FREEDOM 100 CRT TERMINAL
TRAINING PROGRAM

Prepared by:

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PROGRAM OVERVIEW

This training program will prepare you to service the Freedom 100 Video Terminal. You will learn the basic operation of the terminal and how to troubleshoot and repair it as needed. You will also use removal/replacement and adjustment procedures. This program is divided into the following sections or modules.

MODULE 1   PROGRAM OVERVIEW

This module will cover the program objectives, training objectives, and resourses required to complete the course. It also discusses the estimated completion time.

MODULE 2   INTRODUCTION

This module will give you an overview of the hardware and standard features of the Freedom 100 CRT Terminal.

MODULE 3   DOCUMENTATION & TROUBLESHOOTING

In this module you will use the service documentation to become familiar with the terminal. You will also learn how the documentation is used to troubleshoot and repair the Freedom 100 CRT Terminal.

MODULE 4   PARTS

In this module you will find a parts diagram and a master parts list.

MODULE 5   DIFFERENCES

This module will discuss the differences in the Freedom 100 and the Freedom 50.

PREREQUISITES

None

TRAINING PROGRAM OBJECTIVE

At the conculsion of this training program you will be able to use the service manual to diagnose and repair the Freedom Terminal.

ESTIMATED TIME TO COMPLETE THIS PROGRAM

Two hours

REQUIRED RESOURCES

Freedom 100 Maintenance Manual

TRAINING PROGRAM DIRECTIONS

This training program is self-paced and does not require the interaction of a "Course Monitor". Estimated program and module times are approximate and should be used to pace yourself. This manual is reusable. Do not write in it. Answer all questions on a piece of scratch paper. Feedback (answers) to questions will be found at the end of each module. Proceed through each module sequentially and follow all directions.

This program does not require that you have a Freedom 100 Terminal available.

CRITERION TEST

At the end of each module there will be a criterion test. You are to answer all test questions on a separate sheet of paper. Feedback sheets will be provided at the end of each module.

MODULE OVERVIEW

This module will give you an overview of the hardware and standard features of the Freedom 100 Terminal.

PREREQUISITE

Completion of the Course Overview.

MODULE OBJECTIVE

At the end of this module you will be able to answer questions about the standard features of the Freedom 100 Terminal. The questions will be answered in writing on a scratch piece of paper and all available rsources may be used.

## ESTIMATED TIME TO COMPLETE THIS MODULE

Thirty minutes

INTRODUCTION

The Freedom 100 consists of two units: The Monitor Unit, containing the CRT, power supply, and control circuits; and the Keyboard Unit, containing the physical keyboard, it's decoding circuitry, and circuits for communicating with the Monitor Unit.

The Keyboard and Monitor Units are connected by a coiled telephone handset cord with 7.62mm (0.3in) male plugs at each end. Power is supplied via a 3-wire grounded cord, terminated by a U.S. NEMA standard plug (which may be replaced to suit local power systems requirements).

Communications with a Host computer or modem and a printer are provided via asynchronous RS-232 communication via two female DB-25 receptacles on the rear of the Monitor Unit. Controls are provided on the Monitor Unit for Power ON/OFF, Contrast, and setting operating parameters.
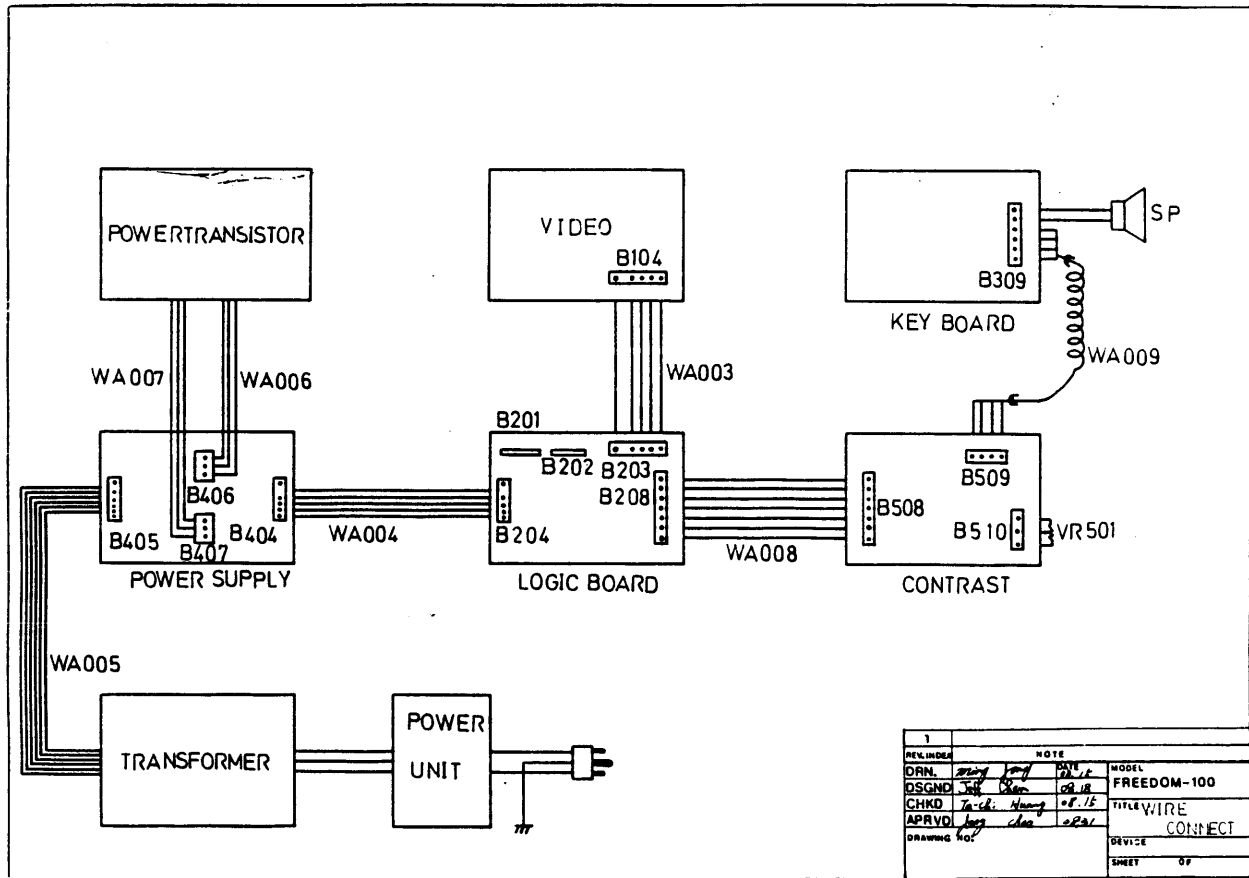
Internally, the Freedom 100 consists of a Transformer and Voltage Selector Switch for converting 115V or 230V AC main power to 10.5V AC, 16.7V AC, and 21.3V AC.

A Power Supply Board, with a 68A02 Microprocessor, 16K of EPROM-resident firmware, 2K of character storage RAM, 4K of attribute and control storage RAM, a 68A45 CRT Controller, a 68A21 PIA, one 6850 and two 6851 ACIAs for Keyboard, Host, and Printer communications, as well as miscellaneous control and sequencing logic.

A Video Control Board, to convert Horizontal and Vertical sychronization pulses to the proper waveforms for controlling CRT raster scan, and circuitry to control pixel display. Connection is made via cables to a 12" diagonal CE745129 VRA tube (or equivalent) for actual display.

A small Contrast control and connector board, having a rotating potentiometer for contrast control, and a female RJ-11 receptacle for the Keyboard connector cord.

A Keyboard, with a 93-key switch-matrix keyboard, decoded by an 8035 stand-alone microcomputer, which generates RS-232 signals by toggling one output line under the control of on-chip software, and receives RS-232 data via software use of interrupts.

TERMINAL OPERATION

The Freedom 100 CRT Terminal is designed to be an inexpensive and convenient data-entry and console device for a wide range of computer and data applications.

The Freedom 100 will normally be connected to a Host computer system, either directly or via MODEM, by asynchronous RS-232 or 20ma current loop, through the Host connector on the rear of the Monitor Unit. The Terminal's on-board firmware allows it to communicate with the Host in Full or Half Duplex, Block Mode (transmitting a screen full of data at once, instead of character-at-a-time), or strictly Local mode (no outside communication). Baud rates from 100 to 19,200 are available. The terminal provides two basic modes for printer operation:

> **Simultaneous Mode**— All characters transmitted from the Host are displayed on the monitor, and also sent to the Printer.

> **Buffer Mode**— Characters from the Host are buffered internally in the Freedom 100, and sent to the Printer without being displayed on the monitor.

The Freedom 100's 16K of on-board-firmware provides 93 basic commands, as well as numerous options, for setting operating parameters. These commands can be sent by the operator from the Keyboard, or by the Host through the Host port.

CRITERION TEST

Answer all questions on a separate sheet of paper. Do not write in this manual. When you have completed all questions, refer to the feedback sheet and check your answers. If you have any questions, review those sections and complete the answers.

1   The Freedom 100 consists of two external units and they are:

    a.   The Monitor and Keyboard Units.

    b.   A Control Unit and a Power Supply.

2.   The Freedom 100 will normally be connected to a Host computer system:

    a.   Directly

    b.   Via modem

    c.   Both a. and b.

3.   The Freedom 100 has Baud rates available from:

    a.   50 to 8000

    b.   100 to 19,200

4.   The term Block Mode refers to:

    a.   Transmitting data a character-at-a-time.

    b.   Transmitting a screen full of data at once.

5.   The Keyboard and Monitor Units are connected by:

    a.   A coiled telephone handset cord with a 7.62mm male plug at each end.

    b.   A parallel cable with centronics interface plug.

FEEDBACK SHEET

1. The Freedom 100 consists of two units: The Monitor Unit and the Keyboard Unit.

2. The Freedom 100 will normally be connected to the Host computer system, either directly or via modem.

3. The Freedom 100 has Baud rates available from 100 to 19,200.

4. The term Block Mode refers to transmitting a screen full of data at once.

5. The Keyboard and Monitor Units are connected by a coiled telephone handset cord with 7.62mm male plugs at each end.

MODULE OVERVIEW

This module will familiarize you with the the troubleshooting techniques used to troubleshoot the Freedom 100. It will also familiarize you with the location of various components of the Freedom 100 and how to check these components.

PREREQUISITES

Completion of modules 1 and 2.

ESTIMATED MODULE COMPLETION TIME

One hour

MAINTENANCE

Open your service manual and read the section titled "Maintenance". Pay particular attention to the section on cleaning the CRT screen, and the warning when removing the CRT.

WARNING

CRITICAL COMPONENT WARNING

SERVICEMAN WARNING: THIS PRODUCT CONTAINS COMPONENTS WHICH ARE CRITICAL FOR X-RADIATION SAFETY. SEE SERVICE MANUAL FOR PROPER REPLACEMENT. NORMAL 2nd ANODE VOLTAGE IS 12K AT ZERO BEAM CURRENT, AC 120 INPUT, AND MUST NOT EXCEED 13K UNDER ANY OPERATING CONDITIONS. TO MEASURE 2nd ANODE VOLTAGE, USE HIGH IMPEDANCE METER. CONNECT (-) TO CHASSIS, USE A HIGH VOLTAGE LEAD FROM (+) TO 2nd ANODE.

MAIN LOGIC BOARD

1.   Open your service manual to the section titled "Main Logic Board", and read the Theory of Operation. After you have completed this section, return to step 2.

NOTE: Refer to page 4-2 for physical location of each subsystem.

2.   The Main Logic Board is located inside the Monitor Unit. To gain access to this board you must:

*   Remove the two phillips head screws located on either side of the Monitor Unit.

*   Remove two phillips head screws located on the back of the Monitor Unit, and remove the rear cover.

*   The Main Logic Board is the large PWB extending out below the yoke of the CRT. Remove three phillips head screws securing the PWB to the chasis.

* Remove connectors at B204, B203, and B208. Slide the Main Logic Board out of the Monitor Unit.

* Open your service manual to the section titled "Main Logic Board".

* Notice the test points, typical waveforms, and signal levels are all displayed .

* Locate these test points on the Main Logic Board. After you have completed this step, return to the training manual.

NOTE: It is not required to have a Freedom 100 Terminal to complete this course. If you are using a terminal, do not replace the Main Logic Board at this time.

POWER SUPPLY

The Power Supply is located on the right wall of the monitor, just above the on/off switch. The transformer is located at the base of the unit, just underneath the Power Supply Board (Power Regular Board).

* Open your service manual to the section titled "Power Supply", and read the Theory of Operations.

* Notice the Troubleshooting Charts to isolate any problems in the Power Supply.

VIDEO BOARD

The Video Board is on the left side of the CRT, opposite the Power Supply Board.

* Open your service manual to the section titled "Video Board", and read the Theory of Operations and Troubleshooting sections.

KEYBOARD

* Open your service manual to the section titled "Keyboard" and read the Theory of Operation.

* Notice the test points, typical waveforms and signal levels section.

* These testpoints are located on the Keyboard PWB and will be used to troubleshoot the the Keyboard Assembly.

If you were using a Freedom Terminal to complete this module, reassemble it at this time.

PRACTICE TROUBLESHOOTING

This practice troubleshooting exercise will familiarize you with the troubleshooting techniques used to repair the Freedom 100 Terminal. In the Introduction section of the service manual is a **Quick Check Out Procedure.** You will start all troubleshooting at this point. This procedure will lead you to a checkout or replacement of a subassembly (ie. Main Logic Board). At this point you can replace the subassembly or refer to the tabbed section which that subassembly is listed for checkout (ie. check signal levels and typical waveforms on Main Logic Board).

Answer all questions on a separate piece of paper. When you have completed all questions, check your answers with the feedback sheet at the end of this module.

1. You have a Freedom 100 which has no display. You referred to the quick check-out procedure and when you checked the primary of the transformer you had 115 volts. What is your next check?

   a. Check the fuse, power switch, and power selector switch.

   b. Check the secondary of the transformer.

2. When you checked the secondary for 16.6v AC 21.3v AC and 16.7v AC, all voltages were correct. What is your next check:

   a. Go to step 3 to check cable from power supply to logic board.

b. Replace transformer.

3. When you disconnected the cable from the Power Supply to the Main Logic Board and checked B 404, all checks were ok. What is the next step?

a. Go to step 5.

b. Replace transistor assembly.

c. Replace Power Supply.

d. Replace Main Logic Board.

You have seen how the service manual is used to isolate problems in the Freedom 100 Terminal. If you have questions or do not feel comfortable using the service manual please review this module. If you feel comfortable with the material you have covered, go to the criterion test.

CRITERION TEST

To complete this criterion test you will need to use the Freedom Service manual. Answer all questions and refer to the feedback sheet at the end of the module to check your answers. If you miss any questions go back to that section and review the information and complete the question with the correct answer. Answer all questions on a separate piece of paper.

1. Your Freedom Terminal has no video signal. After making all preliminary checks you check connector B104 pin 1, and you have 0 volts. Your next check is:

a. Check Main Logic Board and Power Supply.

b. Check for Video signal at TP102.

2. You are performing a quick check out on the Freedom 100. You have determined that you have all standing voltages on B404 at the Power Supply Board, and you do not have any voltage at B204 on the Main Logic Board. Your next check would be to check:

a. The cable that connects B404 and B204.

b. Replace the Power Supply.

2. You need to check typical waveforms and signal levels on the Main Logic Board. You would find this information in the:

a. Theory of Operations.

b. Service manual listed under Main Logic Board.

3 You have just checked the primary of the transformer and found that you have no voltage. Your next check is:

a. Check the Power Supply for typical waveforms and signal levels.

b. Check the fuse, power switch, and power select switch.

4. The video signal is generated form the video circuitry on the:

a. Video Board.

b. Main Logic Board.

c. Keyboard and Contrast Board.

5. Connector B309 is located on the:

a. Contrast Board.

b. Main Logic Board.

c. Keyboard.

6. When checking connector B407, you should have 5.1V DC on pin:

a. One and three

b. One

Check your answers with the Feed Back sheet. If you have missed any questions review that section and correct the answer.

FEEDBACK TO PRACTICE TROUBLESHOOTING

1.   Check secondary of the transformer.

2.   Go to step 3.

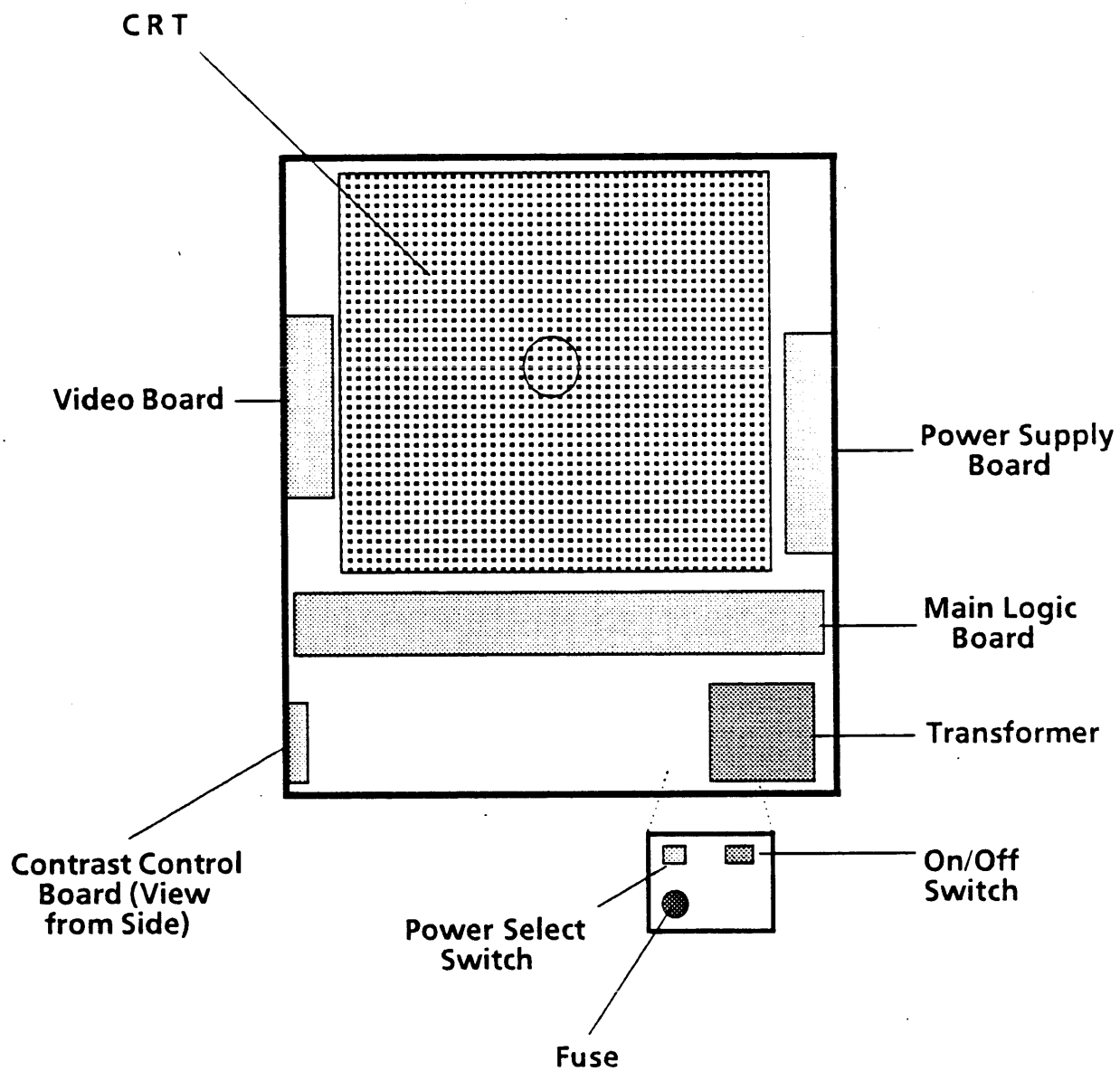3.   Go to step 5.

FEEDBACK TO CRITERION TEST

1.   Check Main Logic Board and Power Supply.

2.   Check cable (WA004), between the Main Logic Board and Power Supply.

3.   Service Manual listed under Main Logic Board.

4.   Main Logic Board.

5.   Keyboard.

6.   Pin one.

Parts

OVERVIEW

In this module there is a master parts list and an exploded view of the Freedom Liberty 100 terminal. If you simply need a part number you can quickly reference the parts list. If you need to identify a particular part, it will be necessary to locate that part on the diagram and associate it with the name. Once this is done you can turn to the master parts list and locate the part number.

View from the rear

CRT

Video Board

Power Supply
Board

Main Logic
Board

Transformer

Contrast Control
Board (View
from Side)

Power Select
Switch

On/Off
Switch

Fuse

Liberty 100 Parts Cossreference

LIBERTY XEROX-PART	SOURCE-PART	KEYWORD	DESCRIPTION
1N36	501101A071003	Base	Base
2N75	501104A020007	Cover	Top Cover
101N131	5011054020001	Cover	Bottom Cover
105N89	375T1200A300	Supply	Power Supply
105N90	39B1211330016	Transformer	Transformer
110N63	375T1200AK01	Keyboard	Keyboard
110N76	3775111700011	Switch	Power Switch
110N77	3776222600016	Switch	Power Select Switch
113N35	37622S0000017	Fuse	Fuse Holder
117N99	412069A600017	Cord	Power Cord
128N15	3A2B1M1200017	Monitor	Monitor Tube
128N16	39C1211200112	Monitor	Monitor Yoke
140N322	375T1200AL01	Board	Main Logic PWA
140N325	375T1200AM00	Board	Video PWA
140N327	375T1200A600	Board	Contrast Control PWA
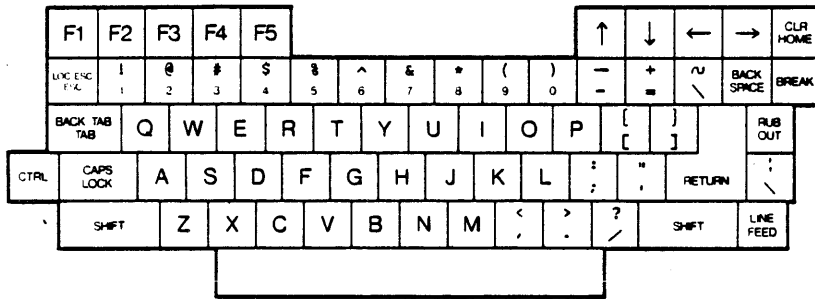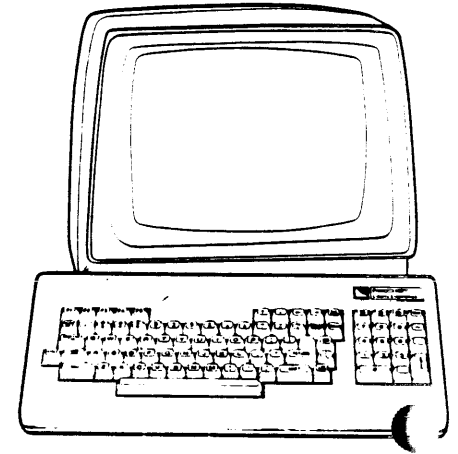
FREEDOM 50

The Freedom 50 is a new low cost, high performance microprocessor-based video display terminal. By streamlining the Freedom 50-- such things as special graphics characters, black mode, and five of the 10 function keys have been eliminated.

The major differences between the Freedom 100 and the Freedom 50 are different EPROMs on the Main Logic Board and Keyboard, and the Freedom 50 has six less keys.

The Liberty part numbers for the Keyboard and Main Logic Board are the same except the Freedom 50 will have a (-50) at the end of the part number ie. 375T1200AL01-50. The Xerox part number will be an altogether different number.

PUBLICATION COMMENT SHEET

Please use this comment sheet to assist with identification of errors or needed improvements in this publication. For specific errors, include a copy of the page that contains the error.

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PUBLICATION NAME   FRANKLIN ACE TRAINING PROGRAM

PUBLICATION NUMBER

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