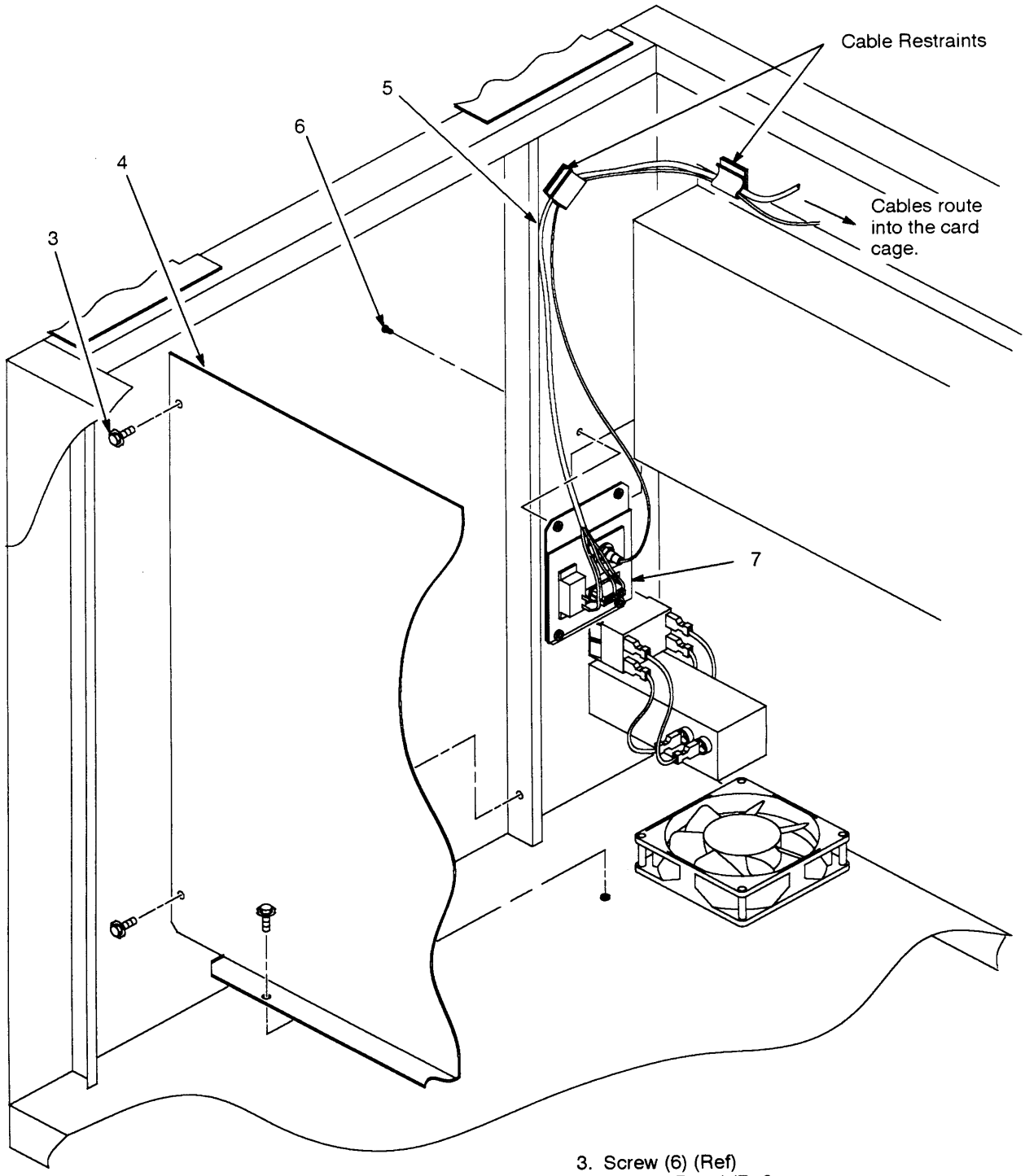


Figure 6–6. Cable Assy, Coaxial/Twinaxial I/O, Removal



3. Screw (6) (Ref)
4. Service Panel (Ref)
5. Coax/twinax I/O Cable Assembly (p/o item 7)
6. Screw (4) (p/o item 5)
7. I/O Interface Connector Plate (P/N 57G1506)

Figure 6–7. Cable Assy, Coaxial/Twinaxial I/O, Removal

Installation

1. Position the coax/twinax I/O interface connector plate in the cutout above the power switch and install the four screws. (See Figure 6–7.)
2. Route the coax/twinax cables up the right rear inside of the cabinet and into the card cage. Secure the cables in the bottom of the existing cable restraints.
3. Connect the orange CT I/O cable (1) to pins 1 and 2 of connector P2 on the CT board. The beveled edge of the connector must face toward the board. (See Figure 6–6, below.)
4. Connect the gray CT I/O cable (2) to pins 3 – 8 of connector P2 on the CT board. Pin 1 on the cable connector faces up.
5. Install the paper stacker tray assembly (page 6–70).
6. Install the service panel (4) and six screws (3).
7. Install the paper guide assembly (page 6–66).
8. Return the printer to normal operation (page 6–132).

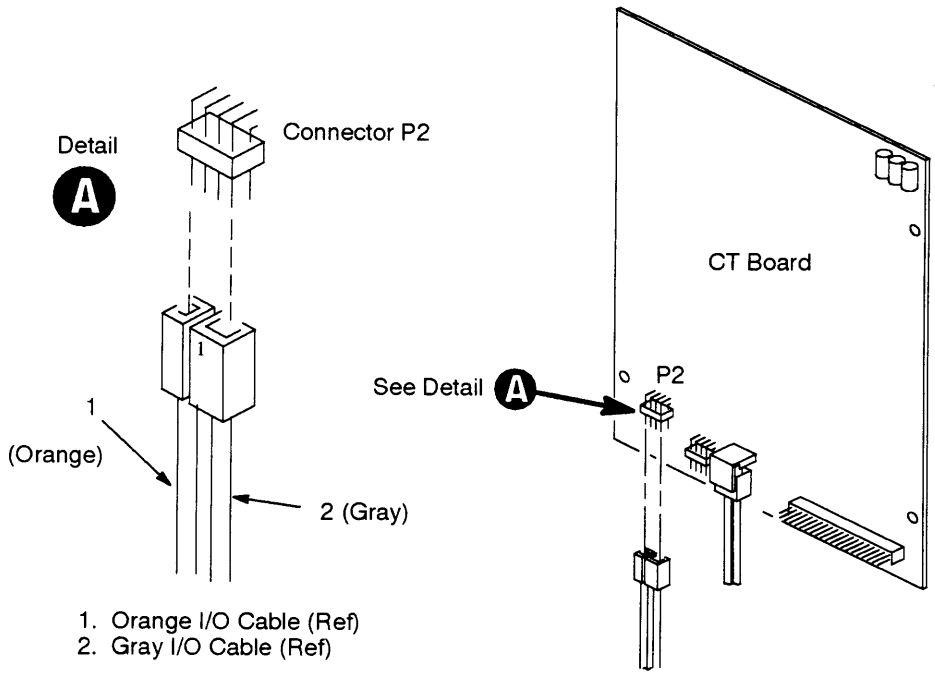
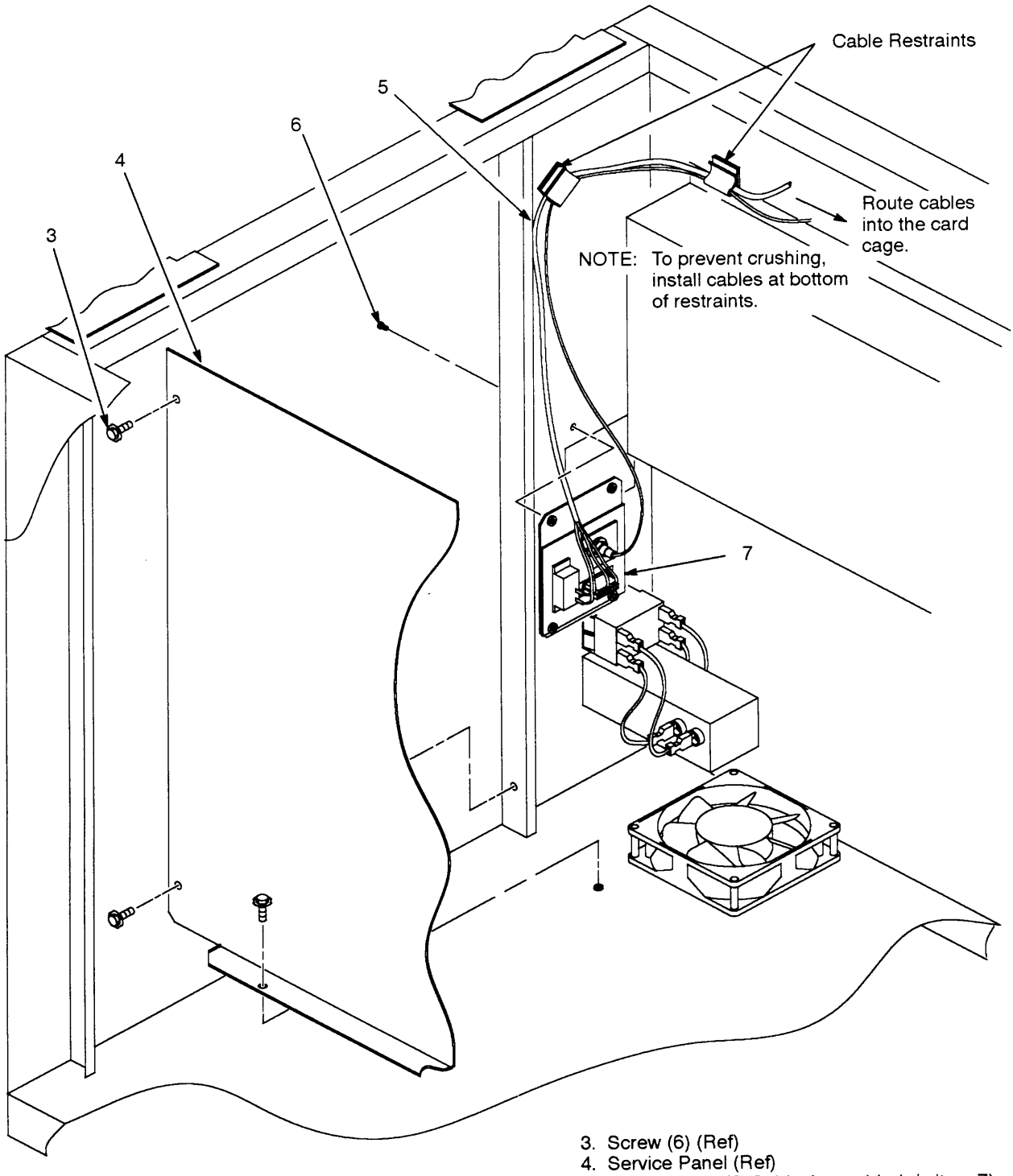


Figure 6–6. Cable Assy, Coaxial/Twinaxial I/O, Installation



3. Screw (6) (Ref)
4. Service Panel (Ref)
5. Coax/twinax I/O Cable Assembly (p/o item 7)
6. Screw (4) (p/o item 5)
7. I/O Interface Connector Plate (P/N 57G1506)

Figure 6–7. Cable Assy, Coaxial/Twinaxial I/O, Installation

Cable Assembly, Multi I/O (Figure 6–8)

Removal

1. Prepare the printer for maintenance (page 6–3).
2. Open the printer cover.
3. Remove the paper guide assembly (page 6–66).
4. Open the cabinet doors.
5. Remove the paper stacker tray assembly (page 6–70).
6. Remove six screws (1) and move the service panel (2) aside.
7. Remove the ribbon cable from the restraints (3) on the upper rear and upper right walls of the cabinet.
8. Open the latches (4) and disconnect the multi I/O ribbon cable connector (5) from connector J1 (6) on the common controller PCBA.
9. Release the multi I/O ribbon cable from the holders on the rear wall of the card cage. Remove the common controller PCBA if necessary (page 6–74).
10. Feed the multi I/O ribbon cable through the card cage and down into the cabinet.
11. Remove four screws (7) securing the multi I/O cable assembly mounting plate (8).
12. Remove the multi I/O cable assembly (9).

1. Screw (6) (Scr, Hex, Wshr, SEMS 10–24x.50)
2. Service Panel (Ref)
3. Ribbon Cable Restraints (Ref)
4. Latch (2) (Ref)
5. Ribbon Cable Connector (p/o item 9.)
6. Common Controller Connector J1 (Ref)
7. Screw (4) (Scr, Hex w/Lock Washer, 10–24x.38)
8. Mounting Plate (Ref)
9. Multi I/O Cable Assembly (P/N 57G1422)

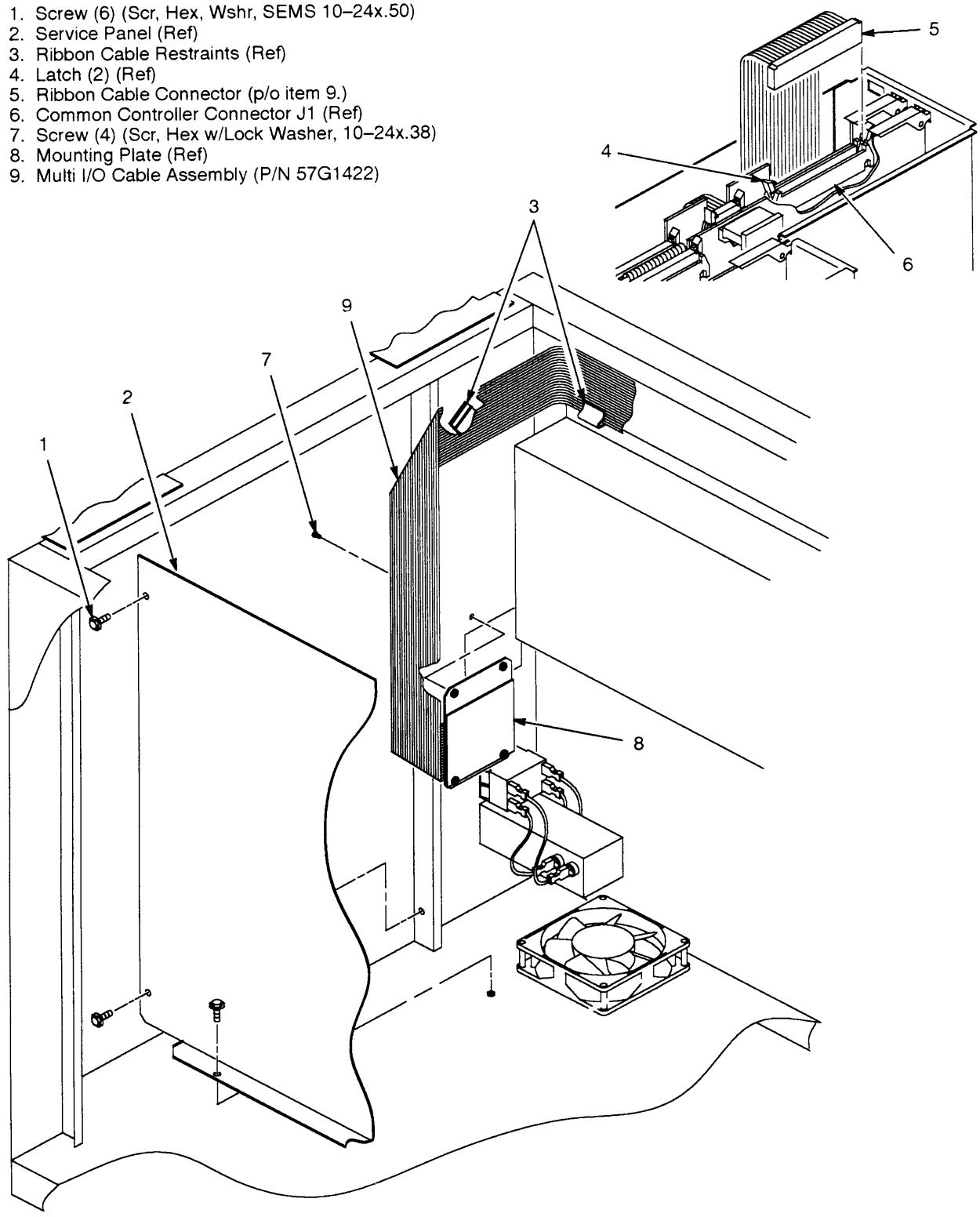


Figure 6–8. Cable Assembly, Multi I/O, Removal

Installation

1. Feed the multi I/O ribbon cable (9) from the lower cabinet up into the opening at the right rear of the card cage. Route the ribbon cable against the right rear wall of the cabinet.
2. Install four screws (7) securing the multi I/O cable assembly mounting plate (8).
3. Latch the multi I/O ribbon cable into the cable restraints (3) located on the upper rear and upper right cabinet walls.
4. Engage the multi I/O ribbon cable in the holders on the rear wall of the card cage. Remove the common controller PCBA if necessary (page 6–74).
5. Connect the multi I/O ribbon cable connector (5) to connector J1 (6) on the common controller PCBA and close the latches (4).
6. Move the service panel (2) into position and install the six screws (1).
7. Install the paper stacker tray assembly (page 6–70).
8. Close the cabinet doors.
9. Install the paper guide assembly (page 6–66).
10. Return the printer to normal operation (page 6–132).

1. Screw (6) (Scr, Hex, Wshr, SEMS 10–24x.50)
2. Service Panel (Ref)
3. Ribbon Cable Restraints (Ref)
4. Latch (2) (Ref)
5. Ribbon Cable Connector (p/o item 9.)
6. Common Controller Connector J1 (Ref)
7. Screw (4) (Scr, Hex w/Lock Washer, 10–24x.38)
8. Mounting Plate (Ref)
9. Multi I/O Cable Assembly (P/N 57G1422)

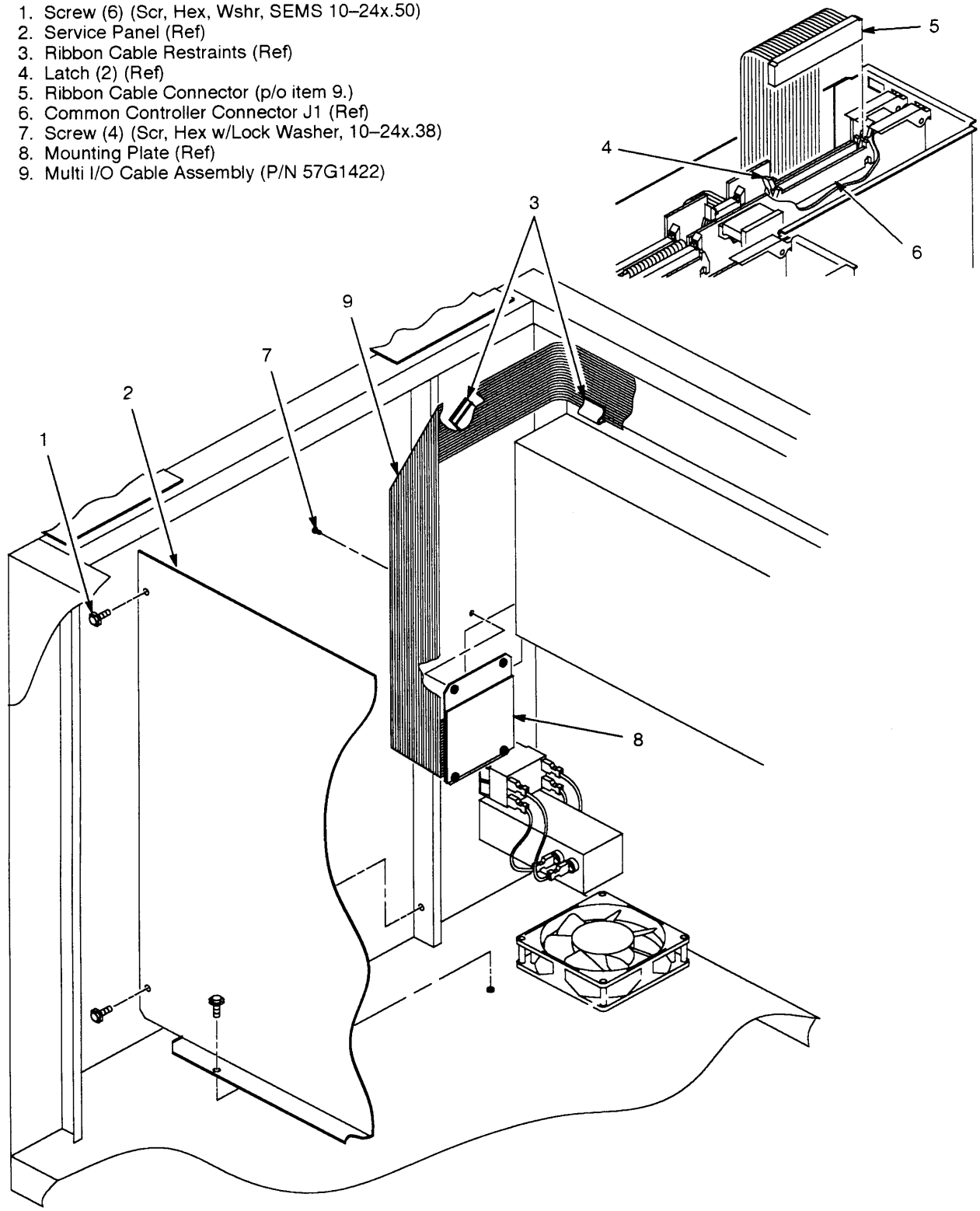


Figure 6–8. Cable Assembly, Multi I/O, Installation

Circuit Breaker (Figure 6–9)

Removal

1. Power off the printer.
2. Disconnect the AC power cord.
3. Prepare the printer for maintenance (page 6–3).
4. Open both cabinet doors.
5. Remove the paper stacker tray assembly (page 6–70).
6. Remove six screws (1) and move the service panel (2) aside.
7. Disconnect the four circuit breaker electrical leads (3).
8. Press in on the spring clips (4) and push the circuit breaker (5) out of the cabinet.

Installation

1. Power off the printer.
2. Disconnect the AC power cord.
3. Press the circuit breaker (5) into the cabinet until the spring clips (4) snap into place.

WARNING

Make sure the four leads are connected as shown in Figure 6–9.

4. Connect the four circuit breaker electrical leads (3) as shown in Figure 6–9.
5. Move the service panel (2) back into position and install the six screws (1).
6. Install the paper stacker tray assembly (page 6–70).
7. Return the printer to normal operation (page 6–132).

1. Screw (6) (Scr, Hex, Wshr, SEMS 10–24x.50)
2. Service Panel (Ref)
3. Circuit Breaker Electrical Lead (4) (Ref)
4. Spring Clip (4) (p/o item 5.)
5. Circuit Breaker (P/N 57G1438)

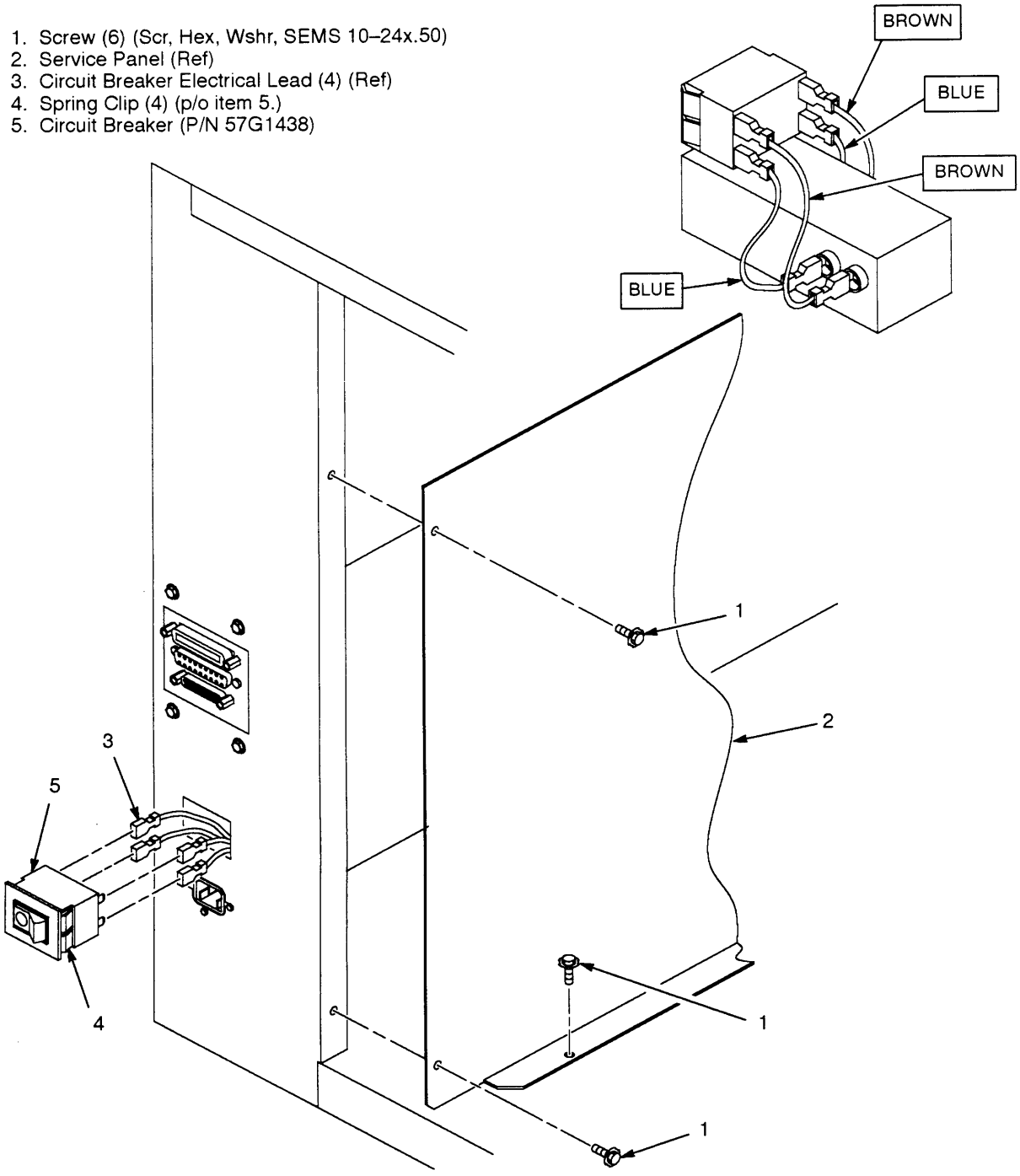


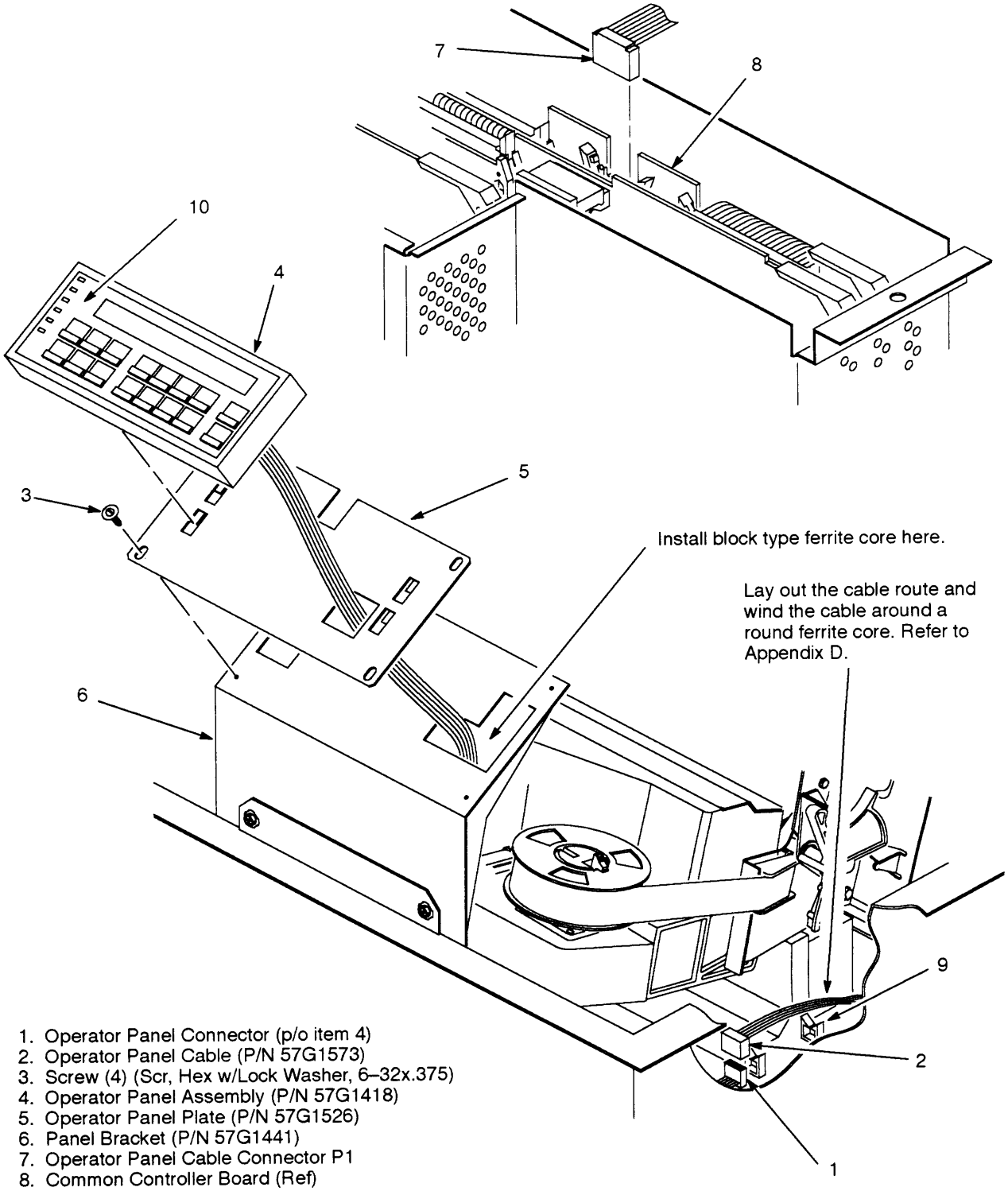
Figure 6–9. Circuit Breaker Removal/Installation

Operator Panel Assembly and Cable (Figure 6–10)

Removal

1. Prepare the printer for maintenance (page 6–3).
2. Open the printer cover.
3. To remove the operator panel:
   a. Disconnect the operator panel connector (1) from the operator panel cable (2).
   b. Remove four screws (3).
   c. Remove the operator panel assembly (4) and panel plate (5) from the operator panel bracket (6).
4. To remove the operator panel cable:
   a. Remove the paper guide assembly (page 6–66).
   b. Open the connector latches and disconnect the operator panel connector P1 (7) from connector J3 on the common controller board (8).
   c. Remove the operator panel ribbon cable from card cage and the wire saddles (9) on the mechanism base pan.
   d. Remove the ferrite cores from the ribbon cable. (Note location and number of turns. You must reinstall the ferrite cores.)

Operator Panel Overlays		
Language	**IBM 6408–CT0**	**IBM 6408–A00**
English	57G1403	57G1397
French	57G1405	57G1399
German	57G1407	57G1401
Spanish	57G1404	57G1398
Italian	57G1406	57G1400
Dutch	57G1408	57G1402



1. Operator Panel Connector (p/o item 4)
2. Operator Panel Cable (P/N 57G1573)
3. Screw (4) (Scr, Hex w/Lock Washer, 6–32x.375)
4. Operator Panel Assembly (P/N 57G1418)
5. Operator Panel Plate (P/N 57G1526)
6. Panel Bracket (P/N 57G1441)
7. Operator Panel Cable Connector P1
8. Common Controller Board (Ref)
9. Wire Saddles (Ref)
10. Operator Panel Overlay (See table on page 6–30)

Figure 6–10. Operator Panel and Cable Removal

Installation

5. To install the operator panel:

   a. Install the correct overlay (10). (See table below.)

   b. Feed operator panel connector (1) through the panel bracket (5) and position the operator panel assembly (4) on the bracket.

   c. Install the operator panel screws (3) hand tight.

   d. Lower the printer cover and center the operator panel assembly (4) in the cutout of the printer cover. Open the printer cover and tighten the four screws (3).

   e. Install a ferrite core on the operator panel cable assembly. (Refer to Appendix D.)

6. To install the operator panel cable:

   a. Route the operator panel cable (2) along the right side of the printer.

   b. Feed the cable and connector (7) through the slot in the card cage. Wind the cable around the round ferrite core and tie wrap the core to the card cage. (Refer to Appendix D.)

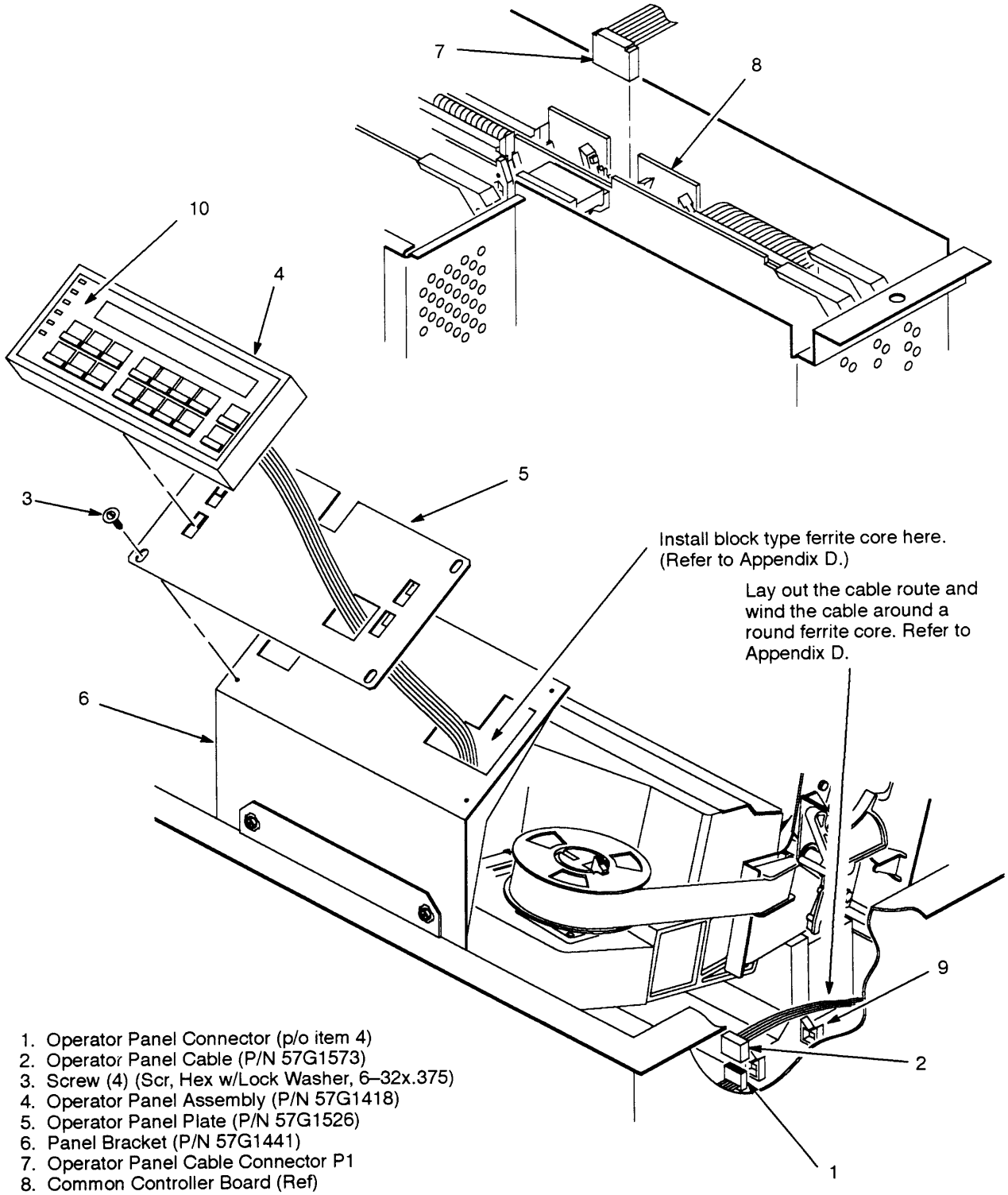
   c. Connect connector P1 (1) to connector J3 on the common controller board (8) and close the connector latches.

   d. Insert the operator panel cable into the wire saddles (9) on the mechanism base pan.

7. Install the paper guide assembly (page 6–66).

8. Return the printer to normal operation (page 6–132).

Operator Panel Overlays		
Language	**IBM 6408–CT0**	**IBM 6408–A00**
English	57G1403	57G1397
French	57G1405	57G1399
German	57G1407	57G1401
Spanish	57G1404	57G1398
Italian	57G1406	57G1400
Dutch	57G1408	57G1402



1. Operator Panel Connector (p/o item 4)
2. Operator Panel Cable (P/N 57G1573)
3. Screw (4) (Scr, Hex w/Lock Washer, 6–32x.375)
4. Operator Panel Assembly (P/N 57G1418)
5. Operator Panel Plate (P/N 57G1526)
6. Panel Bracket (P/N 57G1441)
7. Operator Panel Cable Connector P1
8. Common Controller Board (Ref)
9. Wire Saddles (Ref)
10. Operator Panel Overlay (See table on page 6–32)

Figure 6–10. Operator Panel Assembly Installation

Operator Panel Bracket Assembly (Figure 6–11)

Removal

1. Prepare the printer for maintenance (page 6–3).
2. Open the printer cover.

NOTE: If you need to remove the operator panel bracket assembly to gain access to the hammer bank fan area, you can omit step 3, but be careful not to damage the operator panel ribbon cable.

3. Remove the operator panel assembly (page 6–30).
4. Remove two screws (1) holding the operator panel bracket assembly (2) to the printer frame (3).
5. Remove the operator panel bracket assembly (2).

Installation

1. Position the operator panel bracket assembly (2) on the printer frame (3).
2. Install the two screws (1) hand tight.
3. Install the operator panel assembly (page 6–30) to the operator panel bracket assembly (2).
4. Lower the printer cover and align the operator panel and bracket assemblies in the cutout on the printer cover. Raise the printer cover.
5. Tighten the bracket screws (1).
6. Close the printer cover.
7. Return the printer to normal operation (page 6–132).

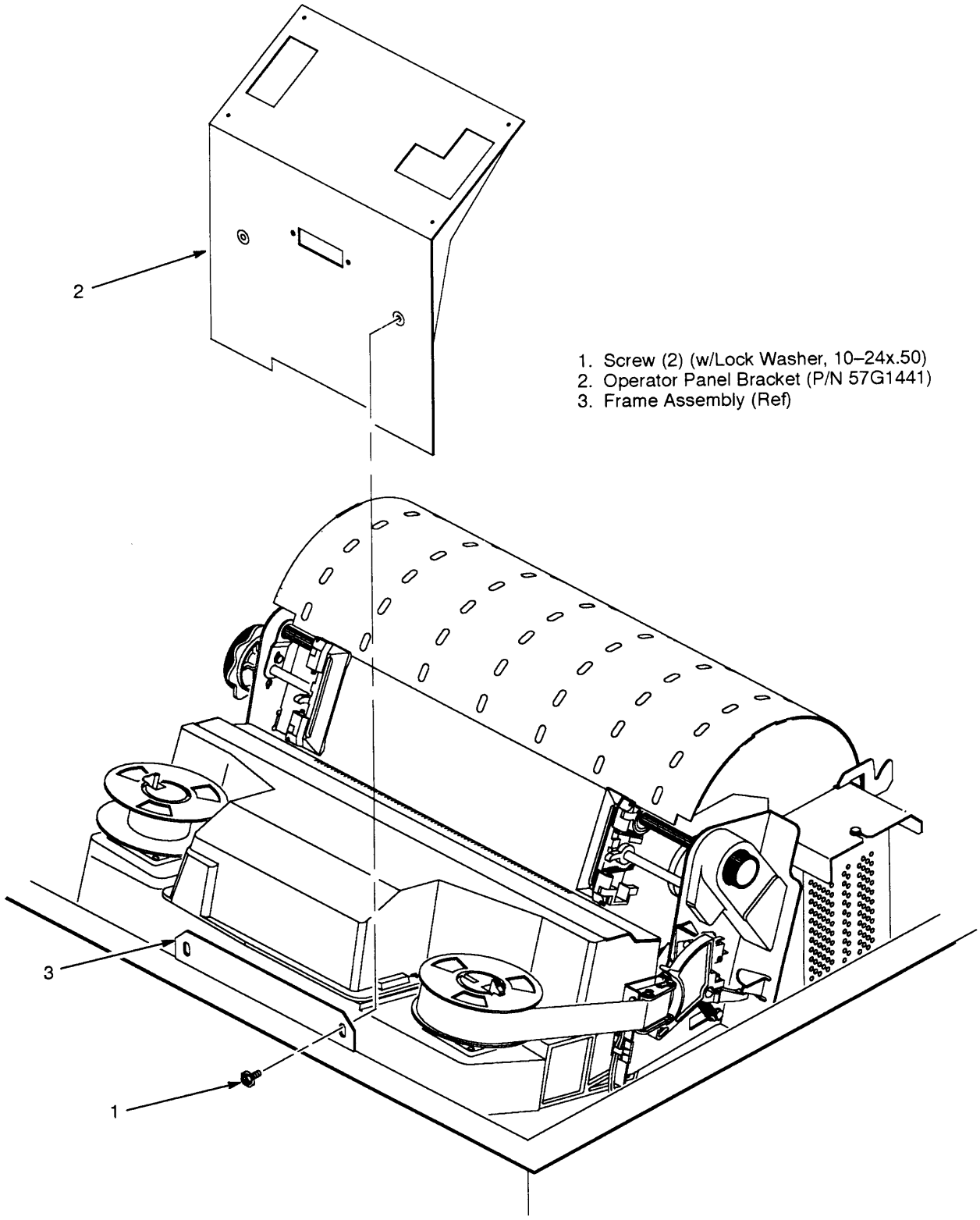


Figure 6–11. Operator Panel Bracket Assembly Removal/Installation

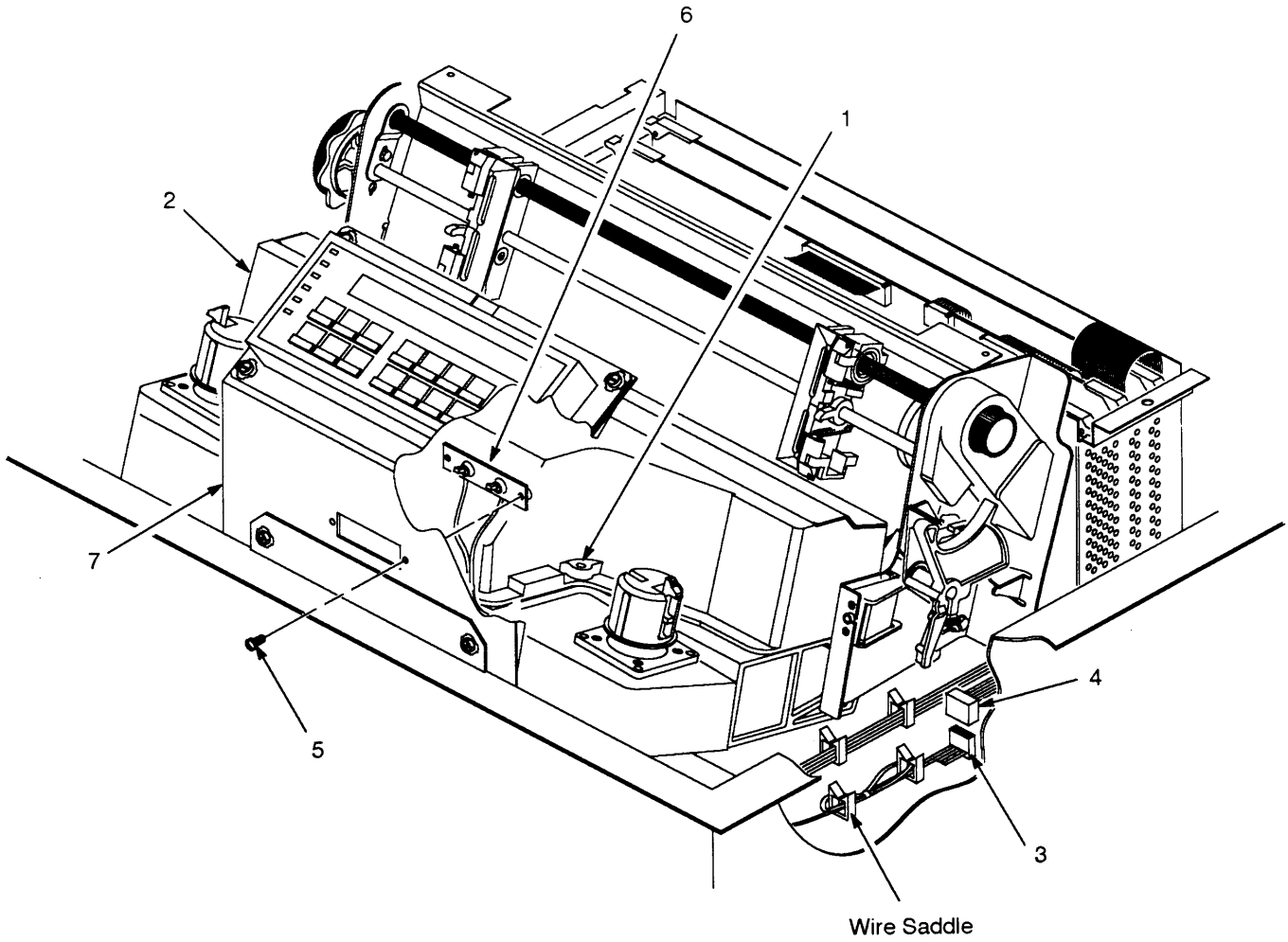
Operator Panel Assembly, IGP (Figure 6–12)

Removal

1. Prepare the printer for maintenance (page 6–3).
2. Open the printer cover.
3. Loosen two captive screws (1) and remove the shuttle cover (2).
4. Disconnect the IGP operator panel connector J11 (3) from IGP ribbon cable connector P11 (4).
5. Remove the screws (5) securing the IGP operator panel assembly (6) to the operator panel support bracket (7).
6. Remove the IGP operator panel assembly (6).

Installation

1. Position the IGP operator panel assembly (6) on the operator panel support bracket (7) and install the screws (5) securing it to the bracket.
2. Connect the IGP operator panel connector J11 (3) to IGP ribbon cable connector P11 (4).
3. Install the shuttle cover (2) and tighten the captive screws (1).
4. Stow cable slack in the wire saddles on the right side of the printer base plate.
5. Close the printer cover.
6. Return the printer to normal operation (page 6–132).



1. Screw, Captive (2) (p/o item 2)
2. Shuttle Cover (Ref)
3. IGP Operator Panel Connector J11 (p/o item 6)
4. IGP Ribbon Cable Connector P11 (Ref)
5. Screw (2) (w/Lock Washer, 6–32x0.25)
6. IGP Operator Panel Assy (P/N 57G1436)
7. Operator Panel Support Bracket (Ref)

Figure 6–12. Operator Panel Assembly, IGP, Removal/Installation

Cover Assembly, Hammer Bank (Figure 6–13)

Removal

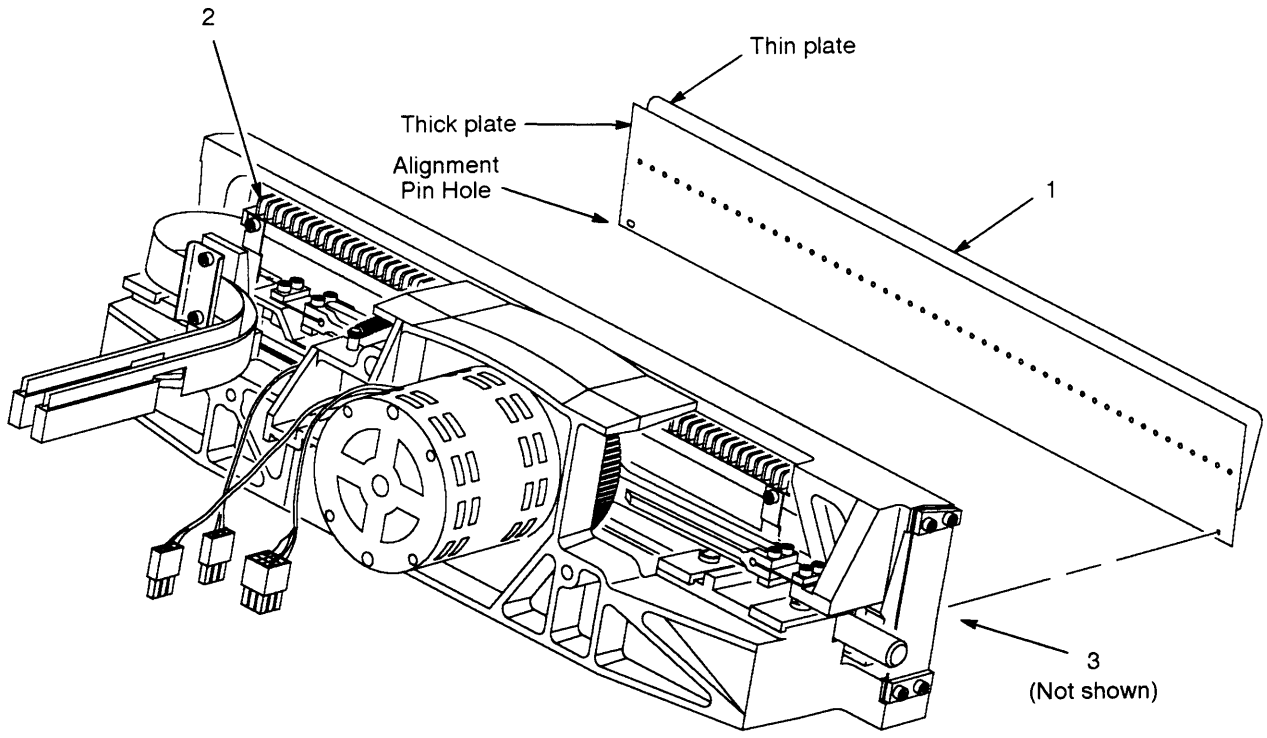
1. Prepare the printer for maintenance (page 6–3).
2. Remove the shuttle frame assembly (page 6–118).
3. Lift the thick plate of the hammer bank cover assembly (1) at one end, and peel the cover away from hammer bank magnets.

Installation

WARNING

The hammer bank contains a strong magnet. To prevent damage to the hammer tips, do not let the hammer bank cover assembly snap into place as the hammer bank magnet attracts it. Any impact of the cover against the hammer bank can break hammer tips.

1. With the thick plate facing the hammer bank (2), engage the bottom edge of the hammer bank cover assembly (1) on the alignment pins (3).
2. Gently lower the hammer bank cover assembly (1) until it lies flush on the hammer bank (2). Check that the hammer bank cover assembly is properly positioned over the alignment pins (3) and hammer tips.
3. Install the shuttle frame assembly (page 6–118).
4. Return the printer to normal operation (page 6–132).



1. Hammer Bank Cover Assembly (P/N 57G1477)
2. Hammer Bank (p/o 57G1443, Shuttle Frame Assy.)
3. Alignment Pin (2) (p/o 57G1443, Shuttle Frame Assy.)

Figure 6–13. Cover Assembly, Hammer Bank, Removal/Installation

Cover Assembly, Printer (Figure 6–14)

Removal

1. Prepare the printer for maintenance (page 6–3).
2. Open printer cover.
3. Lift the wireform paper path and attached chains out of the carrier clips inside the cover assembly.
4. Remove the gas spring assembly (page 6–122).

CAUTION

The printer cover is heavy. Two persons are required to perform this procedure. Hold the cover securely while removing the attaching hardware.

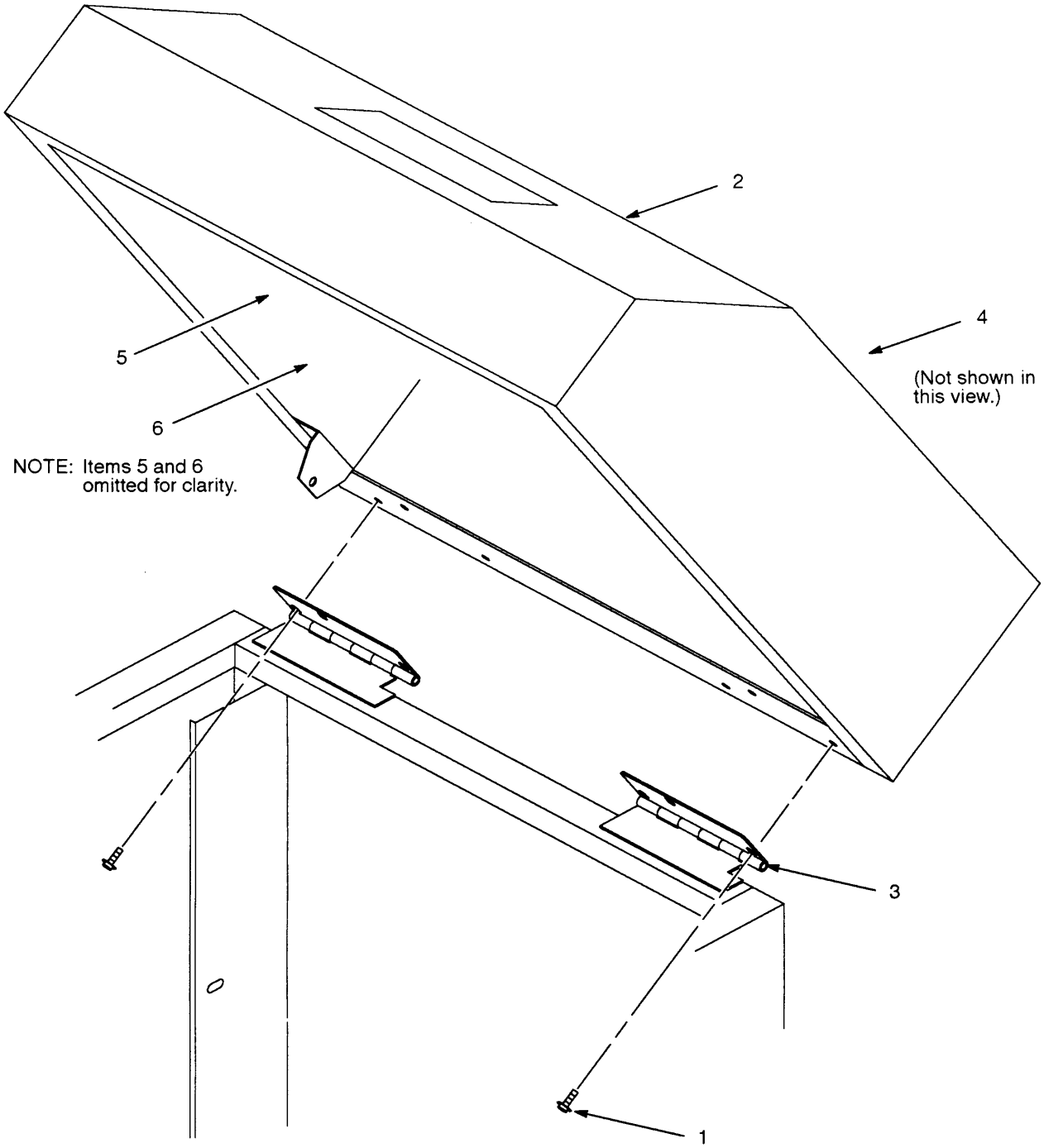
5. Remove six screws (1).
6. Lift the printer cover assembly (2) off the hinges (3) on the printer frame.

Installation

CAUTION

The printer cover is heavy. Two persons are required to perform this procedure. Hold the cover securely while aligning and attaching hardware.

1. Holding the printer cover (2) at an angle, align the cover with the hinges (3) on the printer frame.
2. Install six screws (1).
3. Install the gas spring assembly (page 6–122).
4. Insert the wireform paper path and attached chains into the carrier clips inside the cover assembly.
5. Return the printer to normal operation (page 6–132).



1. Screw (6) (Hex, w/washer, 10–24x.50)
2. Printer Cover (P/N 57G1525)
3. Hinge (2) (Ref)
4. Window (P/N 57G1492)
5. Wire Form, Paper Path (P/N 57G1566)
6. Chain Assy, Outer (4) (P/N 57G1564)

Figure 6–14. Cover Assembly, Printer, Removal/Installation

Cover Assembly, Shuttle (Figure 6–15)

Removal

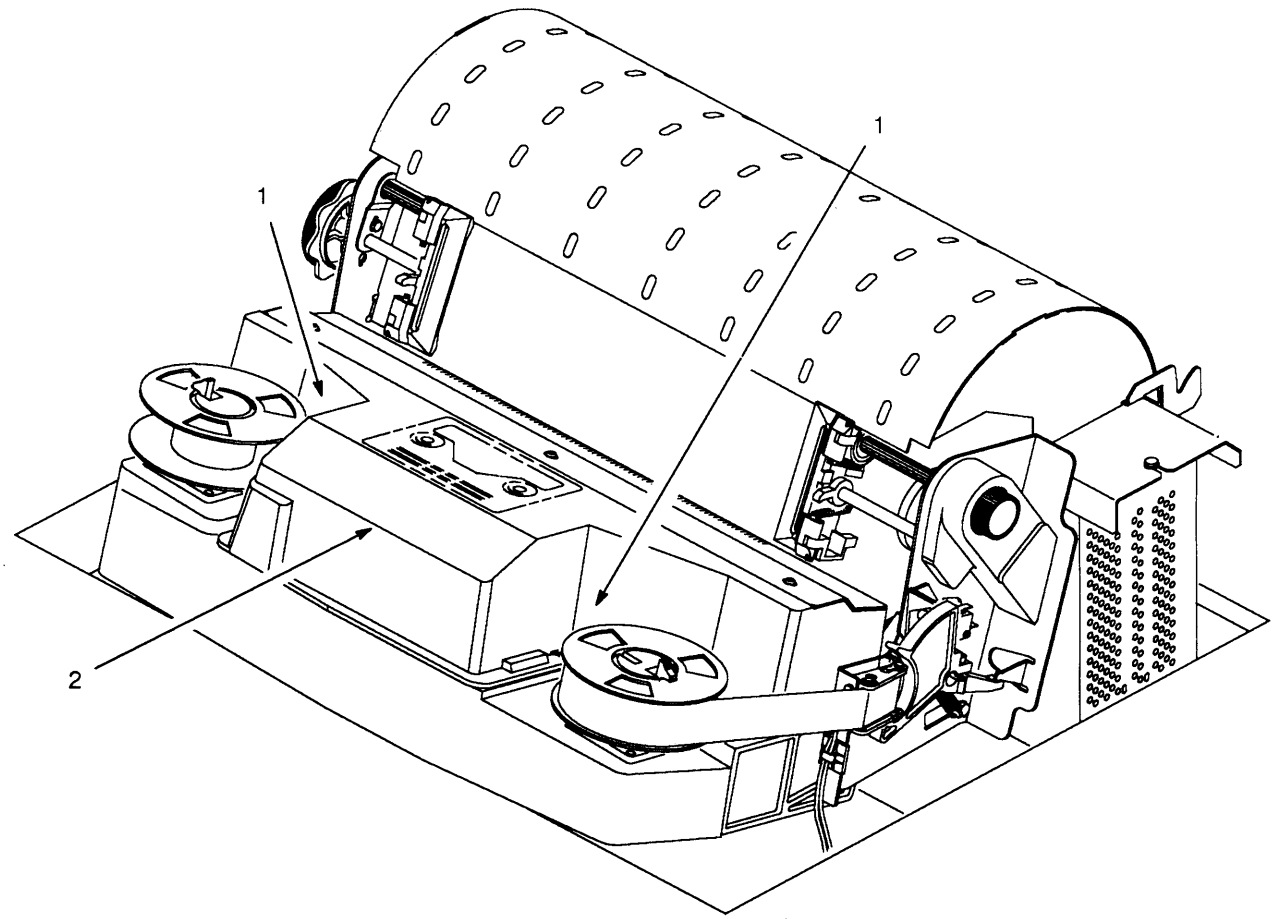
1. Prepare the printer for maintenance (page 6–3).
2. Open the printer cover.
3. Remove the ribbon spools.
4. Loosen the shuttle cover screws (1).
5. Grasping the edges of the shuttle cover assembly (2), tilt up the rear edge and lift the shuttle cover assembly out of the printer.

Installation

1. Place the shuttle cover assembly (2) in the printer. Tilt the forward edge of the cover down slightly and work the cover into position.

NOTE: Make sure the holes in the cover are over the locating pins.

2. Tighten the shuttle cover screws (1).
3. Return the printer to normal operation (page 6–132).



1. Screw, Captive, Shuttle Cover (2) (Scr, 10–24x.62; O–Ring, 0.125x0.250x0.06)
2. Shuttle Cover Assembly (Air Shroud Assembly, P/N 57G1508)

Figure 6–15. Cover Assembly, Shuttle, Removal/Installation

Doors, Hinges, and Casters (Figure 6–16)

NOTE: The front door of the cabinet is larger and hinged on the left side. The rear door of the cabinet is smaller and hinged on the right side. This procedure is written for the front door of the cabinet. The procedure is the same for the rear door.

Removal

1. Prepare the printer for maintenance (page 6–3).
2. Remove the screw (1) and washer (2) securing the retaining cable (3).

CAUTION

Two persons are required to perform this procedure. Hold the door securely while removing the attaching hardware.

3. Remove four screws (4) securing the door (5) to the top and bottom hinges (6).
4. To remove the hinges, remove the four remaining screws (4) securing the hinges (6) to the printer frame (7)

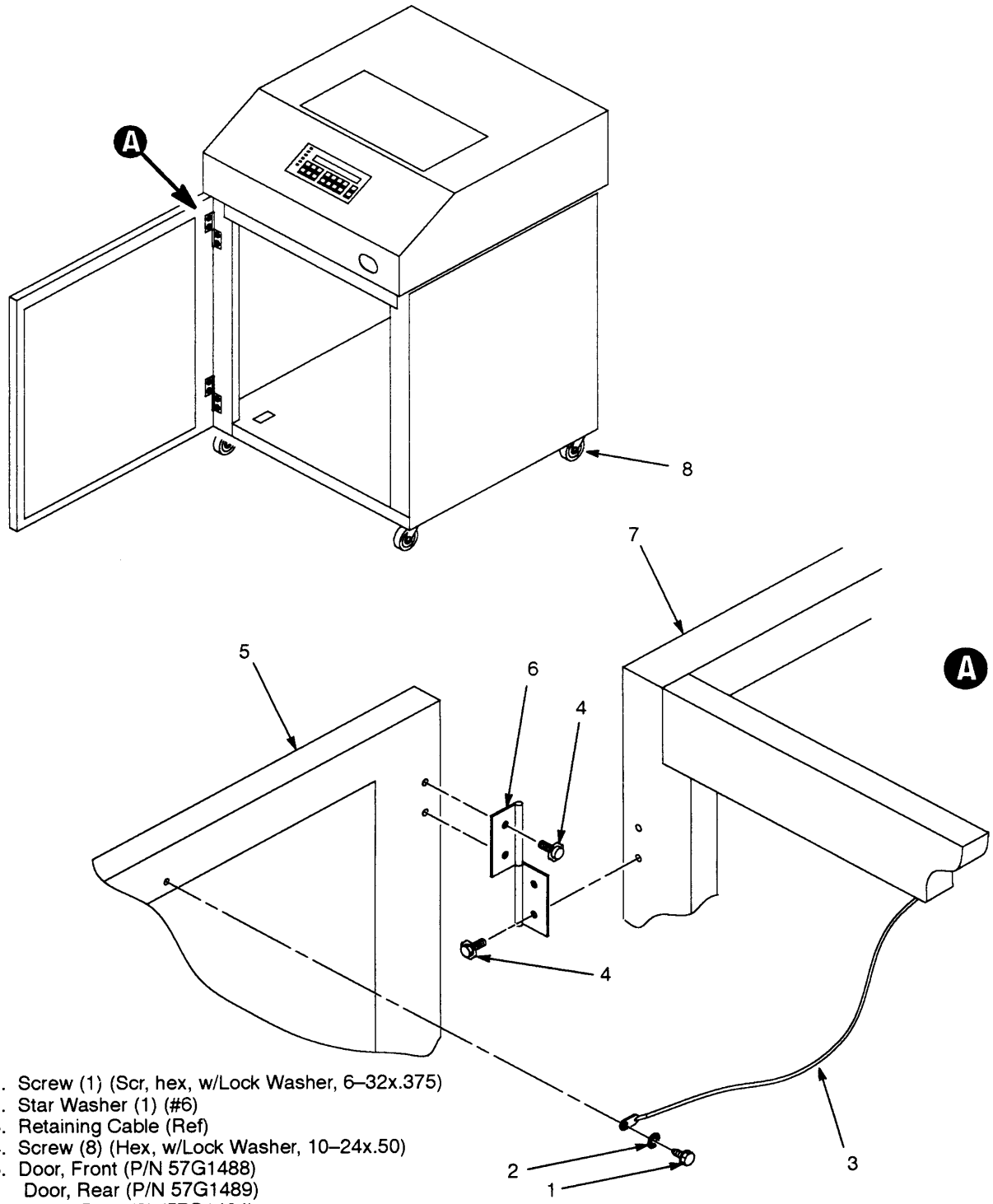
Installation

1. To install the hinges: position each hinge (6) so the lower segment will attach to the frame. Install four screws (4).

CAUTION

Two persons are required to perform this procedure. Hold the door securely while attaching hardware.

2. Hold the door in position and install four screws (4).
3. Attach the retaining cable (3) to the door with the screw (1) and washer (2).
4. Return the printer to normal operation (page 6–132).



1. Screw (1) (Scr, hex, w/Lock Washer, 6–32x.375)
2. Star Washer (1) (#6)
3. Retaining Cable (Ref)
4. Screw (8) (Hex, w/Lock Washer, 10–24x.50)
5. Door, Front (P/N 57G1488)
   Door, Rear (P/N 57G1489)
6. Hinge, Door (2) (57G1484)
7. Printer Frame (Ref)
8. Caster (with brake P/N 57G1485, without brake P/N 57G1486)

Figure 6–16. Doors and Hinges, Removal/Installation

Fan Assembly, Card Cage (Figure 6–17)

Removal

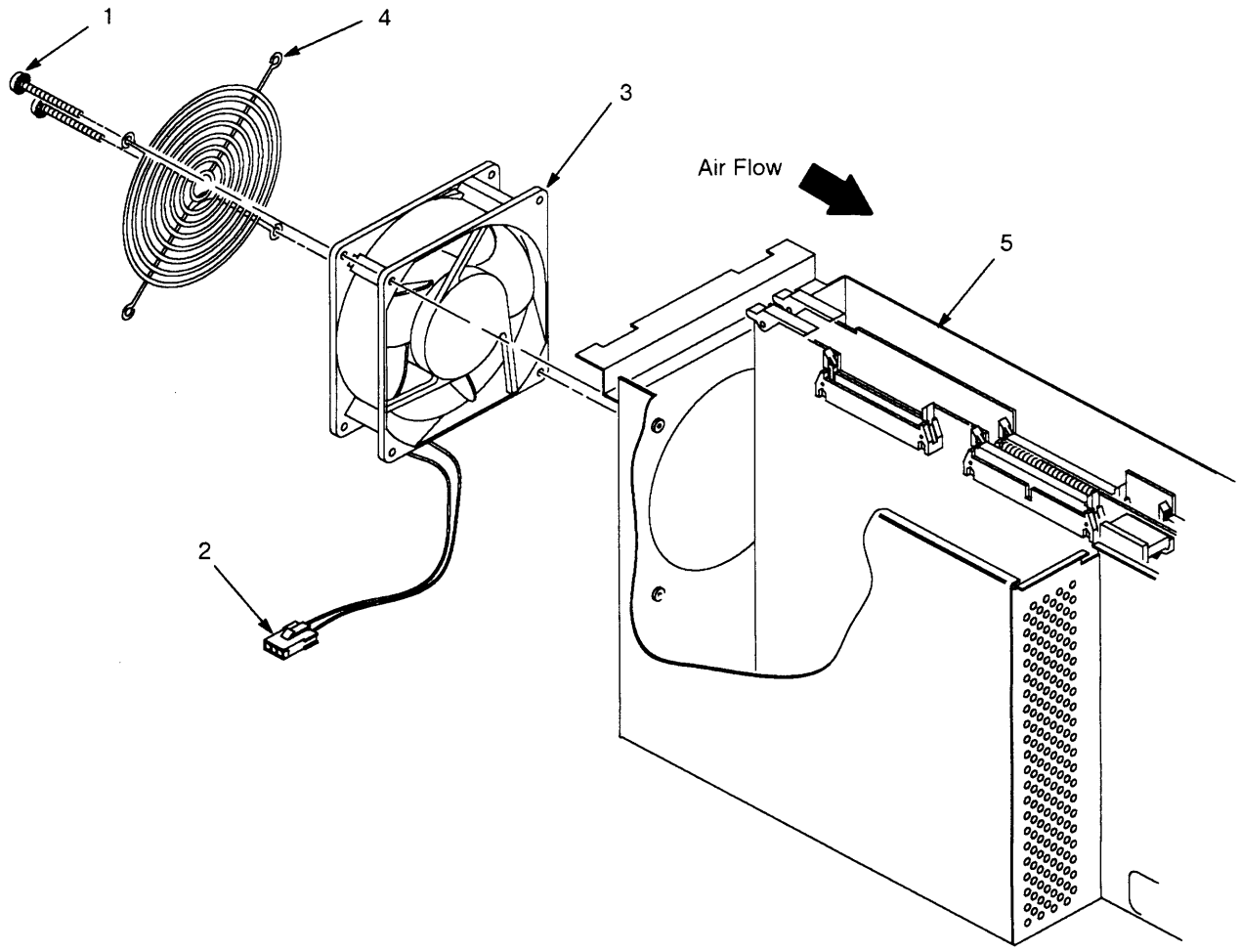
1. Prepare the printer for maintenance (page 6–3).
2. Open the printer cover.
3. Remove the paper guide assembly (page 6–66).
4. Remove two screws (1).
5. Disconnect the fan cable connector (2).
6. Remove the card cage fan assembly (3) and fan guard (4) from the card cage (5).

Installation

WARNING

Make sure to install the fan so the label is against the card cage. Air flow is INTO the card cage.

1. Connect the fan cable connector (4).
2. Position the card cage fan assembly (3) and fan guard (4) in the card cage (5).
3. Install two screws (1).
4. Install the paper guide assembly (page 6–66).
5. Return the printer to normal operation (page 6–132).



1. Screw (4) (Scr, w/Lock Washer, 6–32x2.00)
2. Fan Cable Connector (p/o item 3.)
3. Card Cage Fan Assembly (P/N 57G1440)
4. Fan Guard (P/N 43F1678)
5. Card Cage (Ref)

Figure 6–17. Fan Assembly, Card Cage, Removal/Installation

Fan Assembly, Cabinet Exhaust (Figure 6–18)

Removal

1. Prepare the printer for maintenance (page 6–3).
2. Open the floor cabinet doors.
3. Remove the paper stacker tray assembly (page 6–70).
4. Remove six screws (1) and move the service panel (2) aside.
5. Remove two screws (3) securing the cabinet exhaust fan assembly (4).
6. Disconnect the fan cable connector (5).
7. Remove the cabinet exhaust fan assembly (4) and fan guard (6).

Installation

WARNING

Make sure to install the fan so the label is down. Air flow is down.

1. Connect the fan cable connector (5).
2. Position the cabinet exhaust fan assembly (4) and fan guard (6) on the cabinet floor.
3. Install two screws (3) securing the cabinet exhaust fan assembly (4).
4. Move the service panel (2) back into position and install the six screws (1).
5. Install the paper stacker tray assembly (page 6–70).
6. Return the printer to normal operation (page 6–132).

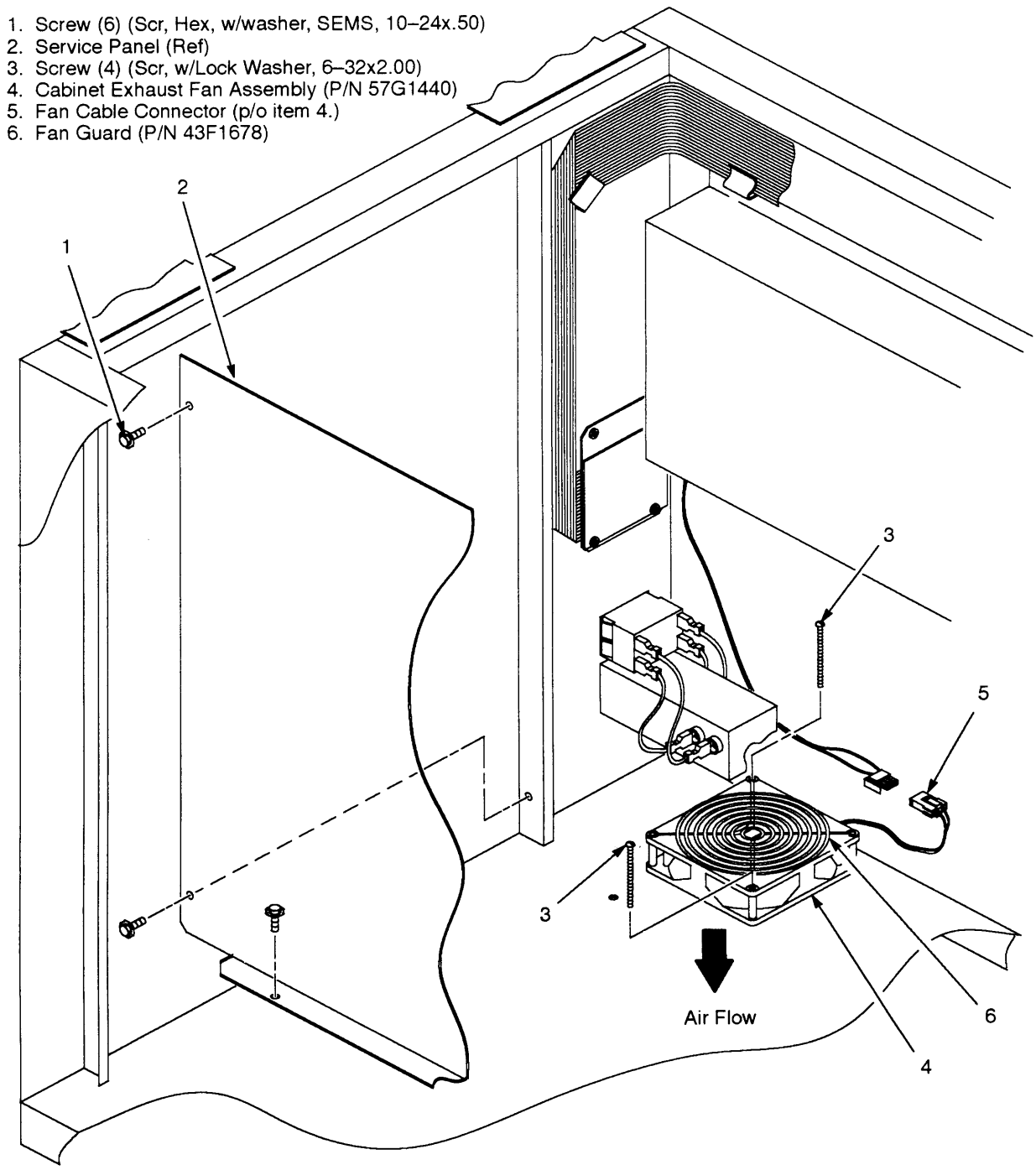


Figure 6–18. Fan Assembly, Cabinet Exhaust, Removal/Installation

Fan Assembly, Hammer Bank (Figure 6–19)

Removal

1. Prepare the printer for maintenance (page 6–3).
2. Remove the shuttle cover assembly (page 6–42).
3. Remove the operator panel bracket assembly (page 6–34).
4. Remove two screws (1).
5. Reach under the base casting (2) and disconnect the hammer bank fan cable connector (3).
6. Remove the hammer bank fan assembly (4) by angling the fan up and out from beneath the shuttle motor and feeding the motor wires and cable connector out from between the base casting and the foam air shroud.

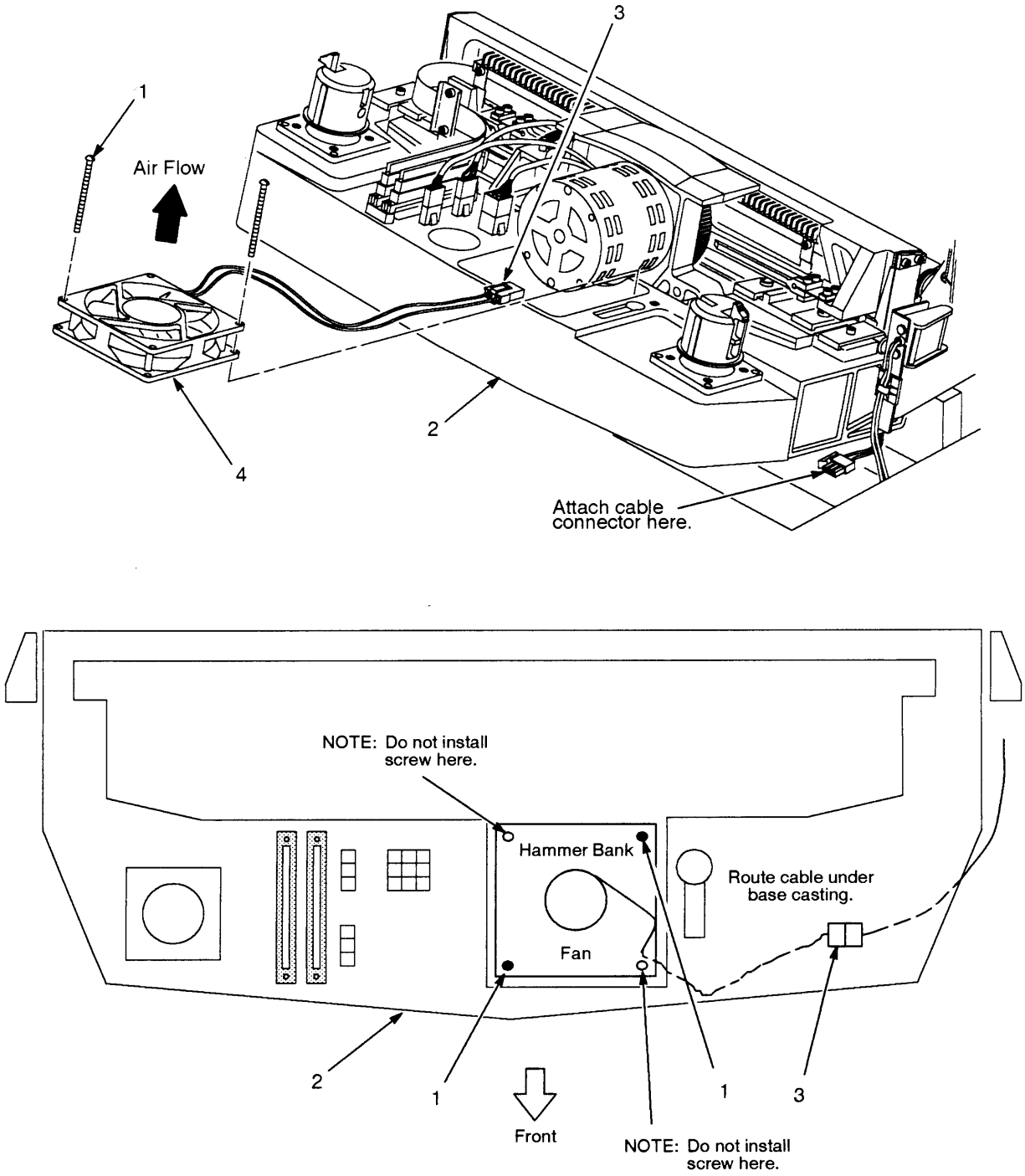
Installation

WARNING

Make sure to install the fan so the label faces up. Air flow is up.

NOTE: The hammer bank fan assembly is installed by angling it down and under the shuttle motor.

1. Feed the hammer bank fan cable connector (3) and motor wires between the fan well of the base casting (2) and the foam air shroud.
2. Reach up under the base casting (2) and route the fan cable to the right and angle the hammer bank fan assembly (4) down into the fan well.
3. Route the motor wires as shown in Figure 6–19 and connect the hammer bank fan cable connector (3).
4. Install two screws (1) in the locations shown in Figure 6–19.
5. Install the operator panel bracket assembly (page 6–34).
6. Install the shuttle cover assembly (page 6–42).
7. Return the printer to normal operation (page 6–132).



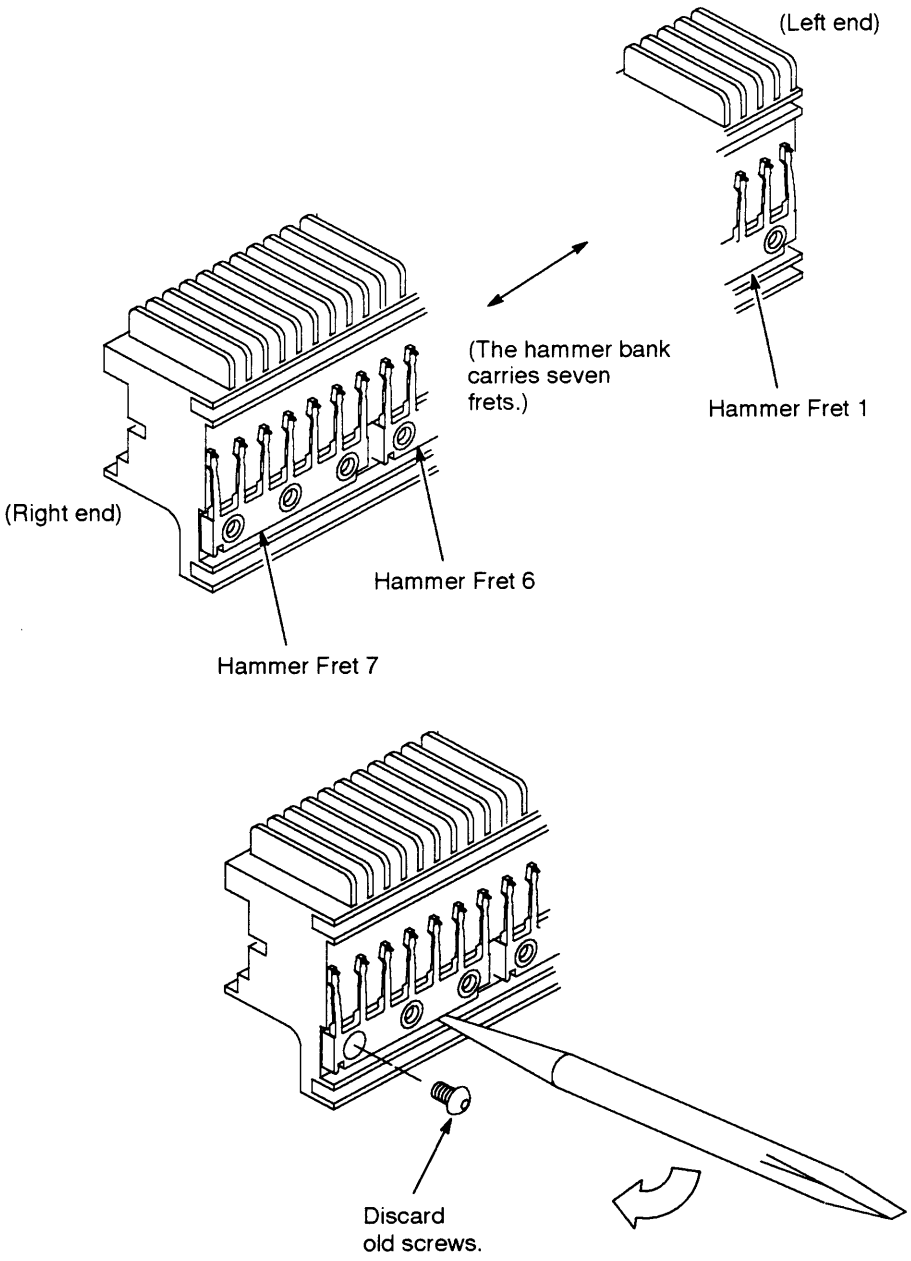
1. Screw (2) (Scr, Hex, w/Lock Washer, 6–32x1.25)
2. Base Casting (Ref)
3. Fan Cable Connector (p/o item 4.)
4. Hammer Bank Fan Assembly (P/N 57G1464)

Figure 6–19. Fan Assembly, Hammer Bank, Removal/Installation

Hammer Spring Assembly (Figure 6–20)

Removal

1. Prepare the printer for maintenance (page 6–3).
2. Remove the shuttle frame assembly (page 6–118).
3. Remove the hammer bank cover assembly (page 6–38).
4. Remove the three socket head screws from the old hammer fret.
5. Using the pointed end of the nylon stick supplied in the hammer spring replacement kit, carefully pry the old hammer fret off its mounting pins as shown in Figure 6–20.
6. Discard the old hammer fret and mounting screws.



(Hammer Spring Replacement Kit: P/N 57G1475)

Figure 6–20. Hammer Spring Assembly, Removal

Installation

IMPORTANT

FRET ONE is on the RIGHT END of the hammer bank as you face the hammer springs. FRET SEVEN is the LEFT END of the hammer bank.

1. If you are replacing an inner fret (frets 2–6), go to step 2.
   If you are replacing 1 one or 7:

   a. Remove the hammer spring fret from the box. Hold the fret by the thick portion, and grab the hammer to be removed with a set of chain–nose pliers in the thin section, as shown in Figure 6–21.

   b. Bend the hammer down 90°, as shown.

   c. Without removing the pliers, bend the hammer up, past the straight position approximately 45°, as shown.

   d. Bend the hammer down again, as in substep b, and it will break off.

   e. Go to step 3.

2. Remove the new fret and mounting screws from the box.

WARNING

Clean the hammer bank surface under the fret before installing a new fret. Dirt or debris between the fret and hammer bank can cause misalignment, degraded performance, or damage to hammers.

3. Install the new fret on the hammer bank mounting pins and press it into position with the flat end of the nylon stick supplied in the hammer spring replacement kit.

4. Install the screws from the replacement kit. Using a Torx™ T–10 bit adapter, torque each screw to 14 in–lbs (1.58 N•m) in the order shown in Figure 6–21.

5. Install the hammer bank cover assembly (page 6–38).

6. Install the shuttle frame assembly (page 6–118).

7. Return the printer to normal operation (page 6–132).

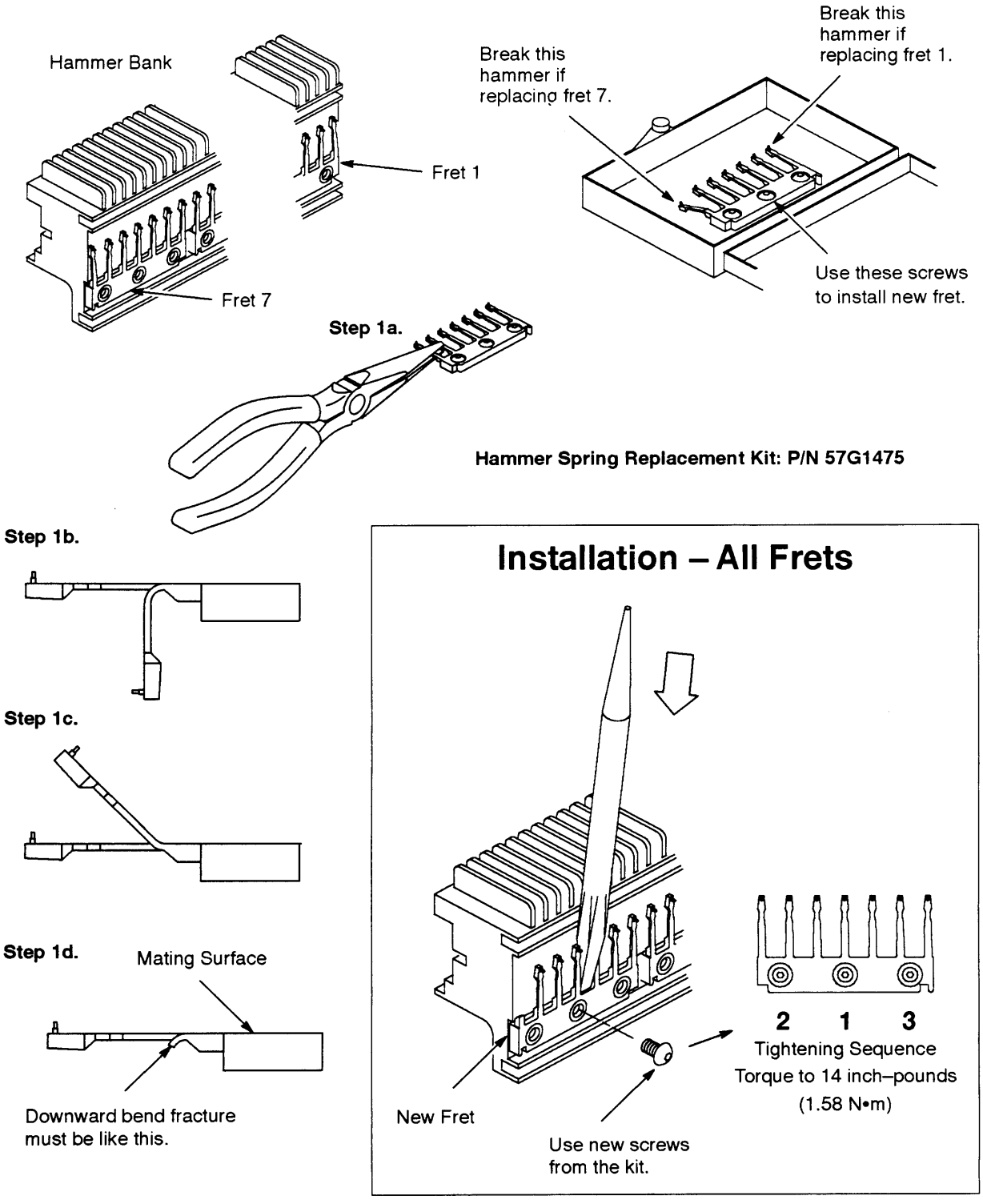


Figure 6–21. Hammer Spring Assembly, Installation

Magnetic Pick–up (MPU) Assembly (Figure 6–22)

Removal

1. Prepare the printer for maintenance (page 6–3).
2. Remove the operator panel bracket assembly (page 6–34).
3. Remove the shuttle cover (page 6–42).
4. Disconnect the shuttle cable assembly connector (6).
5. Disconnect the magnetic pick–up (MPU) cable connector (1).
6. Loosen the 7/64 inch hex MPU clamp screw (2).
7. Remove the MPU assembly (3) by unscrewing it from the MPU bracket (4).

Installation

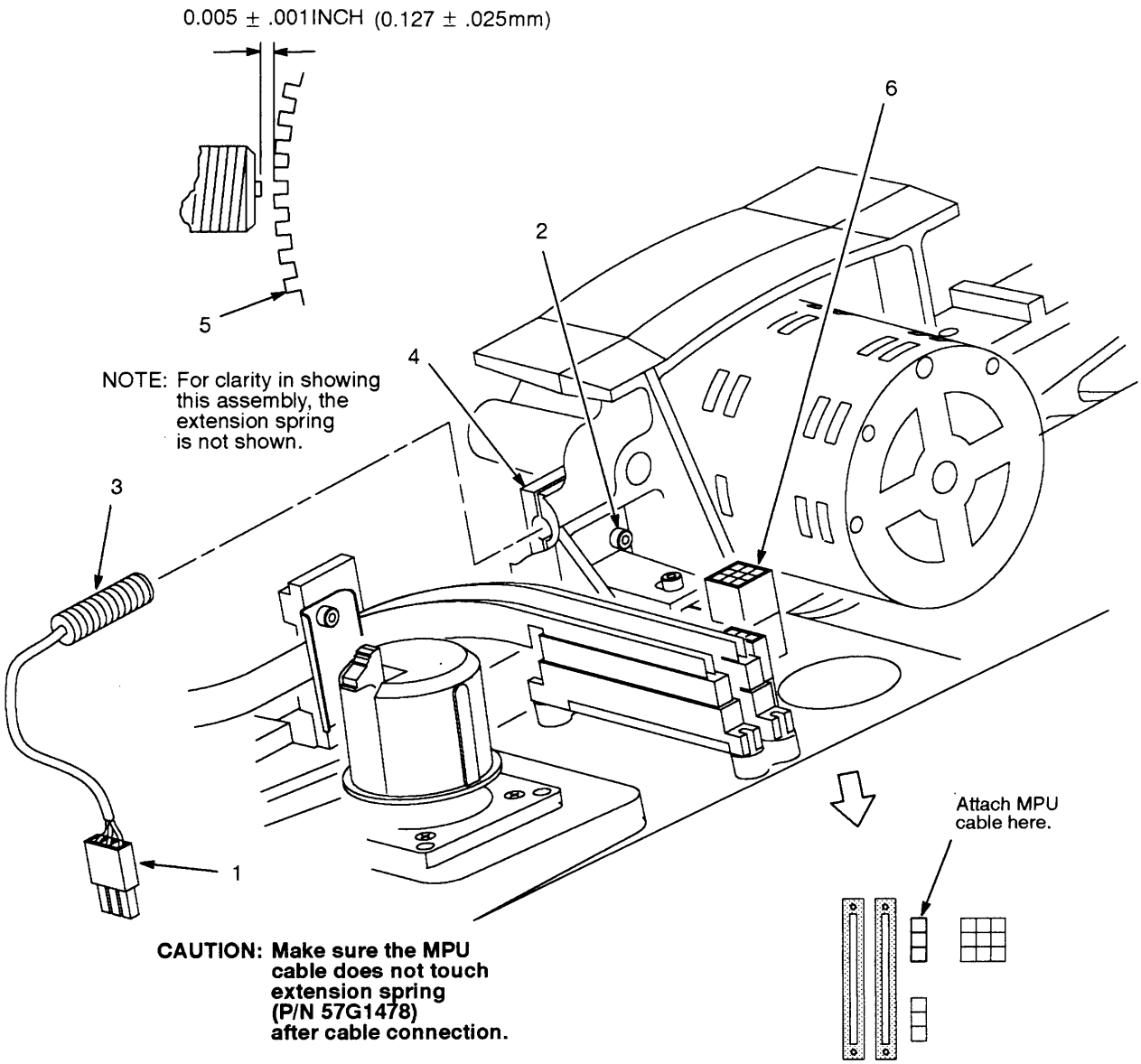
1. Install the MPU assembly (3) by screwing it into the MPU bracket (4).
2. Using a feeler gauge, adjust the gap between the MPU assembly (3) and the flywheel (5) to 0.005 ± .001 inch (0.127 ± 0.025 mm). Torque the MPU clamp screw (2) to 19 ± 1 inch–pounds (2.15 ± 0.11 N•m).
3. Check the gap between the MPU assembly (3) and the flywheel (5) with a feeler gauge:
   a. If the gap is 0.005 ± .001 inch (0.127 ± 0.025 mm), go to step 4.
   b. If the gap is not 0.005 ± 0.001 inch (0.127 ± 0.025 mm), loosen the MPU clamp screw (2) and go back to step 2.

WARNING

In the next step, route the MPU cable <u>under</u> the extension spring and make sure it <u>does not touch</u> the spring after cable connection.

4. Connect the magnetic pick–up (MPU) cable connector (1).
5. Connect the shuttle cable assembly connector (6).
6. Install the shuttle cover (page 6–42).

7. Install the operator panel bracket assembly (page 6–34).
8. Adjust the hammer phasing (page 5–25.)
9. Return the printer to normal operation (page 6–132).



1. MPU Cable Connector (p/o) item 3.)
2. MPU Clamp Screw (Scr, skt cap, 6–32x.38)
3. Magnetic Pick–Up (MPU) Assembly (P/N 57G1476)
4. MPU Bracket (P/N 57G5172)
5. Flywheel (p/o 57G1443, Shuttle Frame Assy.)
6. Shuttle Cable Assembly Connector (Ref)

Figure 6–22. Magnetic Pick–up (MPU) Assembly Removal/Installation

Motor Assembly, Ribbon Drive (Figure 6–23)

Removal

NOTE: The procedure below is the same for the left and right ribbon drive motor assemblies.

1. Prepare the printer for maintenance (page 6–3).
2. Remove the ribbon.
3. Remove the ribbon hub (page 6–110).
4. Remove two screws (1) and washers (2).
5. Lift the ribbon drive motor (3) and its cable from base casting (4).
6. Disconnect the ribbon motor cable connector (5).
7. Remove the snap–on ferrite core from the motor cable.

Installation

NOTE: The procedure below is the same for the left and right ribbon drive motor assemblies.

IMPORTANT

You must install a ferrite core on the ribbon motor cable assembly. Refer to Appendix D.

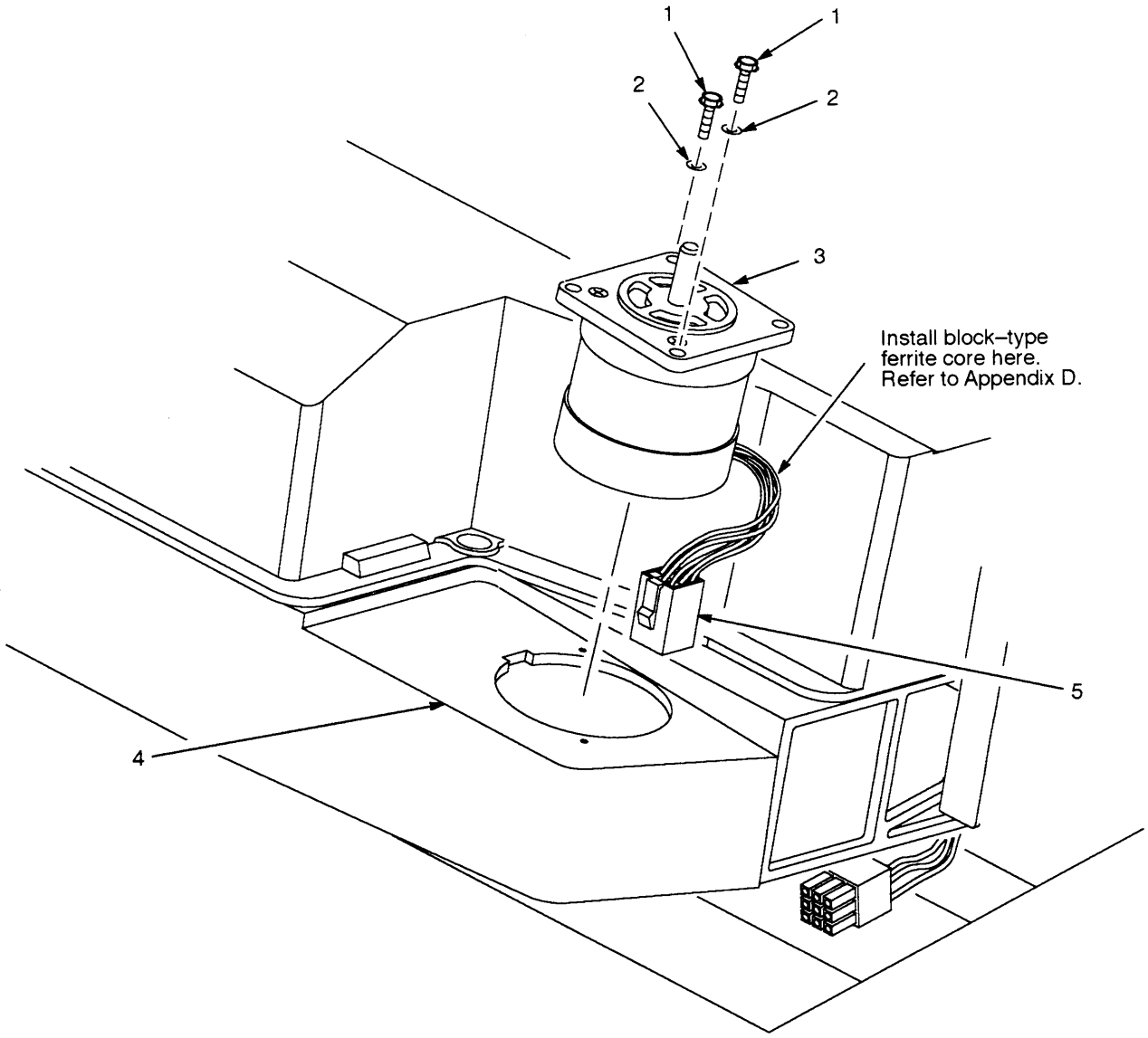
WARNING

Make sure the ferrite core does not pinch the ribbon motor cable wires and take care not to damage the cable wires when inserting the motor into the base casting.

1. Install the snap–on ferrite core to the motor cable.
2. Connect the ribbon motor cable connector (5) and position the ribbon drive motor (3) in the base casting (4).
3. Install screws (1) and washers (2) to secure the front right and rear left corners of the ribbon drive motor assembly (3).

4. Install the ribbon hub (page 6–110).

5. Return the printer to normal operation (page 6–132).



1. Screw (2) (Scr, Hex w/Lock Washer, 6–32x.50)
2. Washer (2) (Flat #6)
3. Ribbon Drive Motor (P/N 57G1577)
4. Base Casting (Ref)
5. Ribbon Motor Cable Connector (p/o item 3.)

Figure 6–23. Motor Assembly, Ribbon Drive, Removal/Installation

Motor Assembly, Paper Feed (Figure 6–24)

Removal

1. Prepare the printer for maintenance (page 6–3).
2. Open the printer cover.
3. Remove the paper guide assembly (page 6–66).
4. Remove four screws and the barrier shield. (See Figure 6–51.)
5. Remove the timing belt cover (1) by squeezing the top and bottom to release the plastic tabs from the slots in the side plate.
6. Loosen the paper feed motor mount screws (7).
7. Loosen the 7/64 inch hex set screw (2) and remove the paper feed motor pulley (3), collar (4), and paper feed timing belt (5).
8. Disconnect the paper feed motor electrical connector (6).
9. Remove the motor mount bolts (7) and nut plate (8).
10. Remove the paper feed motor assembly (9).

Installation

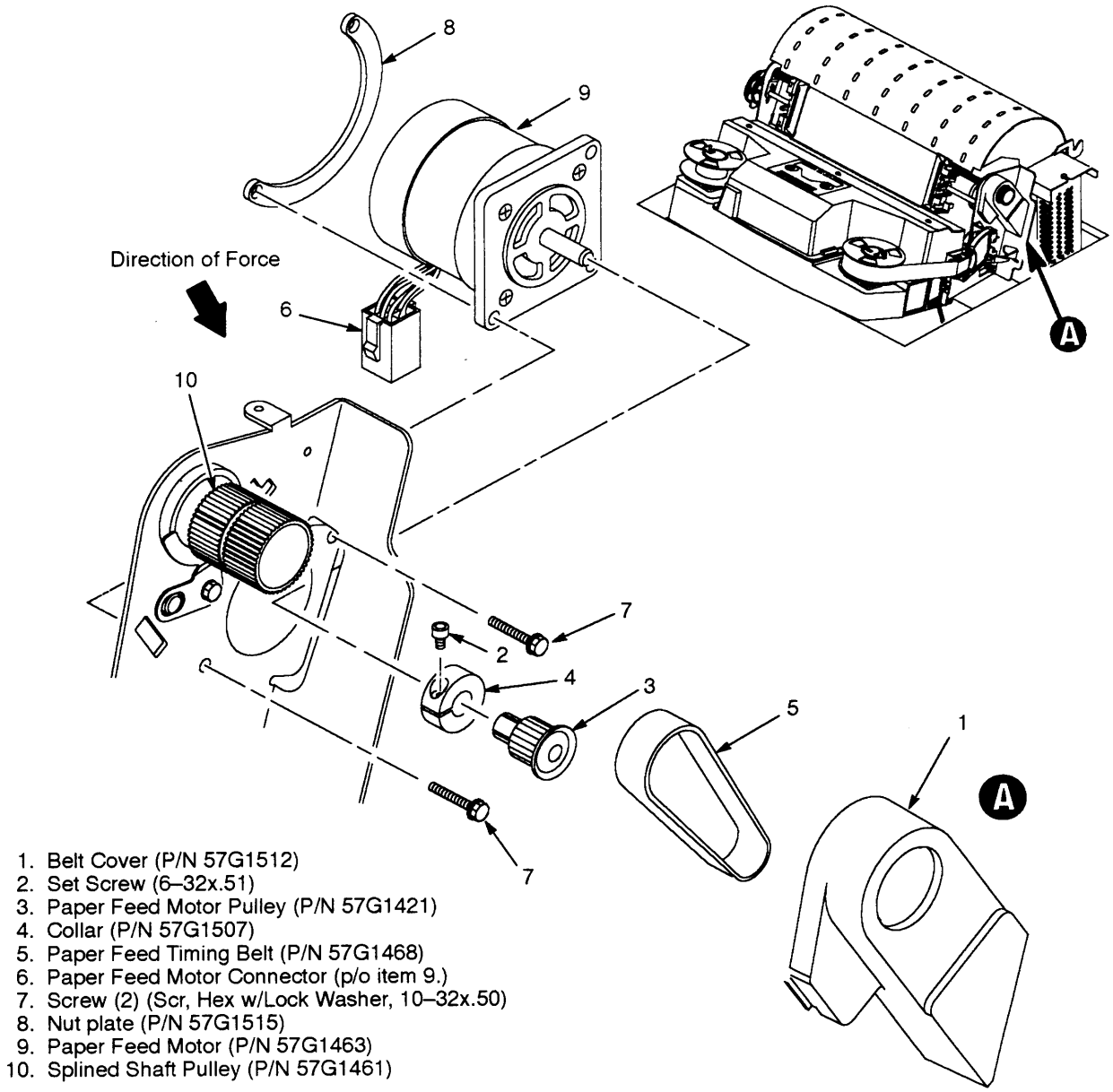
1. Position the paper feed motor assembly (9) on the right side plate and install the motor mount bolts (7) and nut plate (8) finger tight.
2. Connect the paper feed motor electrical connector (6).
3. Install the collar (4), paper feed motor pulley (3), and timing belt (5).
4. Align the paper feed motor pulley (3) with the splined shaft pulley (10).

IMPORTANT

Make sure there is at least 0.010 inches (0.25 mm) of clearance between the collar/pulley and the motor face plate.

5. Hold the collar (4) snug against the motor pulley (3) and torque the set screw (2): If the pulley is black (aluminum), torque the set screw to 11 ± 2 inch–pounds (1.24 ± 0.23 N•m). If the pulley is silver (steel), torque the set screw to 25 ± 2 inch–pounds (2.82 ± 0.23 N•m).
6. Using the straight end of a force gauge, apply 12 pounds (53.4 N) of pressure to the paper feed motor (9). Use the splined shaft to steady the gauge.

7. Reduce pressure to 9 pounds (40.0 N) and torque the motor mount screws (7) to 18 ± 2 inch–pounds (1.36 ± 0.23 N•m).
8. Snap the timing belt cover (1) into the slots in the side plate.
9. Install the barrier shield and four screws. (See Figure 6–51.)
10. Install the paper guide assembly (page 6–66).
11. Return the printer to normal operation (page 6–132).



1. Belt Cover (P/N 57G1512)
2. Set Screw (6–32x.51)
3. Paper Feed Motor Pulley (P/N 57G1421)
4. Collar (P/N 57G1507)
5. Paper Feed Timing Belt (P/N 57G1468)
6. Paper Feed Motor Connector (p/o item 9.)
7. Screw (2) (Scr, Hex w/Lock Washer, 10–32x.50)
8. Nut plate (P/N 57G1515)
9. Paper Feed Motor (P/N 57G1463)
10. Splined Shaft Pulley (P/N 57G1461)

Figure 6–24. Motor Assembly, Paper Feed, Removal/Installation

Motor Assembly, Platen Open (Figure 6–24)

Removal

1. Prepare the printer for maintenance (page 6–3).
2. Remove the card cage fan assembly (page 6–46).
3. Remove the platen open belt cover (1) by squeezing the top and bottom to release the plastic tabs from the slots in the side plate.
4. Loosen the motor mount screws (2).
5. Remove the platen open belt (3).
6. Loosen the 1/16 hex pulley set screw (4) and remove the motor pulley (5).
7. Disconnect the platen motor cable connector (6).
8. Remove the motor mount screws (2) and nut plate (7).
9. Remove the platen open motor assembly (8).

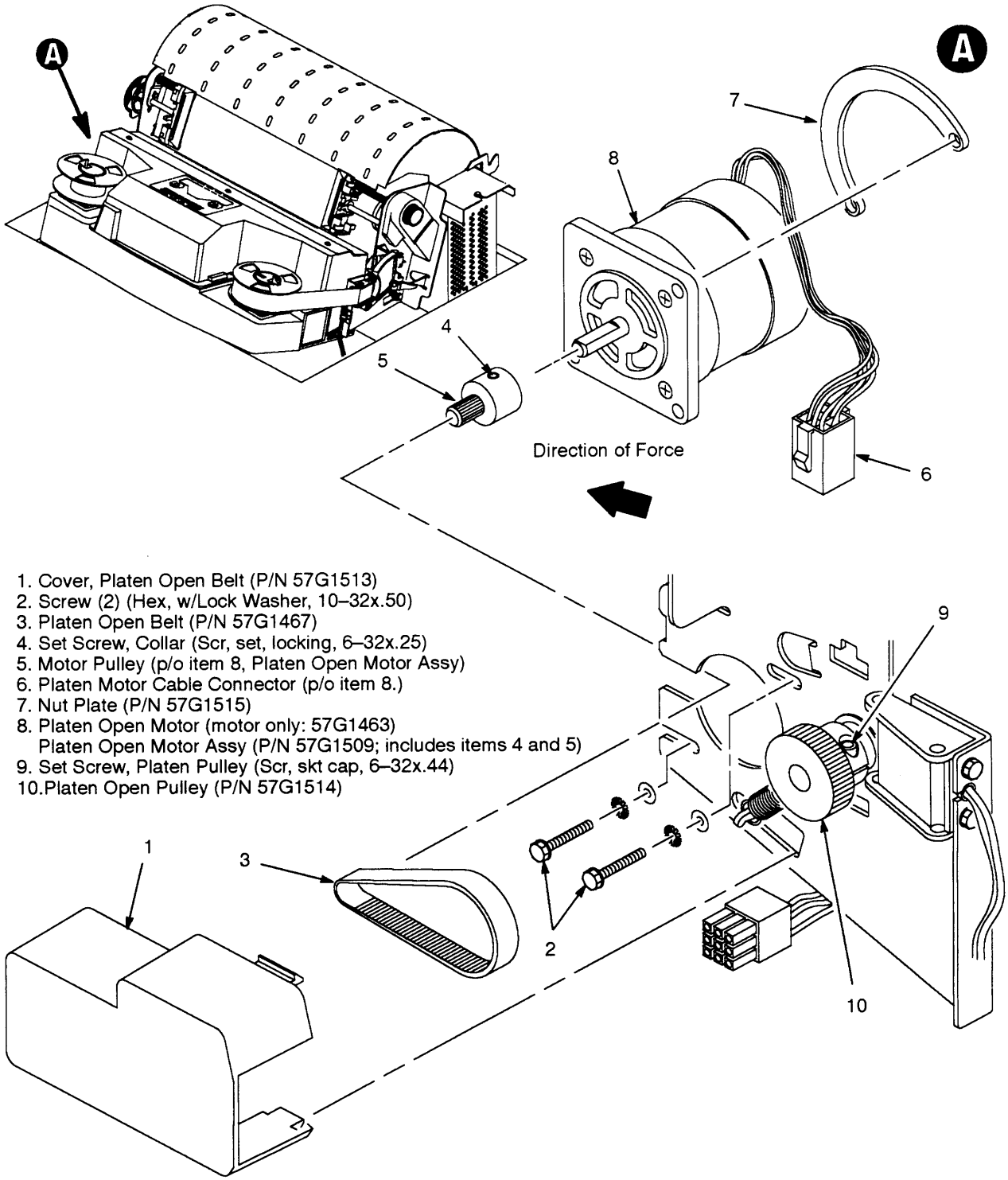


Figure 6–24. Motor Assembly, Platen Open, Removal

Installation

1. Position the platen open motor assembly (8) with wires toward the rear, the nut plate (7), and install the motor mount screws (2) finger tight.
2. Install the motor pulley (5), align it with the platen pulley (9), and tighten the set screw (4) to 9 ± 2 inch–pounds (1.24 ± 0.23 N•m).
3. Connect the platen motor cable connector (6).
4. Install the platen open belt (3).
5. Close the forms thickness lever all the way.
6. Make sure the collar of the platen pulley (9) clears the left ribbon guide with the platen fully closed.
   a. If not, loosen the platen pulley set screw (9), rotate the platen pulley (10) until the collar clears the left ribbon guide and tighten the set screw (9). Go to step 7.
   b. If the collar clears the ribbon guide with the forms thickness lever closed, go to step 7.
7. Using a force gauge, apply 10 pounds (44.48 N) of tension to the platen open motor shaft (8) by pulling away from the large platen pulley, reduce tension to 5 pounds (22.24 N) and torque the motor mount screws (2) to 11 ± 2 inch–pounds (1.24 ± 0.23 N•m).
8. Check the platen gap (page 5–14), and adjust if necessary.
9. Snap the platen open belt cover (1) into the slots in the side plate.
10. Install the card cage fan assembly (page 6–46).
11. Return the printer to normal operation (page 6–132).

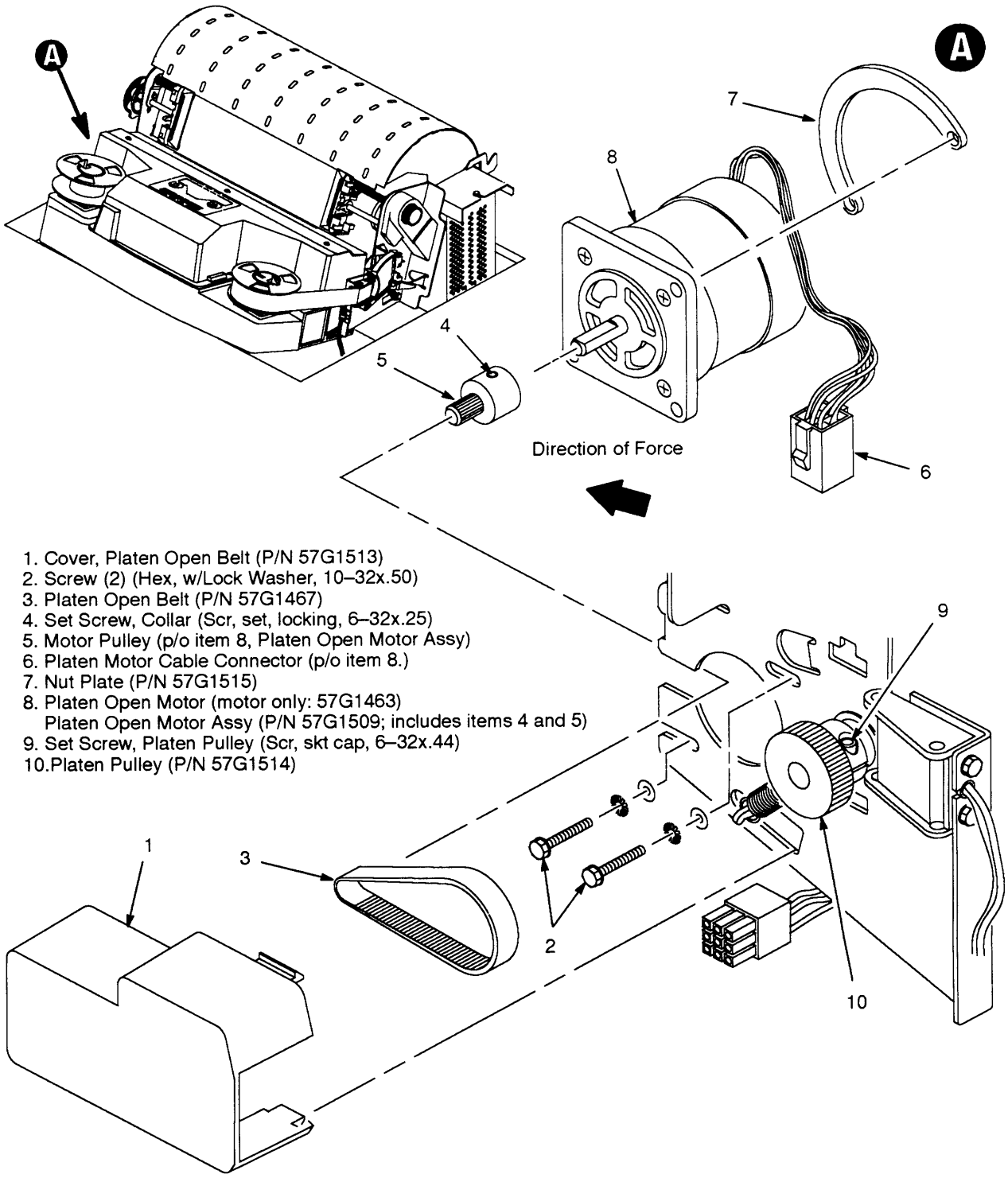


Figure 6–24. Motor Assembly, Platen Open, Installation

Paper Guide Assembly (Figure 6–25)

DANGER

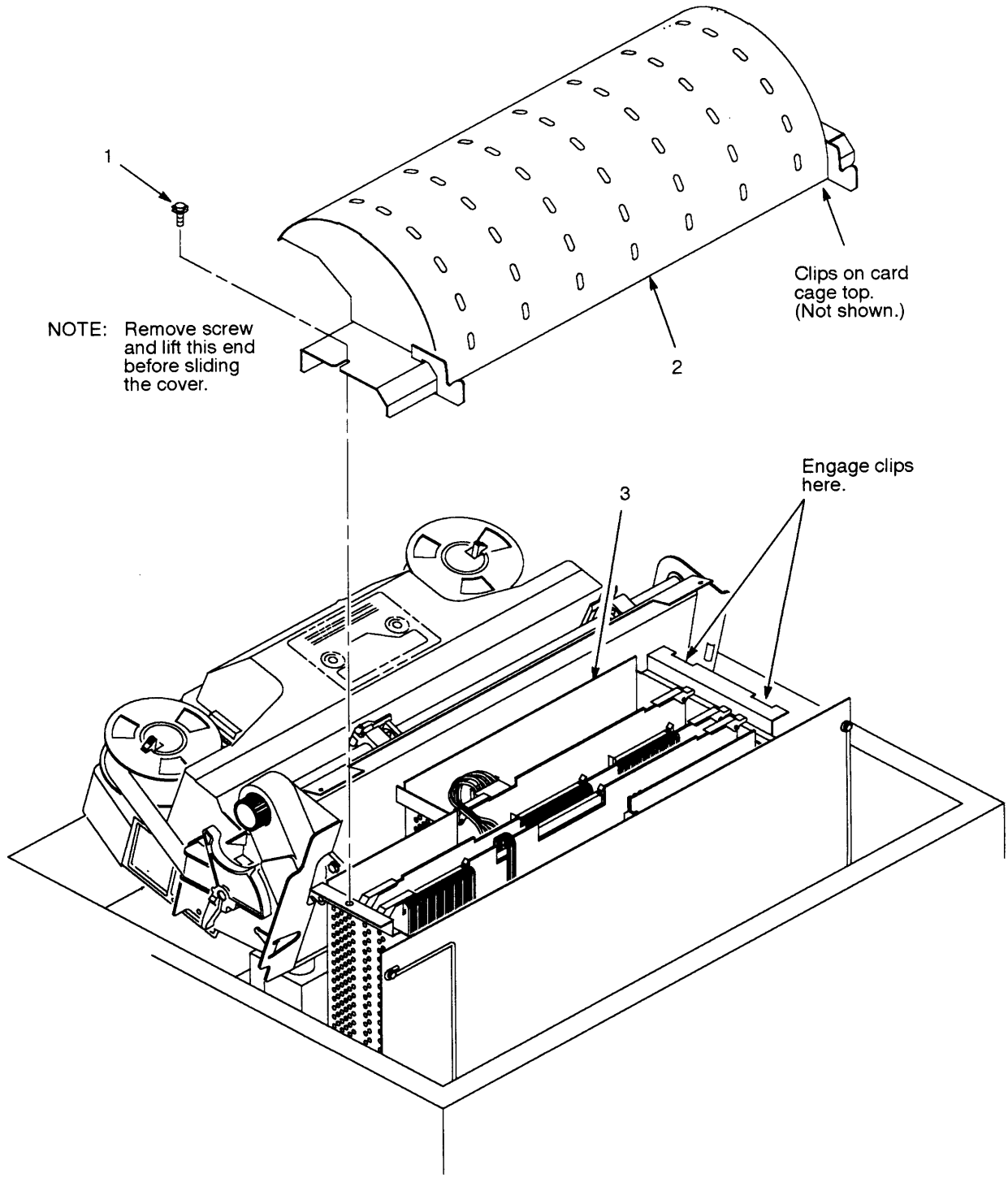
Unless directed to do otherwise, always unplug the printer from the power source before performing a maintenance procedure. Failure to remove power could result in injury to persons or damage to equipment.

Removal

1. Prepare the printer for maintenance (page 6–3).
2. Open the printer cover.
3. Remove the hold–down screw (1).
4. Slightly lift the right end and slide the paper guide assembly (2) to the left. Lift the paper guide assembly off the card cage (3).

Installation

1. Position the paper guide assembly (2) offset slightly to the left on the card cage (3).
2. While holding the right end slightly elevated, slide the paper guide assembly (2) to the right and engage the tabs on the underside of the paper guide assembly with the left edge of the card cage.
3. Slide the paper guide assembly (2) to the right as far as it will go.
4. Lower the right end of the paper guide assembly and install the hold–down screw (1).
5. Return the printer to normal operation (page 6–132).



1. Hold–Down Screw (Hex, w/Lock Washer, 6–32x.25, and Washer, flat, #6)
2. Paper Guide Assembly (P/N 57G1568)
3. Card Cage (Ref)

Figure 6–25. Paper Guide Assembly Removal/Installation

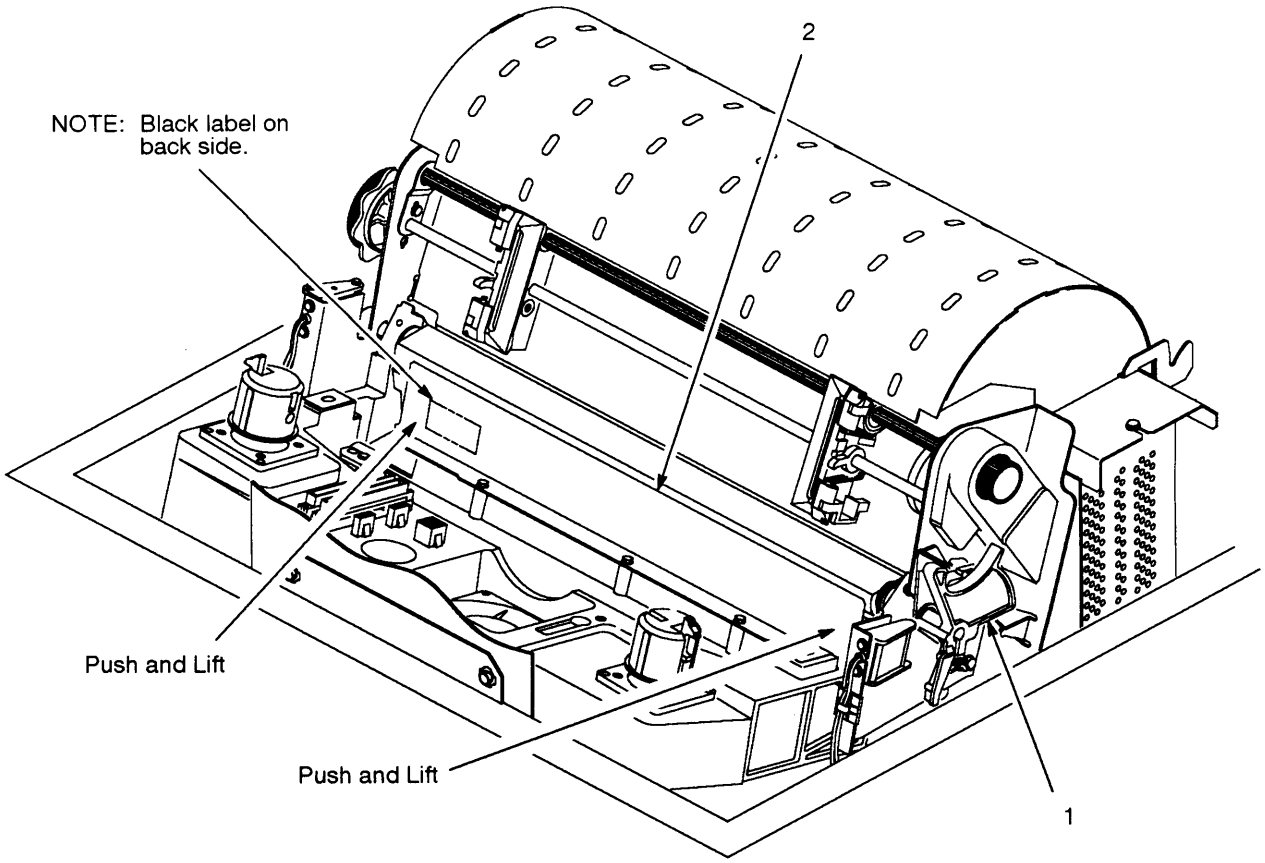
Paper Ironer (Figure 6–26)

Removal

1. Remove the shuttle frame assembly (page 6–118).
2. Move the forms thickness lever (1) to the open position.
3. Push back at the ends of the paper ironer (2) to disengage the tabs, then lift it up and out.

Installation

1. Position the paper ironer (2) so that the lip on the upper edge faces the front of the printer.
2. Push the paper ironer (2) down into the slots until the tabs engage.
3. Install the shuttle frame assembly (page 6–118).
4. Return the printer to normal operation (page 6–132).



1. Forms Thickness Lever (P/N 57G1470)
2. Paper Ironer Assembly (P/N 57G1469)

Figure 6–26. Paper Ironer Removal/Installation

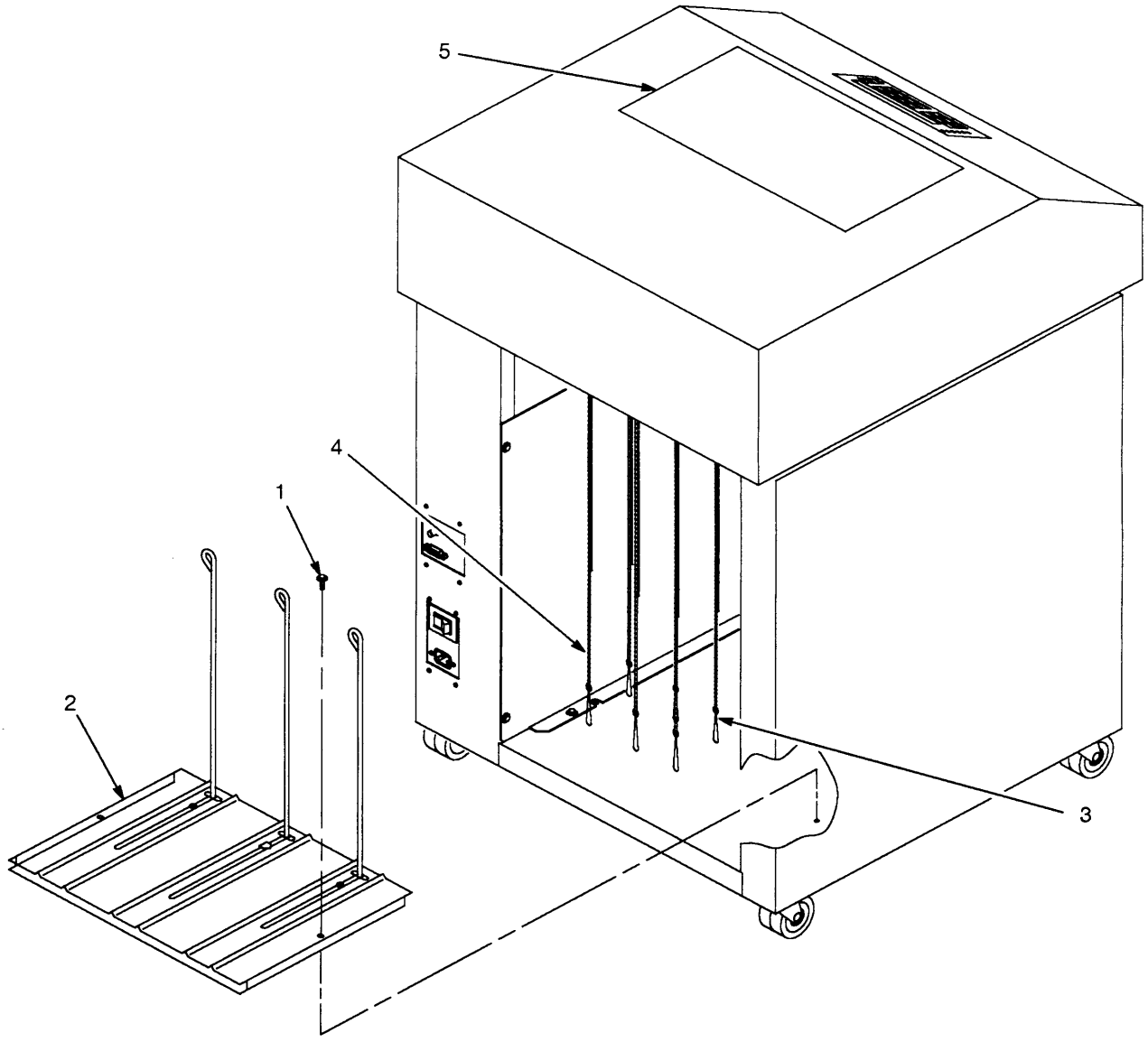
Paper Stacker Tray Assembly (Figure 6–27)

Removal

1. Prepare the printer for maintenance (page 6–3).
2. Open the rear cabinet door.
3. Remove the screws (1) securing the paper stacker tray (2).
4. Slide the stacker tray assembly (2) out the rear of the printer cabinet.

Installation

1. Slide the paper stacker tray assembly (2) into the rear of the cabinet, with the vertical posts closest to the front of the printer.
2. Position the stacker tray (2) over the holes in the floor of the cabinet. Make sure the paper chains hang freely over the stacker tray assembly, with no kinks, twists, or bunching.
3. Install the screws (1) securing the paper stacker tray (2).
4. Close the rear cabinet door.
5. Return the printer to normal operation (page 6–132).



1. Screw, Hex, 10–24x1.00 (2)
2. Paper Stacker Tray Assembly (P/N 57G1567)
3. Chain Assembly, Stacker, Inner (4) (P/N 57G1563)
4. Chain Assembly, Stacker, Outer (4) (P/N 57G1564)
5. Window (P/N 57G1492)

Figure 6–27. Paper Stacker Tray Assembly, Removal/Installation

PCBA, Coax/Twinax Integrated Interface (CT) (Figure 6–28)

NOTE: If the printer is equipped with an IGP board, the CT interface board is mounted on the IGP. Remove the IGP first, then remove the CT board. (See page 6–78.)

WARNING

To prevent electrostatic damage to electronic components, wear a properly grounded static wrist strap when handling PCBAs.

Removal

1. Remove the paper guide assembly (page 6–66).
2. Remove the common controller board (page 6–74).
3. Disconnect the CT interconnect cable (1) from connector P1 on the CT board (2).
4. Disconnect the CT power cable (3) from connector P3 on the CT board.
5. Disconnect the orange CT I/O cable (4) from connector P2.
6. Disconnect the gray CT I/O cable (5) from connector P2.
7. Slide the CT board (2) up and out of the PCBA guides (6) on the CT bracket (7).

Installation

1. Slide the CT board (2) down into the PCBA guides (6) on the CT bracket (7).
2. Connect the gray CT I/O cable (5) from connector P2.
3. Connect the orange CT I/O cable (4) from connector P2.
4. Connect the CT power cable (3) from connector P3 on the CT board.
5. Connect the CT interconnect cable (1) from connector P1 on the CT board (2).
6. Install the common controller board (page 6–74).
7. Install the paper guide assembly (page 6–66).

1. CT Interconnect Cable (P/N 57G1411)
2. CT Board w/o PROMs (P/N 57G1430) (CT PROM Kit, P/N 57G1426)
3. CT Power Cable (w/o IGP, P/N 57G1412; with IGP, P/N 57G1575)
4. Orange CT I/O Cable (p/o P/N 57G1506)
5. Gray CT I/O Cable (p/o P/N 57G1506)
6. PCBA Guide (P/N 57G1511)
7. CT Bracket (Ref)

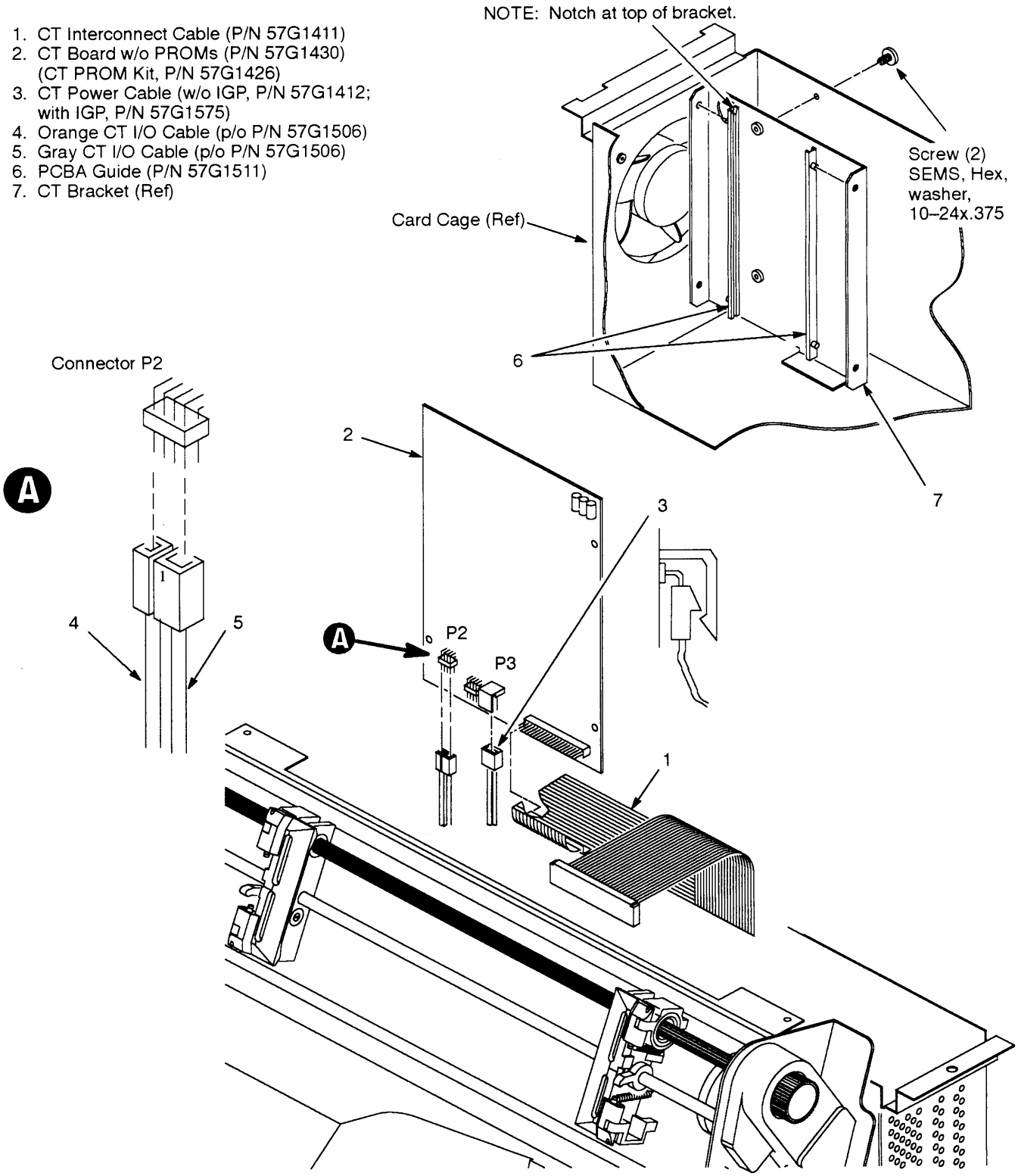


Figure 6–28. Coax/Twinax Integrated Interface (CT), Removal/Installation

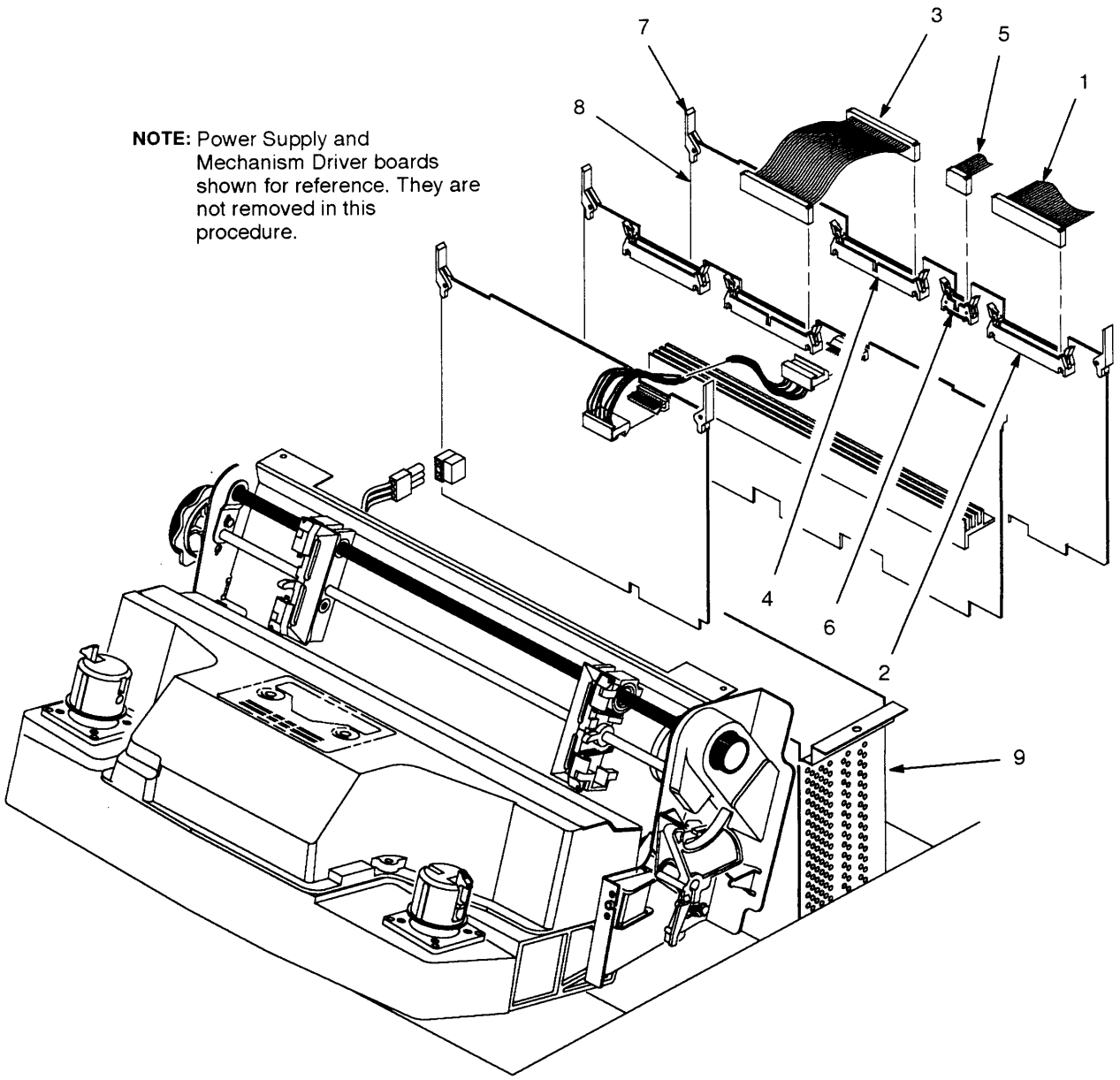
PCBA, Common Controller (Figure 6–29)

WARNING

To prevent electrostatic damage to electronic components, wear a properly grounded static wrist strap when handling PCBAs.

Removal

1. Make a configuration printout. (Refer to the *Setup Guide*.)
2. Prepare the printer for maintenance (page 6–3).
3. Open the printer cover.
4. Remove the paper guide assembly (page 6–66).
5. Open the connector latches and disconnect the multi I/O ribbon cable (1) from connector J1 (2).
6. Open the connector latches and disconnect the CCB/Mech. Driver cable connector (3) from connector J2 (4).
7. Open the connector latches and disconnect the operator panel ribbon cable (5) from connector J3 (6).
8. Lift the ejection levers (7).
9. Grasp the common controller PCBA (8) by the ejection levers and pull it up and out of the card cage (9).
10. Remove the DPU PROMs, font PROMs, RTPU and PFC PROMs (page 6–100), and host terminating resistors (page 6–108).



1. Multi I/O Ribbon Cable (Ref)
2. Connector J1 (p/o item 8.)
3. CCB/Mech. Driver Cable (P/N 57G1454)
4. Connector J2 (p/o item 8.)
5. Operator Panel Cable (P/N 57G1573)
6. Connector J3 (p/o item 8.)
7. Ejection Lever (2) (p/o item 8.)
8. Common Controller PCBA (CCB) w/o PROMs (P/N 57G1445)
   (See Figure 6–38, page 6–101.)
9. Card Cage (Ref)

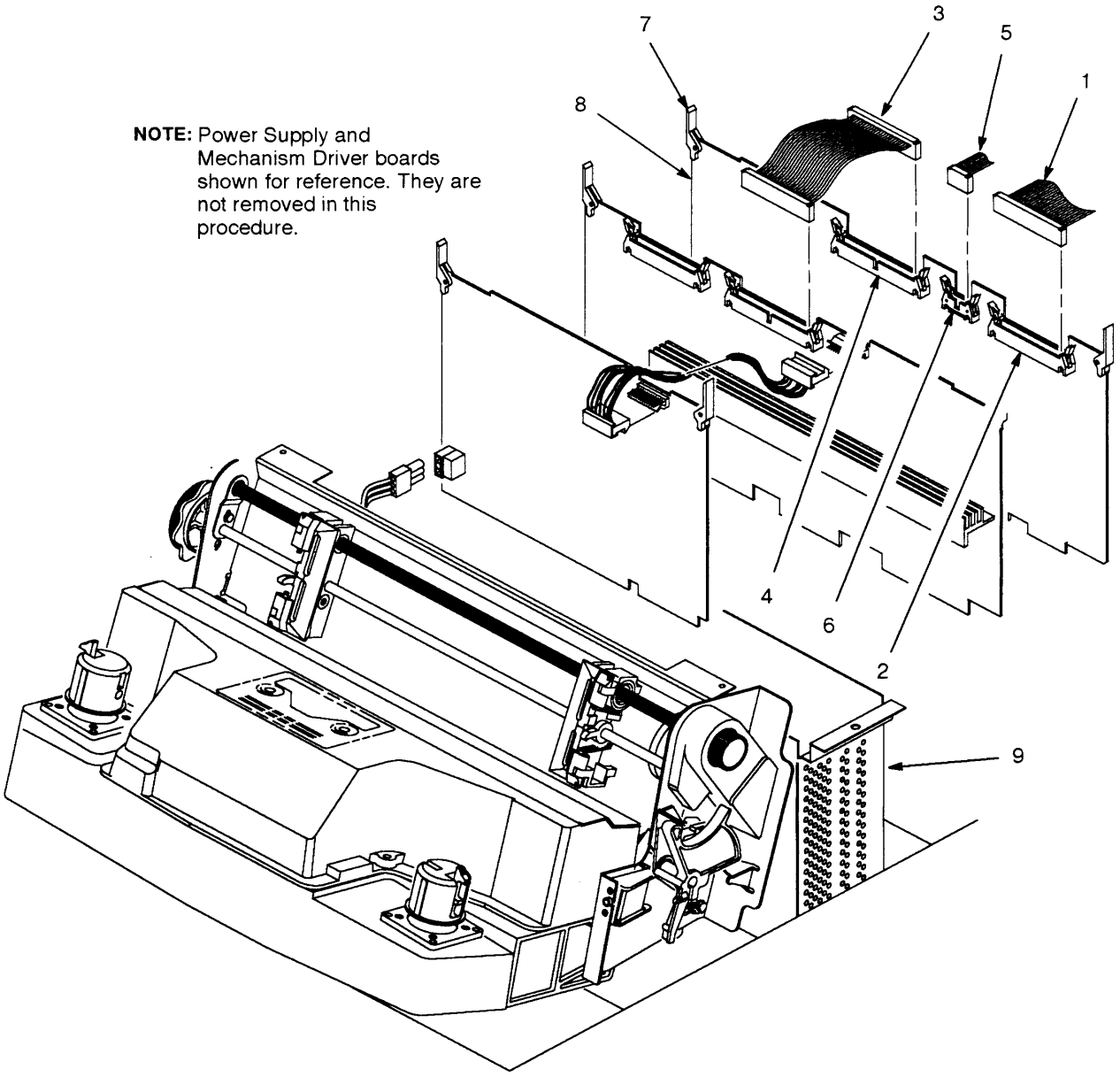
Figure 6–29. PCBA, Common Controller, Removal

Installation

WARNING

To prevent electrostatic damage to electronic components, wear a properly grounded static wrist strap when handling PCBAs.

1. Install the DPU PROMs, font PROMs, RTPU and PFC PROM (page 6–100), and host terminating resistors (page 6–108) onto the replacement PCBA.
2. Slide the common controller PCBA (8) down into the card cage (9). Engage the card edge connectors in the connector at the bottom of the card cage (9).
3. Lower the ejection levers (7) to the closed position.
4. Push the common controller PCBA (8) down into the edge connector.
5. Connect the operator panel ribbon cable (5) to connector J3 (6) and close the latches.
6. Connect the CCB/Mech. Driver cable connector (3) to connector J2 (4) and close the latches.
7. Connect the multi I/O ribbon cable (1) to connector J1 (2) and close the latches.
8. Install the paper guide assembly (page 6–66).
9. Adjust the hammer phasing (page 5–25).
10. Return the printer to normal operation (page 6–132).
11. Using the configuration printout you made as step 1 of the removal procedure, reset and save the printer configuration. (Refer to the *Setup Guide*.)



1. Multi I/O Ribbon Cable (Ref)
2. Connector J1 (p/o item 8.)
3. CCB/Mech. Driver Cable (P/N 57G1454)
4. Connector J2 (p/o item 8.)
5. Operator Panel Cable (P/N 57G1573)
6. Connector J3 (p/o item 8.)
7. Ejection Lever (2) (p/o item 8.)
8. Common Controller PCBA (CCB) w/o PROMs (P/N 57G1445)
   (See Figure 6–38, page 6–101.)
9. Card Cage (Ref)

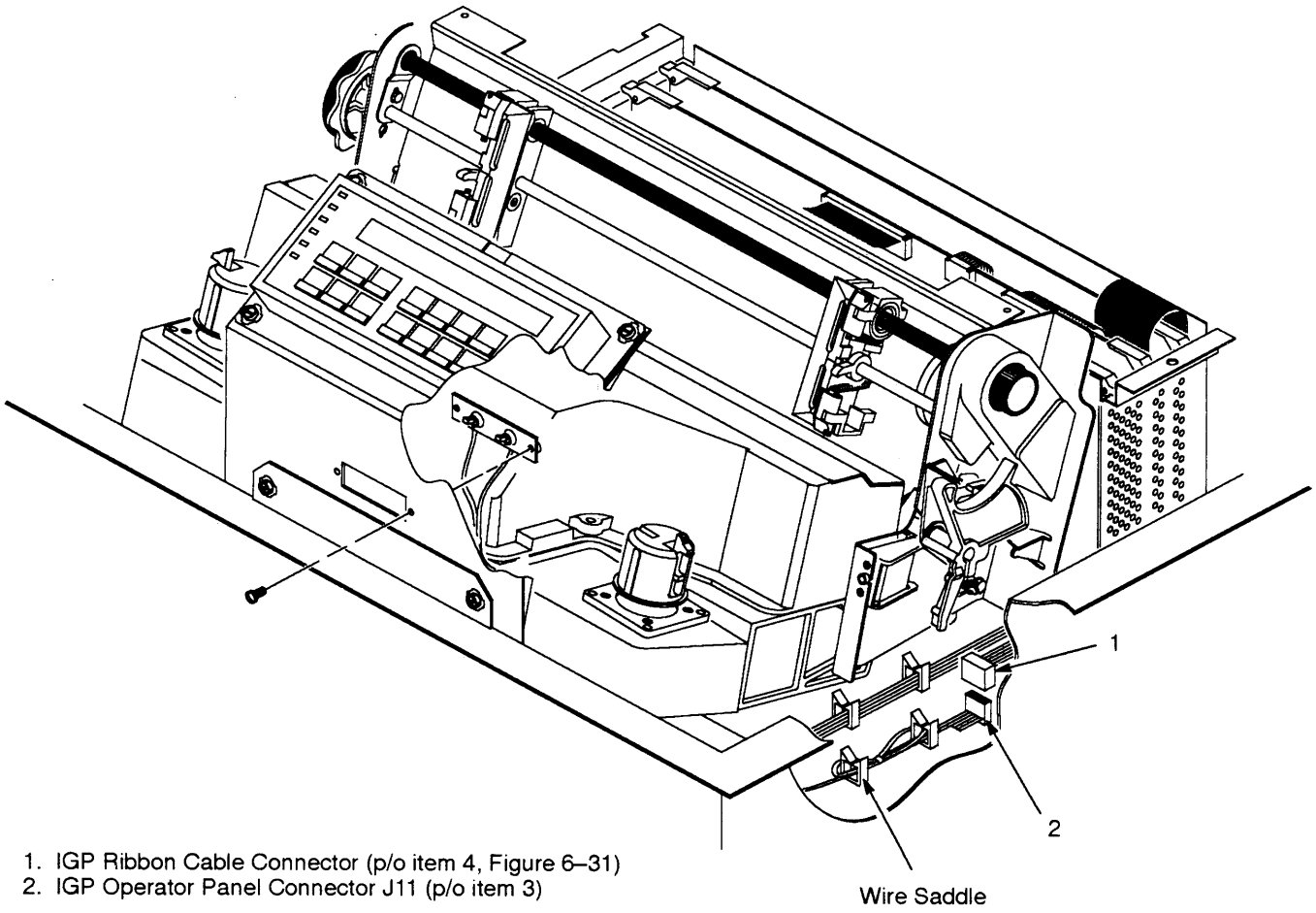
Figure 6–29. PCBA, Common Controller, Installation

WARNING

To prevent electrostatic damage to electronic components, wear a properly grounded static wrist strap when handling PCBAs.

Removal

1. Prepare the printer for maintenance (page 6–3).
2. Remove the paper guide assembly (page 6–66).
3. Disconnect the IGP ribbon cable connector P11 (1) from IGP operator panel connector J11 (2). (See Figure 6–30.)



1. IGP Ribbon Cable Connector (p/o item 4, Figure 6–31)
2. IGP Operator Panel Connector J11 (p/o item 3)

Figure 6–30. IGP Ribbon Cable

4. Disconnect the interconnect cable (3) from connector J60 on the IGP board (4). (See Figure 6–31 and Figure 6–32.)

5. On the IBM 6408–A00, disconnect the multi–I/O cable (5) from connector J61 on the IGP board. (See Figure 6–31.)
   On the IBM 6408–CT0, disconnect the orange CT I/O cable (6), the grey CT I/O cable (7), and the CT power cable (8) from the CT board (9). (See Figure 6–32.)

6. Lift the IGP board (4) enough to disconnect the board from the CT/IGP–2X0 power connector on the bottom of the card cage.

7. Lift and remove the IGP board (4) from the card cage.

3. Interconnect Cable (P/N 57G1410)
4. IGP–2X0 PCBA, without PROMs (P/N 57G1409)
   (IGP–200 PROM Kit: P/N 57G1413;
   (IGP–210 PROM Kit: P/N 57G1415)
5. Multi–I/O Cable Assy (P/N 57G1422)

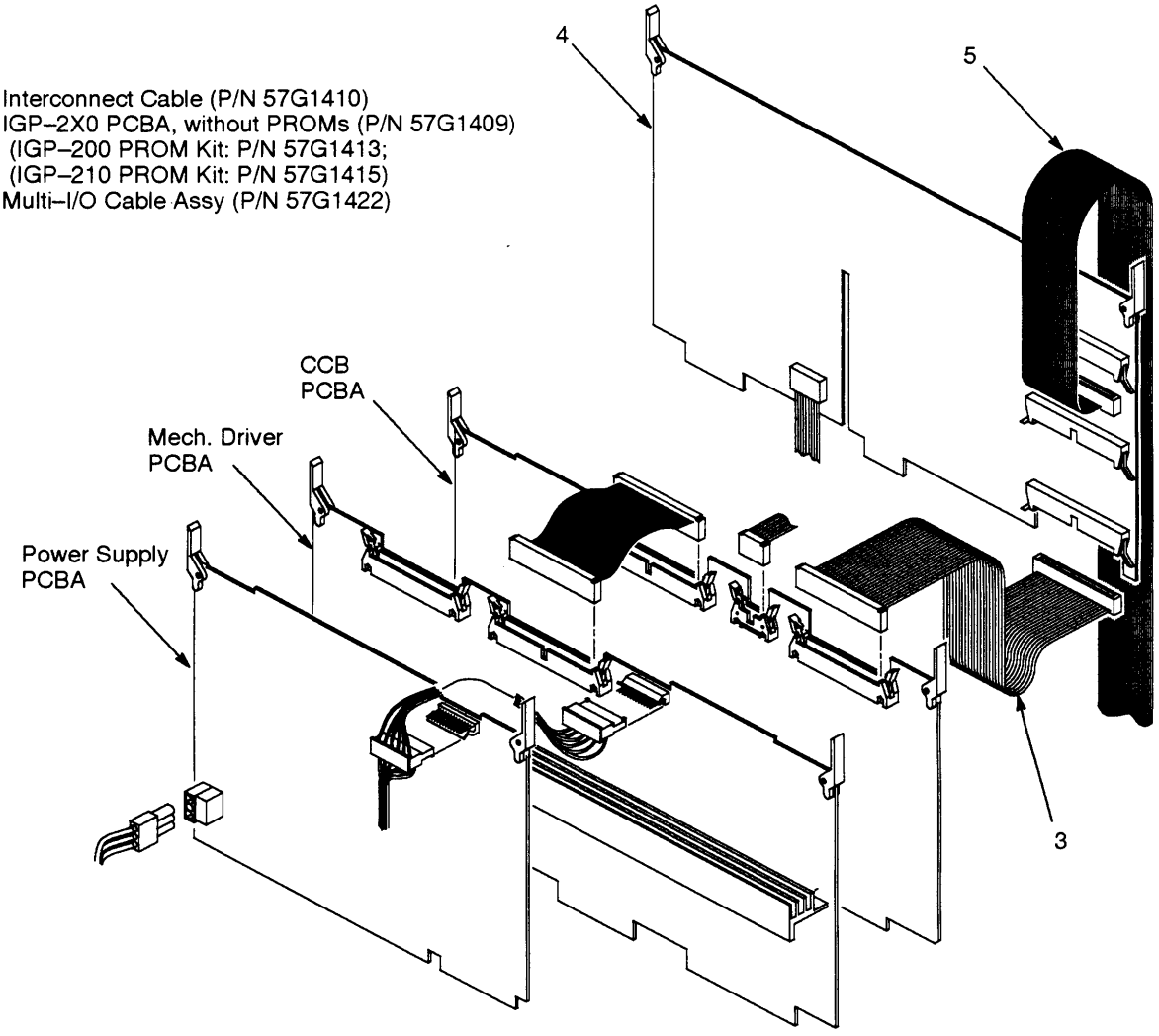
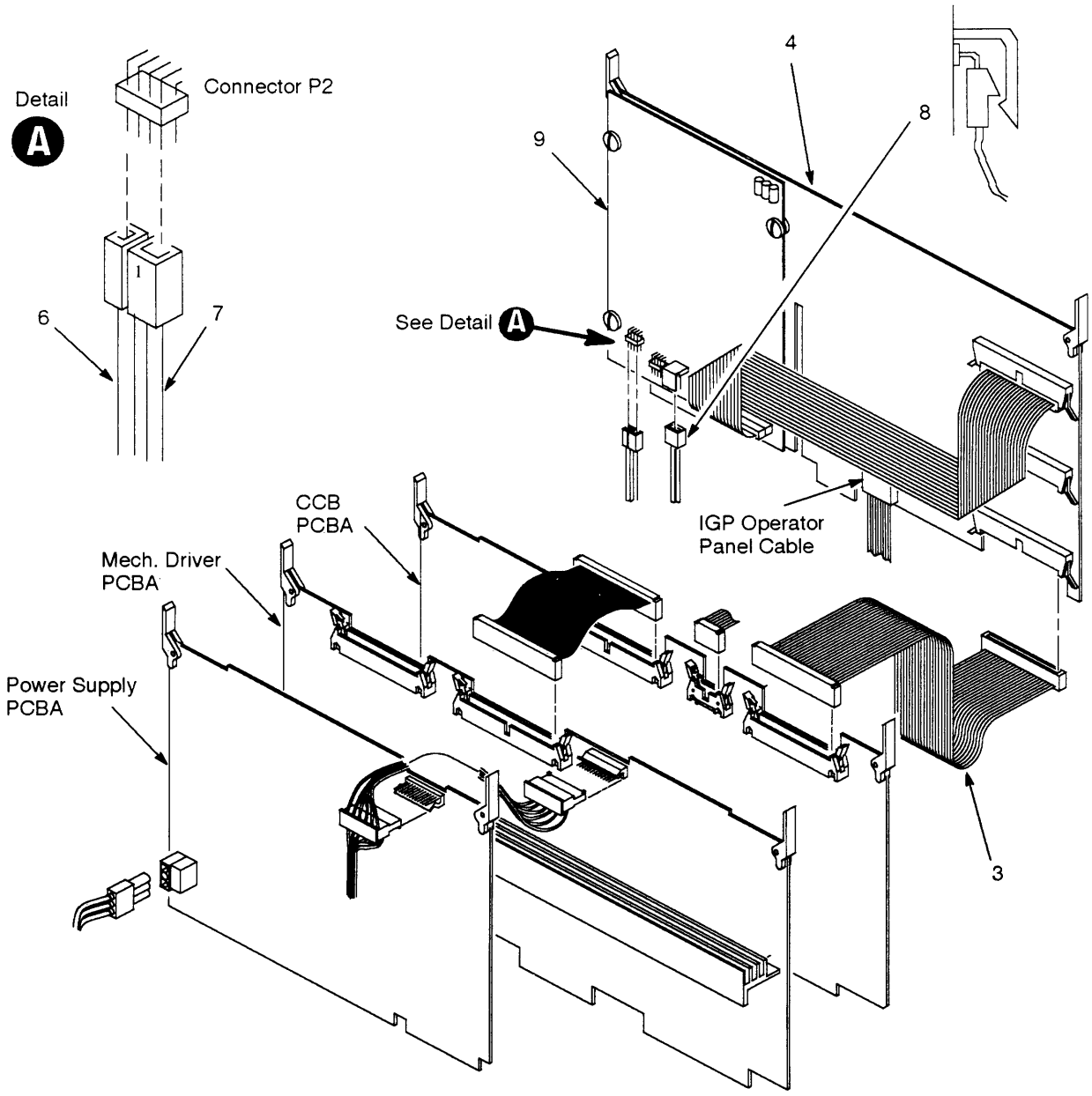


Figure 6–31. Circuit Boards in the IBM 6408–A00 Card Cage



3. Interconnect Cable (P/N 57G1410)
4. IGP–2X0 PCBA, without PROMs (P/N 57G1409)
   (IGP–200 PROM Kit: P/N 57G1413;
   (IGP–210 PROM Kit: P/N 57G1415)
6. Orange CT I/O Cable (p/o Cable Assembly 57G1506)
7. Grey CT I/O Cable (p/o Cable Assembly 57G1506)
8. CT Power Cable (w/o IGP, P/N 57G1412; with IGP, P/N 57G1575)
9. CT Board without PROMs (P/N 57G1430)
   (CT PROM Kit, P/N 57G1426)

Figure 6–32. Circuit Boards in the IBM 6408–CT0 Card Cage

8. IBM 6408–CT0 only: Disconnect the CT–IGP interconnect cable (10) from P1 on the CT board and J61 on the IGP board. (See Figure 6–33.)
9. IBM 6408–CT0 only: Remove the nylon nuts (11), bolts (12), and spacers (13) securing the CT board to the IGP board.

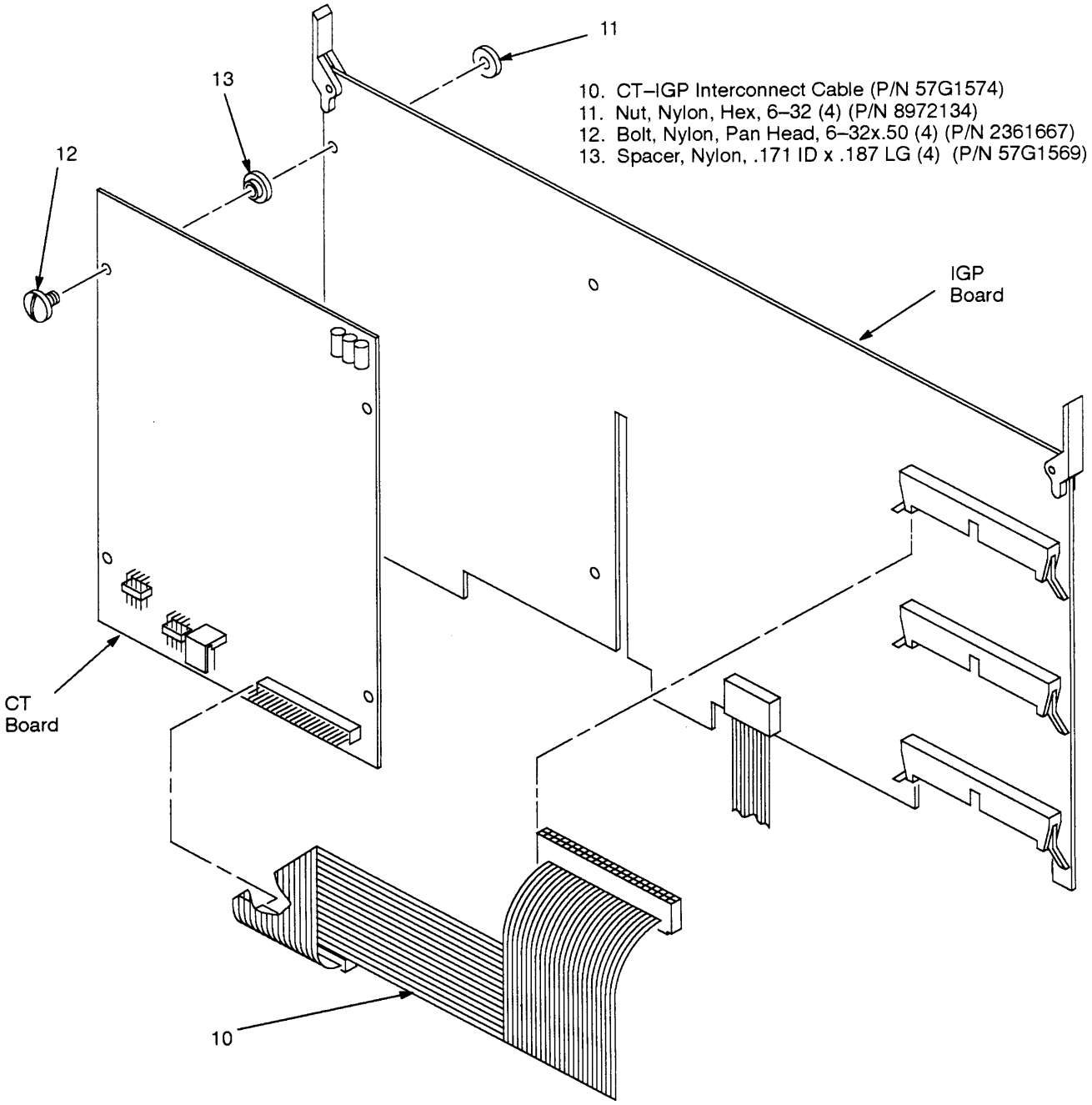


Figure 6–33. Removing the CT Board from the IGP Board

Installation

WARNING

To prevent electrostatic damage to electronic components, wear a properly grounded static wrist strap when handling PCBAs.

1. IBM 6408–CT0 only: install the CT board to the IGP board, using the nylon nuts (11), bolts (12), and spacers (13).
2. IBM 6408–CT0 only: connect the CT–IGP interconnect cable (10) to P1 on the CT board and J61 on the IGP board. (See Figure 6–33.)

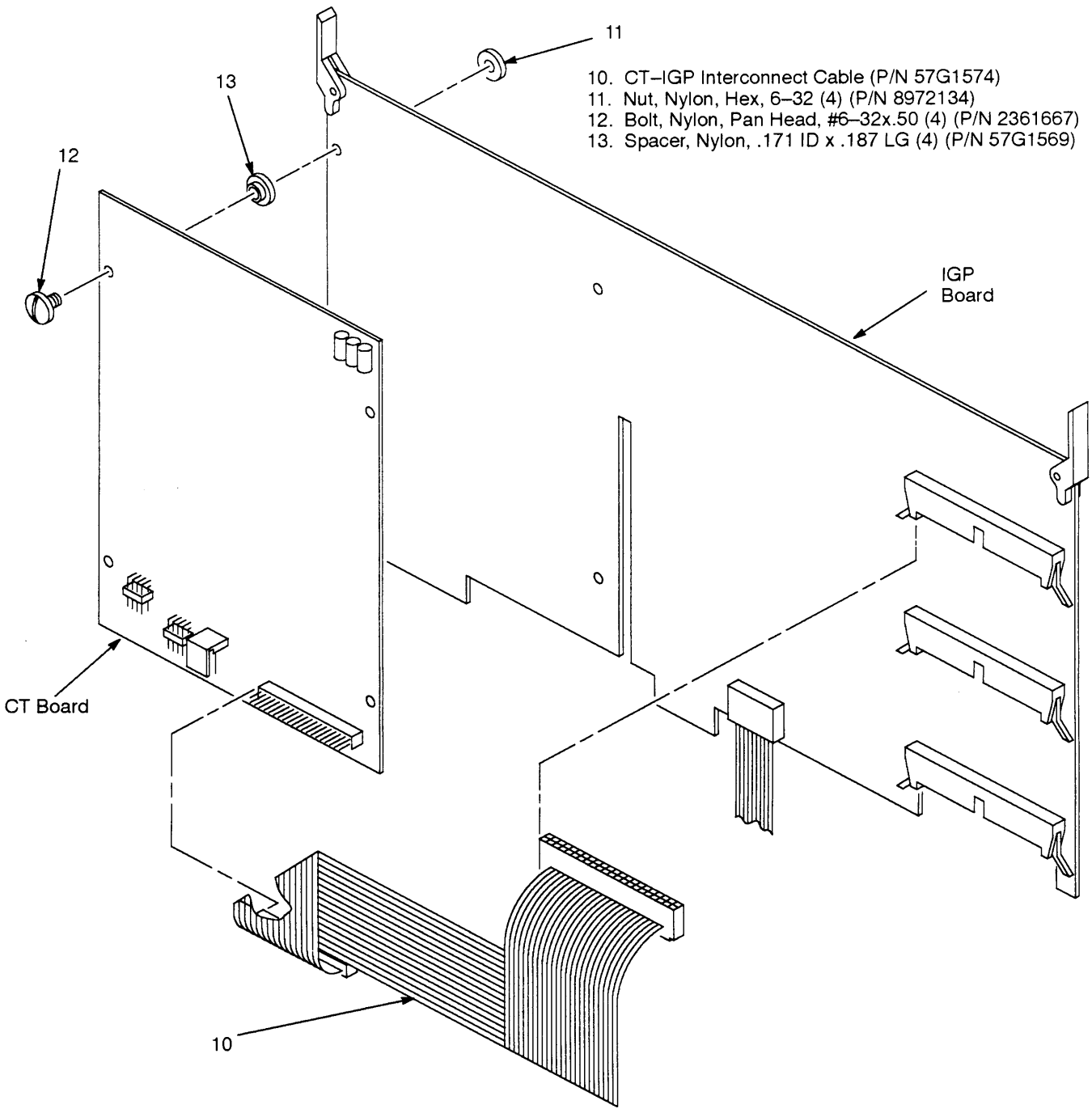


Figure 6–33. Installing the CT Board on the IGP Board

3. Connect the interconnect cable (3) to connector J60 on the IGP board (4). (See Figure 6–31 and Figure 6–32.)

4. Slide the IGP board part way down the rear–most card slot in the card cage. Route the IGP ribbon cable out of the card cage and along the right side of the printer.

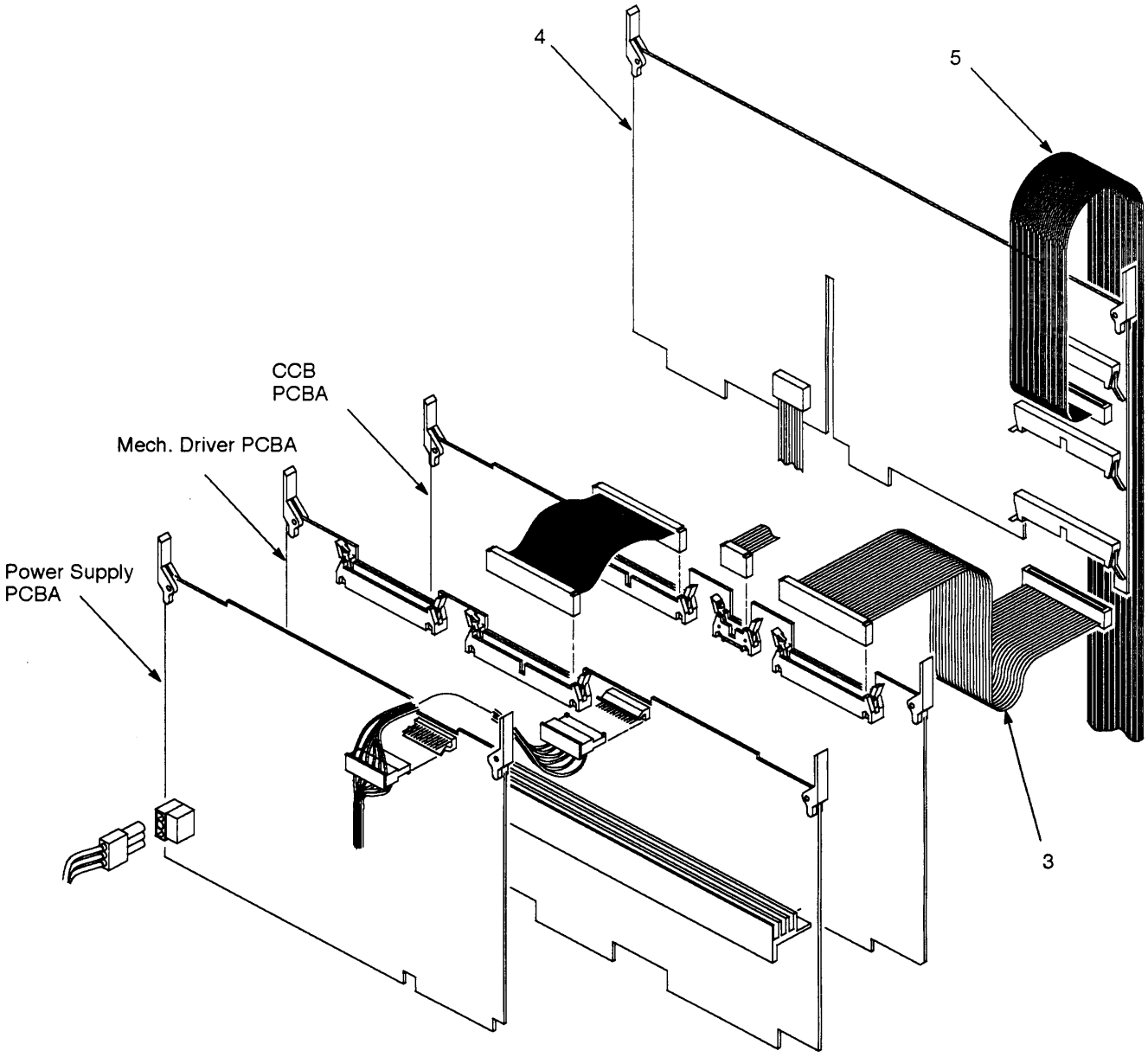
5. On the IBM 6408–A00, loop the printer multi–I/O ribbon cable (5) over the top of the IGP board and connect it to J61. (See Figure 6–31.)

   On the IBM 6408–CT0, connect the orange CT I/O cable (6), the grey CT I/O cable (7), and the CT power cable (8) to the CT board (9). (See Figure 6–32.)

WARNING

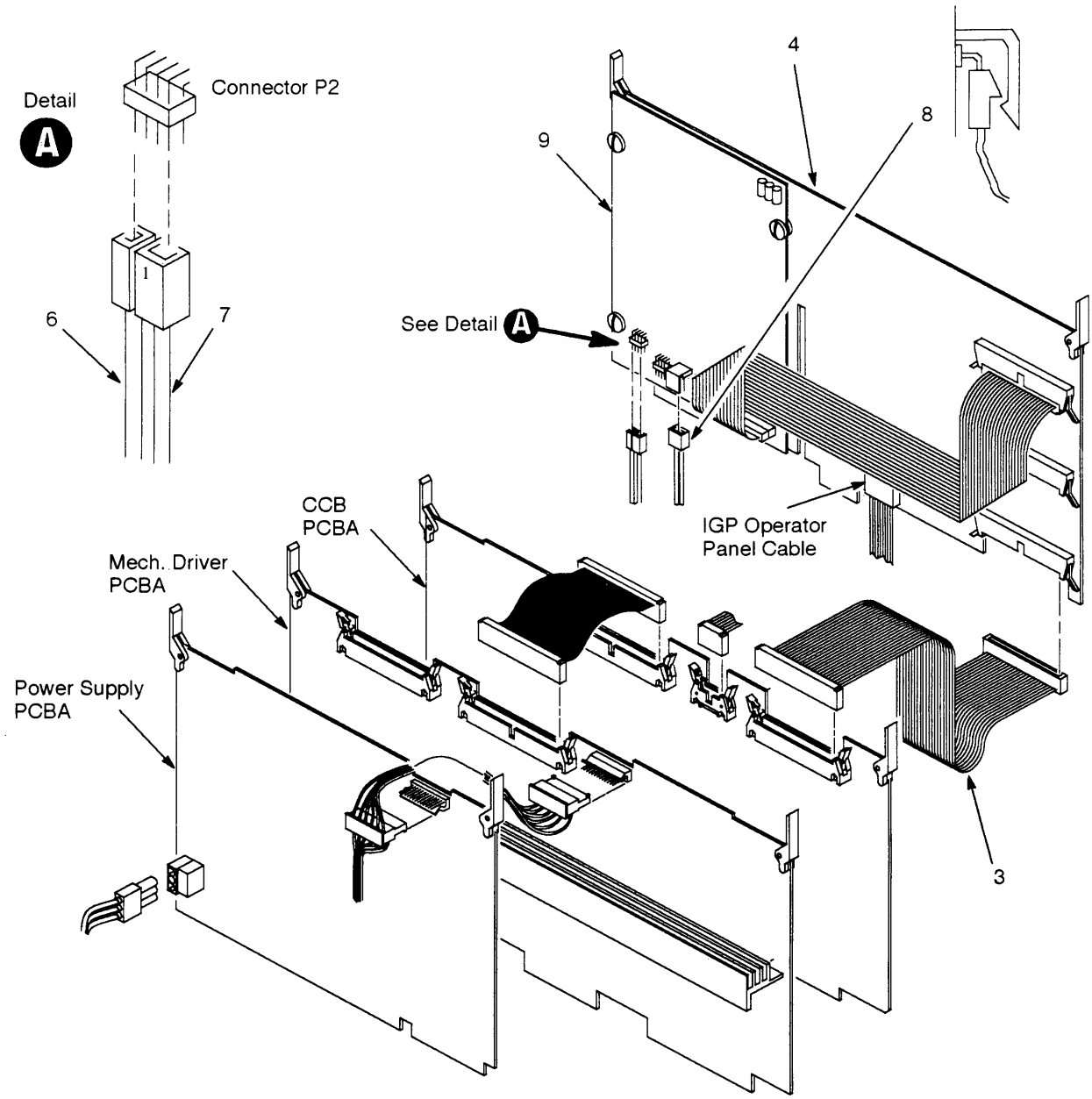
In the next step, make sure the cables under the IGP board are not pinched or crushed.

6. Slide the IGP board down into the card cage and seat the board in the CT/IGP–2X0 power connector on the bottom of the card cage.



3. Interconnect Cable (P/N 57G1410)
4. IGP–2X0 PCBA, without PROMs (P/N 57G1409)
   (IGP–200 PROM Kit: P/N 57G1413;
   (IGP–210 PROM Kit: P/N 57G1415)
5. Multi–I/O Cable Assy (P/N 57G1422)

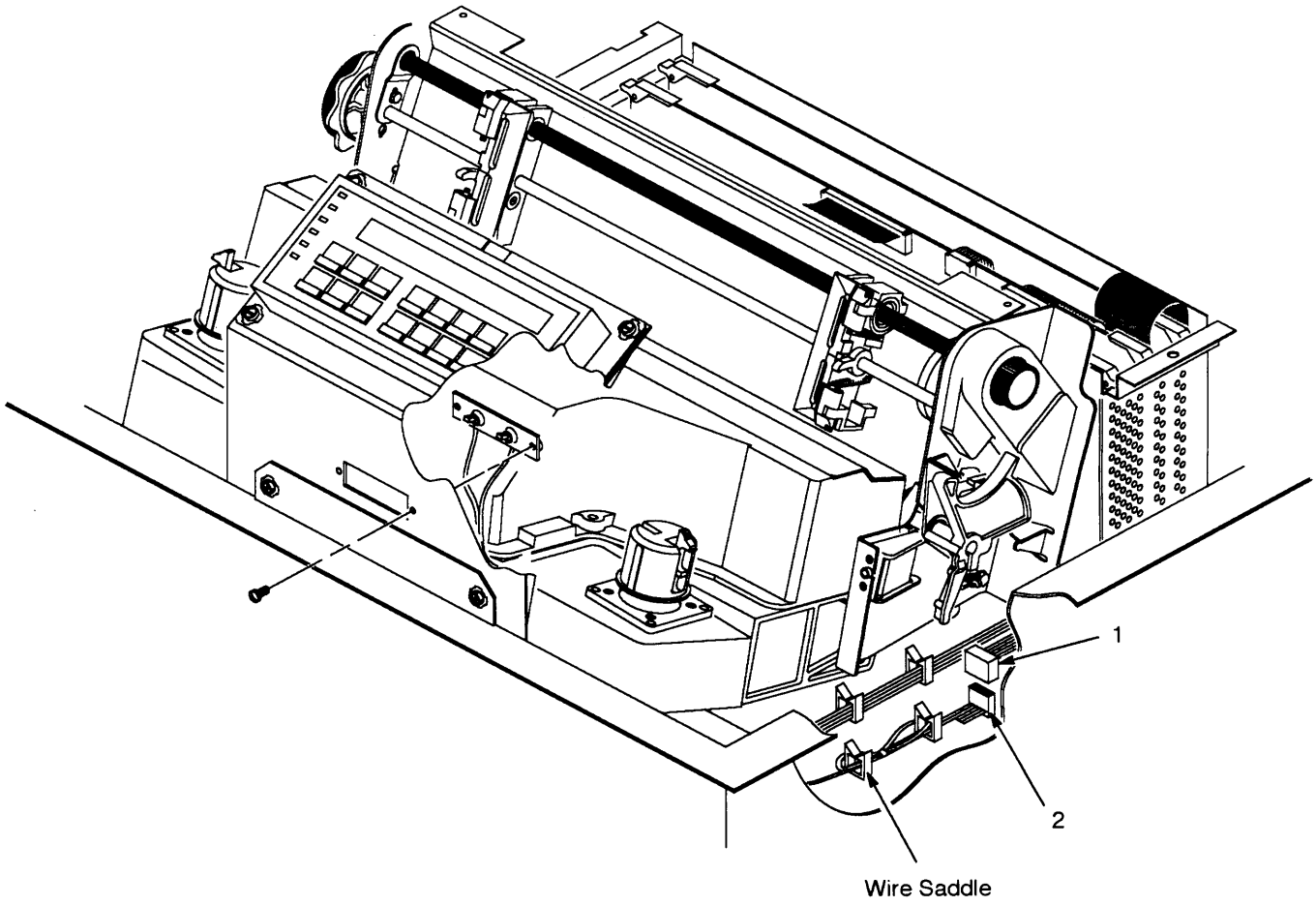
Figure 6–31. Circuit Boards in the IBM 6408–A00 Card Cage



3. Interconnect Cable (P/N 57G1410)
4. IGP–2X0 PCBA, without PROMs (P/N 57G1409)
   (IGP–200 PROM Kit: P/N 57G1413;
   (IGP–210 PROM Kit: P/N 57G1415)
6. Orange CT I/O Cable (p/o Cable Assembly 57G1506)
7. Grey CT I/O Cable (p/o Cable Assembly 57G1506)
8. CT Power Cable (w/o IGP, P/N 57G1412; with IGP, P/N 57G1575)
9. CT Board without PROMs (P/N 57G1430)
   (CT PROM Kit, P/N 57G1426)

Figure 6–32. Circuit Boards in the IBM 6408–CT0 Card Cage

7. Connect the IGP ribbon cable connector P11 (1) to IGP operator panel connector J11 (2). (See Figure 6–30.)
8. Install the paper guide assembly (page 6–66).
9. Return the printer to normal operation (page 6–132).



1. IGP Ribbon Cable Connector (Ref)
2. IGP Operator Panel Connector J11 (Ref)

Figure 6–30. IGP Ribbon Cable

PCBA, Mechanism Driver (Figure 6–34)

WARNING

To prevent electrostatic damage to electronic components, wear a properly grounded static wrist strap when handling PCBAs.

Do not flex the board or grasp components on the mech driver board during removal/installation. Damage to components may result. Handle the board carefully by the ejections levers, sides, or the heat sink.

Removal

1. Prepare the printer for maintenance (page 6–3).
2. Open the printer cover.
3. Remove the paper guide assembly (page 6–66).
4. Open the connector latches and disconnect the CCB/Mech. Driver ribbon cable (1) from connector J6 (2).
5. Disconnect the power supply cable (3) from connector J7 (4).
6. Lift the ejection levers (5).
7. Grasp the mechanism driver PCBA (6) by the ejection levers and pull it up and out of the card cage (7).
8. Remove the RSP PROM (page 6–102).

Installation

1. Install the RSP PROM (page 6–102) onto the replacement PCBA.
2. Slide the mechanism driver PCBA (6) down into the card cage (7). Engage the card edge connectors in the connectors at the bottom of the card cage.
3. Lower the ejection levers (5) to the closed position.
4. Push the mechanism driver PCBA (6) down into the edge connectors.
5. Connect the power supply cable (3) to connector J7 (4). (Make sure to orient it properly to J7.)

6. Connect the CCB/Mech. Driver ribbon cable (1) to connector J6 (2) and close the connector latches.
7. Install the paper guide assembly (page 6–66).
8. Return the printer to normal operation (page 6–132).

1. CCB/Mech. Driver Ribbon Cable (P/N 57G1454)
2. Connector J6 (p/o item 6.)
3. Power Supply Cable (P/N 57G1455)
4. Connector J7 (p/o item 6.)
5. Ejection Lever (2) (p/o item 6.)
6. Mechanism Driver PCBA without PROMS (P/N 57G1446)
   (PROM Kit: IBM 6408–CT0—57G1426
   IBM 6408–A00—57G1419)
7. Card Cage (Ref)

NOTE: Power Supply and Common Controller boards shown for reference. They are not removed in this procedure.

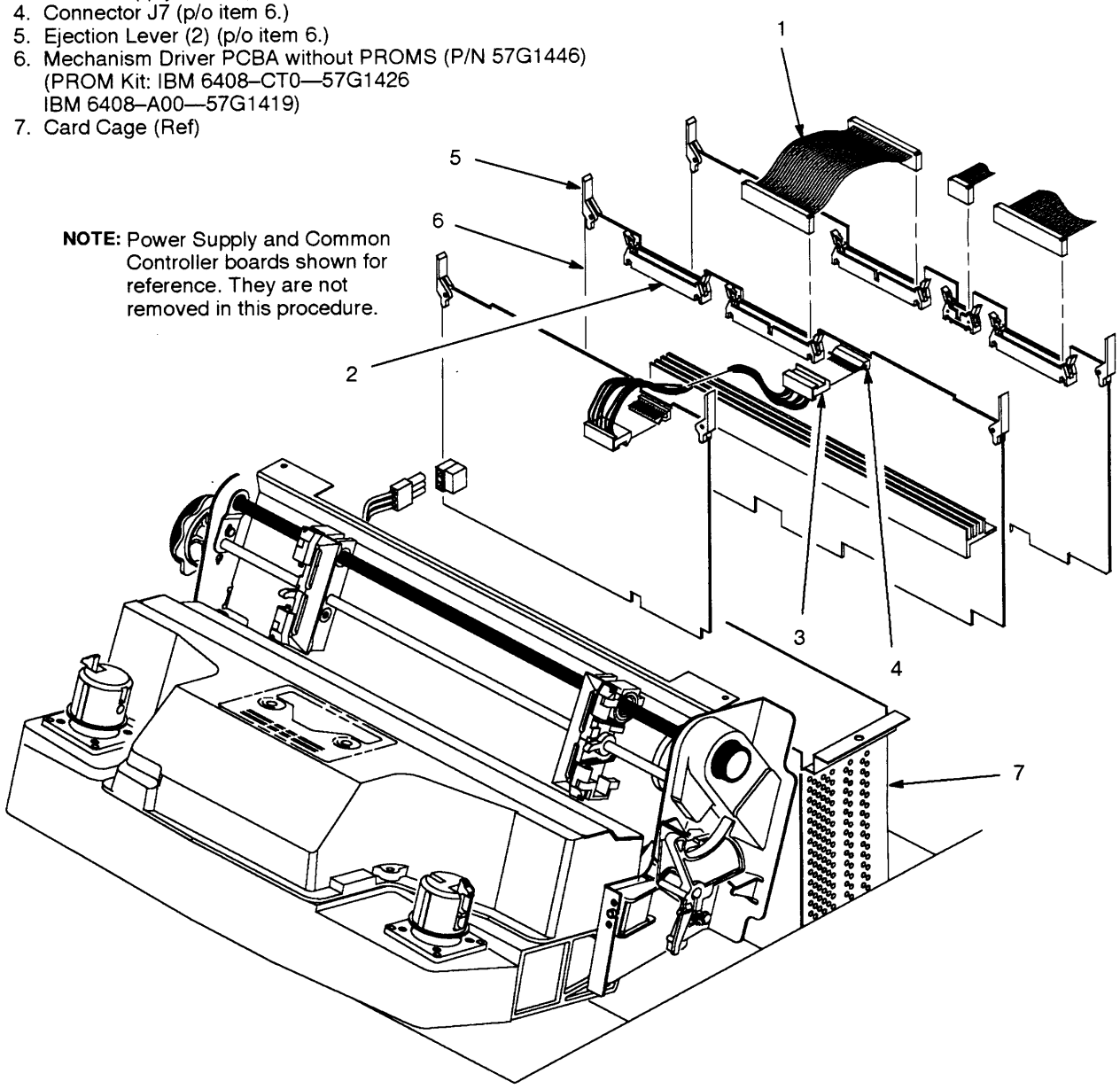


Figure 6–34. PCBA, Mechanism Driver, Removal/Installation

PCBA, Power Board, CT/IGP (Figure 6–35)

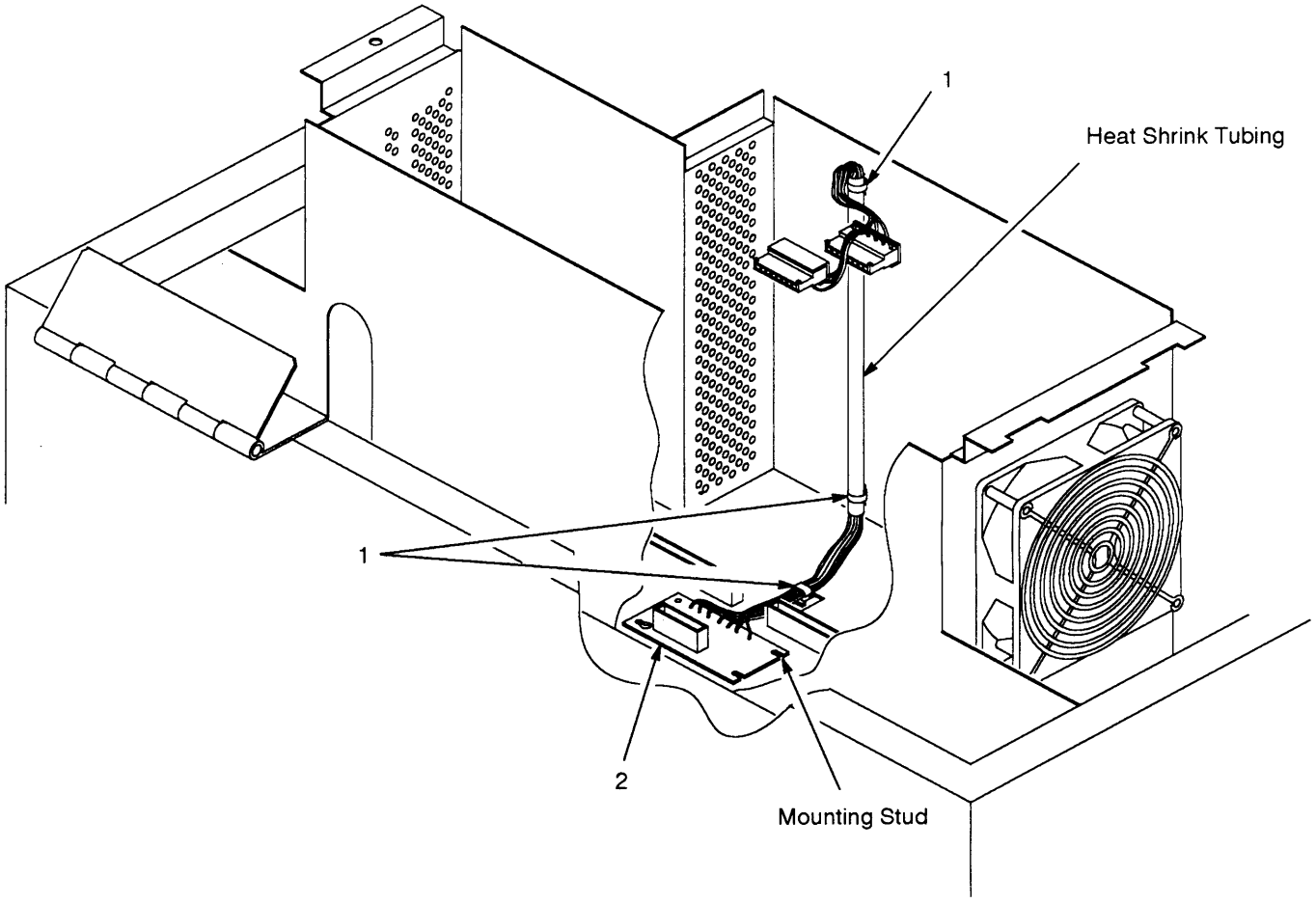
Removal

1. Remove the paper guide assembly (page 6–66).
2. Remove the common controller board (page 6–74).
3. Remove the mechanism driver board (page 6–88).
4. Remove the power supply board (page 6–92).
5. Remove the IGP board (page 6–78).
6. Cut the tie–wraps (1) securing the CT/IGP–2X0 power cable to the card cage floor and wall.
7. Slide the CT/IGP–2X0 power board (2) off the mounting studs (3) on the bottom of the card cage.
8. Remove the CT/IGP–2X0 power board (2) and cable.

Installation

1. Install the CT/IGP–2X0 power board (2) on the bottom of the card cage:
   a. Align the slots in the power board with the studs (3) on the bottom of the card cage. Slide the board into position on the studs so that the cable points toward the front of the printer.
   b. Install the screw securing the power board to the bottom of the card cage.
2. Tie–wrap the power board cable:
   a. Route the cable straight across the bottom of the card cage.
   b. Hold the cable vertical against the front edge of the card cage, remove the slack in the cable, and install the tie wraps (1). Make sure the heat–shrink tubing is under the tie wraps.
3. Install the IGP board (page 6–78).
4. Install the power supply board (page 6–92).

5. Install the mechanism driver board (page 6–88).
6. Install the common controller board (page 6–74).
7. Install the paper guide assembly (page 6–66).
8. Return the printer to normal operation (page 6–132).



1. Tie Wrap (3) (P/N 75X5972)
2. CT/IGP–2X0 Power Board (P/N 57G1435)
3. Mounting Stud (3) (Ref)

Figure 6–35. CT/IGP–2X0 Power Board, Removal/Installation

PCBA, Power Supply (Figure 6–36)

DANGER

To prevent injury from electric shock, wait at least one minute after shutting off power before removing the power supply board.

WARNING

Do not touch components or flex the board during removal/installation. Handle the board by the ejection levers and the sides. Wear a properly grounded static wrist strap when handling the power supply board.

Removal

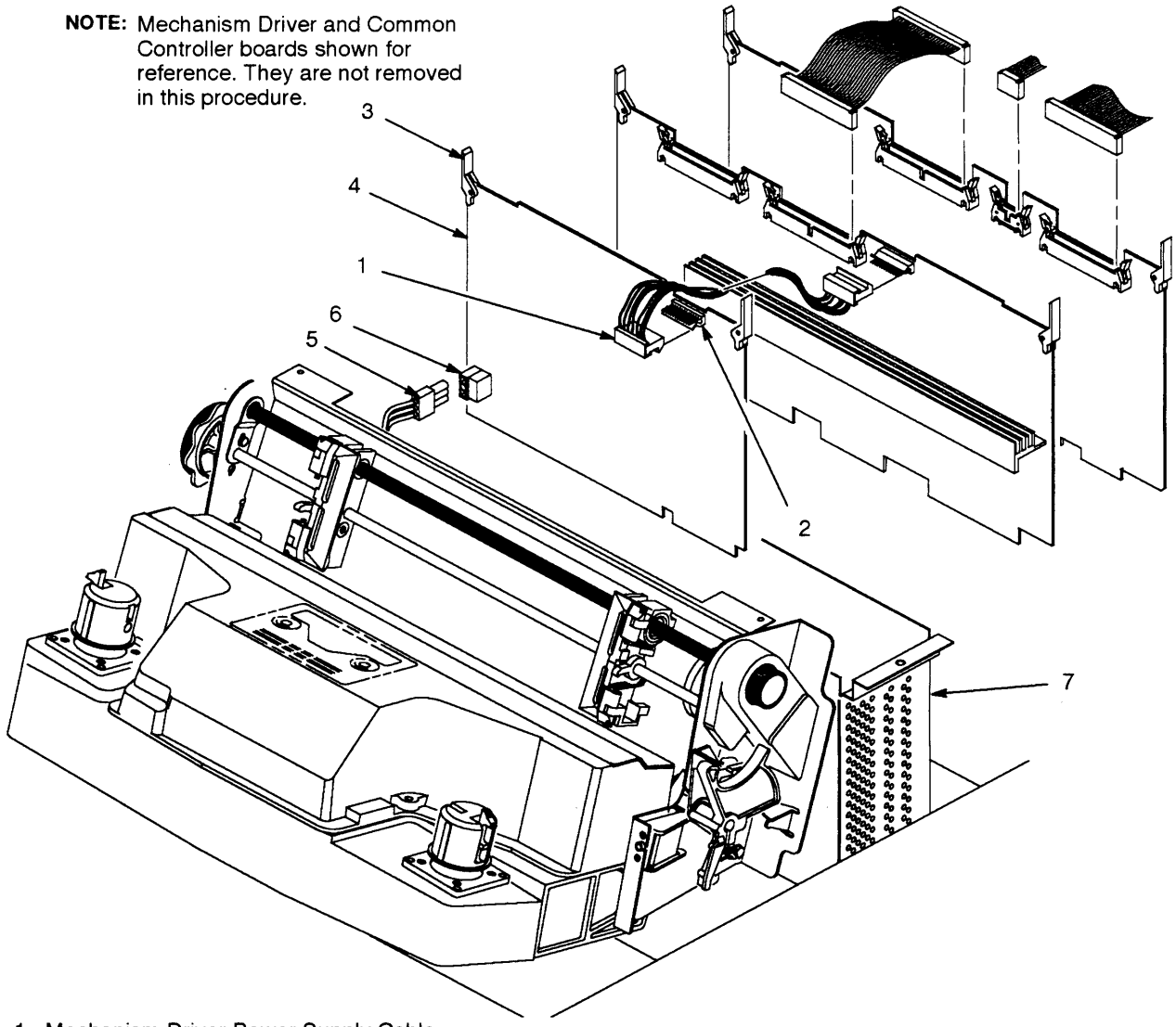
1. Prepare the printer for maintenance (page 6–3).
2. Open the printer cover.
3. Remove the paper guide assembly (page 6–66).
4. Disconnect the mechanism driver power supply cable (1) from connector J102 (2).
5. Lift the ejection levers (3).
6. Grasp the power supply PCBA (4) by the ejection levers and pull it up about four inches.
7. Disconnect the circuit breaker cable (5) from connector J1 (6).
8. Remove the power supply PCBA (4) from the card cage (7).

Installation

1. Connect the circuit breaker cable (5) to connector J1 (6).
2. Slide the power supply PCBA (4) into the card cage (7), engaging the card edge connector at the bottom of the card cage.
3. Lower the ejection levers (3) to the closed position.
4. Connect the mechanism driver power supply cable (1) to connector J102 (2). (Make sure to orient it properly to J102.)
5. Push the power supply PCBA (4) down into the edge connector.

6. Install the paper guide assembly (page 6–66).
7. Return the printer to normal operation (page 6–132).

NOTE: Mechanism Driver and Common Controller boards shown for reference. They are not removed in this procedure.



1. Mechanism Driver Power Supply Cable:
   (IBM 6408–A00 or 6408–CT0 with IGP, P/N 57G1435;
   IBM 6408–A00 without IGP, P/N 57G1455
   IBM 6408–CT0 without IGP, P/N 57G1412)
2. Connector J102 (p/o item 4.)
3. Ejection Lever (2) (p/o item 4.)
4. Power Supply PCBA (P/N 57G1437)
5. Circuit Breaker Cable (P/N 57G1456)
6. Connector J1 (p/o item 4.)
7. Card Cage (Ref)

Figure 6–36. PCBA, Power Supply, Removal/Installation

Platen (Figure 6–37)

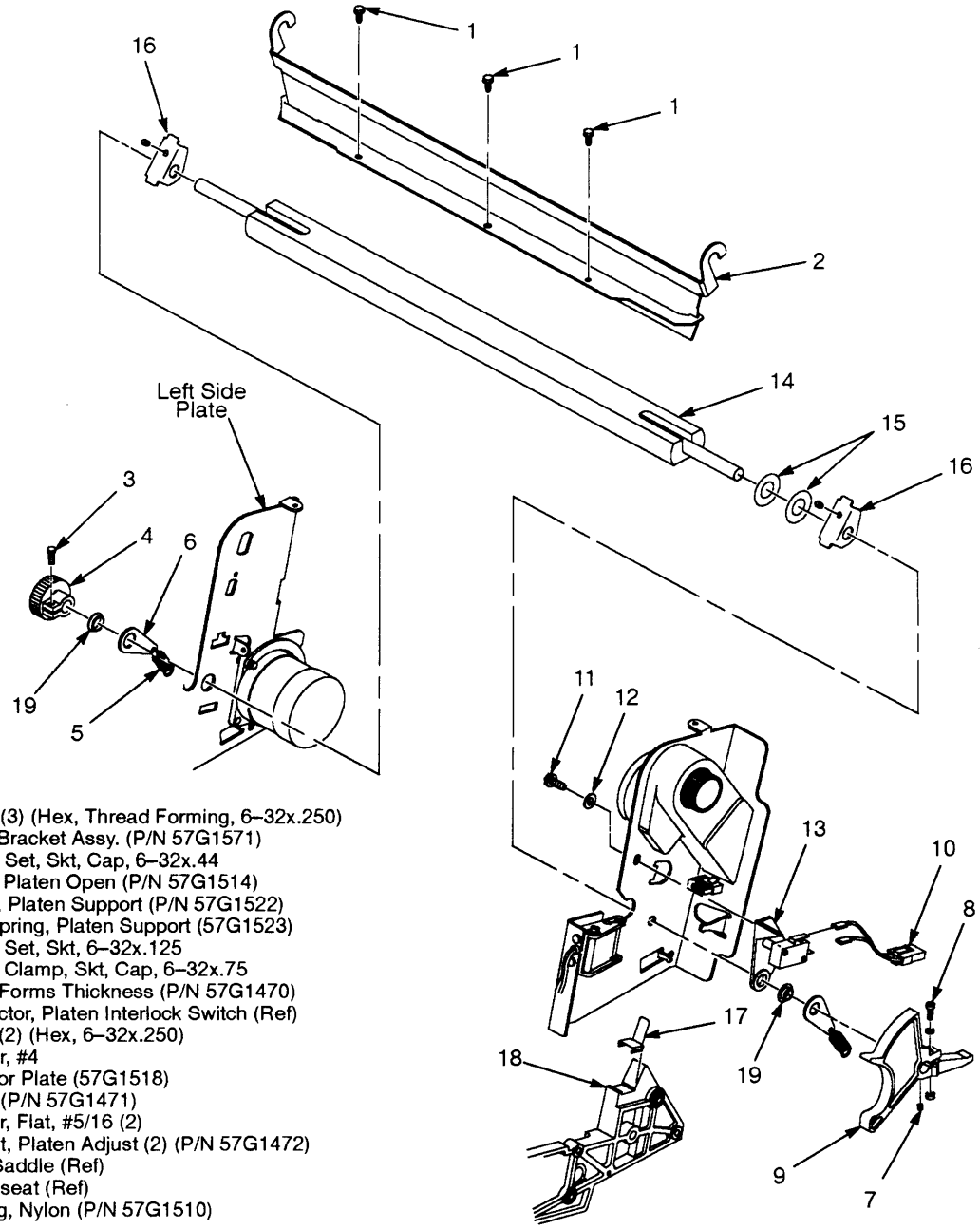
Removal

1. Prepare the printer for maintenance (page 6–3).
2. Remove the shuttle frame assembly (page 6–118).
3. Remove the paper ironer (page 6–68).
4. Remove the paper ironer bracket:
   a. Remove three screws (1).
   b. Lift the two–piece bracket (2) up and out of the printer.
5. Remove the platen open belt (page 6–6).
6. Remove the platen pulley:
   a. Loosen the collar clamp screw (3).
   b. Pull the platen pulley (4) off the platen shaft.
7. Remove the left side platen support spring:
   a. Disconnect the left platen support spring (5) from the spring hook on the side plate.
   b. Pull the spring link (6) and left platen support spring (5) off the platen shaft.
8. Remove the forms thickness lever:
   a. Loosen the set screw (7) and clamp screw (8).
   b. Pull the forms thickness lever (9) off the platen shaft—the lever may be hard to remove due to adhesive applied during factory assembly.
9. Remove the right side platen support spring by repeating step 7. on the right side of the platen.
10. Remove the forms thickness indicator plate:
    a. Disconnect the platen interlock switch connector (10) from the connector in the right side plate.

b. Remove screw (11) and washer (12).

c. Pull the indicator plate (13), with the interlock switch assembly attached, off the platen shaft.

11. Rotate the right side of the platen (14) toward the front of the printer and move the platen to the right and out of the left side plate.



1. Screw (3) (Hex, Thread Forming, 6–32x.250)
2. Ironer Bracket Assy. (P/N 57G1571)
3. Screw, Set, Skt, Cap, 6–32x.44
4. Pulley, Platen Open (P/N 57G1514)
5. Spring, Platen Support (P/N 57G1522)
6. Link, Spring, Platen Support (57G1523)
7. Screw, Set, Skt, 6–32x.125
8. Screw, Clamp, Skt, Cap, 6–32x.75
9. Lever, Forms Thickness (P/N 57G1470)
10. Connector, Platen Interlock Switch (Ref)
11. Screw (2) (Hex, 6–32x.250)
12. Washer, #4
13. Indicator Plate (57G1518)
14. Platen (P/N 57G1471)
15. Washer, Flat, #5/16 (2)
16. Bracket, Platen Adjust (2) (P/N 57G1472)
17. Wear Saddle (Ref)
18. Platen seat (Ref)
19. Bearing, Nylon (P/N 57G1510)

Figure 6–37. Platen, Removal

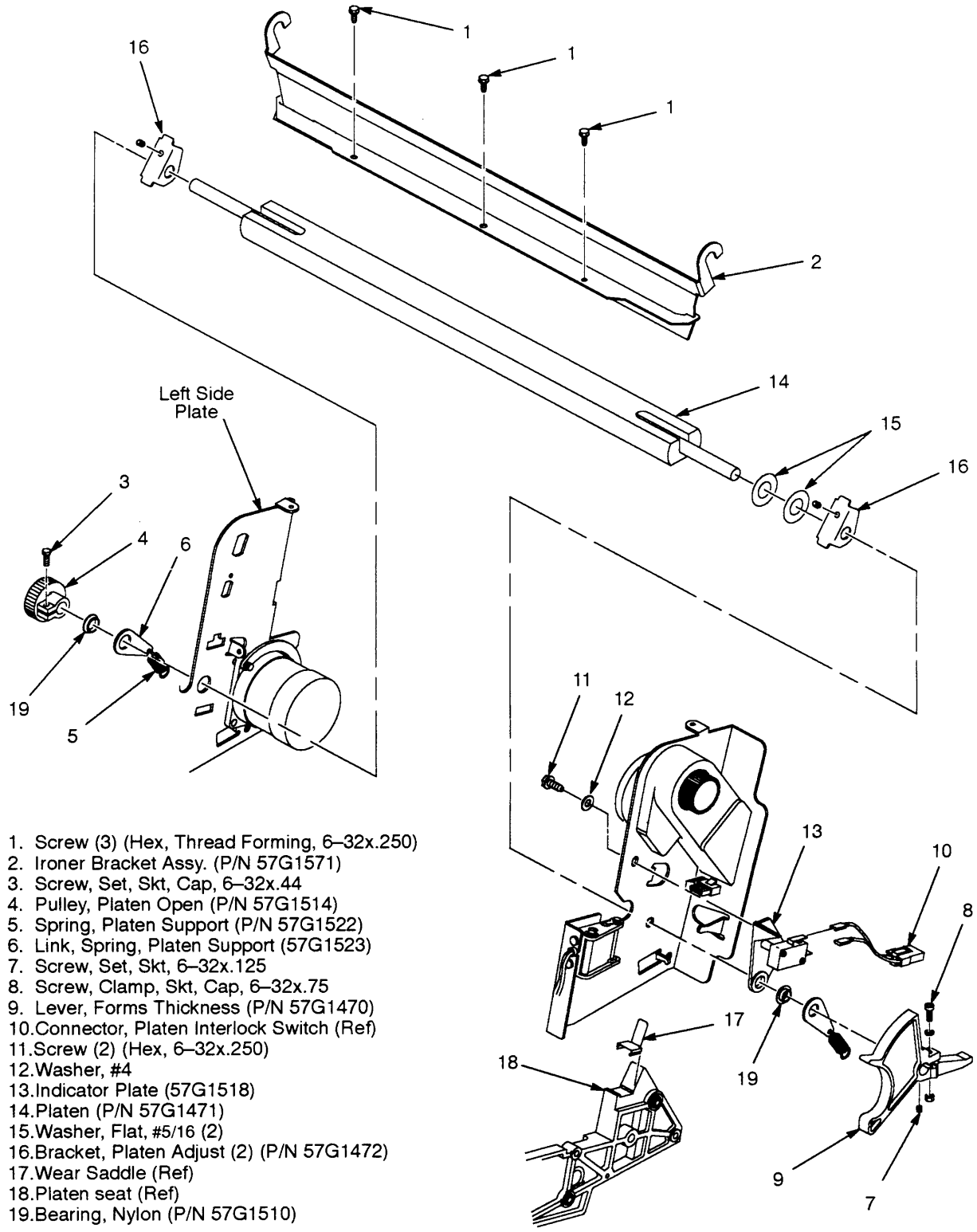
Installation

IMPORTANT

The dowel pins protruding from the ends of the platen are called the platen shafts, and are not equal in length. The platen must be installed with the longer shaft on the right side.

1. Install two washers (15) on the longer platen shaft.
2. Apply IBM #20 lubricant to both platen shafts and to the mating diameters of the platen adjustment brackets (16).
3. Install the platen adjustment brackets (16) onto the platen shafts with the set screws at the top of the brackets.
4. Make sure the two wear saddles (17) are set flush into the corners of the mechanism base platen seat (18).
5. Apply a layer of IBM #20 lubricant 1/4 inch high to the seat of each wear saddle (17), making the layer as wide as the saddle and touching the rear angled surface.
6. Insert the shorter platen shaft through the opening in the left side plate. Rotate the shaft into the opening in the right side plate and position the adjustment brackets (16) so the mechanism base platen seats are between the flanges of the brackets.
7. Install the forms thickness indicator plate:
   a. Slide the indicator plate (13), with the interlock switch assembly attached, onto the platen shaft and up against the right side plate.
   b. Install the washer (12) and screw (11).
   c. Connect the platen interlock switch connector (10) to the connector in the right side plate.
8. Apply IBM #20 lubricant to the two platen shafts:
   a. On the left side, between the end of the platen and the platen adjustment bracket (16).
   b. On the right end, between the two washers (15).

▶ *Platen installation continued on page 6–98.*



1. Screw (3) (Hex, Thread Forming, 6–32x.250)
2. Ironer Bracket Assy. (P/N 57G1571)
3. Screw, Set, Skt, Cap, 6–32x.44
4. Pulley, Platen Open (P/N 57G1514)
5. Spring, Platen Support (P/N 57G1522)
6. Link, Spring, Platen Support (57G1523)
7. Screw, Set, Skt, 6–32x.125
8. Screw, Clamp, Skt, Cap, 6–32x.75
9. Lever, Forms Thickness (P/N 57G1470)
10. Connector, Platen Interlock Switch (Ref)
11. Screw (2) (Hex, 6–32x.250)
12. Washer, #4
13. Indicator Plate (57G1518)
14. Platen (P/N 57G1471)
15. Washer, Flat, #5/16 (2)
16. Bracket, Platen Adjust (2) (P/N 57G1472)
17. Wear Saddle (Ref)
18. Platen seat (Ref)
19. Bearing, Nylon (P/N 57G1510)

Figure 6–37. Platen, Installation

Installation (continued)

9. Apply IBM #20 lubricant to the nylon bearings (19) in the two spring links, slide the spring links onto the two platen shafts, and connect the springs to the spring hooks in the side plates.

10. Install the forms thickness lever (9) onto the right side platen shaft and adjust the platen angle (page 5–12).

11. Install the platen pulley so that it is aligned with the platen open motor pulley (page 5–8).

12. Install, but do not adjust, the platen open belt (page 6–6).

13. Install the paper ironer bracket (2):

    a. With the flat piece of the bracket facing the front of the printer, place the two hooks of the upper piece over the platen shafts. The left hook goes between the left platen adjustment bracket and the platen. The right hook goes between the two washers to the left of the right platen adjustment bracket.

    b. Install and torque three screws (1) to 20 ± 2 inch–pounds (2.26 ± 0.23 N•m).

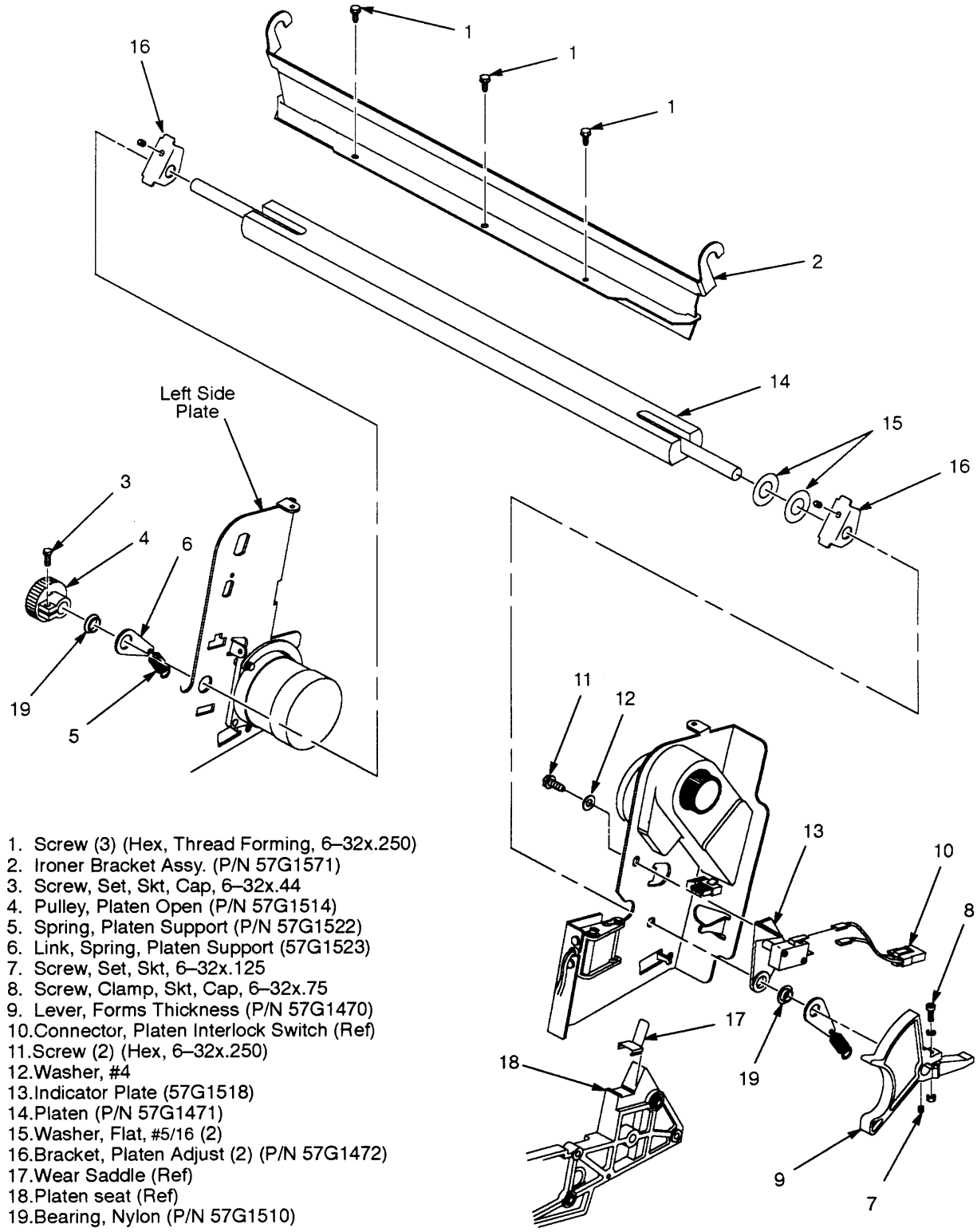
14. Install the paper ironer (page 6–68).

15. Install the shuttle frame assembly (page 6–118).

16. Adjust the platen gap (page 5–14).

17. Adjust the platen open belt (page 5–6).

18. Return the printer to normal operation (page 6–132).



1. Screw (3) (Hex, Thread Forming, 6–32x.250)
2. Ironer Bracket Assy. (P/N 57G1571)
3. Screw, Set, Skt, Cap, 6–32x.44
4. Pulley, Platen Open (P/N 57G1514)
5. Spring, Platen Support (P/N 57G1522)
6. Link, Spring, Platen Support (57G1523)
7. Screw, Set, Skt, 6–32x.125
8. Screw, Clamp, Skt, Cap, 6–32x.75
9. Lever, Forms Thickness (P/N 57G1470)
10. Connector, Platen Interlock Switch (Ref)
11. Screw (2) (Hex, 6–32x.250)
12. Washer, #4
13. Indicator Plate (57G1518)
14. Platen (P/N 57G1471)
15. Washer, Flat, #5/16 (2)
16. Bracket, Platen Adjust (2) (P/N 57G1472)
17. Wear Saddle (Ref)
18. Platen seat (Ref)
19. Bearing, Nylon (P/N 57G1510)

Figure 6–37. Platen, Installation

PROMs and Chips on the CCB (Figure 6–38)

WARNING

To prevent electrostatic damage to electronic components, wear a properly grounded static wrist strap when handling PCBAs and components.

Removal

1. Make a configuration printout. (Refer to the *Setup Guide.*)
2. Prepare the printer for maintenance (page 6–3).
3. Remove the common controller PCBA (page 6–74).
4. Using a chip puller, remove the defective chip(s). Locations are shown in Figure 6–38.

Installation

WARNING

To prevent electrostatic damage to electronic components, wear a properly grounded static wrist strap when handling PCBAs and components.

1. Using a chip installation tool, install chip(s). Locations are shown in Figure 6–38.
2. Install the common controller PCBA (page 6–74).
3. If you changed DPU or font PROMs, adjust hammer phasing (page 5–25).
4. Return the printer to normal operation (page 6–132).
5. Using the configuration printout you made as step 1 of the removal procedure, reset and save the printer configuration. (Refer to the *Setup Guide.*)

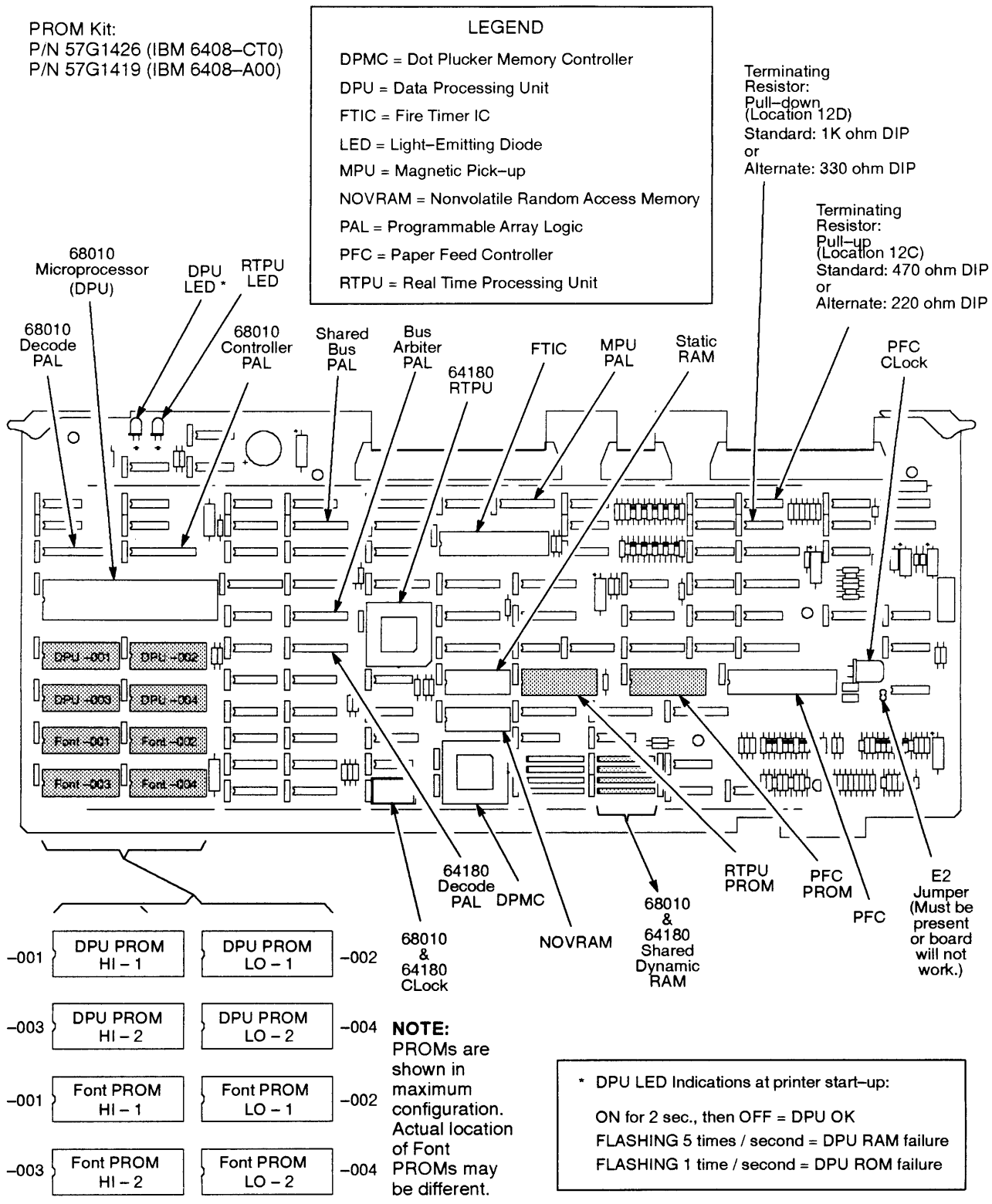


Figure 6–38. PROMs and Chips on the CCB

PROMs and Chips on the Mechanism Driver (Figure 6–39)

Removal

1. Prepare the printer for maintenance (page 6–3).
2. Remove the mechanism driver PCBA (page 6–88).

WARNING

To prevent electrostatic damage to electronic components, wear a properly grounded static wrist strap when handling PCBAs and components.

3. Using a chip puller, remove the defective chip(s). Locations are shown in Figure 6–39.

Installation

WARNING

To prevent electrostatic damage to electronic components, wear a properly grounded static wrist strap when handling PCBAs and components.

1. Using a chip installation tool, install chip(s). Locations are shown in Figure 6–39.
2. Install the mechanism driver PCBA (page 6–88).
3. If you changed DPU or font PROMs, adjust hammer phasing (page 5–25).
4. Return the printer to normal operation (page 6–132).

LEGEND

RSP = Ribbon/Shuttle Processor

ASIC = Application–Specific Integrated Circuit

* RSP PROM is oriented 180 degrees opposite other ICs.
RSP included in PROM kit:
P/N 57G1426 (IBM 6408–CT0)
P/N 57G1419 (IBM 6408–A00)

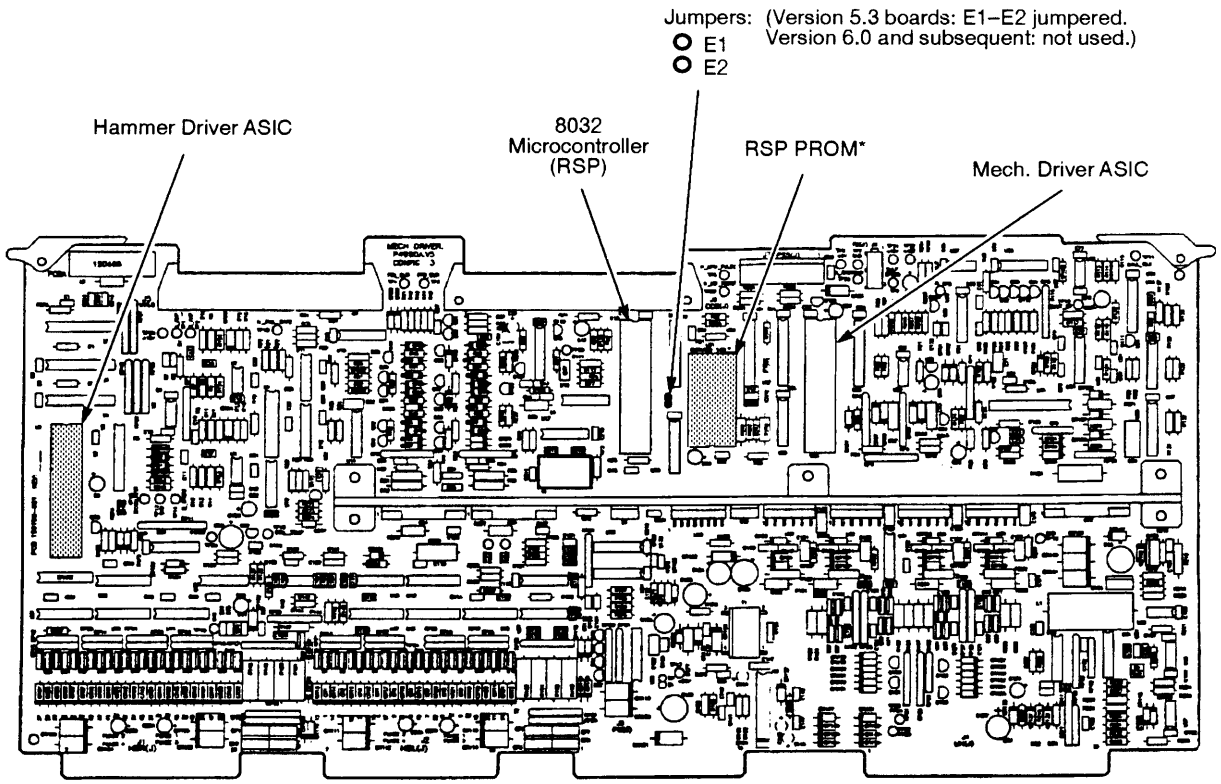


Figure 6–39. PROMs and Chips on the Mechanism Driver

PROMs and Chips on the CT Board (Figure 6–40)

Removal

1. Prepare the printer for maintenance (page 6–3).
2. Remove the Coax/Twinax Integrated Interface (CT) PCBA (page 6–72).

WARNING

To prevent electrostatic damage to electronic components, wear a properly grounded static wrist strap when handling PCBAs and components.

3. Using a chip puller, remove the defective chip(s). Locations are shown in Figure 6–40.

Installation

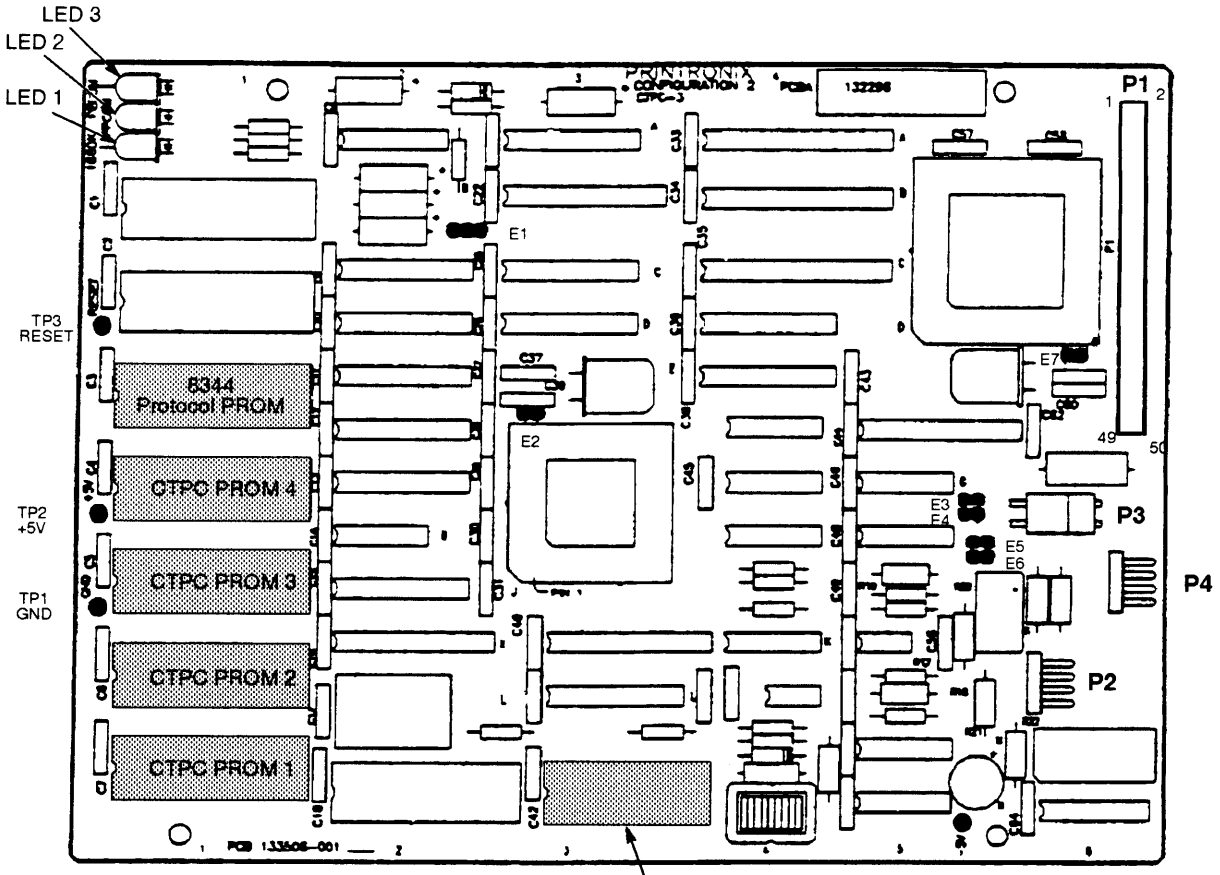
WARNING

To prevent electrostatic damage to electronic components, wear a properly grounded static wrist strap when handling PCBAs and components.

1. Using a chip installation tool, install chip(s). Locations are shown in Figure 6–40.
2. Install the Coax/Twinax Integrated Interface (CT) PCBA (page 6–72).
3. If you changed DPU or font PROMs, adjust hammer phasing (page 5–25).
4. Return the printer to normal operation (page 6–132).

LEGEND

LED = Light Emitting Diode
NVRAM = Nonvolatile Memory
PROM = Programmable Read–Only Memory



Jumper Table

E1	SHOULD BE SET AS ○ ●–●
E2	80C186 CLOCK ENABLE
E3	NOT USED (RESERVED FOR FACTORY USE)
E4	NOT USED (RESERVED FOR FACTORY USE)
E5	NOT USED (RESERVED FOR FACTORY USE)
E6	NOT USED (RESERVED FOR FACTORY USE)
E7	8344 CLOCK ENABLE

PROM Kit:
P/N 57G1426 (IBM 6408–CT0)

Figure 6–40. PROMs and Chips on the CT Board

PROMs and Chips on the IGP–2X0 Board (Figure 6–41)

Removal

1. Prepare the printer for maintenance (page 6–3).
2. Remove the Intelligent Graphics Processor (IGP) PCBA (page 6–78).

WARNING

To prevent electrostatic damage to electronic components, wear a properly grounded static wrist strap when handling PCBAs and components.

3. Using a chip puller, remove the defective chip(s). Locations are shown in Figure 6–41.

Installation

WARNING

To prevent electrostatic damage to electronic components, wear a properly grounded static wrist strap when handling PCBAs and components.

1. Using a chip installation tool, install chip(s). Locations are shown in Figure 6–41.
2. Install the Intelligent Graphics Processor (IGP) PCBA (page 6–78).
3. Refer to IGP documentation for configuration requirements.
4. Return the printer to normal operation (page 6–132).

PROM Kit:
IGP–200: P/N 57G1413
IGP–210 (Code V): P/N 57G1415

Field Kit:
IGP–200: P/N 57G1500
IGP–210 (Code V): P/N 57G1497

LEGEND

PROM = Programmable Read–Only Memory

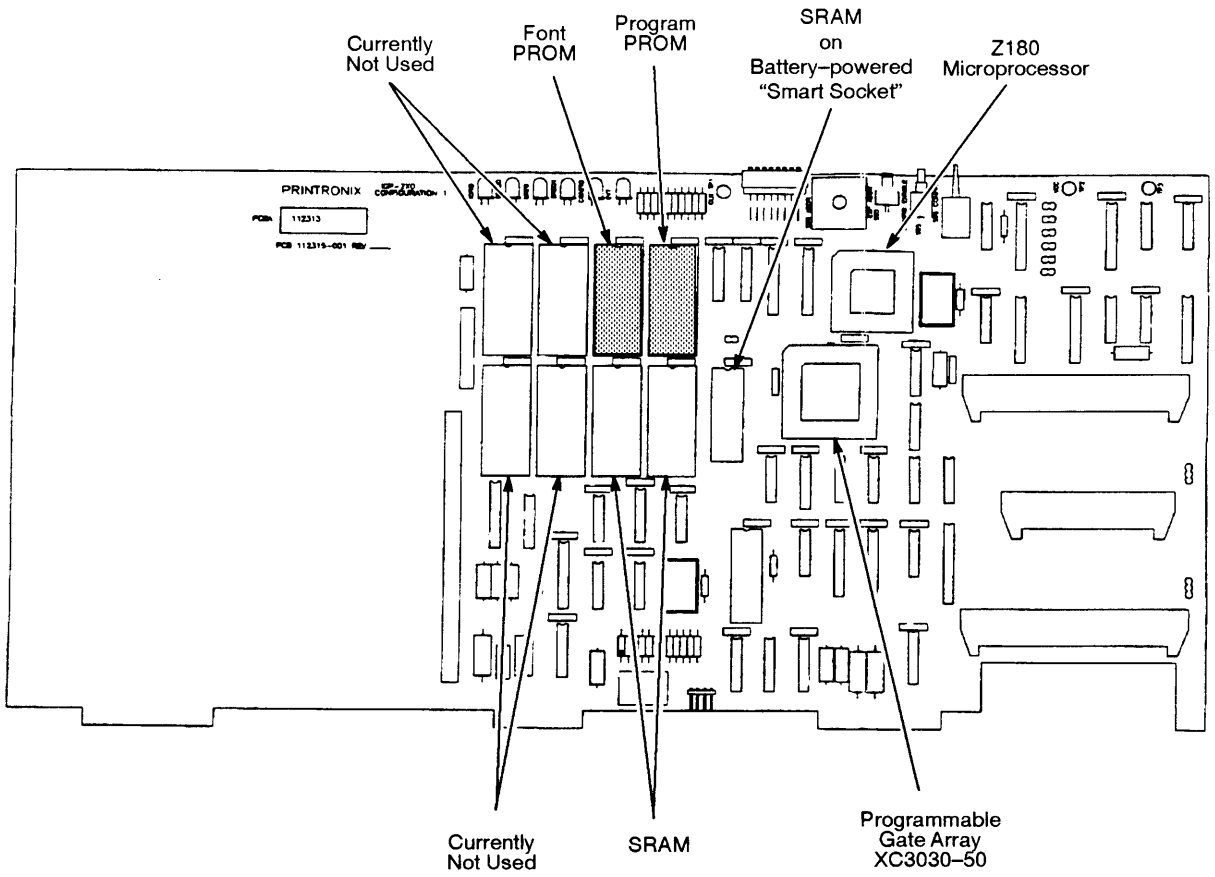


Figure 6–41. PROMs and Chips on the IGP–2X0 Board

Resistors, Terminating (Figure 6–42)

For parallel interface configurations, the printer is equipped with 470 ohm pull–up terminating resistors, located at 12C on the Common Controller PCBA and 1K ohm pull–down terminating resistors at location 12D. These are suitable for most applications.

If the standard terminating resistor pack is not compatible with the particular interface driver requirements of the host computer, other values of pull–up and pull–down resistors may be required. The 220 ohm pull–up and 330 ohm pull–down alternate terminating resistors are provided with the printer. If you install the 220 ohm pull–up resistor, you must also install the 330 ohm pull–down resistor. Possible terminating resistor combinations are shown below.

Pull–up at 12C	470 ohm	220 ohm	1K ohm
Pull–down at 12D	1K ohm	330 ohm	none

Removal

WARNING

To prevent electrostatic damage to electronic components, wear a properly grounded static wrist strap when handling PCBAs and components.

1. Prepare the printer for maintenance (page 6–3).
2. Remove the Common Controller PCBA (page 6–74).
3. Locate the terminating resistor packs (see Figure 6–42).
4. Using a chip puller, remove the packs.

Installation

WARNING

To prevent electrostatic damage to electronic components, wear a properly grounded static wrist strap when handling PCBAs and components.

1. Using a chip installation tool, install the resistor packs in the correct socket (see Figure 6–42).

2. Install the Common Controller PCBA (page 6–74).

3. Return the printer to normal operation (page 6–132).

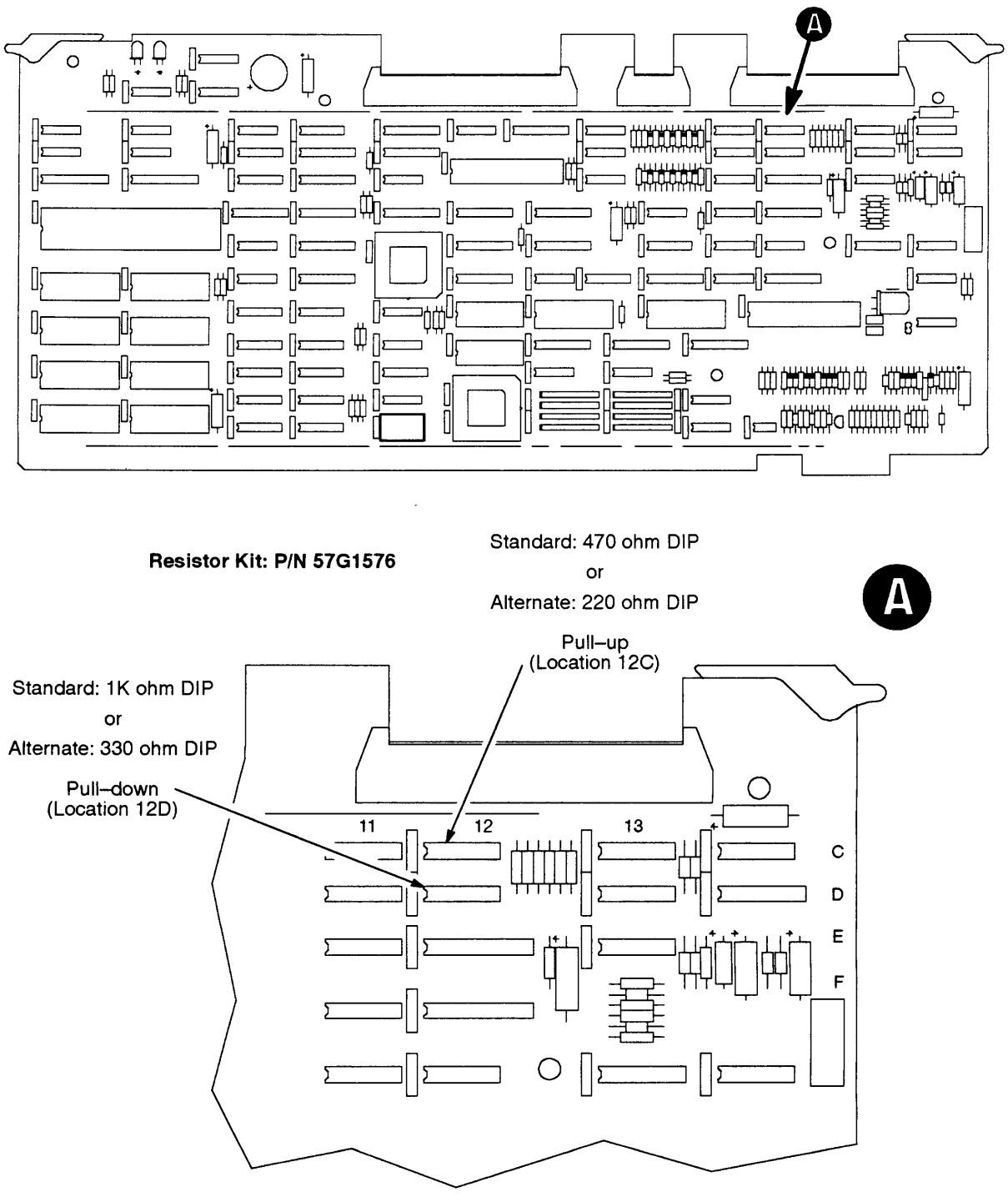


Figure 6–42. Resistors, Terminating, Removal/Installation

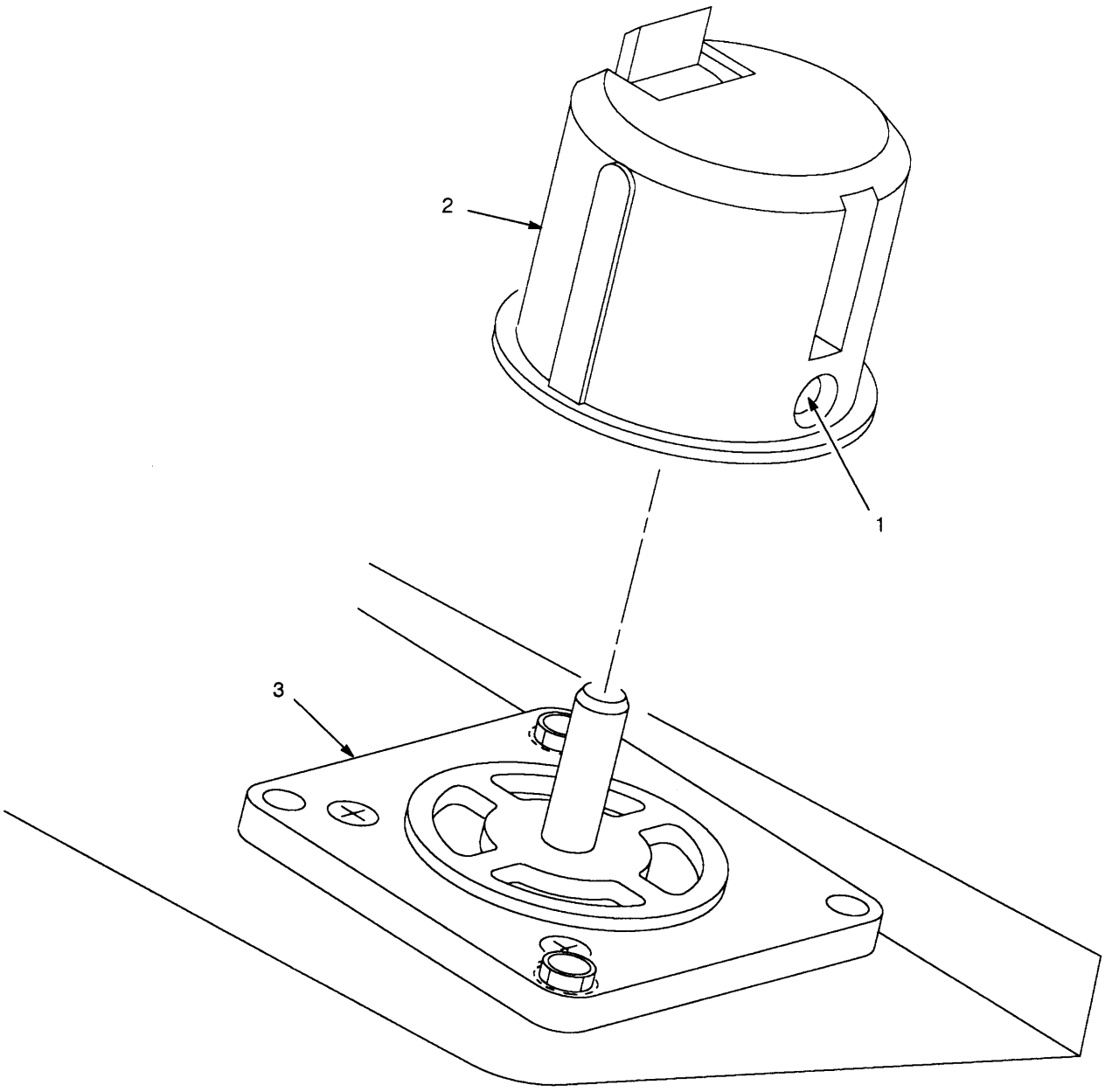
Ribbon Hub (Figure 6–43)

Removal

1. Prepare the printer for maintenance (page 6–3).
2. Remove the printer ribbon.
3. Loosen the screw (1) in the ribbon spool hub (2).
4. Remove the hub (2) from the shaft of the ribbon drive motor (3).

Installation

1. Install the ribbon spool hub (2) over the motor shaft.
2. Tighten the hub screw (1) so that it contacts the flat section of the motor shaft.
3. Return the printer to normal operation (page 6–132).



1. Hub Screw (6–19x.50) (p/o item 2)
2. Ribbon Spool Hub Kit (P/N 57G1479)
3. Ribbon Drive Motor (P/N 57G1463)

Figure 6–43. Ribbon Hub Removal/Installation

Ribbon Guide Assembly (L/R) (Figure 6–44)

Removal

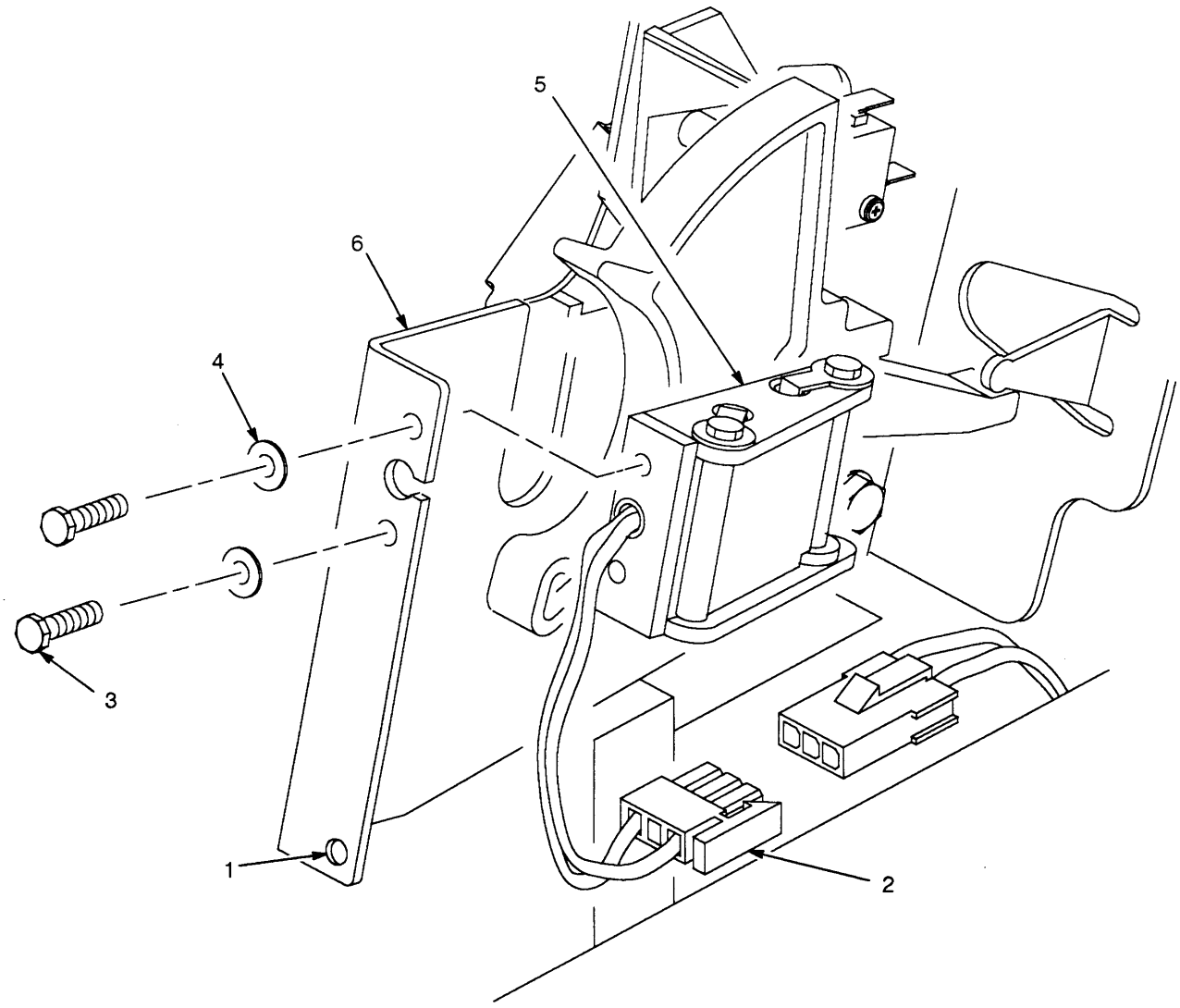
NOTE: The right ribbon guide is shown in Figure 6–44. The removal procedure is the same for the left ribbon guide.

1. Prepare the printer for maintenance (page 6–3).
2. Open the printer cover.
3. Remove the printer ribbon.
4. Cut the tie–wrap and remove it from the tie wrap hole (1) to free the ribbon guide cable.
5. Disconnect the ribbon guide connector (2).
6. Remove the two screws (3) and washers (4).
7. Slide the ribbon guide assembly (5) out of the side plate (6).

Installation

NOTE: The right ribbon guide is shown in Figure 6–44. The installation procedure is the same for the left ribbon guide.

1. Slide the ribbon guide assembly (5) into the side plate (6).
2. Install two screws (3) and washers (4).
3. Connect the ribbon guide connector (2).
4. Tie–wrap the cable to the tie wrap hole (1).
5. Align the ribbon guides (page 5–18).
6. Return the printer to normal operation (page 6–132).



1. Tie Wrap, 5.75 inch (P/N 75X5972)
2. Ribbon Guide Connector (p/o item 5)
3. Screw (2) (Hex, w/Lock Washer, 4–40x.38)
4. Washer (2) (Flat #4)
5. Ribbon Guide Assembly, Right (P/N 57G1450)
   Ribbon Guide Assembly, Left (P/N 57G1449)
6. Side Plate (Ref)

Figure 6–44. Ribbon Guide Assembly (L/R), Removal/Installation

Shaft, Splined (Figure 6–45)

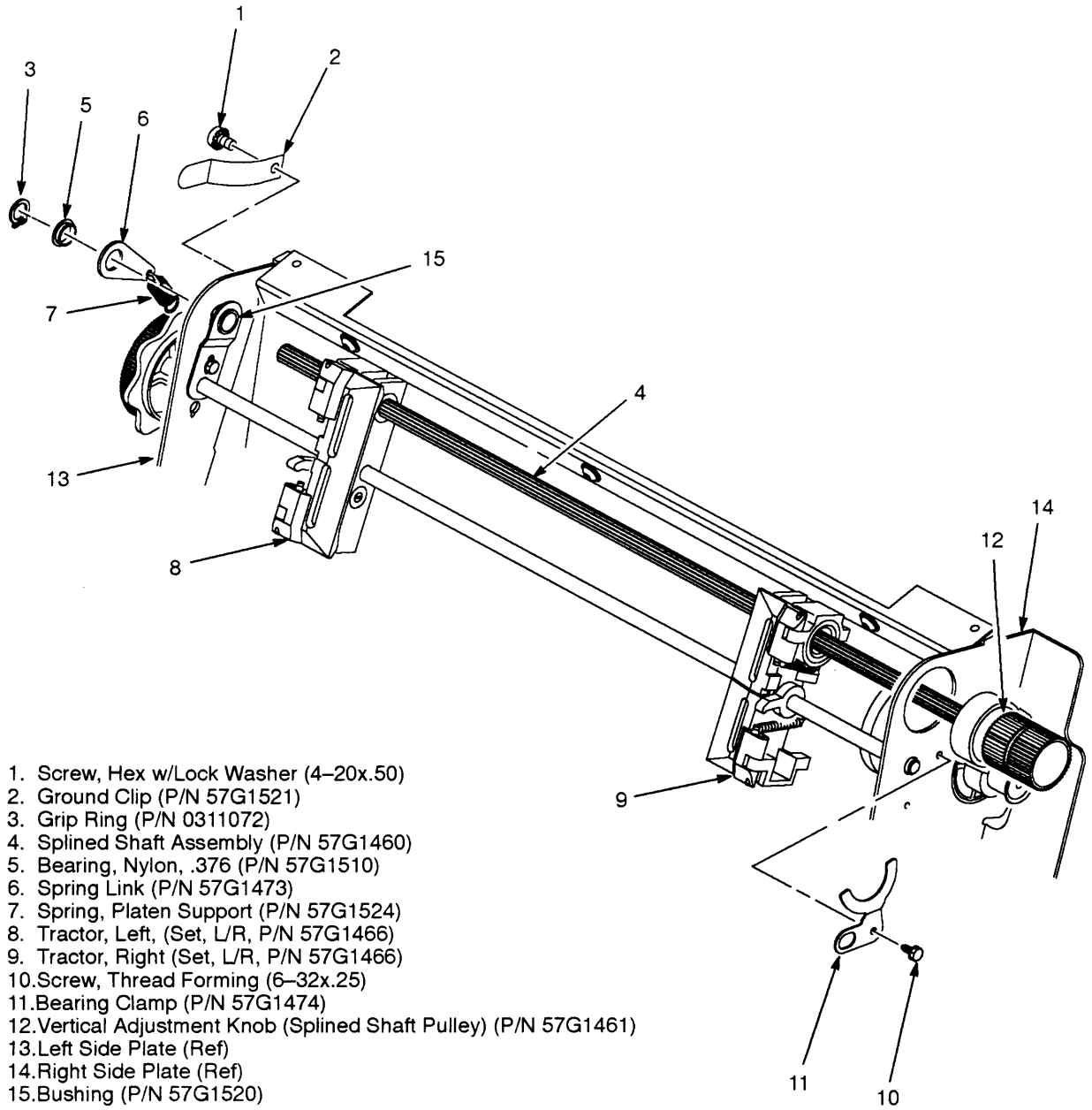
Removal

1. Prepare the printer for maintenance (page 6–3).
2. Open the printer cover.
3. Remove the paper feed timing belt (page 6–4).
4. Remove the screw (1) and ground clip (2).
5. With grip ring pliers, remove the grip ring (3) from the splined shaft (4).
6. Pull the bearing (5) and spring link (6) with the spring (7) off the splined shaft (4).
7. Unlock the left and right tractors (8 and 9) and slide them to the center.
8. Remove the screw (10) and bearing clamp (11).
9. Grasping the vertical adjustment knob (12), slide the splined shaft (4) out of the left and right side plates (13 and 14) and the tractors (8 and 9).

Installation

1. Open the doors on the left and right tractors (8 and 9). Position the tractor belts so the alignment marks are at the top on both tractors.
2. Grasp the vertical adjustment knob (12) and slide the splined shaft (4) through the right side plate (14), tractors (8 and 9), and the left side plate (13). Make sure the same spline passes the marked groove on each tractor.
3. Install the bearing clamp (11) and screw (10).
4. Apply a thin film of IBM #20 lubricant to the bearing (5).
5. Slide the spring link (6) and bearing (5) onto the splined shaft (4).
6. Attach the spring (7) to the left side plate (13) and the spring link (6).
7. Install the grip ring (3) on the splined shaft (4) with 0.010 inches of clearance between the grip ring and the nylon bearing (5).

8. Install the ground clip (2) and screw (1).
9. Install the paper feed timing belt (page 6–4).
10. Set the paper feed timing belt tension (page 5–4).
11. Adjust splined shaft skew (page 5–20.)
12. Return the printer to normal operation (page 6–132).



1. Screw, Hex w/Lock Washer (4–20x.50)
2. Ground Clip (P/N 57G1521)
3. Grip Ring (P/N 0311072)
4. Splined Shaft Assembly (P/N 57G1460)
5. Bearing, Nylon, .376 (P/N 57G1510)
6. Spring Link (P/N 57G1473)
7. Spring, Platen Support (P/N 57G1524)
8. Tractor, Left, (Set, L/R, P/N 57G1466)
9. Tractor, Right (Set, L/R, P/N 57G1466)
10. Screw, Thread Forming (6–32x.25)
11. Bearing Clamp (P/N 57G1474)
12. Vertical Adjustment Knob (Splined Shaft Pulley) (P/N 57G1461)
13. Left Side Plate (Ref)
14. Right Side Plate (Ref)
15. Bushing (P/N 57G1520)

Figure 6–45. Shaft, Splined, Removal/Installation

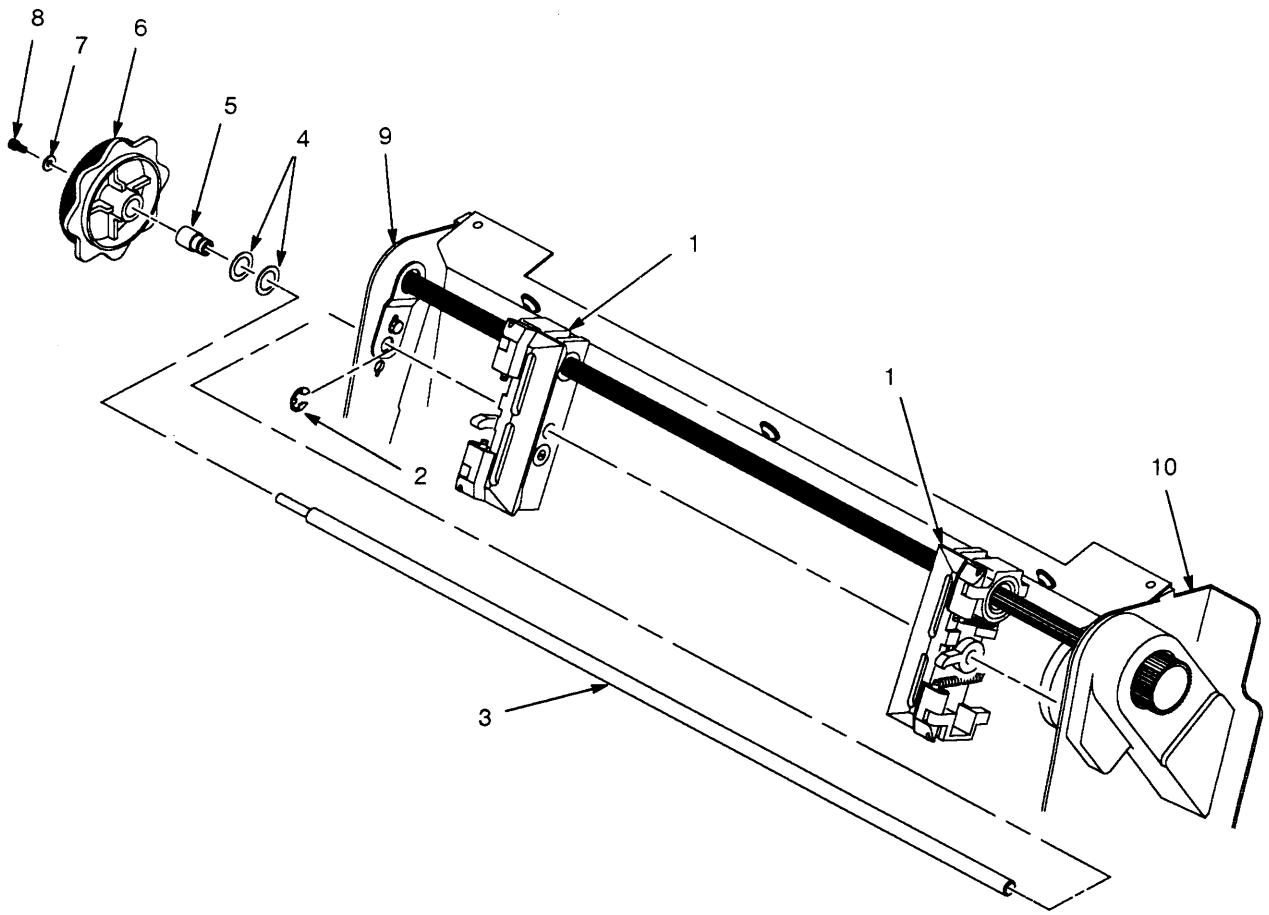
Shaft, Support (Figure 6–46)

Removal

1. Prepare the printer for maintenance (page 6–3).
2. Open the printer cover.
3. Unlock the tractors (1) and slide them to the far right.
4. Remove the E ring (2).
5. Slide the support shaft assembly — consisting of the support shaft (3), two curved washers (4), bushing (5), horizontal adjustment knob (6), washer (7) and screw (8) — to the left, out of the tractors (1) and the left side plate (9).

Installation

1. Slide the support shaft assembly — consisting of the support shaft (3), two curved washers (4), bushing (5), horizontal adjustment knob (6), washer (7), and screw (8) — into the left side plate (9).
2. Slide the tractors (1) onto the support shaft (3).
3. Slide the support shaft assembly through the right side plate (10).
4. While pushing on the knob to compress the curved washers, install the E ring (2) in the groove on the bushing (5).
5. Return the printer to normal operation (page 6–132).



1. Tractor (2) (Set, L/R, P/N 57G1466)
2. E Ring (P/N 0264641)
3. Support Shaft (P/N 57G1519)
4. Curved Washer (2) (P/N 57G1516)
5. Bushing (P/N 57G1520)
6. Horizontal Adjustment Knob (P/N 57G1517)
7. Washer (Flat #4)
8. Screw (Skt cap, 4–40x.25)
9. Left Side Plate (Ref)
10. Right Side Plate (Ref)

Figure 6–46. Shaft, Support, Removal/Installation

Shuttle Frame Assembly (Figure 6–47)

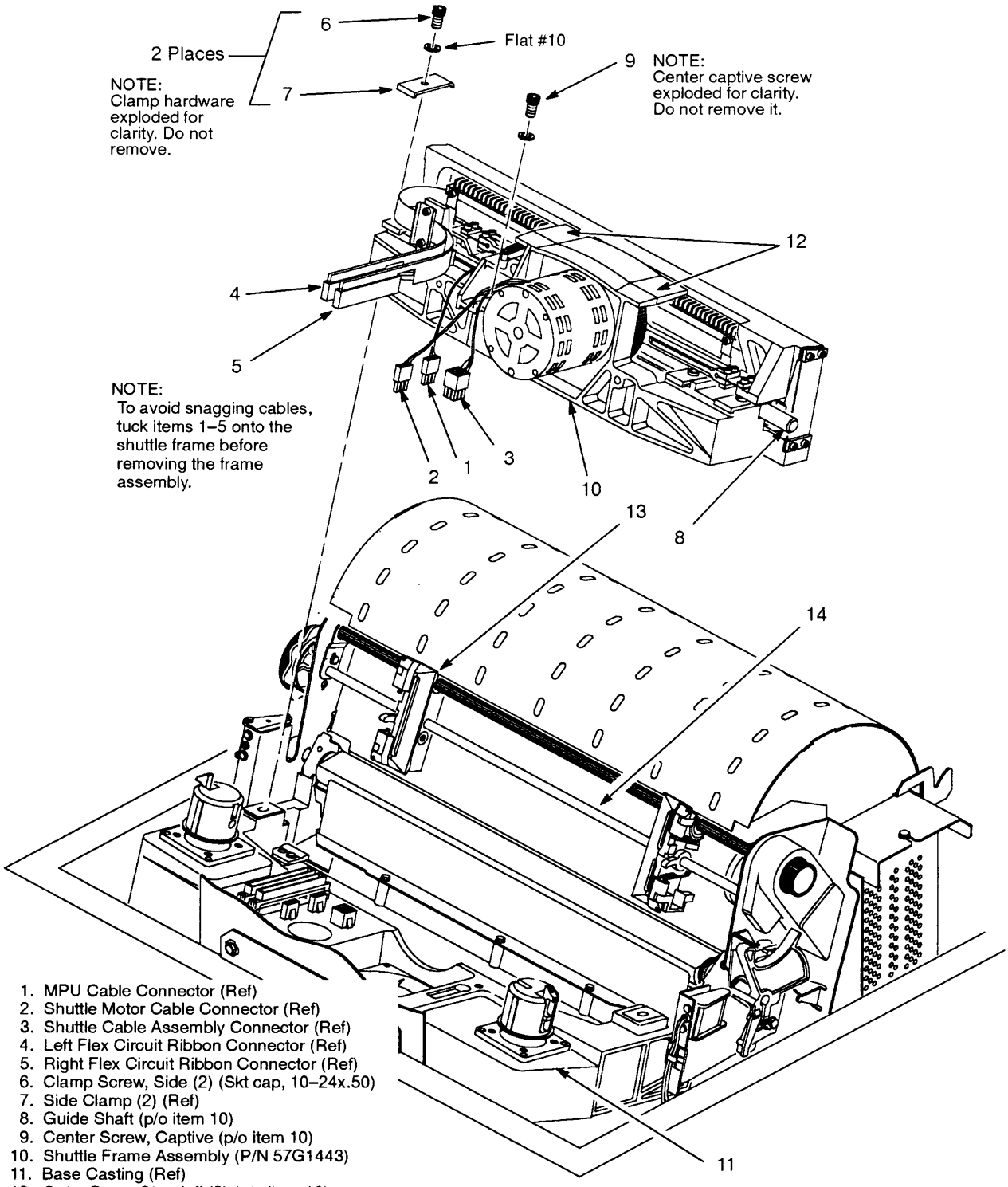
Removal

1. Prepare the printer for maintenance (page 6–3).
2. Remove the shuttle cover assembly (page 6–42).
3. Disconnect the MPU cable connector (1).
4. Disconnect the shuttle motor cable connector (2).
5. Disconnect the shuttle cable assembly connector (3).

WARNING

The hammer bank flex circuit ribbon cables can tear if handled roughly. Do not pull on the cables; grasp the connectors to disconnect the flex circuit ribbon cables. In the next step, disconnect the left and right flex ribbon connectors gently, and do not bend the cables unnecessarily.

6. Disconnect the left and right hammer bank flex circuit ribbon connectors (4 and 5).
7. Loosen the side 5/32 inch socket head clamp screws (6) and pull the clamps (7) back and off the guide shaft (8). Do not remove the clamps.
8. Loosen the center 5/32 inch socket head screw (9) enough to release the shuttle frame assembly (10) from the base casting (11).
9. Unlock and slide the tractors (13) outward as far as they will go on the tractor support shaft (14).
10. Grasping the outer beam standoffs (12), lift the shuttle frame assembly (10) out of the base casting (11). Lift it slowly and carefully: the shuttle frame assembly is heavy.



1. MPU Cable Connector (Ref)
2. Shuttle Motor Cable Connector (Ref)
3. Shuttle Cable Assembly Connector (Ref)
4. Left Flex Circuit Ribbon Connector (Ref)
5. Right Flex Circuit Ribbon Connector (Ref)
6. Clamp Screw, Side (2) (Skt cap, 10–24x.50)
7. Side Clamp (2) (Ref)
8. Guide Shaft (p/o item 10)
9. Center Screw, Captive (p/o item 10)
10. Shuttle Frame Assembly (P/N 57G1443)
11. Base Casting (Ref)
12. Outer Beam Standoff (2) (p/o item 10)
13. Tractor (2) (Set, L/R, P/N 57G1466)
14. Tractor Support Shaft (P/N 57G1519)

Figure 6–47. Shuttle Frame Assembly, Removal

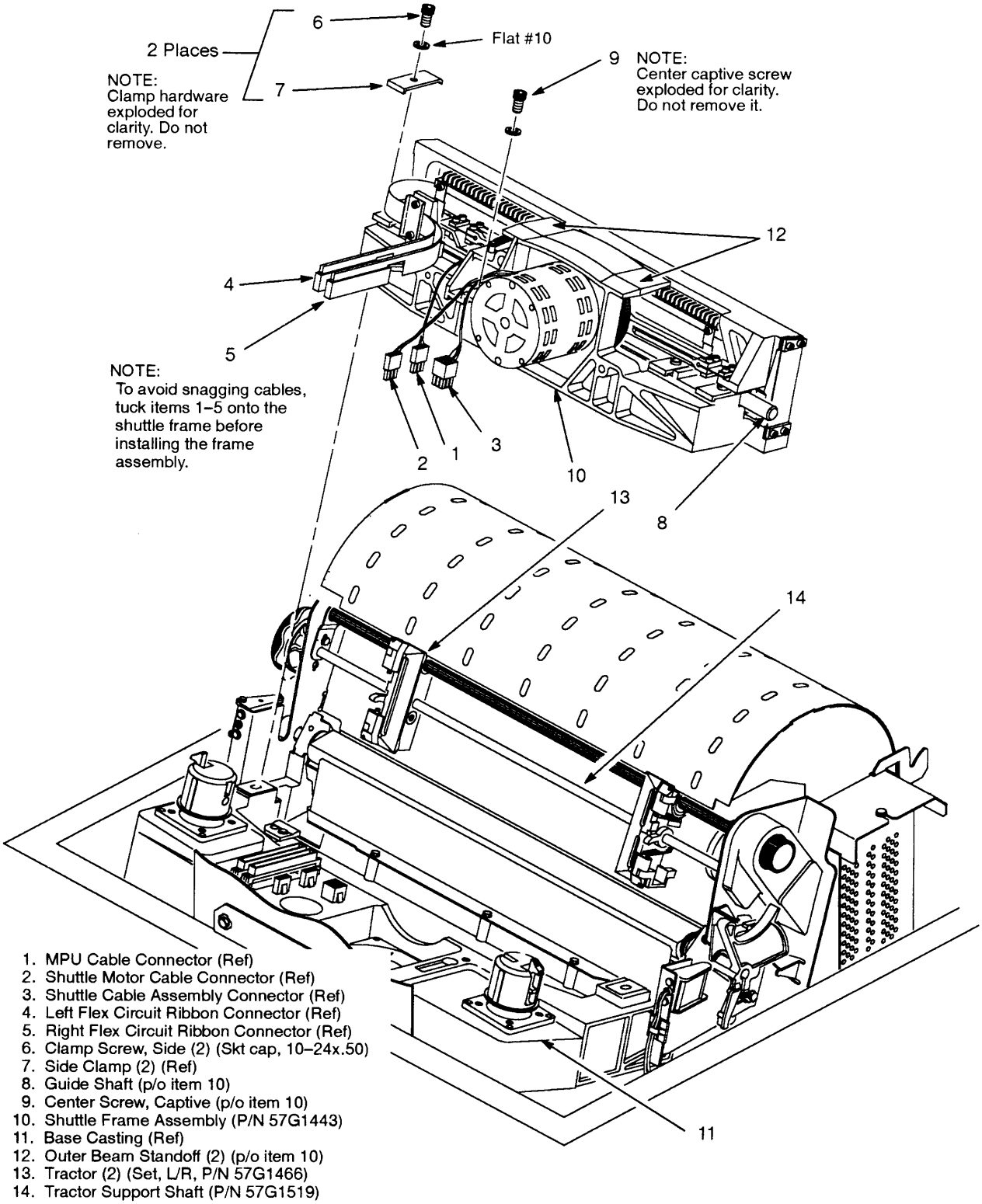
Installation

1. Install the hammer bank cover (page 6–38), if it was removed.
2. Holding the shuttle frame assembly (10) by the outer beam standoffs (12), set it into the base casting (11). Use both hands: the shuttle frame assembly is heavy.
3. Align the center 5/32 inch socket head screw (9) in the base casting (11) and hand turn the screw until only two or three threads have started.
4. Pull the shuttle frame assembly (10) toward the front of the printer and hold it in this position while you do step 5.
5. Slide the side clamps (7) over the guide shaft (8) and torque the 5/32 inch socket head clamp screws (6) to 20 ± 2 inch–pounds (2.26 ± 0.23 N•m).
6. Lift up on the shuttle motor, then gently set it down to align the center screw guide.
7. Torque the center captive 5/32 inch socket head screw (9) to 20 ± 2 inch–pounds (2.26 ± 0.23 N•m).
8. Connect the left and right hammer bank flex circuit ribbon connectors (4 and 5).
9. Connect the shuttle cable assembly connector (3).
10. Connect the shuttle motor cable connector (2).

WARNING

Make sure the MPU cable is below the extension spring and does not touch the spring after the cable is connected.

11. Connect the MPU cable connector (1). (See Figure 6–22, page 6–57.)
12. Loosen the platen open belt (page 5–6, steps 3. and 4.).
13. Adjust the platen gap (page 5–14).
14. Adjust the platen open belt (page 5–6).
15. Check the platen gap again. Readjust if necessary (page 5–14).
16. Install the shuttle cover assembly (page 6–42).
17. Return the printer to normal operation (page 6–132).



1. MPU Cable Connector (Ref)
2. Shuttle Motor Cable Connector (Ref)
3. Shuttle Cable Assembly Connector (Ref)
4. Left Flex Circuit Ribbon Connector (Ref)
5. Right Flex Circuit Ribbon Connector (Ref)
6. Clamp Screw, Side (2) (Skt cap, 10–24x.50)
7. Side Clamp (2) (Ref)
8. Guide Shaft (p/o item 10)
9. Center Screw, Captive (p/o item 10)
10. Shuttle Frame Assembly (P/N 57G1443)
11. Base Casting (Ref)
12. Outer Beam Standoff (2) (p/o item 10)
13. Tractor (2) (Set, L/R, P/N 57G1466)
14. Tractor Support Shaft (P/N 57G1519)

Figure 6–47. Shuttle Frame Assembly, Installation

Spring Assembly, Gas (Figure 6–48)

Removal

NOTE: Two persons may be required to perform this procedure. Hold the printer cover securely while disengaging the gas spring assembly.

1. Prepare the printer for maintenance (page 6–3).
2. Open the printer cover (1).
3. Open the floor cabinet rear door.
4. Pry back the spring retaining clips (8).
5. Remove the gas spring assembly (4) from the ball studs (7).

Installation

NOTE: Two persons may be required to perform this procedure. Hold the printer cover securely while disengaging the gas spring assembly.

1. Position the gas spring assembly (4) against the ball studs (7) on the upper and lower brackets (5 and 6).
2. Push the gas spring assembly (4) onto the ball joints (7).
3. Close the printer cover (1). If necessary, adjust the position of the ball joint stud in the lower bracket to achieve smooth and complete closure.
4. Return the printer to normal operation (page 6–132).

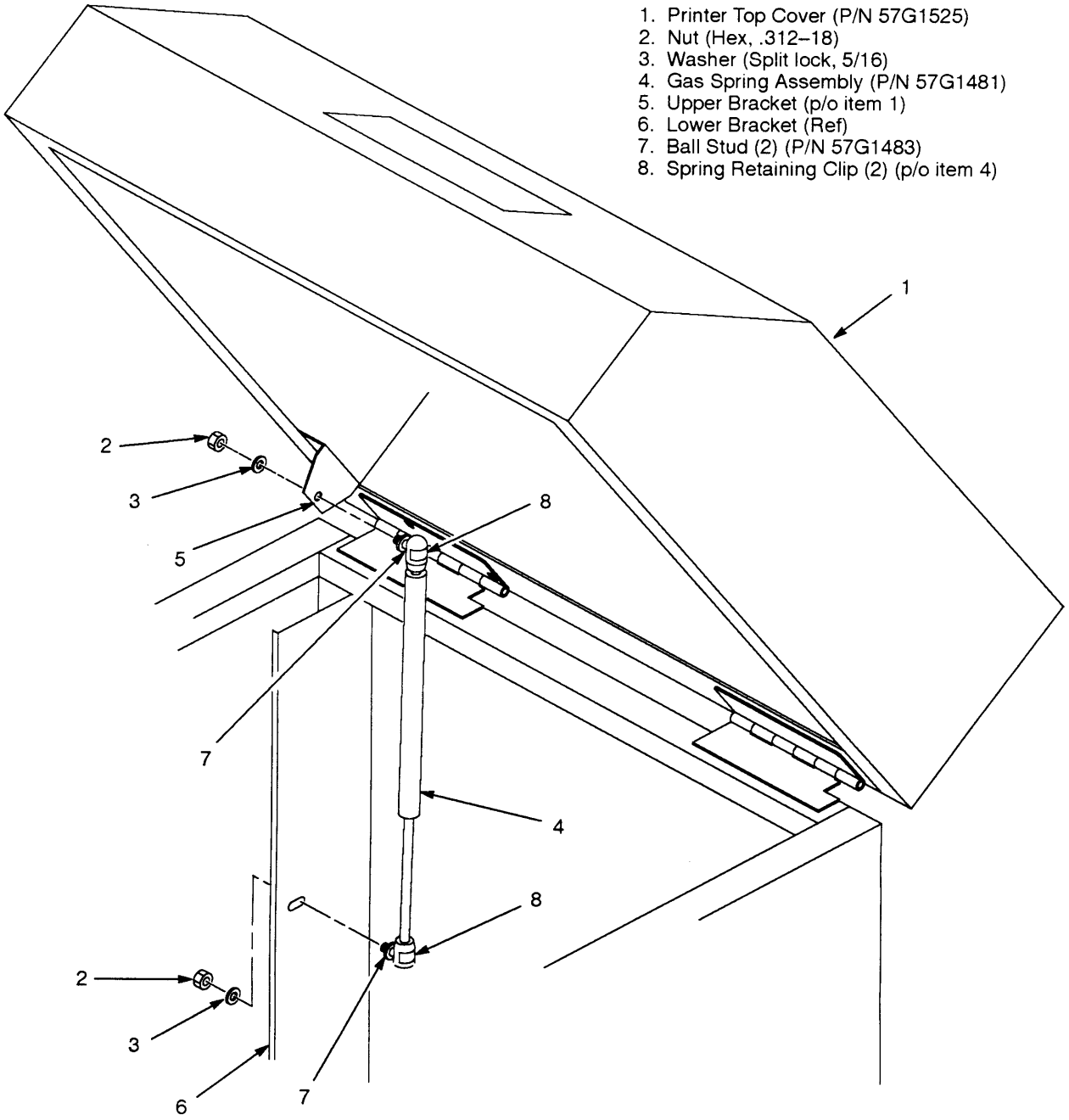


Figure 6–48. Spring Assembly, Gas, Removal/Installation

Spring, Extension (Figure 6–49)

WARNING

Do not allow the hammer bank to rotate toward the platen during spring replacement.

Removal

1. Prepare the printer for maintenance (page 6–3).
2. Open the printer cover.
3. Remove the shuttle cover assembly (page 6–42).
4. Unhook the extension spring (1) from the spring lugs (2) on the hammer bank (3) and shuttle frame (4).

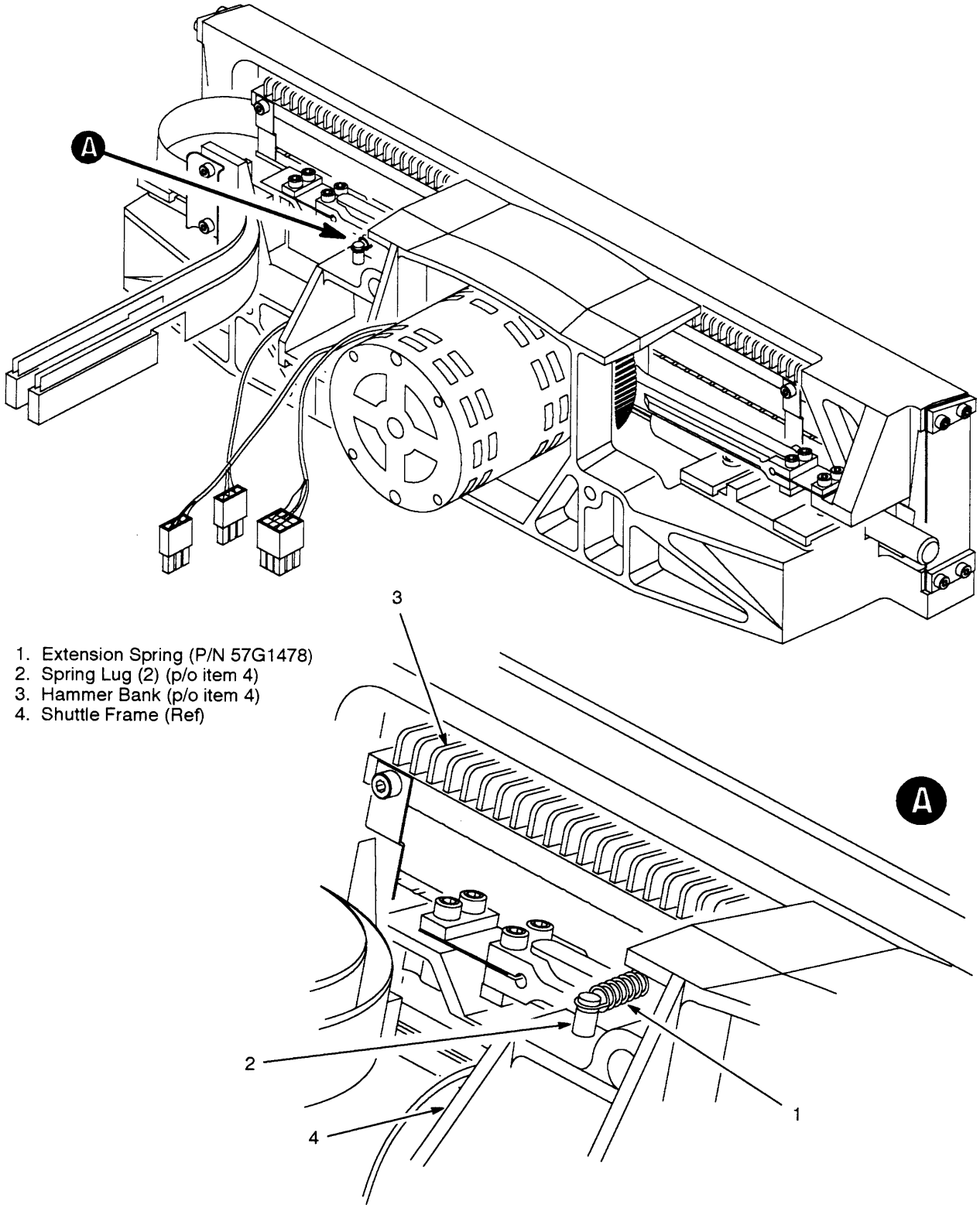
Installation

1. Apply a dab of IBM #20 lubricant to both spring lugs (2).

WARNING

Make sure the extension spring does not touch the MPU cable after installation.

2. Hook the extension spring (1) over the spring lugs (2).
3. Install the shuttle cover assembly (page 6–42).
4. Return the printer to normal operation (page 6–132).



1. Extension Spring (P/N 57G1478)
2. Spring Lug (2) (p/o item 4)
3. Hammer Bank (p/o item 4)
4. Shuttle Frame (Ref)

Figure 6–49. Spring, Extension, Removal/Installation

Switch Assembly, Cover Open (Figure 6–50)

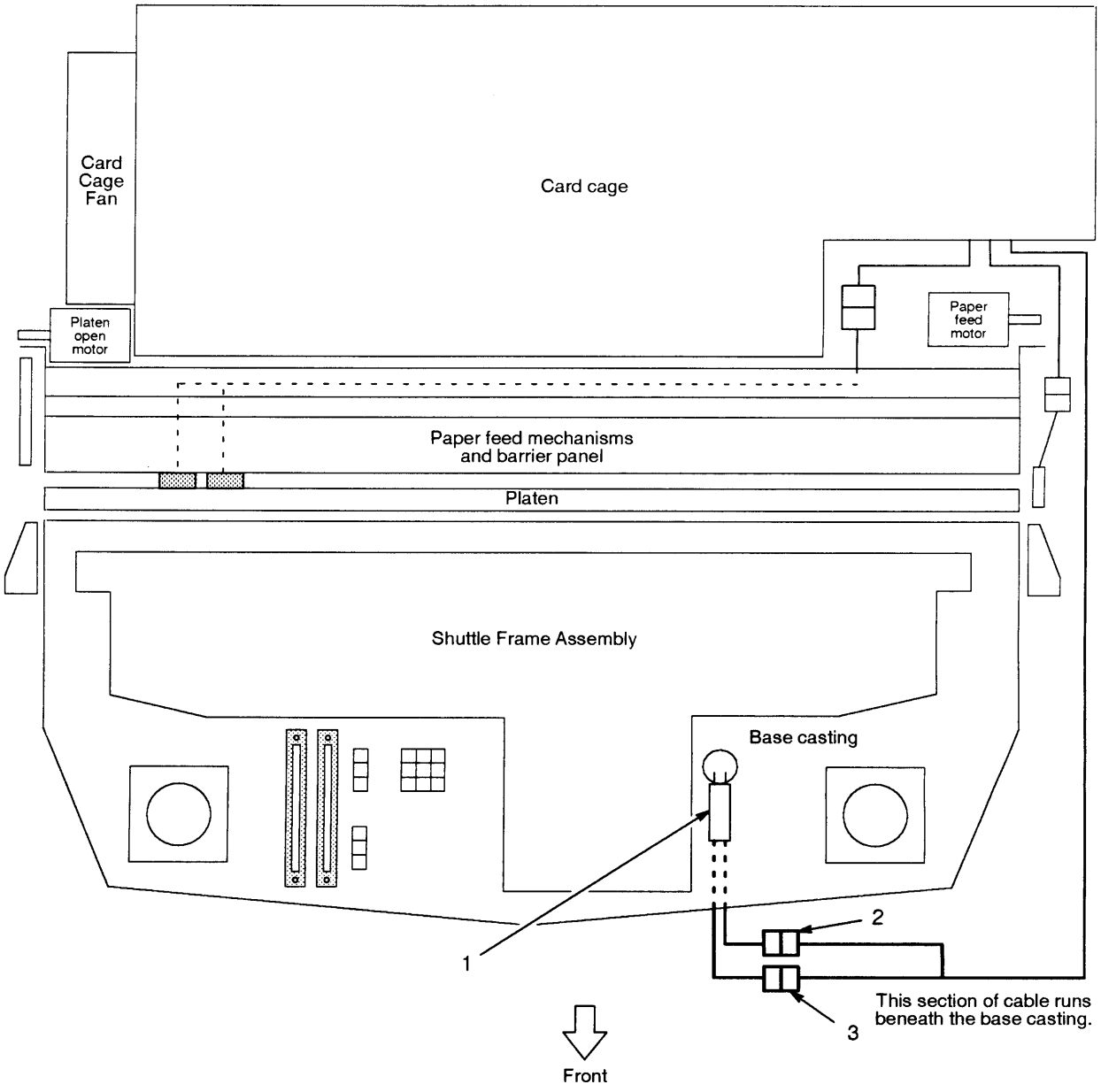
Removal

1. Prepare the printer for maintenance (page 6–3).
2. Open the printer cover.
3. Remove the shuttle cover assembly (page 6–42).
4. Carefully lift and pry the cover open switch assembly (1) out of the base casting.
5. Disconnect the switch connectors from intermediate cable assembly connector CO+ (2) and CO– (3).

Installation

1. Connect the switch connectors to intermediate cable assembly connector CO+ (2) and CO– (3).
2. Remove the protective covering from the adhesive backing on the cover open switch assembly (1).
3. Position the cover open switch assembly (1) in the base casting and press it into place.
4. Install the shuttle cover assembly (page 6–42).
5. Return the printer to normal operation (page 6–132).

Printer viewed from above.



1. Cover Open Switch Assembly (P/N 57G1465)
2. Connector CO+ (Ref)
3. Connector CO– (Ref)

Figure 6–50. Switch Assembly, Cover Open, Removal/Installation

Switch Assembly, Paper Detector (Figure 6–51)

Removal

1. Prepare the printer for maintenance (page 6–3).
2. Remove the paper guide assembly (page 6–66).
3. Remove four screws (1) and the barrier shield (2).
4. Remove the screws (3) securing the paper detector switch assembly (4).
5. Disconnect the paper detector switch cable connector (5) from the intermediate cable assembly connector PMD.
6. Cut the tie wraps securing the switch assembly cable to the front of the card cage and remove the paper detector switch assembly (4).

Installation

1. Holding the slotted wheel against the PMD sensor, position the paper detector switch assembly (4) and install the screws (3) securing it to the printer base.
2. Connect the paper detector switch cable connector (5) to the intermediate cable assembly connector PMD.
3. Install tie wraps securing the switch assembly cable to the front of the card cage.
4. Install the barrier shield (2) and four screws (1).
5. Install the paper guide assembly (page 6–66).
6. Check and adjust the End of Forms Distance (page 5–22).
7. Return the printer to normal operation (page 6–132).

1. Screw (4) (Thread forming, 6–32x.25)
2. Barrier Shield (Ref)
3. Screw (2) (Thread forming, 6–32x.375)
4. Paper Detector Switch Assembly (P/N 57G1453)
5. Paper Detector Switch Cable Connector (p/o item 4)

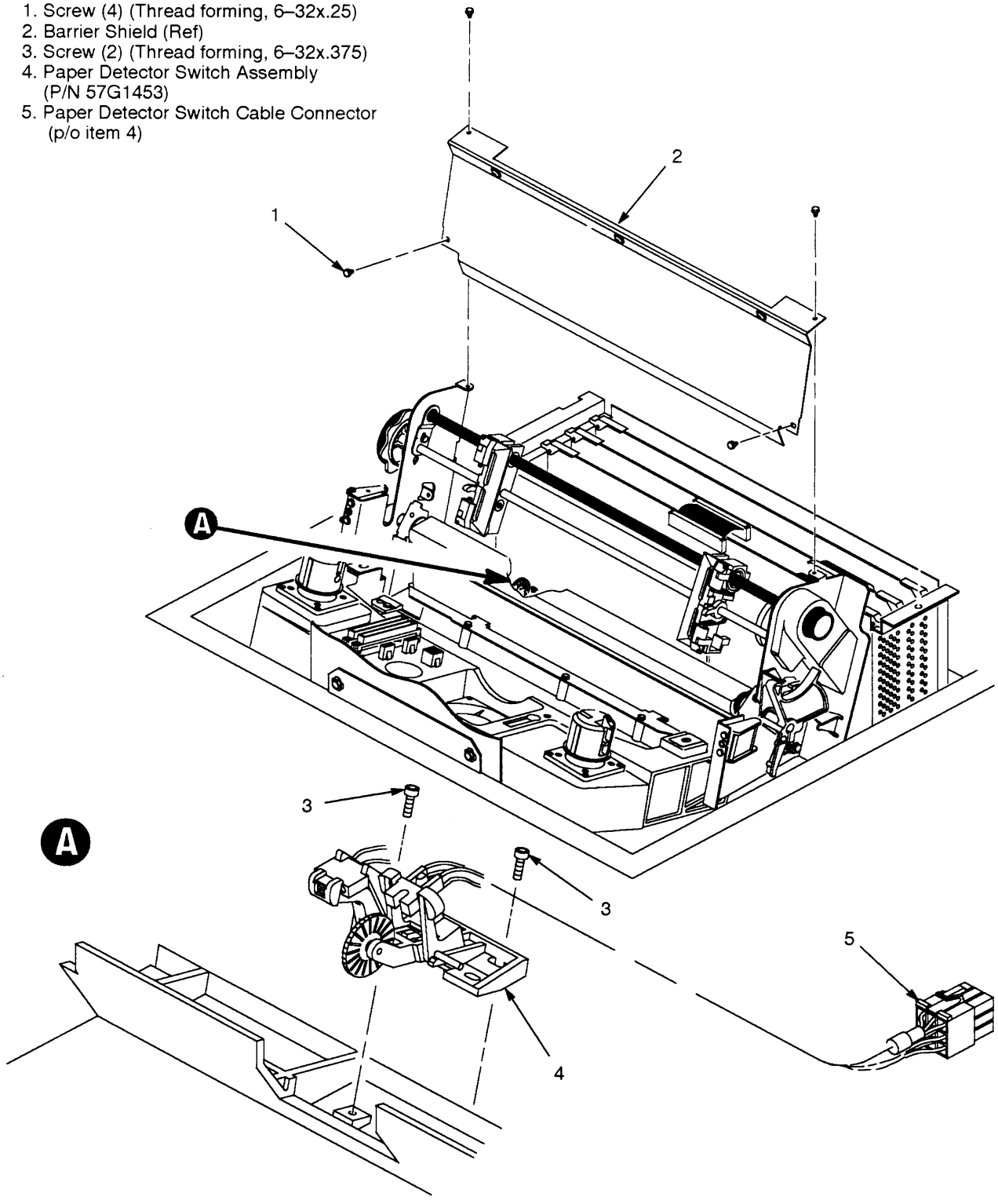


Figure 6–51. Switch Assembly, Paper Detector, Removal/Installation

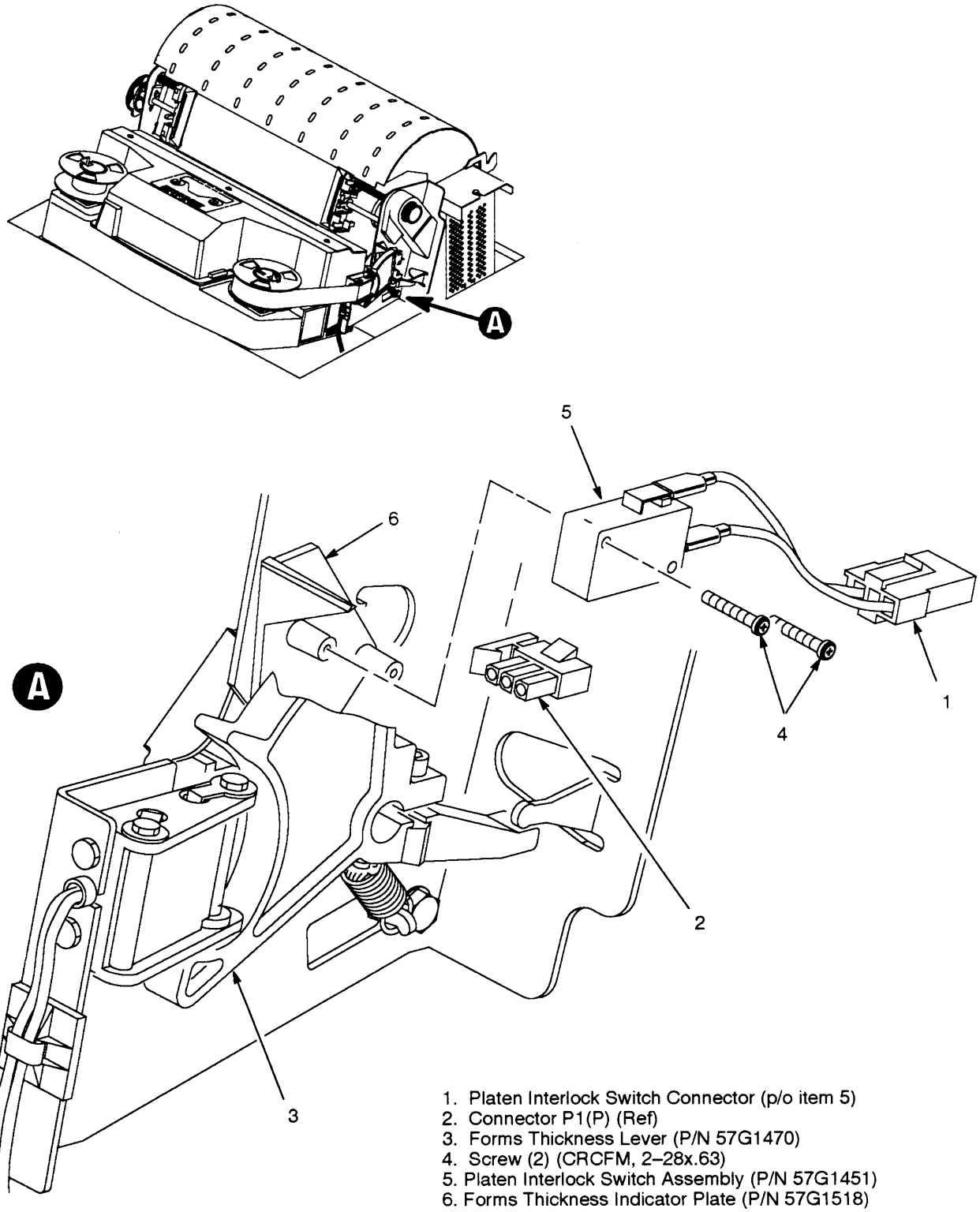
Switch Assembly, Platen Interlock (Figure 6–52)

Removal

1. Prepare the printer for maintenance (page 6–3).
2. Open the printer cover.
3. Disconnect the platen interlock switch connector (1) from connector P1(P) (2).
4. Fully close the forms thickness lever (3) (position 'A').
5. Remove two screws (4).
6. Remove the platen interlock switch assembly (5) from the forms thickness indicator plate (6).
7. Remove the connector (1) from the right side plate.

Installation

1. Fully close the forms thickness lever (3) (position 'A').
2. Position the platen interlock switch assembly (5) on the forms thickness indicator plate (6).
3. Install two screws (4).
4. Install the connector (1) to the right side plate.
5. Connect the platen interlock switch connector (1) to connector P1(P) (2).
6. Return the printer to normal operation (page 6–132).



1. Platen Interlock Switch Connector (p/o item 5)
2. Connector P1(P) (Ref)
3. Forms Thickness Lever (P/N 57G1470)
4. Screw (2) (CRCFM, 2–28x.63)
5. Platen Interlock Switch Assembly (P/N 57G1451)
6. Forms Thickness Indicator Plate (P/N 57G1518)

Figure 6–52. Switch Assembly, Platen Interlock, Removal/Installation

Tractor (L/R)

Removal

1. Prepare the printer for maintenance (page 6–3).
2. Remove the splined shaft (page 6–114).
3. Remove the support shaft (page 6–116).
4. Remove the tractors.

Installation

1. Using the replacement tractors, install the support shaft (page 6–116).
2. Install the splined shaft (page 6–114).
3. Return the printer to normal operation. (See below.)

Returning the Printer to Normal Operation

When you are finished servicing the printer, restore it to operation by following the steps below:

1. Install the ribbon.
2. Connect the AC power cord to the power source and the printer.
3. Power on the printer.
4. Load paper.
5. Close floor cabinet doors and the printer cover.
6. Test printer operation by selecting and running one of the diagnostic print tests. (See Chapter 4.)
7. Select the desired emulation. (Refer to the *Setup Guide*.)
8. Set the top–of–form. (Refer to the *Operator's Guide*.)

7 Principles of Operation

Contents

Functional Elements of the Printer

The IBM 6408 printer consists of five functional elements: the common controller board (CCB), the mechanism driver board, the power supply board, the operator panel, and the components of the electromechanical print mechanism. (See Figure 7–1.) The remainder of this chapter discusses these elements in more detail.

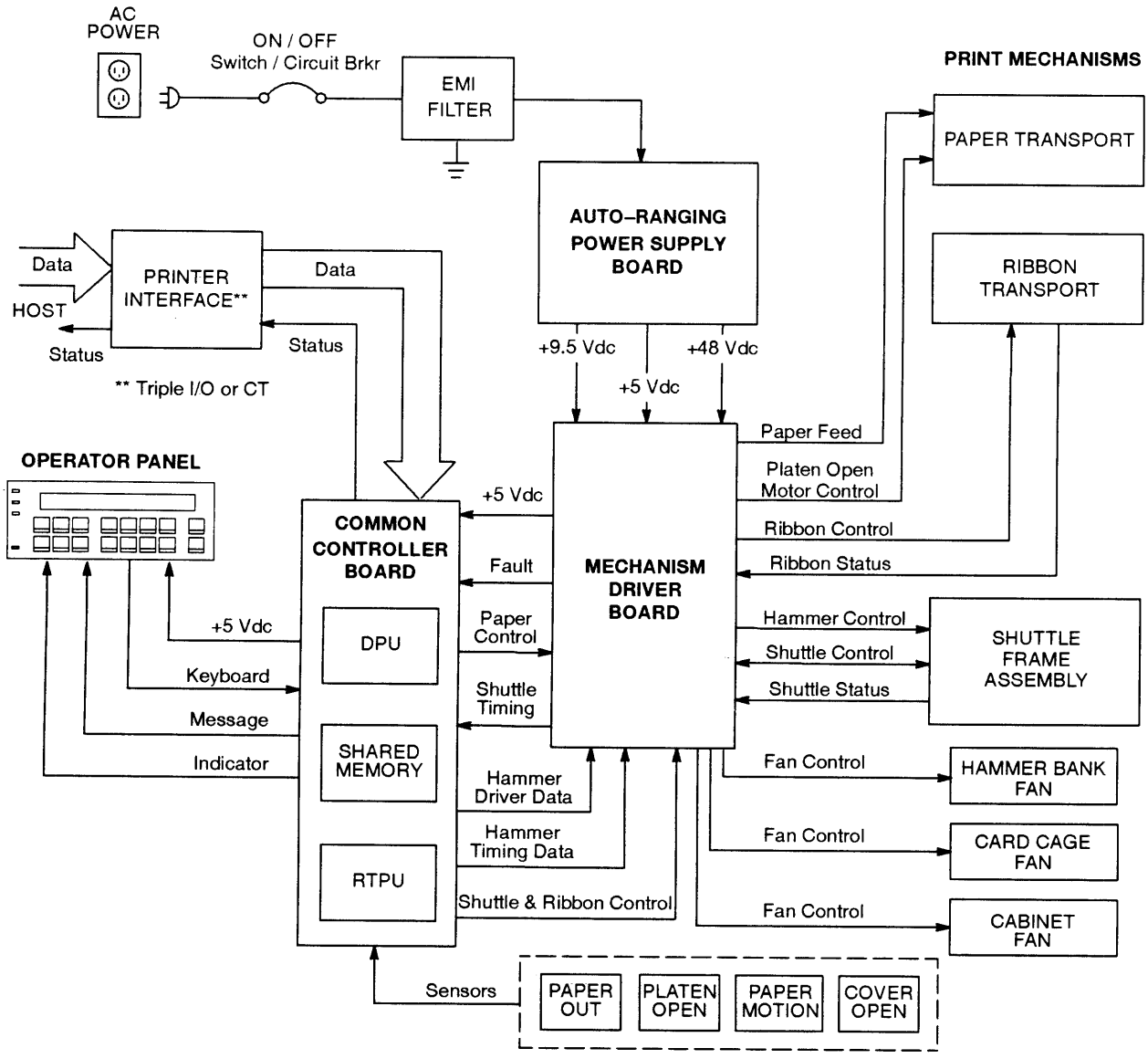


Figure 7–1. Functional Elements of the IBM 6408 Printer

Common Controller Board (CCB)

The heart of the printer is the common controller printed circuit board assembly (PCBA), also called the common controller board (CCB). The CCB oversees and coordinates all printer functions.

The CCB is functionally two units, the data processing unit (DPU) and the real–time processing unit (RTPU). The DPU converts all character data into printable dot images. The DPU is the high–level logical controller of the printer; it is not involved in real–time or hardware–dependent printer operation. The RTPU operates the host interfaces, the operator panel, and the print mechanism. The RTPU also monitors the fault circuitry in the mechanism.

The DPU and RTPU communicate by means of shared memory. The DPU gets host and operator input from buffers in memory which are filled by the RTPU, and returns dot images and operator messages to buffers in memory which the RTPU empties. Figure 7–2 broadly summarizes the architecture of the CCB.

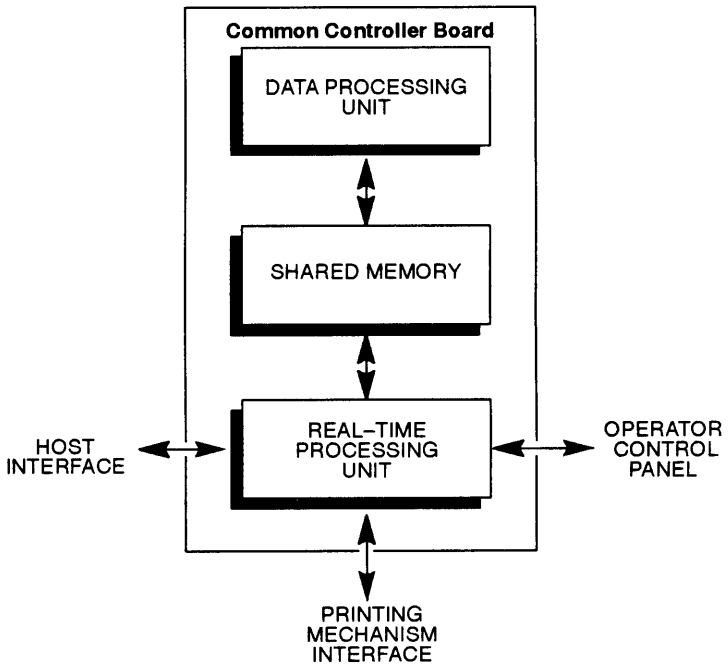


Figure 7–2. Architectural Overview of the Common Controller Board (CCB)

Communicating with the Host Computer

The CCB processes three kinds of computer input: PC parallel, Dataproducts parallel, and RS–232 serial data. The RTPU operates all three interfaces. The parallel interfaces are similar, and the RTPU contains direct–memory–access (DMA) hardware which loads parallel data directly into shared memory. The serial interface requires byte–by–byte intervention by the processor, since ACK/NACK and XON/XOFF protocols require that every byte be examined as it is received. The universal asynchronous receiver/transmitter (UART) is internal to the RTPU, which processes any protocol requirements then puts the data in shared memory, where the DPU can read it. To the DPU, all input data looks the same, regardless of the interface used to receive it.

Communicating with the Operator

All communication to and from the operator is done at the operator panel. The operator panel processes three types of operation: keystroke input, message display output, and indicator output. The RTPU handles the operator panel interface requirements of shifting, clocking, etc., but the DPU processes all operator panel data.

Printing

The RTPU coordinates printing of the dot images sent from the DPU. Printing is a complex process requiring many control functions, but is logically divided into two groups:

- Hammer driver interface functions
- Mechanical interface functions

Hammer Driver Interface

In order to print a dot image, two things must happen. First, the dots must get to the hammers one dot row at a time and in the correct sequence. Second, the hammers must be fired at the appropriate time in the stroke of the shuttle. The RTPU microprocessor controls both of these functions, but each is actually performed by an application–specific integrated circuit (ASIC) containing hardware dedicated to the function. These ASICs are the Dot Plucker Memory Controller (DPMC) and the Fire Timer IC (FTIC). The hammer driver interface functions of the RTPU are summarized in Figure 7–3.

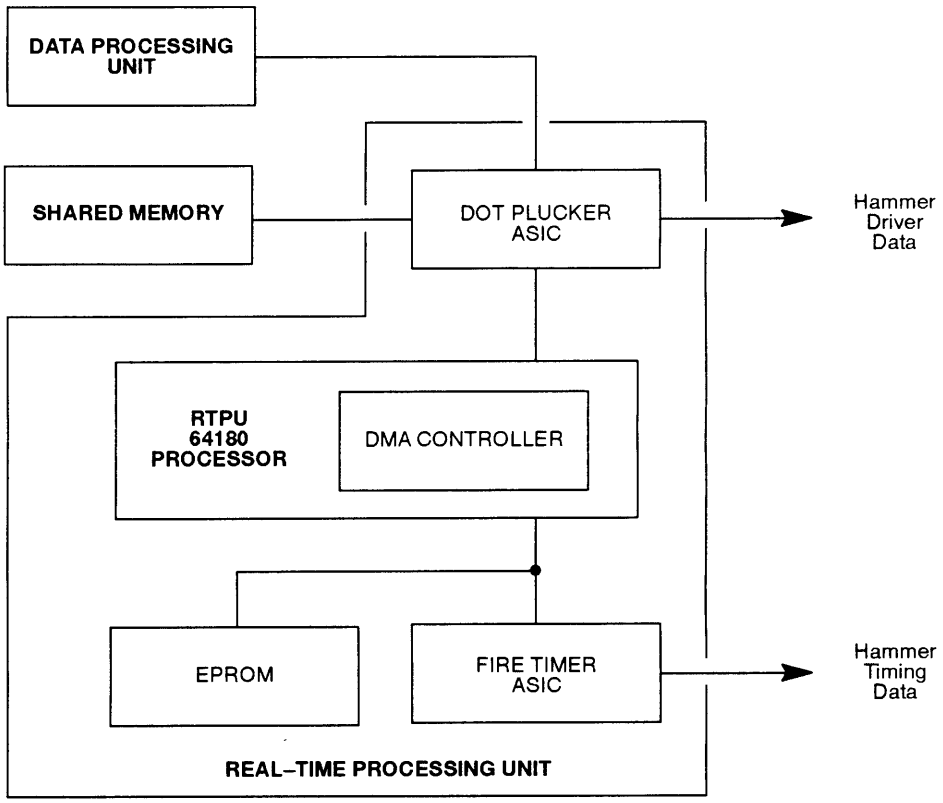


Figure 7–3. Hammer Driver Interface Functions of the RTPU

Getting Dots to the Hammers Getting dots to the hammers consists of going into the shared memory and pulling bits out in a given order and shifting them to the hammer driver at the correct time. This process is called dot plucking. The order in which dots are plucked from memory depends on the dot density, the number of dots per hammer, the number of hammers on the hammer bank, the number of phases, and other factors. These factors are all considered by the RTPU processor as it programs the dot plucker for each dot row.

Synchronizing Dot Plucking and Hammer Firing Transfer of dots to the hammer driver must be synchronized with hammer firing. Dots are transferred to the hammer driver in bursts, serial streams of dots that tell which hammers will print when their phase is next fired. The bursts are timed precisely; they must occur neither too early nor too late. Synchronization is performed by having the FTIC request bursts from the dot plucker. The FTIC reads the magnetic pick–up unit (MPU) to determine when to request a burst. The time at which the burst request is made is contained in the fire timing tables.

Mechanical Interface

Three mechanical operations are coordinated in printing: paper motion, ribbon motion, and shuttle motion. Virtually all digital handling of paper motion is contained in the RTPU. The ribbon and shuttle are controlled by logic on the mechanism driver board, under the direction of the RTPU. Figure 7–4 shows the mechanical interface section of the RTPU.

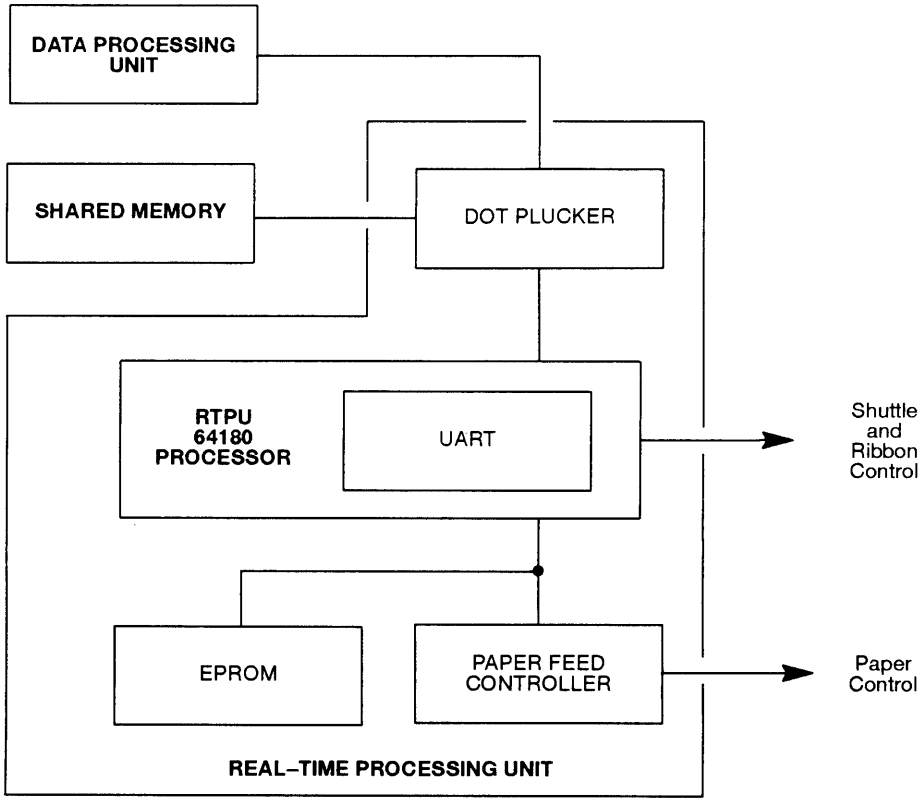


Figure 7–4. Mechanism Driver Interface Functions of the RTPU

Paper Motion The DPU determines when paper must be moved and how far to move it. It communicates this to the RTPU through the shared memory. The RTPU processor performs some paper handling operations (such as holdback on slews), but most RTPU paper handling is done by a dedicated micro–controller called the paper feed controller (PFC).

The PFC moves paper by looking up motion profiles and driving a sequence of motor positions to the mechanism driver board. If the motion is a dot row or interline advance, it is synchronized to hammer firing by a signal from the FTIC that tell the PFC when to move.

Ribbon and Shuttle Motion The ribbon and shuttle motors are controlled by a micro–controller on the mechanism driver board. The RTPU

interface to the ribbon/shuttle processor (RSP) is a 2400 baud asynchronous serial line. A message protocol is used to communicate ribbon and shuttle information.

Fault Monitoring

The RTPU also monitors the hammer driver, mechanism driver, and the electro–mechanical sensors for fault conditions. Fault conditions are reported to the DPU.

Hammer Bank and Hammer Driver Faults

The FTIC works with the hammer driver ASIC to monitor coil shorts, opens, average upper driven phase current, and temperature conditions. The RTPU reads the FTIC registers to determine out–of–range conditions, and these are passed on to the DPU.

Paper Faults

Two kinds of paper faults can occur: paper out and paper jammed. Both of these conditions are monitored through optical sensors. The paper feed controller watches the paper out and paper motion sensors and reports errors to the RTPU. The RTPU passes this information on to the DPU.

Ribbon and Shuttle Faults

The mechanism driver ribbon and shuttle controller monitors fault conditions in the drive circuits and notifies the RTPU if it finds errors. The RTPU can also use the FTIC to measure time between magnetic pick–up (MPU) pulses, enabling it to monitor shuttle speed and thus detect some shuttle faults.

CCB Hardware Overview

A Motorola 68010 microprocessor performs the DPU functions, a 64180 microprocessor handles the RTPU functions, and an 8032 micro–controller serves as the paper feed controller (PFC), which is part of the RTPU. Actual implementation of this hardware blurs the distinctions between the DPU and RTPU, since the 68010 has access to the parallel port and the real–time functions of the dot plucker, which are RTPU resources, while the 64180 has access to the nonvolatile memory (NVRAM), which is a resource of the DPU. These possibilities exist because of efficiencies in the hardware design; software maintains the functional differences between the DPU and RTPU.

The CCB has four data buses:

- The 68010 has a local sixteen bit bus.
- The 64180 uses a local bus eight bits wide.
- A third bus is shared by the DPU and RTPU. It is sixteen bits wide and is arbitrated on a cycle–by–cycle basis.
- The 8032 chip has its own eight bit local bus.

The manner in which the CCB implements this hardware is depicted in Figure 7–5.

The 64180 IC that oversees the RTPU processor contains a Z80 microprocessor with extended memory management, two DMA controllers, two asynchronous and one synchronous serial port, two counter timers, and an interrupt controller.

Communicating with the Host Computer

The 64180 processor runs both the parallel and serial interfaces.

Parallel Input Parallel input data is nine bits wide, and is transferred in one cycle from the parallel port to shared memory over the shared sixteen bit bus. Using the internal DMA controller of the 64180 to transfer parallel data requires some manipulation. The eight bit DMA controller in the 64180 performs either eight or sixteen bit DMA cycles, while the eight bit processor in the 64180 performs only eight bit memory access cycles. Sixteen bit DMA is achieved by hardware shifting of the DMA addresses one bit (effectively multiplying the address by two and changing the DMA auto–increment from byte to word) and by manipulating the control strobe. Software adjusts the addresses provided to the DMA controller when it is programmed for sixteen bit DMA. This manipulation saves both the added cost of a sixteen bit DMA controller and the second cycle that an eight bit transfer would require.

Serial Input One of the 64180 UARTs handles serial communication with the host. Additional modem control lines are provided in the 64180 hardware control register.

Communicating with the Operator

The synchronous serial port in the 64180 shifts data in and out of the operator panel. The control register in the 64180 contains three other operator panel bits: one samples the keys (switches), one strobes the liquid–crystal display, and one strobes a light–emitting diode (LED) holding register.

Printing

Hammer Driver Interface The 64180 programs the dot plucker ASIC every dot row and programs the FTIC every stroke, after which the FTIC uses a DMA request line to control the movement of tables from EPROM to FTIC. The second DMA controller in the 64180 performs this transfer.

Mechanism Driver Interface The paper feed controller (PFC) directs all paper motion. During printing, it usually moves paper in response to a trigger from the FTIC, which synchronizes paper motion with shuttle motion. The 64180 programs the PFC 8032 at the beginning of each dot row, telling the PFC how far to move when the trigger is received. The PFC sets up for the move, waits, then moves when the trigger occurs. The other method of starting paper motion is with a command passed through the inter–processor port (an eight bit parallel port between the 8032 and the 64180). This results in immediate movement. Other paper commands and status signals are also passed through this port.

Ribbon and Shuttle Motion The 64180 interfaces through its second UART to the ribbon / shuttle processor (RSP) on the mechanism driver board. The 64180 begins all transactions on the serial interface; the RSP sets a bit in the 64180 hardware status register when it needs service.

Fault Monitoring

The RTPU 64180, the PFC 8032, and the RSP monitor different functions for faults. The 64180 looks for hammer driver faults, shuttle stalls, and an open platen. The PFC 8032 monitors paper out and the paper motion detector. The RSP watches for faults in the motor drive circuits. The PFC and RSP report errors to the 64180, which collates fault status and passes it on to the DPU 68010 processor.

Hammer Bank and Hammer Driver Faults The 64180 and FTIC check the hammer driver and hammer bank for faults on every shuttle stroke. Faults are detected by circuits on the mechanism driver board and relayed to the CCB. Fault circuitry can detect shorted coils and rising temperatures in the coils. One coil is checked on every shuttle stroke; 48 shuttle strokes are required to check all coils. When the RTPU is notified of a fault, it sends a message to the 68010. If a coil shorts, the 64180 stops printing before firing another dot row.

Paper Faults The PFC 8032 monitors paper faults and reports them to the 64180 through the eight bit parallel port they share. The PFC works with a

friction wheel paper motion detector and a reflective (optical) paper out sensor. The sensors interface directly to the CCB; there are analog circuits on the CCB to condition the sensor inputs.

Ribbon and Shuttle Faults The RSP monitors ribbon and shuttle faults and reports them to the 64180 over the serial interface.

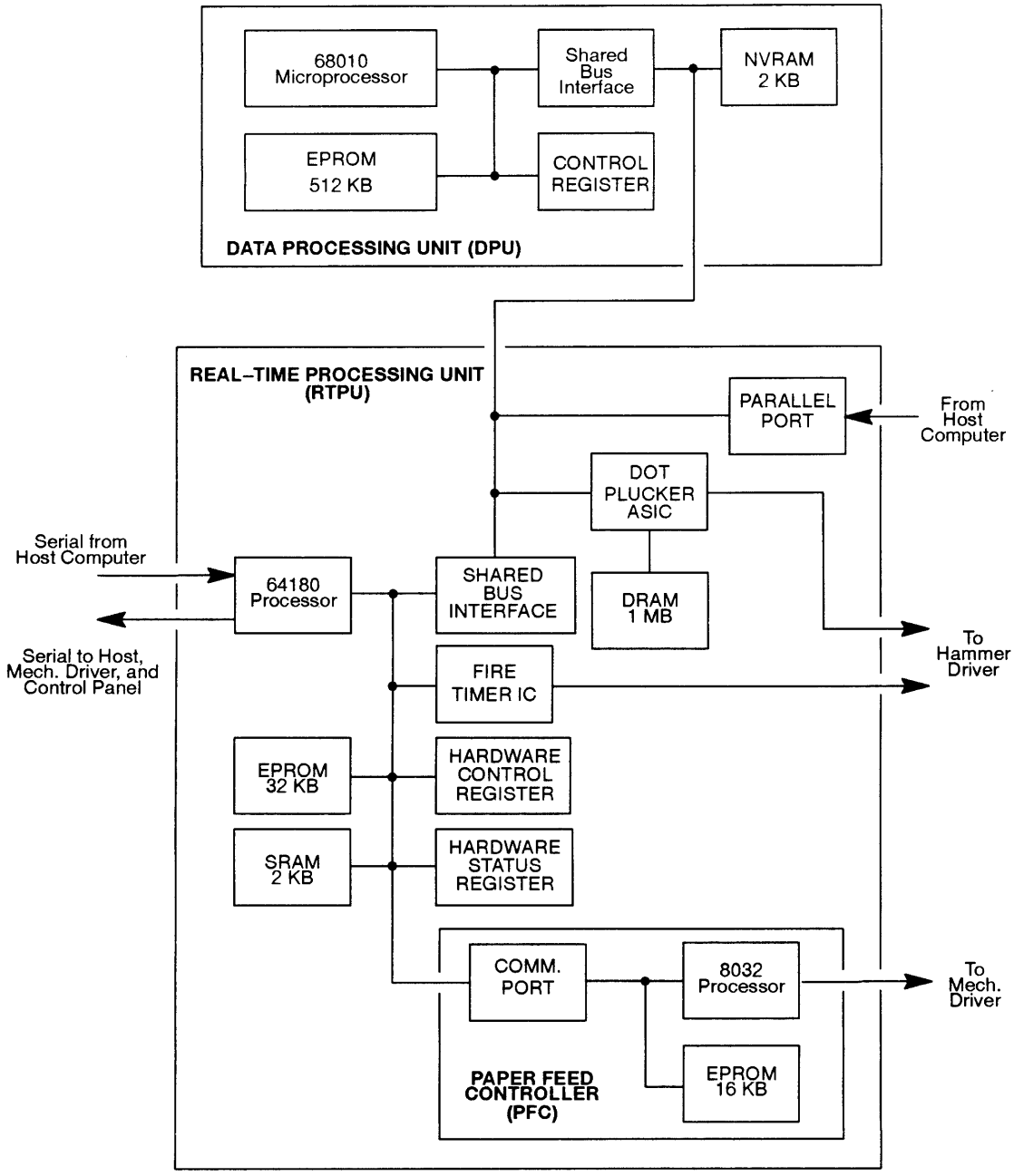


Figure 7–5. Hardware Implementation of the CCB

Mechanism Driver Board

The mechanism driver board, acting on commands from the CCB, controls real–time operation of the electromechanical printer systems. Functionally, the board consists of nine subsystems:

- An 8032 micro–controller that controls ribbon drive and communication with the CCB.
- The interface to the power supply board.
- Pulse–width modulator (PWM) current mode / voltage mode full–bridge power amplifiers connected directly to the shuttle, ribbon, paper feed, and platen open motors. Current mode is used for the paper feed motor, voltage mode is used for the ribbon and shuttle motors.
- The paper feed controller (PFC) accepts control codes from the CCB for each motor phase to vector–control the paper feed motor.
- The shuttle drive controller receives speed commands from the CCB through the 8032 micro–controller and commands the speed of the three–phase dc shuttle motor.
- The ribbon drive controller, based around the 8032 micro–controller, receives speed commands from the CCB and drives two dc stepper motors, regulating the speed and tension of the ribbon and monitoring the end of ribbon sensors.
- The platen drive controller for reverse paper feed.
- Fault detection circuitry samples and senses heat sink temperature, ribbon speed, shuttle speed, hammer driver circuitry, hammer bank coil temperatures, power supply voltages, and fault communication with the CCB.
- Circuitry that registers magnetic pick–up unit (MPU) output, processes it for the logic interface, and sends it to the CCB for timing hammer fire.

Ribbon Drive System

The ribbon drive system is controlled by the 8032 micro–controller. The CCB sends commands to the 8032 to start and stop the ribbon, set the ribbon speed, and apply slack or tension to the ribbon. The real–time control functions are done by the 8032, acting in accordance with firmware control algorithms and look–up tables. The 8032 communicates with an ASIC to provide direct digital PWM drive signals for the ribbon motor PWM amplifier. The 8032 drives the ribbon motors through PWM generators in the

mechanism driver integrated circuit (MDIC). Nearly all mechanical control functions are carried out through the MDIC ASIC. Digital I/O is done through latches connected to the 8032 I/O ports and MDIC. Ribbon faults are passed to the CCB.

Ribbon Velocity

Ribbon velocity is controlled by means of a closed–loop system that first measures the speed of the two ribbon drive motors. One motor is driven; the other motor is not driven and applies tension to the ribbon through its drag circuitry. The velocity of the driven motor is known, while the velocity of the tensioning motor is measured by converting the zero crossing of the back–EMF signal to a digital pulse signal. This signal is processed by the 8032 to determine the radius of the ribbon on the take–up reel. The processor monitors this information and adjusts the velocity of the driven motor to maintain constant linear speed. The roles of the two motors reverse at the end of ribbon travel, when a metallic strip crosses the ribbon guide of the emptying reel and closes a circuit that causes the RSP to reverse motor functions.

The four PWM amplifiers in the ribbon drive system are voltage mode to aid in system damping (as opposed to current mode). The 8032 input to the PWM amplifiers maintains a constant voltage/frequency ratio at the motor. The ribbon drive is protected from over current.

Ribbon Tension

The 8032 processor regulates tension in three discrete steps by using information gathered by the zero–crossing circuitry and ribbon information. Tension is adjusted by controlling the load on the drag motor back emf. This load generates drag torque on the ribbon hub that maintains tension.

Start / Stop Ribbon

The ribbon motors are started and stopped by a digital signal from the CCB. After a stop signal is received, the ribbon is locked to maintain tension. If the CCB sends a slack signal, the PWM amplifiers are tri–stated.

Shuttle Drive System

The shuttle drive system is an analog closed–loop speed controller that accepts commands from the CCB through the 8032 micro–controller and MDIC ASIC. The CCB writes a word to the 8032, which writes a word to the MDIC. The MDIC generates a clock signal based on this word.

The clock signal from the MDIC is the reference input to a phase detector. The other input to the phase detector is a logical combination of the pulses from three Hall–effect sensors in the brushless three–phase dc shuttle motor. The Hall–effect sensors are mounted to the motor stator 120 electrical degrees phase–shifted from each other. The phase detector is both a phase and frequency detector. It operates as a frequency detector when out of lock, and as a phase detector when the loop is phase–locked. During shuttle start, the frequency error from the phase frequency detector drives the servo system towards phase lock. At approximately 85% of final speed, the servo integrator resets to prevent overshoot. When the correct speed is reached, the system is in phase lock with the MDIC clock signal.

The shuttle is protected from overspeed, over current, missing hall–effect sensors, and out–of–sync hall–effect sensors.

Paper Feed System

Dot row advance and slew tables are stored in the CCB. The paper feed drive circuit takes commands directly from the CCB to control the two–phase dc paper feed stepper motor. A CCB paper feed command is a digital word containing a value proportional to the desired current level in the paper feed motor, enabling the motor to be quarter stepped. Two PWM current mode amplifiers, protected against overloads and short circuits, drive the paper feed motor. The paper feed motor is energized whenever printer power is on, unless the platen is open, in order to maintain tension and position of the paper. The paper feed motor is disabled in a platen open fault condition.

Reverse Paper Feed System

To reverse paper motion, the printer must open the platen, move the paper backwards vertically, close the platen, and remove the slack in the paper. A platen open or close command is generated on the CCB and communicated to the RSP 8032 processor. The RSP generates control and step clock signals for the platen driver circuitry. The platen driver circuitry is connected to a

stepper motor that drives the platen through a toothed belt. The platen motor is only energized during the open and close cycles. The platen driver is protected from overcurrent.

Magnetic Pick–up Unit (MPU)

The magnetic pick–up unit (MPU) is mounted next to the shuttle motor flywheel. It provides timing information to the hammer fire controller by way of the CCB. The rotation of the flywheel generates a pulse signal in the MPU. The output frequency is 100 times the shaft frequency of the shuttle motor. The MPU pulse train has one missing pulse in every revolution of the motor for indexing. The incoming signal from the MPU is processed with a zero–crossing detecting circuit to produce a clean signal, compatible with system logic. The clean signal is then sent directly to the CCB.

Power Supply Board

The power supply is contained on a printed circuit board assembly (PCBA) mounted in the card cage. It senses and adjusts to any commercial electrical system that provides AC mains potential in 50 or 60 Hertz systems. AC input power is converted to DC power and sent to the mechanism driver board for distribution to logic and electromechanical circuits.

AC Power

The power supply operates on AC voltages ranging from 86 to 264 V. It can tolerate variations in frequency of 47 to 62 Hz. The power supply is designed to withstand an AC input overvoltage of 300 VAC for one second with no degradation of DC output voltage or damage to printer circuits.

DC Power

The power supply PCBA contains two DC power supply systems for the printer. The first is a + 5 V bus for logic. The second consists of + 48 V and + 9.5 V buses for the electromechanical sections of the printer (that is, all drive motors and the hammer bank).

The maximum total continuous average DC load is 346 W. The + 5 V supply has a separate return line. Both returns are tied together in a single–point ground.

There is an opto–isolated logic level input from the printer that can shut down and latch off the + 48 V and + 9.5 V supplies while maintaining the + 5 V output. The return for this signal is the + 5 V return. In addition, this shutdown circuit discharges and latches the + 48 V down to a level lower than 15 V in less than 200 milliseconds and requires recycling of the circuit breaker (On/Off switch) to reset the latch.

The + 5 V power supply has its own inverter, separate from the + 48 V and + 9.5 V outputs.

Printing Mechanism

The printing mechanism consists of the shuttle frame assembly, which carries the hammer bank assembly, the ribbon transport system, and the paper transport system. Figure 7–6 shows the shuttle frame assembly.

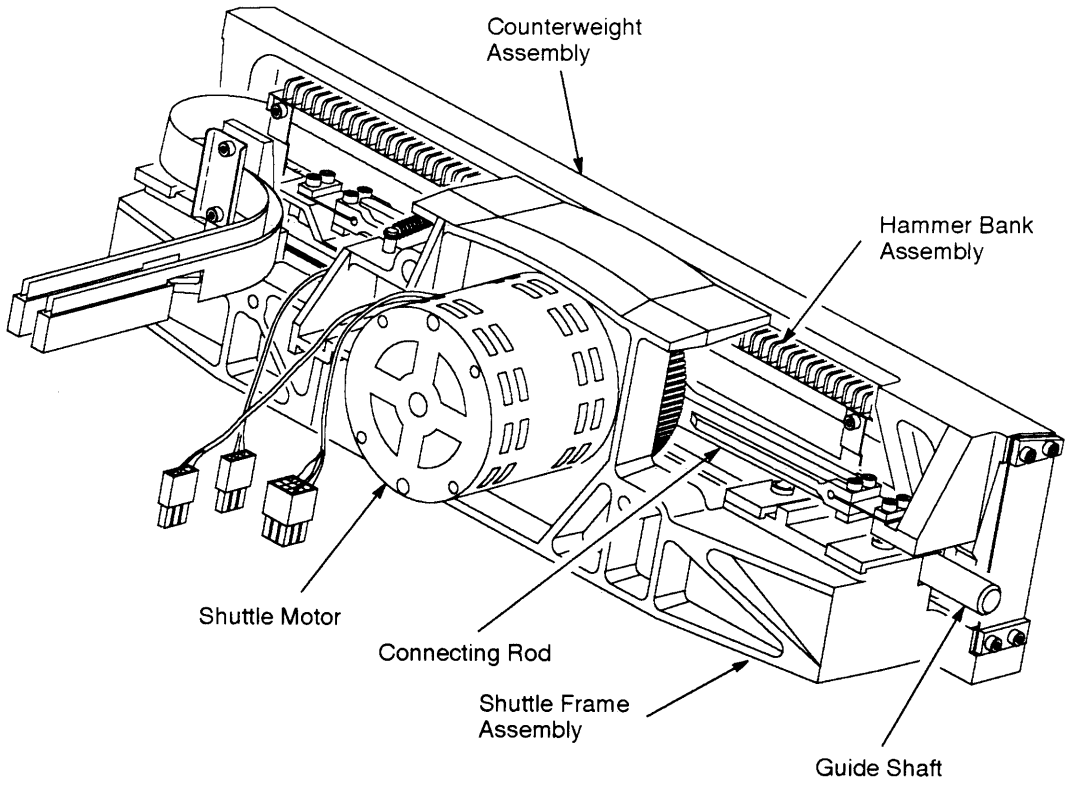


Figure 7–6. Shuttle Frame Assembly

Shuttle Frame and Hammer Bank Assemblies

Dots are printed by 47 hammer springs mounted on the hammer bank. The hammers are arrayed in seven comb–like hammer spring assemblies, or frets. Each fret contains 7 hammers. Using 49 hammers balances the magnetic field characteristics of the hammer bank, while design parameters determine the use of 47 hammers for printing. (The first and 49th hammers do not print.) The frets mount to the hammer bank on alignment pins, eliminating the need for individual hammer alignment.

Each print hammer is a stiff leaf spring with a cylindrical, tungsten carbide tip on the free end. (See Figure 7–7.) A permanent magnet runs the length of the hammer bank and acts on the hammer springs through individual pole pieces. The pole pieces magnetically attract and hold the free end of the hammer spring under tension. This is called the retracted state.

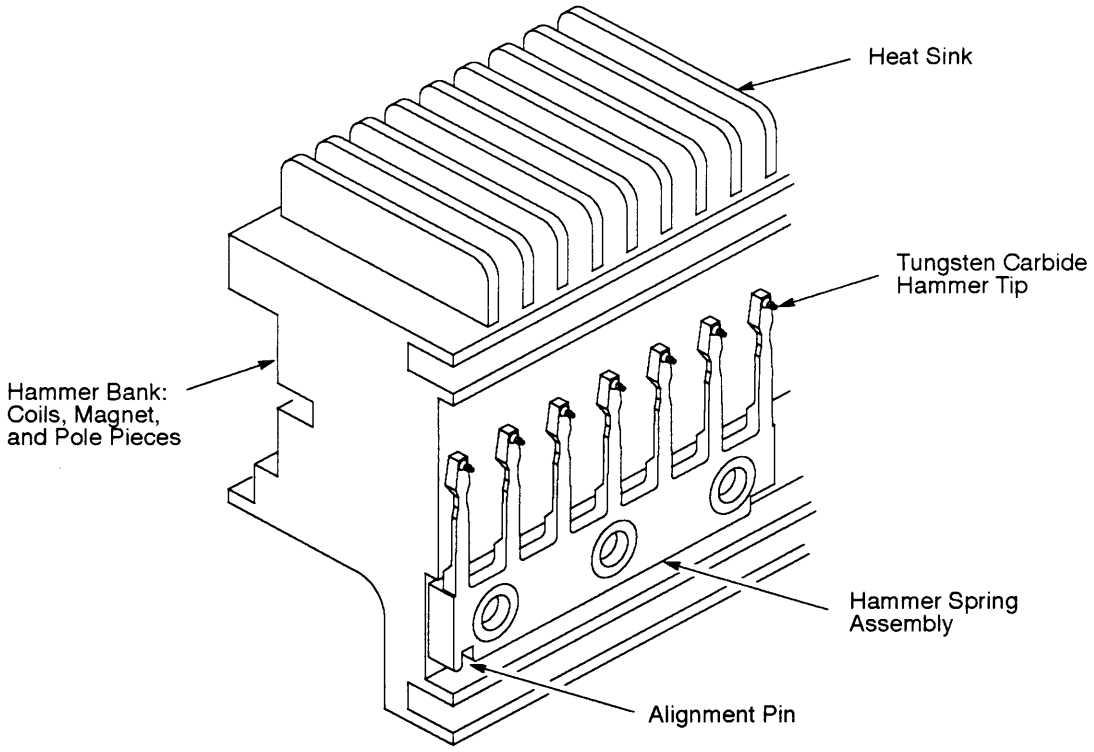


Figure 7–7. Hammer Springs and Hammer Bank (Detail)

A pair of electromagnetic coils is mounted behind each hammer and wound around each pole piece. The coils are normally de–energized. When hammer driver logic determines that the hammer must print a dot, a current pulse energizes the coils. The polarity of the resulting magnetic field opposes the field of the permanent magnet, cancelling its effect and releasing the hammer. The hammer springs forward, strikes the ribbon and paper, and leaves a dot impression of the hammer tip on the paper.

The coil is de–energized and its field collapses while the hammer is in flight. After striking the ribbon and paper, the hammer rebounds and the permanent magnet recaptures it.

A line of characters is created as the shuttle scans horizontally (See Figure 7–8). All the dots in a given row of the character dot matrix are printed in a single scan as the shuttle moves through the character columns

from one side to the other. Figure 7–9 shows how a hammer forms a character as the shuttle scans horizontally.

Characters are formed inside dot matrices, the dimensions of which vary according to the selected font. The dot printing process continues for the number of dot matrix rows determined by the selected font. When an entire character line is printed, the paper feed system advances the paper to the top dot row of the next character line to be printed. During this line advance, the hammer bank assembly continues the right/left oscillation, but the hammers do not print.

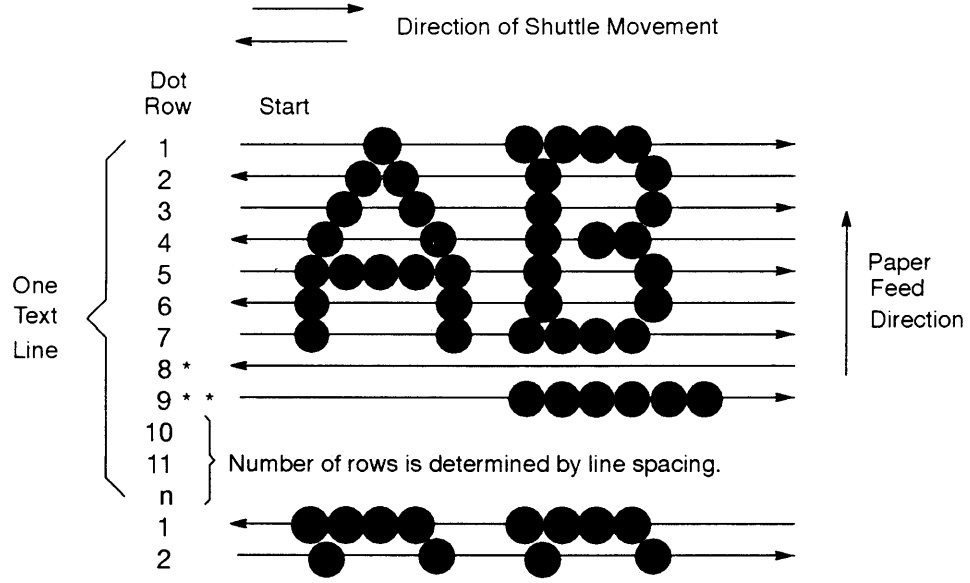


Figure 7–8. Standard Character Formation

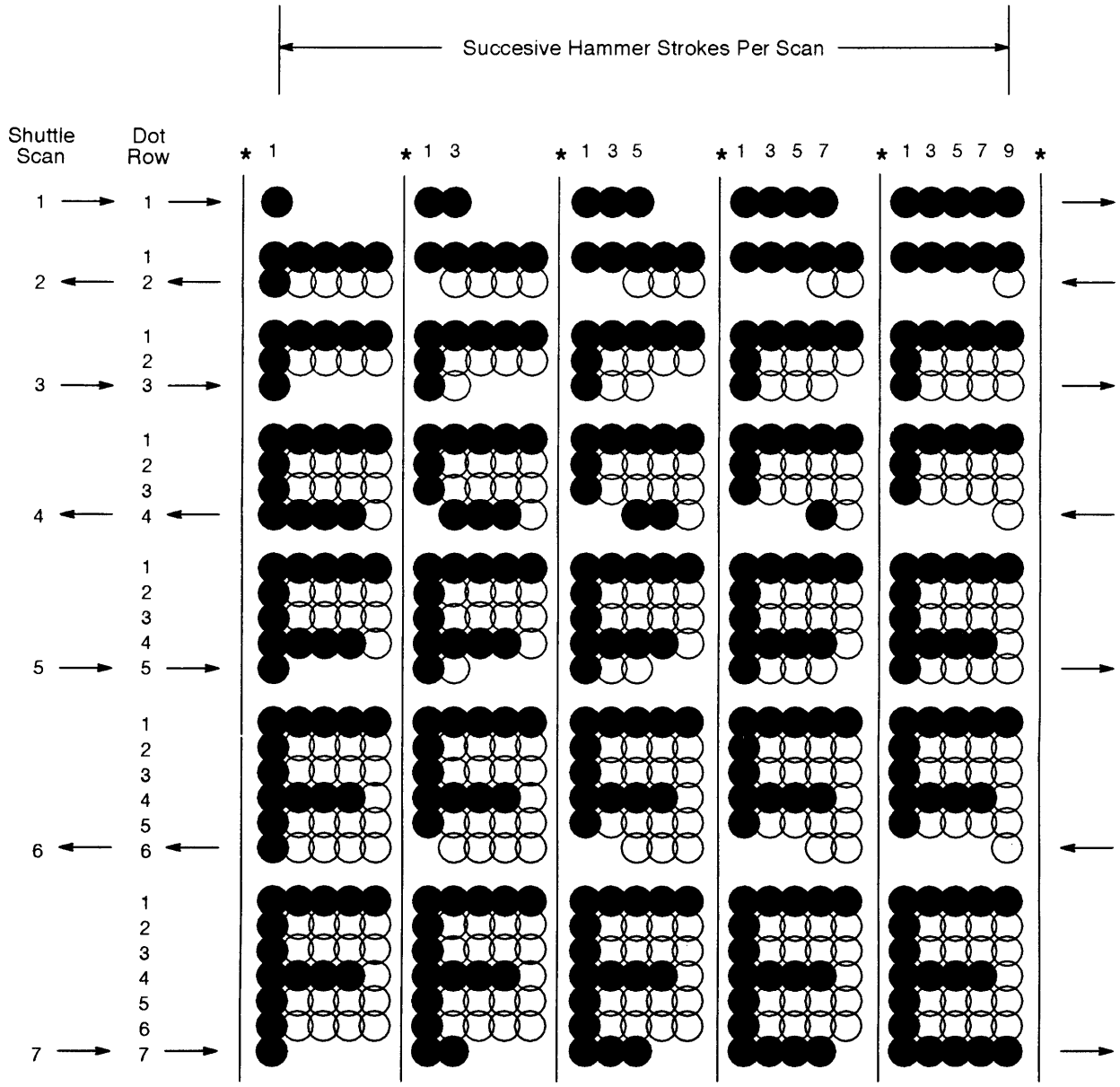


Figure 7–9. Typical Action of One Hammer in Text Printing

Paper Transport System

The paper transport system accepts continuous, fan–folded, edge–perforated paper from three to 16 inches wide and from one to six sheets thick. Horizontal positioning is provided by the horizontal adjustment knob and two tractors. The tractors are laterally adjustable along the splined shaft and tractor support shaft. Each tractor engages paper perforations with six pins and locks in place with a friction lock. During printing, the tractors are driven by the splined shaft, which is belt–driven by the paper feed drive motor. The paper feed drive motor is a two–phase step motor controlled by the paper feed sections of the mechanism driver board and the paper feed controller on the common controller board.

Paper may be manually advanced with the vertical adjustment knob.

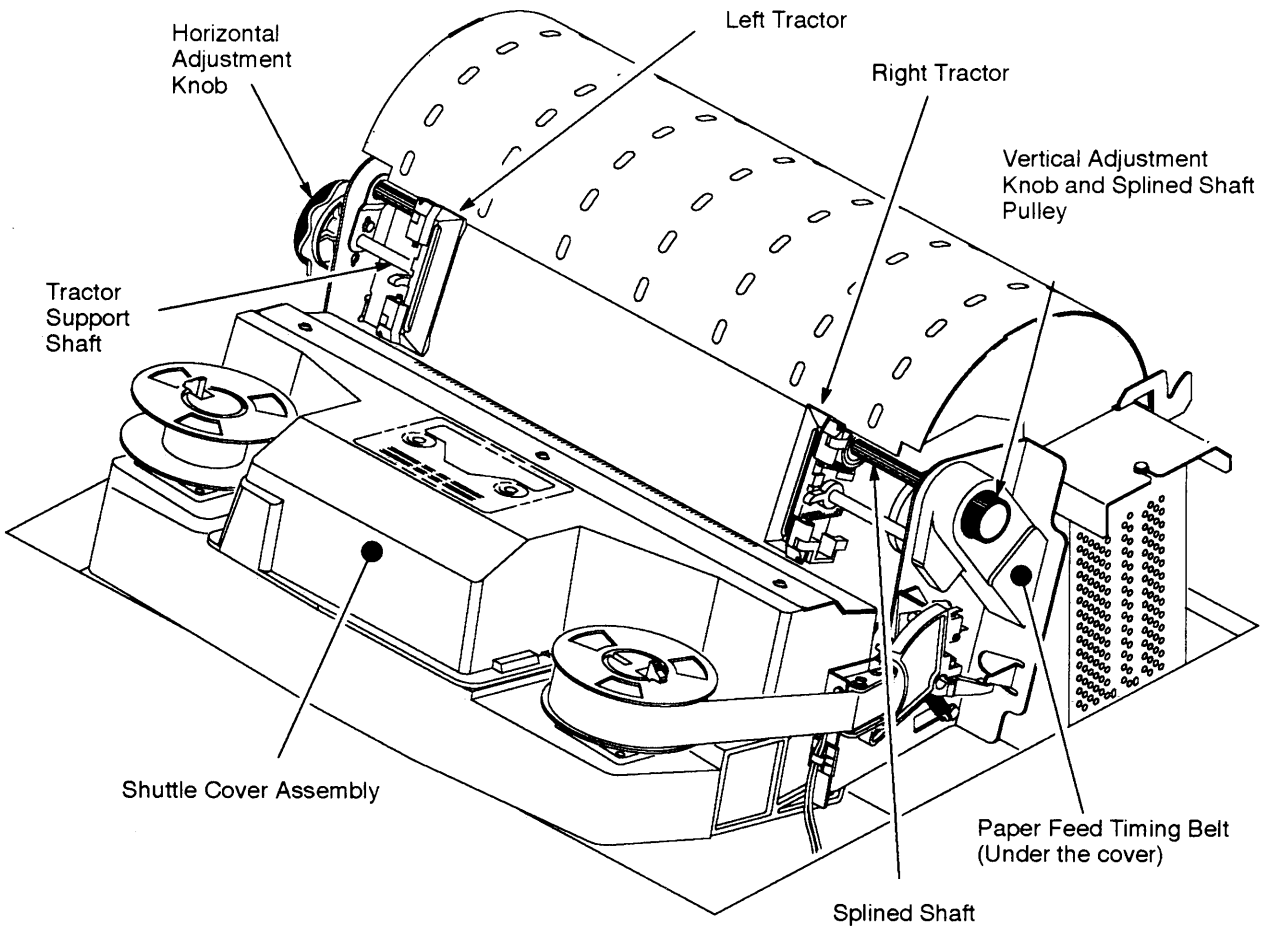


Figure 7–10. Paper Transport System

Ribbon Transport System

The printer ribbon winds and unwinds continuously on a pair of spools latched to hubs which are driven by the ribbon motors. The ribbon motors operate only while the hammer bank assembly is running. Ribbon motion reverses when the metal strip at either end of the ribbon crosses the left or right ribbon guide, completing a circuit that causes both motors to reverse direction.

Constant ribbon tension is maintained by controlling each motor with a drive or drag circuit. While the hammer bank assembly is in motion, one motor acts as a driving motor, drawing the ribbon against the resistance exerted by the other motor—the drag motor. This system maintains a constant motor speed and constant ribbon tension.

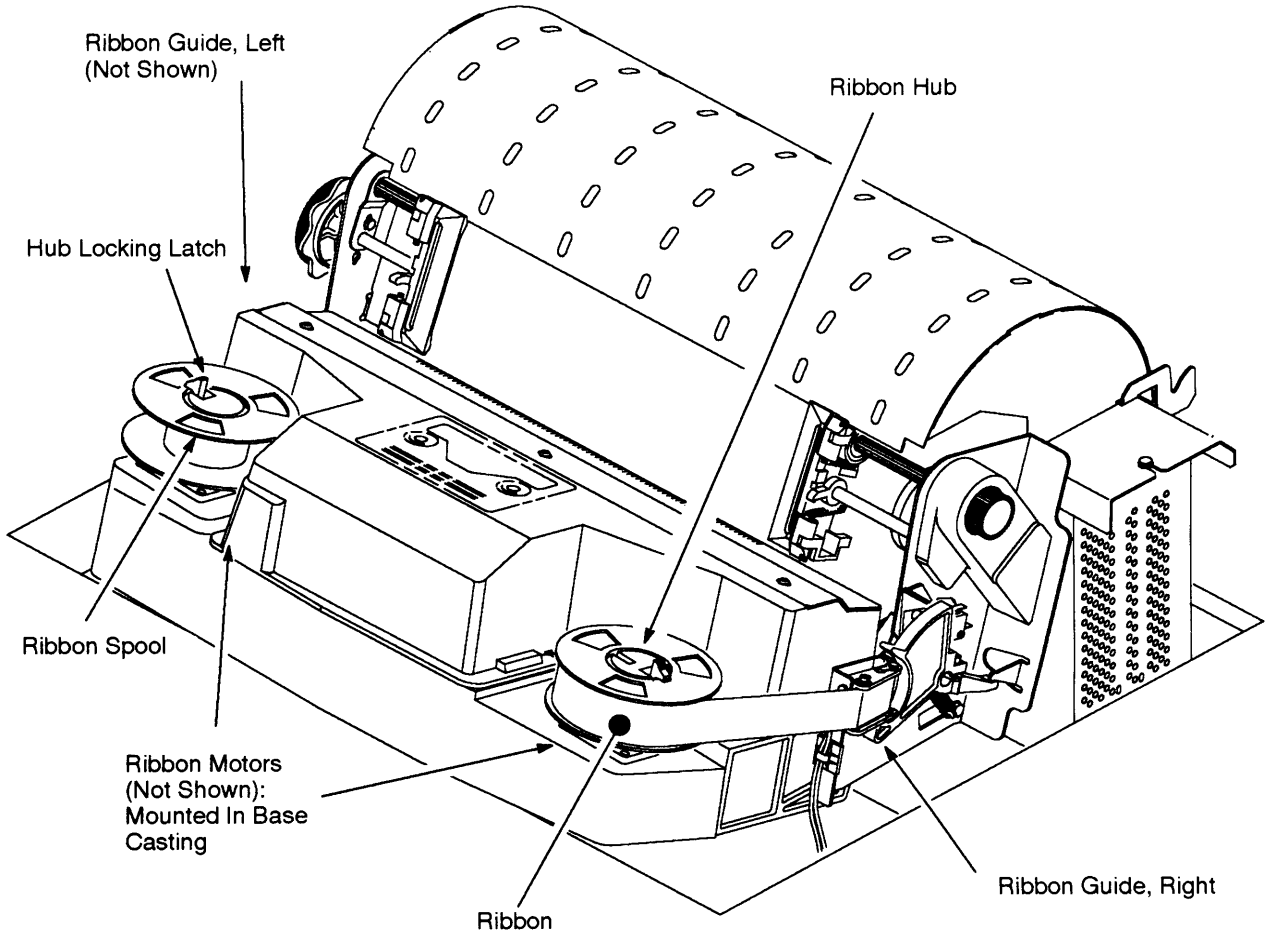


Figure 7–11. Ribbon Transport System

Printer Interfaces and the IGP

The printer interface is the point where the data line from the host computer plugs into the printer. The interface processes all communications signals and data to and from the host computer. The interface consists of a printed circuit board assembly (PCBA) and cable connector(s) for the data line.

On the IBM 6408 printer, the interface determines the model of the printer.

IBM 6408–A00 (ASCII) Interface

The IBM 6408–A00 is equipped with two parallel interfaces (buffered PC parallel and Dataproducts) and an RS–232C serial interface mounted on a single circuit board. This model accepts data in the U.S. ASCII protocol.

Only one interface can be used at a time, and is selected via operator panel configuration. Only one parallel host computer can be connected at a time.

IBM 6408–CT0 (SCS) Interface

The Coax/Twinax Integrated Interface (CT) is a hardware interface and printed circuit board assembly that enables the Model IBM 6408–CT0 to emulate IBM 5225 Models 1, 2, 3, and 4 and 4234 Model 2 printers.

The IBM 6408–CT0 can be attached directly to an IBM network. A switch on the interface plate enables the interface to be set to receive data via coaxial or twinaxial lines.

To process the data and control codes sent from an IBM host system, the CT converts EBCDIC data to an expanded ASCII character set, and sends the converted data to the printer's PCBAs for further processing.

Intelligent Graphics Processor (IGP)

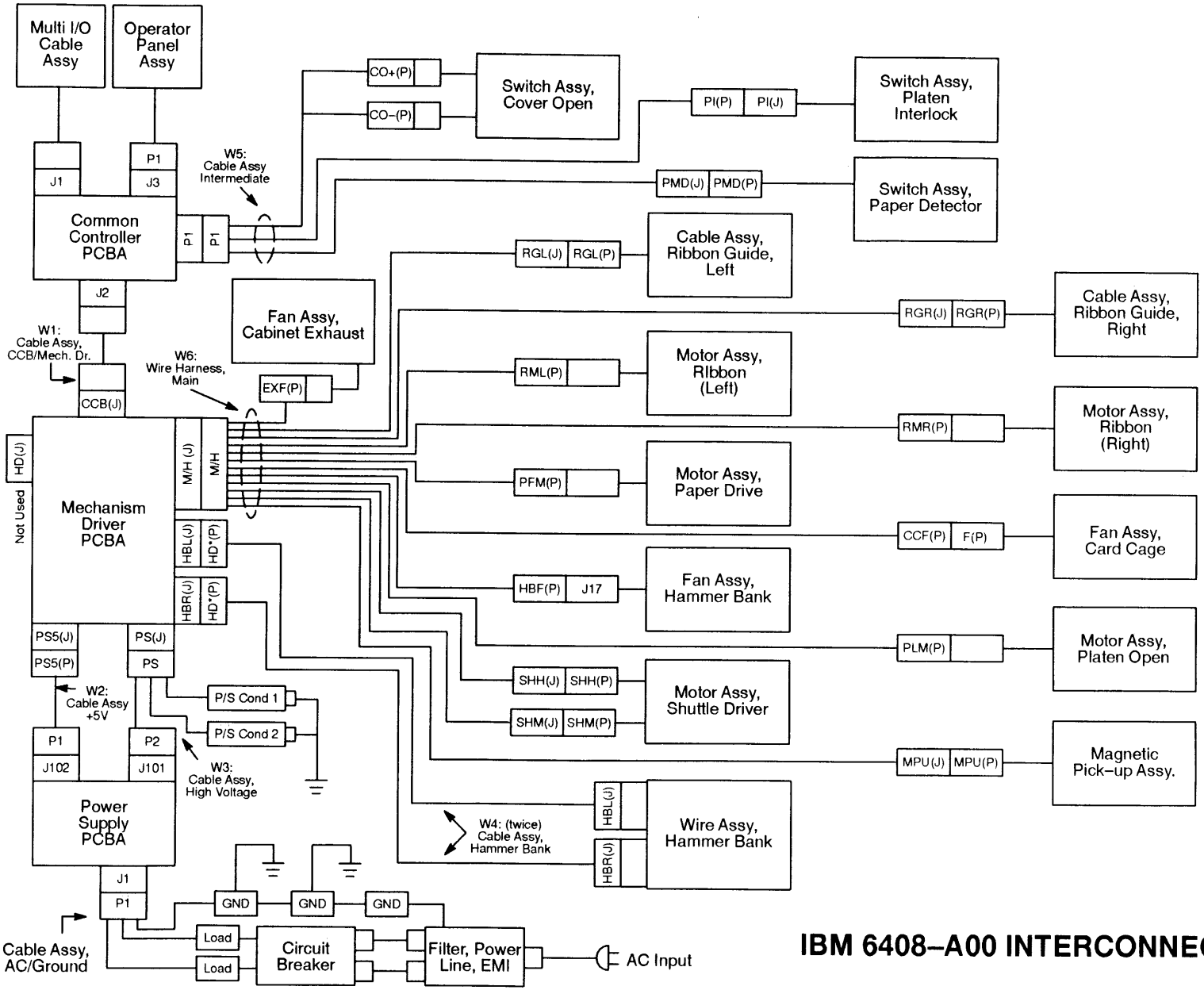
The Intelligent Graphics Processor (IGP) is a printed circuit board assembly that processes and plots all graphics, freeing the host computer for other tasks.

Using a simple programming language, the user can create forms, bar codes, logos, expanded characters, and other graphics. The IGP enables the printer to print sideways, upside down, and make forms combining graphics,

alphanumeric data, and bar codes, all in a single pass. The IGP comes with a set of documents explaining configuration, operation, and programming.

The IGP is installed in the rear–most slot of the card cage. In the IBM 6408–CT0 printer, the CT board is first removed from the rear wall of the card cage, the CT mounting bracket is removed, and the CT is mounted "piggy–back" onto the IGP board.

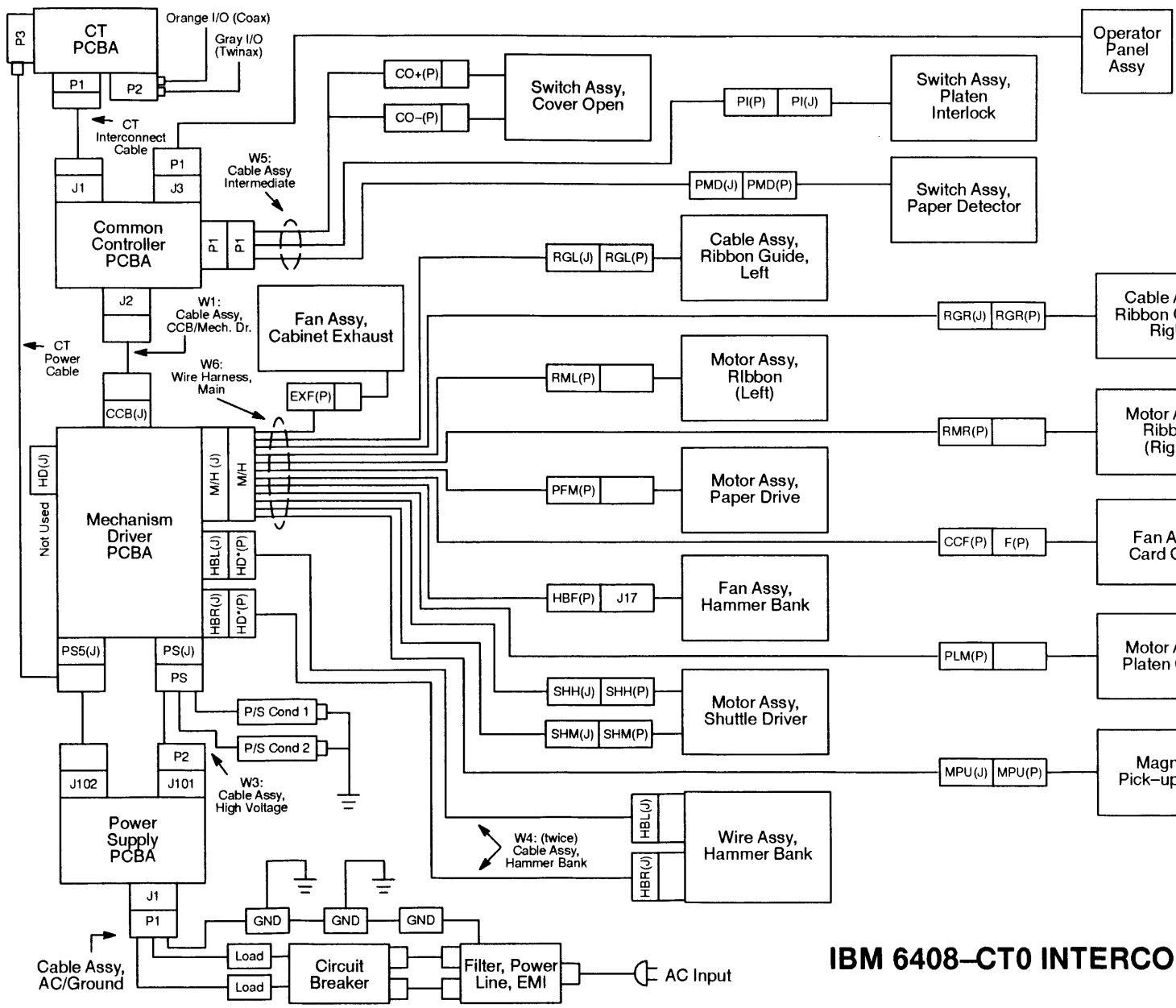
A Wire Data



LEGEND

CCB = Common Controller Board
CCF = Card Cage Fan
CO = Cover Open
EXF = Exhaust Fan
GND = Ground
HB = Hammer Bank
HBF = Hammer Bank Fan
HD = Hammer Driver
(J) = Jack connector
L = Left
MH = Main Harness
MPU = Magnetic Pick Up
(P) = Pin connector
PCBA = Printed Circuit Board Assembly
PFM = Paper Feed Motor
PI = Platen Interlock
PLM = Platen Motor
PMD = Paper Motion Detector
PS = Power Supply
PS5 = Power Supply +5 Volt
R = Right
RG = Ribbon Guide
RM = Ribbon Motor
SHH = Shuttle Hall
SHM = Shuttle Motor

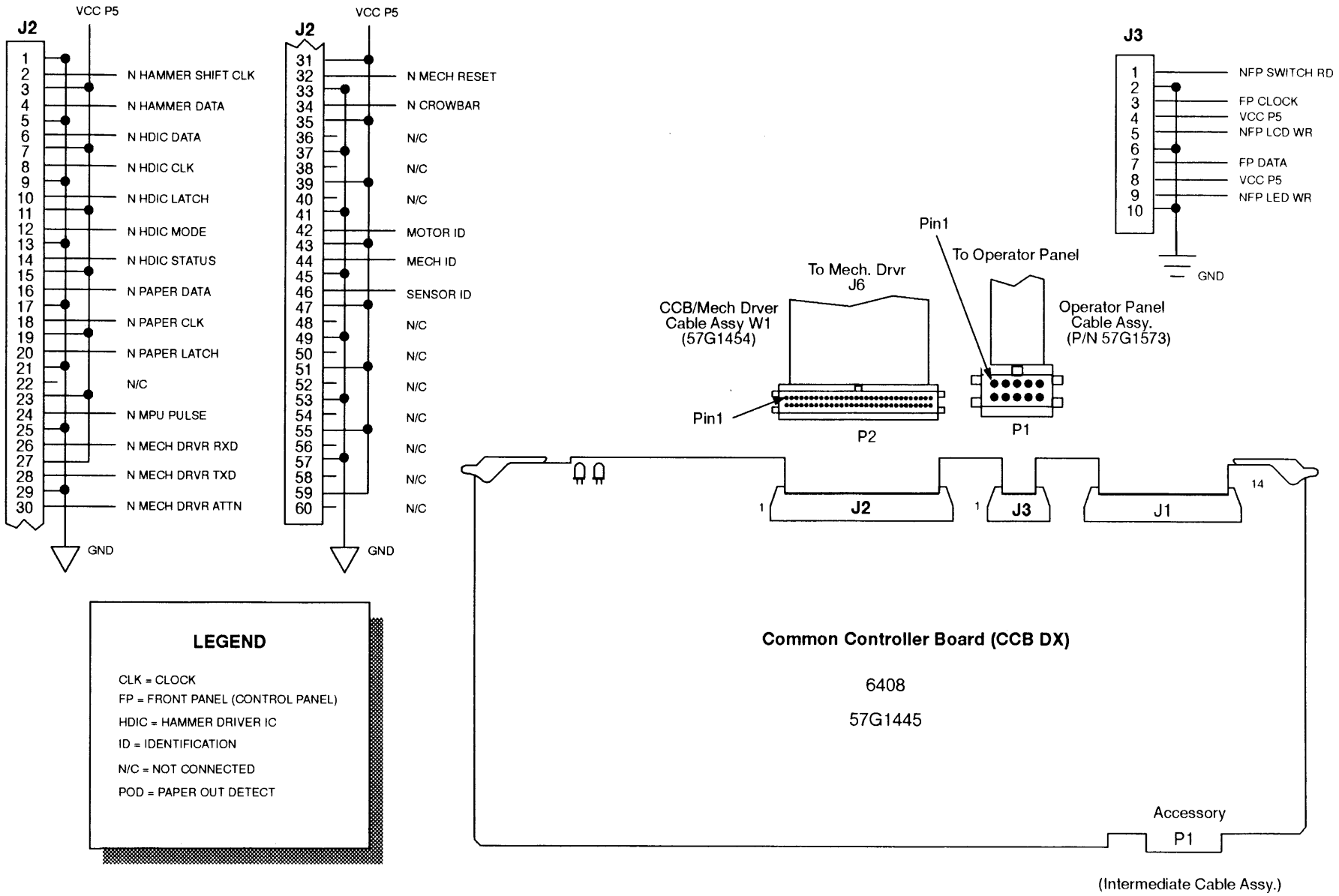
IBM 6408–A00 INTERCONNECTION DIAGRAM

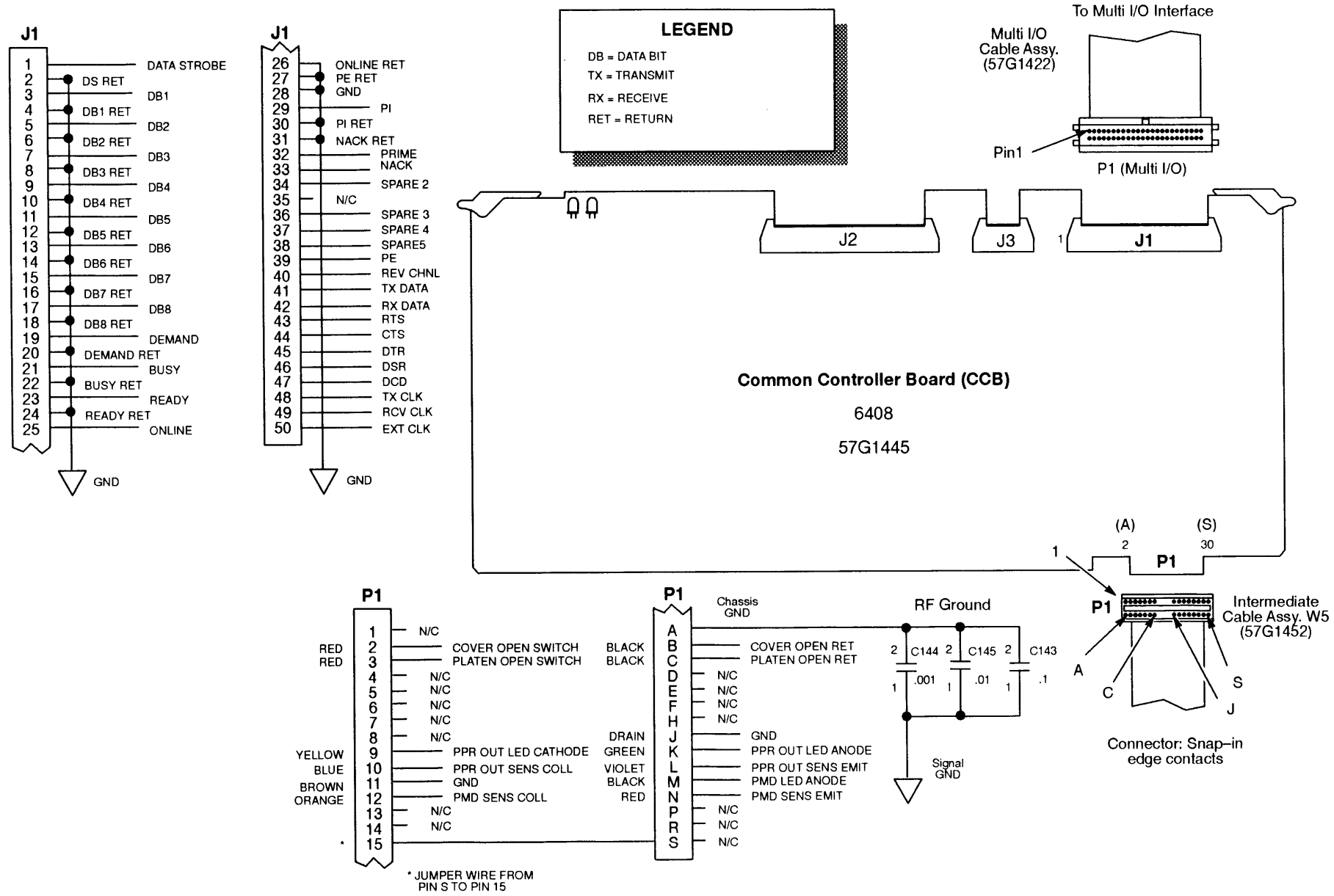


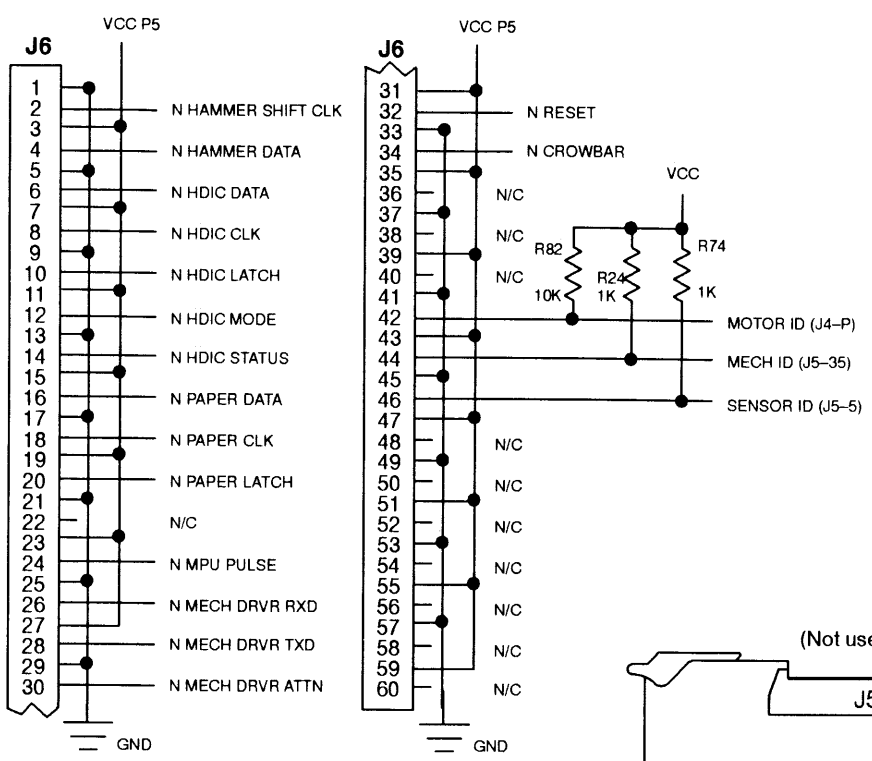
LEGEND

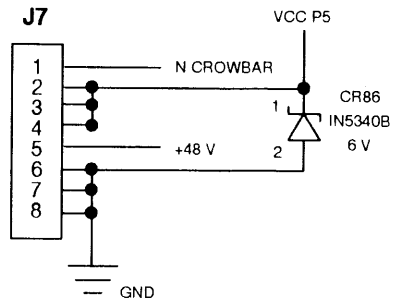
CCB = Common Controller Board
CCF = Card Cage Fan
CO = Cover Open
CT = Coax/Twinax Interface
EXF = Exhaust Fan
GND = Ground
HB = Hammer Bank
HBF = Hammer Bank Fan
HD = Hammer Driver
(J) = Jack connector
L = Left
MH = Main Harness
MPU = Magnetic Pick Up
(P) = Pin connector
PCBA = Printed Circuit Board Assembly
PFM = Paper Feed Motor
PI = Platen Interlock
PLM = Platen Motor
PMD = Paper Motion Detector
PS = Power Supply
PS5 = Power Supply +5 Volt
R = Right
RG = Ribbon Guide
RM = Ribbon Motor
SHH = Shuttle Hall
SHM = Shuttle Motor

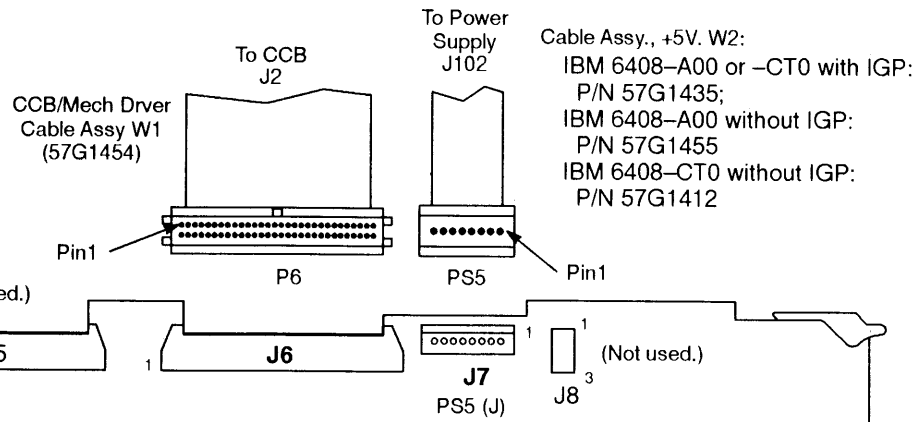
IBM 6408–CT0 INTERCONNECTION DIAGRAM


J2
VCC P5
1 N HAMMER SHIFT CLK
2
3 N HAMMER DATA
4
5 N HDIC DATA
6
7 N HDIC CLK
8
9 N HDIC LATCH
10
11 N HDIC MODE
12
13 N HDIC STATUS
14
15 N PAPER DATA
16
17 N PAPER CLK
18
19 N PAPER LATCH
20
21 N/C
22
23 N MPU PULSE
24
25 N MECH DRVR RXD
26
27 N MECH DRVR TXD
28
29 N MECH DRVR ATTN
30
GND
J2
VCC P5
31 N MECH RESET
32
33 N CROWBAR
34
35 N/C
36
37 N/C
38
39 N/C
40
41 MOTOR ID
42
43 MECH ID
44
45 SENSOR ID
46
47 N/C
48
49 N/C
50
51 N/C
52
53 N/C
54
55 N/C
56
57 N/C
58
59 N/C
60
GND
LEGEND
CLK = CLOCK
FP = FRONT PANEL (CONTROL PANEL)
HDIC = HAMMER DRIVER IC
ID = IDENTIFICATION
N/C = NOT CONNECTED
POD = PAPER OUT DETECT
J3
1 NFP SWITCH RD
2
3 FP CLOCK
4 VCC P5
5 NFP LCD WR
6
7 FP DATA
8 VCC P5
9 NFP LED WR
10
GND
Pin1
To Operator Panel
To Mech. Drvr
J6
CCB/Mech Drver
Cable Assy W1
(57G1454)
Operator Panel
Cable Assy.
(P/N 57G1573)
Pin1
P2
P1
1
J2
1
J3
J1
14
Common Controller Board (CCB DX)
6408
57G1445
Accessory
P1
(Intermediate Cable Assy.)


J1
1 DATA STROBE
2 DS RET
3 DB1
4 DB1 RET
5 DB2
6 DB2 RET
7 DB3
8 DB3 RET
9 DB4
10 DB4 RET
11 DB5
12 DB5 RET
13 DB6
14 DB6 RET
15 DB7
16 DB7 RET
17 DB8
18 DB8 RET
19 DEMAND
20 DEMAND RET
21 BUSY
22 BUSY RET
23 READY
24 READY RET
25 ONLINE
GND
J1
26 ONLINE RET
27 PE RET
28 GND
29 PI
30 PI RET
31 NACK RET
32 PRIME
33 NACK
34 SPARE 2
35 N/C
36 SPARE 3
37 SPARE 4
38 SPARE5
39 PE
40 REV CHNL
41 TX DATA
42 RX DATA
43 RTS
44 CTS
45 DTR
46 DSR
47 DCD
48 TX CLK
49 RCV CLK
50 EXT CLK
GND
LEGEND
DB = DATA BIT
TX = TRANSMIT
RX = RECEIVE
RET = RETURN
To Multi I/O Interface
Multi I/O Cable Assy. (57G1422)
Pin1
P1 (Multi I/O)
J2
J3
1
J1
Common Controller Board (CCB)
6408
57G1445
(A)
2
(S)
30
1
P1
P1
RED N/C
RED 2 COVER OPEN SWITCH
RED 3 PLATEN OPEN SWITCH
4 N/C
5 N/C
6 N/C
7 N/C
8 N/C
YELLOW 9 PPR OUT LED CATHODE
BLUE 10 PPR OUT SENS COLL
BROWN 11 GND
ORANGE 12 PMD SENS COLL
13 N/C
14 N/C
* 15
* JUMPER WIRE FROM PIN S TO PIN 15
P1
A
B BLACK COVER OPEN RET
C BLACK PLATEN OPEN RET
D N/C
E N/C
F N/C
H N/C
J DRAIN GND
K GREEN PPR OUT LED ANODE
L VIOLET PPR OUT SENS EMIT
M BLACK PMD LED ANODE
N RED PMD SENS EMIT
P N/C
R N/C
S N/C
Chassis GND
RF Ground
2 C144 1 .001
2 C145 1 .01
2 C143 1 .1
Signal GND
P1
A
C
S
J
Intermediate Cable Assy. W5 (57G1452)
Connector: Snap–in edge contacts







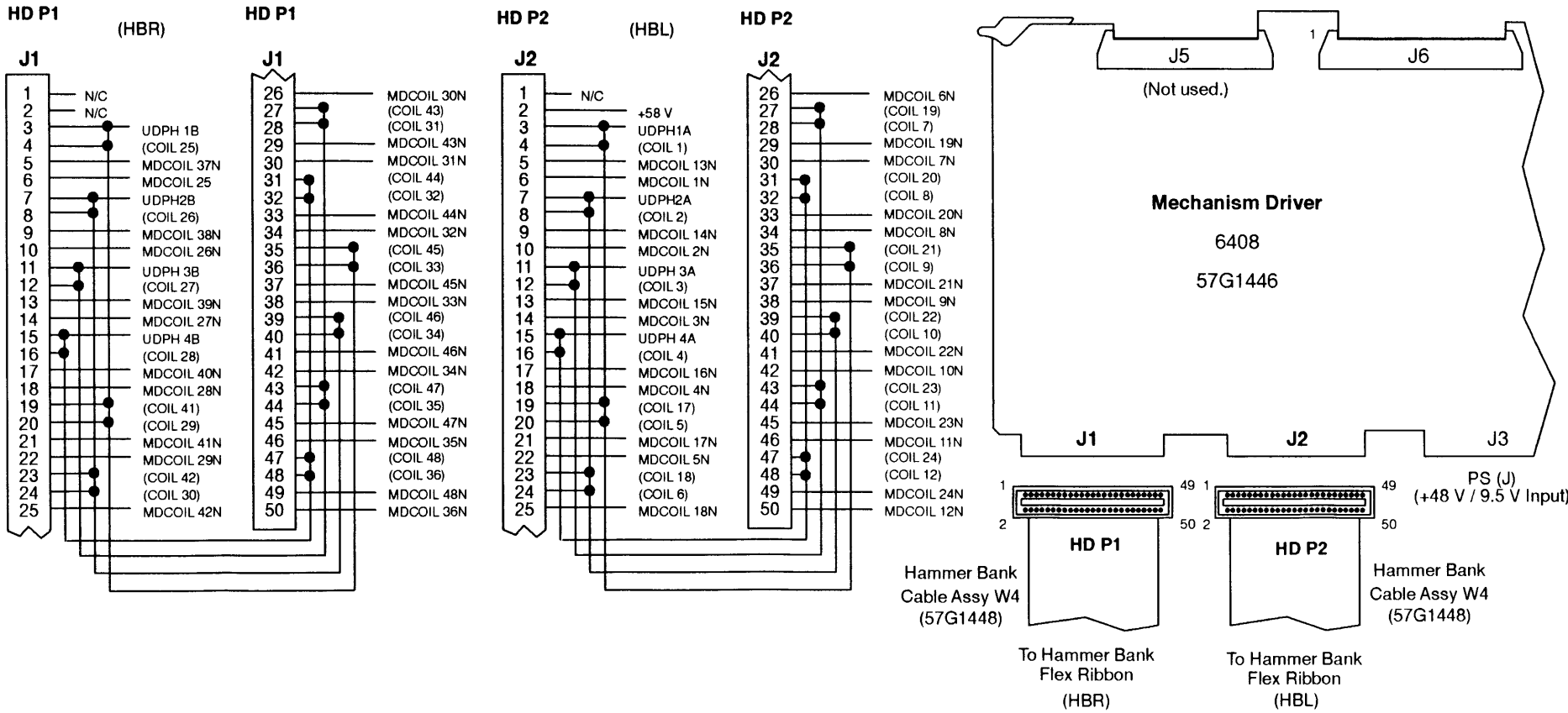
Cable Assy., +5V. W2:
IBM 6408–A00 or –CT0 with IGP:
P/N 57G1435;
IBM 6408–A00 without IGP:
P/N 57G1455
IBM 6408–CT0 without IGP:
P/N 57G1412

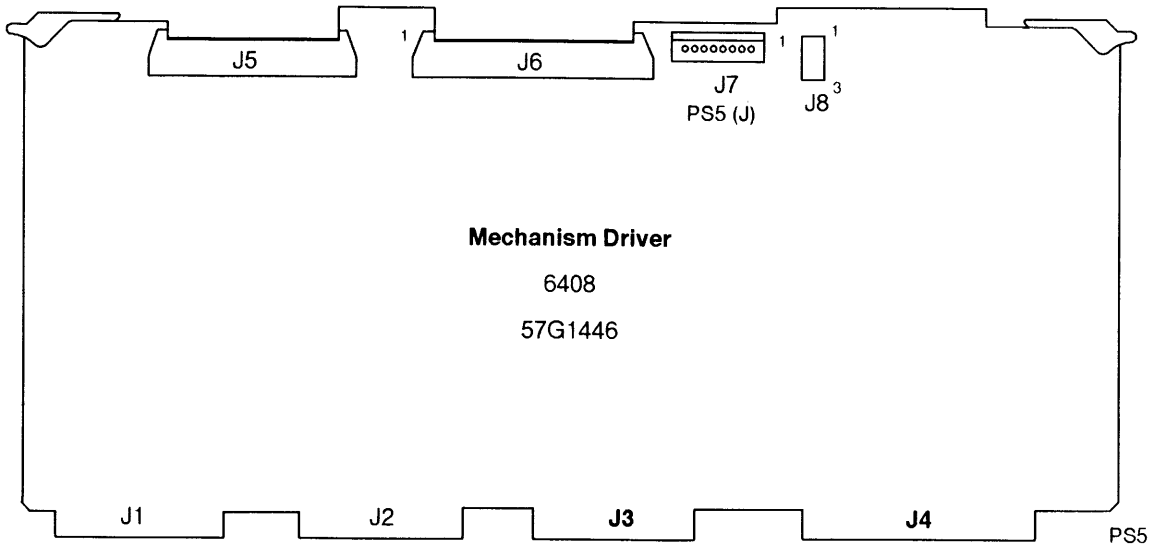
LEGEND

CLK = CLOCK
FP = FRONT PANEL (CONTROL PANEL)
HDIC = HAMMER DRIVER IC
ID = IDENTIFICATION
N/C = NOT CONNECTED

Mechanism Driver
6408
57G1446

J1 HBR (J)
J2 HBL (J)
J3 PS (J)
(+48 V / 9.5 V Input)
J4


HD P1
(HBR)
J1
1 N/C
2 N/C
3 UDPH 1B
4 (COIL 25)
5 MDCOIL 37N
6 MDCOIL 25
7 UDPH2B
8 (COIL 26)
9 MDCOIL 38N
10 MDCOIL 26N
11 UDPH 3B
12 (COIL 27)
13 MDCOIL 39N
14 MDCOIL 27N
15 UDPH 4B
16 (COIL 28)
17 MDCOIL 40N
18 MDCOIL 28N
19 (COIL 41)
20 (COIL 29)
21 MDCOIL 41N
22 MDCOIL 29N
23 (COIL 42)
24 (COIL 30)
25 MDCOIL 42N
HD P1
J1
26 MDCOIL 30N
27 (COIL 43)
28 (COIL 31)
29 MDCOIL 43N
30 MDCOIL 31N
31 (COIL 44)
32 (COIL 32)
33 MDCOIL 44N
34 MDCOIL 32N
35 (COIL 45)
36 (COIL 33)
37 MDCOIL 45N
38 MDCOIL 33N
39 (COIL 46)
40 (COIL 34)
41 MDCOIL 46N
42 MDCOIL 34N
43 (COIL 47)
44 (COIL 35)
45 MDCOIL 47N
46 MDCOIL 35N
47 (COIL 48)
48 (COIL 36)
49 MDCOIL 48N
50 MDCOIL 36N
HD P2
(HBL)
J2
1 N/C
2 +58 V
3 UDPH1A
4 (COIL 1)
5 MDCOIL 13N
6 MDCOIL 1N
7 UDPH2A
8 (COIL 2)
9 MDCOIL 14N
10 MDCOIL 2N
11 UDPH 3A
12 (COIL 3)
13 MDCOIL 15N
14 MDCOIL 3N
15 UDPH 4A
16 (COIL 4)
17 MDCOIL 16N
18 MDCOIL 4N
19 (COIL 17)
20 (COIL 5)
21 MDCOIL 17N
22 MDCOIL 5N
23 (COIL 18)
24 (COIL 6)
25 MDCOIL 18N
HD P2
J2
26 MDCOIL 6N
27 (COIL 19)
28 (COIL 7)
29 MDCOIL 19N
30 MDCOIL 7N
31 (COIL 20)
32 (COIL 8)
33 MDCOIL 20N
34 MDCOIL 8N
35 (COIL 21)
36 (COIL 9)
37 MDCOIL 21N
38 MDCOIL 9N
39 (COIL 22)
40 (COIL 10)
41 MDCOIL 22N
42 MDCOIL 10N
43 (COIL 23)
44 (COIL 11)
45 MDCOIL 23N
46 MDCOIL 11N
47 (COIL 24)
48 (COIL 12)
49 MDCOIL 24N
50 MDCOIL 12N
J5
(Not used.)
J6
Mechanism Driver
6408
57G1446
J1
J2
J3
PS (J)
(+48 V / 9.5 V Input)
HD P1
HD P2
Hammer Bank
Cable Assy W4
(57G1448)
Hammer Bank
Cable Assy W4
(57G1448)
To Hammer Bank
Flex Ribbon
(HBR)
To Hammer Bank
Flex Ribbon
(HBL)



LEGEND

CC = CARD CAGE
PFM = PAPER FEED MOTOR
MOT = MOTOR
RBN = RIBBON
SHUT = SHUTTLE

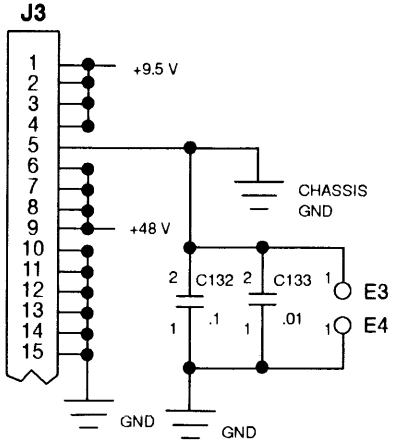
High Voltage Cable Assy W3 (57G1457)

PS (J)

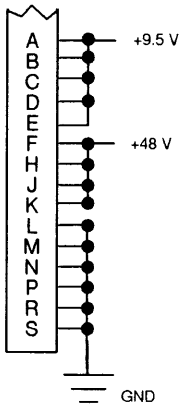
To Power Supply J101

P4980 Main Wire Harness W6 (57G1447)

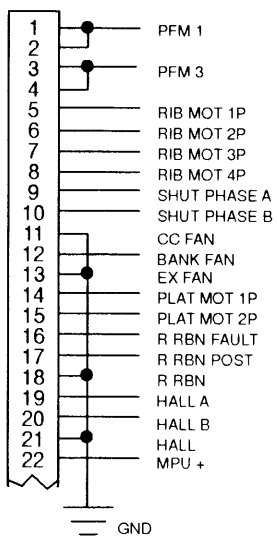
PS J3



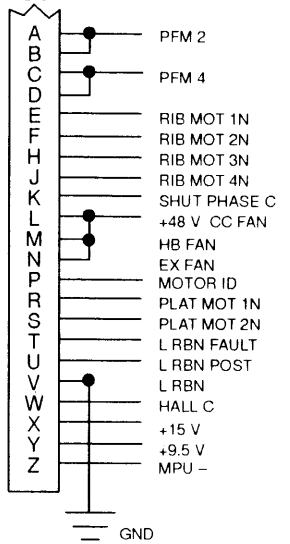
PS J3



PS5 J4



PS5 J4



Test Points: CCB

TP1	GND
TP2	SHUTTLE DIRECTION
TP3	GND
TP4	GND
TP5	GND
TP6	POD
TP7	PMD

LEGEND

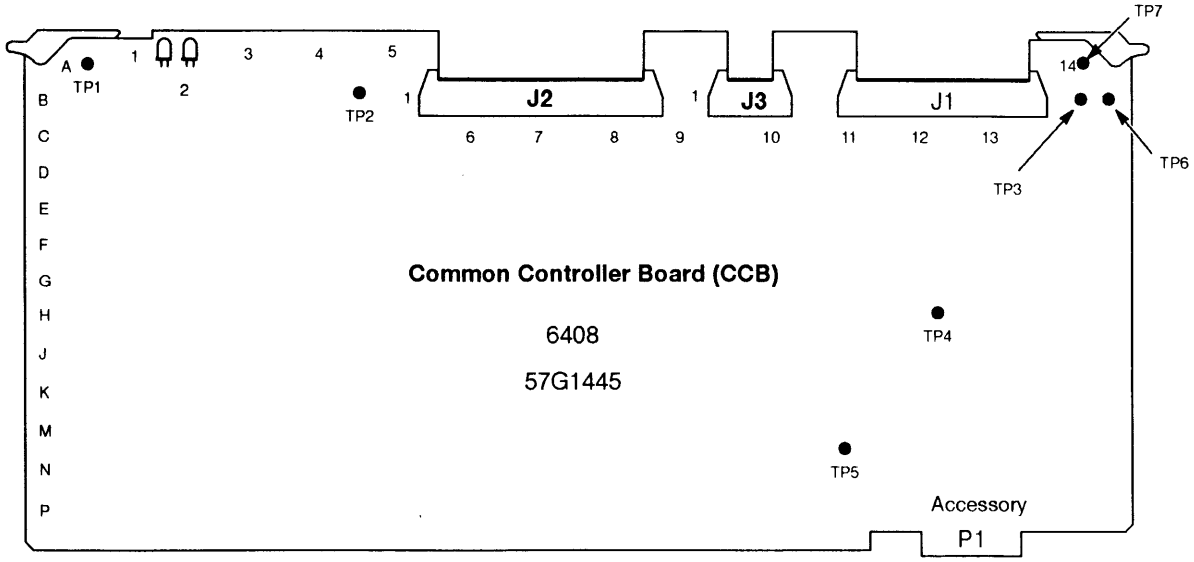
MD = MECH DRIVER

PFM = PAPER FEED MOTOR

PMD = PAPER MOTION DETECT

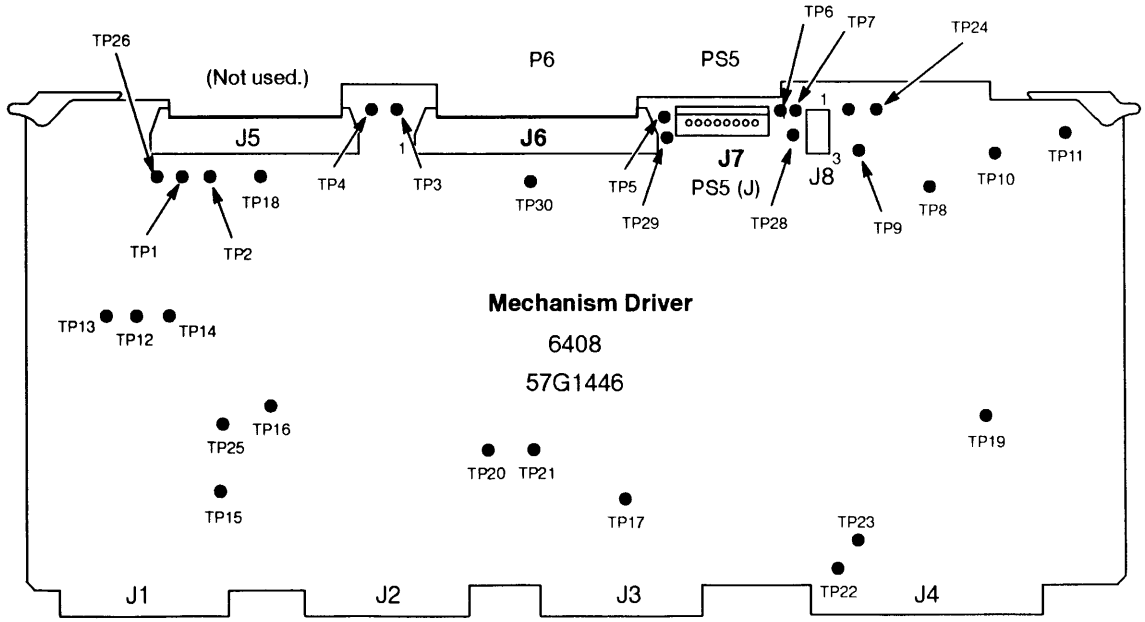
POD = PAPER OUT DETECT

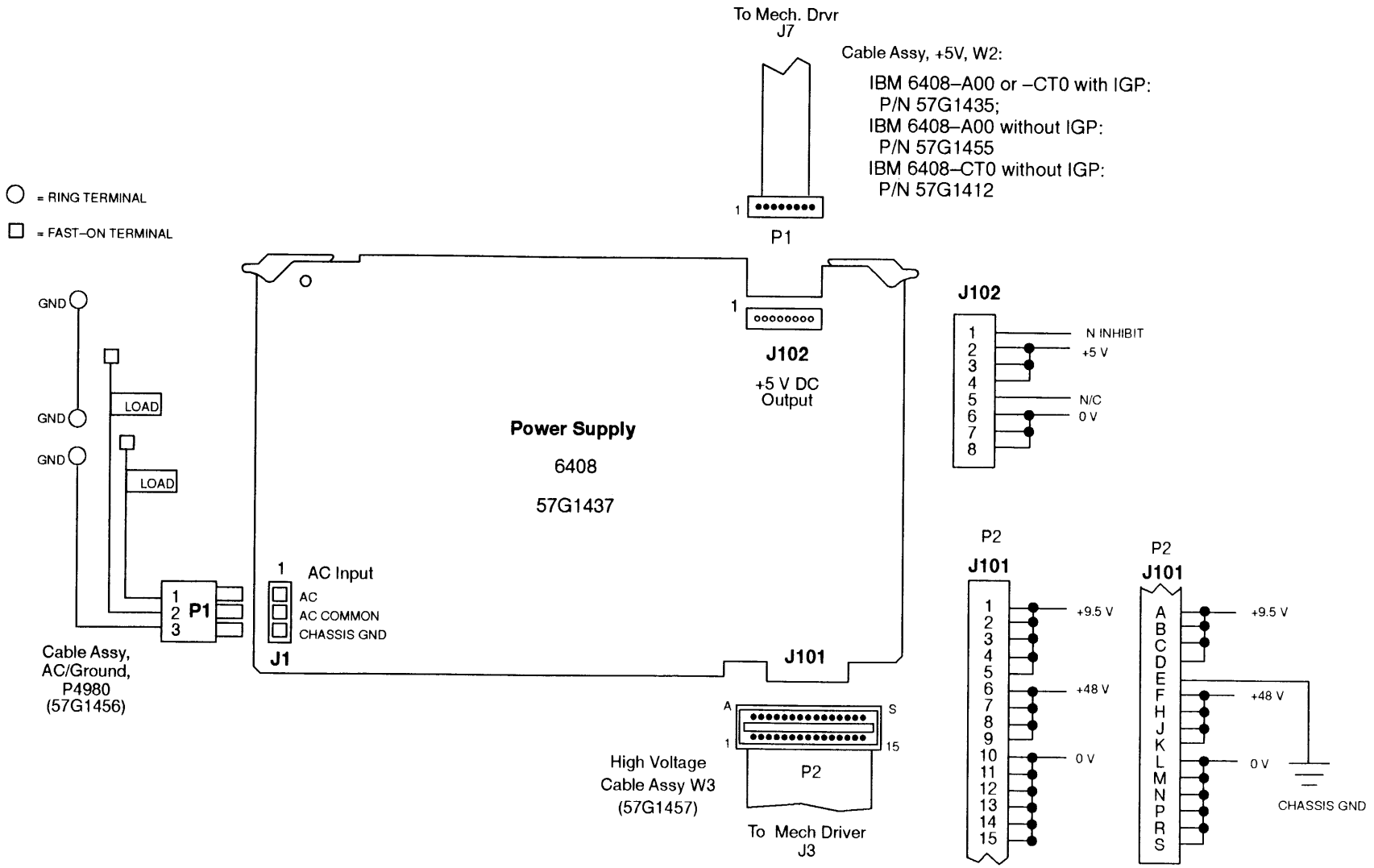
SHUT = SHUTTLE



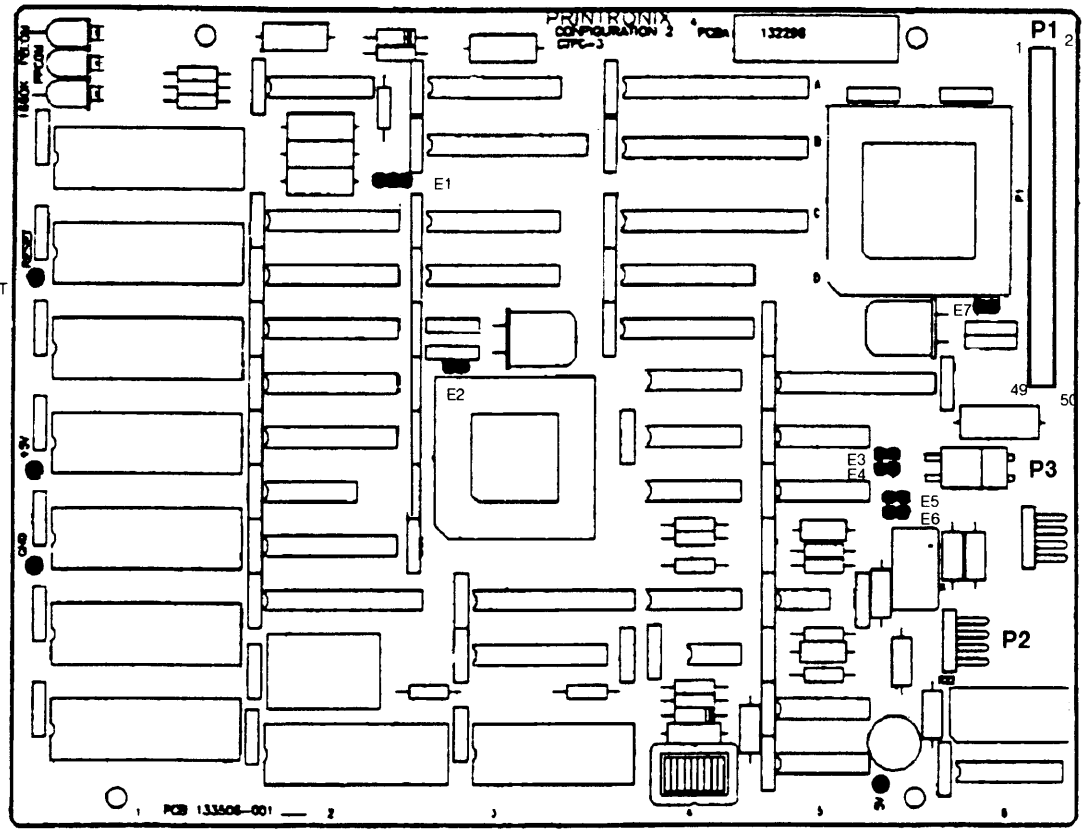
Test Points: Mech. Driver

TP1	PAPER B AMPLITUDE
TP2	PAPER A AMPLITUDE
TP3	PAPER B CURRENT
TP4	PAPER A CURRENT
TP5	N MPU PULSE
TP6	VCC (+5V)
TP7	GND (+5V RET)
TP8	SHUT CLK
TP9	SHUT SPEED
TP10	SHUT ERR
TP11	HALL CLK
TP12	GND (PAPER FEED)
TP13	N COIL TEST
TP14	N SHORT
TP15	GND (HAMMER PWR)
TP16	COIL TEMP
TP17	+58V
TP18	N FAIL SAFE
TP19	GND (SHUTTLE)
TP20	PFM1
TP21	PFM2
TP22	PFM3
TP23	PFM4
TP24	+48V
TP25	+9.5V
TP26	+15V
TP27	+42V
TP28	N CROWBAR
TP29	N MD RESET
TP30	N FAULT




To Mech. Drvr
J7
Cable Assy, +5V, W2:
IBM 6408–A00 or –CT0 with IGP:
P/N 57G1435;
IBM 6408–A00 without IGP:
P/N 57G1455
IBM 6408–CT0 without IGP:
P/N 57G1412
P1
= RING TERMINAL
= FAST–ON TERMINAL
GND
GND
GND
LOAD
LOAD
1
2
3
P1
Cable Assy,
AC/Ground,
P4980
(57G1456)
Power Supply
6408
57G1437
1 AC Input
AC
AC COMMON
CHASSIS GND
J1
J102
+5 V DC
Output
J102
1
2
3
4
5
6
7
8
N INHIBIT
+5 V
N/C
0 V
J101
A
S
1
15
P2
High Voltage
Cable Assy W3
(57G1457)
To Mech Driver
J3
P2
J101
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
+9.5 V
+48 V
0 V
P2
J101
A
B
C
D
E
F
H
J
K
L
M
N
P
R
S
+9.5 V
+48 V
0 V
CHASSIS GND

Coax/Twinax Integrated Interface Board (CT) 57G1430



P1 Printer

1	STB
2	
3	P1
4	
5	P2
6	
7	P3
8	
9	P4
10	
11	P5
12	
13	P6
14	
15	P7
16	
17	P8
18	
19	DRQ
20	
21	
22	
23	RDY
24	
25	SLCT
26	
27	
28	
29	PI
30	
31	
32	IGPBUFCL
33	
34	
35	
36	
37	RDTTL
38	TDTTL
39	
40	
41	RD232
42	TD232
43	
44	
45	
46	
47	
48	
49	
50	

Jumper Table

E1	SHOULD BE SET AS ○ ●●
E2	80C186 CLOCK ENABLE
E3	NOT USED (RESERVED FOR FACTORY USE)
E4	NOT USED (RESERVED FOR FACTORY USE)
E5	NOT USED (RESERVED FOR FACTORY USE)
E6	NOT USED (RESERVED FOR FACTORY USE)
E7	8344 CLOCK ENABLE

P2 Twinax/Coax

1	CS
2	CD
3	
4	TX/CX
5	
6	TPA
7	
8	TPB

P3 Power

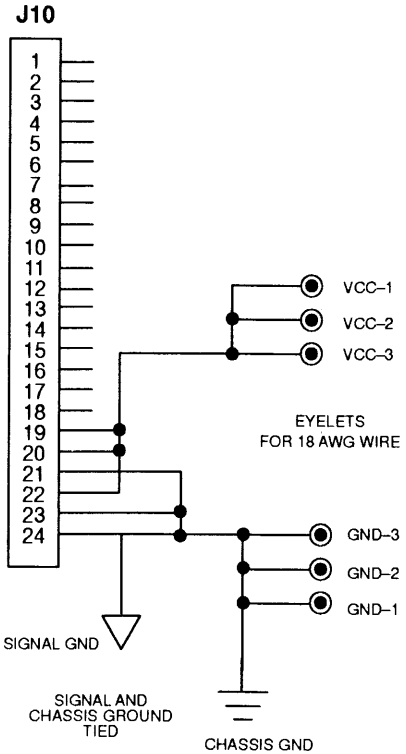
1	VCC
2	

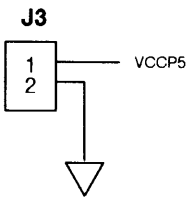
C61 22 20% 15V

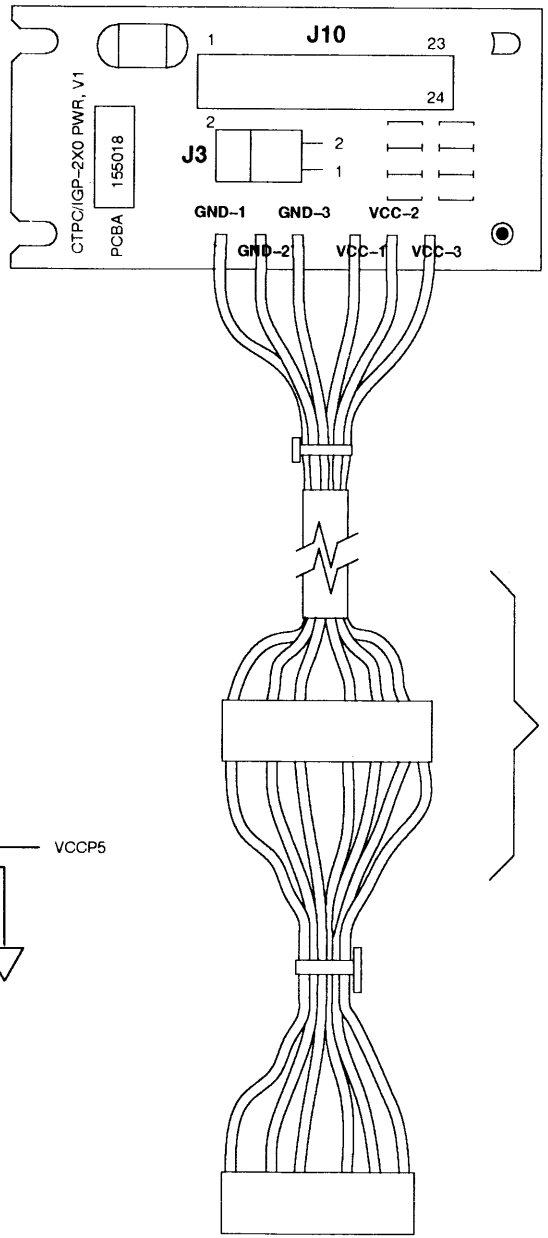
P4 IGP Serial

1	IRXD
2	ITXD
3	
4	
5	
6	
7	
8	

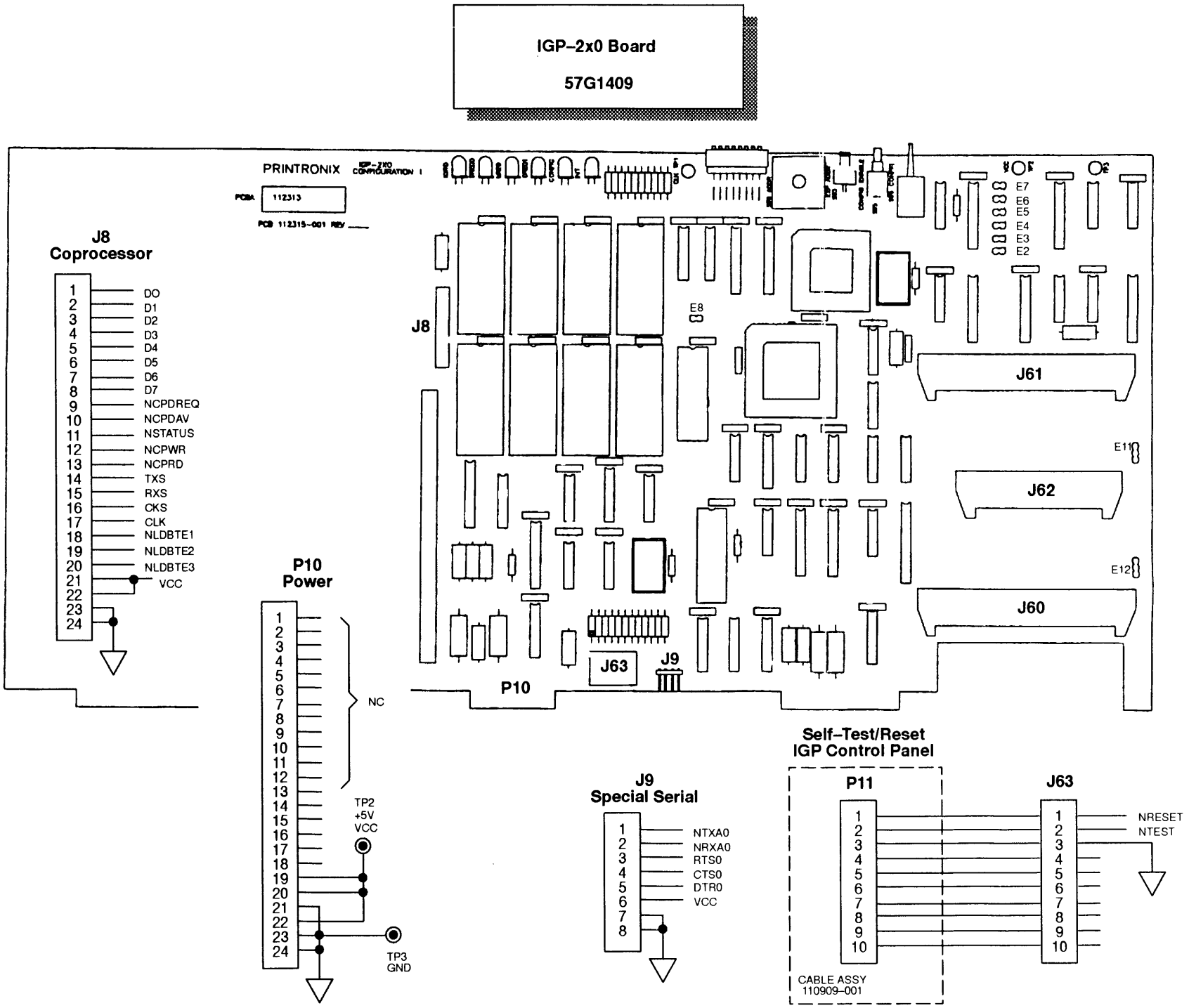
CTPC/IGP–2X0 Power Board
57G1435





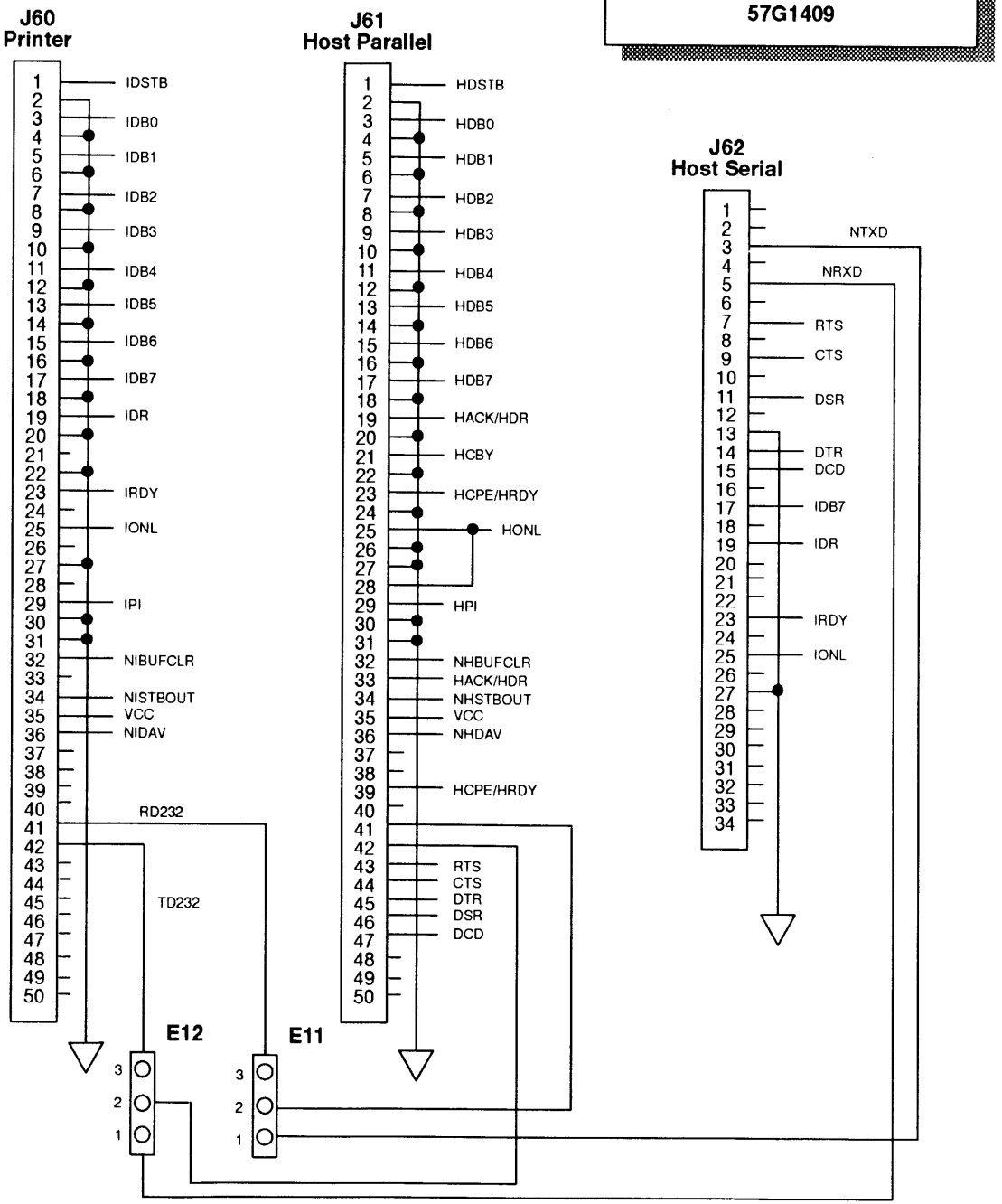


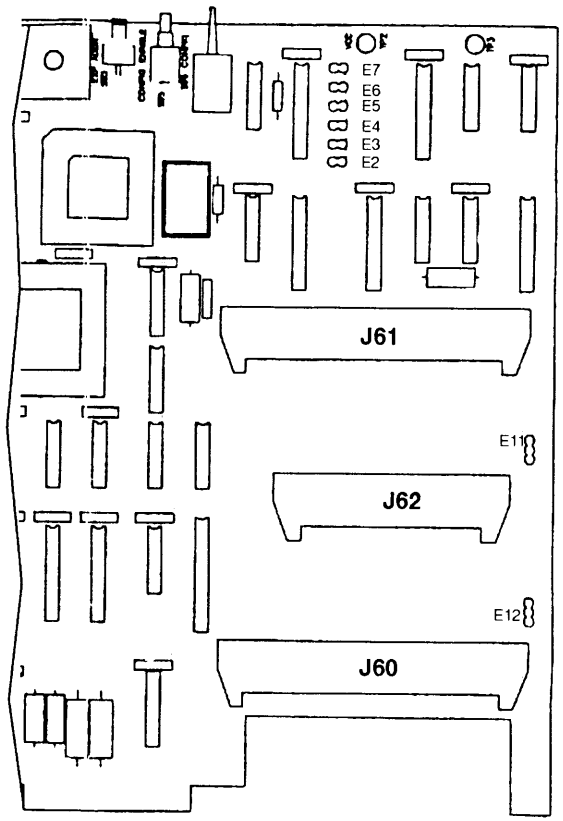
Cable Assembly, Power,
CTPC/IGP–2X0
(Page A–18)


IGP–2x0 Board
57G1409
PRINTRONIX
PCBA 112313
PCB 112315-001 REV
J8
Coprocessor
1 DO
2 D1
3 D2
4 D3
5 D4
6 D5
7 D6
8 D7
9 NCPDREQ
10 NCPDAV
11 NSTATUS
12 NCPWR
13 NCPRD
14 TXS
15 RXS
16 CKS
17 CLK
18 NLDBTE1
19 NLDBTE2
20 NLDBTE3
21 VCC
22
23
24
E7
E6
E5
E4
E3
E2
E8
J61
E11
J62
E12
J60
J63
J9
P10
P10
Power
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
NC
TP2
+5V
VCC
TP3
GND
J9
Special Serial
1 NTXA0
2 NRXA0
3 RTS0
4 CTS0
5 DTR0
6 VCC
7
8
Self–Test/Reset
IGP Control Panel
P11
1
2
3
4
5
6
7
8
9
10
J63
1 NRESET
2 NTEST
3
4
5
6
7
8
9
10
CABLE ASSY
110909–001

IGP–2x0 Board

57G1409



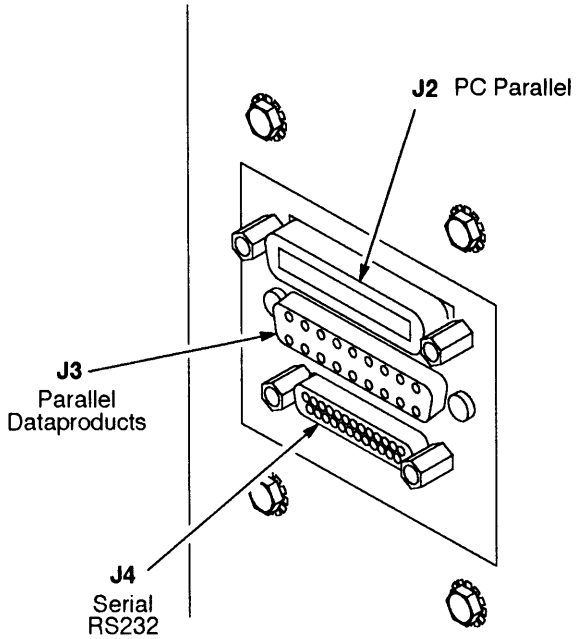


Jumper Table

E2	150NS DELAY ON HOST STROBE LINE
E3	120NS DELAY ON HOST STROBE LINE
E4	90NS DELAY ON HOST STROBE LINE
E5	60NS DELAY ON HOST STROBE LINE
E6	30NS DELAY ON HOST STROBE LINE
E7	0NS DELAY ON HOST STROBE LINE
E8	SELECT HOST SERIAL PORT TO INPUT NEW CONFIGURATION
E11	1–2 : NORMAL RS232 RXD CONNECTION 2–3 : PASS RS232 RXD TO DCU
E12	1–2 : NORMAL RS232 TXD CONNECTION 2–3 : PASS RS232 TXD TO DCU

Multi I/O Cable Assy.
(57G1506)

Interface Connectors



PC Parallel

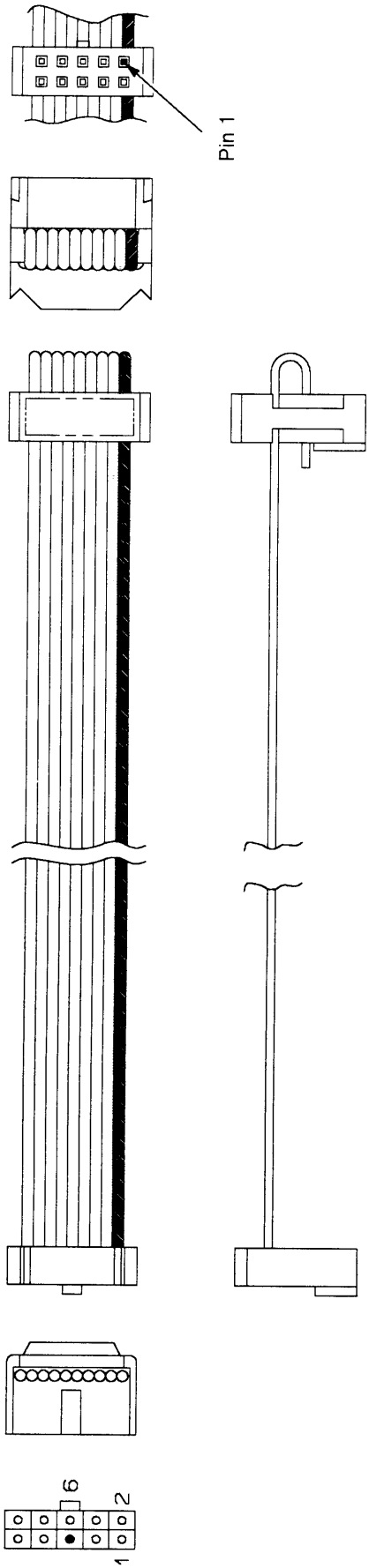
J2		J2	
1	DATA STROBE	19	DS RET
2	DB1	20	DB1 RET
3	DB2	21	DB2 RET
4	DB3	22	DB3 RET
5	DB4	23	DB4 RET
6	DB5	24	DB5 RET
7	DB6	25	DB6 RET
8	DB7	26	DB7 RET
9	DB8	27	DB8 RET
10	NACK	28	BUSY RET
11	BUSY	29	PI RET
12	PE	30	GND
13	ONLINE	31	PRIME
14	N/C	32	ONLINE
15	PI	33	NACK RET
16	PE RET	34	N/C
17	CHASSIS GND	35	N/C
18	N/C	36	N/C

Parallel Dataproducts

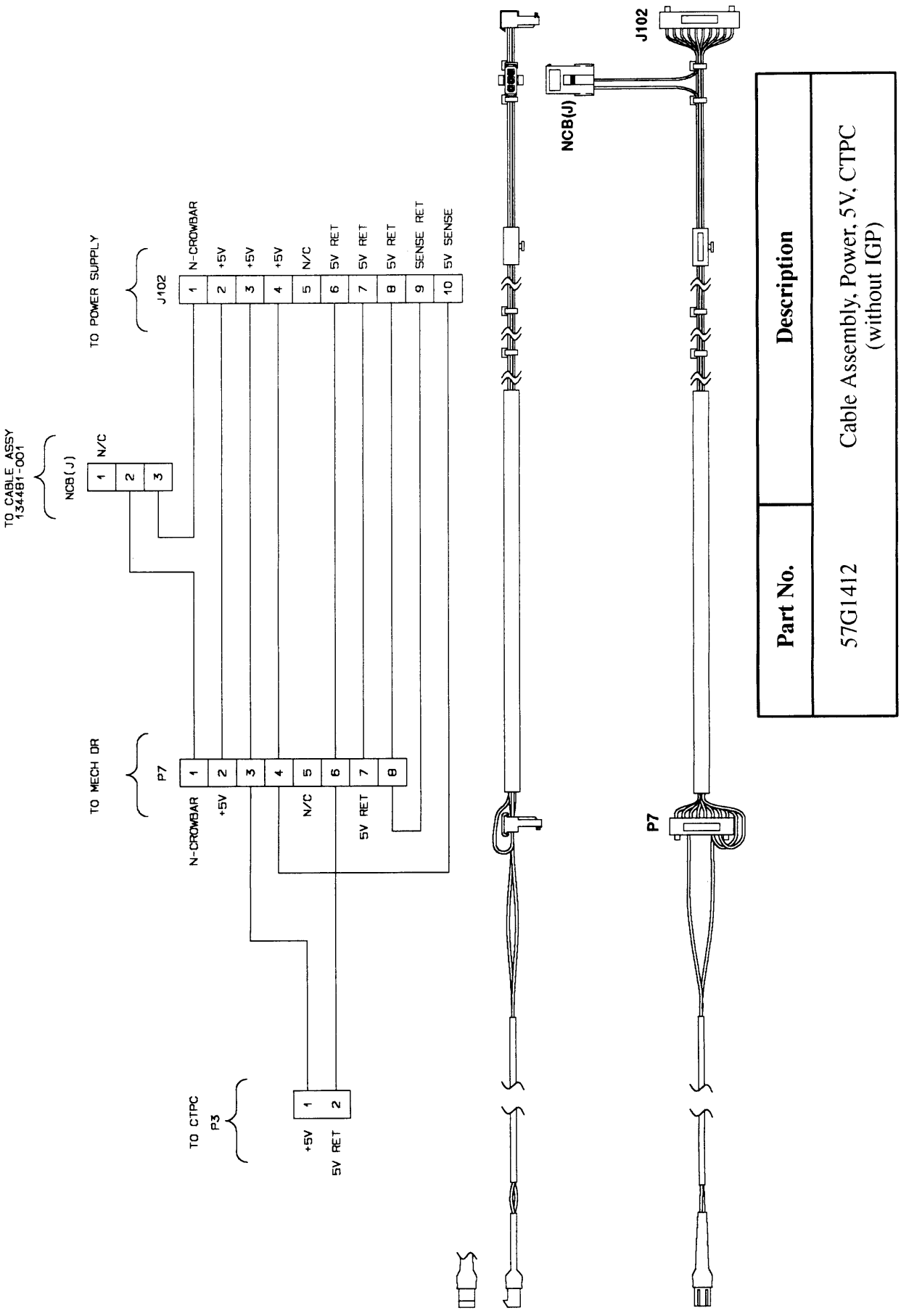
J3		J3	
1	DB3	26	VFU READY (N/C)
2	DB3 RET	27	PAR ERROR (N/C)
3	DB1 RET	28	DB8
4	DB2 RET	29	PARITY (N/C)
5	OL RET	30	PI
6	READY RET	31	BUF CLR (N/C)
7	DEMAND RET	32	N/C
8	N/C	33	N/C
9	N/C	34	DB5
10	VFU RET (N/C)	35	DB7 RET
11	PAR ERR RET (N/C)	36	DB7
12	N/C	37	DS RET
13	PARITY RET (N/C)	38	DATA STROBE
14	PI RET	39	GND
15	BUF CLR (N/C)	40	DB4 RET
16	N/C	41	DB4
17	N/C	42	DB6 RET
18	DB5 RET	43	DB6
19	DB1	44	DB8 RET
20	DB2	45	CABLE VER
21	ONLINE	46	
22	READY	47	N/C
23	DEMAND	48	N/C
24	N/C	49	N/C
25	N/C	50	N/C

Serial RS232

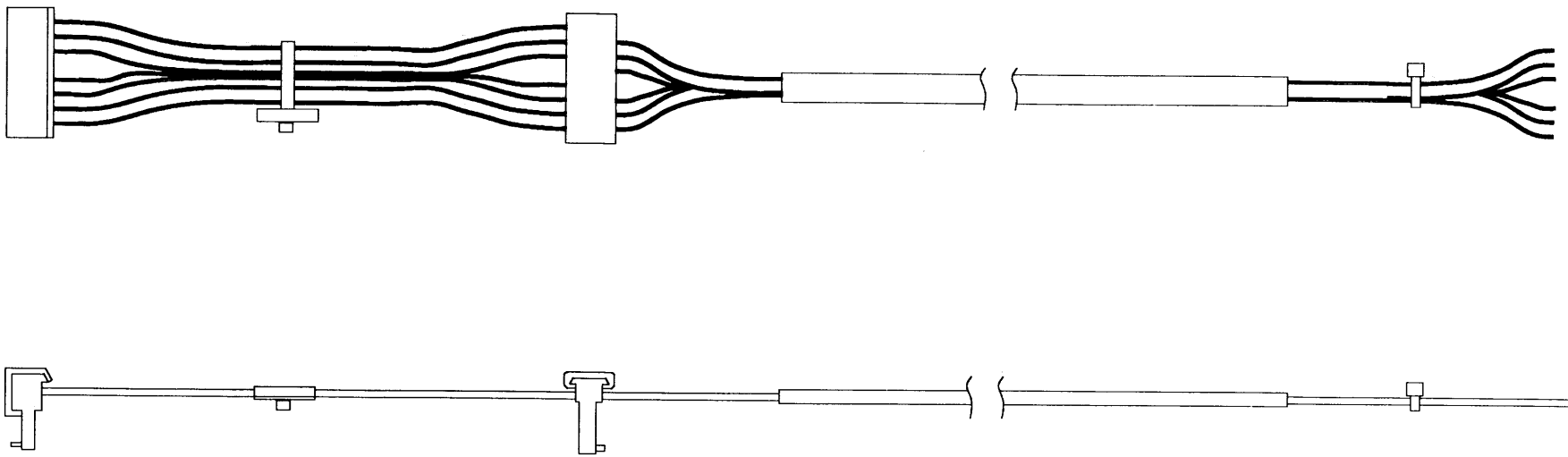
J4	
1	CHASSIS GND
2	TD
3	RD
4	RTS
5	CTS
6	DSR
7	GND
8	DCD
9	N/C
10	N/C
11	N/C
12	N/C
13	N/C
14	REV CHNL
15	TX CLK
16	N/C
17	RCV CLK
18	N/C
19	N/C
20	DTR
21	N/C
22	N/C
23	N/C
24	N/C
25	EXT CLK

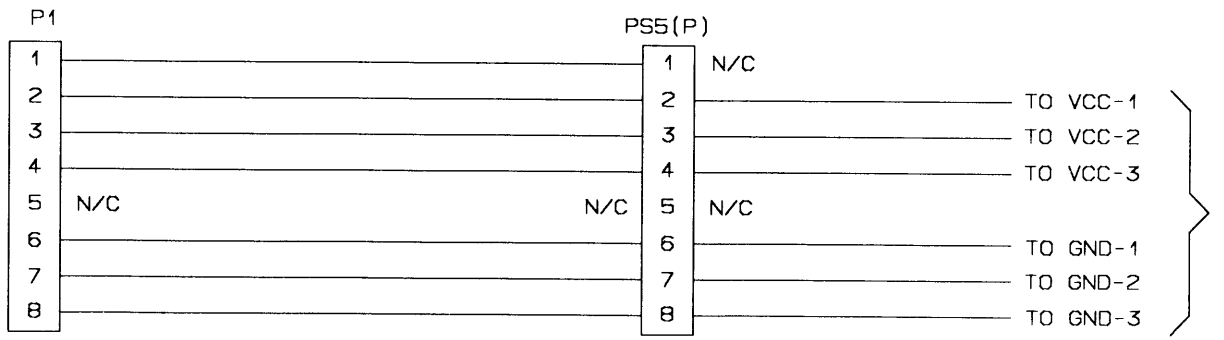


Part No.	Description
	Cable, Operator Panel, Long



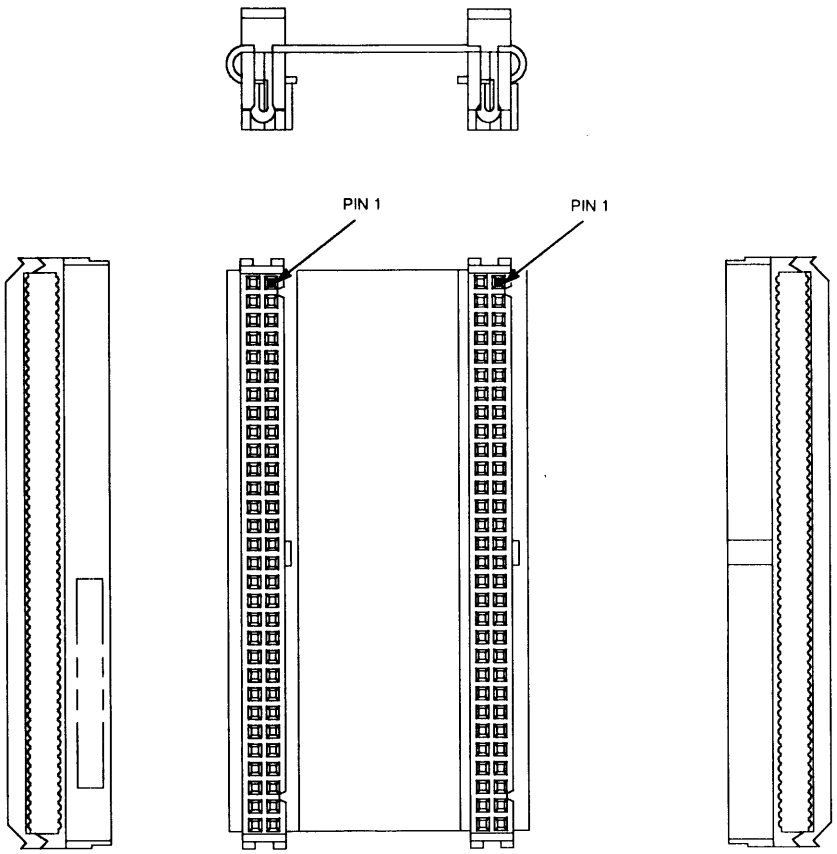
Part No.	Description
57G1412	Cable Assembly, Power, 5V, CTPC (without IGP)



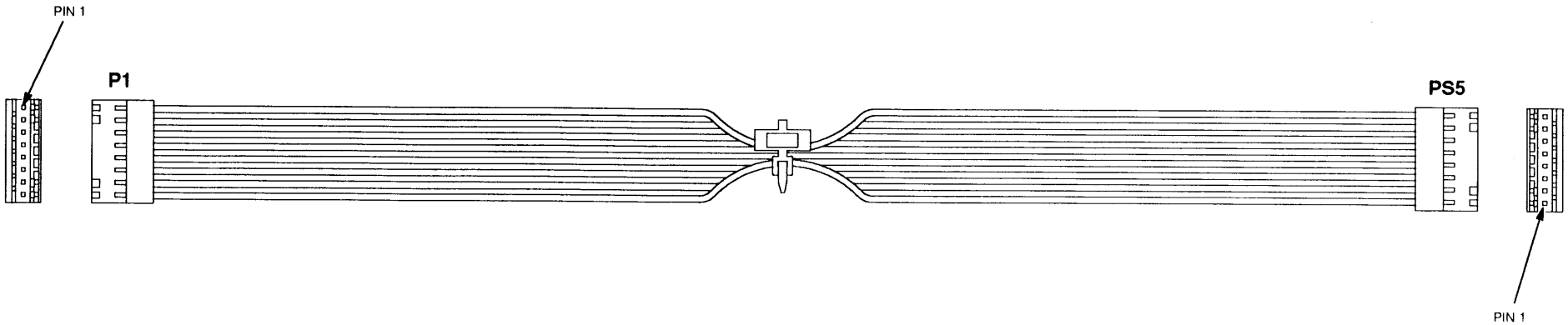


N/C = Not Connected

Part No.	Description
Part of 57G1435 (Page A–12)	Cable Assembly, Power, CTPC/IGP–2X0

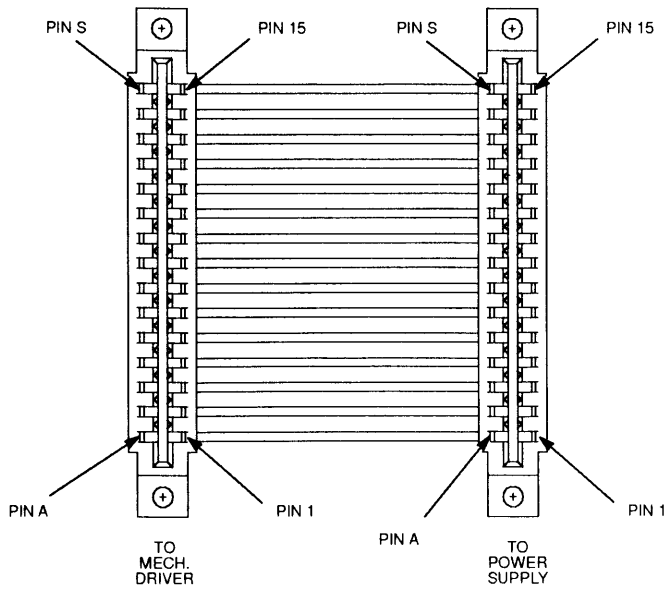


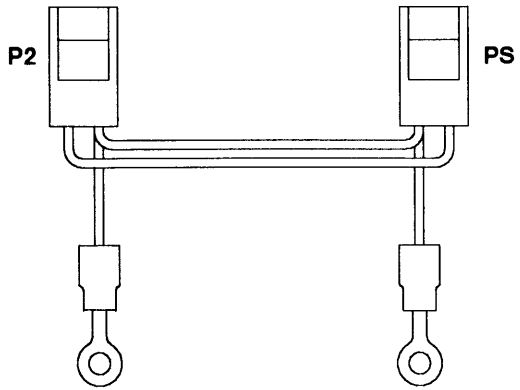
Cable No.	Part No.	Description
W1	57G1454	Cable Assembly, CCB/Mech. Dr.



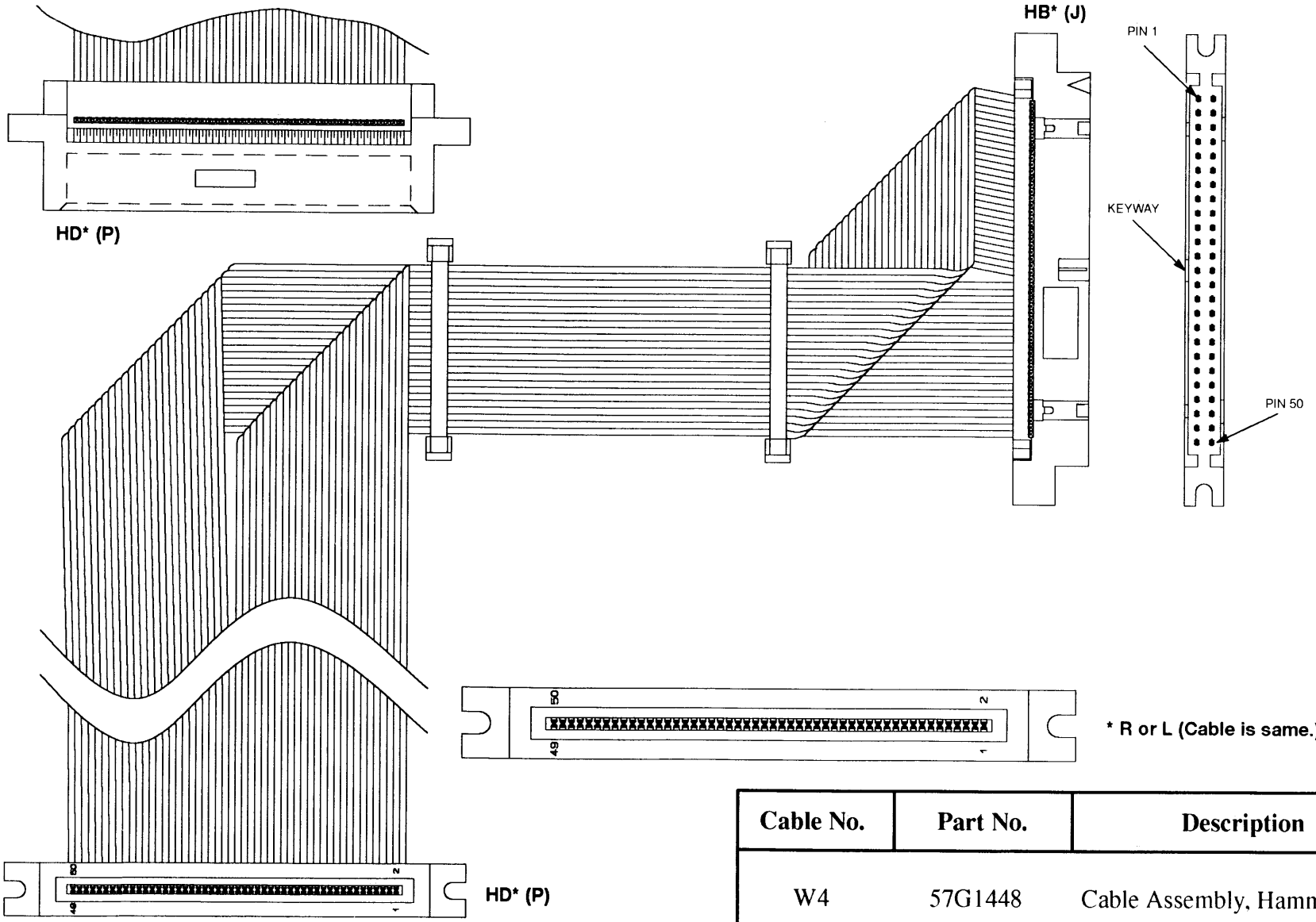
NOTE: PIN 5 NOT CONNECTED

Cable No.	Part No.	Description
W2	57G1455	Cable Assembly, +5 V

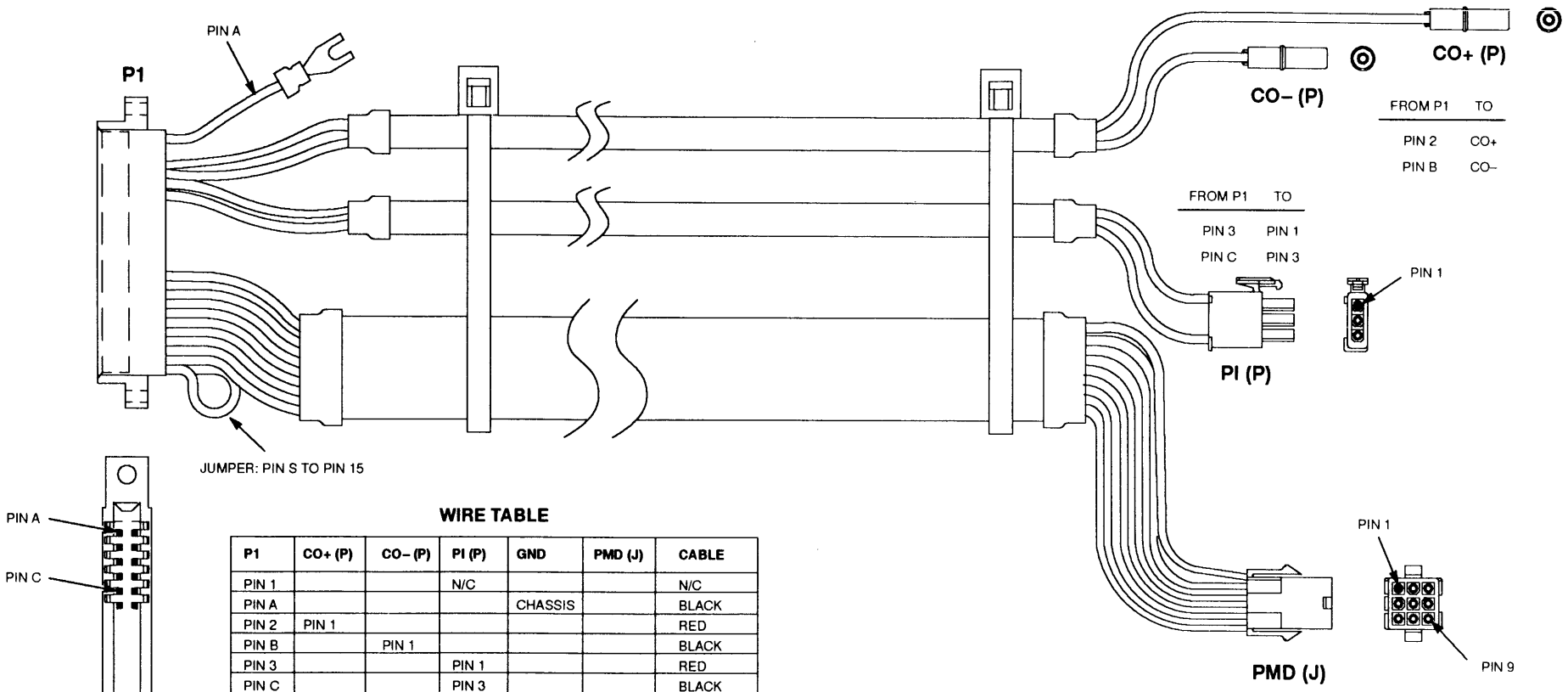




Cable No.	Part No.	Description
W3	57G1457	Cable Assembly, Hi Voltage



Cable No.	Part No.	Description
W4	57G1448	Cable Assembly, Hammer Bank

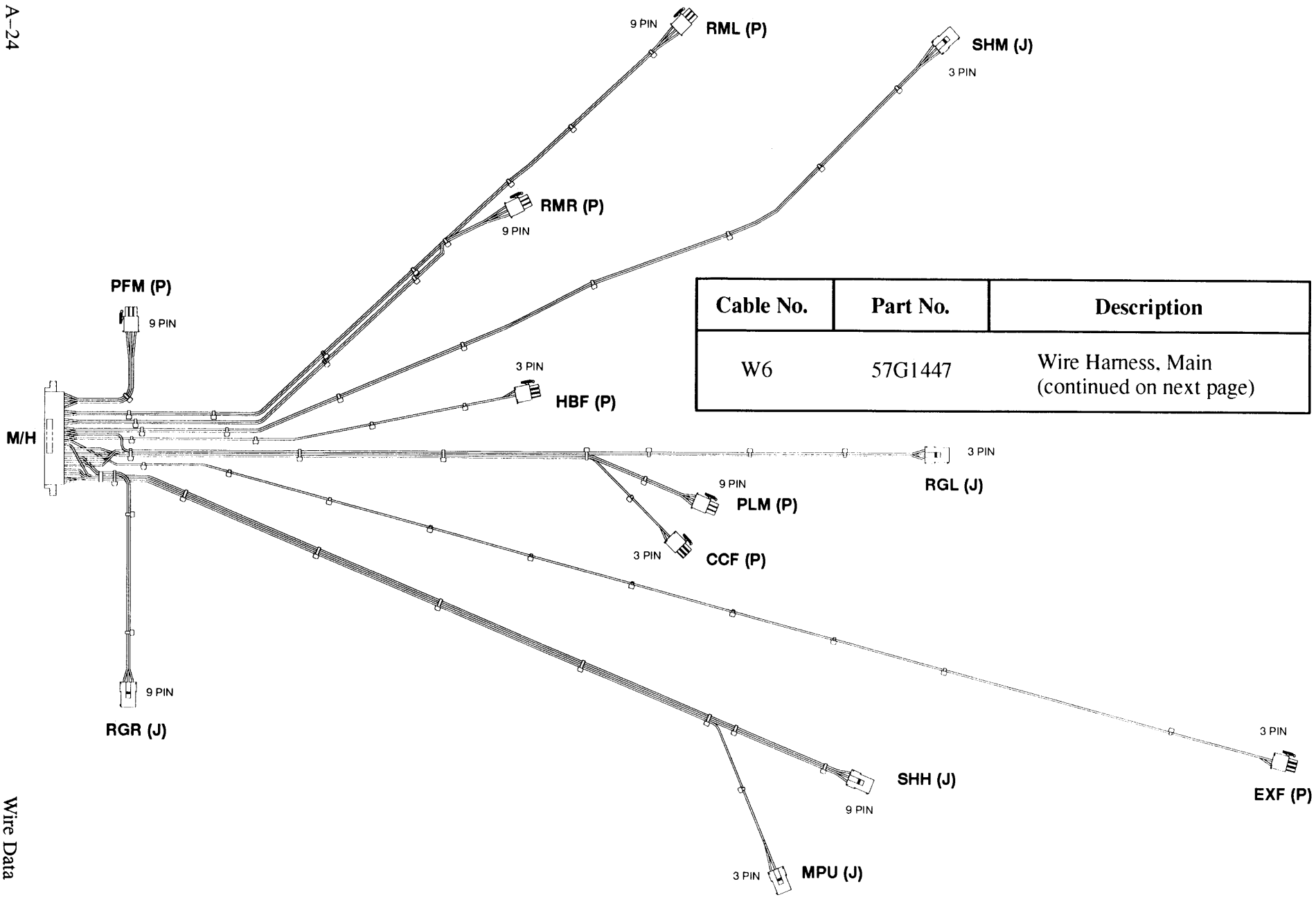


WIRE TABLE

P1	CO+ (P)	CO– (P)	PI (P)	GND	PMD (J)	CABLE
PIN 1			N/C			N/C
PIN A				CHASSIS		BLACK
PIN 2	PIN 1					RED
PIN B		PIN 1				BLACK
PIN 3			PIN 1			RED
PIN C			PIN 3			BLACK
PIN 4						N/C
PIN D						N/C
PIN 5						N/C
PIN E						N/C
PIN 6						N/C
PIN F						N/C
PIN 7						N/C
PIN H						N/C
PIN 8						N/C
PIN J					PIN 1	DRAIN
PIN 9					PIN 2	YELLOW
PIN K					PIN 3	GREEN
PIN 10					PIN 4	BLUE
PIN L					PIN 5	VIOLET
PIN 11					PIN 6	BROWN
PIN M					PIN 7	BLACK
PIN 12					PIN 8	ORANGE
PIN N					PIN 9	RED
PIN 13						N/C
PIN P						N/C
PIN 14						N/C
PIN R						N/C
PIN 15						N/C
PIN S						N/C

FROM P1	TO	
PIN J	PIN 1	
PIN 9	PIN 2	PAPER OUT DETECT (POD)
PIN K	PIN 3	
PIN 10	PIN 4	
PIN L	PIN 5	
PIN 11	PIN 6	PAPER MOTION DETECT (PMD)
PIN M	PIN 7	
PIN 12	PIN 8	
PIN N	PIN 9	

Cable No.	Part No.	Description
W5	57G1452	Cable Assembly, Intermediate



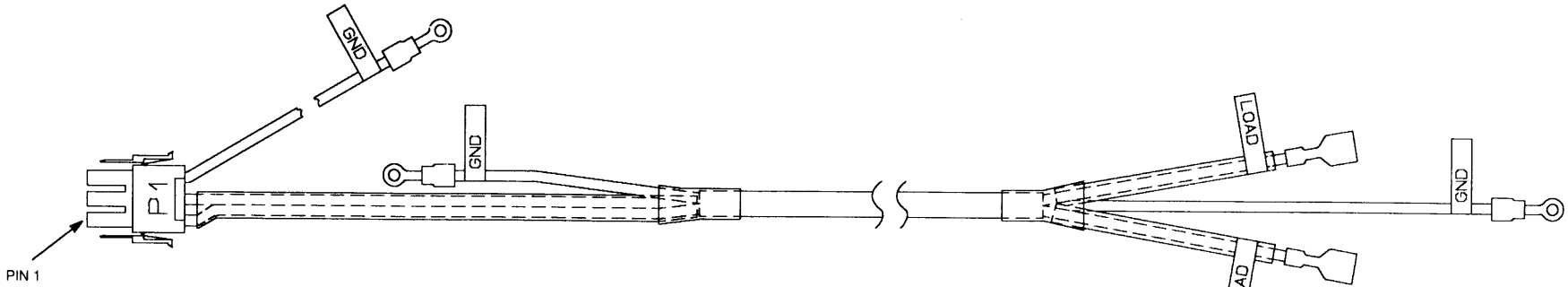
Cable No.	Part No.	Description
W6	57G1447	Wire Harness, Main (continued on next page)

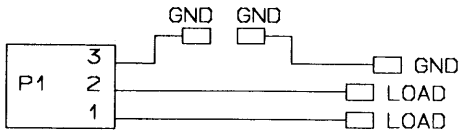
WIRE TABLE

CONNECTOR													WIRE LENGTH (+/- .25")	MAIN HARNESS WIRE COLOR	MATE TO WIRE COLOR
M/H	PFM	RML	RMR	SHM	CCF	HBF	EXF	SHH	PLM	RGR	RGL	MPU			
1	1												6.37"	BLACK	BROWN
A	3												6.37"	BLACK	ORANGE
2	2												6.37"	BLACK	BLUE
B	4												6.37"	BLACK	BLACK
3	5												6.37"	BLACK	YELLOW
C	7												6.37"	BLACK	RED
4	6												6.37"	BLACK	WHITE
D	8												6.37"	BLACK	GREEN
5		5											30.00"	BLACK	YELLOW
E		7											30.00"	BLACK	RED
6		3											30.00"	BLACK	ORANGE
F		1											30.00"	BLACK	BROWN
7			7										17.50"	BLACK	RED
H			5										17.50"	BLACK	YELLOW
8			3										17.50"	BLACK	ORANGE
J			1										17.50"	BLACK	BROWN
9				2									30.00"	BLACK	BLACK
K				3									30.00"	BLACK	RED
10				1									30.00"	BLACK	BLUE
L					2								24.50"	BLACK	RED
11					3								24.50"	BLACK	BLACK
M						2							17.50"	BLACK	RED
12						1							17.50"	BLACK	BLACK
N							2						29.35"	BLACK	RED
13							3						29.35"	BLACK	BLACK
P								6					32.75"	BLACK	BLACK
14									7				24.50"	BLACK	RED
R									5				24.50"	BLACK	YELLOW
15									3				24.50"	BLACK	ORANGE
S									1				24.50"	BLACK	BROWN
16										2			10.50"	BLACK	BLACK
T											2		33.00"	BLACK	BLACK
17										3			10.50"	BLACK	BLACK
U											3		33.00"	BLACK	BLACK
18										1			10.50"	BLACK	BLACK
V											1		33.00"	BLACK	BLACK
19								5					32.75"	BLACK	BROWN
W								2					32.75"	BLACK	YELLOW
20								4					32.75"	BLACK	ORANGE
X								3					32.75"	BLACK	WHITE
21								1					32.75"	BLACK	PURPLE
Y												N/C	33.00"	DRAIN	
22												2	33.00"	RED	WHITE
Z												1	33.00"	BLACK	BLACK

PIN ASSIGNMENT

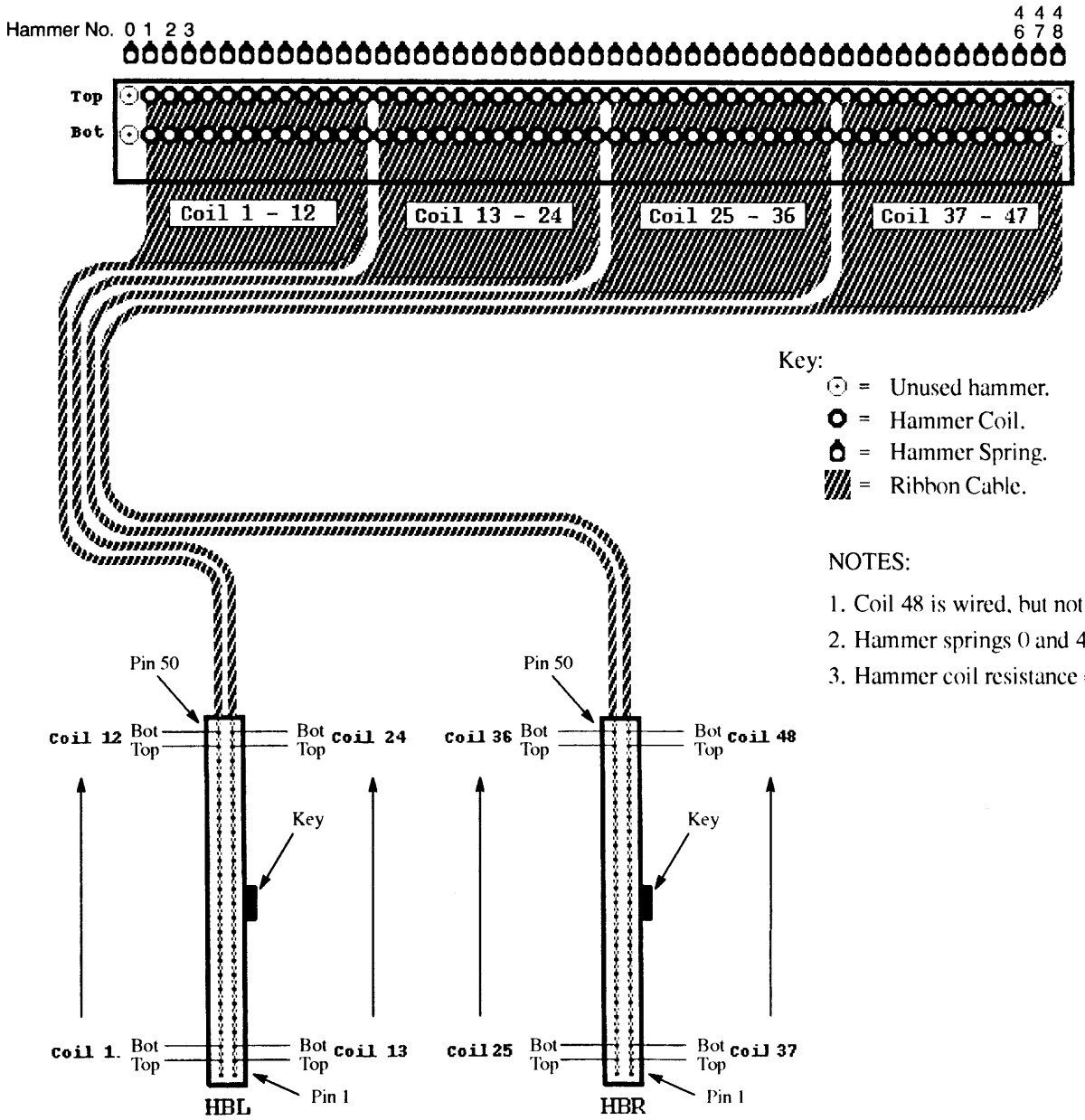
Cable No.
W6
Part No.
57G1447
Description
Wire Harness, Main (continued from previous page)





Cable No.	Part No.	Description
W7	57G1456	Cable Assembly, AC/Ground

Hammer Bank Wiring Diagram



Key:

- ⊙ = Unused hammer.
- O = Hammer Coil.
- Ω = Hammer Spring.
- ▨ = Ribbon Cable.

NOTES:

1. Coil 48 is wired, but not used.
2. Hammer springs 0 and 48 are not used.
3. Hammer coil resistance = **4.7 Ohms**.

B Printer Specifications

Contents

Ribbon Specifications

NOTE: Use only the ribbons listed below:

IBM General Purpose Ribbon	Part No. 1040990
IBM High Contrast Ribbon	Part No. 1040993

Paper Specifications

Paper

Type:	Edge–perforated, fan–fold, 3 to 16 inches (7.62 to 40.64 cm) wide, 1 to 12 inches (2.54 to 30.48 cm) long
Thickness:	Single–part: 15 to 100 pound (6.80 to 45.36 kg) stock; Multi–part: 1– to 6–part forms (maximum 12 lb [5.44 kg] ply of upper plies)
Sheet Thickness:	0.025 inch (0.0635 cm) maximum
Drive:	Adjustable tractors (6–pin engagement)
Slew Rate:	16 in/sec (40.64 cm/sec) maximum

Labels

On Backing:	One–part continuous perforated fanfold back form. Labels must be placed at least 1/6 inch (0.42 cm) from the fan–fold perforation. Backing adhesive must not be squeezed out during printing.
Sheet Size:	3 to 16 inches (7.62 to 40.64 cm) wide, including the two standard perforated tractor feed strips. A maximum sheet length of 12 inches (30.48 cm) between top and bottom perforations.
Thickness:	Not to exceed 0.025 inch (0.064 cm) (including backing sheet)

Printer Dimensions

Height:	41 inches (104.1 cm)
Width:	27 inches (68.6 cm)
Depth:	29 inches (73.7 cm)
Weight:	190 pounds (86.2 kg) (Unpacked)

Environmental Characteristics

Temperature

Operating	41° to 104° F (5° to 40° C) up to 5000 feet (1524 meters) 41° to 90° F (5° to 32° C) up to 8000 feet (2438 meters)
Storage	–40° to 158° F (– 40° to 70° C)

Relative Humidity

Operating	10% to 90% (noncondensing)
Storage	5% to 95% (noncondensing)

Acoustic Noise Level

52 dBA (tested per ISO 7779)

Interfaces

IBM 6408–A00 (ASCII)

Type:	Two resident parallel, one resident serial
Logic Levels:	TTL/EIA–232D
Data Format:	ASCII
Compatibility:	PC Parallel, EIA–232D, Dataproducts
Transfer Rates:	Up to 200K bytes on parallel interfaces Up to 19200 baud on serial interface

IBM 6408–CT0 (Coax/Twinax SCS)

Type:	Coaxial/Twinaxial Integrated Interface (CT)
Data Format:	EBCDIC–to–ASCII conversion

Electrical Characteristics

Input Power

Voltage (RMS)	120 VAC or 230 VAC (94 to 140 VAC or 188 to 275 VAC)
Phase	Single
Frequency	47 to 62 Hz
Max RMS Current	6A @ 120 V; 3A @ 230 V

Power Rating

Standby	200 VA 60 Hz (145 Watts)
Operating	420 VA 60 Hz (320 Watts)

Data Input Rate (maximum)

PC Parallel	Up to 30,000 characters per second
RS–232	Up to 19,200 baud
Dataproducts	Up to 30,000 characters per second

Radio Frequency Interference (RFI)

Radio Frequency Interference tested/certified to RFI standards FCC 15.B Class A; VDE 0871 Class B; CSA C108.8–M1983 Class A.

Printing Rates

Printing speed of text is measured in lines/minute, and is a function of the selected font and dot density. Printing speed is independent of the number of characters configured in the character set repertoire. Print rates for lines containing attributes such as bold or emphasized printing, superscripts, subscripts, or elongated attributes will decrease to not less than half the rates of the font without such attributes. Typical printing rates are charted in Table B–1.

Plotting speed of graphics is measured in inches/minute, and is calculated as follows:

$$\frac{1}{\text{Shuttle Speed} \times \text{Vertical Density}} \times 60\,000 = \text{Plot Speed in } \frac{\text{inches}}{\text{minute}}$$

Shuttle speed varies with the horizontal dot density:

	Horizontal Density (dots/inch)	Shuttle Speed (milliseconds/stroke)
Selectable by graphics control codes	50	12.5
	60	12.5
	70	12.5
	80	12.5
	90	12.5
	100	12.5
	110	12.5
	120	12.5
	130	13.5
	140	14.5
	150	15.6
	160	16.67
	180	18.75
	200	20.8

To prevent damage from overheating when graphics plotting is done over extended periods, the hammer bank contains a thermal sensing feature that automatically reduces the print rate.

Table B–1. Nominal Printing Rates

Print Dimensions			Performance		
Dot Density (DPI) NOTE 1	Characters per Inch (CPI)	Dot Matrix NOTE 2	Uppercase Only	Descenders & Underline	Plot Mode NOTE 3
			LPM*	LPM*	IPM**
OCR–A / OCR–B 180 (180) X 144	10	13 (13) X 14 + 2	210 110 NOTE 4	185 100 NOTE 4	16.5 16.5 NOTE 5
Correspondence 90 (180) X 96	10 12 12.9 15 16.4	7 (13) X 9 + 3 6 (11) X 9 + 3 5 (9) X 9 + 3 5 (9) X 9 + 3 4 (7) X 9 + 3	320	245	33
Data Processing 60 (120) X 72	10 12 13.3 15 17.1 20	5 (9) X 7 + 2 4 (7) X 7 + 2 4 (7) X 7 + 2 3 (5) X 7 + 2 3 (5) X 7 + 2 3 (5) X 7 + 2	600	480	66
High Speed Draft (HS) 60 (120) X 48	10 12 13.3 15 17	5 (9) X 5 + 1 4 (7) X 5 + 1 4 (7) X 5 + 1 3 (5) X 5 + 1 3 (5) X 5 + 1	800	685	100

NOTE 1 A (B) X C, where: A is maximum horizontal dot density
B is horizontal placement resolution
C is vertical dot density

NOTE 2 D (E) X F + G, where: D is maximum number of dots that may be placed on E horizontal dot positions
F is number of vertical dots for uppercase symbols
G is number of dots available for descenders

NOTE 3 Plot speeds are obtained if the dot count per row does not exceed 85% of the maximum dots allowed for that mode and the steps per dot row do not exceed the vertical density of that mode.

NOTE 4 Speeds shown for OCR A and OCR B are best case and worst case. Normal speed falls between these speeds. Best case assumes no adjacent dots on the line, and worst case assumes there are adjacent dots on each dot row. Any dot row containing adjacent dots requires two shuttle strokes to print, thus slowing print speed.

NOTE 5 OCR plot density is 90 (180) X 144.

* LPM = Lines Per Minute

** IPM = Inches Per Minute

Duty Cycle

The IBM 6408 printer will print 75, 000 pages per month under the following conditions:

- Uppercase only
- 6 lines/inch
- 10 characters/inch
- 63% character density or 83 characters per line
- 63% line density or 42 lines/11–inch page
- Single part (18 lb) paper
- Printer is installed in accordance with the *Setup Guide*
- Printer is maintained in accordance with this maintenance information manual

C Power Cords

Part No.	Units	Description
1332168	1	Power Cord, 110V 6 Feet Non–Lock, U.S., Canada
46F2112	1	Power Cord, 220V 6 Feet Non–Lock, U.S., Canada
6952299	1	Power Cord, 110V 12 Feet Non–Lock, U.S., Canada, Brazil, Cayman Islands, Costa Rica, Dominican Republic, El Salvador, Guatemala, Mexico, Liberia, Panama, Saudi Arabia, Phillipines, Honduras, Peru, Columbia, Nicaragua, Bermuda, Bahamas, Barbados, Bolivia, Guyana, Ecuador, Haiti, Jamaica, Venezuela, Netherlands, Antilles, Trinidad, Suriname, Taiwan, Tobago, Saint Lucia, Indonesia
1838573	1	Power Cord, 220V 12 Feet Non–Lock, U.S., Canada, Honduras, Nicaragua, Peru, Phillipines, Saint Lucia, Taiwan, Thailand, Tobago, Panama
80F7277	1	Power Cord, 110V 6 Feet Twist–Lock, U.S., Canada
80F7278	1	Power Cord, 220V 6 Feet Twist–Lock, U.S., Canada
7842142	1	Power Cord, 110V 12 Feet Twist–Lock, U.S., Canada
7842124	1	Power Cord, 220V 12 Feet Twist–Lock, U.S., Canada
46F5893	1	Power Cord, 110V 6 Feet Watertight, U.S., Canada
73F5157	1	Power Cord, 220V 6 Feet Watertight, U.S., Canada
46F5894	1	Power Cord, 110V 12 Feet Watertight, U.S., Canada
73F4932	1	Power Cord, 220V 12 Feet Watertight, U.S., Canada
13F9941	1	Power Cord, 12 Feet, Argentina, Australia, Colombia, New Guinea, New Zealand, Paraguay, Samoa, Uraguay
13F9979	1	Power Cord, 9 Feet, Afghanistan, Algeria, Angola, Austria, Belgium, Benin Republic/Dahomey, Bulgaria, Burundi, Cameroon, Chad, Congo/Brazzaville, Central Africa Empire, Czechoslovakia, East Germany, Egypt, Finland, France, Greece, Guinea, Hungary, Iceland, Indonesia, Iran, Ivory Coast, Jordan, Korea, Lebanon, Luxembourg, Mali, Madagascar, Mauritania, Monaco, Morocco, Mozambique, Netherlands, Norway, Poland, Portugal, Rhodesia, Romania, Spain, Sudan, Sweden, Syria, Togo, Tunisia, Turkey, Upper Volta, USSR, West Germany, Yugoslavia, Zaire
13F9997	1	Power Cord, 9 Feet, Denmark
14F0015	1	Power Cord, 9 Feet, Bangladesh, Burma, Pakistan, South Africa, Sri Lanka
14F0033	1	Power Cord, 9 Feet, Bahrain, Brunei, Channel Islands, PRC, Cyprus, Hong Kong, India, Iraq, Ireland, Kenya, Kuwait, Malaysia, Malta, Nepal, Nigeria, Oman, Polynesia, Qatar, Sierra Leone, Singapore, Tanzania, Uganda, United Arab Emirates, U.K., Zambia
14F0051	1	Power Cord, 9 Feet, Switzerland, Liechtenstein
14F0069	1	Power Cord, 9 Feet, Chile, Ethiopia, Italy, Libya
14F0087	1	Power Cord, 9 Feet, Israel
1332167	1	Power Cord, 12 Feet, Japan
57G1432	1	Power Cord, No Plug

D Ferrite Noise Suppression Cores

Ferrite cores reduce radio frequency interference (RFI) to and from electronic equipment located near the printer.

Two kinds of ferrite cores are used in the printer:
1. Cylindrical cores—Cables pass through the core or are wound around it.
2. Block cores—The core is housed in a hinged plastic case. Cables are laid in a groove in the core, and the plastic case is closed, securing the core to the cable.

Figure D–1 shows the location of the ferrite cores.

IMPORTANT

When removing cables that pass through or around ferrite cores, note the number of times the cable is wound around the core. You must duplicate these windings when you replace the cable. Use Figure D–1 as your guide.

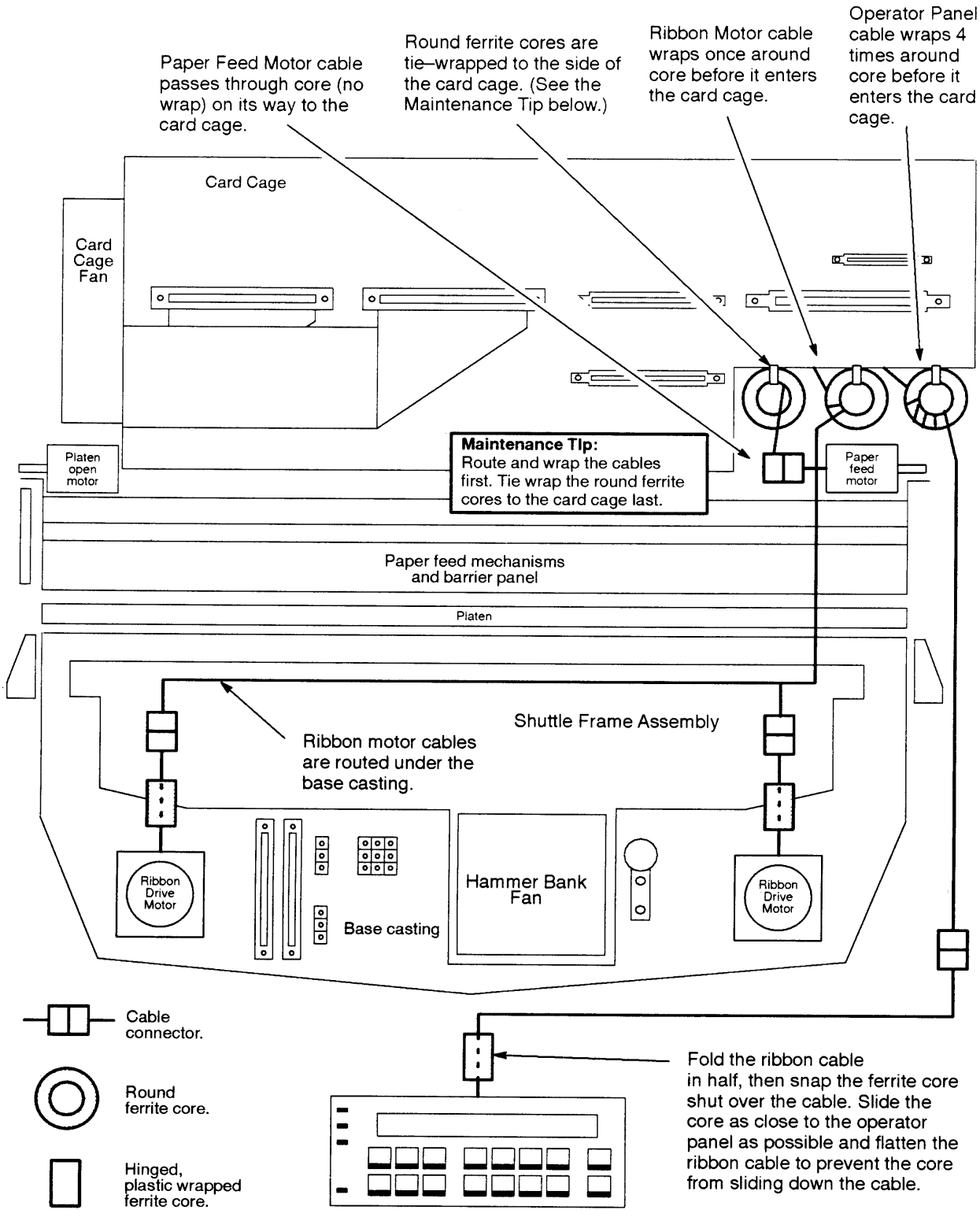


Figure D–1. Ferrite Core Locations

E Metric Conversion Tables

Length

Multiply	By	To Obtain
foot	0.3048*	meter (m)
foot	30.48*	centimeter (cm)
foot	304.8*	millimeter (mm)
inch	0.0254*	meter (m)
inch	2.54*	centimeter (cm)
inch	25.4*	millimeter (mm)
meter	3.280840	foot
centimeter	0.03280840	foot
millimeter	0.003280840	foot
meter	39.37008	inch
centimeter	0.3937008	inch
millimeter	0.03937008	inch
	* Figure is exact.	

Torque and Force

Multiply	By	To Obtain
pound–inch	0.11298	newton–meter (N•m)
pound–foot	1.3558	newton–meter (N•m)
newton–meter (N•m)	8.8511	pound–inch
newton–meter (N•m)	0.7376	pound–foot
pound	4.4482	Newton (N)
Newton (N)	0.22481	pound

Mass and Density

Multiply	By	To Obtain
pound*	0.4535924	kilogram (kg)
ounce*	28.34952	gram (g)
kilogram	2.204622	pound*
gram	0.03527397	ounce*
	* avoirdupois	

Temperature

To Convert From	To	Use Formula
temperature Celsius (t_C)	temperature Fahrenheit (t_F)	$t_F = 1.8t_C + 32$
temperature Fahrenheit (t_F)	temperature Celsius (t_C)	$t_C = (t_F - 32)/1.8$

Power

Multiply	By	To Obtain
Btu (International Table)/hour	0.2930711	watt (W)
watt (W)	3.412141	Btu (International Table)/hour
watt (W)	0.001359621	horsepower (metric)
horsepower (metric)	735.499	watt (W)

F Safety Inspection Guide

Safety Inspections

The IBM 6408 printer incorporates safety items installed to protect customers, operators, and service personnel from injury. Use this inspection guide as an aid in identifying possible unsafe conditions in the printer.

Perform the inspection steps outlined in this guide before the normal inspection for Maintenance Agreement Qualification, or any time you are instructed to make a safety inspection.

If you find any unsafe conditions, determine the severity of the hazard and whether or not you can continue the inspection without first correcting the problem.

NOTE: The correction of any unsafe condition is the customer's responsibility.

Preparation

You must have completed the "Electrical Safety Training Course for IBM Customer Engineers" (self–study course 77170 or existing level) to do the Safety Inspection.

Have the following items available:

1. *Electrical Safety for IBM Customer Engineers*, Order No. S229–8124.
2. A Fluke** meter (P/N 8496278) or similar device for resistance and voltage measurements.
3. An ECOS** Electrical Safety Tester (P/N 6339695) in the United States or a similar safety tester in other countries.

For each safety check on the following pages, do the steps in the order presented. Do not omit any steps.

Prepare the Printer for Inspection

DANGER

Always disconnect the AC power cord from the power source before performing any maintenance procedure. Failure to remove power could result in injury to persons or damage to equipment. If you must apply power during maintenance, you will be instructed to so in the maintenance procedure.

1. Have the operator take the printer off–line.
2. Power off the printer.
3. Unplug the printer power cord from the customer's outlet.

Inspect Mechanical Parts

Top Cover and Doors

1. Inspect the top cover:
   a. Open the top cover. Make sure the gas spring assembly holds the cover up in the open position.
   b. Lower the top cover. Make sure the operator panel is centered in the opening of the cover.
   c. Make sure the window is not cracked or broken.
   d. Make sure the seal around the top cover is not cracked or broken.
   e. Make sure the ESD (electrostatic discharge) fingers are not loose or damaged. Make sure they touch the contact strips on the frame when the cover is closed.
   f. Make sure there are no exposed or sharp edges.
   g. Make sure the wireform paper path is undamaged.
2. Inspect the front and rear cabinet doors:
   a. Make sure the seals and magnetic strips are not loose or damaged.

b. Make sure the restraining cable is attached and unbroken.

c. Make sure there are no exposed or sharp edges.

3. Open the rear cabinet door and inspect the lower rear paper path:

   a. Make sure the service panel permitting access to the I/O plate and circuit breaker (on/off switch) is installed.

   b. Make sure the paper stacker tray assembly is in place and undamaged.

Print Mechanism

1. Open the printer top cover.

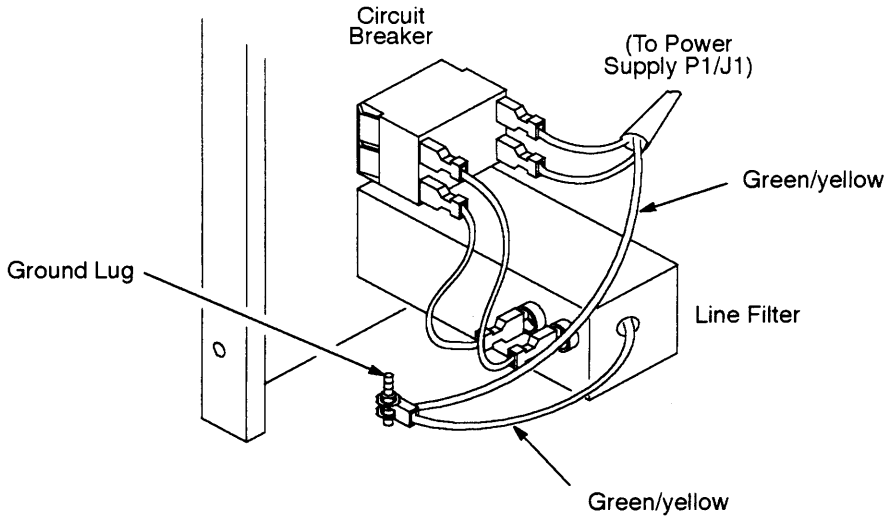
2. Make sure the shuttle cover is correctly installed and undamaged. (See page 6–42.)

3. Make sure the paper guide assembly, which also covers the card cage, is correctly installed and undamaged. (See page 6–66.)

Safety Ground Path

NOTE: Ground paths are summarized in Figure F–1.

1. Make sure the printer power cord is unplugged.
2. Remove the paper stacker tray assembly (page 6–70).
3. Remove six screws and the service panel. (Refer to Figure 6–9, page 6–29.)
4. Make sure the yellow/green cables from the line filter and circuit breaker power leads are undamaged and firmly attached to the ground lug on the floor of cabinet, as shown below:



5. Set a Fluke meter (P/N 8496278) or similar device to the lowest resistance scale. Measure the resistance between the power cable ground pin and the printer frame: safety ground circuits should measure 0.1 Ohm or less.
6. Install six screws and the service panel. (Refer to Figure 6–9, page 6–29.)
7. Install the paper stacker tray assembly (page 6–70).

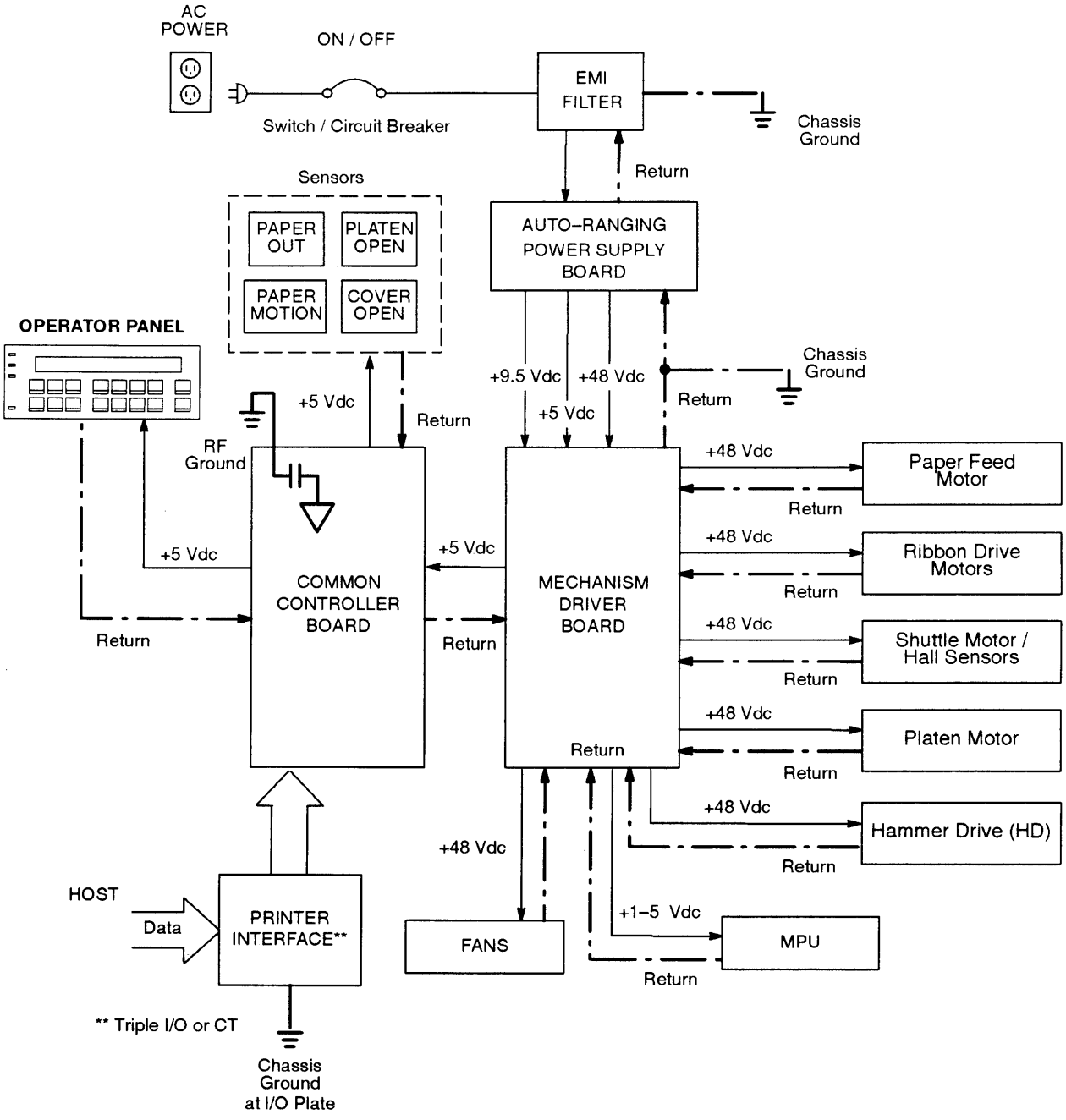


Figure F–1. Ground Path Diagram

Customer Power Source Service Check

Use an ECOS Electrical Safety Tester (P/N 6339695) in the United States or a similar safety tester in other countries.

NOTE: The ECOS tester will trip ground fault detector protected outlets. This is a good test of the ground fault detector. Reset the outlet as needed.

Plug the ECOS meter into the customer's outlet. Follow the instructions supplied with the meter to test for the following:

1. Wiring errors
2. Low voltage
3. Neutral to ground short
4. Ground path impedance
5. Neutral impedance

NOTE: The customer is responsible for correcting problems with the power source. Inform the IBM Installation Planning Representative (IPR) of any problems with the customer's power source.

Each branch circuit must be grounded for safety and correct operation of the printer. This ground must be connected either to the electrical service ground or to a suitable building ground. The printer power cable has a green or green/yellow insulated grounding conductor. This is *not* a neutral.

Power Cable

1. Make sure the power cable is not damaged.
2. Make sure the power plug is the correct type.

Power On/Off Verification

1. Make sure all covers are installed.
2. Plug the power cable into the customer's power outlet.
3. Power on the printer and watch the LCD.
4. Verify that the power–on diagnostic tests and initialization routines are successful.
5. The IBM 6408–A00 should cycle automatically to the NOT READY mode.
   The IBM 6408–CT0 should cycle automatically to the READY mode.
6. Power off the printer. Verify that the LCD goes completely blank and all fans stop.

Print Interlock Service Check

1. Power on the printer.
2. Open the printer top cover.
3. Open the forms thickness lever.
   The LCD should display a Platen Open message. (On the IBM 6408–A00, the audible alarm should sound if it is enabled.)
4. On the IBM 6408–A00, press **Stop**. The audible alarm should stop.
5. Close the forms thickness lever.
   On the IBM 6408–A00, the fault message should clear automatically.
   On the IBM 6408–CT0, press **Stop**. The fault message should clear.
6. Loosen the shuttle cover screws and lift the shuttle cover enough to pull the magnet away from the cover open switch.
   The LCD should display a Cover/Door Open message. (On the IBM 6408–A00 printer, the audible alarm should sound if it is enabled.)
7. On the IBM 6408–A00, press **Stop**. The audible alarm should stop.
8. Reseat the shuttle cover and tighten the cover screws.
   On the IBM 6408–A00, the fault message should clear automatically.
   On the IBM 6408–CT0, press **Stop**. The fault message should clear.

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