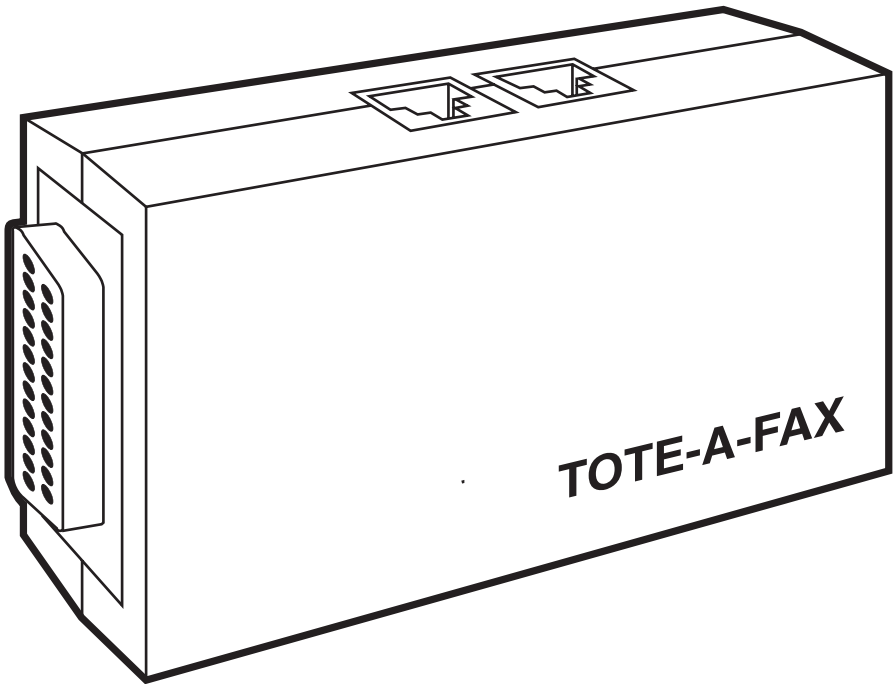




## Tote-a-Fax 542



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# Tote-A-Fax 542 Installation and Operation Manual

## FCC REQUIREMENTS

This equipment complies with FCC Rules Part 68. Located on the equipment is the FCC Registration Number and Ringer Equivalence Number (REN). You must provide this information to the telephone company if requested.

The Registration Number and REN will be inscribed on the printed circuit board on insert cards or on a label affixed to the chassis bottom. The FCC requires these numbers be prominently displayed on an outside surface of the device.

The REN is used to determine the number of devices you may legally connect to your telephone line. In most areas, the sum of the REN of all devices connected to one line must not exceed five (5.0). Contact your telephone company to determine the maximum REN for your calling area.

The telephone company may change technical operations or procedures; these changes may affect your equipment. You will be notified of changes in advance; this will give you the necessary time to make arrangements to maintain uninterrupted telephone service.

If you experience trouble with this telephone equipment, contact your dealer for information regarding service or repairs. The telephone company may ask that you disconnect this equipment from the network until the problem has been resolved. If your equipment continues to disrupt the network, the telephone company may temporarily disconnect service. If this happens, you will be informed of your right to file a complaint with the FCC.

The equipment may not be used on coin service provided by the telephone company. Connection to party lines is subject to state tariffs.

### WARNING!

This equipment generates and uses radio frequency energy. If not installed and used in accordance with the manufacturer's instructions, it could cause interference to radio and television reception. It has been type tested and complies with the limits for a Class B computing device in accordance with the specifications in Part 15 of the FCC Rules designed to provide reasonable protection against interference in a residential installation. There is no guarantee that interference will not occur. If this equipment causes interference to radio or television, as determined by turning the equipment off and on, the user is encouraged to correct the interference with the following measures:

- Reorient the receiving antenna.
- Relocate the computer with respect to the receiver.
- Plug the computer into a different outlet so the computer and receiver are on different branch circuits.

Changes or modifications to this unit not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

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### SHIELDED CABLES

This product has been tested and complies with FCC limits for a Class B computing device. Using unshielded cables could cause your system to emit excess radio frequency increasing the change of interference. To comply with FCC regulations, it is necessary to use shielded DTE cables with your installation.

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# 1. SPECIFICATIONS

## FACSIMILE MODEM

**Standards** — CCITT V.29/Group III, V.27 ter, V.21 sync

**Speed** — 9600-, 7200-, 4800-bps

**Operation** — Half-duplex

**Interface** — EIA RS-232/CCITT V.24

**Certification** — FCC Part 68

**Transmit Level** — 0 to -15 dBm

**Receive Level** — 0 to -43 dBm

**Audio** — Provided through built-in speaker

## DATA MODEM

**Standards** — CCITT V.21, V.22, V.22 bis, Bell 103, Bell 211A

**Data compression** — CCITT V.42, V.42 bis, MNP Level 5

**Speed** — 2400-, 1200-, 300-bps

**Operation** — Full-duplex

**Interface** — EIA RS-232/CCITT V.24

**Memory** — Built-in non-volatile memory; EEPROM for configuration storage

## GENERAL SPECIFICATIONS

**System Requirements** — DOS 2.1 or higher, 640K RAM

**Ringer Equivalency** — 0.4 B (Canadian Load Number: 41 B)

**Connectors** — (1) DB25 female; (2) RJ-11 telephone interface jacks

**Power** — 115 VAC $\pm$  10%; 60 Hz, or 9-volt battery, 200 mA

**Size** — 0.8"H x 2.2"W x 4"D (2 x 5.6 x 10.2 cm)

**Weight** — Shipping weight: 3.5 oz. (.001 kg) (not including optional Power Supply PS 427)

## 2. INTRODUCTION

### 2.1 DESCRIPTION

The Tote-A-Fax 542 (FX119A) is a compact, battery-powered, portable 9600-bps Group III fax and 2400-bps Hayes® compatible data modem. The data modem supports today's most popular and powerful data compression and error correction protocols: CCITT V.42, V.42 bis, and MNP® Level 5.

The Tote-A-Fax 542 is ideal for portable, laptop, and notebook PC users. It is perfect for travelers who use portable PCs and need a way to send files from remote locations to the office mainframe, LAN server, PC, and/or fax machine.

The Tote-A-Fax 542 is one of our growing line of ultra-compact products (modems, line drivers, muxes) that provide you with full datacomm support *and* the convenience of a small enclosure. Like the Tote-A-Fax (FX112A), it is one of the smallest fax modems in the world. It is compatible with all DOS-based PCs, Windows 3.0, and the Apple Macintosh®.

With the Tote-A-Fax 542 you can gather data while "in the field". Then connect the Tote-A-Fax 542 to a telephone (in a hotel room, at your remote office, an airport, etc.) and to your portable PC; now you're ready to send files anywhere.

### 2.2 FEATURES/BENEFITS

#### 2.2.1 FAX MODEM FEATURES

- **Compatible with virtually all portable PCs *and* with any Group III fax.**

The Tote-A-Fax 542 is compatible with CCITT V.29 recommendations for Group III fax transmissions. Send and receive faxes from your portable/laptop/notebook PC (DOS, Windows, or Macintosh systems) to fax machines anywhere at speeds up to 9600 bps.

- **Integrated fax and data communications software.**

The integrated fax/data communications software loads in just a few minutes to your portable PC. The software is easy to use and gives you all of the functions and options to compile files, merge many files into one file, and send any fax or data file. You can even customize a cover sheet for transmissions.

- **Background Send and Receive functions.**

The Tote-A-Fax 542 sends and receives fax files in background mode. You continue to work while your fax transmissions go to their destination; you continue to work while incoming faxes arrive at your laptop/portable PC. The Tote-A-Fax 542 doesn't tie you down or hold you back from your other tasks. The end result: you send and receive your faxes without wasting time or being distracted from current work in other applications.

- **Print fax files directly to a printer.**

The Tote-A-Fax 542 will print your received fax files to your local Epson dot matrix printer or Hewlett-Packard LaserJet II/III laser printer (or compatible printers). HGA, CGA, EGA, and VGA mono- and color-modes are supported, too. You can make those incoming faxes jump through a few other hoops, too: they can be flipped, compressed, or expanded for better viewing, and they can be displayed or printed either automatically or on demand.

- **Schedule fax transmission to save money.**

The Tote-A-Fax 542 lets you schedule your fax transmissions. This means you can send files at some time in the future so that you can take advantage of lower telephone rates. You save money in telephone line connect charges. Plus the Tote-A-Fax 542 provides an activity log to monitor and manage your incoming and outgoing fax calls; print the activity log to add to your business account ledger.

- **Transmit a fax to a single remote fax or to any number of fax machines.**

The Tote-A-Fax lets you do a traditional fax transmission (point A to point B) and it gives you the ability to broadcast a fax file to a group of fax machines. This would be very helpful to travellers who need to get the same information out to a number of people in different places.

## 2.2.2 DATA MODEM FEATURES

- **V.42, V.42 bis, and MNP5 data compression/error correction protocol support.**

Double or even quadruple your effective data throughput rate (from 2400 bps to 4800 bps, 7200 bps, or even 9600 bps). The Tote-A-Fax 542 will communicate with other V.42, V.42bis, and MNP compatible modems to get your data files to their destination in less time—with total accuracy. This saves you costly telephone connect time charges and valuable time while you are on business.

- **Compatible with five of the most popular transmission standards: CCITT V.21, V.22, V.22 bis, V.23, Bell 103, and Bell 212A.**

The Tote-A-Fax 542 modem can communicate with most any modem in the world. This wide range of standards support is invaluable to anyone who has to send files to different modems on a regular basis. You can send your files at any of the following three base speeds: 2400 bps, 1200 bps, 300 bps.

- **Hayes AT Command Set compatibility.**

You can issue any of the Hayes AT Commands to the Tote-A-Fax 542 for easy control of the modem's operations: you don't have to learn a new proprietary communications "language" to use this fax/data modem.

- **Built-in non-volatile memory supplied by EEPROM for storing configuration.**
- **Automatic power down of the unit for extended life of battery.**

Don't worry if you forget to turn off the Tote-A-Fax 542—it knows when to go to sleep to conserve its battery power.

## 2.3 System Requirements

- IBM® PC/AT® or compatible computer with at least 640K RAM and a hard disk drive with a minimum of 5MB of available disk space; or
- Apple Macintosh®
- EGA/CGA/VGA/HGA adapter and monitor.
- Direct outside telephone line.
- Printer (optional)

## 3. INSTALLATION

Follow these steps to connect the Tote-A-Fax 542 to your computer:

1. Attach the 110V Power Supply unit (PS427) to the PWR connector on the Tote-A-Fax 542. **DO NOT PLUG THE POWER ADAPTER INTO A POWER OUTLET AT THIS TIME.** Wait until step #4 to apply power to the modem.\*
2. Connect the RS-232 connector on the Tote-A-Fax 542 to the RS-232 port on your personal computer.
3. Connect one end of the supplied RJ-11 telephone cable to the LINE jack on the Tote-A-Fax 542. Connect the other end of this cable to the telephone line jack.
4. Plug the Power Supply unit into a power outlet.\*

Here is a listing of the indicators (LEDs) on the front panel of the on the Tote-A-Fax 542:

PWR.....	Power
AA .....	Auto Answer
SD .....	Send Data
RD .....	Receive Data

\*You can also operate the Tote-A-Fax 542 with batteries rather than using the Power Supply unit.



## 4.0 OPERATION

### 4.1 The Basics of Modem Operation

After you've connected your Tote-A-Fax 542 modem to your personal computer, you need to establish a procedure to communicate (exchange data) with a data modem in another location.

You now have the hardware connected: on your end you have the Tote-A-Fax 542 modem linked to your PC; on the other (remote) end there should be a modem attached to another PC. Each modem is attached to a telephone line.

A telephone call can be placed between the two modems over the telephone line. Once the modems establish a connection, they need a common set of parameters (rules and limits) to exchange data bits. This is the data communications protocol.

### 4.2 Giving Commands to a Modem

Finally, you need a way to "talk" to your modem through your computer. You can use the:

- command code for the modem; learning code is a difficult and time consuming task.
- Standard AT Command Set to issue commands to the modem.

The Standard AT Command Set is a simplified "modem language" supported by a majority of today's modems. It consists of short groupings of keyboard characters, followed by a carriage return or enter key. Each character or character group represents a command or series of commands. Pressing the return key initiates the command you've stated to the modem. This method of telling your modem to do certain functions is quick, simple, and easier to use than command code.

The Tote-A-Fax 542's built-in command set is very compatible with the Standard AT Command Set. It is an asynchronous communication program that you can learn with little effort. It will let you take control of your modem through your PC's keyboard. The commands are short, simple, and fast.

### 4.2.1 THE AT COMMAND

Each command in the Standard AT Command Set is preceded by the two-character sequence **AT**. AT is short for “Attention!”. You control and command the modem by first demanding its “attention” and then dictating your command. When you press the return or enter key you officially initiate the command.

Each AT Command consists of the following elements:

1. The two-character attention sequence AT
2. A command
3. A command parameter
4. Press the return key

**NOTE:** There are two exceptions to this convention: the *A/* and the *+++* commands. Both commands are discussed later in this manual.

A command is not initiated until you press the carriage return key <CR>. The modem ignores entries represented as spaces (that is, if you press the space bar on your keyboard the modem does not acknowledge these characters as part of the command).

### 4.2.2 AT COMMAND PARAMETERS

Not all commands have command parameters associated with them. If a parameter is missing from an AT command statement, the value of zero is assigned to it. Sometimes zero is actually a valid command parameter.

**Summary:** The sequence of characters that follow the AT sequence constitute the core of the command. They cause the modem to enter a command state.

Command parameters give the modem further details about the command. Pressing the carriage return key initiates the command (that is, the modem goes to work).

If you key in AT without a command, you are simply sending a “wake-up call” to the modem, telling it to get ready to listen to a command.

The modem queues commands in a 40-character command line. The command line beginning with AT can have several commands.

**NOTE:** It is not necessary to have a separator between the commands.

Here is the command line format:

```
AT command <parameter>command<parameter>
<CR>
```

The carriage return <CR> terminates the command line. When the modem receives the <CR> the commands are performed in the order in which they are sent to the modem. If more than 40 characters are sent to the modem an error occurs; all commands must then be reentered.

## 4.3 The AT Command Set for the Data Modem

The following table gives the AT commands supported by Tote-A-Fax 542 modem, including a description of each command, its command “range” and size. Pertinent notes are included within the table.

<b>COMMAND</b>	<b>DESCRIPTION/RANGE —SIZE</b>
A/	Execute previous command, without pressing <CR> key
AT	Attention
ATA	Answer immediately
ATB0	CCITT V.22 mode
ATB1	Bell 212A mode <b>(default)</b>
ATDP	Dial using Pulse Dial
ATD	Dial command
ATDT	Dial using DTMF Tone Dial Default
ATDL	Dial using last number, regardless of last command

**Note:** The following eight modifiers will dial using the previously used technique (pulse or tone), or the T or P command can be added after the D (Dial) command.

ATDW	Wait for Dial tone for period set by S7 register
ATD@	Quiet answer: wait for 5 seconds of silence before dialing
ATD!	Hookflash: commonly used in PBX systems
ATDR	Reverse answer mode
ATDS $n$	Dial stored number $n=0-3$
ATD/	Wait 0.125 seconds
ATD;	Return to command mode after dialing
ATD,	Pause for amount of time set in Register S8
ATE0	Command echo disabled
ATE1	Command mode echo enabled <b>(default)</b>
ATF0	No echo when connected
ATF1	Echo transmitted characters when connected <b>(default)</b>
ATH0	Go on hook (open relay)
ATH1	Go off hook (close relay)

COMMAND	DESCRIPTION/RANGE —SIZE
ATI0	Identification Code
ATI1	Identification Code
ATI2	“OK” response if checksum verifies
ATI3	Revision number
ATL0	Lowest volume setting
ATL1	Same as ATL0
ATL2	Medium volume setting <b>(default)</b>
ATL3	Maximum volume setting
ATM0	Speaker always off
ATM1	Speaker on until carrier is detected <b>(default)</b>
ATM2	Speaker always on
ATM3	DTMF Tones are not heard, but speaker is on until carrier detected
ATO	Originate immediate or return to data mode
ATQ0	Enable result code <b>(default)</b>
ATQ1	Disable result code
ATS <i>n</i> ?	Provide S Register Value ( <i>n</i> =0—27)
ATS <i>n</i> =	Set register value ( <i>n</i> =0—27)
ATV1	Verbose response <b>(default)</b> . See ATV0 for response.
ATW0	Negotiation process result codes not returned <b>(default)</b>
ATW1	Negotiation process result codes returned
ATX0	Enable result codes 0—4
ATX1	Enable result codes 0—5
ATX2	Enable result codes 0—6
ATX3	Enable result codes 0—5, 7, and 10
ATX4	Enable result codes 0—10 <b>(default)</b>
ATY0	Disable long space disconnect <b>(default)</b>
ATY1	Enable long space disconnect
ATZ0	Software reset, restore S Register from Profile Location 0
ATZ1	Restore S Register
AT&C0	EIA carrier line always forced on <b>(default)</b>
AT&D0	DTR always on <b>(default)</b>
AT&D1	Modem goes to command mode when DTR goes Off

<b>COMMAND</b>	<b>DESCRIPTION/RANGE —SIZE</b>
AT&D2	Modem goes On Hook and return to command mode when DTR goes Off
AT&D3	Modem initializes when DTR goes OFF
AT&F	Fetch S Register from EPROM for factory default
AT&G0	No guard tone <b>(default)</b>
AT&G1	500 Hz guard tone enabled
AT&G2	1800 Hz guard tone enabled
AT&J0	RJ-11 select <b>(default)</b>
AT&J1	No function
AT&L0	Switched line select <b>(default)</b>
AT&L1	Leased line select (not supported)
AT&M0	ASynchronous mode <b>(default)</b>
AT&P0	US Make/Break Ratio for Pulse dialing <b>(default)</b>
AT&P1	UK Make/Break Ratio for Pulse dialing
AT&Q0	Same as AT&M0
AT&R0	Clear to Send (CTS) follows RTS <b>(default)</b>
AT&R1	CTS always On
AT&S0	Data Set Ready (DSR) always On <b>(default)</b>
AT&S1	DSR normal
AT&T0	Terminate test in progress <b>(default)</b>
AT&T1	Initiate local analog loopback for time set by register S18
AT&T2	Not defined
AT&T3	Initiate digital loopback for time set by register
AT&T4	Enable remote digital loopback (RDLB) response
AT&T5	Disable remote digital loopback (RDLB) response
AT&T6	Initiate RDLB
AT&T7	Initiate RDLB with Self Test
AT&T8	Initiate ALB with Self Test
AT&W0	Write S Registers into User Profile Number 0
AT&W1	Write S Registers into User Profile Number 1
AT&X0	Modem provides transmit clock
AT&X1	DTE supplies transmit clock
AT&X2	Slave clock mode (not supported)

<b>COMMAND</b>	<b>DESCRIPTION/RANGE —SIZE</b>
AT&Y0	Power up recall User Profile 0
AT&V	List configuration both active and stored
AT&7m=An	Store telephone numbers into NVRAM (XL93C46) where: <i>m</i> is the Number Location (0—3) <i>A</i> is P or T (Pulse or Tone) <i>n</i> is the telephone number

## 4.4 S-Registers for the Data Modem

### 4.4.1 WHAT IS AN S-REGISTER?

A modem holds vital information about modem configuration and operation in internal memory locations called Status (S-) Registers. Each S-Register is assigned a number from 0 to 27, and each contains 8 data bits (or, one byte of information). In some S-Registers each bit has a different function; these are termed bit-mapped S-Registers. The bits are numbered 0—7, with 0 the least significant bit. Other S-Registers use the total number of bits (8) to represent a single value.

One of the functions of an S-Register is to store modem configuration information. Thus, commands which change or alter the configuration operate by modifying the corresponding S-Register.

Most S-Registers have a fixed, predefined meaning to the modem, and can be read or altered. Others are read only registers; if you try to change that particular register, the modem responds with an error message. Still other registers are either destined not to be used or are reserved for future options for the modem. A reserved register cannot be read or changed.

### 4.4.2 BIT-MAPPED S-REGISTERS

Bit-mapped S-Registers contain configuration information for more than one option or modem function. Each bit is mapped to a different modem function.

Sometimes a group of bits within a particular register are mapped to a function.

### 4.4.3 DIFFERENT S-REGISTER SETS AND THEIR PURPOSES

The Tote-A-Fax 542 modem uses three different sets of S-Register values to do its various functions and options. You can alter (modify) some registers but not others.

Here is a summary of the three types of S-Registers:

- Active (Current) Configuration S-Registers

These are the S-Register values that the modem uses to operate. When you “read from” or “write to” an S-Register, you are working with an active (current) configuration S-Register.

- Stored Configuration S-Registers

Stored configuration S-Registers are kept in *nonvolatile memory*; the register values are stored in a semiconductor random access memory (RAM) chip that retains the information even when the modem loses power. So if the modem's batteries wear down, the power adapter is unplugged, or the power outlet fails, the stored configuration S-Registers remember their contents.

When the modem powers up it loads the current S-Register configuration with the stored configuration.

Use the AT commands discussed at the beginning of this chapter to store your current configuration to the stored configuration, or to load the current configuration with the stored configuration.

- Factory Configuration S-Registers

These registers are factory-set choices for the modem; they form a "default" configuration.

These values are permanently stored in a "read only memory" (ROM) semiconductor chip.



## S-Registers for the Data Modem

This configuration can be used to reset your S-Registers with known default values—a home-base for the modem to return to should you want to reset your modem configuration.

### **4.4.4 S-REGISTER NUMBERS AND THE REGISTER FUNCTIONS**

The table on the following pages lists all 27 S-Register numbers and includes a description of each register's function.

Refer to the *Software User's Manual* for instructions on how to change the S-Registers for the Tote-A-Fax 542 modem.

REGISTER  
NUMBER

## REGISTER FUNCTION

S0	Number of rings to answer; <b>default = 0</b> (no answer) (stored)
S1	Ring count: Stores number of rings
S2	Escape code character; <b>default = 043</b> (ASCII character is + )
S3	Carriage return character; <b>default = 013</b>
S4	Line feed character; <b>default = 043</b> (ASCII character is + )
S5	Back space character; <b>default = 003</b>
S6	Wait for dial tone; <b>default = 002</b> (seconds) (minimum setting)
S7	Wait for carrier after dial; <b>default = 030</b> seconds
S8	Duration for delay after comma; <b>default = 002</b> (seconds)
S9	Carrier detect response time; <b>default = 0.6</b> (seconds)
S10	Lost carrier to hang up delay; <b>default = 1.4</b> (seconds)
S11	Touch tone duration; <b>default = 095</b> (milliseconds)
S12	Escape code guard time; <b>default = 1</b> (seconds)
S13	Bit mapped register
S14	Bit mapped register: stored in nonvolatile RAM (XL93C46)
	Bit 0 Reserved
	Bit 1 Echo
	Bit 2 Result codes
	Bit 3 Numeric result codes
	Bit 4 Always 0
	Bit 5 Tone/Pulse dialing
	Bit 6 Reserved
	Bit 7 Answer/Originate
S15	Reserved
S16	Test Register
	Bit 0 ALB
	Bit 1 Reserved
	Bit 2 Local Digital Loopback
	Bit 3 Remote Digital Loopback

**REGISTER  
NUMBER**

**REGISTER FUNCTION**

S16	Test Register ( <i>continued</i> )		
	Bit 4	Initiate Remote Test	
	Bit 5	Initiate Remote Test with Self Test	
	Bit 6	Analog Loopback with Self Test	
	Bit 7	Reserved	
S17	Reserved		
S18	Test time stored in nonvolatile RAM (XL93C46); <b>default = 000</b> (seconds)		
S19	Reserved		
S20	Reserved		
S21	Bit mapped register: stored in nonvolatile ROM (XL93C46)		
	READ ONLY MEMORY		
	Bit 0	0 = RJ11 Jack	
	Bit 1	Reserved	
	Bit 2	CTS/RTS Function	
	Bit 3	DTR Function	
	Bit 4	DTR Function	
		<u>Bit 4</u>	<u>Bit 3</u> <u>Function</u>
		0	0      DTR always true — <b>default</b>
		0	1      DTR Off, forces command state
		1	0      DTR Off, forces modem offline
		1	1      Modem initializes with DTR Off (ATZ)
	Bit 5	EIA carrier status	
	Bit 6	Guard tone select	
	Bit 7	Guard tone select	
		<u>Bit 7</u>	<u>Bit 6</u> <u>Function</u>
		0	0      No guard tone — <b>default</b>
		0	1      550 Hz guard tone
		1	0      1800 Hz guard tone
		1	1      Reserved

REGISTER  
NUMBER

## REGISTER FUNCTION

S22

Option bit mapped register

Bit 0 Determines speaker volume

Bit 1 Determines speaker volume

<u>Bit 1</u>	<u>Bit 0</u>	<u>Function</u>
0	0	Low speaker volume
0	1	Low speaker volume
1	0	Medium speaker volume — <b>default</b>
1	1	High speaker volume

Bit 2 Determines speaker status

Bit 3 Determines speaker status

<u>Bit 3</u>	<u>Bit 2</u>	<u>Function</u>
0	0	Speaker always off
0	1	On until carrier is detected — <b>default</b>
1	0	Speaker always on
1	1	Same as “01”, except off for dialing

Bits 4-6 Determines response messages

<u>Bit 6</u>	<u>Bit 5</u>	<u>Bit 6</u>	<u>Function</u>
0	0	0	Basic message set
1	0	0	Extended with connect 1200, connect 2400
1	0	1	Extended with “No dial tone”
1	1	0	Extended with “Busy”
1	1	1	Extended with all messages — <b>default</b>

Bit 7 Determines Off Hook/On Hook (Make/Break) Ratio for Pulse dialing

<u>Bit 7</u>	<u>Ratio</u>
0	39/61 (USA and Canada); <b>default</b>
1	33/67 (UK and Hong Kong)

**REGISTER  
NUMBER**

**REGISTER FUNCTION**

S23	Option bit mapped register Bit 0 determines whether a request from a remote modem for RDLB is acknowledged. The <b>Default is Enabled</b> . (Bit 0 Set)															
Bit 1	Determines speed of transmitting and receiving data															
Bit 2	Determines speed of transmitting and receiving data															
	<table border="0"> <thead> <tr> <th><u>Bit 1</u></th> <th><u>Bit 2</u></th> <th><u>Speed (bps)</u></th> </tr> </thead> <tbody> <tr> <td>0</td> <td>0</td> <td>300</td> </tr> <tr> <td>0</td> <td>1</td> <td>Reserved</td> </tr> <tr> <td>1</td> <td>0</td> <td>1200</td> </tr> <tr> <td>1</td> <td>1</td> <td>2400</td> </tr> </tbody> </table>	<u>Bit 1</u>	<u>Bit 2</u>	<u>Speed (bps)</u>	0	0	300	0	1	Reserved	1	0	1200	1	1	2400
<u>Bit 1</u>	<u>Bit 2</u>	<u>Speed (bps)</u>														
0	0	300														
0	1	Reserved														
1	0	1200														
1	1	2400														
Bit 3	Undefined															
Bit 4	Determines the parity for transmitting and receiving data															
Bit 5	Determines the parity for transmitting and receiving data															
	<table border="0"> <thead> <tr> <th><u>Bit 4</u></th> <th><u>Bit 5</u></th> <th><u>Parity</u></th> </tr> </thead> <tbody> <tr> <td>0</td> <td>0</td> <td>Even — <b>default</b></td> </tr> <tr> <td>0</td> <td>1</td> <td>Space/None</td> </tr> <tr> <td>1</td> <td>0</td> <td>Odd</td> </tr> <tr> <td>1</td> <td>1</td> <td>Mark</td> </tr> </tbody> </table>	<u>Bit 4</u>	<u>Bit 5</u>	<u>Parity</u>	0	0	Even — <b>default</b>	0	1	Space/None	1	0	Odd	1	1	Mark
<u>Bit 4</u>	<u>Bit 5</u>	<u>Parity</u>														
0	0	Even — <b>default</b>														
0	1	Space/None														
1	0	Odd														
1	1	Mark														
Bit 6	Determines guard tone frequency															
Bit 7	(Used in European applications)															
	<table border="0"> <thead> <tr> <th><u>Bit 7</u></th> <th><u>Bit 6</u></th> <th><u>Guard Tone (Hz)</u></th> </tr> </thead> <tbody> <tr> <td>0</td> <td>0</td> <td>Even — <b>default</b></td> </tr> <tr> <td>0</td> <td>1</td> <td>Space/None</td> </tr> <tr> <td>1</td> <td>0</td> <td>Odd</td> </tr> <tr> <td>1</td> <td>1</td> <td>Undefined</td> </tr> </tbody> </table>	<u>Bit 7</u>	<u>Bit 6</u>	<u>Guard Tone (Hz)</u>	0	0	Even — <b>default</b>	0	1	Space/None	1	0	Odd	1	1	Undefined
<u>Bit 7</u>	<u>Bit 6</u>	<u>Guard Tone (Hz)</u>														
0	0	Even — <b>default</b>														
0	1	Space/None														
1	0	Odd														
1	1	Undefined														
S24	Not used															
S25	Delay to DTR (stored in nonvolatile RAM); <b>default = 005</b> (seconds)															
S26	RTS to CTS delay (synchronous mode only)															

REGISTER  
NUMBER

## REGISTER FUNCTION

S27	Bit mapped register stored in nonvolatile RAM		
Bit 0	Transmission mode		
Bit 1	Transmission mode		
	<u>Bit 1</u>	<u>Bit 0</u>	<u>Function</u>
	0	0	Asynchronous mode — <b>default</b>
	0	1	Synchronous mode 1
	1	0	Synchronous mode 2
	1	1	Synchronous mode 3
Bit 2	Reserved		
Bit 3	Reserved		
Bit 4	Transmission mode		
Bit 5	Transmission mode		
	<u>Bit 5</u>	<u>Bit 4</u>	<u>Function</u>
	0	0	Internal mode clock used — <b>default</b>
	0	1	DTE supplied clock
	1	0	Slave clock mode
	1	1	Same as “00”
Bit 6	CCITT or Bell handshaking standard		
	0	CCITT handshake	
	1	Bell handshake (including CCITT V.22 bis)	
Bit 7	Reserved		

## 4.5 Fax Command Set for the Fax Modem

COMMAND	FACTORY DEFAULT	DESCRIPTION
+FCLASS	N=0	<p><b>Select Service Class.</b> +FCLASS=n command sets the active service class.</p> <p>+FCLASS=0    Return to data mode</p> <p>+FCLASS=1    Fax Class 1</p> <p>+FCLASS=2    Fax Class 2 (not supported)</p> <p>+FCLASS=3    Fax Class 3 (not supported)</p>
+F<command>?		<p><b>Report Active Configuration.</b> +F&lt;command&gt;? interrogates the modem to determine the active configuration.</p> <p>The responses are:</p> <p>+FAA?            0 if auto answer is disabled                     1 if auto answer is enabled</p> <p>+FCLASS?        0 if in data mode                     1 if in fax mode</p> <p>+FF?             0 if flow control off                     1 if flow control on</p>
+F<command>=?		<p><b>Report Operating Capabilities.</b></p> <p>+F&lt;command&gt;=? can be used to determine the operating capabilities of the modem.</p> <p>The responses are:</p> <p>+FAA=?           0, 1</p> <p>+FCLASS=?       0, 1</p> <p>+FTM=?           24, 48, 72, 96</p> <p>+FRM=?           24, 48</p> <p>+FTH=?           3</p> <p>+FRH=?           3</p> <p>+FF=?            0, 1</p> <p>+F&lt;command&gt;=&lt;parameter&gt;? interrogates the modem as to whether that fraction is supported. The modem responds with OK if the parameter</p>

COMMAND	FACTORY DEFAULT	DESCRIPTION
		issued for the specific command is supported or will respond with ERROR if it is not supported.
+FAA		<b>Data/Fax Auto Answer.</b> +FAA command configures the modem to automatically detect whether an incoming call is from a data modem or a fax modem. This command is valid in both data and fax modes.
	n=0	<b>Disable data/fax auto answer mode (default).</b> The modem answers according to the +FCLASS setting.
	n=1	<b>Enable data/fax auto answer mode.</b> The modem determines calling type and issues DATA result code (13) if caller is a data modem or issues FAX result code (15) if caller is a fax modem.
+FF	n=0	<b>Enhanced Flow Control.</b> +FF command enables flow mode for data transfer between the DTE and the DCE. n=0 Disable enhanced flow control interface. In this mode, data transfer is compatible with the EIA-578 standard. n=1 Enable enhanced flow control.
+FTS=n	n=0	<b>Stop Transmission &amp; Wait.</b> +FTS=n causes the modem to terminate a transmission. The transmission is terminated and the modem waits for n 10 millisecond intervals before responding with the OK result code. An ERROR response code appears if this command is issued while the modem is on-hook.



<b>COMMAND</b>	<b>FACTORY DEFAULT</b>	<b>DESCRIPTION</b>						
+FRS=n	n=0	<p><b>Receive Silence.</b> +FRS=n causes the modem to report back to the DTE with an OK result code after n 10 millisecond intervals of silence have been detected on the line. This command is aborted if any command character is received. The modem discards the aborting character and issues an OK result code. An ERROR response code results if this command is issued while the modem is on-hook.</p>						
+FTM=n	N=48	<p><b>Transmit Data.</b> +FTM=n causes the modem to transmit data using the modulation technique defined below. An ERROR response code results if this command is issued while the modem is on-hook.</p> <p>+FTM=24      V.27 ter 2400 bps            +FTM=48      V.27 ter 4800 bps            +FTM=72      V.29 7200 bps            +FTM=96      V.29 9600 bps</p>						
+FTH=n	n=3	<p><b>Transmit Data with HDLC Framing.</b> +FTH=n causes the modem to transmit data framed in HDLC protocol using the modulation defined below. An ERROR response code results if this command is issued while the modem is on-hook.</p> <p>+FRH=3      V.21 Channel 2 300 bps</p>						
+FRTn	n=48	<p><b>Receive Test Data.</b> +FRTn causes the modem to go off-hook and begin demodulating received data at the specified rate.</p> <table border="1"> <thead> <tr> <th><b>n</b></th> <th><b>Configuration/Data Rate</b></th> </tr> </thead> <tbody> <tr> <td>n=24</td> <td>V.27 ter 2400bps</td> </tr> <tr> <td>n=48</td> <td>V.27 ter 4800 bps</td> </tr> </tbody> </table>	<b>n</b>	<b>Configuration/Data Rate</b>	n=24	V.27 ter 2400bps	n=48	V.27 ter 4800 bps
<b>n</b>	<b>Configuration/Data Rate</b>							
n=24	V.27 ter 2400bps							
n=48	V.27 ter 4800 bps							

COMMAND	FACTORY DEFAULT	DESCRIPTION
+FTTn=m	n=96, m=0	<p><b>Transmit Test Data.</b> +FTTn=m causes the modem to transmit a continuous eye pattern at the specified rate. The transmission will terminate by a DTE abort (i.e., any character recognized at the DTE interface).</p> <p><b><u>n</u></b>                    <b><u>Configuration/Data Rate</u></b></p> <p>n=24                    V.27 ter 2400bps</p> <p>n=48                    V.27 ter 4800 bps</p> <p>n=72                    V.29 7200 bps</p> <p>n=96                    V.29 9600 bps</p> <p><b><u>m</u></b>                    <b><u>Test Pattern</u></b></p> <p>m=0                    ASCII data (20h—7fh sequential)</p> <p>m=1                    All zeros</p> <p>m=2                    All ones</p> <p>m=3                    Alternate 1, 0</p> <p>m=4                    Sliding 0 (01111)</p> <p>m=5                    Sliding 1 (00001)</p>

## 4.6 Result Codes Table for the Data Modem

<b>Word(s) Code</b>	<b>Digit Code</b>	<b>Meaning</b>
OK	0	Acknowledges execution of the command line.
CONNECT	1	A connection has been established at 0 to 300 bps.
RING	2	Ring detected.
NO CARRIER	3	Failure to connect or a loss of the carrier signal.
ERROR	4	This command is not recognized.
CONNECT 1200	5	A connection has been established at 1200 bps.
NO DIALTONE	6	A dial tone is not detected within the specified time.
BUSY	7	A busy signal is detected.
NO ANSWER	8	Five seconds of silence was not detected when the dial modifier @ was issued.
CONNECT 2400	10	A connection has been established at 2400 bps.

## 4.7 Data Compression and Error Detection for the Modem

This section explains the concepts behind a set of data protocols (MNP Levels 1–5) and a set of international standards (V.42/V.42 bis), both of which involve the application of data correction and compression techniques.

### 4.7.1 MNP LEVELS 1–5

The Microcom Networking Protocol (MNP) doesn't apply to data transmission *between* modems; rather, they apply to data exchanges *between a DTE and modem*.

What does this mean to the user of a modem that supports these protocols? You can send data from your DTE (PC, data terminal, etc.) to the modem at speeds higher than 2400 bps. The modem then implements the MNP 1–5 protocols, which compress the data using an encoding scheme, and checks the data for errors, corrects the errors, and sends the data over the phone line.

The transmission is still, for example, 2400 bps. But the data has been encoded and compressed (eliminating “wasteful” data), so the amount of data sent represents more than the 2400 bps.

The remote modem that receives the signal does the following: it “rebuilds” or (decompresses) the data, checks it for errors, corrects the errors, and funnels the data to the remote DTE (computer).

**NOTE:** Data correction/compression techniques are applied to asynchronous data only.

The result? Your personal computer can talk to the Tote-A-Fax 542 modem at high speeds (that is, your PC can feed data to the modem in large quantities) and yet your modems can still talk to each other at 2400 bps. And the data travels from one computer to the other computer without errors.

### 4.7.2 CCITT V.42, V.42 BIS

The same scenario applies when the V.42 or V.42 bis standards are applied to the data exchange between DTE and modem. The V.42 specifications formally standardize and enhance the error correction functions that make up MNP Levels 2–4 (MNP protocols have been, until recently, the *de facto* industry standards).

CCITT V.42 is now an internationally recognized standard for error correction. Similarly, CCITT V.42 bis is the new accepted standard for data compression techniques; V.42 bis roughly corresponds to MNP Level 5. One big difference is in the amount of data compressed: V.42 bis generates about a 4:1 ratio of data compression, while MNP Level 5 generates a 2:1 ratio of data compression.

**NOTE:** The extent of compression is always dependent on the type of file that is being transferred.

Finally, no matter which data compression and error correction protocols you apply to your data transmissions, a vital factor for the overall success of your data transmissions will be due to the *quality of the connection made over dialup telephone lines between your modem and the remote modem*.

In other words, if you happen to get a poor quality connection (and it is totally random), you will not quadruple your data throughput simply because the local and remote modems both support V.42 and V.42 bis. You *will* get a higher effective data throughput working with two modems that support V.42 and V.42 bis. But you will get a higher effective data throughput with a good “clear” connection, and a correspondingly lower effective data throughput speed with a “noisy” connection.

#### **4.7.3 V.42 & V.42 BIS IN DETAIL**

The Tote-A-Fax 542 modem supports V.42 and V.42 bis. An internal controller regulates data compression. Efficient block size adjustments help to compensate for situations where the signal-to-noise ratio is poor.

A V.42 bis modem combines two error correction protocols: Link Access Procedure–M (LAPM), and MNP 1–4. This increases the the possibility of an error-free transmission. Data is sent in frames with a “start” bit and a “stop bit” on either end of the data frame. The start and stop bits are “stripped” from the data being transmitted. This means only eight (8) bits per character are sent from the local terminal device (your PC), rather than 10 bits per character. This represents a 20% gain in data throughput. However, this gain is partially off-set by the framing characters and Cyclic Redundancy (CRC) data used by MNP.

Encoded information is added to the data frame for the receiver to decode. It then determines if the block was error free. That determination is made through the CRC process. The receiver checks the data-encoded information to:

- Indicate if the data is correct.
- Recognize and identify imperfect data frames/
- Determine if the data has failed CRC. If so, retransmission is automatically spread.

The V.42 bis modem works by a simple process. Its initial action is to seek LAPM error correction compatibility with the receiving modem.

- If the compatibility exists, it employs the LAPM error correction protocol.
- If the V.42 bis modem cannot find LAPM compatibility, it tries to connect using the MNP-5 protocol.
- If it can't establish connection according to either protocol, it will still connect with the remote modem in normal mode; error correction is not applied.

#### **4.7.4 SUMMARY**

The Tote-A-Fax 542 modem is a 2400 bps modem. It has the potential to allow effective data throughput of up to 7200 bps when it uses MNP Level 5 data compression, or up to 9600 bps when it uses the V.42 bis data compression protocol.

## 5. TROUBLESHOOTING

**How do I find out if I have any COM PORTS (communications ports) on my computer?**

First, consult your PC's owner's manual. You can also run a diagnostics program, if necessary.

**I am using a "mouse" on COM PORT 1. On which COM PORT should I install my modem?**

COM PORTS 1 and 3 share the same IRQ (Interrupt Request Line) within the computer. Set your modem to either of COM PORTS 2 or 4. If you are using a mouse on COM PORTS 2 or 4, set the modem for COM PORTS 1 or 3. Make sure that you disable COM PORT 1 or 3 and IRQ4 from the other serial board.

**Can I use the same modem communications software for both an internal and external modem?**

Yes. The external modem will work off your serial adapter board.

**What causes non-sensical text or characters to appear on my screen? How do I correct this problem?**

What you see on your computer screen is referred to as "garbage". There are eight common causes:

1. A conflict with IRQ with other serial ports.
2. Initialization is not correct. Refer to Chapters 3 and 4 of this manual.
3. The data rate (baud or bps rate) of your modem does not match the rate of the host modem.
4. The parity bit is not set properly.
5. The stop bit is not set properly.
6. The modem is not set to full-duplex.
7. If there is hissing on the telephone line and garbage on the screen, the telephone line is most likely the culprit. You have received a bad connection, perhaps due to a weather disturbance. Disconnect the call and try again.
8. The modem may be defective.

Run an analog loopback test to determine whether the problem is one of the first seven listed above, or if it is a faulty modem. To run this test, issue either of the following AT commands:

### **AT&T1**

This command will initiate a local analog loopback test

### **AT&T8**

This command will initiate an analog loopback and a modem self test.

Whichever test you select, observe the LEDs on the modem and monitor the activity on your PC screen.

If the loopback test is successful without creating garbage on the screen, then the modem is working properly. The problem is most likely in the configuration you have chosen, in your PC, or in the telephone line.

**I tried to transfer a compressed data file (.ZIP file, .ARC file, etc.) but did not get a higher effective data throughput with this modem. Why?**

This modem has the ability to compress data files before transmitting the data to the receiving modem. This enables effective data throughput rates much higher than the actual modem connection data rate. If you have the modem configured to use the V.42 bis/MNP Level 5 data compression protocols (which is probably the case), then you are transferring a data file which is already compressed. The data compression protocols cannot compress the data anymore. Thus, the data throughput is not higher.

**To send and receive data files (either fax or computer files), do I need to have my PC turned on?**

Yes.

# ADDENDUM I

## Tote-A-Fax 542

This document contains corrections to your Tote-A-Fax 542 *Installation and Operation Manual* (August 1992). Changes are indicated by the use of vertical black bars in the margin of each page, as shown to the right of this statement.

## 1.0 SPECIFICATIONS

### DATA MODEM

**Standards** — CCITT V.21, V.22, V.22 bis, Bell 103, Bell 212A

**Data compression** — CCITT V.42, V.42 bis, MNP Level 5 (software)

**Speed** — 2400-, 1200-, 300-bps

**Operation** — Full-duplex

**Interface** — EIA RS-232/CCITT V.24

**Memory** — Built-in non-volatile memory; EEPROM for configuration storage

### GENERAL SPECIFICATIONS

**System Requirements** — DOS 2.1 or higher, 640K RAM

**Ringer Equivalency** — 0.4 B (Canadian Load Number: 41 B)

**Connectors** — (1) DB9 female; (1) RJ-11 telephone interface jack

**Power** — 115 VAC± 10%; 60 Hz, or 9-volt battery, 200 mA

**Size** — 0.8"H x 2.2"W x 4"D (2 x 5.6 x 10.2 cm)

**Weight** — Shipping weight: 3.5 oz. (not including optional Power Supply PS 427)

## 2.1 DESCRIPTION

The Tote-A-Fax 542 (FX119A) is a compact, battery-powered, portable 9600-bps Group III fax and 2400-bps Hayes® compatible data modem. With the appropriate software the data modem supports today's most popular and powerful data compression and error correction protocols: CCITT V.42, V.42 bis, and MNP® Level 5.

### 2.2.2 DATA MODEM SOFTWARE FEATURES

- **V.42/V.42 bis, and MNP5 data compression/error correction protocol support.**

Double or even quadruple your effective data throughput rate (from 2400 bps to 4800 bps, 7200 bps, or even 9600 bps). With the appropriate software, the Tote-A-Fax 542 will communicate with other V.42, V.42bis, and MNP compatible modems to get your data files to their destination in less time—with total accuracy. This saves you costly telephone connect time charges and valuable time while you are on business.

- **Compatible with five of the most popular transmission standards: CCITT V.21, V.22, V.22 bis, Bell 103, and Bell 212A. (The unit is not CCITT V.23 compatible.)**

## 4.0 OPERATION

### 4.7.3 V.42 & V.42 BIS IN DETAIL

The Tote-A-Fax 542 modem supports V.42 and V.42 bis. Efficient block size adjustments help to compensate for situations where the signal-to-noise ratio is poor. (The original manual incorrectly states that an internal controller regulates data compression.)





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