

COVER Book Cover

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**IBM**

**High Speed Internal  
Data/FAX Modems  
(Models FC3632 and FC3650)**

**PCMCIA Data/FAX Modems  
(Models FC3634 and FC3635)**

**Hardware Maintenance Manual**

**March 1993**

Document Number S61G-1556-00

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+--- **Note** -----+  
|  
| Before using this information and the product it supports, be sure to  
| read the general information under "Notices" in topic 9.0.  
|  
+-----+

**First Edition (March 1993)**

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FRONT\_1 About This Pamphlet

This pamphlet includes the following:

- Safety information
- General Information
- Symptom-to-FRU Index
- Parts listing

Also included with this pamphlet are special self-booting diskettes that contain the diagnostic programs to test the modems.

**Note:** Do not attempt to load the diagnostic programs, contained on the diskettes in this package, onto a system reference diskette.

This pamphlet should be used with the advanced diagnostics tests and maintenance manual for the system you are servicing.

```
+--- Important -----+
|
| This manual is intended for trained servicers who are familiar with
| PS/2 products. Before servicing a PS/2 product, see "Safety
| Information" in topic 8.0.
|
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1.0 General Information

The IBM (\*) High Speed Internal Data/FAX Modems (Models FC3632 and FC3650), IBM PCMCIA (\*\*) Data/FAX Modem (Model FC3634), and IBM High Speed PCMCIA Data/FAX Modem (Model FC3635), allow a variety of portable systems to communicate with the International Consultative Committee on Telegraph and Telephone (CCITT) Group 3 facsimile devices, the CCITT modem, and Bell 103F/212A modems, which are connected through a public switched telephone network.

(\*) Trademark of the IBM Corporation.

(\*\*) Trademark of the Personal Computer Memory Card International Association.

## 2.0 IBM High Speed Internal Data/FAX Modems (Models FC3632 and FC3650)

The IBM High Speed Internal Data/FAX Modems (Models FC3632 and FC3650) are supported in the following systems.

Machine Type	Model
5523	N23SX
5527	N27SX
8533	N33SX
8551	N51SX
8551	N51SLC
8552	C52 486SLC
8552	N52 486SLC
8554	CL57SX

Only one modem can be installed in the above systems.

**Note:** The Model FC3632 and Model FC3650 have the same features. However, the Model FC3650 has special programming considerations and is designed to be used in Japan only.

## Subtopics

2.1 Features (Models FC3632 and FC3650)

2.2 Cabling (Model FC3632 and FC3650)

2.1 Features (Models FC3632 and FC3650)

The IBM High Speed Data/FAX Modems have the following features:

Data Modem

300 - 14 400 bps  
CCITT V.32bis (14 400 bps duplex)  
CCITT V.32 (9 600 bps duplex)  
CCITT V.22bis (1 200/2 400 bps duplex)  
CCITT V.22 (1 200 bps duplex)  
CCITT V.23 (1 200/75 bps duplex)  
Bell 212A (600/1 200 bps duplex)  
CCITT V.21-Bell 103 (300 bps duplex)

FAX Modem

300 - 14 400 bps  
CCITT V.17 (14 400 bps)  
CCITT V.29 (7 200/9 600 bps)  
CCITT V.27ter (2 400/4 800 bps)  
CCITT V.21 (300 bps)

Facsimile Group 3

CCITT T.30 (Facsimile transmission)  
EIA/TIA 578 & 592 (Facsimile interface)  
FAX Class I  
FAX Class II

Modem Control

"AT" Command Set  
Data Security  
Auto Baud Detect (public switch telephone network) (PSTN)  
Line)  
Auto Speed Detect (Serial Port)  
Error Correction/Detection  
V.42  
MNP 4

Data Compression

V.42bis (X 4 = 57 600 bps)  
MNP 5

System Interfaces

Hayes (\*\*) Autosync  
X.25 - X.32 Interface

External Interfaces

Data Access Arrangement  
World Wide PSTN (data access arrangement (DAA)  
Phone Cellular DAA  
Enhanced Phone Cellular (Axsys)  
Acoustic Coupler

(\*\*) Trademark of Hayes Microcomputer Products.

*2.2 Cabling (Model FC3632 and FC3650)*

The Data Access Arrangement (DAA) provides access to a local telephone system on the Public Switched Telephone Network (PSTN). The IBM High Speed Data/Fax Modems (Models FC3632 and FC3650) have both an internal DAA and a connector for attaching an external DAA. The United States, Canada, and Japan use the internal DAA.

Subtopics

2.2.1 Internal DAA Cabling

2.2.2 External DAA Cabling

2.2.3 Cable Check

2.2.1 Internal DAA Cabling

The PSTN cable connects to the square connector on the modems. The following illustration shows the arrangement of the cable when using the internal DAA.

- 1 PSTN cable

PICTURE 1

2.2.2 External DAA Cabling

All other countries use a country specific external DAA. Refer to "Parts" in topic 7.0 for the external DAA for your country.

The 9-pin MiniDIN-to-MiniDIN cable connects to the round connector on the modem. The following illustration shows the arrangement of the cables when using an external DAA.

- 1 9-pin MiniDIN-to-MiniDIN cable
- 2 External DAA
- 3 PSTN cable

PICTURE 2

2.2.3 *Cable Check*

The External DAA, PSTN, and MiniDIN-to-MiniDIN cables are wired with pin 1 connected to pin 1, pin 2 connected to pin 2, and etc.. A continuity check of the cables will determine if the cables are good.

**IBM PS/2 Data/FAX Internal Modems HMM**  
**IBM PCMCIA Data/FAX Modems (Models FC3634 and FC3635)**

*3.0 IBM PCMCIA Data/FAX Modems (Models FC3634 and FC3635)*

The IBM PCMCIA Data/Fax Modem (Model FC3634) and the IBM High Speed PCMCIA Data/FAX Modem (Model FC3635) are designed for IBM PS/2 (\*) computers (for example, a notebook or a tablet) that conform to the Personal Computer Memory Card International Association (PCMCIA) standard, Release 2.0, for a Type II input and output (I/O) PCMCIA PC card slot.

Multiple options may be installed.

(\*) Trademark of the IBM Corporation.

Subtopics

3.1 Features (Model FC3634)

3.2 Features (Model FC3635)

3.3 Cabling (Models FC3634 and FC3635)

3.1 Features (Model FC3634)

The Model FC3634 option has the following features:

- 2 400 Speed PCMCIA Modem
- Exchangeable DAAs
- Cellular Capability
- Modem Control
  - "AT" Command set
  - Data Security
  - Hayes Autosync
  - Error Correction/Detection
    - V.42
    - MNP 4
  - Data Compression
    - V.42bis
    - MNP 5
- Data Modem
  - 300 - 2 400 bps
- FAX Modem
  - 300 - 9 600 bps
  - Facsimile Group 3
    - CCITT T.4 (Facsimile formatting)
    - CCITT T.30 (Facsimile transmission)
    - EIA/TIA 578 & 592 (Facsimile interface)
      - FAX Class I
      - FAX Class II
- External Interfaces
  - Exchangeable DAAs
  - Phone Cellular DAA
  - Acoustic Coupler

3.2 Features (Model FC3635)

The Model FC3635 option has the following features:

Data Modem

300 - 14 400 bps  
CCITT V.32bis (14 400 bps duplex)  
CCITT V.32 (9 600 bps duplex)  
CCITT V.22bis (1 200/2 400 bps duplex)  
CCITT V.22 (1 200 bps duplex)  
CCITT V.23 (1 200/75 bps duplex)  
Bell 212A (600/1 200 bps duplex)  
CCITT V.21-Bell 103 (300 bps duplex)

FAX Modem

300 - 14 400 bps  
CCITT V.17 (14 400 bps)  
CCITT V.29 (7 200/9 600 bps)  
CCITT V.27ter (2 400/4 800 bps)  
CCITT V.21 (300 bps)

Facsimile Group 3

CCITT T.30 (Facsimile transmission)  
EIA/TIA 578 & 592 (Facsimile interface)  
FAX Class I  
FAX Class II

Modem Control

"AT" Command Set  
Data Security  
Auto Baud Detect (PSTN Line)  
Error Correction/Detection  
V.42  
MNP 4

Data Compression

V.42bis (X 4 = 57 600 bps)  
MNP 5

System Interfaces

Hayes Autosync  
X.25 - X.32 Interface

External Interfaces

Data Access Arrangement  
World Wide PSTN DAA  
Phone Cellular DAA  
Enhanced Phone Cellular (Axsys)  
Acoustic Coupler

3.3 Cabling (Models FC3634 and FC3635)

The Data Access Arrangement (DAA) provides access to a local telephone system on the Public Switched Telephone Network (PSTN). The IBM PCMCIA Data/FAX Modem (Model FC3634), and IBM High Speed PCMCIA Data/FAX Modem (Model FC3635) both use an external DAA. The external DAAs used with these modems are country specific. Refer to "Parts" in topic 7.0 for the external DAA for your country. The following illustration shows the arrangement of the cables.

- 1 PCMCIA-to-MiniDIN cable
- 2 External DAA
- 3 PSTN cable

PICTURE 3

#### 4.0 *Setting the Transmit Levels*

The Data mode and FAX mode transmit levels are preset. However, in some situations, due to signal loss during transmission, the local telephone company may advise you to change the transmit level.

Have the customer send a telephone company monitored Data transmission and a FAX transmission. Record the recommended transmit levels for the Data mode and the FAX mode. You will need this information in the following procedures to set the transmit levels.

##### Subtopics

- 4.1 Setting the Data Transmit Level
- 4.2 Setting the FAX Transmit Level

#### 4.1 Setting the Data Transmit Level

You must have the recommended transmit level setting from the local telephone company to complete this procedure.

1. Ensure that the system is powered-on and the operating system is loaded.
2. At the operating system prompt type: **copy con com2**
3. Press **Enter**.
4. Type: **at\_ibmserv**
5. Press **Enter**.

The letter **X** in the next command is the decibel based on one milliwatt (dBm) transmit level you received from the local telephone company.

6. Type: **ats91=X**
7. Press **Enter**.

The Data transmit level is now set, continue with "Setting the FAX Transmit Level" in topic 4.2.

4.2 Setting the FAX Transmit Level

You must have the recommended transmit level setting from the local telephone company to complete this procedure.

1. Ensure that the system is powered-on and the operating system is loaded.
2. At the operating system prompt type: **copy con com2**
3. Press **Enter**.
4. Type: **at\_ibmserv**
5. Press **Enter**.

The letter **X** in the next command is the decibel based on one milliwatt (dBm) transmit level setting you received from the local telephone company.

6. Type: **ats92=X**
7. Press **Enter**.

The FAX transmit level is now set.

5.0 General Checkout

+----+  
|001|  
+----+

- Power-off the system.
- Ensure that the modem is installed correctly.
- Ensure that the public switch telephone network (PSTN) cable and the data access arrangement (DAA) cable, if installed, are connected correctly.

If you need to correct one of the above conditions, do so now; then continue.

- Power-on the system.
- Insert the IBM Data/FAX Modem diskette into the default diskette drive.
- If you are servicing a High Speed Internal Data/Fax Modem (Models FC3632 and FC3650), at the DOS prompt (for example, A:\), type **IBMDIAG**; then press **Enter**.
- If you are servicing a PCMCIA Data/FAX Modem (Models FC3634 and FC3635), at the DOS prompt (for example, A:\), type **ESTDIAG**; then press **Enter**.
- Follow the instructions on the screen. (If you need help, press **F1**.)

**DID THE DIAGNOSTIC TESTS DETECT AN ERROR?**

Yes No

| |  
| |  
| +----+  
| |002|  
| +----+  
| |  
| |  
| |

The diagnostic tests have completed successfully. If you suspect a problem, go to Step 004.

+----+  
|003|  
+----+

Go to "Symptom-to-FRU Index" in topic 6.0.

+----+  
|004|  
+----+

- Check the PSTN cable and the DAA cable, if installed, for continuity.

**IS THE CABLE(S) GOOD?**

Yes No

| |  
| |  
| +----+  
| |005|  
| +----+  
| |  
| |

Replace the defective cable(s).

+----+  
|006|  
+----+

- Have the customer transmit a call.

**WAS THE CALL TRANSMITTED SUCCESSFULLY?**

Yes No

| |  
| |  
| +----+  
| |007|  
| +----+  
| |  
| |  
| |

If installed, replace the external DAA. If you do not have an external DAA installed, or replacing the external DAA does not correct the problem, replace the modem.

+----+  
|008|  
+----+

- Have the customer receive an incoming call on the modem.

**WAS THE INCOMING CALL RECEIVED?**

Yes No

| |  
| |  
| +----+  
| |009|  
| +----+  
| |  
| |  
| |

If installed, replace the external DAA. If you do not have an external DAA installed, or replacing the external DAA does not correct the problem, replace the modem.

+----+  
|010|  
+----+

The diagnostic tests have completed successfully. If you still suspect a problem that is not software related, replace the External DAA; then replace the modem.

6.0 Symptom-to-FRU Index

Error codes and the FRUs that might be responsible for the failure are listed below. The most-likely failing FRU is listed first.

Error Codes	FRU/Action
10101, 10102 10103, 10104 10105, 10106 10107, 10108 10109, 10110 10111, 10112 10113, 10114 10115, 10116	Have the customer verify that the correct operating system device drivers are installed and operational. Modem
10117	Check system speaker. Check PSTN cable. External DAA (if installed) Modem
10118	Run System Diagnostics and verify the correct operation of the modem slot. Modem
10119	Diagnostics detected a non-IBM modem. Modem
10120	Check PSTN Cable. External DAA (if installed) Modem
10132, 10133 10134, 10135 10136, 10137 10138, 10139 10140, 10141 10142, 10143 10144, 10145 10146, 10147 10148, 10149 10150, 10151 10152, 10153	Modem

7.0 Parts

Internal Modem (Model FC3632)	42G2592
Internal Modem (Model FC3650, for Japan only)	92F0285
9-pin MiniDIN-to-MiniDIN Cable (for 42G2592 and 92F0285)	92F0284
Internal Modem (Model FC3634)	42G2593
High Speed Internal Modem (Model FC3635)	42G2594
PCMCIA-to-MiniDIN Cable (for 42G2593 and 42G2594)	92F0287
<b>External DAA for:</b>	
Australia	43G3412
Austria	43G3399
Belgium	43G3414
Chile	58G4330
Czechoslovakia	54F0695
Denmark	43G4302
Finland	54F0715
France	43G3396
Germany	43G3415
Greece	54F0720
Hong Kong	54F0693
Hungary	54F0763
Iceland	43G4302
Ireland	43G3407
Israel	54F0780
Italy	43G3408
Luxembourg	54F0996
Malaysia	58X9868
Morocco	43G3396
Netherlands	43G3409
Norway	43G3410
New Zealand	43G3411
Poland	54F0763
Portugal	54F0997
Rumania	54F0763
Singapore	43G3403
South Africa	54F0998
Spain	54F0999
Sweden	54F0717
Switzerland	43G3416
Taiwan	43G3397
United Kingdom	43G3413
Yugoslavia	54F0515

(Parts continues)

(Parts continued)

<b>PSTN Cable for:</b>	
Australia	58G4343
Austria	58G4386
Belgium	58G4346
Canada, Chile, Czechoslovakia	94X1540
Denmark	58G4333
Finland	58G4334
France	58G4335
Germany	58G4347
Greece	94X1540
Hong Kong	58G3232
Hungary	94X1540
Iceland	58G4336
Ireland	94X1540
Israel	58G4338
Italy	58G4339
Japan, Luxembourg, Malaysia	94X1540
Morocco	58G4335
Netherlands	58G4340
Norway	58G4341
New Zealand	58G4332
Poland, Portugal, Rumania, Singapore	94X1540
South Africa	58G4344
Spain	94X1540
Sweden	58G4336
Switzerland	58G4348
Taiwan	94X1540
United Kingdom	58G4345



8.0 *Safety Information*

The following section contains the safety information required to service an IBM product. Familiarize yourself with this information before servicing an IBM product.

Subtopics

- 8.1 General Safety
- 8.2 Safety Inspection Guide
- 8.3 Handling Electrostatic Discharge (ESD) Sensitive Devices
- 8.4 Electrical Safety

## 8.1 General Safety

Use these rules to ensure general safety:

- Observe good housekeeping in the area of the machines during maintenance and after completing it.
- When lifting any heavy object:
  1. Ensure you can stand safely without slipping.
  2. Distribute the weight of the object equally between your feet.
  3. Use a slow lifting force. Never move suddenly or twist when you attempt to lift.
  4. Lift by standing or by pushing up with your leg muscles; this action removes the strain from the muscles in your back. *Do not attempt to lift any objects that weigh more than 16 kg (35 lb) or objects that you think are too heavy for you.*
- Do not perform any action that causes hazards to the customer or that makes the equipment unsafe.
- Before you start the machine, ensure that other service representatives and the customer's personnel are not in a hazardous position.
- Put removed covers and other parts in a safe place, away from all personnel, while you are servicing the machine.
- Keep your tool case away from walk areas so that other people will not trip over it; for example, put it under a desk or table.
- Do not wear loose clothing that can be trapped in the moving parts of a machine. Ensure that your sleeves are fastened or rolled up above your elbows. If your hair is long, fasten it.
- Insert the ends of your necktie or scarf inside other clothing or fasten the necktie with a clip, preferably nonconductive, approximately 8 centimeters (3 inches) from the end.
- Do not wear jewelry, chains, metal-frame eyeglasses, or metal fasteners for your clothing.

**Remember:** A metal object lets more current flow if you touch a live conductor.

- Wear safety glasses when you are:
  - Using a hammer to drive pins or similar parts
  - Drilling with a power hand-drill
  - Using spring hooks or attaching springs
  - Soldering parts
  - Cutting wire or removing steel bands
  - Cleaning parts with solvents, chemicals, or cleaning fluids
  - Working in any other conditions that might be hazardous to your eyes.
- After maintenance, reinstall all safety devices such as shields, guards, labels, and ground wires. Exchange any safety device that is worn or defective for a new one.

**Remember:** Safety devices protect personnel from hazards. You destroy the purpose of the devices if you do not reinstall them before completing your service call.

- Reinstall all covers correctly before returning the machine to the customer.

## 8.2 Safety Inspection Guide

The intent of this inspection guide is to assist you in identifying potentially unsafe conditions on these products. Each machine, as it was designed and built, had required safety items installed to protect users and service personnel from injury. This guide addresses only those items. However, good judgment should be used to identify potential safety hazards due to attachment of non-IBM features or options not covered by this inspection guide.

If any unsafe conditions are present, you must determine how serious the apparent hazard could be and whether you can continue without first correcting the problem.

Consider these conditions and the safety hazards they present:

- Electrical hazards, especially primary power: primary voltage on the frame can cause serious or fatal electrical shock.
- Explosive hazards, such as a damaged CRT face or bulging capacitor, can cause serious injury.
- Mechanical hazards, such as loose or missing hardware, can cause serious injury.

The guide consists of a series of steps presented in a checklist. Begin the checks with the power off and the power cord removed from the power receptacle.

Checklist:

1. Check exterior covers for damage (loose, broken, or sharp edges).
2. Power off the system. Disconnect the power cord from the electrical outlet.
3. Check the power cord for:
  - a. A third-wire ground connector in good condition. Use a meter to measure third-wire ground continuity for 0.1 ohm or less between the external ground pin and frame ground.
  - b. The cables and attachments should be the appropriate type as specified in "Parts" in topic 7.0.
  - c. Insulation must not be frayed or worn.
4. Remove the cover.
5. Check for any obvious non-IBM alterations. Use good judgment as to the safety of any non-IBM alterations.
6. Check inside the unit for any obvious unsafe conditions, such as metal filings, contamination, water or other liquids, or signs of fire or smoke damage.
7. Check for worn, frayed, or pinched cables.
8. Check that the power-supply cover fasteners (screws or rivets) have not been removed or tampered with.

### 8.3 Handling Electrostatic Discharge (ESD) Sensitive Devices

Any part containing transistors or integrated circuits (ICs) should be considered sensitive to electrostatic discharge (ESD).

**Note:** Use product-specific ESD procedures when they exceed the requirements noted here.

ESD damage can occur when there is a difference in charge between objects. Protect against ESD damage by equalizing the charge so that the machine, the part, the work mat, and the person handling the part are all at the same charge. The use of a grounding cord system is desirable but not required to protect against ESD damage. The ESD grounding wrist band must be worn against the skin. Select the grounding cord system to provide protection for the specific service requirement. If an ESD-sensitive part is swapped, the mat must be used to provide an ESD-safe work surface to protect the part removed from the system. The mat might not be required for a simple insertion. The mat can be used as an ESD-protective container for swapping parts between systems. Use the mat with the BLACK side up.

The ESD ground clip can be attached to any frame ground, ground braid, or green wire ground. For systems that are double-insulated, or battery-operated, an ESD common ground or reference point should be used. The round ground-prong on the AC plug can be used on AC-operated systems. Coax or connector-outside shells can be used on double-insulated or battery-operated systems.

ESD-sensitive parts must not touch any part of your clothing. Most clothing is insulative and retains a charge even when you are wearing a wrist band. Avoid contact with other people when handling ESD-sensitive parts. Keep ESD-sensitive parts in protective packages until they are inserted into the product.

#### 8.4 Electrical Safety

Observe the following rules when working on electrical equipment:

- Find the room emergency power-off (EPO) switch or disconnecting switch. If an electrical accident occurs, you can then operate the switch quickly.
- Do not work alone under hazardous conditions or near equipment that has hazardous voltages.
- Disconnect all power:
  - Before doing a mechanical inspection
  - Before working near power supplies
  - Before removing or installing main units
- Before you start to work on the machine, unplug its power cable. If you cannot unplug the cable, ask the customer to switch off the wall box that supplies power to the machine and to lock the wall box in the off position.
- If you need to work on a machine that has *exposed* electrical circuits, observe the following precautions:
  - Ensure that another person, familiar with the power-off controls, is near you.

**Remember:** Another person must be there to switch off the power, if necessary.

**CAUTION:**

Some hand tools have handles covered with a soft material that does not insulate you when working with live electrical currents. Use only approved tools and testers.

- Use only one hand when working with powered-on electrical equipment; keep the other hand in your pocket or behind your back.

**Remember:** There must be a complete circuit to cause electrical shock. By observing the above rule, you may prevent a current from passing through your body.

- When using testers, set the controls correctly and use the approved probe leads and accessories for that tester.

**CAUTION:**

Many customers have, near their equipment, rubber floor mats that contain small conductive fibers to decrease electrostatic discharges. Do not use this type of mat to protect yourself from electrical shock.

- Stand on suitable rubber mats (obtained locally, if necessary) to insulate you from grounds such as metal floor strips and machine frames.

Observe the special safety precautions when you work with very high voltages; these instructions are in the safety sections of maintenance information. Use extreme care when measuring high voltages.

- Regularly inspect and maintain your electrical hand tools for safe operational condition.
- Do not use worn or broken tools and testers.
- *Never assume* that power has been disconnected from a circuit. First, *check* that it has been switched off.
- Always look carefully for possible hazards in your work area. Examples of these hazards are moist floors, nongrounded power extension cables, power surges, and missing safety grounds.
- Do not touch live electrical circuits with the reflective surface of a plastic dental mirror. The surface is conductive; such touching can cause personal injury and machine damage.
- Do not service the following parts *with the power on* when they are removed from their normal operating places in a machine:
  - Power supply units
  - Pumps
  - Blowers and fans
  - Motor generators

and similar units. (This practice ensures correct grounding of the units.)

- If an electrical accident occurs:
  - **Use caution; do not become a victim yourself.**
  - **Switch off power.**
  - **Send another person to get medical aid.**

9.0 Notices

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