SIGNALMAN MK XII

OWNERS MANUAL

ANCHOR AUTOMATION, INC.

6913 Valjean Avenue, Van Nuys, CA 91406
(213) 997-6493

TABLE OF CONTENTS

Anchor Automation, Inc. reserves the right to make improvements in its products without notice at any time.

INSTALLATION AND OPERATION MANUAL

MARK XII DATA MODEM

LIMITED WARRANTY

Anchor Automation, Inc. warrants equipment manufactured and sold by it to be free from defects in material and workmanship and to meet applicable specifications under normal use and service for a period of two (2) years after sale to the original owner. If any equipment or parts not covered by another manufacturer's warranty are deemed by Anchor Automation to have been defective originally, or if these parts or equipment are found to have become defective under normal usage rather than misuse, negligence or accident, Anchor Automation will repair or replace them without charge.

This warranty shall not apply to equipment or parts which are normally consumed in operation, nor to equipment which, in the opinion of Anchor Automation, has been repaired or altered outside the Anchor Automation plant in any way so as to affect its reliability or stability. Also not covered: equipment which has been subjected to misuse, negligence or accident; or which has been altered, defaced or has had the serial number removed.

Anchor Automation, Inc. does not assume any liability for consequential damages and, in any event, the company's liability shall not exceed the purchase price.

SERVICE

If you believe the modem itself is malfunctioning, disconnect it until the source of the problem is discovered. A malfunctioning modem may cause effects on public telephone lines outside the permissible operating specifications of FCC Part 68.

In the event of equipment failiure, all repairs shall be performed by Anchor Automation, Inc. or by an authorized agent of Anchor Automation, Inc. It is the equipment user's responsibility to report the need for service.

Do not return any item without instructions from Anchor Automation, Inc. Call (213) 997-6493, ask for the Service Department and report the problem or malfunction. Give the model number, type and serial number of the equipment. On receipt of this information, Anchor Automation, Inc. will provide service instructions.

Chapter 1

INTRODUCTION

Welcome to high-speed communications! Your SIGNALMAN MARK XII will serve as the link between your computer (or terminal) and the world of data bases and computer networks. The MARK XII is compatible with the Bell System 212 standard which allows operation in full-duplex mode at either high speed (1200 bits per second) or low speed (300 and 110 bits per second).
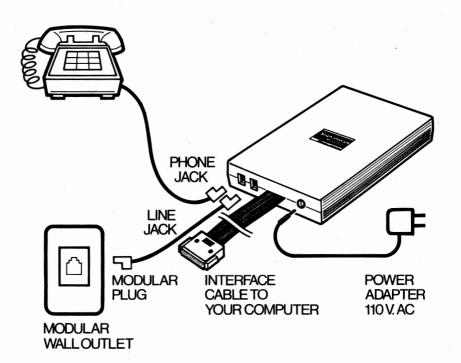
This modem comes equipped with a built-in ribbon cable with a 25 pin connector installed for use directly with the industry standard RS-232 type computer and terminal interfaces. The telephone connection is made between the modem and any telephone wall outlet. A 6 foot telephone cable is included with your modem. Power is provided by the 110 volt power adapter.

The SIGNALMAN MARK XII modem is a "smart" device, incorporating a microprocessor and associated firmware to carry out a variety of communication functions. The on-board firmware is compatible with that of the Smart 1200 [TM] Modem manufactured by Hayes Micro-computer Products, Inc. It is further enhanced by the capability to detect dial tone and busy signal on the telephone automatically.

The SIGNALMAN MARK XII may be used in conjunction with most communications oriented software programs, being generally Hayes compatible. In most circumstances no modifications will be necessary, and most references by the user will be to the software manual rather than to these MARK XII modem instructions. Nevertheless, all necessary information is included for operating the modem manually through a computer or terminal keyboard or for the development of other communications software.

[TM]Trademark of Hayes Microcomputer Products, Inc.

SIGNALMAN MARK XII CONNECTION DIAGRAM

PHONE
JACK

LINE
JACK

MODULAR
PLUG

INTERFACE
CABLE TO
YOUR COMPUTER

POWER
ADAPTER
110 V. AC

MODULAR
WALL OUTLET

Chapter 2

INSTALLATION

This chapter covers what you must do before installing your MARK XII, how to install it, and how to check your installation. Refer to Figure 1.

Notifying your Telephone Company

The Federal Communications Commission (FCC) has established rules which govern modem connection to telephone lines. Before connecting your modem you must notify your local telephone company that you are going to connect an FCC registered device to your telephone line. They'll ask you for the following information:

1. Your telephone number.

2. The modem FCC Registration Number (located on modem decal).

3. The Ringer Equivalence Number: 0.0B (also located on modem decal).

4. The USOC telephone jack needed for connection: RJ11 (refer to Chapter 7 if your home is equipped with the older 4-prong telephone jacks).

Your telephone company may make changes in its service and operation from time to time. If these changes will affect the operation of your modem, they'll notify you before doing so.

FCC rules also require you to notify your local telephone company before permanently disconnecting your modem.

Things You Cannot Do

FCC rules prohibit the use of your modem in the following ways:

1. The modem may not be connected to a telephone which has a party line.

2. The modem may not be connected to a coin-operated telephone.

3

3.   The modem cannot replace your telephone; there must
       be at least one telephone connected to your telephone
       line.

Connecting Modem To Telephone Line

Plug one end of the supplied modular telephone cable into
the line jack on the modem rear panel and the other end into
the wall outlet (Figure 1).

Connecting An Attendant Telephone To Modem

If you wish to have an attendant telephone, plug the modular
telephone cable coming from the rear of your telephone into
the phone jack on the modem rear panel.

Connecting Modem To Computer

Plug the cable coming from the modem rear panel into a
mating RS-232 connector on your computer or terminal. The mating
connector on the computer should be a female DB-25 type wired
as DTE (Date Terminal Equipment); if not, refer to Chapter 7.

Connecting Power

First plug the supplied 12V DC adapter into a 115V AC wall
outlet and then plug its cable into the DC PWR jack on the modem
rear panel.

Checking Installation

1.   Check to see that your telephone works properly.
       If it doesn't, make sure that it is securely plugged
       into the jack marked TELSET.

2.   Set the POWER switch on the modem front panel to ON;
       the modem MR indicator should light. If it doesn't,
       check the 12V adapter connections and your 115V AC
       wall outlet.

3.   If your modem is connected to a computer being used
       as a terminal, identify for it the port to which the
       modem is connected; refer to your computer manual
       for the proper command.

4.   Enter **AT**, followed by **cr**, if the modem is listening
       and functioning properly, it will respond with OK
       on the display and await your command. If something

4

is wrong, no message appears. Consult your dealer
to see if the unit should be returned for repair.
If so, follow the instructions for SERVICE located
on Page 1 of this manual.

5.   If you should experience difficulty with the telephone
line after installation, disconnect the modem. If
it is responsible for the problem, do not use it until
it has been repaired by Anchor Automation, Inc. The
telephone company is not responsible for disturbances
caused by nontelephone equipment.

FCC Information

The Federal Communications Commission has established technical
standards regarding radiation or radio frequency energy emitted
by computing devices. The MARK XII falls under rules for a
Class B computing device and the following information must
be supplied to the user in accordance with 47 CFR 15.838.

"This equipment generates and uses radio frequency
energy, and if not installed and used in strict accordance
with the installation and operating instructions contained
in this Instruction Sheet, may cause interference
with radio and television reception.

"The Signalman has been type-tested and found to comply
with the limits for a Class B computing device in
accordance with the specifications of Subpart J of
Part 15 FCC Rules, which are designed to provide reasonable
protection against radio and television interference
in a residential installation.

"However, there is no guarantee that interference
will not occur in your particular installation. If
this modem does cause interference with radio or television
reception, which you can check by simply turning the
modem on and off, you are encouraged to try one or
more of these corrective measures:

"* Reorient the receiving antenna.

"* Move the modem away from the receiver.

"* Plug your computer system into a different
outlet so that the receiver is on a different
branch circuit.

"If necessary, consult the dealer who sold you this
modem or an experienced radio/television technician
for additional suggestions. You might also find a

5

booklet prepared by the FCC helpful. Entitled 'How
to Identify and Resolve Radio TV Interference Problems',
it is available from:

> U.S. Government Printing Office
> Washington, D.C. 20402
> (Stock Number 004-000-00345-4)

\

Chapter 3

BASIC OPERATION
(Manual Dialing)

This chapter provides a description of the control and indicators of the MARK XII, with instructions on how to establish a data link and transfer data. If you have problems during operation, please refer to the troubleshooting guide in Chapter 7; answers to many of the most often encountered system problems can be found there. Automatic dialing/answering is covered in Chapter 4, and a detailed description of all comands and result codes is given in Chapters 5 and 6, respectively.

Control And Indicators

The POWER switch and four indicator lights on the front panel of the MARK XII (Figure 3) function as follows:

MR Indicator   -   Indicates that power is applied and modem is ready to operate.

SR/RD Indicator   -   Indicates that data is being transferred from the computer to the modem or the modem to the computer.

CD Indicator   -   Indicates that modem has detected a carrier from a distant modem.

HS Indicator   -   Indicates that modem is operating in the high speed mode.

Establishing The Data Link

A data communication link requires that one station transmit and receive in the originate mode, and the other receive and transmit in the answer mode. When a call is received from a remote computer the modem is in the answer mode. Conversely, when a remote computer is dialed, the modem is in the originate mode. The DTE's on both ends must be set the same for number of stop bits, parity, and number of bits in data word.

Call Origination. Calls may be originated manually as follows:

> 1.   Use attendant telephone to dial number of remote modem.

7

2. When remote modem answer tone is heard, command MARK XII to seize line and go on-line as follows:

Command: **ATD cr**
Operational Result Code: None
Connection Result Code: CONNECT or CONNECT 1200

3. Hang up attendant telephone. Modem is on line.

Call Answering. Calls may be answered manually as follows:

1. When attendant phone rings, lift handset off hook to answer.

2. Command modem to go on-line as follows:

Command: **ATA cr**
Operational Result Code: None
Connection Result Code: CONNECT or CONNECT 1200

3. Hang up telephone. Modem is on line.

NOTE: If register S0 (Chapter 5) is not set to 0 (auto answer disabled) the modem answers automatically on the ring specified in the S0 register. At power up or following an ATZ command, the S0 register is set to 001 and will answer an incoming call on the first ring.

Data Transfer

Once a data link has been established as indicated by a CONNECT or CONNECT 1200 result code, data may be transferred between the MARK XII and the distant modem. If necessary, change operational parameters such as duplex or DTE screen echo as follows:

1. Escape from the on-line to command state:

Command: (wait 1 second) **+++** (wait 1 second)
Operational Result Code: OK

2. Execute desired commands.

3. Return on-line:

Command: **ATO cr**
Operational Result Code: CONNECT

8

Disconnect

The data link may be either manually or automatically disconnected as follows:

1. Manual Disconnect - Manual disconnect can be accomplished by any of the following methods:

    a. Commanded Disconnect - escape to command state as previously described followed by issue of hang-up command or reset command as follows:

        (1) Hang-up Command Disconnect

             Command: **ATH cr**
             Operational Result Code: OK

        (2) Reset Command Disconnect

             Command: **ATZ cr**
             Operational Result Code: OK

2. Telephone Line Or Power Off Disconnect - Perform either of the following:

    a. Unplug modular telephone cable from modem line jack or wall outlet, then plug back in.

    b. Remove power from modem by one of the following methods:

        (1) Set modem POWER switch to OFF.

        (2) Unplug 12V DC adapter from wall outlet.

        (3) Unplug 12V DC adapter cable from modem DC PWR jack.

3. Automatic Disconnect - The telephone line will disconnect and the modem will return to the command state and issue a NO CARRIER result code to the DTE under the following conditions:

    a. A lapse of 18 seconds with no activity after initial connection to telephone line for purpose of establishing a data link.

    b. Loss of on-line data carrier for 450 milliseconds.

9

Chapter 4

AUTOMATIC DIALING/ANSWERING

This chapter provides complete instructions for executing automatic dialing/answering commands through the MARK XII.

Automatic Dialing

Command the modem to dial the phone number of the remote modem as follows:

Command: **ATDxxxTyyy, Pzzz cr**
Operational Result Code: DIAL TONE or None
Connection Result Code: CONNECT or CONNECT 1200

The dial command shown directs the modem to pulse dial one portion of the number; xxx, tone dial yyy, pause two seconds, pulse dial zzz, and then go on-line. If the ";" had been placed at the end of the dial command, the modem would have returned to the command state after dialing rather than having gone on-line.

If the number called is busy, the following result codes are sent to the DTE:

Connection Result Code: BUSY

The number may be redialed as follows:

Command: **A/**
Operational Result Code: None
Connection Result Code: CONNECT or CONNECT 1200

Automatic Answering

The modem can be set to answer on a specified number of rings (S0 register = 1 to 255 rings), or not to answer at all (S0 = 0). When the line rings, the result code RING is output to the DTE as follows:

Command: None
Operational Result Code: RING (modem answers on specified
                                 ring)
Connection Result Code: CONNECT or CONNECT 1200

The modem is on-line.

10

When in command mode, the modem may be set to answer on the 9th ring, as follows:

1.   Enter:

     Command: **ATS0 = 9 cr**
     Operational Result Code: OK

2.   To read S0 register contents, enter:

     Command: **ATS0? cr**
     Operational Result: 009

Chapter 5

COMMANDS AND RESULT CODES

This chapter lists and defines all instructions and commands which can be sent to the MARK XII. Also included are the result codes which the modem sends in response to the commands, and a listing of the set register functions.

Commands and result codes are exchanged between the modem and terminal or computer via the RS-232 data connector.

Modem Instructions

It is necessary to follow certain basic guidelines when sending commands to the MARK XII. The group of instructions which follow, while commands in themselves, are used to compose and edit command lines which, in turn, cause the modem to execute specific actions.

Instruction	Function	Definition
AT	Attention Code (Prefix)	All command lines must begin with **AT** except where the **A/** and **+++** commands are used. The modem determines the transmission speed of your equipment from the **A**, and parity from the **T**.
cr	Command Terminator (Suffix)	Carriage return. Terminates all command lines. The modem will not execute a command until it receives a carriage return command (**cr**). (Except "**+++**".)
A/	Repeat Command	Causes a repeat of the previous command. **A/** used in place of **AT** with no carriage return command (**cr**) required. Generally used to redial a telephone when a busy signal is encountered.
bs	Edit	Backspace. Deletes last character entered to permit simple editing. Does not delete attention code (**AT**) at beginning of command line.

12

Modem Commands

Tables 1 and 2 list and define all MARK XII commands. Where applicable, the default value for each command is given. These values determine how the modem will function if an argument for a given command is not specified or a software reset command (Z) is given.

A command without an argument causes a default to zero. Commands may be in either upper or lower case characters but **must** be in ASCII serial format.

Spaces inserted in the command line for display clarity are ignored, but they do occupy space in the command buffer. A single command line cannot exceed a combination of 38 characters and spaces. For ease of reference, the commands have been separated into operational and dial commands.

<u>Operational Commands</u>. Commands are sent to the modem via the terminal or computer keyboard. Table 1 lists and defines the operational commands.

<u>Dial Commands</u>. The dial commands allow telephone calls to be originated either automatically or manually. In the automatic mode a telephone is unnecessary. Calls can be made to a distant modem or time-sharing system without the need of an automatic calling unit or other device.

When using the dial commands, the following characters occupy buffer space but are ignored:

Character	Definition
( )	Parenthesis
-	Dash
*	Asterisk
#	Pound Sign
R	

Table 2 lists and defines each of the dial commands.

13

TABLE 1. OPERATIONAL COMMANDS

Command	Function	Description	Default
+++	Escape On-Line (Mode Change)	Causes an escape from the on-line mode to the command mode. For escape to occur, a 1-second guard time must both precede <ins>and</ins> follow the escape command during which time there can be no output from your equipment.	
Ø	Return On-Line	Causes modem to return on-line from an escape condition	
AT?	Menu	Prints the most used commands on the screen for your reference.	
A	Answer Phone Without Waiting For Ring	Causes modem to seize line and go on-line in the answer mode. Typically used by two individuals who have modems to transfer a call from voice communication to computer communication; one individual enters the "A" command while the other enters the "D" command to establish computer-to-computer communication.	
CØ	Modem Carrier Off	Turns modem transmitter carrier off.	CO
C1	Modem Carrier On	The modem transmitter carrier is normally switched on or off automatically when the modem calls, answers, or is connected to a distant modem. This is accomplished with other commands (e.g. "A", and "D"). Commands CØ and C1 allow manual control of the carrier. C1 turns the carrier on without any other action occurring.	
EØ	Inhibit Echo Of Commands	Modem does not echo operator commands back to DTE screen.	E1

14

TABLE 1. OPERATIONAL COMMANDS (cont.)

Command	Function	Description	Default
E1	Permit Echo Of Commands	Modem echos operator commands back to DTE screen.	
F0	Select Half-Duplex Operation	When on-line, modem echos transmitted characters back to terminal; select full-duplex if remote system echos characters, otherwise characters will appear doubled on your screen.	F1
F1	Select Full-Duplex Operation	When on-line, remote system and not modem echos transmitted characters back to terminal; select half-duplex if remote system does not echo characters, otherwise transmitted characters will not appear on your screen.	
H0	Telephone On-Hook (Switch Hook Control)	Normal state when modem is not in operation. Is used for manual disconnect.	H0
. H1	Telephone Off-Hook (Switch Hook Control)	For special applications the H1 command can be used to control the telephone switch hook relay to seize the line.	
I0	Interrogate Modem	A 3-digit product code (122) is returned. The left two digits represent the Anchor Automation code for the modem; the right-most digit is the modem's revision level. The code is used for unit service or repair.	
I1	Interrogate Modem	A 3-digit number resulting from a cyclic redundancy check (CRC) of the ROM is returned. It is used for unit service or repair.	

TABLE 1. OPERATIONAL CODES (cont.)

Command	Function	Description	Default
Q0	Send Result Codes To DTE	Result codes displayed by DTE. Result codes sent in word or digit form (as determined by **V0**, **V1** commands to terminal.	
Q1	Do Not Send Result Codes To DTE	No result codes sent to DTE. When using the modem with a receive-only printer, you may want to eliminate result codes from the print-out of transmitted data.	Q0
V0	Send Result Codes As Digits	Digits used in place of words. Recommended if DTE software does not easily handle character strings.	V1
V1	Send Result Codes As Words	Words used in place of digits. Recommended for clarity and ease of recognition.	
Z	Software Reset	Forces all command parameters and set registers to their default state.	

TABLE 2. DIAL COMMANDS

Command	Function	Description
Dx	Places Modem In Originate Mode To Dial a Specified Number	Represented by **"x"** are the digits of the telephone number to be dialed, or the number combined with other dialing commands (i.e., **T,P,R,,,** and **;**). If a number is not specified, the modem will go on-line in the originate mode.
P	Selects Pulse Dial	Causes the modem to pulse dial the digits following the command. This command can be used in combination with the **T** command to allow the dialing type to be changed during the dialing operation (i.e., the first digits of a number can be

16

TABLE 2. DIAL COMMANDS (cont.)

Command	Function	Description
		pulse-dialed and the remaining digits tone-dialed). If neither pulse (**P**) nor tone (**T**) dial is specified, the default is last form of dialing commanded.
T	Selects Tone Dial	Causes the modem to tone dial the digits following the command. Can be used in combination with the **P** command. If not specified, default is last form of dialing commanded.
,	Wait 2 Seconds	Inserting the comma into the telephone number causes the modem to pause for 2 seconds and wait for the second dial tone. Multiple commas may be used for longer pause times.
;	Return To Command Mode After Dialing A Number	Causes the modem to return to the command mode after dialing without disconnection.

Set Registers

There are six set or "S" registers which allow the operator to control certain variable parameters of the MARK XII. Table 3 lists the function of each register along with its range, units and default values.

TABLE 3. S REGISTER FUNCTIONS

Register	Range	Units	Default	Description
S0	0 to 255	Rings	001	Controls the number of rings after which an automatic answer will occur. A value of 0 disables the automatic answer function.
S1	0 to 255	Rings	000	Decrements each time the telephone rings. Reset to **S0** value following **AT** command or **AT** power up.

17

TABLE 3.   S REGISTER FUNCTIONS (cont.)

Register	Range	Units	Default	Description
S2	0 to 127	ASCII	043	Holds the ASCII decimal value of the character recognized as the escape code.
S3	0 to 127	ASCII	013	Holds the ASCII decimal value of the character recognized as the carriage return command.
S4	0 to 127	ASCII	010	Holds the ASCII decimal value of of the line feed character.
S5	0 to 32, 127	ASCII	008	Holds the ASCII decimal value of the character recognized as the backspace command.
Sx?				S Register Interrogate Command (x = S register number, 0 through 5). Causes the three-digit value of the selected S register to be output to the DTE.

Result Codes

Result codes are modem responses to your commands. A command·
line followed by a carriage return (**cr**) causes the modem to
execute the command. When the command has been completed, the
oeprator may elect to have the modem send a result code for
display on the DTE screen or printer.

Result codes can be output as words or digits, or not sent
at all, as selected by the operator using the **Q** and **V** commands.
Words are recommended for clarity and ease of recognition unless
your equipment does not handle strings of characters efficiently.
In this case you may prefer the result codes to be sent in digit
form. Table 4 lists the codes and their definitions.

18

TABLE 4. RESULT CODES

Word Code	Digit Code	Description
OK	Ø	A command line has been executed without error.
ERROR	4	A command could not be executed for one of three reasons: 1. Error in command line. 2. Invalid command (command not recognized). 3. Command line exceeds command buffer capacity (greater than 38 characters).
DIAL TONE		A dial tone has been detected.
RING	2	The telephone line is ringing. The modem will answer the call only if given an **A** command, or if set register **SØ** = 1 to 255.
BUSY	3	The telephone number dialed is busy.
NO CARRIER	3	A carrier has not been detected or the carrier has been lost.
CONNECT	1	Low speed data link established. A low speed carrier has been detected from a remote modem - 11Ø or 3ØØ bps.
CONNECT 12ØØ	5	High speed data link established. A high speed carrier has been detected from a remote modem - 12ØØ pbs.

19

Chapter 6

SOME BASICS ON COMMUNICATIONS BY MODEM

Functional Description

If the MARK XII is your first modem, or you are generally unfamiliar with modems, just keep in mind that a modem is simply a device which permits the exchange of data between computers and terminals using ordinary telephone lines. The word "modem" is simply a contraction of the phrase MOdulator-DEModulator. The modulator portion of the modem converts the digital data generated by computers into signals or tones which are in turn sent over telephone lines. The demodulator reconverts these signals or tones back into digital form to be used by the receiving computer or terminal. For a data link (computer-to-computer or computer-to-terminal connection) to function, both ends of the link must be equipped with modems.

Communication lines or data links are typically classified by the direction and manner in which data can be moved. The simplex link represents the most basic type of connection. Data moves in one direction only. Radio and television are examples of simplex communication. Half-duplex allows <u>alternating</u> communications using a single channel. CB radio is an example of half-duplex operation. Only one person at a time can communicate. Full-duplex permits <u>simultaneous</u> communications and uses two channels; one going <u>in each direction</u>. This is the most efficient and rapid means of exchanging data. The telephone is an example of a full-duplex system.

The MARK XII operates in either full-duplex or half-duplex. Full-duplex is generally used since most time-sharing systems operate in full-duplex with echo-plex. This, rather than one-way or two-way communication, determines in which mode the modem should be operated.

With echo-plex, typed characters travel to the remote computer and are echoed by it for display on the originating terminal's screen. An advantage of echo-plex is that the quality of the transmission may be monitored; a character that is garbled on the telephone line appears distorted on the screen and a character lost in transmission does not appear at all. When the remote computer does not echo characters half-duplex is used so that the modem can echo characters back to the terminal's screen instead.

Operating States

The MARK XII is always in one of two distinct functional states: command state or on-line state. When power is applied to the modem, it defaults to the command state.

While in the command state, commands are entered via a terminal keyboard or under program control to select full-duplex or half-duplex operation, control variable parameters and initiate dial/answer commands which establish remote communications and cause the MARK XII to enter the on-line state.

The on-line state consists of two sub-modes: answer and originate. The originate mode is used to place calls either manually or automatically. The answer mode accepts incoming calls, which like the originate mode can be answered manually or automatically. When on-line, data is transmitted and received over communication lines. The modem does not execute commands while on-line but must be returned to the command state by entering an escape code.

High Speed vs. Low Speed

The MARK XII is two modems in the same package which employ significantly different communication techniques. The most significant difference, typical of all 212A type modems, is in the nature of communication errors. The data recovery techniques employed for high speed operation unavoidably increase the probability of error due to distortion and noise from the telephone lines. At low speed, a bit error causes a single character to be interpreted as either an incorrect or missing character. The same error at high speed is multiplied, usually causing two or more incorrect characters. These errors often produce a characteristic left brace ([) or lower case "i". This occurrence should not be interpreted as a hardware defect.

Transmission Speed

Commands given to the modem in the command state must be ASCII coded at rates of 110, 300 or 1200 bps only. When on-line at 110 or 300 bps, any code may be used. When on-line at 1200 bps, any code may be used provided it has one start bit, eight information bits, and at least one stop bit (10-bit character). Furthermore, high speed transmission by the DTE to the modem may not vary beyond the limits of -2.5% to +1% from 1200 bps.

When the modem originates a call, it automatically adjusts to the transmission speed of the DTE. Transmission speed of the modem is not changed by a command. The rate for the DTE

must be the same as the remote system. Commands must be issued and result codes sent at the same speed as the remote system.

When the modem answers a call, it determines the transmission speed from the received signal of the remote modem. The modem will output result codes which will be sent to the DTE at the speed determined by the last answered connection, or last **AT** command sent to the modem by the DTE, whichever came last. All subsequent data and result codes must be sent by the DTE to the modem at the speed established by the new connection. The result code CONNECT 1200 indicates that the new connection is at 1200 bps. CONNECT indicates that the connection is a low speed connection. The modem is capable of differentiating between high and low speed. However, it is incapable of determining whether a low speed connection is at 110 or 300 bps.

Powering Up

Whenever power is applied to the modem or a software reset command is given, the modem default values for the operating parameters are assumed. Modem transmission speed will be at the high rate (1200 bps). Operation will be full-duplex, on-hook and register **S0** will be set to 1 (automatic answer function enabled).

Chapter 7

TROUBLESHOOTING

This chapter provides a user troubleshooting guide, information on how to connect the MARK XII to other than a modular wall outlet, and what to do if your equipment interface connector is not a female DB-25 wired as DTE.

USER TROUBLESHOOTING GUIDE

Symptom   Problem/Solution

Modem MR indicator   1. Check that POWER switch is set
does not light   to ON (up).
                            2. Check 12V DC adapter connections.
                            3. Check 115V AC wall outlet.

Modem CD indicator   1. Poor telephone connection.
does not light   2. Weak carrier from distant modem.
                            3. Modem at other end incompatible;
                                should be Bell 103 or 212A or equiva-
                                lent.

Modem SD/RD indicator   RS-232C interface connections incompatible;
does not light   refer to "RS-232C Connection" in this
                            chapter.

Modem HS indicator   The DTE is not sending data to the
does not light   modem at 1200 bps.

Incorrect Data   1. The telephone line should be clean
                                and noise free.
                            2. There should be no one talking
                                on the telephone line.
                            3. The attendant telephone and all
                                extension telephones should be
                                on the hook.

Garbled Display   1. Same as the "Incorrect Data."
                            2. Check communications protocol (baud
                                rate, parity, number of data bits,
                                stop bits); change if necessary.

4-Prong Wall Outlet Connection

Purchase a modular-to-4-prong adapter at your local dealer, discount store, or hardware store. Simply plug one end of the supplied modular telephone cable into the line jack on the modem

23

rear panel, and the other end into the adapter; plug adapter into wall outlet (Figure 4).

RS-232C Connection

Minimum to operate are pins 7, 2 and 3. Refer to Appendix A for the RS-232C connector pin assignments. No wiring changes or adapter cables are needed if your terminal or computer has a female DB-25 connector wired as DTE. If you are not certain how your unit is wired, check your equipment manual or contact your dealer. When you have determined your equipment interface, do one of the following:

1. If your equipment has a male DB-25 connector wired as DTE, make an adapter cable with a female DB-25 connector at each end. Wire pins 1, 2, 3, 5, 6, 7, 8, 12, and 22 direct.

2. If your equipment has a male DB-25 connector wired as DCE, make an adapter cable with a female DB-25 connector at each end, as shown:

Female (to Modem)	Male or Female (to DTE)
2	3
3	2
1	1
7	7
6	20
5	4

3. If your equipment has a female DB-25 connector wired as DCE, make an adapter cable with a male DB-25 connector at one end, and a female DB-25 connector at the other end. Wire as in Step 2.

24

Appendix A

RS-232C CONNECTOR PIN ASSIGNMENTS

Pin	Signal	Circuit	Description	Source
1	GND	AA	Protective Ground	---
2	TXD	BA	Transmit Data - serial bit stream sent from DTE (computer or terminal to modem (DCE)	Modem
3	RXD	BB	Receive Data - a serial bit stream sent from modem to DTE	Modem
5	CTS	CB	Clear To Send - high level indicates modem is ready to accept data from DTE	Modem
6	DSR	CC	Data Set Ready - high level indicates modem is ready to operate	Modem
7	GND	AB	Ground - reference level for all data signals	---
8	DCD	CF	Data Carrier Detect - high level indicates data carrier from distant modem is detected	Modem
12	HSI	CI	High Speed Indicator - high level indicates modem is operating in high-speed mode	Modem
22	RI	CE	Ring Indicator - high level indicates telephone is ringing	Modem

25

Appendix B

SPECIFICATIONS

Operate Mode   Automatic ANSW/ORIG selection, computer-controlled dial, computer-controlled answer, automatic speed mode selection

Line Interface   2-wire direct connect

Data Interface   RS-232C compatible, built-in cable to computer

Duplex Select   Full or half

Transmit Carrier Level   -10 dBm fixed

Carrier Detect Level   ON at -43 dBm
             OFF at -47 dBm

Timers

 Answer Quiet   2.1 sec

 Carrier Fail Disconnect 450 ms

 Data Carrier Detect   ON in 155 ms
            OFF in 50 ms

 Answer Abort Disconnect 18 sec

 Originate Abort Disconnect 36 sec

Low Speed Operation

 Data Format   Serial, binary, asynchronous

 Data Rate   110/300 bps

 Modulation   Phase coherent, frequency shift-keyed (FSK)

 Transmit Frequency   ORIG   ANSW

      MARK   1270 Hz 2225 Hz
      SPACE 1070 Hz 2025 Hz

 Transmit Frequency
 Accuracy   ±0.01%

26

Receive Frequency	ORIG	ANSW
MARK	2225 Hz	1270 Hz
SPACE	2025 Hz	1070 Hz

Receive Frequency Tolerance	±0.5%

High Speed Operation

Data Format	Serial, binary, character asynchronous

Modulation	Differential quadrature coherent phase shift keying (DQCPSK)

Transmit Frequencies	BAND	FREQ
	LO	1200 Hz
	HI	2400 Hz

Input Data Rate (DTE to Modem)	1182 to 1212 bps

Line Data Rate (Local to Remote Modem)	1200 bps (±0.01%)

Output Data Rate (Modem to DTE)	1219 bps

Data Character Length	10 bits

Transmit Frequency Tolerance	±0.01%

Received Frequency Tolerance	±7.0 Hz

Equalization Type	Fixed compromise

Scramble Polynominal	1 + (D-14) + (D-17)

Power Requirement	12V DC, 60 mA; provided by adapter (supplied)

Operating Environment	0 to 50°C (32 to 122.6°F) 95% RH noncondensing

Size	15.2 cm x 23 cm x 2.5 cm (6.0 in. x 9.0 in. x 1.0 in.)

Weight	368 gm (13 oz.)

27

Appendix C

ASCII CHARACTER TABLE

DEC	HEX	CODE		DEC	HEX	CODE
0	00	NUL		47	2F	/
1	01	CTRL A		48	30	0
2	02	CTRL B		49	31	1
3	03	CTRL C		50	32	2
4	04	CTRL D		51	33	3
5	05	CTRL E		52	34	4
6	06	CTRL F		53	35	5
7	07	CTRL G		54	36	6
8	08	CTRL H		55	37	7
9	09	CTRL I		56	38	8
10	0A	CTRL J		57	39	9
11	0B	CTRL K		58	3A	:
12	0C	CTRL L		59	3B	;
13	0D	CTRL M		60	3C	<
14	0E	CTRL N		61	3D	=
15	0F	CTRL O		62	3E	>
16	10	CTRL P		63	3F	?
17	11	CTRL Q		64	40	@
18	12	CTRL R		65	41	A
19	13	CTRL S		66	42	B
20	14	CTRL T		67	43	C
21	15	CTRL U		68	44	D
22	16	CTRL V		69	45	E
23	17	CTRL W		70	46	F
24	18	CTRL X		71	47	G
25	19	CTRL Y		72	48	H
26	1A	CTRL Z		73	49	I
27	1B	ESC		74	4A	J
28	1C	FS		75	4B	K
29	1D	GS		76	4C	L
30	1E	RS		77	4D	M
31	1F	US		78	4E	N
32	20	SP		79	4F	O
33	21	!		80	50	P
34	22	"		81	51	Q
35	23	#		82	52	R
36	24	$		83	53	S
37	25	%		84	54	T
38	26	&		85	55	U
39	27	'		86	56	V
40	28	(		87	57	W
41	29	)		88	58	X
42	2A	*		89	59	Y
43	2B	+		90	5A	Z
44	2C	,		91	5B	[

Dec	Hex	Char		Dec	Hex	Char
45	2D	–		92	5C	\
46	2E	.		93	5D	]
94	5E	^		111	6F	o
95	5F			112	70	p
96	60	`		113	71	q
97	61	a		114	72	r
98	62	b		115	73	s
99	63	c		116	74	t
100	64	d		117	75	u
101	65	e		118	76	v
102	66	f		119	77	w
103	67	g		120	78	x
104	68	h		121	79	y
105	69	i		122	7A	z
106	6A	j		123	7B	{
107	6B	k		124	7C	|
108	6C	l		125	7D	}
109	6D	m		126	7E	~
110	6E	n		127	7F	DEL