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**MERLIN**<sup>TM</sup>  
COMMUNICATIONS SYSTEM

SERVICE AND  
MAINTENANCE MANUAL  
MODEL 820

SERVICE AND MAINTENANCE

MANUAL - MODEL 820

**MERLIN™ COMMUNICATIONS SYSTEM**

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## **HOW TO USE THIS MANUAL**

*If you place an outside call using your voice terminal and cannot be heard, cannot hear, or you hear static on the line; hang up and try to place the call again before trying to locate the trouble.*

The trouble locating procedures in this manual have been designed so that you can easily locate a *component* causing trouble in your small business communications system (Model 820). Also, the trouble locating procedures help you identify and correct any problem in your system that is caused by incorrect use of certain system features. When using this manual, you should first read this section completely; then perform the tests described in the “BASIC TROUBLE TESTS” section.

If you have questions concerning any information contained in this manual, please call your equipment supplier for help.

For your convenience, the instructions for identifying a cause of trouble are divided into the following sections:

- Basic Trouble Tests
- How to Select the Correct Procedure
- Trouble on One Voice Terminal
- Trouble on More than One Voice Terminal
- Trouble on an Accessory
- Maintenance Exchange Procedures.

Before trying to isolate a trouble, you should read this section completely.

At all times, you must:

- Follow the instructions carefully.
- Conduct tests in the specified order.

To use this manual, you do not need special skills in troubleshooting or electronics. But you will need to do the following.

### **FIRST: Perform the Tests in the “BASIC TROUBLE TESTS” Section**

When trouble is detected, you should first perform the tests described in the “BASIC TROUBLE TESTS” section of this manual. These tests give you the simple tests that may be performed on your communications system. If the cause of the

## **How to Use This Manual**

trouble is not found when you have completed these tests, go to “HOW TO SELECT THE CORRECT PROCEDURE” section in this manual to continue your attempt to find the cause of the trouble.

### **SECOND: Determine Whether the Trouble Is Constant or Intermittent**

If the cause of the trouble was not found by performing the basic trouble tests, you should find out whether it is always present or whether it is intermittent. For example, if there is noise on an outside call, place the outside call again to see if the noise is still present.

If the trouble comes and goes, you have an intermittent problem. Locating the cause of intermittent trouble is hard because it may not last long enough for you to complete the trouble isolation procedures. If the trouble keeps coming and going, call your equipment supplier for help.

### **THIRD: Describe the Trouble**

If the problem is not intermittent but persists, describe it on paper. Include the following information:

- The intercom number(s) of the voice terminal(s) on which the trouble appears (the intercom numbers range from 10 to 29).
- The telephone number(s) of the line button(s) on which the trouble appears, or the label of the feature button which seems to be causing the trouble. For example, if the trouble appears while you are trying to make an intercom or outside call, write “intercom” or the number of the outside line button from which you are calling.
- The kind of trouble. For example, write down “noise on the line,” “light does not come on by the INTERCOM button,” “cannot interrupt dial tone,” or “HOLD button does not work.”

### **FOURTH: Select the Correct Trouble Isolation Procedure**

After describing the trouble on paper, follow the steps in the section labeled “HOW TO SELECT THE CORRECT PROCEDURE.” This explains which procedure to follow for finding faulty components such as voice terminals, cartridges, modular cords, or adapters.

### **FIFTH: Perform the Trouble Isolation Procedure Selected**

When you have determined which trouble isolation procedure to use (either Trouble on One Voice Terminal, Trouble on More than One Voice Terminal, or Trouble on an Accessory), perform that procedure to locate the faulty component. If you are unable to locate the faulty component, call your equipment supplier for help.

### **SIXTH: Replace Faulty Components**

When you locate the faulty component, you can replace it with one that works properly. If you have a maintenance contract, it will specify whether you should:

1. Order a replacement component.
- or
2. Return the component to an Exchange Center for replacement.

If you do not have an on-site maintenance contract, the Maintenance Exchange Procedures section at the end of this manual will explain how to obtain replacement components.

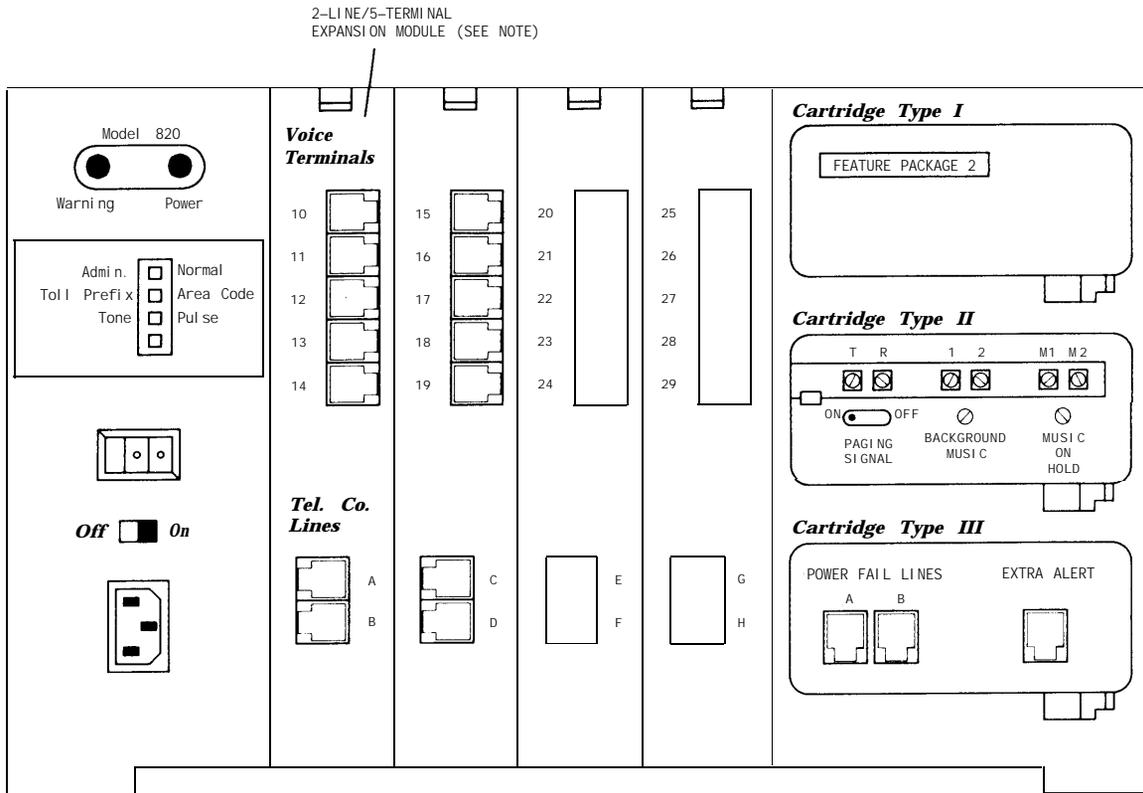
### **AN OVERVIEW OF YOUR SYSTEM**

Your system may include all of the following components. Each component is replaceable.

- **Voice terminals**, including the handset, the handset cord, and the voice terminal body.
- **Wiring** between the voice terminal and the control unit, and between the control unit and the network interface. The wiring includes all modular cords, cables, adapters, modular to modular connectors, and 103A Modular Jacks.
- **Accessories**, including power failure transfer telephones, headset adapters, hands-free units, equipment for music-on-hold, paging, extra alerts, voice terminal power supply, and auxiliary power unit.
- **Control unit**, including feature cartridge(s) and expansion modules (see Figure 1).
- **Network interface**, the point at which local telephone company equipment is connected to your small business communications system. Clearing trouble at the network interface or outside your system is the responsibility of the local telephone company.

These components are usually connected in one of the five wiring plans in Figure 2.

# How to Use This Manual

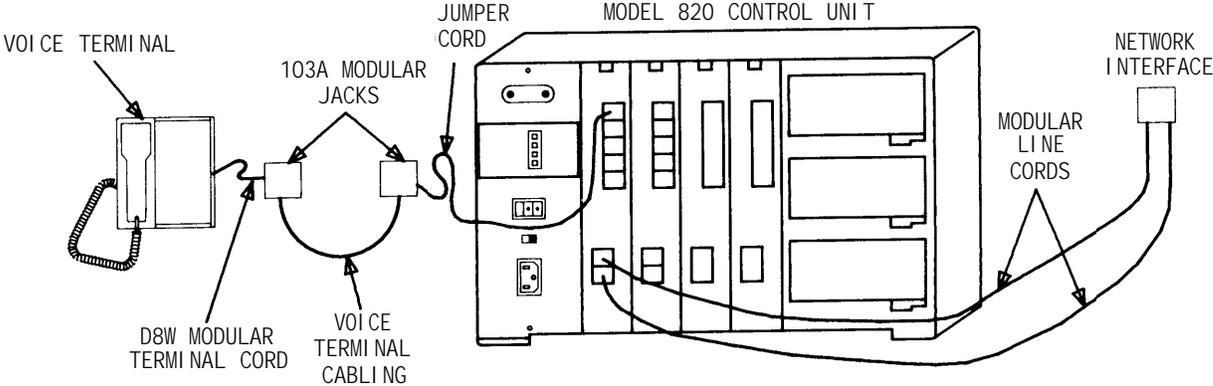


**NOTE:**

Each 2-Line/5-Terminal expansion module gives you the capability to connect and use two outside lines and five voice terminals. One expansion module is shipped with each control unit; therefore, to have more than two outside lines and five voice terminals connected to your system, you must order additional expansion modules. The control unit can handle up to four expansion modules.

**Figure 1—Knowing Your Control Unit**

WIRING PLAN A – USING MODULAR TERMINAL CORDS, VOICE TERMINAL CABLING, MODULAR JACKS, AND 2.5-FOOT JUMPER CORDS



WIRING PLAN B – USING MODULAR TERMINAL CORDS, CABLE EXTENSION KITS (THIS KIT CONTAINS A 100- OR 200-FOOT SINGLE-ENDED CABLE AND A MODULAR JACK), A JACK PANEL, AND 2.5 FOOT JUMPER CORDS

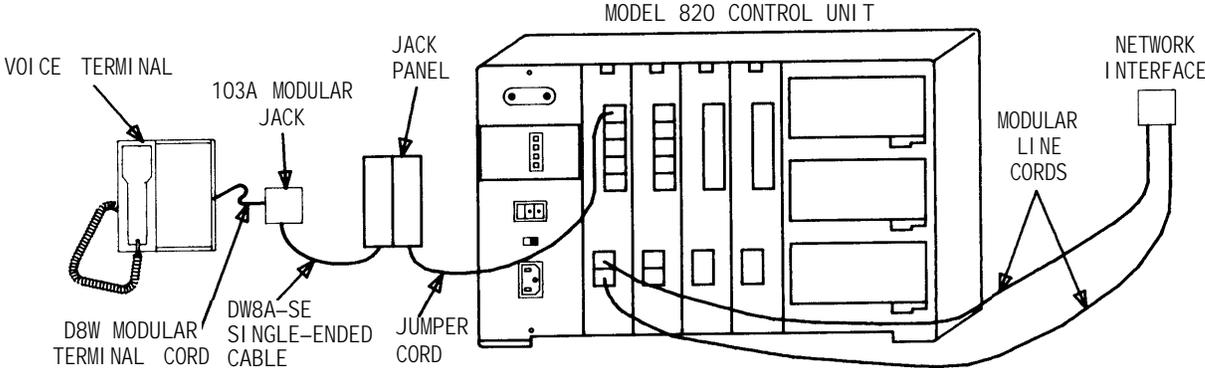
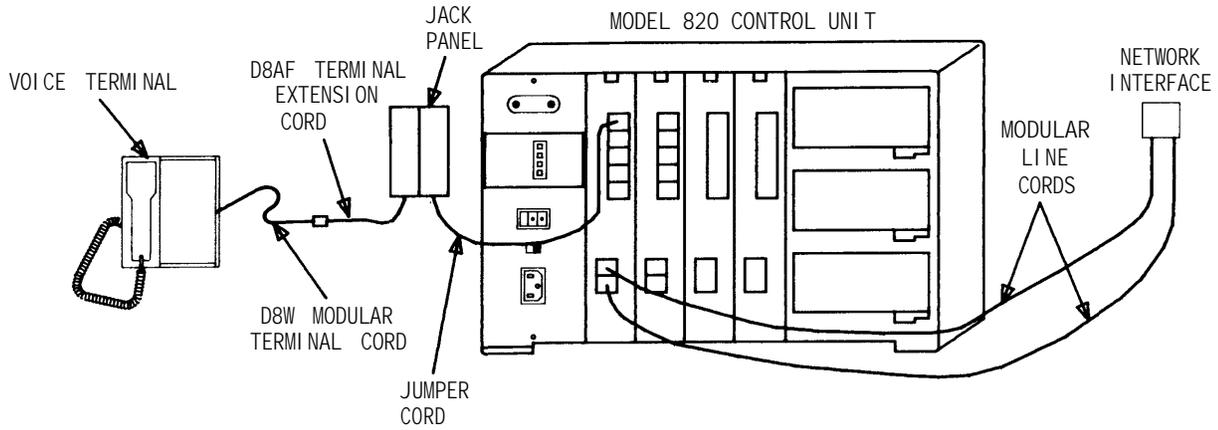


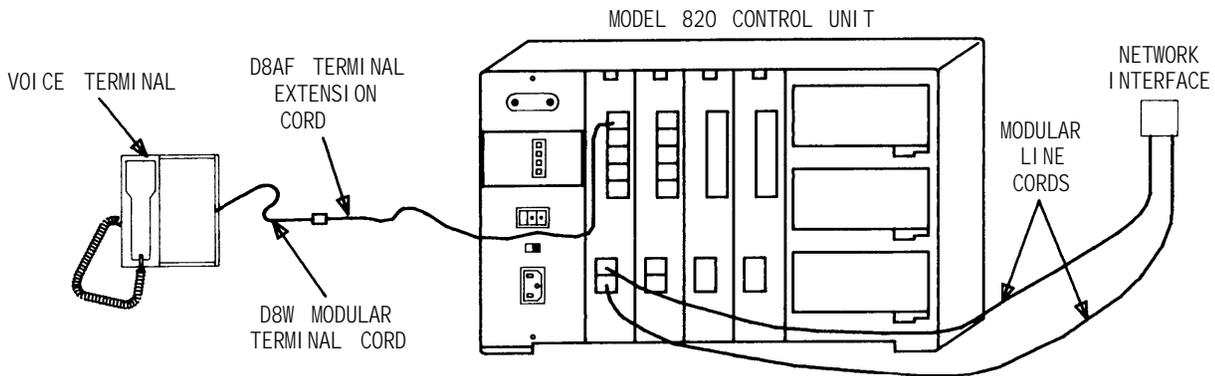
Figure 2—Typical Wiring Plans

# How to Use This Manual

WIRING PLAN C – USING MODULAR TERMINAL CORDS, TERMINAL EXTENSION CORD(S), A JACK PANEL, AND 2.5-FOOT JUMPER CORDS



WIRING PLAN D – USING MODULAR TERMINAL CORDS AND TERMINAL EXTENSION CORD(S)



**Figure 2—Typical Wiring Plans (contd)**

WIRING PLAN E – USING MODULAR TERMINAL CORDS ONLY

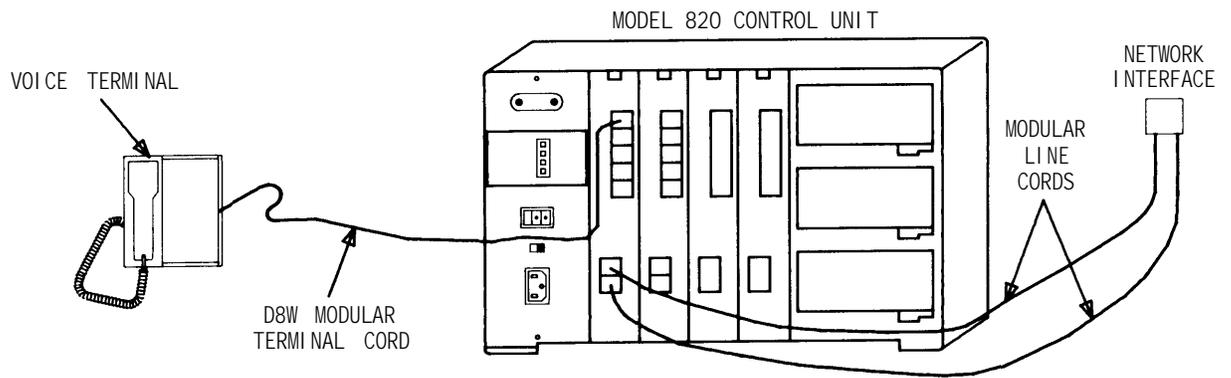


Figure 2—Typical Wiring Plans (contd)

## **BASIC TROUBLE TESTS**

If your communications system malfunctions, these tests may help you rapidly locate the cause of the trouble.

These tests are divided into three main sections:

1. **Tests to Determine if the Trouble Is in Your System:** This section helps you determine if the trouble is caused by local telephone company equipment or by your communications system.
2. **Symptom-Based Tests:** This section helps you to identify the causes of specific common problems your system may encounter.
3. **General Tests:** This section helps you to do further tests if the tests in the first two sections did not identify the cause of your system's problems.

If the appropriate tests do not help you find the trouble in your system, either go on to "HOW TO SELECT THE CORRECT PROCEDURE" in this manual or call your equipment supplier for help.

### **TESTS TO DETERMINE IF THE TROUBLE IS IN YOUR SYSTEM**

Your local telephone company is responsible for providing service from the telephone company to the network interface. You are responsible for the operation of your communications system and its connection to the network interface.

This shared responsibility means that problems must be isolated before they can be solved. If problems are in your communications system, you must see that repairs are made. If service problems are caused by trouble on the telephone network, your local telephone company must make repairs.

## Basic Trouble Tests

- Step 1. Determine the extent of the problem by placing a series of outside calls. These outside calls should be placed from more than one voice terminal. Be sure all of the outside calls are not placed from the same columns of **Voice Terminals** jacks (jacks 10 through 14 is one column). See Figure 1. Remember each voice terminal will have an intercom number that is the same as the number of the voice terminal jack that it is connected.

<b>IF</b>	<b>THEN</b>
The trouble does NOT appear on calls outside of your business,	The trouble is caused by some component of your system. Go to the "Symptom-Based Tests."
The trouble does appear on outside calls (on only one voice terminal),	The trouble is caused by some component of your system. Go to the "Symptom-Based Tests."
The trouble does appear on outside calls (on more than one voice terminal),	Either the local telephone company equipment or your system could be the cause. Go on to Step 2.

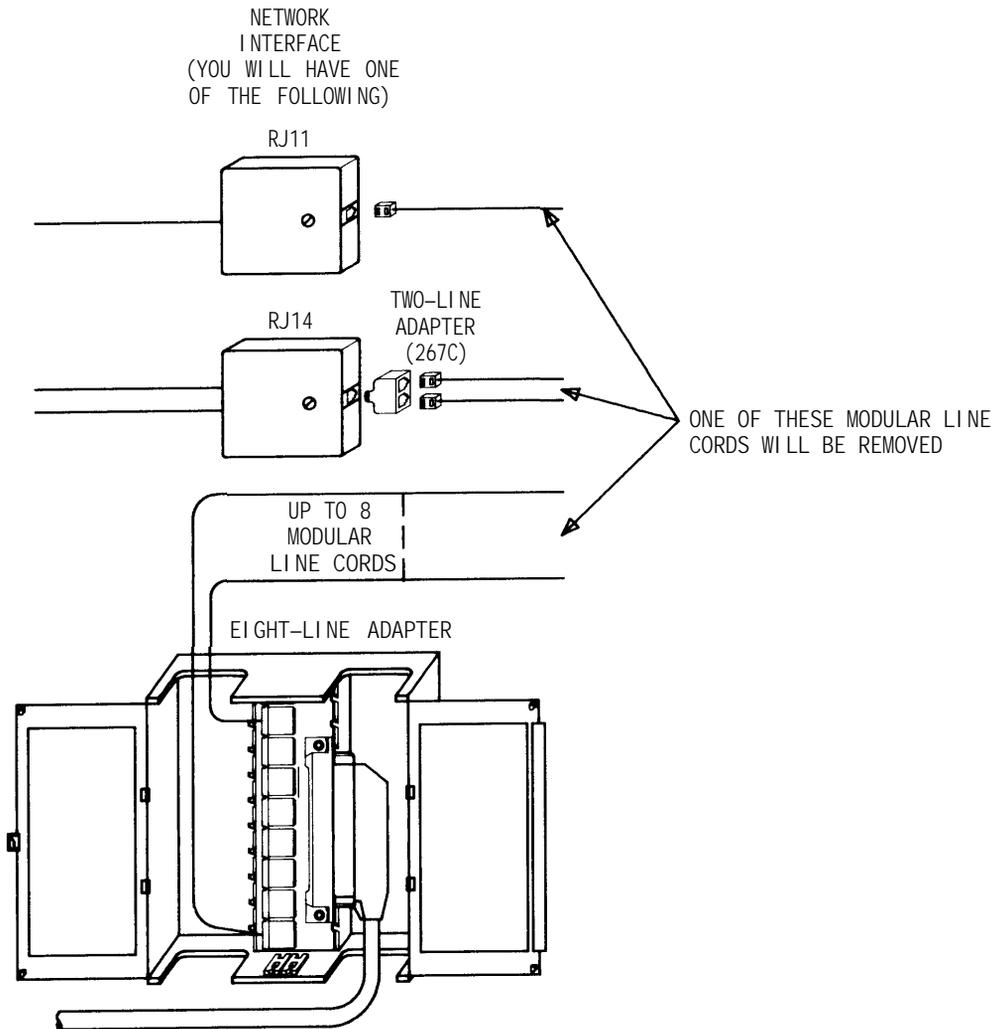
- Step 2. Determine if you have a standard telephone with a modular cord/plug.

**Note:** You may be using a standard telephone with a modular cord/plug as a power failure transfer telephone. The power failure transfer telephone is the telephone connected to the Type III Cartridge in the control unit. The power failure transfer telephone can be used for this test, but a Model 820 voice terminal cannot.

<b>IF</b>	<b>THEN</b>
You have a standard telephone with a modular cord/plug (it must also be compatible with the tone or rotary dialing service provided by the local telephone company),	Go on to Step 3.
You do not have a standard telephone with a modular cord/plug and cannot make an outside call,	Go to the "Symptom-Based Tests" section.
You do not have a standard telephone with a modular cord/plug but you can make an outside call; however, there is a problem after you are connected with the person you called (for example, conversation is not clear),	Go to the "General Tests" section.

Step 3. Remove the Modular Line Cord (D4CH) from the network interface. Figure 3 shows examples of what you will see at the network interface.

**Note:** If at the network interface you are using a 267A2 Line Bridging Adapter, remove it along with the modular line cord.



**Figure 3—Types of Network Interface**

## Basic Trouble Tests

- Step 4. Plug the cord of the standard telephone into the network interface (outside line) on which the trouble appeared and make an outward call using the standard telephone. (Labels at the network interface or your system directory will help you find the line with trouble.)

IF	THEN
The trouble appears on the standard telephone and an adapter (either a two-line or eight-line adapter) is used at the network interface,	The trouble is caused by either the adapter or local telephone company equipment.  Go on to Step 5.
The trouble appears on the standard telephone and an adapter (either a two-line or eight-line adapter) is not used at the network interface,	<b>Trouble found.</b> The trouble is caused by local telephone company equipment. Call the local telephone company.
The trouble does not appear on the standard telephone,	The trouble is caused by your communications system. Go on to the "Symptom-Based Tests."

- Step 5. Remove the standard telephone cord from the adapter.

- Step 6. Replace the suspected adapter with one known to be in good working order, if available. Plug the cord of the standard telephone into the new adapter and make an outward call.

IF	THEN
The trouble appears on the standard telephone,	<b>Trouble found.</b> The trouble is caused by local telephone company equipment. Call the local telephone company.
The trouble does NOT appear on the standard telephone,	<b>Trouble found.</b> The original <i>adapter</i> is the cause.  Read the section on Maintenance Exchange Procedures at the end of this manual.

### SYMPTOM-BASED TESTS

The symptom-based tests are designed to help you decide which system component is causing the trouble. Find your symptom in the following list and perform the corresponding test. If your symptom is not in the list, go to the “General Tests” section.

#### List of Symptom-Based Tests

- A. Voice Terminal Does Not Ring
- B. Cannot Make an Outside Call
- C. Trouble with Indicator Lights, Speaker, or Ringing
- D. Some Custom Features Do Not Work
- E. All Voice Terminals Have No Lights and No Dial Tone (Entire System Down)
- F. Voice Terminal Rings Constantly.

#### A. Voice Terminal Does Not Ring

- Step 1. Check the volume control setting on the voice terminal. This control is located on the left-hand edge of your voice terminal. Pushing the control away from you should increase ringing volume. If you have Basic Service only, skip to Step 4.
- Step 2. See if your voice terminal has a programmed Do-Not-Disturb button. If it does, make sure Do-Not-Disturb is not active. If the green light is on beside the Do-Not-Disturb button, press the button to deactivate the feature.
- Step 3. Reprogram your line ringing assignments at the voice terminal. Your voice terminal may have been programmed not to ring. (Refer to the User’s Guide.)
- Step 4. If trouble persists, go on to the tests in “C. Trouble with Indicator Lights, Speaker, or Ringing.”

## Basic Trouble Tests

### B. Cannot Make an Outside Call

- Step 1. If you have Basic Service only, go on to Step 2. If you have an optional Type I Feature Cartridge, be sure the voice terminal is not restricted from originating outward calls. To make sure the voice terminal is not restricted, refer to the Administration Manual to remove outward call restrictions from the voice terminal. After you have removed the restriction, pick up the handset and dial an outside number.

<b>IF</b>	<b>THEN</b>
The call is completed satisfactorily,	<b><i>Trouble found</i></b> and cleared. Test is complete.
The trouble remains,	The voice terminal programming is not the source of the trouble.  Go on to Step 2.

- Step 2. Check the **Tone/Pulse** switch on the control unit to make sure that it is set correctly.
- If your local telephone company is equipped for touch-tone dialing, set the **Tone/Pulse** switch to **Tone**.
  - If your local telephone company is equipped for rotary dialing only, set the **Tone/Pulse** switch to **Pulse**.

If you do not know what type of signaling your system should send, find out from your local telephone company and set the switch accordingly. Then dial an outside line.

<b>IF</b>	<b>THEN</b>
The call is completed satisfactorily,	<b><i>Trouble found</i></b> and cleared. The test is complete.
The trouble remains,	Go to the “GENERAL TESTS” section.

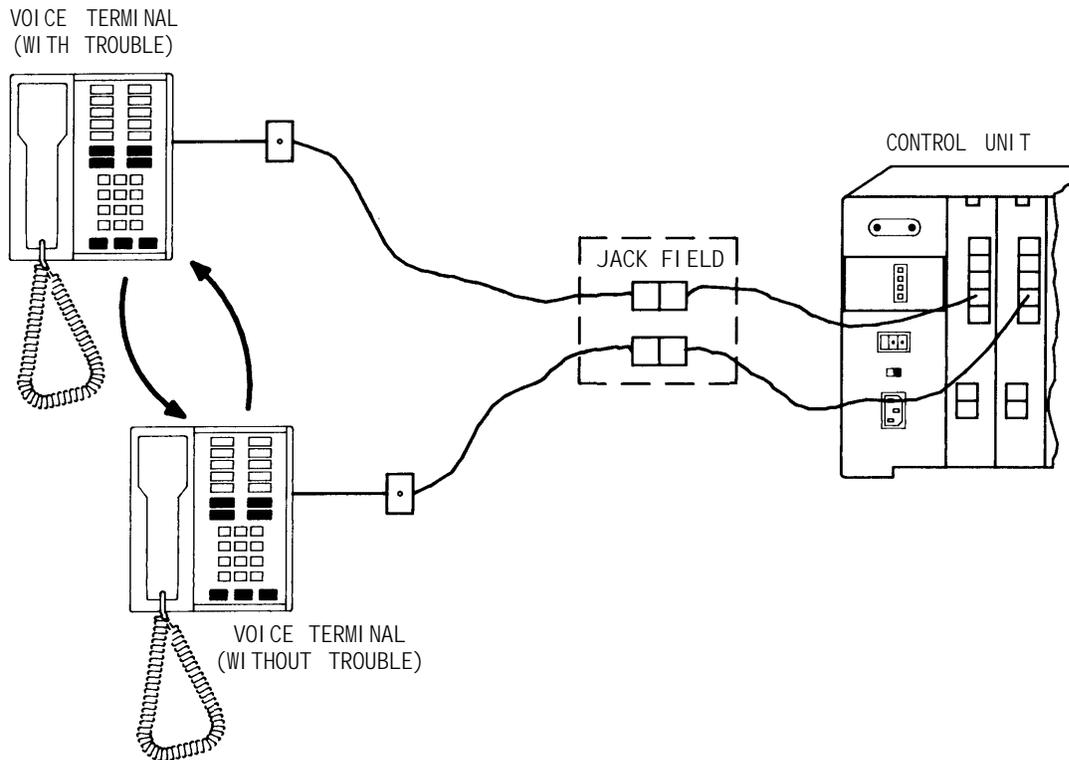
**C. Trouble with Indicator Lights, Speaker, or Ringing**

Step 1. Hold the **T/P** switch on the left side of the voice terminal in the **T** (test) position.

<b>IF</b>	<b>THEN</b>
All red and green lights flash alternately and a tone sounds continuously,	The voice terminal operation appears to be normal. Since the test is inconclusive, go on to the "General Tests."
The red and green lights appear dim,	Go on to the "General Tests" section to see if you need an auxiliary power unit.
There is any other pattern of lights and tone; for example, all red and green lights flash alternately but the tone does not sound at all or the tone does not sound continuously. Another example is that some red and green lights flash alternately or the tone sounds continuously,	The trouble is caused by either the voice terminal, control unit, expansion module, or cord/cable connections between them.  Go on to Step 2.

Step 2. Unplug the voice terminal on which the trouble appears from its modular terminal cord and switch it with a working voice terminal (see Figure 4). The intercom number of the working voice terminal should be five greater or five less than that of the voice terminal with trouble. (This is done to make sure your voice terminals are connected to different expansion modules.) Also, add to your notes the intercom numbers of the voice terminals switched (for example, "voice terminal with trouble-Intercom 10," "voice terminal known to be working-Intercom 15").

## Basic Trouble Tests

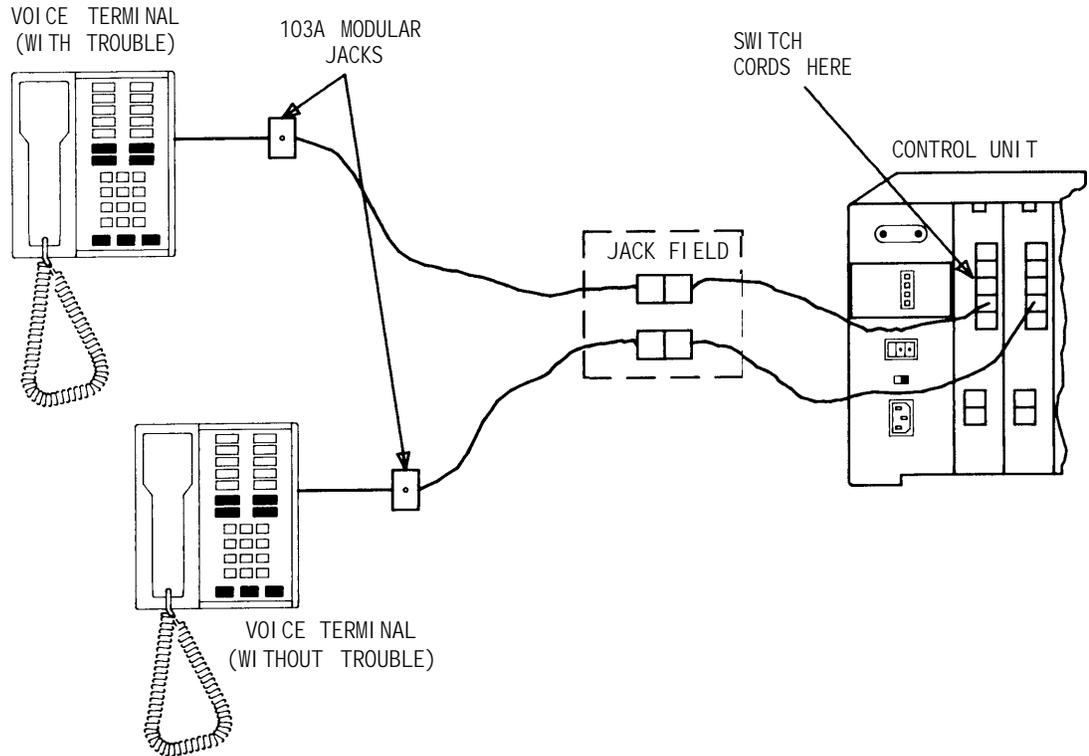


**Figure 4—Switching Voice Terminals**

Step 3. Using the voice terminal known to be working, hold the **T/P** switch in the **T** (Test) position.

<b>IF</b>	<b>THEN</b>
The same trouble appears,	The trouble is not caused by the voice terminal. It may be caused by the control unit, expansion module, cords, or cables. Return the voice terminals to their original position.  Go on to Step 4.
The trouble does not appear,	<b>Trouble found.</b> It is caused by the <i>first voice terminal</i> .  Read the section on Maintenance Exchange Procedures at the end of this manual.

- Step 4. Go to the control unit and locate the **Voice Terminals** jack numbers that are the same as the intercom numbers of the two voice terminals you have been using. Switch the cords that are connected to these two **Voice Terminals** jacks (see Figure 5).



**Figure 5—Switching Cords at the Control Unit**

## Basic Trouble Tests

- Step 5. Using the voice terminal with the intercom number of the voice terminal known to be working (see notes made in Step 2), perform the action that revealed the trouble.

<b>IF</b>	<b>THEN</b>
The trouble persists,	The trouble is caused by either the control unit or the expansion module inserted into the control unit. Replace the cords as they were.  Go to “Test D: 2-Line/5-Terminal Expansion Module Test” in the “TROUBLE ON ONE VOICE TERMINAL” section.
The trouble no longer appears,	<b>Trouble found.</b> It is caused by one of the cords/cables to the original voice terminal location. To find out which cord/cable is defective, replace them, one at a time, with other cords/cables.  Read the section on Maintenance Exchange Procedures at the end of this manual.

**D. Some Custom Features Do Not Work**

The most commonly used custom features are listed below:

- Outside Auto-Dial
- Intercom Auto-Dial
- Saved Number Redial
- Last Number Redial
- Do Not Disturb
- Privacy
- Automatic Answer
- Automatic Line Selection (idle line preference)
- Line Ringing Assignment
- Paging Feature
- Touch-Tone Enable
- Speed Calling.

If the feature that does not work is “Outside Auto-Dial,” “Last Number,” “Saved Number,” or “Speed Calling” make sure the voice terminal is programmed to permit outward calls. (See the preceding “B. Cannot Make an Outside Call.”) If some of the features listed above do not work, complete the following:

Step 1. Check the User’s Guide and make sure that the feature is being used correctly.

Step 2. Reprogram the feature and try it again.

<b>IF</b>	<b>THEN</b>
The feature now operates properly,	<b><i>Trouble cleared.</i></b> Test is complete.
The feature is being used correctly and reprogramming it does not work,	Go on to Step 3.

## Basic Trouble Tests

Step 3. Go to a second voice terminal and program the feature on it.

<b>IF</b>	<b>THEN</b>
The feature works on the second voice terminal,	The trouble is caused by either the first voice terminal or the control unit.  Go on to Step 4.
The feature does not work on the second voice terminal,	This test is inconclusive. Go on to the "General Tests."

Step 4. Switch the voice terminal on which the trouble appears with a working voice terminal.

Step 5. Program the feature on the voice terminal that was working previously and try it again.

<b>IF</b>	<b>THEN</b>
The same trouble remains,	<b><i>Trouble found.</i></b> It is caused by the <i>control unit or the Type I Feature Cartridge.</i>  Read the section on Maintenance Exchange Procedures at the end of this manual.
The trouble no longer appears,	<b><i>Trouble found.</i></b> It is caused by the <i>first voice terminal.</i>  Read the section on Maintenance Exchange Procedures at the end of this manual.

**E. All Voice Terminals Have No Lights and No Dial Tone (Entire System Down)**

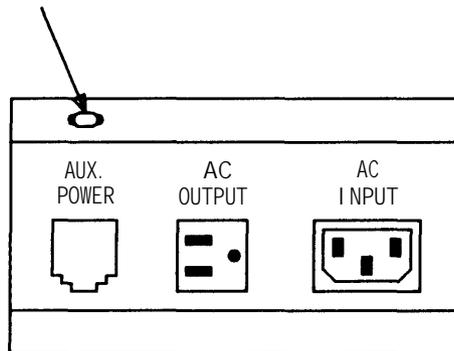
Step 1. Determine if your control unit is connected to an auxiliary power unit.

<b>IF</b>	<b>THEN</b>
You are NOT using an auxiliary power unit,	Skip to Step 13.
You are using an auxiliary power unit,	Go on to Step 2.

Step 2. Check the auxiliary power supply to see if its green light is on (see Figure 6).

<b>IF</b>	<b>THEN</b>
The light is on,	Skip to Step 12.
The light is NOT on,	Go on to Step 3.

THE GREEN POWER ON LIGHT IS LOCATED HERE



**Figure 6—Auxiliary Power Unit**

## Basic Trouble Tests

Step 3. Check to see if the auxiliary power unit is properly connected to the ac outlet. Then proceed according to the following:

<b>IF</b>	<b>THEN</b>
The light comes on,	Skip to Step 12.
The light does not come on,	Go on to Step 4.

Step 4. Make sure the ac outlet is supplying power. Do this by plugging a lamp or radio into the ac outlet.

<b>IF</b>	<b>THEN</b>
The ac outlet is supplying power,	Go on to Step 5.
The ac outlet is NOT supplying power,	<b>Trouble found.</b> It is caused by the ac outlet.

Step 5. Disconnect the auxiliary power unit from the ac outlet.

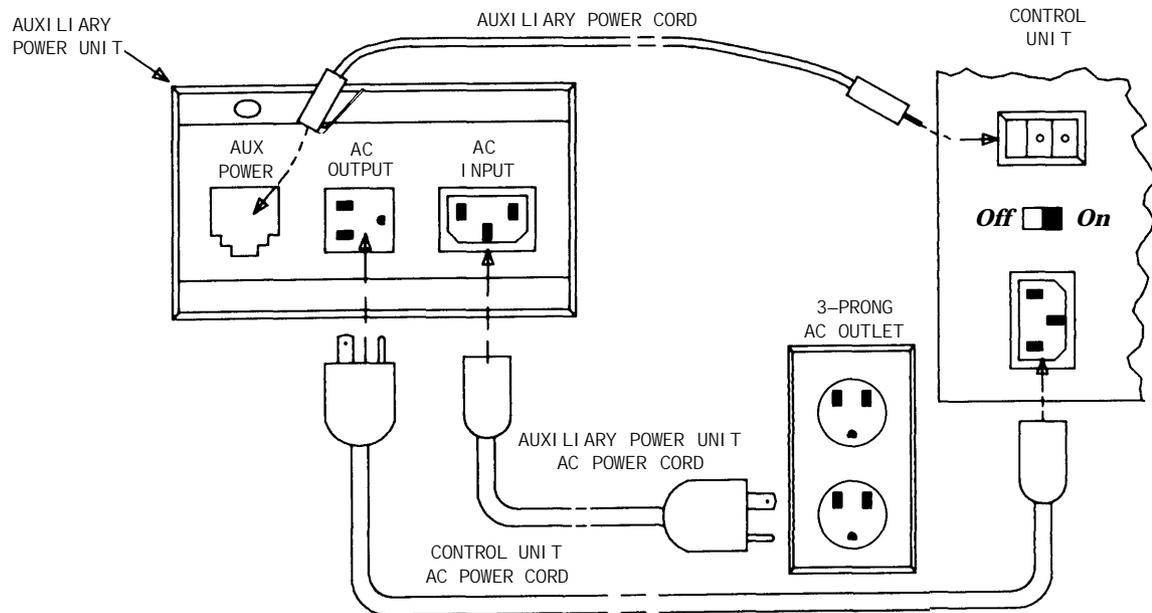
Step 6. Disconnect the auxiliary power unit from the control unit.

Step 7. Plug the control unit power cord into the ac outlet.

Step 8. Perform the action that first revealed the trouble.

<b>IF</b>	<b>THEN</b>
The trouble remains,	Go on to Step 9.
The trouble no longer appears,	<b>Trouble found.</b> It is caused by the <i>auxiliary power unit</i> . You may need to disconnect some of your voice terminals and/or accessories until the auxiliary power unit can be replaced.  Read the section on Maintenance Exchange Procedures at the end of this manual.

- Step 9. Unplug the control unit power cord from the ac outlet and plug it into the **AC Output** outlet on the auxiliary power unit.
- Step 10. Plug the auxiliary power unit connector back into the control unit (see Figure 7).
- Step 11. Connect the auxiliary power unit ac power cord to the ac outlet (see Figure 7).
- Step 12. Make sure the control unit power cord is properly connected to the auxiliary power unit (see Figure 7).



**Figure 7—Auxiliary Power Unit Connections**

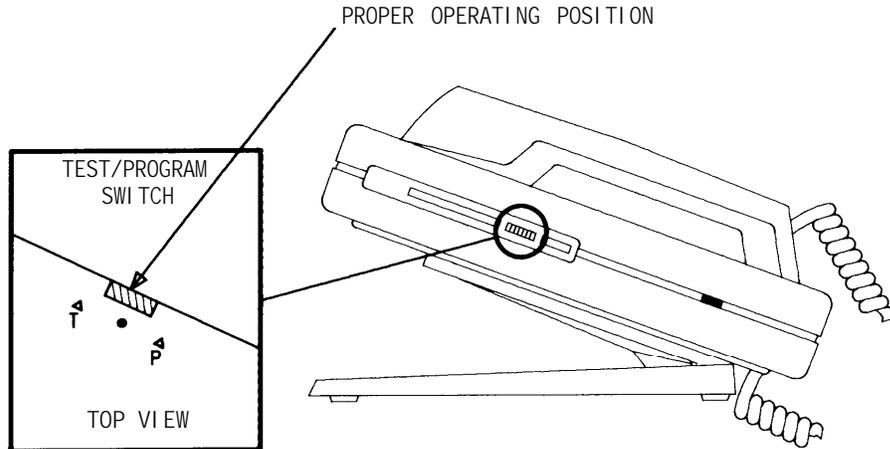
## Basic Trouble Tests

- Step 13. Unplug the control unit from the ac power outlet and plug it in again. Also, if you are using a 3-prong extension cord to connect the control unit to the ac outlet, check the extension cord to make sure it is properly plugged into the control unit power cord.
- Step 14. At the control unit, momentarily set the control unit **On/Off** switch to **Off** and disconnect the control unit ac power cord. Then after waiting 1 minute, reconnect the ac power cord and set the control unit **On/Off** switch to **On**.
- Step 15. Check the red **WARNING** light and the green **POWER** light in the upper left corner of the control unit.

<b>IF</b>	<b>THEN</b>
The green <b>POWER</b> light is on and the red <b>WARNING</b> light is off,	The control unit indications are now normal. If the voice terminal trouble remains, go on to “ <b>HOW TO SELECT THE CORRECT PROCEDURE.</b> ”
Both lights are off,	Make certain that the ac outlet is supplying power (not under control of a wall switch). Do this by plugging a lamp or radio into the ac outlet. If the ac outlet is supplying power, call your equipment supplier for help.
The red <b>WARNING</b> light is on,	Go on to the “ <b>General Tests.</b> ”

### F. Voice Terminal Rings Constantly

If your voice terminal rings constantly, check the position of the **T/P** switch located on the left side of the voice terminal. The **T/P** switch should be in the center position for proper operation of the voice terminal (see Figure 8).



**Figure 8—Setting the Test/Program Switch**

## Basic Trouble Tests

### GENERAL TESTS

When the symptom does not appear in the Symptom-Based Tests listed above and when the cause of trouble has not yet been found, make the following general test of your system.

Step 1. Look at the red WARNING light in the upper left corner of the control unit.

**Warning:** *Remove control unit ac power (using the control unit On/Off switch) before inserting or removing a cartridge. If you are using an auxiliary power unit, unplug it from the ac outlet.*

IF	THEN
A cartridge is installed and the red WARNING light is flashing or on,	Turn the control unit off (using the control unit <b>On/Off</b> switch and unplugging the auxiliary power unit, if used, from the ac outlet). Remove and replace each cartridge securely. Turn the control unit back on. (The control unit is reset on application of power; resetting may correct the trouble.) If the trouble remains, go on to Step 2.
A cartridge is not installed and the red WARNING light is on,	Momentarily turn the control unit off and back on (using the control unit <b>On/Off</b> switch and unplugging the auxiliary power unit, if used, from the ac outlet). (The control unit is reset on application of power; resetting may correct the trouble.) If the trouble remains, go on to Step 2.

**Note:** Steps 2 through 8 should be followed for each voice terminal power supply you have connected to your system.

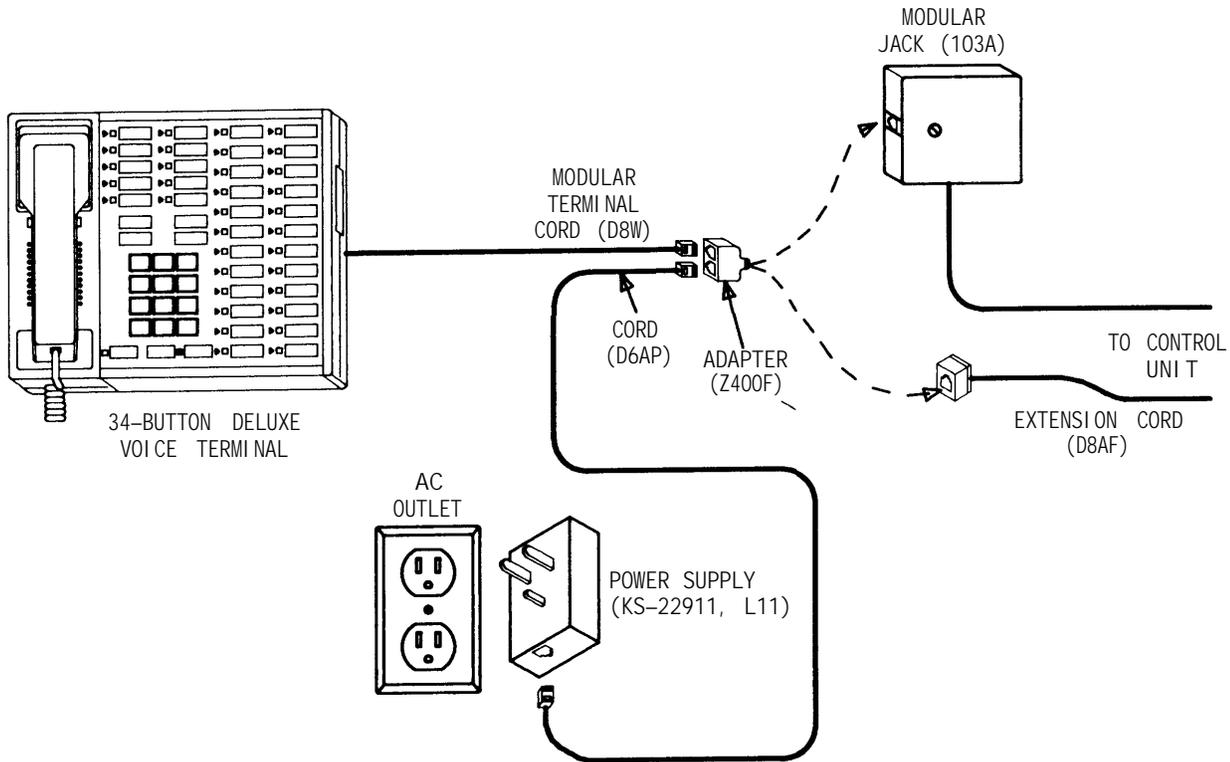
Step 2. Determine if you have an auxiliary power unit or a voice terminal power supply.

<b>IF</b>	<b>THEN</b>
You have an auxiliary power unit,	Go on to "HOW TO SELECT THE CORRECT PROCEDURE."
You do NOT have an auxiliary power unit,	See note below.
You have a voice terminal power supply,	Go on to Step 3.
You do NOT have a voice terminal power supply,	Go on to "HOW TO SELECT THE CORRECT PROCEDURE."

**Note:** An auxiliary power unit may be required in cases where the control unit must handle extreme work loads. An extreme load may exist when you have a combination of the following: the maximum number of voice terminals for your system, several voice terminal accessories, long wiring runs between the control unit and the voice terminals, and most of the voice terminals are being used at the same time. If the light indicators on some of the voice terminals become dim or go out altogether during periods of heavy use, it could mean that an auxiliary power unit is required for normal operation. To determine if you need an auxiliary power unit, disconnect your voice terminals and accessories in your system until the number of terminals, hands-free units and headset adapters is no more than twenty. Then perform the action that caused the trouble. If the trouble is no longer present, you need an auxiliary power supply.

## Basic Trouble Tests

- Step 3. Make sure the voice terminal power supply is properly connected to the 103A Modular Jack (it can also be connected to a terminal extension cord) and that power is being supplied from the ac outlet for the voice terminal power supply. Use a lamp, radio, or similar device to check the ac outlet (see Figure 9).



**Figure 9—Voice Terminal Power Supply Connections**

- Step 4. Disconnect the power supply from the ac outlet.  
Step 5. Disconnect the Z400F Adapter from the 103A Modular Jack.

Step 6. Perform the action that first revealed the trouble.

<b>IF</b>	<b>THEN</b>
The trouble remains,	The voice terminal power supply was not the source of the trouble. Go on to Step 7.
The trouble no longer appears,	<b><i>Trouble found.</i></b> It is caused by the <i>voice terminal power supply</i> . Do not reconnect the adapter.  Read the section on Maintenance Exchange Procedures at the end of this manual.

Step 7. Connect the Z400F Adapter back into the 103A Modular Jack.

Step 8. Connect the power supply back into the ac outlet.

### **IF TROUBLE REMAINS**

If you have not located the cause of the trouble, go on to “HOW TO SELECT THE CORRECT PROCEDURE.”

## **HOW TO SELECT THE CORRECT PROCEDURE**

This section explains how to determine which of the three trouble isolation procedures to use. Before using this section you should:

1. Read “HOW TO USE THIS MANUAL” in this manual.
2. Do the “BASIC TROUBLE TESTS” in this manual.

If you have done the “BASIC TROUBLE TESTS” and read “HOW TO USE THIS MANUAL,” you are ready to start testing your system.

### **TEST SEQUENCE**

- Step 1. Make certain that the trouble is not intermittent by determining that the same trouble appears at least twice.
- Step 2. Write a description of the trouble on paper, including exactly what it is and where it appears.
- Step 3. Decide whether the trouble appears only when using an accessory (headset, hands-free unit, music on hold, paging system, power failure transfer telephone, extra alert, voice terminal power supply, or auxiliary power unit).

<b>IF</b>	<b>THEN</b>
The trouble appears only when using an accessory.	Go to “TROUBLE ON AN ACCESSORY.”
The trouble does not appear when using an accessory,	Go on to Step 4.

- Step 4. See if exactly the same trouble appears on a second voice terminal. If the trouble appears when using an outside line button, make sure you use the *same* outside line button on the other voice terminal.

## How to Select the Correct Procedure

For example, if one voice terminal does not have dial tone, check the *same* outside line button on the other voice terminal to see if there is dial tone.

<b>IF</b>	<b>THEN</b>
The same trouble appears on the second voice terminal,	Go on to Step 5.
The same trouble does not appear on the second voice terminal,	Go to "TROUBLE ON ONE VOICE TERMINAL."

Step 5. Determine if both voice terminals are *dead* (no lights, no dial tone, and no response when a button on the dial pad is pressed).

<b>IF</b>	<b>THEN</b>
Both voice terminals are <i>dead</i> ,	Go on to Step 6.
Both voice terminals are not <i>dead</i> ,	Go to "TROUBLE ON MORE THAN ONE VOICE TERMINAL."

Step 6. See if the remaining voice terminals in the system are dead.

<b>IF</b>	<b>THEN</b>
All of the voice terminals are <i>dead</i> ,	Go on to Step 7.
At least one voice terminal is not <i>dead</i> ,	Go to "TROUBLE ON MORE THAN ONE VOICE TERMINAL."

Step 7. The "BASIC TROUBLE TESTS" in this manual entitled "E. All Voice Terminals Have No Lights and No Dial Tone" should be used for this trouble condition. If you have already used the procedure, call your equipment supplier for help.

## TROUBLE ON ONE VOICE TERMINAL

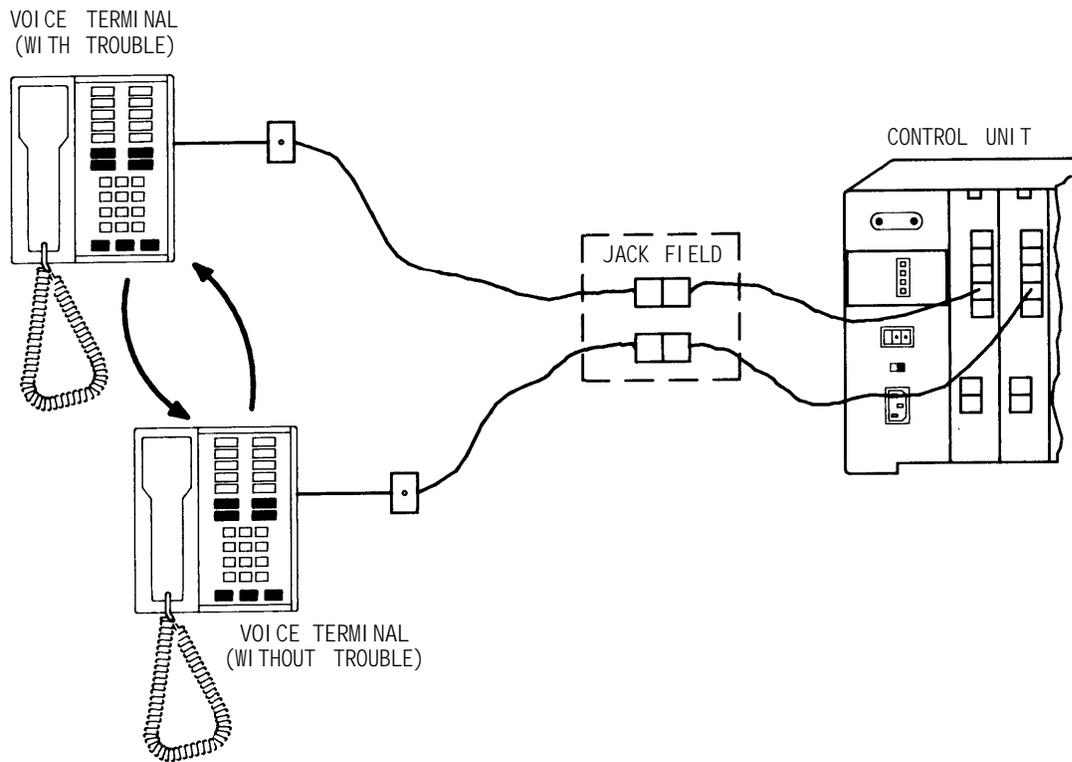
Use this procedure only if the same trouble does not appear on the second voice terminal that you have checked.

This procedure will help you find the cause of trouble that occurs on only one voice terminal. The trouble could be caused by the voice terminal, its handset, its handset cord, a voice terminal accessory, the expansion module, the control unit, or the wiring between the control unit and voice terminal. Ways for testing each component that might be causing the trouble are presented in this procedure.

### TEST A: VOICE TERMINAL TEST

- Step 1. Make certain you have the note describing the trouble and its location. This note is especially important for remembering the outcome of tests during troubleshooting.
- Step 2. Disconnect any accessory from the **OTHER** jack of your 10- or 34-button voice terminal. If the trouble is cleared, go to "TROUBLE ON AN ACCESSORY." If the trouble persists, leave the accessory unplugged and continue.
- Step 3. Switch the voice terminal on which the trouble appears with the second voice terminal that you checked (see Figure 10). The intercom number of the working voice terminal should be five greater or five less than that of the voice terminal with trouble. (This is done to make sure your voice terminals are connected to different expansion modules.)

# Trouble on One Voice Terminal



**Figure 10—Voice Terminal Switch**

Step 4. On both voice terminals, perform the action that revealed the trouble.

IF	THEN
The trouble appears on the voice terminal on which it first appeared,	The trouble is caused by some part of the voice terminal.  Replace the voice terminals as they were before. Go on to Step 5.
The trouble appears on the voice terminal that at first did not have the trouble,	Replace the voice terminals as they were before. The voice terminal is OK.  Go to "Test B: Control Unit Test."

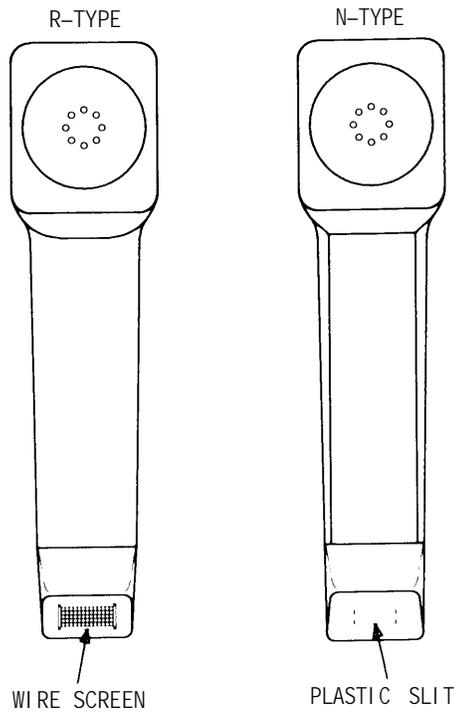
- Step 5. Decide whether the trouble is the quality of sound in the handset. (For example, is there difficulty in hearing, being heard, or is there noise on the line?)

<b>IF</b>	<b>THEN</b>
The trouble is in the quality of sound,	Go to Step 6 to find out what part of the voice terminal is causing trouble.
The trouble is not in the quality of sound,	<b>Trouble found.</b> It is caused by the <i>voice terminal</i> body (excluding the handset and cord).  Read the section on Maintenance Exchange Procedures at the end of this manual.

- Step 6. In this step you will have to switch voice terminal handsets.

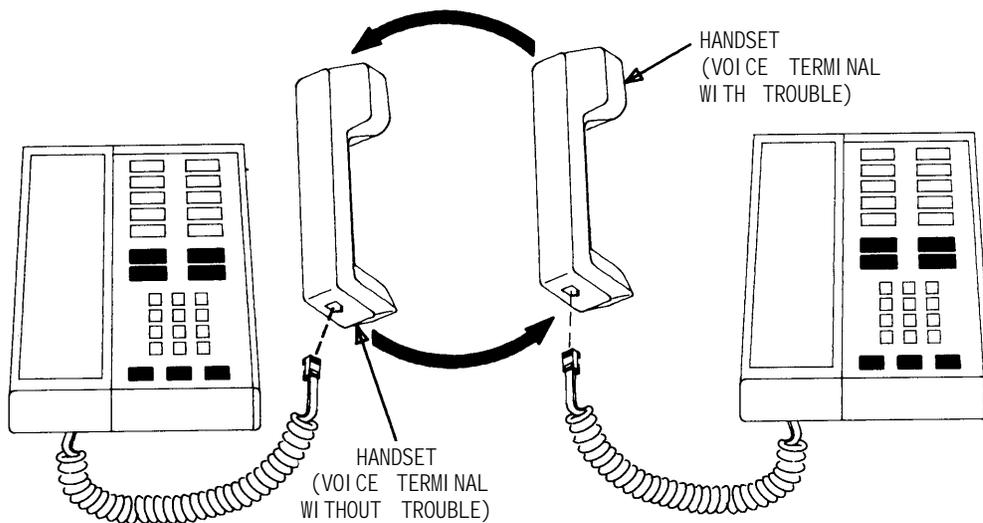
**Note:** Different voice terminals in your system may have different types of handsets. There are two types of handsets available, an N-type and an R-type. You must be sure to switch an R-type handset with another R-type handset, or an N-type handset with another N-type handset. Figure 11 shows how to identify your handset types.

## Trouble on One Voice Terminal



**Figure 11—Types of Handsets**

Switch the handset of the voice terminal with the trouble and the handset of the other voice terminal. Do not exchange handset cords (see Figure 12).



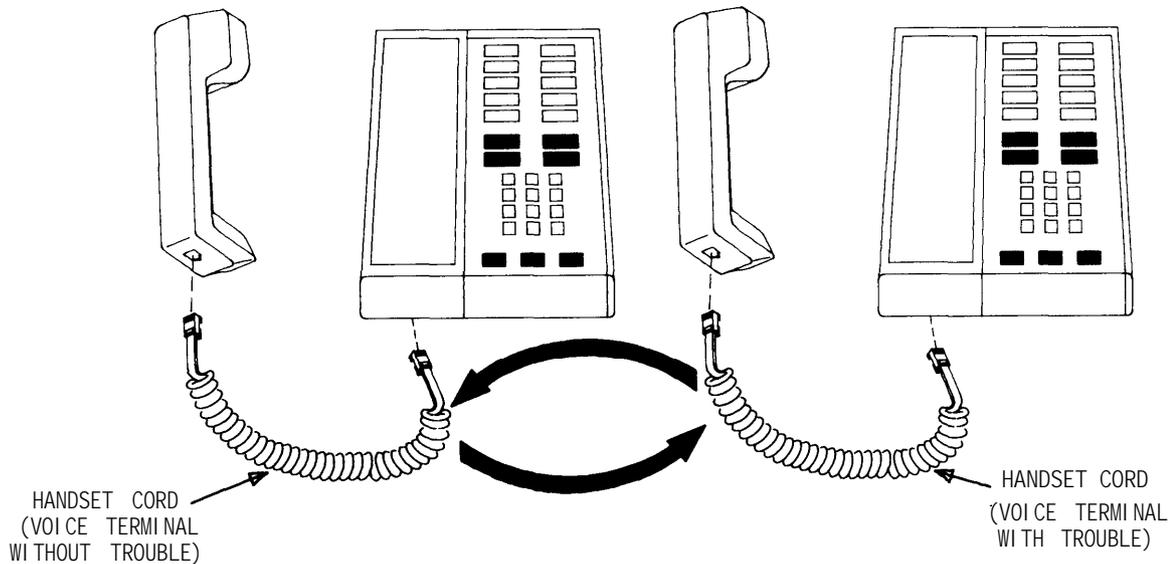
**Figure 12—Switching Handsets**

## Trouble on One Voice Terminal

Step 7. On both voice terminals, perform the action that revealed the trouble.

IF	THEN
The trouble appears on the voice terminal on which it first appeared,	The handset is not causing the trouble. Replace the handsets as they were and go to Step 8.
The trouble appears on the voice terminal that at first did not have the trouble,	<b>Trouble found.</b> It is caused by the <i>handset</i> on which the trouble now appears.  Read the section on Maintenance Exchange Procedures at the end of this manual.

Step 8. Switch the handset cord of the voice terminal on which the trouble appears and the handset cord of the voice terminal with no trouble (see Figure 13).



**Figure 13—Switching Handset Cords**

## Trouble on One Voice Terminal

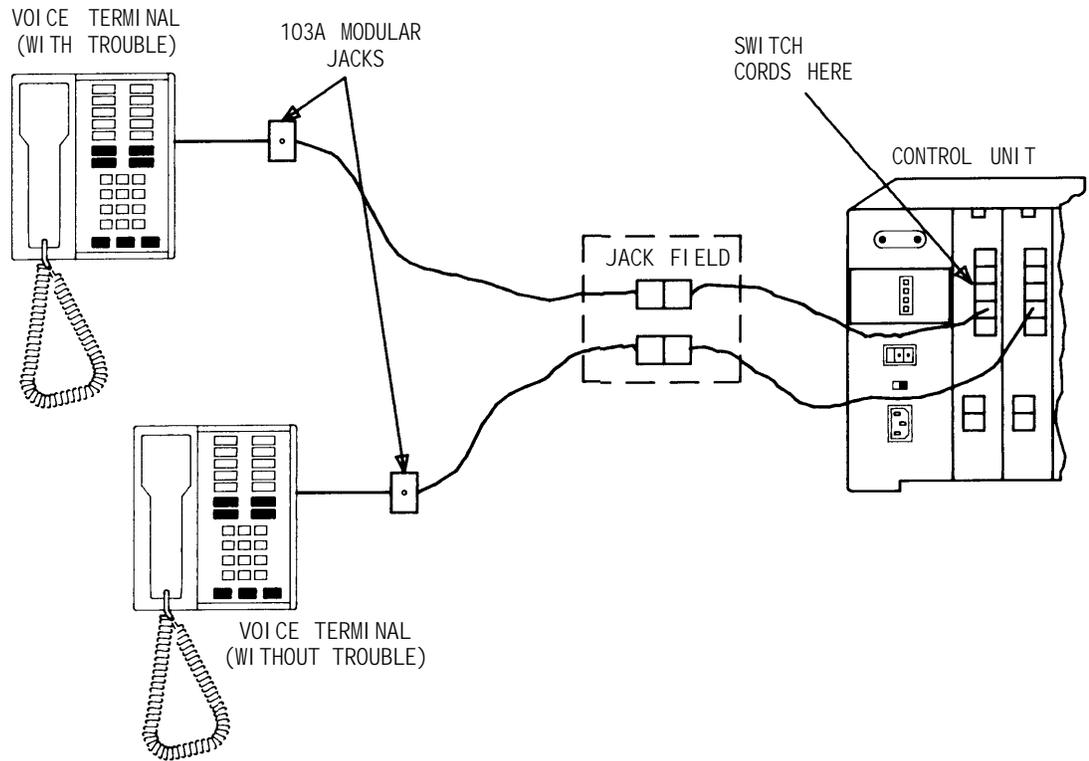
Step 9. On both voice terminals, perform the action that revealed the trouble.

<b>IF</b>	<b>THEN</b>
The trouble appears on the voice terminal on which it first appeared,	<b><i>Trouble found.</i></b> It is caused by the <i>voice terminal</i> body.  Read the section on Maintenance Exchange Procedures at the end of this manual.
The trouble appears on the voice terminal that at first did not have the trouble,	<b><i>Trouble found.</i></b> It is caused by the <i>handset cord</i> .  Read the section on Maintenance Exchange Procedures at the end of this manual.

**TEST B: CONTROL UNIT TEST**

Do this test only if the previous test indicated the trouble was not caused by the voice terminal.

- Step 1. Go to the control unit and locate the **Voice Terminals** jacks for the voice terminal on which the trouble appears and for the voice terminal with no trouble. Switch these two cords at the control unit (see Figure 14). The number of the **Voice Terminals** jacks should match the intercom number of the voice terminals.



**Figure 14—Switching Cords at the Control Unit**

## Trouble on One Voice Terminal

Step 2. On both voice terminals, perform the action that revealed the trouble.

<b>IF</b>	<b>THEN</b>
The trouble appears on the voice terminal on which it first appeared,	<b><i>Trouble found.</i></b> It is caused by <i>wiring</i> between the voice terminal and the control unit. Replace the plugs as they were.  Go to “Test C: Voice Terminal Cords and Cable Test.”
The trouble appears on the other voice terminal,	The trouble is caused by the control unit or the expansion module inserted in the control unit. Replace the plugs as they were.  Go to “Test D: 2-Line/5-Terminal Expansion Module Test.”

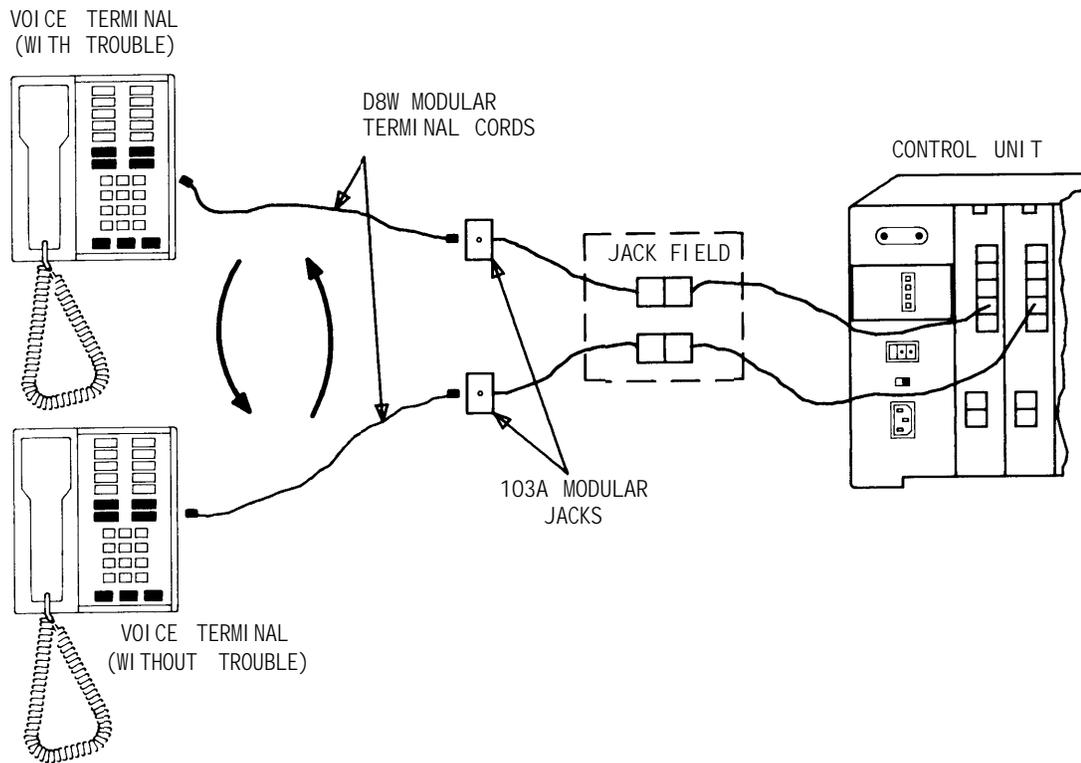
**TEST C: VOICE TERMINAL CORDS AND CABLE TEST**

Do this test only if the result of Test B indicated that the trouble was caused by the wiring.

Step 1. See if there is only one modular terminal cord between the control unit and the voice terminal on which the trouble appears.

IF	THEN
There is only one modular cord,	<b>Trouble found.</b> It is caused by the <i>modular terminal cord</i> .  Read the section on Maintenance Exchange Procedures at the end of this manual.
There is more than one modular cord,	Go on to Step 2.

Step 2. Switch the modular terminal cord of the voice terminal on which the trouble appears and the modular terminal cord of the voice terminal with no trouble (see Figure 15).



**Figure 15—Switching Modular Terminal Cords**

## Trouble on One Voice Terminal

Step 3. On both voice terminals, perform the action that first revealed the trouble.

<b>IF</b>	<b>THEN</b>
The trouble appears on the voice terminal that at first had no trouble,	<b><i>Trouble found.</i></b> It is caused by the <i>modular cord</i> connected to the voice terminal that now has the trouble. Replace the cords as they were and obtain a replacement for the defective one.  Read the section on Maintenance Exchange Procedures at the end of this manual.
The trouble appears on the voice terminal on which it first appeared,	Replace the voice terminal cords as they were.  Go on to Step 4.

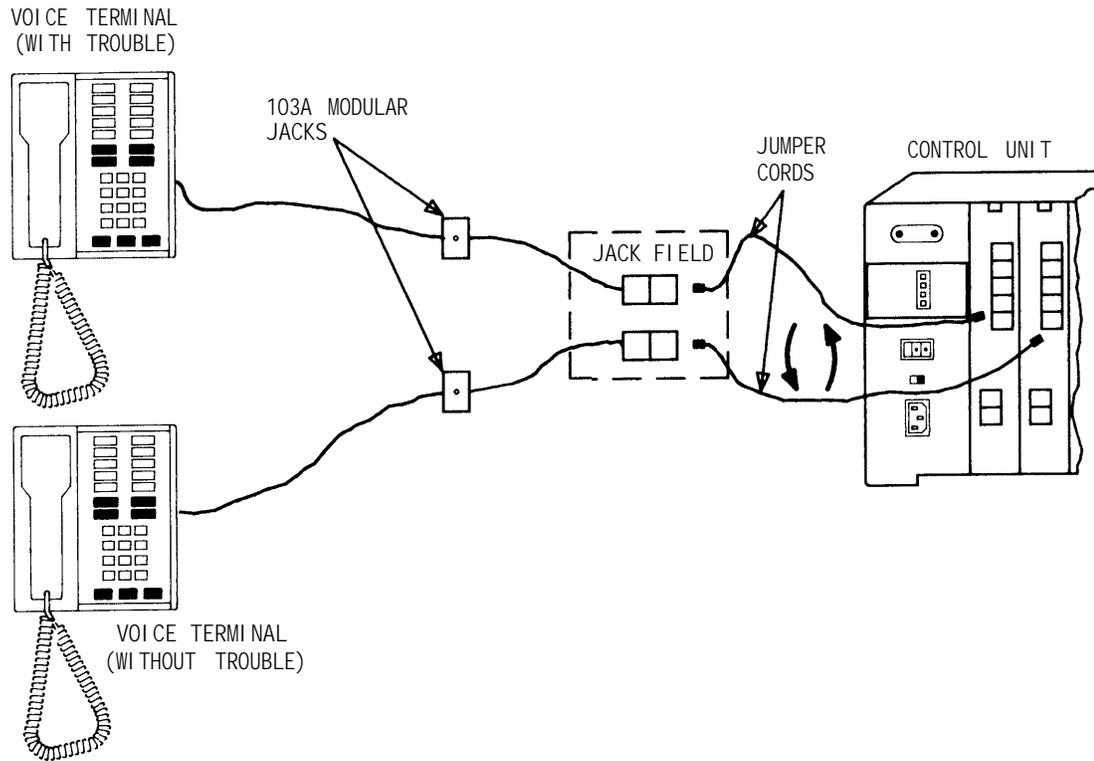
Step 4. Move the voice terminal on which the trouble appeared and its modular cord to the control unit and connect directly to the **Voice Terminals** jack. The number on the **Voice Terminals** jack that the modular cord is connected to should be the same as the intercom number.

<b>IF</b>	<b>THEN</b>
The trouble remains,	Go to "Test D: 2-Line/5-Terminal Expansion Module Test."
The trouble no longer appears,	Go on to Step 5.

Step 5. See if you have jumper cords connected to your control unit (see Figure 16). The jumper cords will also be connected to the jack field (jack panels or 103A Modular Jacks).

<b>IF</b>	<b>THEN</b>
You have jumper cords connected to your control unit,	Go on to Step 6.
You do NOT have jumper cords connected to your control unit,	Skip to Step 8.

## Trouble on One Voice Terminal



**Figure 16—Switching Jumper Cords**

- Step 6. Switch the jumper cord of the voice terminal on which trouble appears and the jumper cord of the voice terminal with no trouble (see Figure 16).
- Step 7. On both voice terminals, perform the action that first revealed the trouble.

IF	THEN
The trouble appears on the voice terminal that at first had no trouble,	<p><b>Trouble found.</b> It is caused by the <i>jumper cord</i> connected to the voice terminal that now has the trouble. Replace the cords as they were and obtain a replacement for the defective one.</p> <p>Read the section on Maintenance Exchange Procedures at the end of this manual.</p>
The trouble appears on the voice terminal on which it first appeared,	<p>Replace the voice terminal cords as they were.</p> <p>Go on to Step 8.</p>

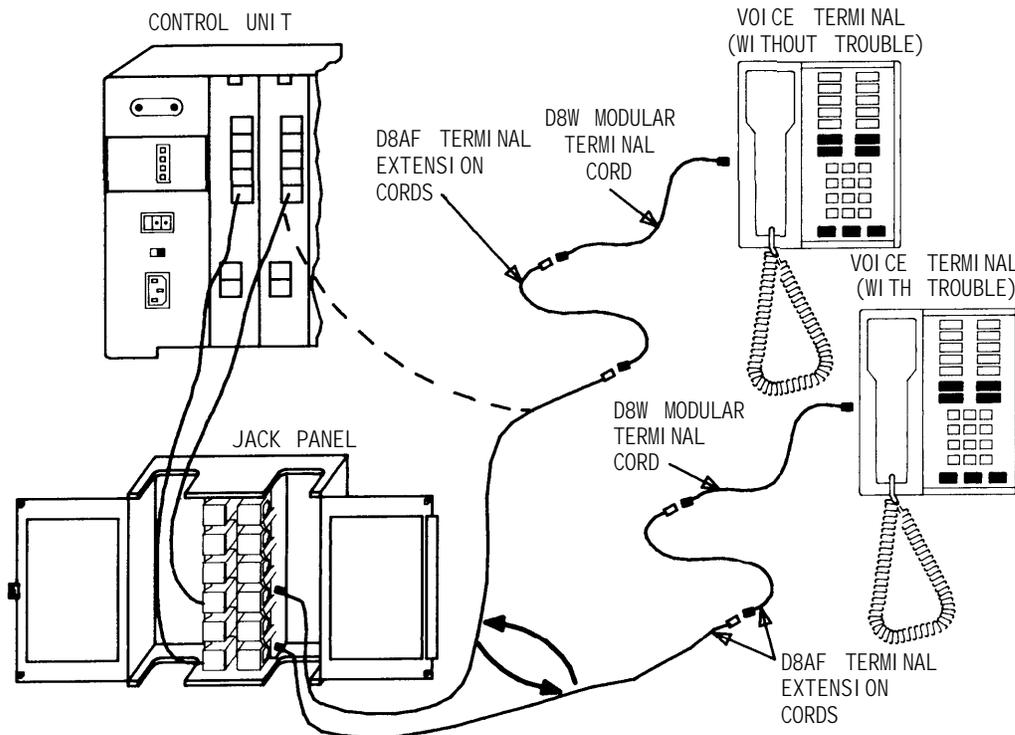
## Trouble on One Voice Terminal

Step 8. See if there are one or more terminal extension cords between the control unit and the modular terminal cord of the voice terminal on which the trouble appears.

**Note:** A modular terminal cord, with a 451A Adapter connected to one end, is the equivalent of a terminal extension cord in this step and in the following steps.

IF	THEN
There is one or more than one terminal extension cord(s).	Go on to Step 9.
There is not a terminal extension cord.	Skip to Step 11.

Step 9. Switch the terminal extension cord of the voice terminal on which the trouble appears and the terminal extension cord of the voice terminal with no trouble (see Figure 17). The terminal extension cord(s) may be connected directly to the control unit or to a jack panel. The dotted line in Figure 17 shows the terminal extension cord(s) connected directly to the control unit.



**Figure 17—Switching Voice Terminal Extension Cords**

## Trouble on One Voice Terminal

Step 10. On both voice terminals, perform the action that revealed the trouble.

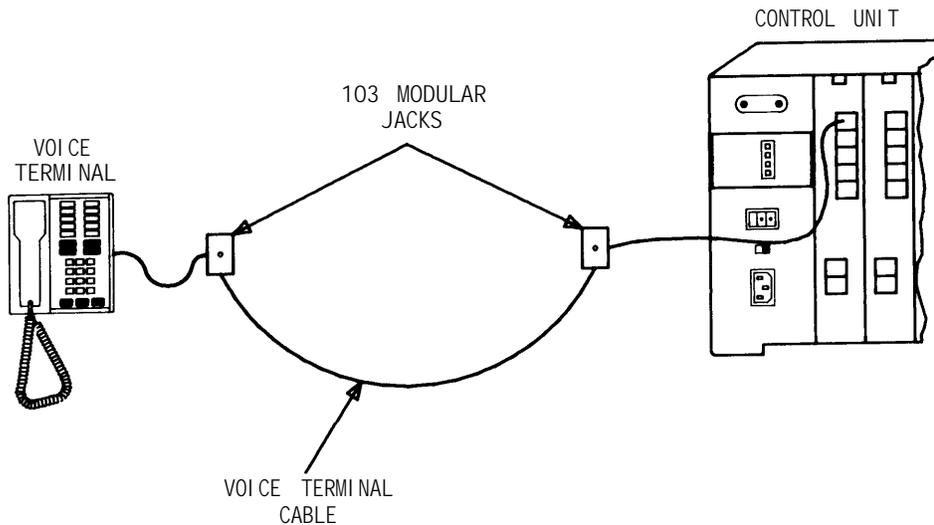
IF	THEN
Some or all of the terminal extension cords have been switched and the trouble appears on the voice terminal that at first had no trouble,	<p><b><i>Trouble found.</i></b> It is caused by the <i>terminal extension cord</i> just connected to the voice terminal that at first had no trouble. Replace the terminal extension cords as they were and obtain a replacement for the defective cord.</p> <p>Read the section on Maintenance Exchange Procedures at the end of this manual.</p>
All terminal extension cords have been switched and the trouble appears on the voice terminal that at first had the trouble,	<p>The switched terminal extension cords are not causing the problem. Replace the cords as they were.</p> <p>Go on to Step 11.</p>
Some terminal extension cords have not been switched and the trouble appears on the voice terminal that at first had the trouble,	Replace the terminal extension cords as they were. Go back to Step 9 to switch another terminal extension cord.

Step 11. Determine whether there are other components between the control unit and the voice terminal that have trouble.

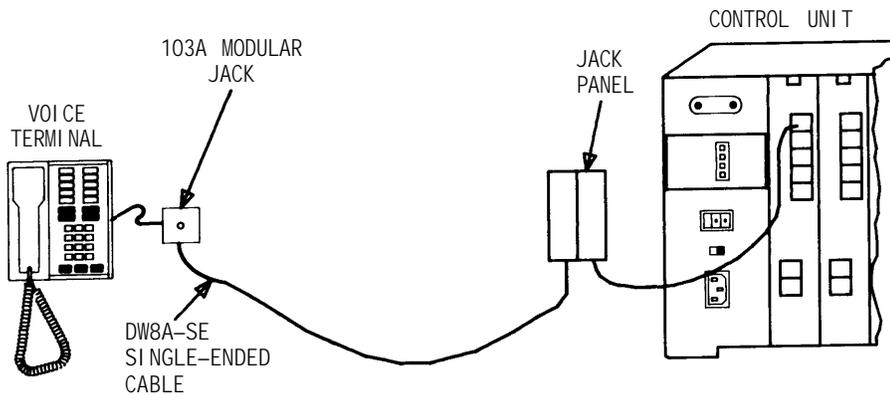
IF	THEN
Jack panels are the only other components used,	<p><b><i>Trouble found.</i></b> It is caused by the <i>modular to modular connector</i> in the jack panel that is connected to the voice terminal with trouble.</p> <p>Read the section on Maintenance Exchange Procedures at the end of this manual.</p>
Jack panels, cables, and/or 103A Modular Jacks are used,	Go on to Step 12.
No other components are used,	Call your equipment supplier for help.

## Trouble on One Voice Terminal

- Step 12. Inspect the wiring between the 103A Modular Jacks (Figure 18) or between the 103A Modular Jack and jack panel (Figure 19) for damage.



**Figure 18—Wiring with Jacks and Cables**



**Figure 19—Wiring with Jack, Jack Panel, and Cable**

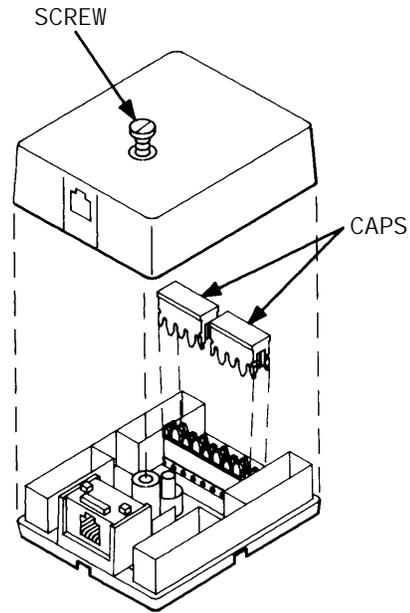
- Step 13. After checking for outer damage, remove the cover from the modular jacks for the voice terminal with trouble. (Loosen the center screw, but do not remove the screw from the cover. Remove the two plastic caps by pulling them straight up.) See Figure 20.

## Trouble on One Voice Terminal

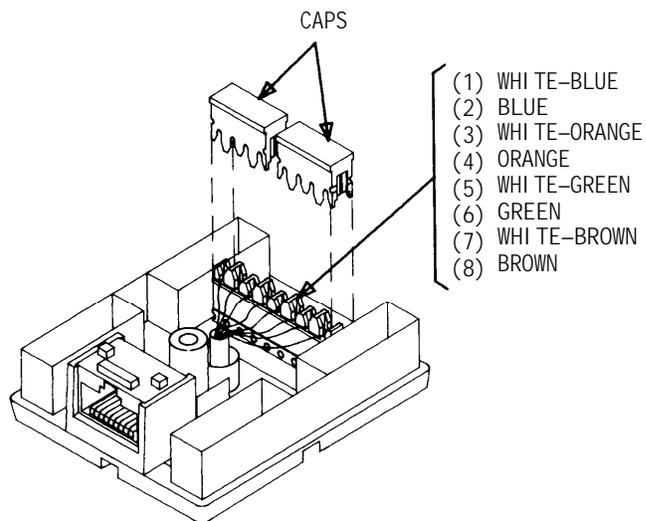
- Step 14. Check the modular jack(s) to make sure there are no broken wires, that the wires are tightly inserted in their notches, that wires are not touching each other, and that the wires are inserted in the correct order. See Figure 21.

<b>IF</b>	<b>THEN</b>
The wiring is OK and a jack panel is NOT used to connect the voice terminal to the control unit,	The trouble is not caused by the wiring. Replace the plastic caps by aligning them and applying pressure until they snap into place. Replace the jack cover and tighten the screw. Call your equipment supplier for help.
The wiring is OK and a jack panel is used to connect the voice terminal to the control unit,	<b>Trouble found.</b> It is caused by the <i>modular to modular connector</i> in the jack panel that is connected to the voice terminal with trouble. Replace the plastic caps by aligning them and applying pressure until they snap into place.  Read the section on Maintenance Exchange Procedures at the end of this manual.
There is a problem with the wiring,	<b>Trouble found.</b> It is caused by the <i>wiring</i> .  Read the section on Maintenance Exchange Procedures at the end of this manual.

## Trouble on One Voice Terminal



**Figure 20—Removing the Cover from a Jack**



**Figure 21—103A Modular Jack Wiring**

## TEST D: 2-LINE/5-TERMINAL EXPANSION MODULE TEST

Do this only if other tests have determined that the trouble was caused by the control unit or the expansion module. Also, you will need more than one expansion module to perform this test. If you have only one expansion module, call your equipment supplier for help. Figure 1 shows where your expansion modules are located.

**Caution:** *Turning off the control unit ac power will interrupt normal service to all outside lines.*

Step 1. Add to your notes the **Voice Terminals** jack number (or intercom number) of the jack (or voice terminal) on which the trouble appears.

**Caution:** *If the line cords and terminal cords are not properly labeled, you should label them now. Each modular line cord should be labeled at both ends with the letter of the Tel. Co. Lines jack that it is connected. Also, each modular terminal cord should be labeled at both ends with the number of the Voice Terminals jack that it is connected.*

Step 2. Disconnect all of the modular terminal cords and modular line cords from both the expansion module on which the trouble appears and an expansion module with no trouble.

Step 3. Place the control unit **On/Off** switch in the **Off** position. If an auxiliary power unit is used, unplug it from the ac outlet.

**Warning:** *Remove control unit ac power (using the control unit On/Off switch) before inserting or removing an expansion module. If you are using an auxiliary power unit, unplug it from the ac outlet.*

Step 4. Switch the expansion module on which the trouble appears and the expansion module with no trouble.

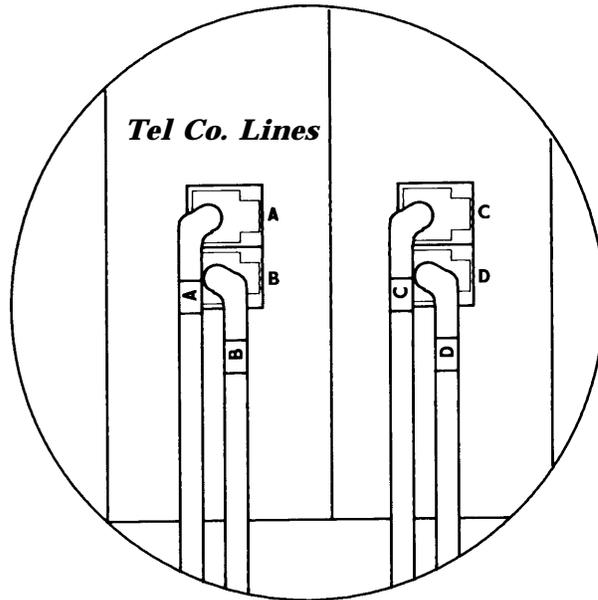
Step 5. Connect the modular line cords back into the expansion modules. To determine where to connect the cords, match the line cord labels to the **Tel. Co. Lines** jack letters on the faceplate (see Figure 22).

Step 6. Connect the modular terminal cord back into the **Voice Terminals** jack on which the trouble appears (see notes made in Step 1). The terminal cord label must match the **Voice Terminals** jack number. For example, if the problem appears on the voice terminal with intercom number 14, then the terminal cord will be connected to **Voice Terminals** jack 14 (see Figure 23).

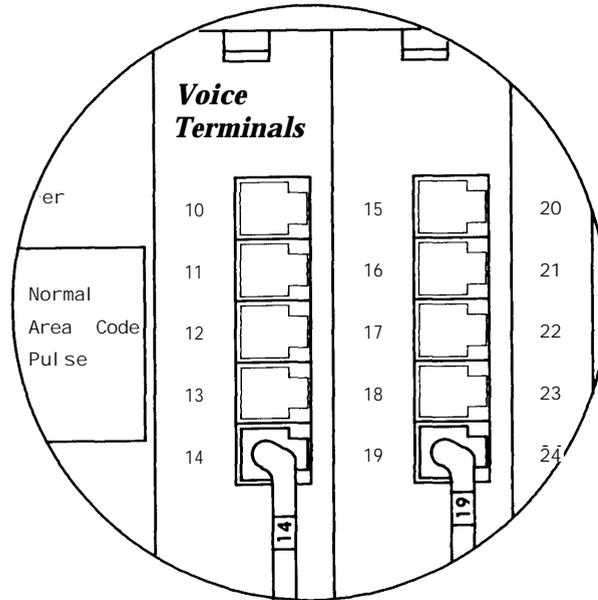
## Trouble on One Voice Terminal

Step 7. At the group of **Voice Terminals** jacks that do not have terminal cords connected to them (these are the jacks with the faceplate numbers of the expansion module with no trouble), connect a modular terminal cord to the jack that is on the same level as the terminal cord connected in Step 6. For example, if the terminal cord in Step 6 was connected to **Voice**

**Terminals** jack 14, then the terminal cord in this step would be connected to **Voice Terminals** jack 19 (see Figure 23).



**Figure 22—Reconnecting Modular Line Cords**



**Figure 23—Reconnecting Modular Terminal Cords**

- Step 8. Place the control unit **On/Off** switch in the **On** position. If an auxiliary power unit is used, plug it back into the ac outlet.
- Step 9. Using the voice terminals with intercom numbers that are the same as the **Voice Terminals** jack numbers you connected to in Steps 6 and 7 (for instance, intercom 14 and 19), perform the action that revealed the trouble.

<b>IF</b>	<b>THEN</b>
The trouble appears on the voice terminal that at first had no trouble,	<b><i>Trouble found.</i></b> It is caused by the <i>expansion module</i> connected to this voice terminal.  Go on to Step 10.
The trouble appears on the voice terminal that it first appeared,	<b><i>Trouble found.</i></b> It is caused by the <i>control unit</i> .  Go on to Step 10.

- Step 10. Place the control unit **On/Off** switch in the **Off** position. If an auxiliary power unit is used, unplug it from the ac outlet.

## Trouble on One Voice Terminal

***Warning: Remove control unit ac power (using the control unit On/Off switch) before inserting or removing a expansion module. If you are using an auxiliary power unit, unplug it from the ac outlet.***

- Step 11. Switch the expansion modules back to their original position.
- Step 12. Reconnect all of the modular terminal cords and line cords to their original position.
- Step 13. Return ac power to the control unit.
- Step 14. Read the section on Maintenance Exchange Procedures at the end of this manual to obtain a replacement for the defective component.

## **TROUBLE ON MORE THAN ONE VOICE TERMINAL**

Use this procedure only if you found the same trouble on at least two voice terminals. If all of your voice terminals are *dead*, and you have read the section entitled “E. All Voice Terminals Have No Lights and No Dial Tone” in the “BASIC TROUBLE TESTS” section of this manual without finding the trouble, call your equipment supplier for help.

This procedure will help you find the cause of trouble that appears on two or more voice terminals. The trouble is probably caused by the control unit, the expansion module, the modular line cords, or the local telephone company equipment.

### **TEST A: CONTROL UNIT TEST**

- Step 1. Make certain you have your notes describing the trouble and its location.
- Step 2. Disconnect extra-alert accessories at the control unit. If the trouble is cleared, go to “TROUBLE ON AN ACCESSORY.” If the trouble persists, leave the accessory unplugged and continue.
- Step 3. Go to one of the voice terminals on which the trouble appears. Try to make the following calls:
  - Place an outside call using one of the outside line buttons. Then place an outside call using a second outside line button (if you have one). If the trouble appears on both outside lines, make certain that you add this information to your notes.
  - Place an intercom call from the voice terminal. Write in your notes whether the trouble appears on the intercom call.
- Step 4. Go to the other voice terminals on which the trouble appears. Try to make the two calls you just attempted from the first voice terminal. Add the results of these calls to your notes.

## Trouble on More Than One Voice Terminal

Step 5. To determine where the trouble appears, compare your notes to the following table.

<b>IF</b>	<b>THEN</b>
The trouble appears on intercom calls only (on more than one voice terminal),	<b><i>Trouble found.</i></b> It is caused by the <i>control unit</i> .  Read the section on Maintenance Exchange Procedures at the end of this manual.
The trouble appears on intercom calls and on one or two outside lines (from two or more voice terminals),	The trouble is caused by the control unit or the expansion module. Go to “Test C: 2-Line/5-Terminal Expansion Module Test.”
The trouble appears on one or more outside lines but not on intercom calls (from two or more voice terminals),	Go to “Test B: Modular Line Cords and Network Interface Test.”

## TEST B: MODULAR LINE CORDS AND NETWORK INTERFACE TEST

Step 1. On the line with the trouble, determine if there is a line bridging adapter between the control unit and the network interface.

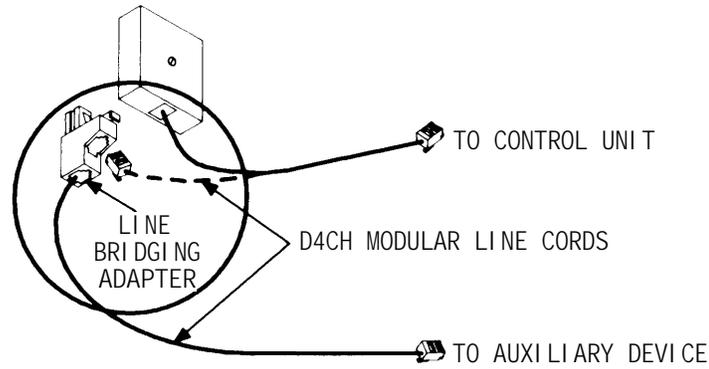
<b>IF</b>	<b>THEN</b>
There is no line bridging adapter,	Skip to Step 7.
There is a line bridging adapter,	Go on to Step 2.

Step 2. Following Steps A and B below, bypass the line bridging adapter (see Figure 24).

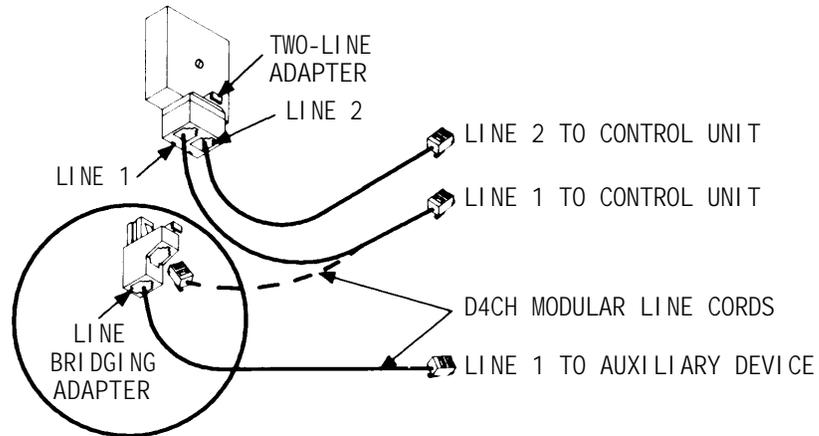
- A. At the line bridging adapter, unplug the modular line cord.
- B. Remove the line bridging adapter from the network interface. Connect the modular line cord from the control unit to the network interface. If a two-line or eight-line adapter is present, connect through it.

# Trouble on More Than One Voice Terminal

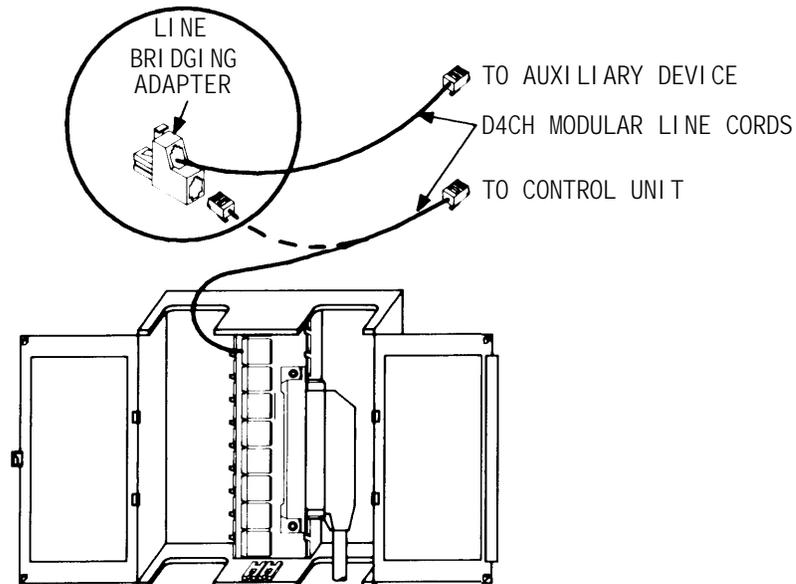
## NETWORK INTERFACE WITH ONE (1) LINE



## NETWORK INTERFACE WITH TWO (2) LINES



## NETWORK INTERFACE WITH EIGHT-LINE ADAPTER



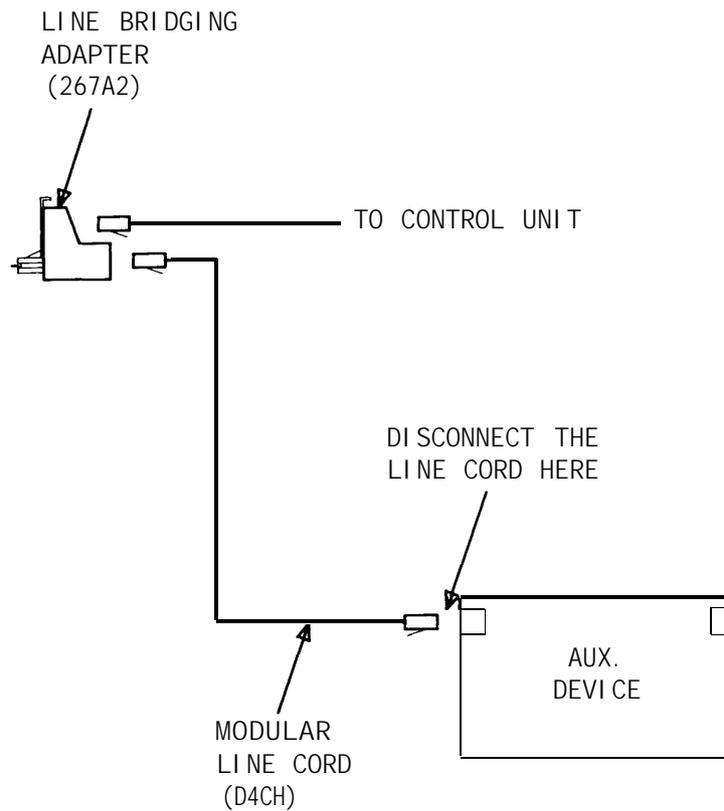
**Figure 24—Removing a Line Bridging Adapter from the Network Interface**

## Trouble on More Than One Voice Terminal

Step 3. From a voice terminal, try to make an outside call on the line with trouble.

<b>IF</b>	<b>THEN</b>
The trouble is still present,	Skip to Step 7.
The trouble is no longer present,	Return the cords and line bridging adapter to their original position. Then go on to Step 4.

Step 4. At the auxiliary device (for example, telephone answering service), disconnect the modular line cord (see Figure 25).



**Figure 25—Disconnecting Auxiliary Device**

## Trouble on More Than One Voice Terminal

Step 5. From a voice terminal, try to make an outside call on the line with trouble.

<b>IF</b>	<b>THEN</b>
The trouble is no longer present,	<b><i>Trouble found.</i></b> It is your <i>auxiliary device</i> . Do not reconnect the device until the trouble has been corrected.
The trouble is still present,	<b><i>Trouble found.</i></b> It is the <i>line bridging adapter</i> or the <i>modular cord that extends to the auxiliary device</i> .  Go on to Step 6.

Step 6. To use the outside line with trouble, bypass the line bridging adapter and modular extension cord by following the instructions in Step 2 (A and B) above. Read the section on Maintenance Exchange Procedures at the end of this manual to get a new line bridging adapter.

Step 7. See if you have a standard telephone with a modular plug.

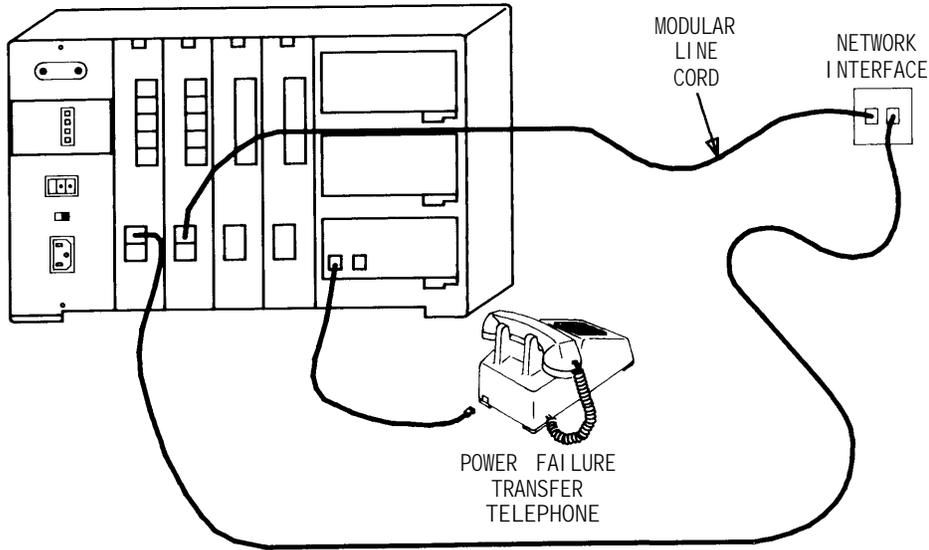
**Note:** You may be using a standard telephone with a modular cord/plug as a power failure transfer telephone. The power failure transfer telephone is the telephone connected to the Type III Cartridge in the control unit. The power failure transfer telephone can be used for this test, but a Model 820 voice terminal cannot.

<b>IF</b>	<b>THEN</b>
You have a standard modular telephone,	Go on to Step 8.
You do not have a standard modular telephone,	Skip to Step 20.

Step 8. Following Steps A and B below, connect the standard modular telephone to the modular line cord with the number of an outside line on which the trouble appears.

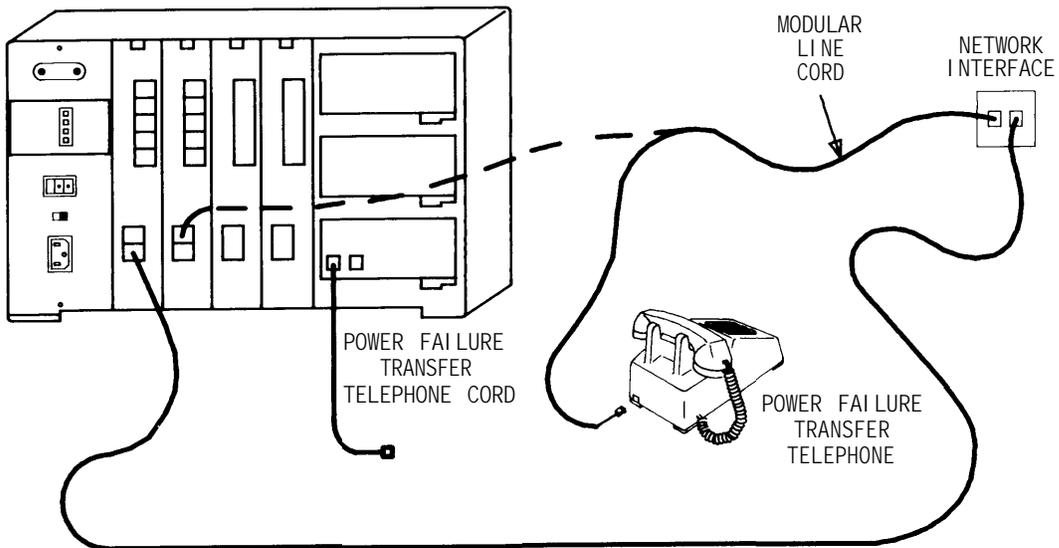
A. Unplug the cord of the standard modular telephone (or power failure transfer telephone [PFTT]) from the base of the telephone (see Figure 26).

## Trouble on More Than One Voice Terminal



**Figure 26—Unplugging the Cord from a PFTT**

- B. At the control unit, unplug the modular line cord from the **Tel. Co. Lines** jack and plug it into the standard modular telephone. Make certain that the line cord is labeled with the number of an outside line on which trouble appears (see Figure 27).



**Figure 27—Plugging a Modular Line Cord into a PFTT**

## Trouble on More Than One Voice Terminal

Step 9. Place an outside call using the standard modular telephone, and make a note of what happened.

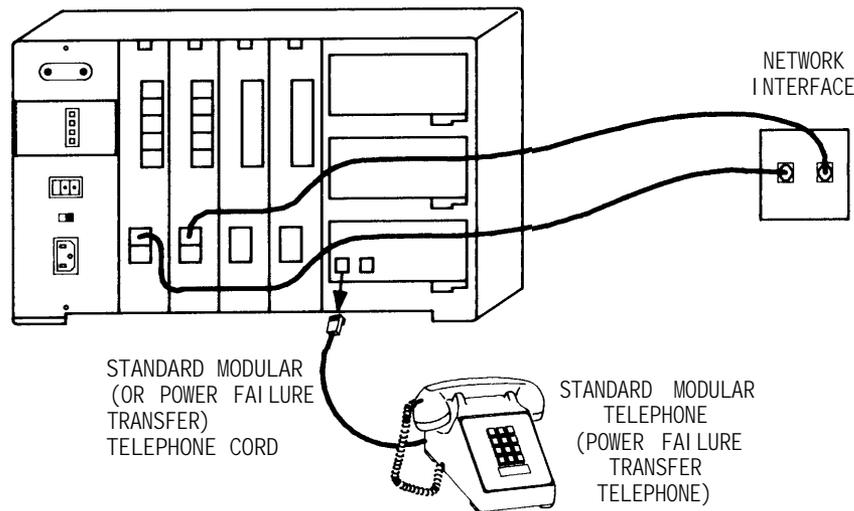
<b>IF</b>	<b>THEN</b>
The trouble is no longer present,	The trouble is caused by the control unit or the expansion module. Using Step 10, replace the cords as they were, then go to the "Tel. Co. Lines Test" in the "Test C: 2-Line/5-Terminal Expansion Module Test" section.
The trouble is still present,	Go on to Step 10.

Step 10. Following Steps A and B below, place the modular line cords back in their original positions:

- A. Unplug the modular line cord from the standard modular telephone and plug the cord back into the control unit **Tel. Co. Lines** jack.
- B. Plug the standard modular telephone cord back into the base of the telephone.

Step 11. Following Steps A and B below, connect the cord of the standard modular telephone (or PFTT) to the network interface.

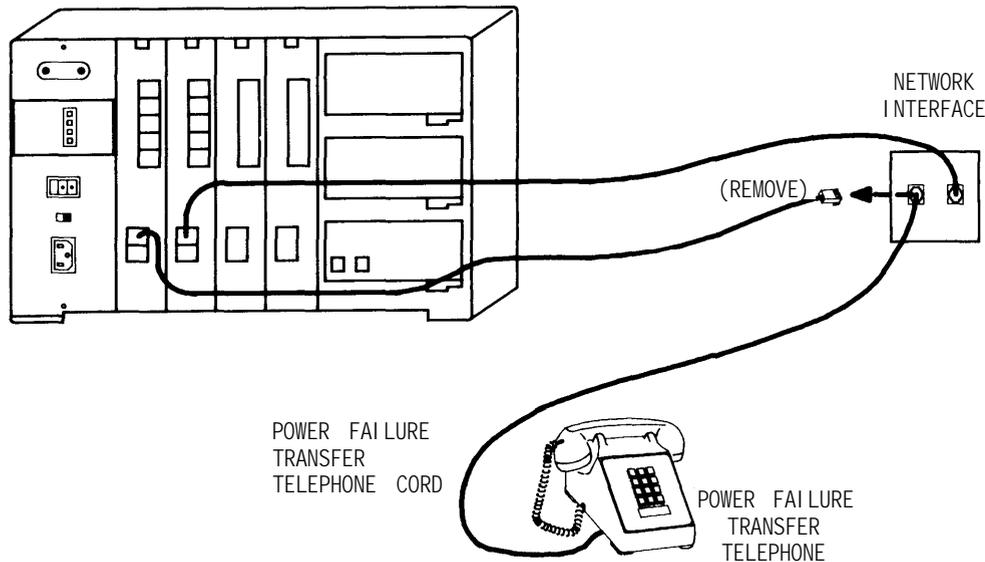
- A. Unplug the standard modular telephone from the control unit (see Figure 28).



**Figure 28—Unplugging the Cord from a Type III Cartridge**

## Trouble on More Than One Voice Terminal

- B. Remove the modular line cord from the network interface for the line with trouble. Connect the standard modular telephone to the network interface using the cord of the standard modular telephone (see Figure 29). If a two-line or eight-line adapter is present, connect through it.



**Figure 29—Plugging the PFTT Cord into the Network Interface**

- Step 12. Place an outside call using the standard modular telephone, and make a note of what happens.

IF	THEN
The trouble is no longer present on the outside line,	Go on to Step 13.
The trouble is still present on the outside line,	The trouble is caused by local telephone company equipment external to your communications system. <b>You may have a two-line or eight-line adapter connecting the line with trouble to the network interface. If you have not checked the adapter, it could be causing the trouble.</b> Before calling your local telephone company to report the trouble, write down the telephone number of the line with trouble and go to Step 17.

## Trouble on More Than One Voice Terminal

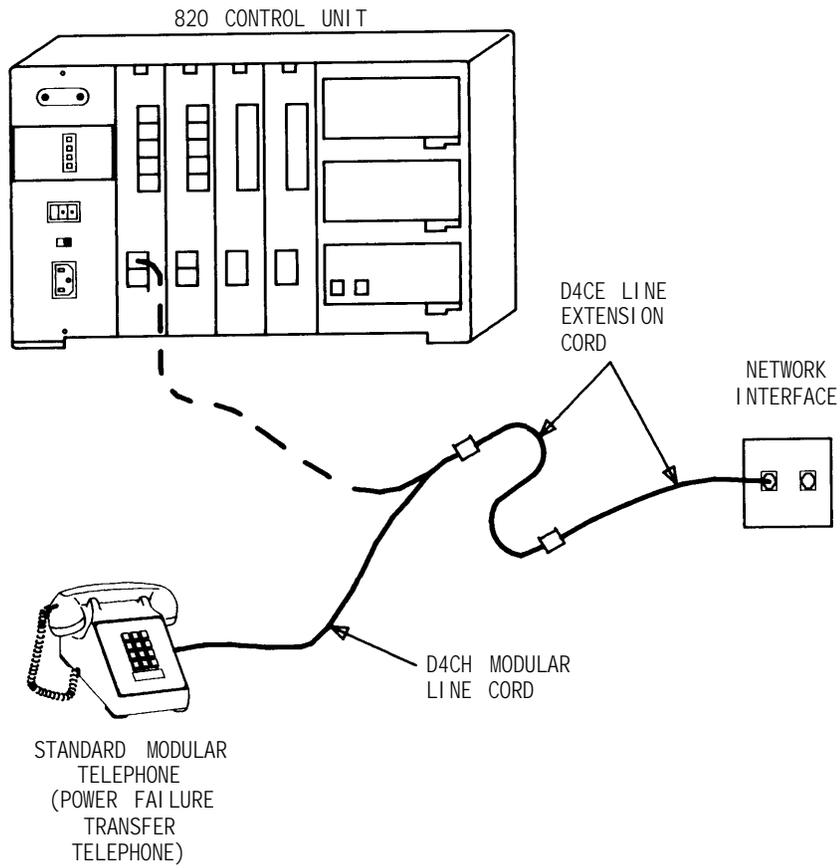
Step 13. See if you have any Line Extension Cords (D4CE) connecting the modular line cord to the control unit.

<b>IF</b>	<b>THEN</b>
You do not have any line extension cords,	<b><i>Trouble found.</i></b> It is caused by the <i>modular line cord</i> .  Read the section on Maintenance Exchange Procedures at the end of this manual.
You do have a line extension cord,	Go on to Step 14.

Step 14. Following Steps A, B, and C below, connect the standard modular telephone to the line with trouble. Figure 30 shows your connections after you have finished the steps.

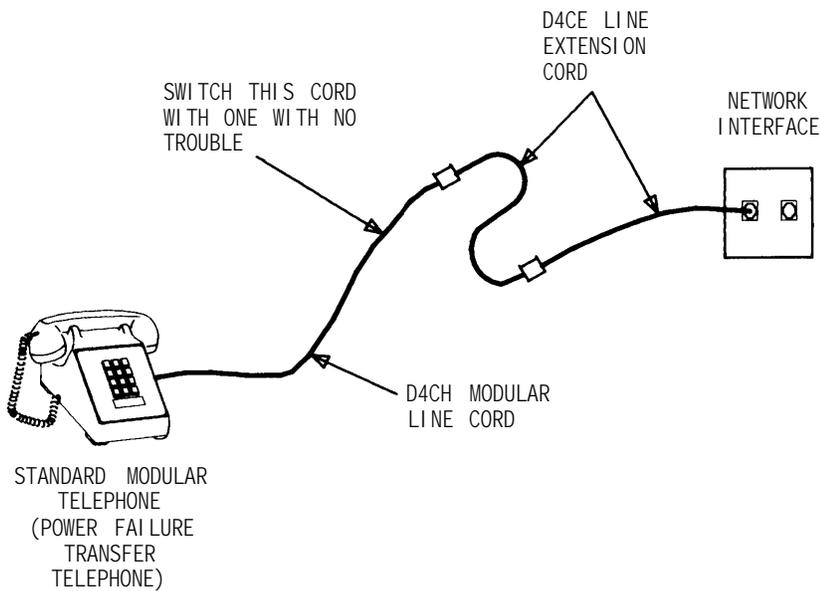
- A. Remove the standard modular telephone from the network interface and replace it with the modular line cord.
- B. Remove the standard modular telephone cord from the standard modular telephone.
- C. Remove the modular line cord of the line with trouble from the control unit and plug it into the standard modular telephone.

# Trouble on More Than One Voice Terminal



**Figure 30—Connections to Test Line Cords**

Step 15. Switch the modular line cord connected to the standard modular telephone and a line cord of the line with no trouble (see Figure 31).



**Figure 31—Showing which Line Cord to Switch**

## Trouble on More Than One Voice Terminal

Step 16. Using the standard modular telephone, perform the action that revealed the trouble.

<b>IF</b>	<b>THEN</b>
The trouble is no longer present,	<p><b>Trouble found.</b> It is caused by the <i>modular line cord</i>. Replace the cords as they were and obtain a replacement for the defective cord.</p> <p>Read the section on Maintenance Exchange Procedures at the end of this manual.</p>
The trouble is still present and you have only one line extension cord,	<p><b>Trouble found.</b> It is caused by the <i>line extension cord</i>.</p> <p>Read the section on Maintenance Exchange Procedures at the end of this manual.</p>
The trouble is still present and you have more than one extension cord,	<p><b>Trouble found.</b> It is caused by one of the <i>line extension cords</i>. To find out which line extension cord is defective, replace them one at a time with a line extension cord with no trouble. After you have found the defective cord, return all cords to their original position. Obtain a replacement for the defective cord.</p> <p>Read the section on Maintenance Exchange Procedures at the end of this manual.</p>

Step 17. Following Steps A and B below, replace the cords as they were:

- A. Remove the standard modular telephone from the network interface and replace the modular line cord.
- B. Plug the standard modular telephone cord back into the Type III Cartridge on the control unit.

Step 18. See if there is another outside line with trouble.

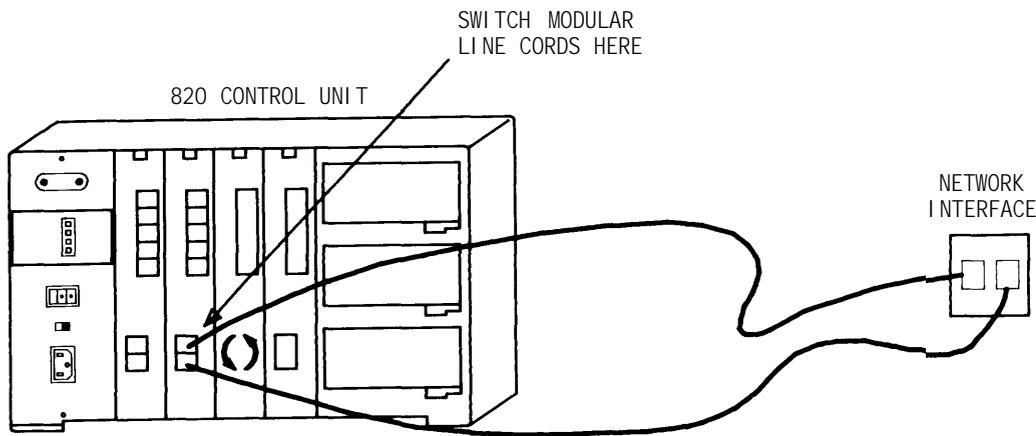
<b>IF</b>	<b>THEN</b>
There is another,	Repeat Steps 11 and 12 for the other outside line(s).
There is not another,	Go on to Step 19.

## Trouble on More Than One Voice Terminal

- Step 19. Call your local telephone company to report the number(s) of the outside line(s) with trouble. You have now completed TEST B.
- Step 20. You should use this step only if you do not have a power failure transfer telephone or any other standard modular telephone. Refer to the notes which you made (Test A: Control Unit Test, Steps 3 through 5) to determine if the trouble appears on one or on more than one outside line.

IF	THEN
The trouble does not appear on all outside lines,	Go on to Step 21.
The trouble appears on all outside lines,	Call your local telephone company for service.

- Step 21. Select two modular line cords to be tested, one which has trouble and one which does not have trouble. See Figure 32 for the location of the modular line cords to be switched. If necessary, you can refer to your system directory to determine the line (A, B, C, D, E, F, G, or H) that corresponds to each telephone number.
- Step 22. At the control unit, switch the two modular line cords selected in Step 21 (see Figure 32).



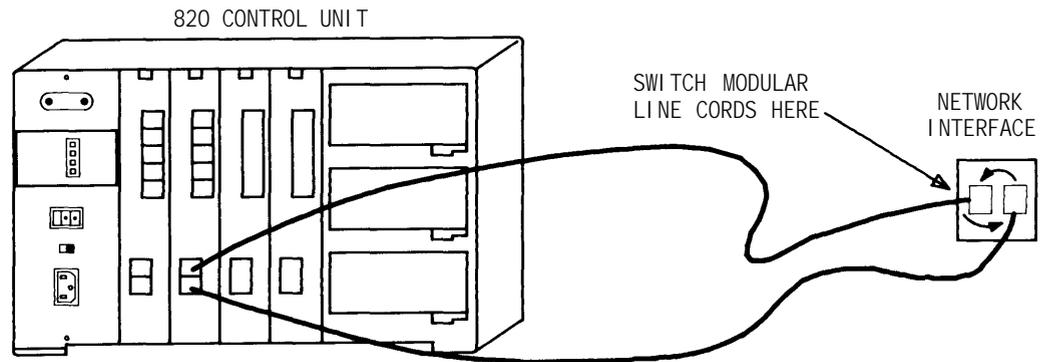
**Figure 32—Switching Modular Line Cords at the Control Unit**

## Trouble on More Than One Voice Terminal

Step 23. From one voice terminal, try to make an outside call on each of the outside lines.

<b>IF</b>	<b>THEN</b>
The trouble appears on the same outside line button as before,	The trouble is caused by the control unit or the expansion module. Put the modular cords back in their original position. Then, go to the "Tel. Co. Lines Test" in the "Test C: 2-Line/5-Terminal Expansion Module Test" section.
The trouble appears on a different outside line button,	Put the modular cords back in their original position at the control unit. Then go on to Step 24.

Step 24. Go to the network interface and switch the two modular cords (see Figure 33).



**Figure 33—Switching Modular Line Cords at the Network Interface**

## Trouble on More Than One Voice Terminal

Step 25. From one voice terminal, try to make an outside call on each of the outside lines which are switched.

IF	THEN
The trouble appears on the same line as Step 23,	The trouble is caused by local telephone company equipment external to your communications system. <b>You may have a two-line or eight-line adapter connecting the line with trouble to the network interface. If you have not checked the adapter, it could be causing the trouble.</b> Before calling your local telephone company to report the trouble, write down the telephone number of the line with trouble and go on to Step 30.
The trouble appears on a different outside line.	Go on to Step 26.

Step 26. See if you have any Line Extension Cords (D4CE) connecting the modular line cord to the control unit.

IF	THEN
You do not have any line extension cords,	<b><i>Trouble found.</i></b> It is caused by the <i>modular line cord</i> .  Read the section on Maintenance Exchange Procedures at the end of this manual.
You do have a line extension cord,	Go on to Step 27.

Step 27. Return the cords to their original position.

Step 28. Switch the modular line cord of the line with trouble and the modular line cord of the line with no trouble.

Step 29. From one voice terminal, try to make an outside call on the outside line with trouble.

## Trouble on More Than One Voice Terminal

IF	THEN
The trouble is no longer present,	<p><b>Trouble found.</b> It is caused by the <i>modular line cord</i> connected to the outside line with no trouble. Replace the cords as they were and obtain a replacement for the defective cord.</p> <p>Read the section on Maintenance Exchange Procedures at the end of this manual.</p>
The trouble is still present and you have only one line extension cord,	<p><b>Trouble found.</b> It is caused by the <i>line extension cord</i> connected to the outside line with trouble.</p> <p>Read the section on Maintenance Exchange Procedures at the end of this manual.</p>
The trouble is still present and you have more than one extension cord,	<p><b>Trouble found.</b> It is caused by one of the <i>line extension cords</i> connected to the outside line with trouble. To find out which line extension cord is defective, replace them one at a time with a line extension cord with no trouble. After you have found the defective cord, return all cords to their original position. Obtain a replacement for the defective cord.</p> <p>Read the section on Maintenance Exchange Procedures at the end of this manual.</p>

Step 30. Return the line cords to their original position.

Step 31. See if there is another outside line with trouble.

IF	THEN
There is another,	Repeat Steps 21 and 25 for the other outside line(s).
There is not another,	Go on to Step 32.

Step 32. Call your local telephone company to report the number(s) of the outside line(s) with trouble.

### TEST C: 2-LINE/5-TERMINAL EXPANSION MODULE TEST

Do this test only if other tests have determined that the trouble was caused by the control unit or the expansion module. The trouble must also appear on more than one voice terminal. Also, you will need more than one expansion module to perform this test. If you have only one expansion module, call your equipment supplier for help. Figure 1 shows which lines (A, B, C, etc...) are present on each expansion module. Also, by matching your voice terminal intercom number with the **Voice Terminals** jack number on the control unit, you can use Figure 1 to determine which voice terminal is connected to which **Voice Terminals** jack.

**Caution: Turning off the power to the control unit will interrupt normal service to all outside lines.**

#### Voice Terminals Jack Test

Step 1. Add to your notes the **Voice Terminals** jack numbers of the jacks on which the trouble appears.

**Caution: If the line cords and terminal cords are not properly labeled, then you should label them now. Each modular line cord should be labeled at both ends with the letter of the Tel. Co. Lines that it is connected. Also, each modular terminal cord should be labeled at both ends with the number of the Voice Terminals jack that it is connected.**

Step 2. Disconnect all of the modular terminal cords and modular line cords from both the expansion module on which the trouble appears and an expansion module with no trouble.

Step 3. Place the control unit **On/Off** switch in the **Off** position. If an auxiliary power unit is used, unplug it from the ac outlet.

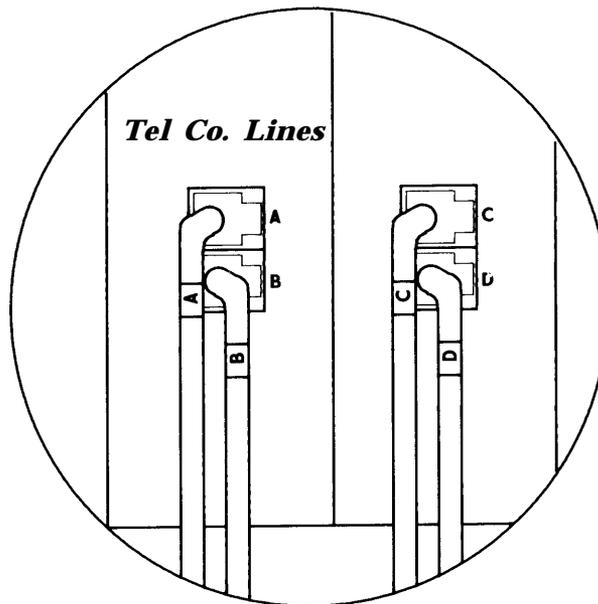
**Warning: Remove control unit ac power (using the control unit On/Off switch) before inserting or removing an expansion module. If you are using an auxiliary power unit, unplug it from the ac outlet.**

Step 4. Switch the expansion module on which the trouble appears and the expansion module with no trouble.

Step 5. Connect the modular line cords back into the expansion modules. To determine where to connect the cords, match the line cord labels to the **Tel. Co. Lines** jack letters on the faceplate (see Figure 34).

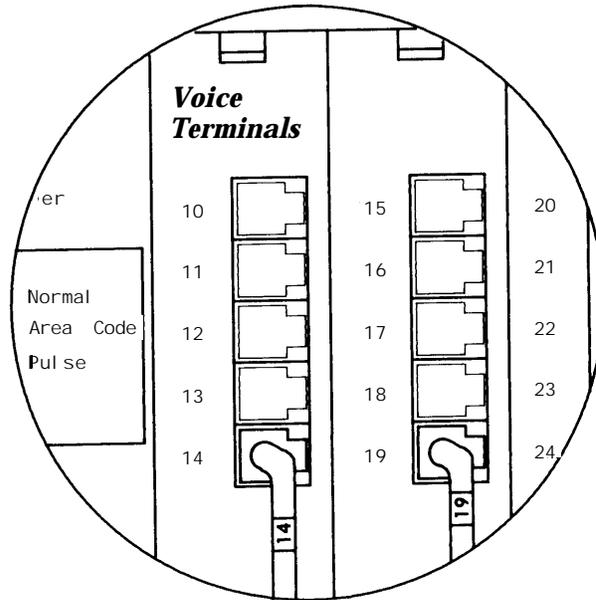
## Trouble on More Than One Voice Terminal

- Step 6. Connect the modular terminal cord back into one of the **Voice Terminals** jacks on which the trouble appears (see notes made in Step 1). The terminal cord label must match the **Voice Terminals** jack number. For example, if the problem appears on the voice terminal with intercom number 14, then the terminal cord will be connected to **Voice Terminals** jack 14 (see Figure 35).
- Step 7. At the group of **Voice Terminals** jacks that do not have terminal cords connected to them (these are the jacks with the faceplate numbers of the expansion module with no trouble), connect a modular terminal cord to the jack that is on the same level as the terminal cord connected in Step 6. For example, if the terminal cord in Step 6 was connected to **Voice Terminals** jack 14, then the terminal cord in this step would be connected to **Voice Terminals** jack 19 (see Figure 35).



**Figure 34—Reconnecting Modular Line Cords**

## Trouble on More Than One Voice Terminal



**Figure 35—Reconnecting Modular Terminal Cords**

- Step 8. Place the control unit **On/Off** switch in the **On** position. If an auxiliary power unit is used, plug it back into the ac outlet.
- Step 9. Using the voice terminals of the two lines just connected to the **Voice Terminals** jacks (the voice terminals' intercom number will match the **Voice Terminals** jack numbers), perform the action that revealed the trouble.

<b>IF</b>	<b>THEN</b>
The trouble appears on the voice terminal that at first had no trouble,	<b>Trouble found.</b> It is caused by the <i>expansion module</i> connected to this voice terminal.  Go on to Step 10.
The trouble appears on the voice terminal that it first appeared,	<b>Trouble found.</b> It is caused by the <i>control unit</i> .  Go on to Step 10.

- Step 10. Place the control unit **On/Off** switch in the **Off** position. If an auxiliary power unit is used, unplug it from the ac outlet.

## Trouble on More Than One Voice Terminal

**Warning: Remove control unit ac power (using the control unit On/Off switch) before inserting or removing an expansion module. If you are using an auxiliary power unit, unplug it from the ac outlet.**

Step 11. Switch the expansion modules back to their original position.

Step 12. See if any of the other voice terminals on which the trouble appears are on the same expansion module as the voice terminal just checked.

IF	THEN
All of the other voice terminal on which trouble appears are on the same expansion module,	Go on to Step 13.
There is no other expansion module to be tested and/or the trouble was caused by the control unit,	Go on to Step 13.
All of the other voice terminals with trouble are on a different expansion module,	Add to your notes the top <b>Voice Terminals</b> jack number for the defective expansion module (10, 15, 20, or 25). This will help you keep track of the defective modules (for example, "defective module-15"). Then, repeat Steps 2 through 9 to determine what is causing the trouble to the other voice terminals.
Some voice terminals with trouble are on a different module and some voice terminals with trouble are on the same module,	Add to your notes the top <b>Voice Terminals</b> jack number for the defective expansion module (10, 15, 20, or 25). This will help you keep track of the defective modules (for example, "defective module-15"). Then, repeat Steps 2 through 9 to determine what is causing the trouble to the other voice terminals.

Step 13. Return all of the modular terminal cords and line cords to their original position.

Step 14. Return ac power to the control unit.

Step 15. Read the section on Maintenance Exchange Procedures at the end of this manual to obtain a replacement for the defective component (either control unit or expansion module).

## Trouble on More Than One Voice Terminal

### Tel. Co. Lines Test

This test should be performed when the trouble appears only on outside calls and when the trouble is caused by either the control unit or the expansion module.

- Step 1. Add to your notes the **Tel. Co. Lines** jack letter (A through H) of the telephone number on which the trouble appears. (Refer to your system directory if necessary.)

**Caution:** *If the line cords and terminal cords are not properly labeled, then you should label them now. Each modular line cord should be labeled at both ends with the letter of the Tel. Co. Lines that it is connected. Also, each modular terminal cord should be labeled at both ends with the number of the Voice Terminals jack that it is connected.*

- Step 2. Disconnect all of the modular terminal cords and modular line cords from both the expansion module on which the trouble appears and an expansion module with no trouble.

- Step 3. Place the control unit **On/Off** switch in the **Off** position. If an auxiliary power unit is used, unplug it from the ac outlet.

**Warning:** *Remove control unit ac power (using the control unit On/Off switch) before inserting or removing an expansion module. If you are using an auxiliary power unit, unplug it from the ac outlet.*

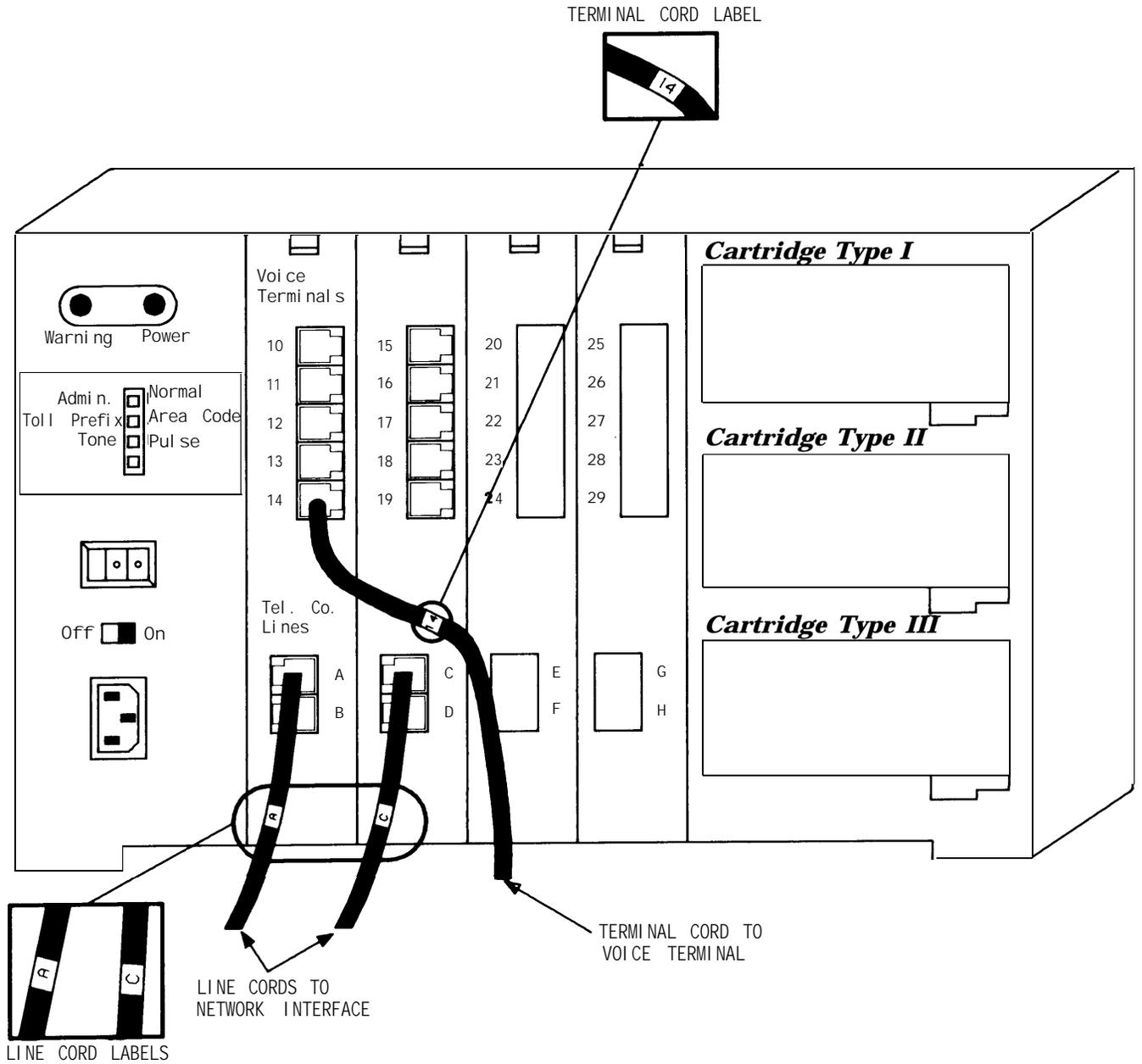
- Step 4. Switch the expansion module on which the trouble appears and the expansion module with no trouble.

- Step 5. Connect the modular line cord back into the **Tel. Co. Lines** jack on which the trouble appears. To determine where to connect the cord, match the line cord label to the **Tel. Co. Lines** jack letter on the faceplate (see Figure 36).

- Step 6. At the two **Tel. Co. Lines** jacks that do not have terminal cords connected to them, connect a modular line cord to the jack that is on the same level as the line cord connected in Step 5. For example, if the line cord in Step 5 was connected to **Tel. Co. Lines** jack A, then the line cord connected in this step would be connected to jack C (see Figure 36).

- Step 7. Connect a modular terminal cord back into one of the **Voice Terminals** jacks of the expansion modules. The terminal cord label must match the **Voice Terminals** jack number (see Figure 36).

# Trouble on More Than One Voice Terminal



**Figure 36—Connections to the Control Unit after the Expansion Modules are Switched**

## Trouble on More Than One Voice Terminal

- Step 8. Place the control unit **On/Off** switch in the **On** position. If an auxiliary power unit is used, plug it back into the ac outlet.
- Step 9. Using the voice terminal just connected to the **Voice Terminals** jack (the voice terminal intercom number will match the **Voice Terminals** jack number), try to make an outside call on each of the outside lines. If necessary, you can refer to your system directory to determine the telephone number that corresponds to each line (A, B, C, D, E, F, G or H).

<b>IF</b>	<b>THEN</b>
The trouble appears on a different outside line,	<b><i>Trouble found.</i></b> It is caused by the <i>expansion module</i> .  Go on to Step 10.
The trouble appears on the same outside line as before,	<b><i>Trouble found.</i></b> It is caused by the <i>control unit</i> .  Go on to Step 10.

- Step 10. Place the control unit **On/Off** switch in the **Off** position. If an auxiliary power unit is used, unplug it from the ac outlet.
- Warning:** *Remove control unit ac power (using the control unit On/Off switch) before inserting or removing an expansion module. If you are using an auxiliary power unit, unplug it from the ac outlet.*
- Step 11. Switch the expansion modules back to their original position.
- Step 12. Return all of the modular terminal cords and line cords to their original position.
- Step 13. Return ac power to the control unit.
- Step 14. Read the section on Maintenance Exchange Procedures at the end of this manual to obtain a replacement for the defective component (either control unit or expansion module).

## **TROUBLE ON AN ACCESSORY**

This procedure should be used only if the trouble appears on an accessory. If there is trouble with an accessory, see if there is an auxiliary power unit connected to the control unit **Auxiliary Power** socket. Also, see if there is a voice terminal power supply connected to a 34-button deluxe voice terminal (see Figure 38). If there is an auxiliary power device (auxiliary power unit or voice terminal power supply), check it first using Test A. Whether you use Test B or Test C depends upon the accessory having trouble.

- Use Test B if the accessory is connected directly to a voice terminal:
  - Headset
  - Hands-free unit.
- Use Test C if the accessory is not connected directly to a voice terminal:
  - Power failure transfer telephone
  - Music-on-hold equipment
  - Paging system
  - Extra-alert devices (uses one or more bells or horns to alert workers in noisy or remote areas to calls).

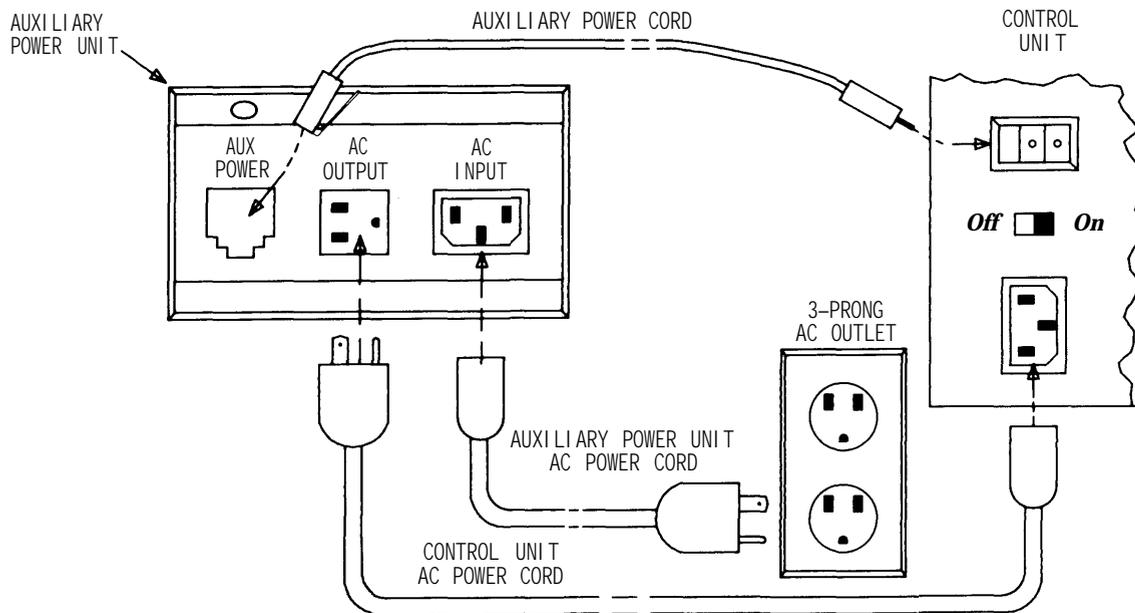
### **TEST A: FOR AUXILIARY POWER DEVICES**

Locate the device you have and perform that test.

#### **Auxiliary Power Unit**

- Step 1. Make certain that the auxiliary power unit is correctly plugged into the control unit (see Figure 37) and that power is being supplied from the ac outlet for the auxiliary power unit. Use a lamp, radio, or similar device to check the ac outlet.

## Trouble on an Accessory



**Figure 37—Auxiliary Power Unit Connections**

- Step 2. Make sure the accessory with trouble is connected properly.
- Step 3. Count the number of voice terminals, hands-free units, and headset adapters in your system.
- Step 4. Disconnect voice terminals and accessories in your system until the number of terminals, hands-free units, and headset adapters is not more than twenty. But, leave the accessory with trouble properly connected.

***Caution: Disconnecting the auxiliary power unit from the ac power source will interrupt normal service to all outside lines.***

- Step 5. Disconnect the auxiliary power unit from its ac power source.
- Step 6. Disconnect the auxiliary power unit from the control unit.
- Step 7. Plug the control unit power cord into the ac outlet.

Step 8. Perform the action that first revealed the trouble.

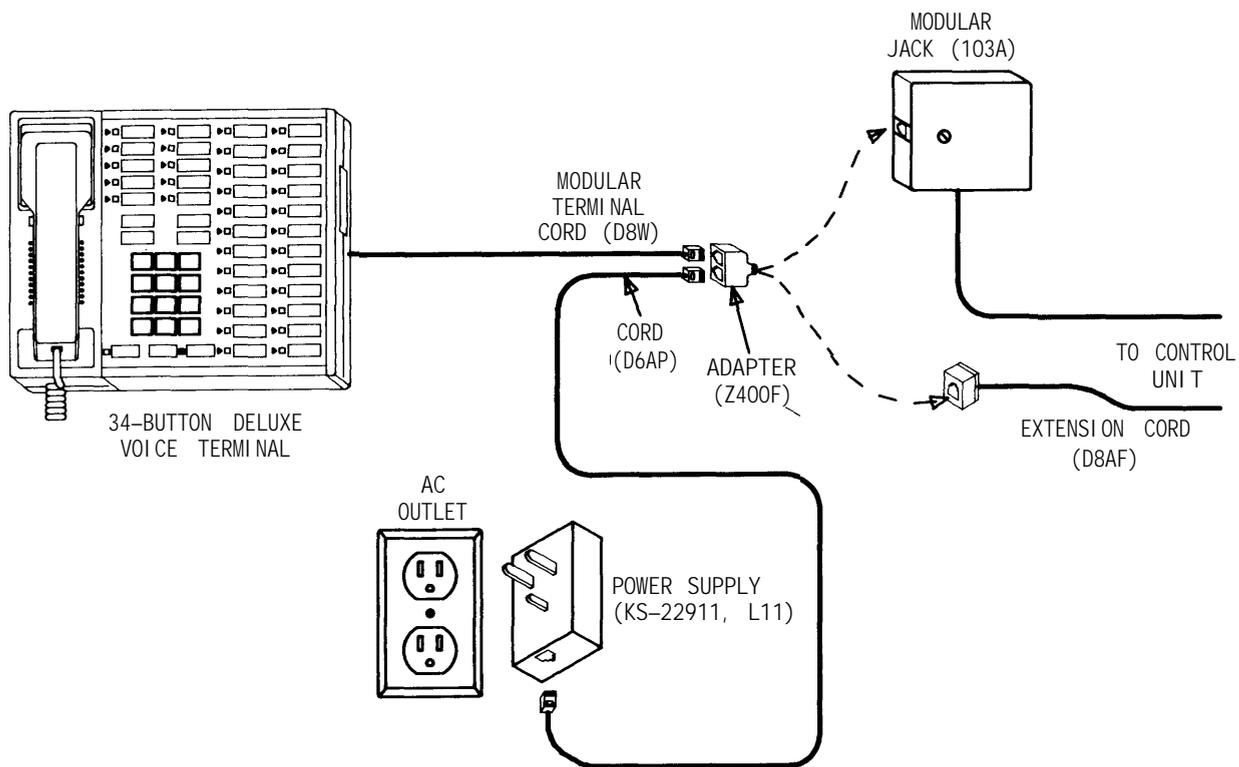
IF	THEN
The trouble remains,	The auxiliary power unit is not the source of the trouble. Go on to Step 9.
The trouble no longer appears,	<p><b><i>Trouble found.</i></b> It is caused by the <i>auxiliary power unit</i>. Do not reconnect the voice terminals and accessories disconnected in Step 4.</p> <p>Read the section on Maintenance Exchange Procedures at the end of this manual.</p>

- Step 9. Reconnect the voice terminals and accessories you disconnected in Step 4.
- Step 10. Unplug the control unit power cord from the ac outlet and plug it into the **AC Outlet** on the auxiliary power unit.
- Step 11. Plug the auxiliary power unit connector into the control unit socket labeled **Auxiliary Power**.
- Step 12. Connect the auxiliary power unit to an ac power source.
- Step 13. Proceed to Test B or Test C for the accessory with trouble.

### Voice Terminal Power Supply

- Step 1. Perform this test only if you have an accessory connected to a 34-button deluxe voice terminal. Make sure the voice terminal power supply is properly connected to the 103A Modular Jack (it can also be connected to a terminal extension cord) and that power is being supplied from the ac outlet for the voice terminal power supply. Use a lamp, radio, or similar device to check the ac outlet (see Figure 38).

## Trouble on an Accessory

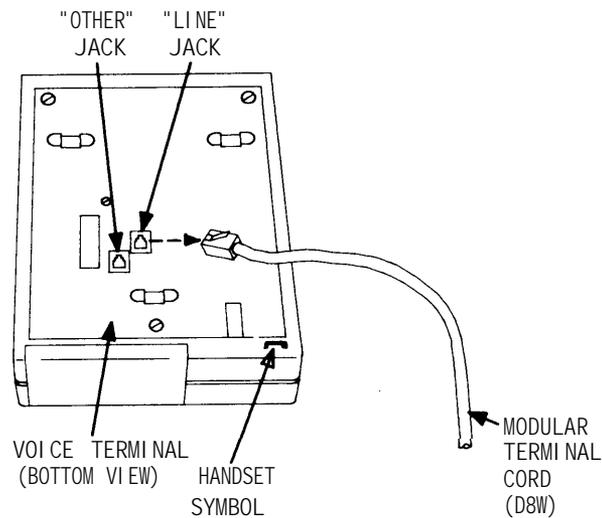


**Figure 38—Voice Terminal Power Supply Connections**

- Step 2. Disconnect the power supply from the ac outlet.
- Step 3. Disconnect the Z400F Adapter from the 103A Modular Jack.
- Step 4. Remove the Modular Terminal Cord (D8W) from the adapter and connect it into the modular jack.
- Step 5. Perform the action that first revealed the trouble.

IF	THEN
The trouble remains,	Go on to Step 6.
The trouble no longer appears.	<p><b>Trouble found.</b> It is caused by the <i>voice terminal power supply</i>. Do not reconnect the power supply.</p> <p>Read the section on Maintenance Exchange Procedures at the end of this manual.</p>

Step 6. Go to three other voice terminals in your system and disconnect the modular terminal cords from the **LINE** jack (see Figure 39).



**Figure 39—Disconnecting Terminal Cord from LINE Jack**

Step 7. Perform the action that first revealed the trouble.

IF	THEN
The trouble remains,	The voice terminal power supply is not the source of the trouble. Go on to Step 8.
The trouble no longer appears.	<p><b>Trouble found.</b> It is caused by the <i>voice terminal power supply</i>. Reconnect the modular terminal cords to the three voice terminals (disconnected in Step 6).</p> <p>Read the section on Maintenance Exchange Procedures at the end of this manual.</p>

Step 8. Reconnect the modular terminal cords to the three voice terminals disconnected in Step 6.

Step 9. Remove the modular terminal cord that was originally connected to the adapter of the voice terminal power supply from the 103A Modular Jack.

Step 10. Connect the Z400F Adapter into the modular jack.

## Trouble on an Accessory

Step 11. Connect the modular terminal cord into the adapter.

Step 12. Connect the power supply into the ac outlet.

Step 13. Proceed to Test B for the accessory with trouble.

### **TEST B: FOR ACCESSORIES ATTACHED TO A VOICE TERMINAL**

Step 1. Make certain that the accessory is securely plugged into the jack labeled **OTHER** on the bottom of the voice terminal. If the trouble remains, go on to Step 2.

Step 2. Unplug the accessory from the voice terminal.

Step 3. Move the accessory to a second voice terminal. Plug it into the jack labeled **OTHER** on the bottom of the voice terminal. Use the accessory to see if the same trouble appears.

<b>IF</b>	<b>THEN</b>
The same trouble appears on the accessory,	<b><i>Trouble found.</i></b> It is caused by the <i>accessory or accessory cord</i> .  Read the section on Maintenance Exchange Procedures at the end of this manual.
The same trouble does not appear on the accessory,	Go on to Step 4.

Step 4. Move the accessory back to the first voice terminal. Plug it into the jack labeled **OTHER** on the bottom of the voice terminal. Use the accessory to determine if the trouble remains.

<b>IF</b>	<b>THEN</b>
The trouble remains,	<b><i>Trouble found.</i></b> It is caused by the original <i>voice terminal</i> .  Read the section on Maintenance Exchange Procedures at the end of this manual.

## TEST C: FOR ACCESSORIES NOT ATTACHED TO A VOICE TERMINAL

Locate the appropriate test (on the following pages) for the accessory in trouble.

### Power Failure Transfer Telephone (PFTT)

**Caution:** *Disconnecting the control unit from the ac power outlet to test the PFTT will interrupt normal service to all outside lines.*

**Note:** The PFTT can be fully tested only if at least one outside line to the local telephone company equipment is working.

Step 1. Make certain that the PFTT is plugged into one of the **Power Fail Lines** jacks on the Type III Cartridge in the control unit.

Step 2. Unplug the control unit from the ac power outlet.

**Warning:** *Unplug the control unit power cord from the ac outlet before inserting or removing a cartridge.*

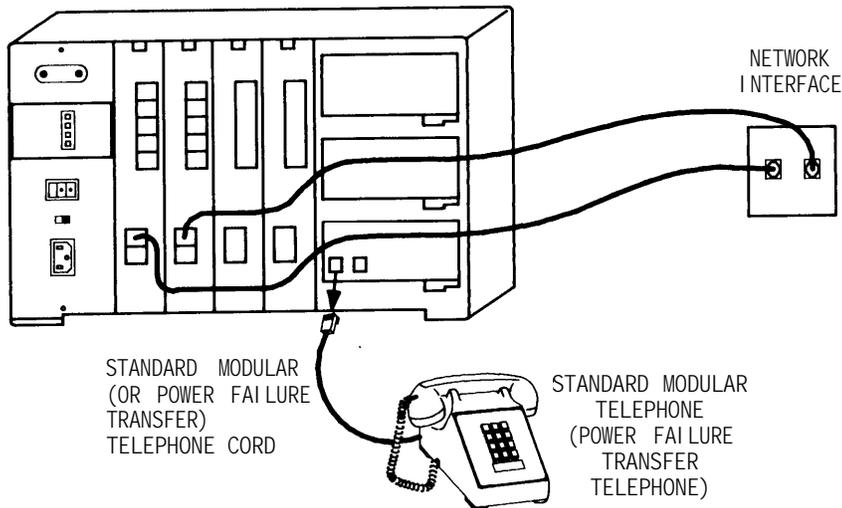
Step 3. Make certain that the Type III Cartridge is properly inserted into the control unit. This can be accomplished by removing the Type III Cartridge from the control unit, then pushing the cartridge slowly and steadily into the control unit until the ridge on the front of the cartridge is aligned with the front panel of the control unit.

Step 4. Lift the PFTT handset and try to make an outside call.

<b>IF</b>	<b>THEN</b>
The call is completed normally,	The PFTT is working. Test complete.
The call cannot be completed normally,	Go on to Step 5.

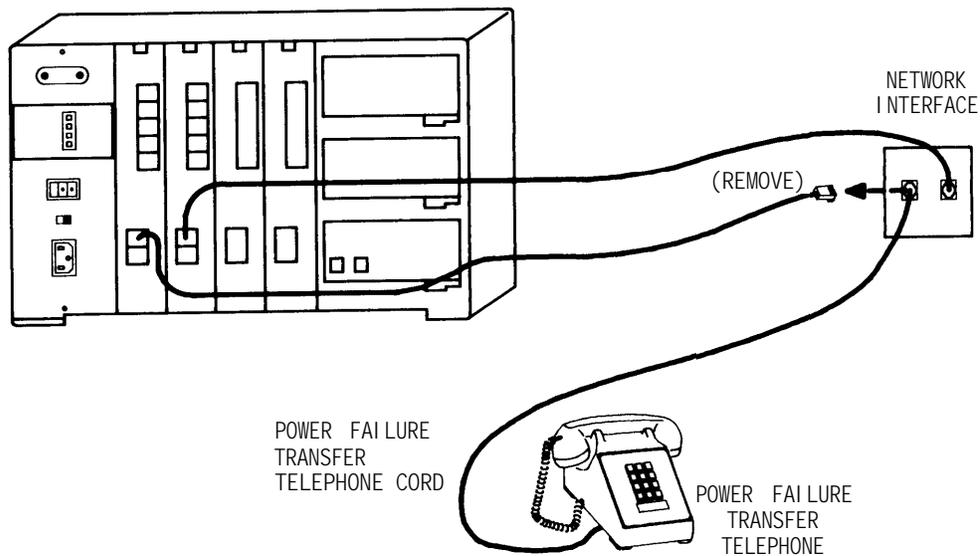
## Trouble on an Accessory

Step 5. Unplug the PFTT from the Type III Cartridge (see Figure 40).



**Figure 40—Unplugging a PFTT from a Type III Cartridge**

Step 6. At the network interface, unplug a modular line cord, then plug the cord of the PFTT into the network interface (see Figure 41).

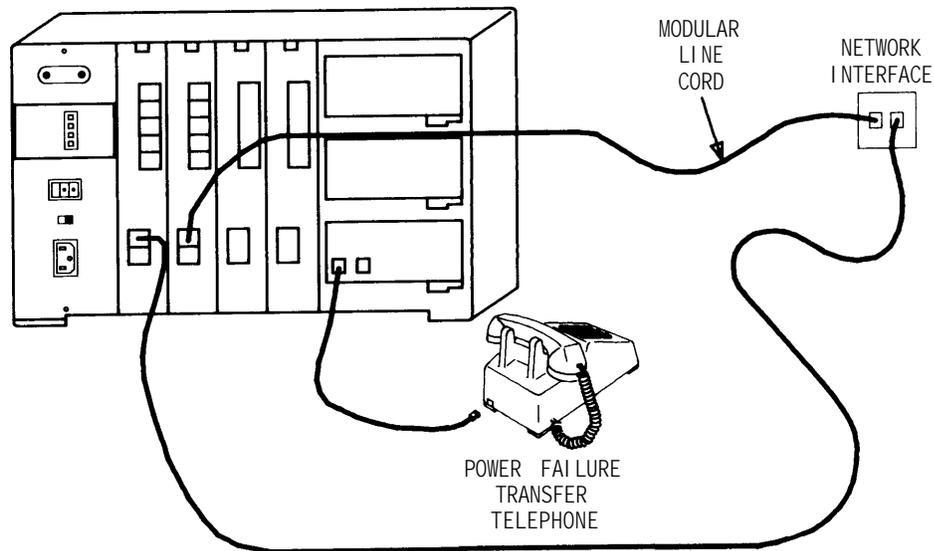


**Figure 41—Plugging a PFTT into the Network Interface**

Step 7. Lift the PFTT handset and try to make an outside call.

<b>IF</b>	<b>THEN</b>
The call is completed normally,	<b>Trouble found.</b> It is either in your <i>Type III Cartridge</i> or in the <i>control unit Type III Cartridge receptacle</i> . Return the modular line cords to their original positions. Reconnect the control unit power cord to the ac outlet. Then read the section on Maintenance Exchange Procedures at the end of this manual.
The call cannot be completed on one outside line,	Repeat from Step 6 for another outside line.
The call cannot be completed on any outside line,	Return the modular line cord and PFTT line cord to their original positions. Go on to Step 8.

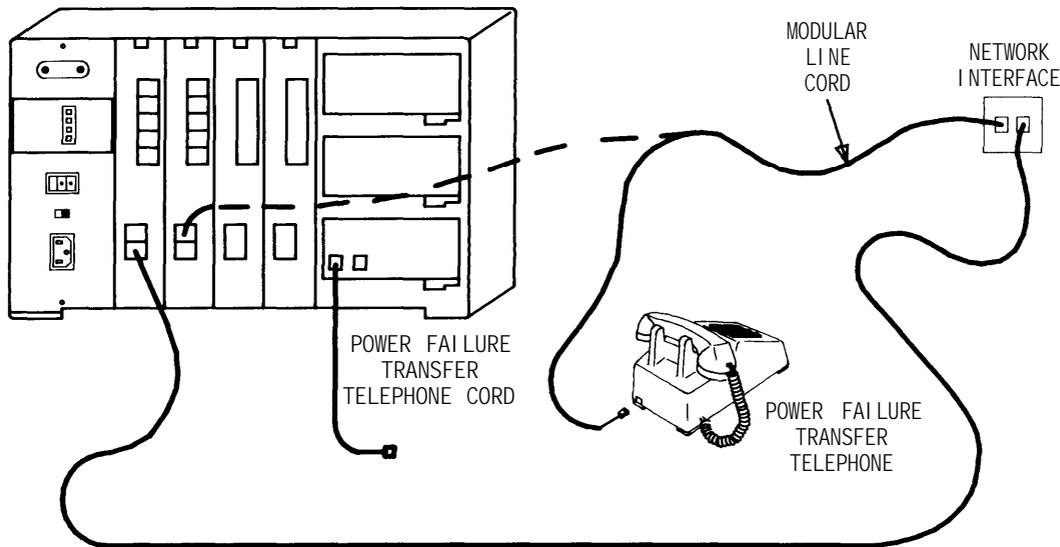
Step 8. Unplug the cord of the PFTT from the base of the telephone (see Figure 42).



**Figure 42—Unplugging the PFTT**

## Trouble on an Accessory

Step 9. At the control unit, unplug a modular line cord from the **Tel. Co. Lines** jack and plug it into the PFTT (see Figure 43).



**Figure 43—Plugging a Modular Line Cord into the PFTT**

Step 10. Place a call using the PFTT.

IF	THEN
The call is completed normally,	<b>Trouble found.</b> It is the <i>PFTT modular line cord connected to the Type III Cartridge</i> . Replace the modular line cords to their original positions. Reconnect the control unit power cord to the ac outlet. Then read the Maintenance Exchange Procedures at the end of this manual.
The call cannot be completed,	<b>Trouble found.</b> It is the <i>PFTT</i> . Replace the modular line cord to its original position. Reconnect the control unit power cord to the ac outlet. Then read the Maintenance Exchange Procedures at the end of this manual.

**Music-on-Hold Equipment**

Step 1. Following the installation and testing instructions in the Customer Information Brochure (CIB 2871) that came with your Type II Cartridge, check the music-on-hold installation.

Step 2. Locate a substitute 8-ohm speaker (with wiring) known to be in working condition.

***DANGER: Hazardous voltages may be present at the speaker terminals on your music source.***

Step 3. Unplug your music source from the ac power outlet. At the music source, disconnect the wires going to the control unit.

Step 4. Connect the two wires of the substitute 8-ohm speaker to the terminals of your music source.

Step 5. Plug the music source into the ac power outlet.

<b>IF</b>	<b>THEN</b>
Music is not heard,	<b><i>Trouble found.</i></b> It is in your <i>music source.</i>
Music is heard,	The source of the trouble is your Type II Cartridge or the wiring to the music source. Go on to Step 6.

***DANGER: Hazardous voltages may be present at the speaker terminals on your music source.***

Step 6. Unplug your music source from the ac power outlet. Temporarily connect substitute wiring between the music source and the Type II Cartridge.

Step 7. Plug the music source into the ac power outlet.

<b>IF</b>	<b>THEN</b>
The trouble is no longer present,	<b><i>Trouble found.</i></b> It is your <i>wiring.</i>
The trouble persists,	Go on to Step 8.

Step 8. The trouble is either in the Type II Cartridge or in the control unit. Read the section on Maintenance Exchange Procedures at the end of this manual.

## Trouble on an Accessory

### Paging System

**Note:** Your paging amplifier must be compatible with the Type II Cartridge output of 500- to 700-ohm impedance at 0 to 10 dBm.

Step 1. Using directions in your paging system manual, test whether your paging amplifier is operational. If it is, go on to Step 2.

**Note:** If a microphone or test signal is not available, momentarily placing the input leads across a small dry-cell (1.5-volt) should produce a loud clicking sound at the speaker.

**Warning:** *Unplug the control unit power cord from the ac outlet before inserting or removing a cartridge.*

Step 2. Make certain that the Type II Cartridge is properly inserted into the control unit.

Step 3. Count the number of speakers connected to your paging system.

IF	THEN
Your paging system only uses one speaker,	Go on to Step 4.
Your paging system uses more than one speaker and none are working,	Go on to Step 4.
Your paging system uses more than one speaker and at least one is working,	<b>Trouble found.</b> One or more of your <i>speakers</i> is defective. Replace the defective speaker(s).

Step 4. Check your Type II Cartridge.

IF	THEN
A music source is connected to the M1 and M2 terminals,	Skip to Step 8.
A music source is not connected to the M1 and M2 terminals,	Go on to Step 5.

Step 5. Check the wiring for physical defects between the paging amplifier and the Type II Cartridge by disconnecting the wires from the **T** and **R** terminals of the cartridge and momentarily placing the wires across a small dry-cell (1.5-volt) battery. This should produce a loud clicking sound at the speaker.

<b>IF</b>	<b>THEN</b>
A wiring defect is found (no sound heard),	Replace the wiring. Go on to Step 6.
A wiring defect is not found (sound heard),	Skip to Step 7.

Step 6. Attempt to page from a voice terminal.

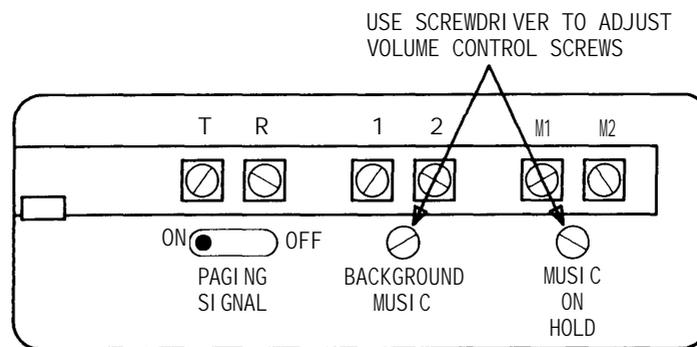
<b>IF</b>	<b>THEN</b>
The trouble is no longer present,	<b><i>Trouble found.</i></b> It was the <i>defective wiring.</i>
The trouble is still present,	Go on to Step 17.

Step 7. The trouble is either in the Type II Cartridge or in the control unit. Read the section on Maintenance Exchange Procedures at the end of this manual.

Step 8. With a music source connected to the Type II Cartridge terminals, M1 and M2, refer to Figure 44 to adjust:

- A. **Music-on-Hold** volume control
- B. **Background Music** volume control
- C. **Paging Signal** switch to ON.

If either the music-on-hold or background music feature is not working, add this information to your notes.



**Figure 44—Adjusting Features on a Type II Cartridge**

Step 9. Identify the trouble and the proper steps to follow with reference to the following tables (A and B).

## Trouble on an Accessory

**Note:** The following test assumes that you have the same music source for music-on-hold and background music.

A. Paging system is not working and:

<b>IF</b>	<b>THEN</b>
Background music is OK. Music-on-hold is either OK or not working,	Skip to Step 17.
Background music is not working. Music-on-hold is OK,	Go on to Step 10.
Background music and music-on-hold are not working,	Skip to Step 12.

B. Paging system is working and:

<b>IF</b>	<b>THEN</b>
Background music is OK. Music-on-hold is not working,	Skip to Step 18.
Background music is not working. Music-on-hold is OK,	Skip to Step 16.
Background music and music-on-hold are not working,	Skip to Step 13.
Background music and music-on-hold are both working, but background music is not cutting off during paging,	Skip to Step 15.

Step 10. Check the wiring for physical defects between the paging amplifier and the Type II Cartridge by disconnecting the wires from the **T** and **R** terminals of the cartridge and momentarily placing the wires across a small dry-cell (1.5-volt) battery. This should produce a loud clicking sound at the speaker.

<b>IF</b>	<b>THEN</b>
A wiring defect is found (no sound heard),	Go on to Step 11.
A wiring defect is not found (sound heard),	Skip to Step 12.

Step 11. Replace the wires between the **T** and **R** screw contacts on the Type II Cartridge (see Figure 44) and the paging amplifier. If the trouble remains, go on to Step 12.

- Step 12. Using your paging system manual, check the operation of the entire paging system. If the paging system is working properly but the trouble remains, skip to Step 18.
- Step 13. Check the music source by doing Steps 2 through 5 in the “Music-on-Hold Equipment” test. The “Music-on-Hold Equipment” test is the test that comes before “Paging System.” If the music source is working properly, go on to Step 14.
- Step 14. Replace the wires between the **M1** and **M2** screw contacts on the Type II Cartridge (see Figure 44) and your music source. If the trouble remains, skip to Step 18.
- Step 15. Using the paging system manual, check the operation of the paging system switch. If the paging system switch is working properly, replace the **1** and **2** wiring (see Figure 44), if used between the Type II Cartridge and the paging amplifier. If the trouble remains, skip to Step 18.
- Step 16. Check the paging system manual to see if (to conserve power) contact closure is required to turn on music; some paging systems turn off when paging is not in use. If contact closure is required, short the contact closures on the paging unit by connecting a wire between these contacts on the paging unit. If the trouble remains, skip to Step 18.
- Step 17. Check the paging system manual to see if contact closure is required to turn on voice paging. If contact closure is required, connect wires from terminals **1** and **2** on the Type II Cartridge to the contact closure terminals on the paging unit. If the trouble remains, go on to Step 18.
- Step 18. The trouble is either in the Type II Cartridge or in the control unit. Read the section on Maintenance Exchange Procedures at the end of this manual.

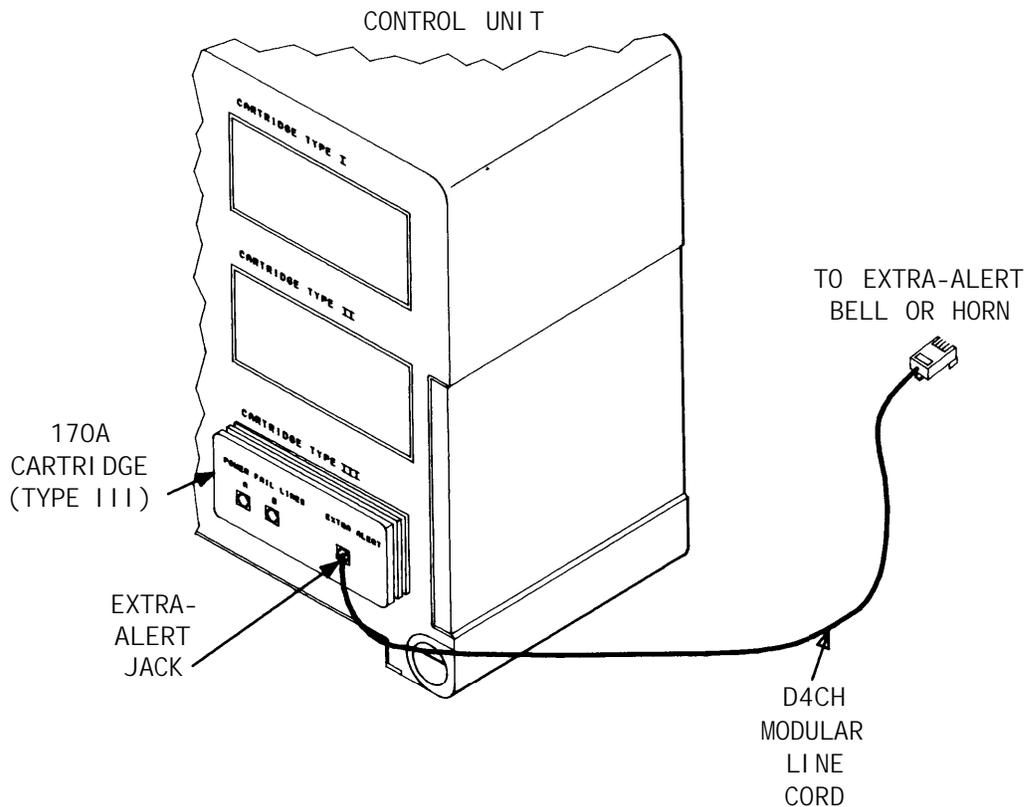
**Extra-Alert Devices**

*Note:* Certain older alerts require a Control Switch (452A-50) to operate. If you have any of these alerts, call your equipment supplier for help.

- Step 1. Check the modular line cords between the Type III Cartridge and the Extra Alert. Replace the modular line cord between the extra alert and the Type III Cartridge with another line cord, if available (see Figure 45). Then, using a voice terminal, dial an outside call to the line with the extra-alert device.

<b>IF</b>	<b>THEN</b>
The extra alert works properly,	<b><i>Trouble found.</i></b> It is caused by the <i>modular line cord</i> .
The extra alert does not work,	Return the cords to their original position. Then go on to Step 2.

## Trouble on an Accessory



**Figure 45—Type III Cartridge and Extra-Alert Modular Line Cord**

Step 2. If your extra alert requires a separate 117-volt ac power supply, check that power is being supplied from the ac outlet. Use a lamp, radio, or similar device to check the ac outlet. Be sure to use an ac outlet providing 117-volt ac power, if it is required. Using a voice terminal, dial an outside call to your other line.

IF	THEN
The extra alert works properly,	<b>Trouble found.</b> The extra alert requires 117-volt ac power.
The extra alert does not work,	Go on to Step 3.

Step 3. If you have an optional ON/OFF switch (Wheelock KS-23053,L5) connected between your extra-alert device and the Type III Cartridge, make sure the ON/OFF switch is set to the proper **ON** position. The switch must be set to the **ON** position that corresponds with the extra-alert device you are using. (Figure 46 shows the optional ON/OFF switch.)

<b>IF</b>	<b>THEN</b>
You do not have an ON/OFF switch,	Skip to Step 6.
You have an ON/OFF switch,	Make sure the ON/OFF switch is in the proper <b>ON</b> position. Then go on to Step 4.

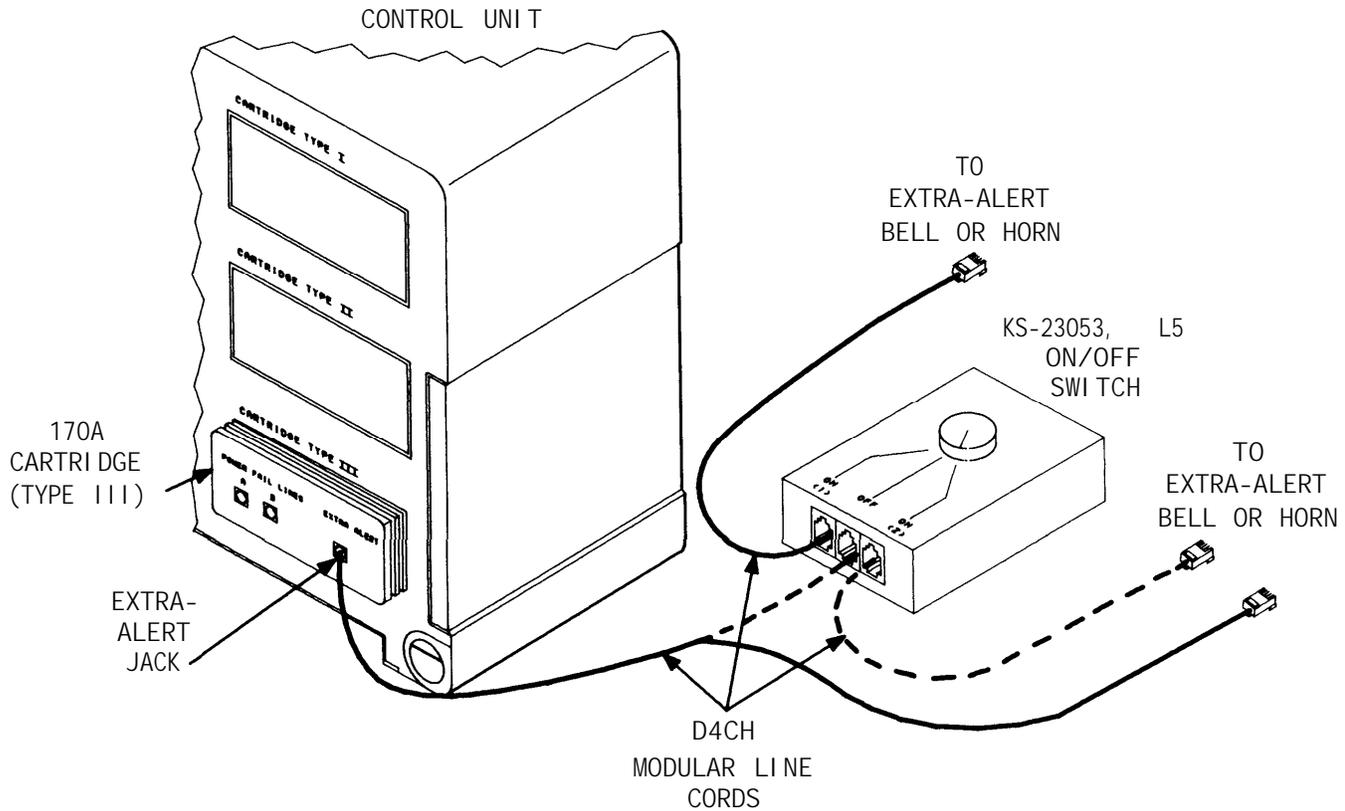
Step 4. Using a voice terminal, dial an outside call to your other line number.

<b>IF</b>	<b>THEN</b>
The extra alert works properly,	<b><i>Trouble found.</i></b> The <i>ON/OFF switch</i> must be set to the proper <b>ON</b> position.
The extra alert does not work,	Go on to Step 5.

Step 5. Disconnect the modular line cord going from the cartridge to the ON/OFF switch and plug it directly into the extra alert (see Figure 46). Using a voice terminal, dial an outside call to your other line.

<b>IF</b>	<b>THEN</b>
The extra alert works properly,	<b><i>Trouble found.</i></b> It is the <i>ON/OFF switch</i> .  Read the section on Maintenance Exchange Procedures at the end of this manual.
The extra alert does not work,	Go on to Step 6.

## Trouble on an Accessory



**Figure 46—Bypassing ON/OFF Switch**

Step 6. Locate a substitute extra-alert device known to be in working condition.

IF	THEN
You have a substitute extra-alert device known to be working properly,	Go on to Step 7.
You do not have a substitute extra-alert device,	Call your equipment supplier for help.

- Step 7. Unplug one malfunctioning extra-alert device from the ac power outlet, if required.
- Step 8. At the malfunctioning extra-alert device, disconnect the modular line cord coming from the Type III Cartridge.
- Step 9. Connect the substitute extra-alert device to the modular line cord coming from the Type III Cartridge.

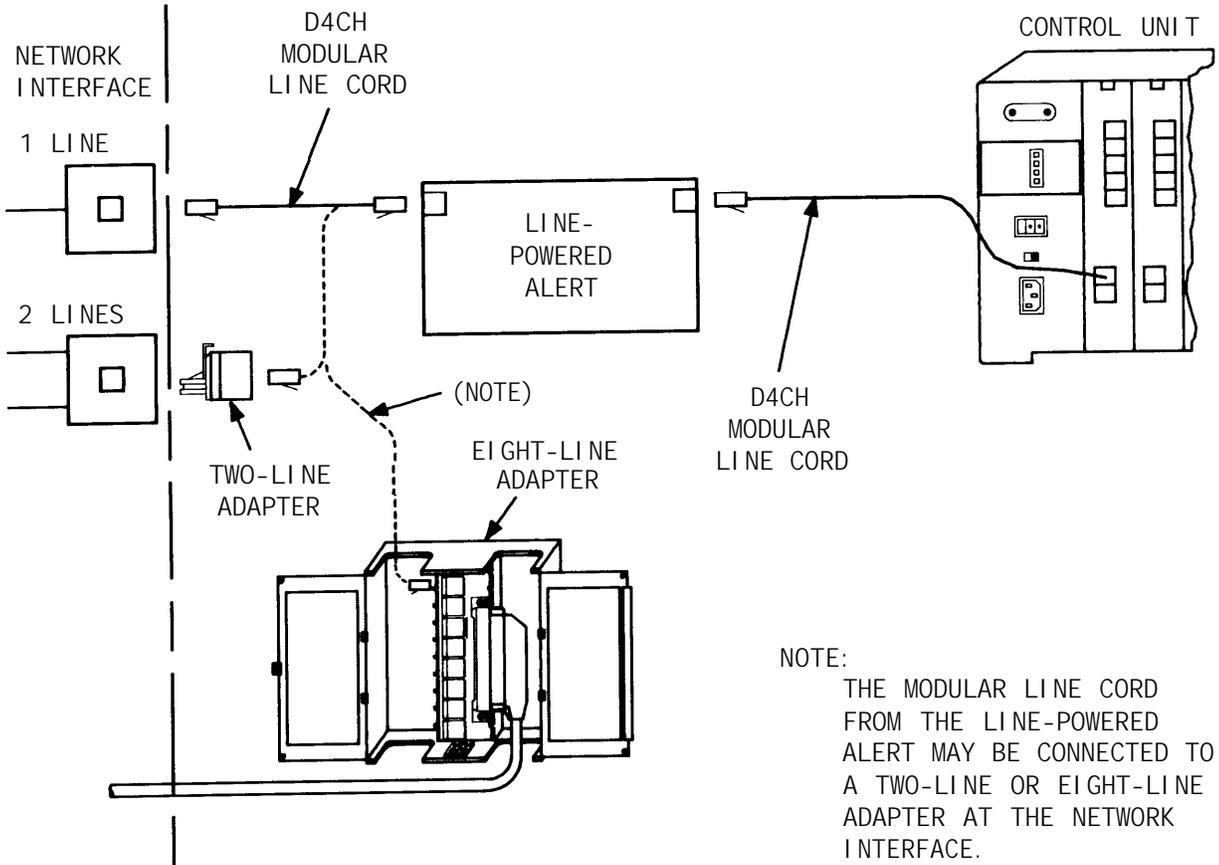
- Step 10. Plug the substitute extra-alert device into the ac power outlet, if required.
- Step 11. Using a voice terminal, dial an outside call to the line with the substitute extra-alert device.

<b>IF</b>	<b>THEN</b>
The substitute extra-alert device works properly,	<b><i>Trouble found.</i></b> It is the original <i>extra-alert device</i> .  Read the Maintenance Exchange Procedures at the end of this manual.
The substitute extra-alert device does not work,	<b><i>Trouble found.</i></b> It is caused by the <i>control unit or the Type III Cartridge connected into the control unit</i> . Reconnect the original extra-alert device. Then read the Maintenance Exchange Procedures at the end of this manual.

## Trouble on an Accessory

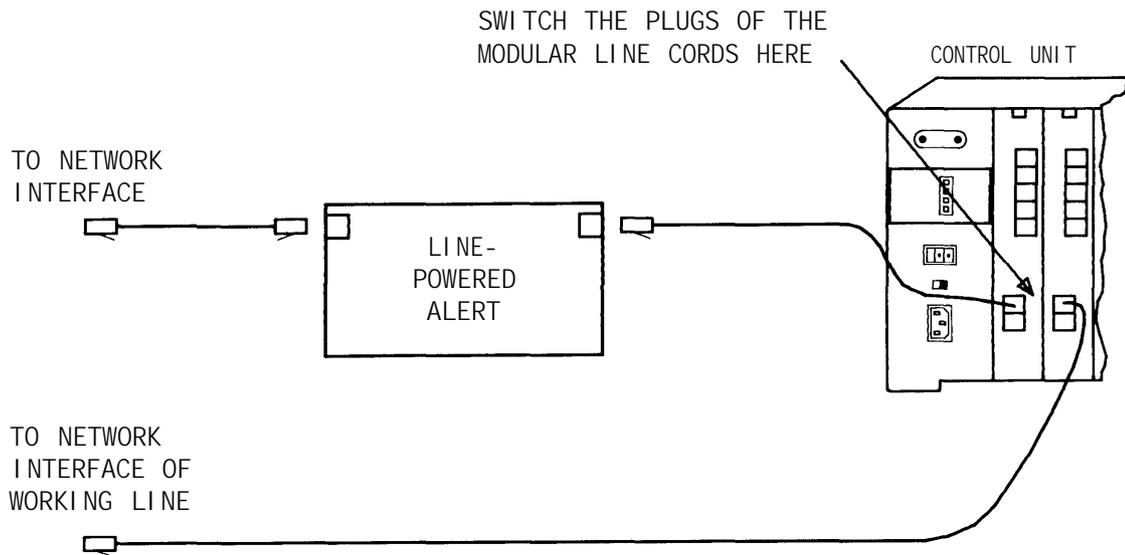
### Line-Powered Alerts

- Step 1. Check the modular line cords between the network interface, line powered ringer, and the control unit (see Figure 47).



**Figure 47—Line-Powered Alert Connections**

Step 2. At the control unit, switch the modular line cord plug of a line known to be working with the plug of the line cord connected to the line-powered alert (see Figure 48).



**Figure 48—Line Cord Plug Switch**

Step 3. Place a call using the line known to be working. If the call can be completed, then have the person you called return your call using the telephone number of the line known to be working.

<b>IF</b>	<b>THEN</b>
The call cannot be completed or the person was unable to return your call,	<b>Trouble found.</b> It is caused by the <i>control unit or expansion module</i> connected to the line cord known to be working. Go to the "Tel. Co. Lines Test" section of "TROUBLE ON MORE THAN ONE VOICE TERMINAL" to determine which component is causing the problem.
The call can be completed and the person was able to return your call,	Return the cords to their original positions, then go on to Step 4.

## Trouble on an Accessory

Step 4. Determine if you have a standard telephone with a modular cord/plug.

**Note:** You may be using a standard telephone with a modular cord/plug as a power failure transfer telephone. The power failure transfer telephone is the telephone connected to the Type III Cartridge in the control unit. The power failure transfer telephone can be used for this test, but a Model 820 voice terminal cannot.

<b>IF</b>	<b>THEN</b>
You have a standard telephone with a modular cord/plug (it must also be compatible with the tone or rotary dialing service provided by the local telephone company),	Go on to Step 5.
You do not have a standard telephone with a modular cord/plug,	Skip to Step 8.

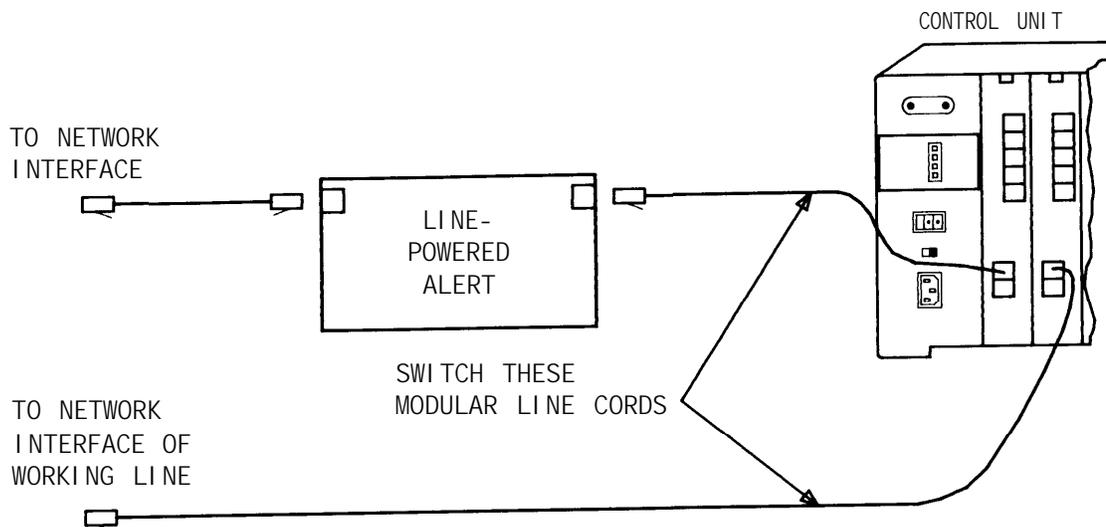
Step 5. Remove the Modular Line Cord (D4CH), that extends to the line-powered alert, from the network interface.

Step 6. Plug the cord of the standard telephone into the network interface and make an outward call.

<b>IF</b>	<b>THEN</b>
The call cannot be completed,	The trouble is caused by the local telephone company equipment. <b>You may have a two-line or eight-line adapter connecting the line with trouble to the network interface. If you have not checked the adapter, it could be causing the trouble.</b> Call your local telephone company to report the line with trouble.
The call is completed,	Go on to Step 7.

Step 7. Unplug the cord of the standard telephone from the network interface, then plug the modular line cord that extends from the line-powered alert back into the network interface.

Step 8. Switch the modular line cord of the line known to be working with the modular line cord connected between the line-powered alert and the control unit (see Figure 49).



**Figure 49—Switching Line Cords to Test Line-Powered Alert**

Step 9. Place a call using a voice terminal that has the telephone number of the line with the line-powered alert (consult your system directory).

IF	THEN
The call is completed,	<p><b>Trouble found.</b> It is caused by the modular line cord originally connecting the line-powered alert to the control unit.</p> <p>Read the Maintenance Exchange Procedures section at the end of this manual.</p>
The call cannot be completed,	<p><b>Trouble found.</b> It is caused by the line-powered alert or the modular line cord connecting the line-powered alert and the network interface. (This cord was shipped with the line-powered alert.)</p> <p>Read the Maintenance Exchange Procedures section at the end of this manual.</p>

# MAINTENANCE EXCHANGE PROCEDURES

If you elect to do your own troubleshooting to isolate a faulty component of your Model 820, an exchange service is available so that you can obtain working replacements (see Note). This service is available for all systems purchased or leased from AT&T Information Systems. (Otherwise, contact the agent from whom you purchased. The arrangements may be similar.) Service is offered at no extra charge under your lease agreement or during the warranty period of a purchased system. There are two options:

1. **Carry-In:** Take your faulty equipment to the Exchange Point nearest you. You will receive a working replacement in exchange.
2. **Mail-In:** Ship faulty equipment to an Exchange Point. A replacement unit will be shipped to you within 24 hours of receipt.

To obtain the address of your Exchange Point, call your equipment supplier. If you plan to use mail-in exchange, be sure to specify this, since not all Exchange Points offer this option. If you plan to go to the Exchange Point yourself, the equipment supplier can provide travel directions.

When packing defective equipment for shipment to the Exchange Point, please follow these steps:

1. Use the original carton and packing material. If these are not available, use a sturdy carton and cushion the equipment with layers of newspaper, plastic foam, etc. Do not leave equipment free to move inside the carton.
2. Complete the Maintenance Exchange Form at the end of this manual and place it inside the carton. Please identify your firm as it appears on your Service/Purchase agreement with AT&T Information Systems. Also include your telephone number so that you can be reached if the return will be delayed.
3. Seal the carton securely with strong tape.

**Note:** On-site maintenance is available. You can arrange a maintenance visit by calling your equipment supplier. There is a charge for each maintenance visit if you do not have an on-site maintenance contract. If you are interested in a maintenance contract, contact your equipment supplier.

# IMPORTANT TELEPHONE NUMBERS

When you need HELP: Call your AT&T Information Systems toll-free HELP number 1-800-628-2888. When you call the help number, you may need the serial numbers of your system components.

If you know the nearest AT&T Information Systems representative, write the name and telephone number here. \_\_\_\_\_  
\_\_\_\_\_

For the name and telephone number of the AT&T Information Systems representative nearest you: Call the National Referral Center toll-free number 1-800-247-1212.

If you have a service contract, write your service contract company number here. \_\_\_\_\_

When you need to order parts: Call your AT&T Information Systems toll-free number 1-800-222-PART.

# MAINTENANCE EXCHANGE FORM

I am returning the following defective equipment for exchange:

<b>QTY</b>	<b>ITEM</b>	<b>DEFECT</b>
___	_____	_____
___	_____	_____
___	_____	_____
___	_____	_____

YOUR NAME \_\_\_\_\_

YOUR PHONE NUMBER \_\_\_\_\_

FIRM NAME\* \_\_\_\_\_

FIRM ADDRESS\* \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_

\*Name and address as found on your firm's service/purchase contract.

SHIP REPLACEMENT TO:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

# COMPONENT SERIAL NUMBERS

Control Unit: \_\_\_\_\_

Voice Terminals:

_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

Hands-Free Units:

_____	_____	_____
_____	_____	_____

Headset Adapters:

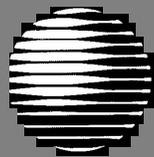
_____	_____	_____
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Extra-Alert Devices:

_____	_____	_____
-------	-------	-------

Other:

_____	_____	_____
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