SLC® Series 5 Carrier System Centralized Operations and Provisioning Installation, Test, and Maintenance

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1. Overview

1.01 This practice contains information concerning installation and maintenance of the centralized operations and provisioning (COP) controller used with the *SLC*® Series 5 Carrier System. Four basic methods of connecting the COP controller are illustrated along with the criteria and restrictions for the equipment used. The method selected depends upon the type of line used and the equipment provided. The COP requires Feature Package C or later. The extended test controller (XTC) controller unit (XCU) must be an MC97761A and the XTC data link unit (XDLU) must be an AUB63B. This practice is written for individuals with a background in telephony and an understanding of basic digital transmission principles.

1.02 This practice is reissued to add the AT&T 6386 SX/EL WGS personal computer (PC) and the NEC 9635E/2 modem to the list of vendor equipment available to support centralized provisioning.

1.03 This practice does not contain any admonishments (danger, warning, or caution).

1.04 To report errors or request changes to this practice, please call the toll-free number: 1-800-334-0404 and give the nine-digit document number (AT&T 363-205-103). To document your request, a feedback form is provided at the back of this practice. If the feedback form is missing, please send your comments and suggestions to:

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1.05 Additional copies of this practice may be ordered from the AT&T Customer Information Center by using one of the following applicable methods:

(a) **AT&T Employees:**
AT&T employees should process their orders as follows:

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  or

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Call 1-800-432-6600.

1.06 AT&T will provide customer assistance on the *SLC* Series 5 Carrier System including, but not limited to, troubleshooting assistance, technical consultation, operational problem consultation, procedural advice, and emergency recovery assistance from a qualified system support professional from the Regional Technical Assistance Center (RTAC).

Service is provided from the RTAC at 1-800-225-RTAC. This telephone number is monitored 24 hours a day, 7 days a week. During regular business hours your call will be answered by your local regional RTAC. Outside of normal business hours all calls will be answered at a centralized technical assistance center where service-affecting problems will be dispatched immediately to your local RTAC. All other problems will be referred to your local RTAC on the next regular business day.

2. Introduction

2.01 The following four methods of connecting the COP controller (PC) are referred to as:

- Two-wire subscriber line installation
- Two-wire subscriber line installation with security callback
- Private line installation
- Direct connection.

A tested product list follows the descriptions of the four methods of connection. The products listed are not necessarily recommended, although they have been tested and proved to function properly. A listing of switch settings and programming information is also provided.

2.02 The following specifications are required for all equipment used:

- All equipment must be powered from 60 Hz, 110 V AC.
- All equipment must operate at 1,200 baud.
- All equipment must be optioned full duplex, asynchronous, and even parity.
- Bytes used consist of 7 character bits and 1 stop bit.

The following specifications apply only to equipment used on the XDLU side in the central office (CO).

- All equipment must be capable of resuming operation in the event that power is cycled off and on. Options must be switch settable or stored in nonvolatile [Electronically Erasable Programmable Read Only Memory (EEPROM)] memory.
- All equipment must meet J1C182XB universal data shelf (or equivalent) space requirements unless other mounting arrangements are specified by the customer.
- All equipment must operate in the new equipment building standards (NEBS) (TR64) temperature range.

2.03 ***General Modem Requirements:*** The connectors on the device must consist of one female DB 25-pin RS-232 connector (except for internal modems on the PC) and one RJ-11 female modular phone jack or similar jack which will accept an RJ-11 plug.

2.04 ***Criteria for Protocol Converters:***

NOTE:
Throughout this practice the converter is referred to as an RS-232/RS-422 converter. Although the XTC provides an RS-423 interface to the converter, the two interfaces, RS-422 and RS-423, are compatible as long as certain length restrictions are met.

- The device must use a DB-25 connector (female) for the RS-232 connection.
- The device must use a DB-37 connector (female) for the RS-422 connection.
- The device should be configurable for data communication equipment (DCE) communication on the XDLU side and for data terminal equipment (DTE) on the modem or security device side.

  The terms DCE and DTE for this application refer to the data control timing leads of the RS-232C interface. Table A provides a list of the pin numbers, lead names, and signal originations and destinations.

2.05 Additional equipment requirements are listed with each configuration.

2.06 In this practice, the notation "<RETURN>" means to press the carriage return key on the terminal or PC keyboard.

Depending upon the status of the modem, some commands may not be shown upon the cathode ray tube (CRT).

Table A. RS-232C Interface Lead Designations

Pin	Description	From	To
1	Protective Gnd		
2	Transmit Data	DTE	DCE
3	Receive Data	DCE	DTE
4	Request to Send	DTE	DCE
5	Clear to Send	DCE	DTE
6	Data Set Ready	DCE	DTE
7	Signal Gnd		
8	Carrier Detect	DCE	DTE
20	Data Terminal Ready	DTE	DCE
22	Ring Indicator	DCE	DTE

2.07 The following AT&T documents give additional information on COP, Series 5 equipment, and related systems. Check the appropriate numerical index for practice availability.

Document	Title
AT&T 363-205-000	SLC *Series 5 Carrier System, Ordering Guide, Loop Transmission Systems*
AT&T 363-205-100	SLC *Series 5 Carrier System, General Description, Loop Transmission Systems*
AT&T 363-205-103	*Centralized Operations and Provisioning—Installation, Test, and Maintenance*
AT&T 363-205-300	SLC *Series 5 Carrier System, Extended Test Controller Description, Turnup, and Maintenance*
AT&T 363-205-402	SLC *Series 5 Carrier System, Channel Unit Installation, Loop Transmission Systems* (TOP)

2.08 The following drawings also provide additional information:

Number	Title
ED-7C675-10	XTC Field Assembly Guidelines
J1C182-XA	Extended Test Controller
J1C182-XB	*SLC* Series 5 Mounting Shelf & Interconnection Cables for Centralized Operations and Provisioning
J1C182-XC	*SLC* Series 5 Floppy Disk and User's Guide for Centralized Operations and Provisioning
SD-7C127-01	Extended Test Controller

See also the Craft Interface Unit (CIU) User's Guide (Select Code 500-206).

3. Two-Wire Subscriber Line Installations

3.01 Before beginning, acquire all necessary additional equipment (refer to Section 8 — *Necessary Equipment*). You will also need an XDLU2 plug-in and the COP software.

3.02 Figure 1 shows the first method of connecting the COP controller. This method connects the PC to the XTC through the central office switch by means of a pair of modems. An RS-232/RS-422 converter is required for protocol conversion between the PC and the XTC. This method of connection should be used only if adequate security is guaranteed by features of the CO switch; if not, a security callback modem should be used. Failure to provide adequate security procedures could result in severe disruption of services.

3.03 Modem requirements for this configuration are as follows:

Subscriber lines used for the COP controller modems must use data service lines. These lines will be of voice jack quality. For information on the requirements of these lines, see AT&T 314-205-501.

At the PC:

Internal: The modem must support the *Hayes* * "AT" command set (and preferably only that set) for the *Smartmodem 1200* † modem.

The modem must be compatible with expansion slots of the AT&T PC 6300, AT&T PC 6300 WGS, AT&T PC 6386 SX/EL WGS, or the *IBM* ‡ PC XT and should have a switch to select either COM 1 or COM 2.

External: The modem must support the *Hayes* "AT" command set (and preferably only that set) for the *Smartmodem 1200* modem.

At the XDLU:

— The modem must autoanswer when the phone rings. The preferred arrangement is for this to be switch settable.

— The command set must be disabled to prevent the XDLU from changing modem parameters. The preferred arrangement is that the unit have no automatic calling unit (ACU) and therefore no command set.

* Registered trademark of Hayes Microcomputer Products, Inc.

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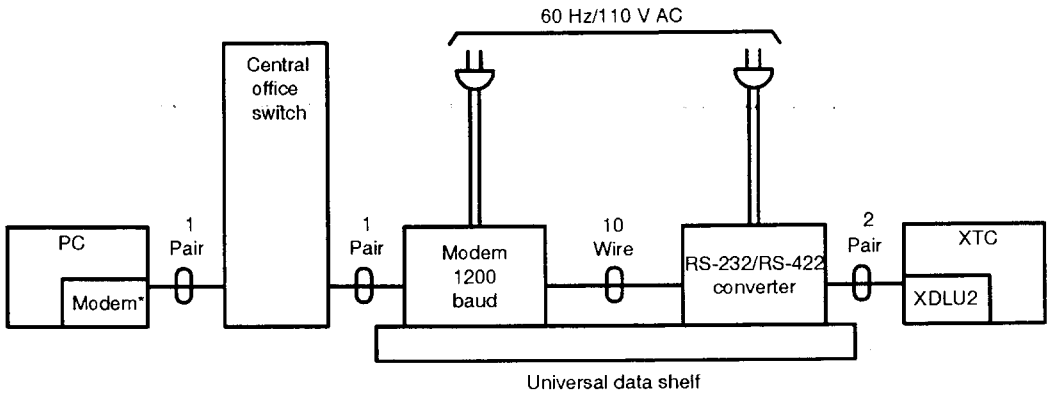
‡ Registered trademark of International Business Machines Corporation.



* Modem may be external to PC.

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Figure 1. COP Controller Configuration Using a 2-Wire Subscriber Line

— All response codes and character echoes sent to the XDLU must be disabled.

— The device must not require active data terminal ready (DTR), ready to send (RTS), or other RS-232 signal leads (excluding transmit and receive) to operate.

Vendor Equipment Needed

3.04 As a guide to the user, Tables B, C, and D provide a list of vendor equipment samples which appear to provide satisfactory performance. Appearance on the list of a particular product is not an endorsement of the product or a guarantee of its usefulness. Equipment manufactured by other vendors is likely to provide equivalent performance but has not been evaluated because of limitations of time and facilities.

3.05 The equipment listed in Tables B, C, and D can be used in any combination (mix and match).

Table B. Personal Computers

PC	Manufacturer
PC 6300 (or PC 6300 WGS) or PC 6386 SX/EL WGS with 10 Megabyte hard disk, 640K RAM and *MS-DOS* * Version 2.1 or later.	AT&T
PC XT with 640K RAM and *MS-DOS* Version 2.1 or later. If an external modem is used, the PC must be equipped with a serial port - COM 1 or COM 2.	*IBM* †

* Registered trademark of Microsoft Corp.

† Registered trademark of International Business Machines Corporation.

Table C. Modems

Location	Modem	Manufacturer
XDLU Side	*Smartmodem 1200* * modem	Hayes Microcomputer Products, Inc. 705 Westech Drive Norcross, GA 30092
	212A	Universal Data Systems (UDS) 5000 Bradford Drive Huntsville, AL 35805-1953
PC Side - Switched Line (Internal)	Model 4112	AT&T
	Smartmodem 1200B * modem	Hayes Microcomputer Products, Inc. 705 Westech Drive Norcross, GA 30092
PC Side - Switched Line (External)	Model 4000	AT&T
	Smartmodem 1200 modem	Hayes Microcomputer Products, Inc. 705 Westech Drive Norcross, GA 30092

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Table D. Protocol Converters

Converter	Manufacturer
RS-232 <> RS-422 interface converter	Black Box Corporation Box 12800 Pittsburgh, PA 15241
ARK * RS-232/422 interface adapter	ARK Electronics Products Inc. 1500 West Nasa Blvd. Melbourne, FL 32902-2169

* Registered trademark of ARK Electronic Products, Inc.

Installation of COP Equipment (XTC Side)

A. RS-422 to RS-232 Converter Installation

3.06 The following installation procedure verifies the operation of the converter box and then the data link from the RS-232 port of the converter box to the XTC.

RS-422 to RS-232 Converter Unit Test By Itself

1. Configure the terminal according to Table E.

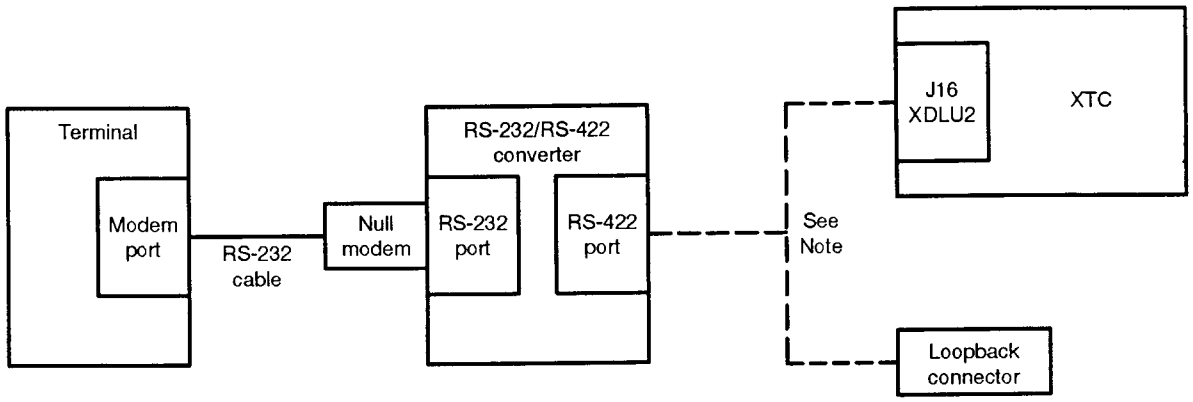
Table E. Terminal Configuration

Feature	Option Settings
Speed or Baud	1200
Parity	Even
Duplex	Full
Monitor Mode	On
Bits Per Character *	7
Stopbit-Length *	1

* Some terminals do not allow for the setting of these parameters. Having a terminal which allows you to change these parameters will make installation easier but is not necessary.

NOTE:
Enabling monitor mode means that the terminal screen will display the special American standard code for information interchange (ASCII) control characters such as ENQ, ACK, EOT, and so forth.

2. Configure the converter as shown in Section 7 — *Equipment Programming*.
3. Connect the RS-449 loopback connector, listed in Section 8 — *Necessary Equipment*), to the RS-422 port of the converter as shown in Figure 2.
4. Connect the terminal to the RS-232 port of the converter by means of the null modem, listed in Section 8 — *Necessary Equipment*), as shown in Figure 2.



Note: The loopback connector is used first to test the converter box by itself. After the converter has been tested, the connection will then be made to the XTC.

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Figure 2. Protocol Converter Test Connections

5. Power up the converter unit.
6. From the terminal keyboard, type in several characters.

   If the characters are not displayed on the terminal CRT:

   (a) Check the configuration of the converter box.

   (b) Check the cabling from the terminal to the converter box.

   (c) Check the loopback connector.

   (d) Consult the converter box user's manual.

   (e) Consult the manufacturer.

7. Disconnect the loopback connector on the RS-422 port.

RS-422 to RS-232 Converter Box Installation to the XTC

1. Install the cable W1 (ED-7C697-20, G1) between the XTC's XDLU2 (J16 connector) and the RS-422 port of the converter box. See the XTC SD (SD-7C127-01), Issue 5M or later, cable assembly drawing (CAD) 86 for more information.
2. Plug in the XDLU2.
3. When the XDLU2 comes out of reset, an ASCII "U" and "ENQ" (ENQ; Control-e) should be displayed repeatedly on the terminal CRT. The characters will appear approximately every four seconds and the sequence is one ASCII "U" followed by four "ENQs." If no characters or "garbage" characters are displayed:
   (a) Check the terminal settings.
   (b) Check the continuity of the cable between the XTC and the converter box.
   (c) Replace the XDLU2.
   (d) Repeat the loopback test for the converter.
4. Once the characters are displayed on the terminal CRT, use the terminal keyboard to enter an "ACK" (ACK; control-f) and a "!".
5. The two characters typed in will be echoed back to the terminal CRT along with the message appearing in Figure 3.

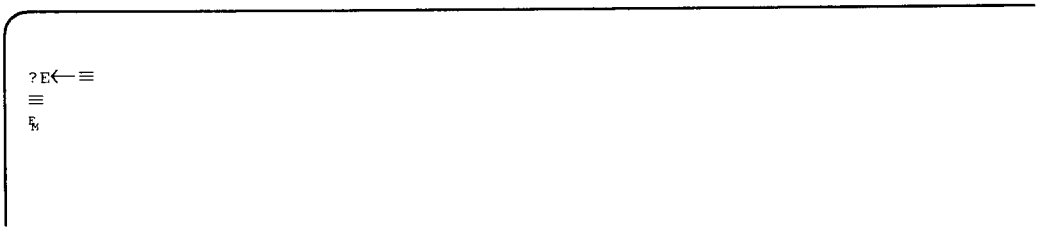


Figure 3. Terminal CRT Display

NOTE:
The carriage return and line feed characters may be evidenced only by the change of cursor position.

Then, the ASCII "U" and "ENQ" should be displayed repeatedly and in the same sequence as stated previously in Step 3.

If the preceding display was not returned to the terminal CRT:

(a) Check the continuity of the cable between the XTC and the converter box.

(b) Replace the XDLU2.

(c) Repeat the loopback test for the converter.

6. Disconnect the terminal cable and the null modem from the converter.

B. Modem Installation XTC Side

3.07 The following installation procedure verifies the operation of the modem by itself and then in conjunction with the converter box and the XTC.

Verification of Modem Operation

1. Configure the terminal according to Table F if not previously configured.

Table F. Terminal Configuration

Feature	Option Settings
Speed or Baud	1200
Parity	Even
Duplex	Full
Monitor Mode	On
Bits Per Character *	7
Stopbit-Length *	1

* Some terminals do not allow for the setting of these parameters. Having a terminal which allows you to change these parameters will make installation easier but is not necessary.

NOTE:
Enabling monitor mode means that the terminal screen will display the special ASCII control characters such as ENQ, ACK, EOT, and so forth.

2. Connect the terminal to the RS-232 port of the modem as shown in Figure 4.
3. Analog Loopback Test:

(A) *Hayes Smartmodem 1200* modem

(1) Set the switches on the modem as shown in Section 7 — *Equipment Programming* with the following exception:

Switch 3: Down (Result codes sent)

(2) Power up the modem.

(3) Enter the following command by means of the terminal:
AT <RETURN>
The modem will respond with: **OK**

If this response does not occur:

(a) Check the settings of the terminal.

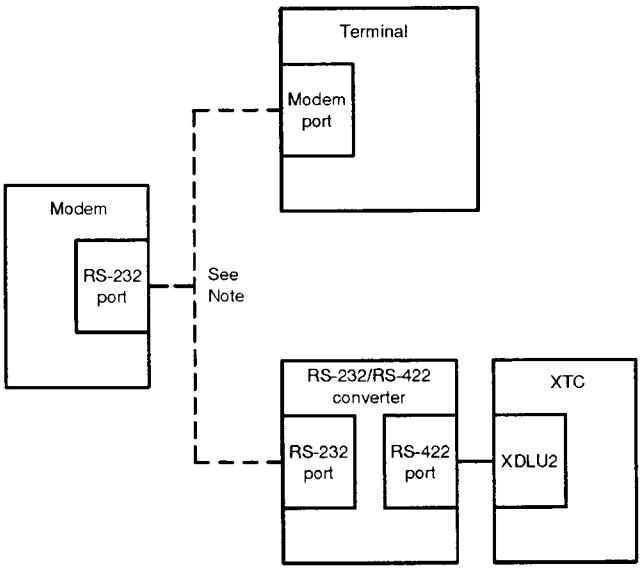
(b) Check the switch settings of the modem.

(c) Check the cable between the modem and the terminal.

(d) Consult the user's manual of the modem.

(e) Consult the modem manufacturer.

(4) Put the modem into Analog Loopback (Answer) Mode by entering the following command: **ATS16=1A** <RETURN>
The modem will respond: **CONNECT**.



Note: When verifying the operation of the modem, the terminal will be connected to the RS-232 port of the modem. When the operation of the modem has been verified, the RS-232 port of the modem will be connected to the RS-232 port of the converter unit.

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Figure 4. Modem Test Connections

(5) The following LEDs must be lighted on the front of the modem and all characters entered on the terminal keyboard will be displayed on the terminal CRT:

HS	High Speed
AA	Auto-Answer (if provided)
CD	Carrier Detect
OH	Off-Hook
TR	Terminal Ready
MR	Modem Ready

If this response does not occur:

(a) Check the execution of the Analog Loopback Command.

(b) Check the settings of the terminal.

(c) Check the switch settings of the modem.

(d) Check the cable between the modem and the terminal.

(e) Consult the user's manual of the modem.

(f) Consult the modem manufacturer.

(6) Return to the command mode by entering the escape command +++.
The modem responds with: **OK**.

(7) Take the modem out of the Analog Loopback Mode by entering the command: **ATH** <RETURN>.
The modem responds with: **OK**.

(8) Put the modem into the Analog Loopback (originate) Mode by entering the following command: **ATS16=1D** <RETURN>.
The modem responds with: **CONNECT**.

(9) The following LEDs must be lighted on the front of the modem and all characters entered on the terminal keyboard will be displayed on the terminal CRT:

HS	High Speed
AA	Auto-Answer (if provided)
CD	Carrier Detect
OH	Off-Hook
TR	Terminal Ready
MR	Modem Ready

If this response does not occur:

(a) Check the execution of the Analog Loopback Command.

(b) Check the settings of the terminal.

(c) Check the switch settings of the modem.

(d) Check the cable between the modem and the terminal.

(e) Consult the user's manual of the modem.

(f) Consult the modem manufacturer.

(10) Return to the command mode by entering the escape command **+++.**
The modem responds with: **OK.**

(11) Take the modem out of the Analog Loopback Mode by entering the command **ATH** <RETURN>.
The modem responds with: **OK.**

(12) Power the unit down and place switches as shown in Section 7 — *Equipment Programming.*

(13) Power up the modem and proceed to Step 4.

(B) UDS 212A

(1) Set the switches on the modem as shown in Section 7 — *Equipment Programming.*

(2) Power up the unit.

(3) Put the modem into the Analog Loopback Mode by placing the rotary switch on the front panel in the **AL** position.

(4) Once in the Analog Loopback Mode, all characters entered on the terminal keyboard will be displayed on the terminal CRT.

If this response does not occur:

(a) Check the execution of the Analog Loopback Command.

(b) Check the settings of the terminal.

(c) Check the switch settings of the modem.

(d) Check the cable between the modem and the terminal.

(e) Consult the user's manual of the modem.

(f) Consult the modem manufacturer.

(5) Place the rotary switch on the front of the XTC modem into the **DATA** position.

4. Remove the terminal cable from the RS-232 port of the XTC modem.
5. Connect the RS-232 loopback listed in Section 8 — *Necessary Equipment* to the RS-232 port of the XTC modem.
6. Connect the telephone line to the XTC modem by means of cable W4 (ED-7C698). See the XTC SD (SD-7C127-01), Issue 5M or later, CAD 88 for more information.
7. Connect a temporary line to the modem listed in Section 8 — *Necessary Equipment.*
8. Set the switches on the installation modem as shown in Section 8 — *Necessary Equipment.*
9. Connect the terminal to the RS-232 port of the modem listed in Section 8 — *Necessary Equipment.*
10. Power up the installation modem.
11. Dial up the line assigned to the XTC modem by entering the following command by means of the terminal: **ATDT <phone# of the XTC modem>** <RETURN>.

    NOTE:
    If no response occurs from the keyboard active, recheck the installation modems switches.

12. After the connection has been established the installation modem will respond with **CONNECT**. If the modem returned a **NO CARRIER**:
    (A) Verify that the number dialed was the correct one.
    (B) Verify that the modem on the XTC side has been set-up for autoanswer.
13. Enter random characters from the terminal keyboard.

    The characters entered will be displayed on the terminal CRT.

    If this response does not occur:
    (A) Verify that the connection has been made.
    (B) Check the RS-232 loopback connector.
    (C) Check the settings of the terminal.
    (D) Check the switch settings of the modems.
    (E) Check the cable between the modem and the terminal.
    (F) Consult the user's manual of the modem.
    (G) Consult the modem manufacturer.
14. Put the installation modem in the command state by entering +++. This command may take several seconds to be executed. When it has been executed an **OK** response will be sent by the installation modem.

15. Hang up the modem by entering the command **ATH** <RETURN>. When the command has been executed the modem will return a response of **OK**.
16. Remove the RS-232 loopback connector from the RS-232 port of the XTC modem.

Modem Installation to Converter Box and XTC

1. Connect the RS-232 port of the XTC modem to the RS-232 port of the converter box by means of cable W2 416-1(M-M) INMAC. See the XTC SD (SD-7C127-01), Issue 5M or later, CAD 87 for more information.
   (A) Power down the XTC modem.
   (B) Power up the XTC modem.
2. Dial the phone line connected to the modem on the XTC side by entering the following command: **ATDT<phone # of the XTC modem>** <RETURN>.
3. When the line connection has been made the modem will send the terminal a **CONNECT** message. If the modem returned a **NO CARRIER**:
   (A) Verify that the number dialed was the correct one.
   (B) Verify that the modem on the XTC side has been set-up for auto-answer.
4. A connection to the XTC is now established.
5. Enter an "ACK" (^K; control-f) and "!" when the XTC sends an "ENQ" (^Q; control-e) or an ASCII "**U**". The message sent will be echoed back to the terminal CRT along with the message appearing in Figure 5 from the XTC.

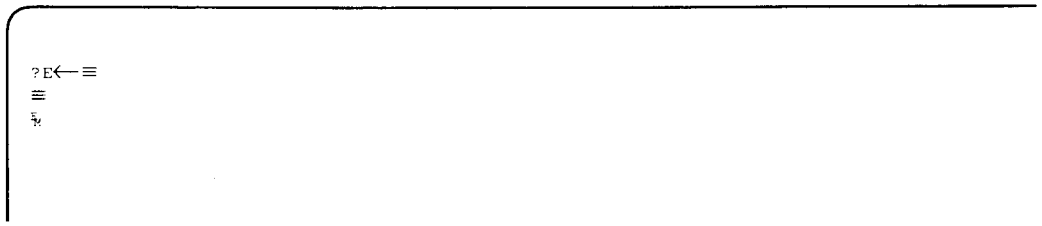


Figure 5. Terminal CRT Display

NOTE:
The carriage return and line feed characters may be evidenced only by the change of cursor position.

Then, the ASCII "U" and "ENQ" (Control-e) should be displayed repeatedly on the terminal CRT. The characters will appear approximately every four seconds and the sequence is one ASCII "U" followed by four "ENQ"s.

If this message was not received, try to isolate the faulty equipment by stepping through the individual sections again.

6. If this message was received, installation of COP on the XTC side is complete.

   (A) Put the installation modem in the command state by entering +++. This command may take several seconds to be executed. When it has been executed, an **OK** response will be sent by the installation modem.

   (B) Hang up the modem by entering the command **ATH** <RETURN>. When the command has been executed, the modem will return a response of **OK**.

   NOTE:
   The installation modem and the temporary line assigned to it are no longer needed and can be removed.

Installation of COP Equipment (PC Side)

3.08 The following installation procedure verifies the operation of the serial port on the PC and the COP controller side modem and completes the installation of the COP equipment. If a modem or serial communications port which plugs into an expansion slot of the PC is to be used, but has not been installed, install that unit now. Consult the product's user manual for information on how to install the unit. Applications using a modem which plugs into the PC do not require the following section on the serial communications port.

3.09 Equipment installed on the PC side will be installed using the COP controller software. This software has the capability to communicate with COM 1 or COM 2. The COM port to be used will depend on how the modem or serial port has been installed in the PC. Changing the port to which the software is communicating can be done using the **F1** function key.

A. Verification of Serial Port Operation

(1) If an *IBM* PC is used, install the serial communications port printed wiring board (PWB) if it has not already been installed. Consult the serial port user's manual for installation information.

(2) Connect the RS-232 loopback connector to the serial communications port of the PC. The gender changer, listed in Section 8 — *Necessary Equipment*, is required.

(3) Power up the PC.

(4) If not already installed, install the COP Controller Software.

(5) Activate the software (see the Centralized Operations and Provisioning User's Guide). Response: "SET-UP ACTIVE" screen is displayed along with the function key selections.

(6) Enter several characters from the PC.

(7) These characters will be printed out on the PC CRT. If they did not print:

(A) Check the loopback connector.

(B) Verify that the serial port of the PC has been installed properly if using an *IBM* PC.

(C) Verify that the COP Controller Software has been installed correctly and the correct COM port is being used.

(8) If the characters were returned, disconnect only the RS-232 loopback connector and proceed to the modem installation section.

B. Verification of Modem Operation

(1) If an external modem is used, proceed to Section 7 — *Equipment Programming* and perform the necessary switch setting and programming.

(2) If an external modem is used, connect the serial port of the COP controller PC to the RS-232 port of the modem by means of cable W6. A gender changer is required at the PC if not previously installed. See the XTC SD (SD-7C127-01), Issue 5M or later, CAD 90 for cabling information.

(3) Power up the modem.

(4) Analog Loopback Test:

(A) AT&T Models 4000 and 4112 modems:

(1) Dial up line applications only, enter the following command by means of the PC: **ATE0** <RETURN>.

(2) The characters **ATE0** sent to the modem will be echoed back to the PC along with a response of **OK**. If this response does not occur:

(a) Verify that the correct COM port is being used.

(b) Verify that the modem is set to echo incoming characters.

(c) Check the switch settings of the modem.

(d) Check the cable between the modem and the PC.

(e) Consult the user's manual of the modem.

(f) Consult the modem manufacturer.

(3) Enter the following command: **AT&T1** <RETURN>.
The modem responds with **OK**.

(4) Once in the Analog Loopback Mode all characters entered on the PC keyboard will be displayed on the PC CRT. If this response does not occur:

(a) Check the execution of the Analog Loopback Command.

(b) Check the switch settings of the modem.

(c) Check the cable between the modem and the PC (not used with 4112).

(d) Consult the user's manual of the modem.

(e) Consult the modem manufacturer.

(5) Return the modem to the command state by entering +++.
The modem responds with **OK**.

(6) Disable the Analog Loopback Mode by entering
AT&T0 <RETURN>.
The modem responds with **OK**.

(B) *Hayes Smartmodem 1200* and *Smartmodem 1200B* modems:

(1) Enter the following command by means of the PC:
ATE0 <RETURN>

(2) The characters sent to the modem will be echoed back to the PC CRT along with **OK**.

If this response does not occur:

(a) Check the switch settings of the modem.

(b) Check the cable between the modem and the PC.

(c) Consult the user's manual of the modem.

(d) Consult the modem manufacturer.

(3) Put the modem into the Analog Loopback (answer) Mode by entering the following command: **ATS16=1A** <RETURN>

⇒ **NOTE:**
These characters will not be echoed back to the PC CRT.

The modem will respond: **CONNECT 1200**.

(4) The following LEDs must be lighted on the front of the external modem, if used, and all characters entered on the PC keyboard will be displayed on the PC CRT:

HS	High Speed
AA	Auto-Answer (if provided)
CD	Carrier Detect
OH	Off-Hook
TR	Terminal Ready
MR	Modem Ready

If this response does not occur:

(a) Check the execution of the Analog Loopback Command.

(b) Check the switch settings of the modem.

(c) Check the cable between the modem and the PC.

(d) Consult the user's manual of the modem.

(e) Consult the modem manufacturer.

(5) Return to the command mode by entering the escape command **+++**.
The modem responds with **OK**.

(6) Hang up the modem by entering the command: **ATH** <RETURN>.
The modem responds with **OK**.

(7) Put the modem into the Analog Loopback (originate) Mode by entering the following command: **ATS16=1D** <RETURN>.
The modem responds with **CONNECT 1200**.

(8) The following LEDs must be lighted on the front of the external modem, if used, and all characters entered on the PC keyboard will be displayed on the PC CRT:

HS	High Speed
AA	Auto-Answer (if provided)
CD	Carrier Detect
OH	Off-Hook
TR	Terminal Ready
MR	Modem Ready

If this response does not occur:

(a) Check the execution of the Analog Loopback Command.

(b) Check the switch settings of the modem.

(c) Check the cable between the modem and the PC.

(d) Consult the user's manual of the modem.

(e) Consult the modem manufacturer.

(9) Return to the command mode by entering the escape command **+++**.
The modem responds with **OK**.

(10) Take the modem out of the Analog Loopback Mode by entering the command **ATH** <RETURN>.
The modem responds with **OK**.

C. Verification of the Data Link to the XTC

(1) Connect a telephone line to the PC side modem (internal or external) by means of cable W4 (ED-7C698). See the XTC SD (SD-7C127-01), Issue 5M or later, CAD 88 for more information.

(2) Dial up the XTC by using the **F7** function key of the PC.

NOTE:
After depressing the **F7** function key, the instructions will be menu driven.

(3) When the software prompts **ENTER TELEPHONE NUMBER FOR THE MODEM**, enter the XTC modem's phone number.

The modem responds with **CONNECT** or **CONNECT 1200** when the line between the modems has been established.

(4) Using the PC's keyboard, enter an "ACK" (^K; control-f) and a "!". The message sent will be echoed back to the PC along with the message appearing in Figure 6.

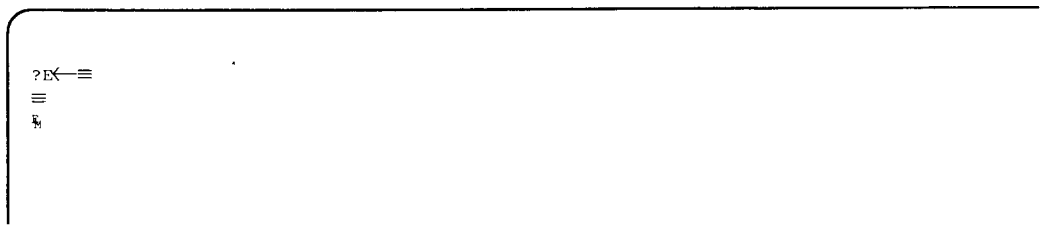


Figure 6. Terminal CRT Display

NOTE:
The carriage return and line feed characters may be evidenced only by the change of cursor position.

If this message was not received, try to isolate the faulty equipment by stepping through the individual sections again.

(5) If the message was correct, installation of the COP controller equipment is complete.

4. Two-Wire Subscriber Line Installations with Security Callback

4.01 Before beginning, acquire all the necessary additional equipment (refer to Section 8 — *Necessary Equipment*). You will also need an XDLU2 plug-in and the COP software.

4.02 Figure 7 shows the second method of connecting the COP controller. This method is identical to the first method with the addition of a security callback feature which is incorporated into the modem.

4.03 ***Criteria for the Security Callback Modem:*** Subscriber lines used for the COP controller modems must use data service lines. These lines will be of voice jack quality. For information on the requirements of these lines, see AT&T 314-205-501.

— The modem must store the lookup table for the callback phone numbers in nonvolatile memory. The preferred arrangement is EEPROM.

— The modem must not require active DTR, RTS or other RS-232 signal leads from the XDLU to operate.

— The modem should support the "AT" command set and preferably only that set. If the modem is not compatible with this command set, the user must determine equivalent operations for modem operations.

— The modem must auto-answer when the phone rings. The preferred arrangement is for this to be switch settable.

— All response codes and character echoes to the XDLU side must be disabled.

— The modem must send "user-friendly" prompts to the remote site, for example, a message to log on such as Please Enter Password.

— The modem must disconnect the user on initial connection if the user is instructed to do so and fails to do so.

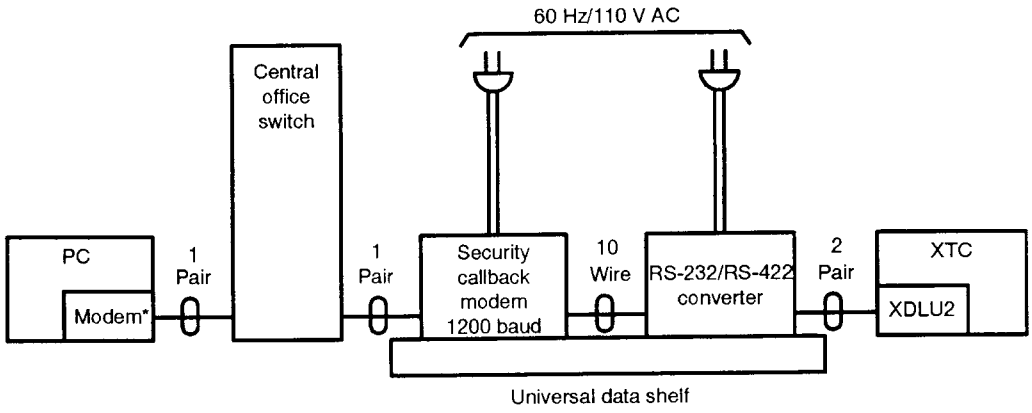
— The unit must **not** be affected by any XCU/XDLU string sent from the XTC during any phase of a call (no call, incoming call with verification in progress, or dial back). The preferred arrangement is that the device not accept commands once it has been programmed.

4.04 ***Modem requirements for the PC side modem:***

Internal: The modem must support the *Hayes* "AT" command set (and preferably only that set) for the *Smartmodem 1200* modem.

The modem must be compatible with expansion slots of the AT&T PC 6300, AT&T PC 6300 WGS, AT&T PC 6386 SX/EL WGS, or the *IBM* PC XT and should have a switch to select either COM 1 or COM 2.

External: The modem must support the *Hayes* "AT" command set (and preferably only that set) for the *Smartmodem 1200* modem.



* Modem may be external to PC.

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Figure 7. **COP Controller Configuration Using a 2-Wire Subscriber Line with Security Callback**

Vendor Equipment Needed

4.05 As a guide to the user, Tables G, H, I, and J provide a list of vendor equipment samples which appear to provide satisfactory performance. Appearance on the list of a particular product is not an endorsement of the product or a guarantee of its usefulness. Equipment manufactured by other vendors is likely to provide equivalent performance but has not been evaluated because of limitations of time and facilities.

4.06 The equipment listed in Tables G, H, I, and J can be used in any combination (mix and match).

Table G. Personal Computers

PC	Manufacturer
PC 6300 (or PC 6300 WGS) or PC 6386 SX/EL WGS with 10 Megabyte hard disk, 640K RAM and *MS-DOS* * Version 2.1 or later.	AT&T
PC XT with 640K RAM and *MS-DOS* Version 2.1 or later. If an external modem is used, the PC must be equipped with a serial port - COM 1 or COM 2.	*IBM* †

* Registered trademark of Microsoft Corp.

† Registered trademark of International Business Machines Corporation.

Table H. Modems

Location	Modem	Manufacturer
PC Side - Switched Line (Internal)	Model 4112	AT&T
	Smartmodem 1200B * modem	Hayes Microcomputer Products, Inc. 705 Westech Drive Norcross, GA 30092
PC Side - Switched Line (External)	Model 4000	AT&T
	Smartmodem 1200 * modem	Hayes Microcomputer Products, Inc. 705 Westech Drive Norcross, GA 30092

* Trademark of Hayes Microcomputer Products, Inc.

Table I. Security Callback Modems

Device	Manufacturer
N2420/30S or N9635E/2 with Security Option	NEC America, Inc. Data Communications Products 110 Rio Robles San Jose, California 95134 (408) 433-1277

Table J. Protocol Converters

Converter	Manufacturer
RS-232 <> RS-422 interface converter	Black Box Corporation Box 12800 Pittsburgh, PA 15241
*ARK** RS-232/422 interface adapter	ARK Electronics Products Inc. 1500 West Nasa Blvd. Melbourne, FL 32902-2169

* Registered trademark of ARK Electronic Products, Inc.

Installation of COP Equipment (XTC Side)

A. RS-422 to RS-232 Converter Installation

4.07 The following installation procedure verifies the operation of the converter box and then the data link from the RS-232 port of the converter box to the XTC.

RS-422 to RS-232 Converter Unit Test By Itself

(1) Configure the terminal according to Table K.

Table K. Terminal Configuration

Feature	Option Settings
Speed or Baud	1200
Parity	Even
Duplex	Full
Monitor Mode	On
Bits Per Character *	7
Stopbit-Length *	1

* Some terminals do not allow for the setting of these parameters. Having a terminal which allows you to change these parameters will make installation easier but is not necessary.

NOTE:
Enabling the Monitor Mode means that the terminal screen will display the special ASCII control characters such as ENQ, ACK, EOT, and so forth.

(2) Configure the converter as shown in Section 7 — *Equipment Programming.*

(3) Connect the RS-449 loopback connector, listed in Section 8 — *Necessary Equipment*, to the RS-422 port of the converter as shown in Figure 8.

(4) Connect the terminal to the RS-232 port of the converter by means of the null modem, listed in Section 8 — *Necessary Equipment*, as shown in Figure 8.

(5) Power up the converter unit.

(6) From the terminal keyboard, type in several characters.

If the characters typed are not displayed on the terminal CRT:

(A) Check the configuration of the converter box.

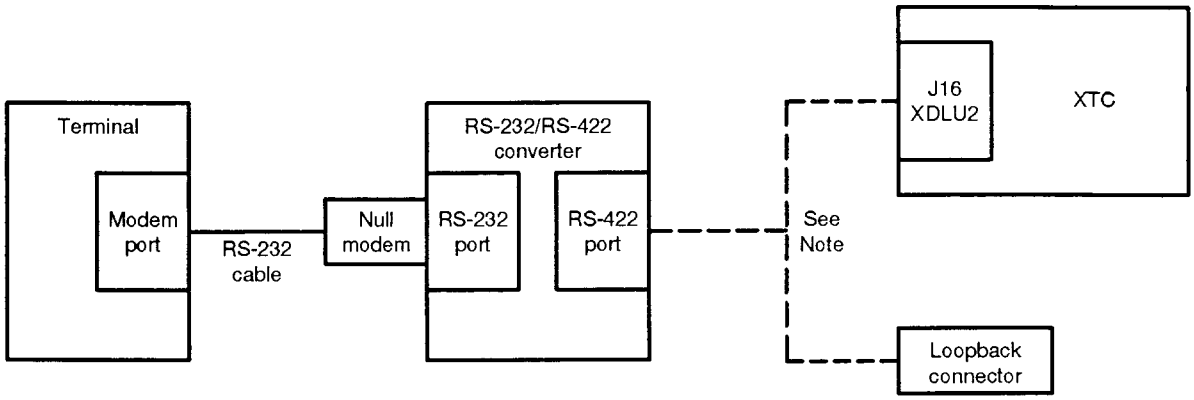
(B) Check the cabling from the terminal to the converter box.

(C) Check the loopback connector.

(D) Consult the converter box user's manual.

(E) Consult the manufacturer.

(7) Disconnect the loopback connector on the RS-422 port.



Note: The loopback connector is used first to test the converter box by itself. After the converter has been tested, the connection will then be made to the XTC.

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Figure 8. Protocol Converter Test Connections

RS-422 to RS-232 Converter Box Installation to the XTC

(1) Install the cable W1 (ED-7C697-20, G1) between the XTC's XDLU2 (J16 connector) and the RS-422 port of the converter box. See the XTC SD (SD-7C127-01), Issue 5M or later, CAD 86 for more information.

(2) Plug in the XDLU2.

(3) When the XDLU2 comes out of reset an ASCII "U" and "EQ" (Control-e) should be displayed repeatedly on the terminal CRT. The characters will appear approximately every four seconds and the sequence is one ASCII "U" followed by four "EQ"s. If no characters or "garbage" characters are displayed:

   (A) Check the terminal settings.

   (B) Check the continuity of the cable between the XTC and the converter box.

   (C) Replace the XDLU2.

   (D) Repeat the loopback test for the converter.

(4) Once the characters are displayed on the terminal CRT, use the terminal keyboard to enter an "AK" (control-f) and a "!".

(5) The two characters typed in will be echoed back to the terminal CRT along with the message appearing in Figure 9.

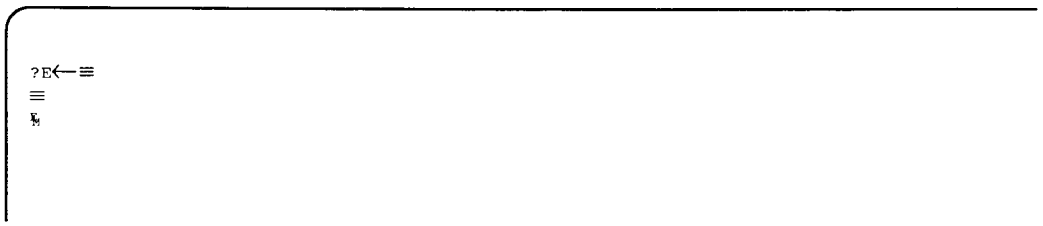


Figure 9. Terminal CRT Display

Then, the ASCII "U" and "Q" should be displayed repeatedly and in the same sequence as stated previously in Step 3.

NOTE:
The carriage return and line feed characters may be evidenced only by the change of cursor position.

(6) If the preceding display was not returned to the terminal CRT:

(A) Check the continuity of the cable between the XTC and the converter box.

(B) Replace the XDLU2.

(C) Repeat the loopback test for the converter.

(7) Disconnect the terminal cable and the null modem from the converter.

B. Security Callback Modem Installation XTC Side

4.08 The following installation procedure verifies the operation of the security callback modem by itself and then in conjunction with the converter box and the XTC.

Verification of Security Callback Modem Operation

(1) Configure the terminal according to Table L if not already configured.

NOTE:
- Enabling the Monitor Mode means that the terminal screen will display the special ASCII control characters such as ENQ, ACK, EOT, and so forth.

(2) Select a security callback modem that fulfills the requirements in this section.

(3) Connect the terminal to the RS-232 port of the security callback modem as shown in Figure 10.

Table L. Terminal Configuration

Feature	Option Settings
Speed or Baud	1200
Parity	Even
Duplex	Full
Monitor Mode	On
Bits Per Character *	7
Stopbit-Length *	1

* Some terminals do not allow for the setting of these parameters. Having a terminal which allows you to change these parameters will make installation easier but is not necessary.

(4) Set the switches on the security callback modem and perform any programming as shown in Section 7 — *Equipment Programming.*

NOTE:
For this procedure, two telephone lines are required and should be programmed at this time.

(A) Installation modem's temporary line and password.

(B) PC side modem's telephone line and password.

(5) Power up the modem.

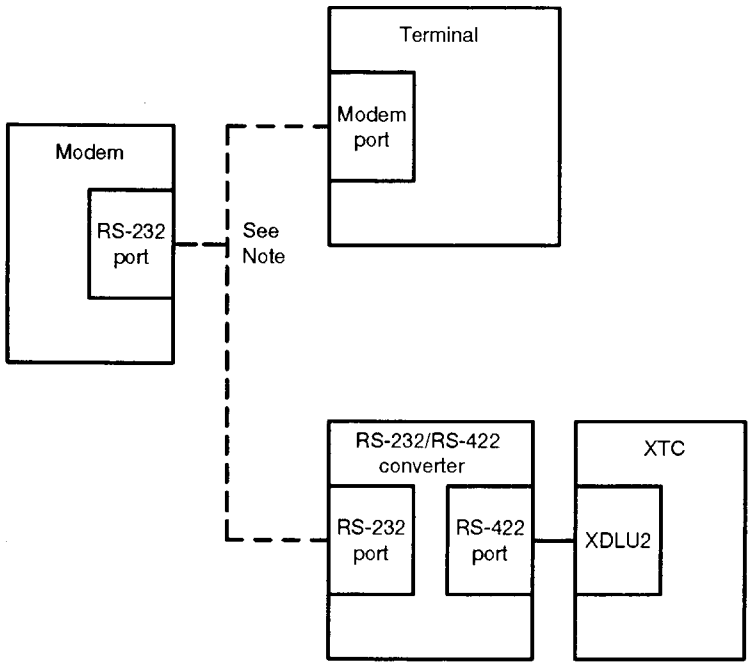
(6) Analog Loopback Test:

NEC Model N2420/30S security callback modem:

(A) Depress the **AL** button on the front panel of the unit.

(B) Enter random characters from the terminal keyboard.

(C) All characters entered on the terminal keyboard are echoed back to the terminal CRT.



Note: When verifying the operation of the security callback modem, the terminal will be connected to the RS-232 port of the modem. When the operation of the security callback modem has been verified, the RS-232 port of the modem will be connected to the RS-232 port of the converter unit.

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Figure 10. Modem Test Connections

If this response does not occur:

(1) Check the execution of the Analog Loopback command.

(2) Check the settings of the terminal.

(3) Check the switch settings of the modem.

(4) Check the cable between the modem and the terminal.

(5) Consult the user's manual of the modem.

(6) Consult the modem manufacturer.

(D) Take the modem out of the Analog Loopback Mode by depressing the **AL** button on the front panel.

(E) Remove the terminal cable from the RS-232 port of the security callback modem.

(F) Connect the RS-232 loopback connector listed in Section 8 — *Necessary Equipment* to the RS-232 port of the security callback modem.

(G) Connect the telephone line to the security callback modem by means of cable W4 (ED-7C698). See the XTC SD (SD-7C127-01), Issue 5M or later, CAD 88 for more information.

(H) Connect a temporary line to the modem listed in Section 8 — *Necessary Equipment.*

NOTE:
The installation modem should be set up for auto-answer; refer to Section 8 — *Necessary Equipment* for the appropriate switch settings.

(I) Connect the terminal to the RS-232 port of the modem listed in Section 8 — *Necessary Equipment.*

(J) Power up the installation modem.

(K) Dial up the line assigned to the security callback modem by entering the following command by means of the terminal: **ATDT <phone# of the security callback modem>** <RETURN>.

(L) After the connection has been established the installation modem will respond with **CONNECT**. If the modem returned a **NO CARRIER**:

(1) Verify that the number dialed was the correct one.

(2) Verify that the security callback modem has been set-up for auto-answer.

(M) The security callback modem will now prompt you for a password. Enter **<your password>** <RETURN>.

NOTE:
This is the password assigned to the installation modems temporary line.

(N) The security callback modem will tear down the line and call you back.

NOTE:
If the modem connected to the temporary line is not set for autoanswer, when the security callback modem returns your call, the following command will answer it for you: **ATA** <RETURN>.

(O) The installation modem responds with **CONNECT** when the line has been set-up between it and the security callback modem.

(P) The security callback modem will now prompt as to whether the call should be completed. Enter: **Y** <RETURN>.

(Q) Enter random characters from the terminal keyboard.

The characters entered will be displayed on the terminal CRT.

If this response does not occur:

(1) Verify that the connection has been made.

(2) Check the RS-232 loopback connector.

(3) Check the settings of the terminal.

(4) Check the switch settings of the modems.

(5) Check the cable between the modem and the terminal.

(6) Consult the user's manual of the modem.

(7) Consult the modem manufacturer.

(R) Remove the RS-232 loopback connector from the RS-232 port of the XTC security callback modem.

(S) Put the installation modem in the command state by entering +++. This command may take several seconds to be executed. When it has been executed an **OK** response will be sent by the installation modem.

(T) Hang-up the modem by entering the command **ATH** <RETURN>. When the command has been executed the modem will return a response of **OK**.

Modem Installation to Converter Box and XTC

(1) Connect the RS-232 port of the XTC security callback modem to the RS-232 port of the converter box by means of cable W2 416-1(M-M) INMAC. See the XTC SD (SD-7C127-01), Issue 5M or later, CAD 87 for more information.

(2) Dial the assigned phone number of the security callback modem on the XTC side by entering the following command: **ATDT<phone # of the XTC security callback modem>** <RETURN>.

(3) When the line connection has been made the modem will send the terminal a **CONNECT** message. If the modem returned a **NO CARRIER**:

(A) Verify that the number dialed was the correct one.

(B) Verify that the modem on the XTC side has been set-up for auto-answer.

(4) The XTC security callback modem prompts for a password. Enter your password <RETURN>.

NOTE:
This is the password assigned to the installation modem and temporary line.

(5) The XTC security callback modem disconnects, calls back, and prompts whether to proceed or not. Enter **Y** <RETURN>.

NOTE:
If the modem connected to the temporary line is not set up for auto-answer, when the security callback modem returns your call, the following command will answer it for you: **ATA** <RETURN>.

A connection to the XTC is now established.

(6) Enter a "^K" (control-f) and "!" when the XTC sends a "^Q" (control-e) or an ASCII "U". The message sent will be echoed back to the terminal CRT along with the message appearing in Figure 11 from the XTC.

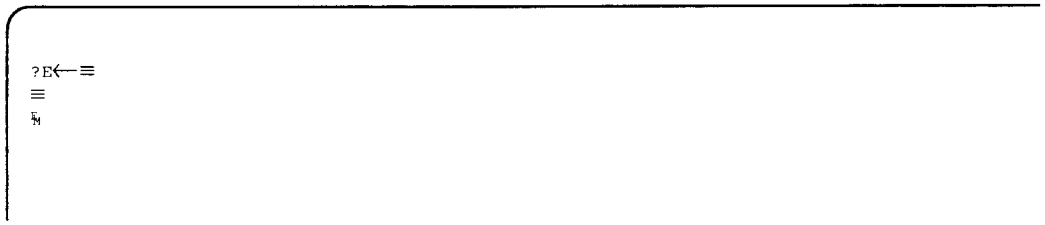


Figure 11. Terminal CRT Display

Then, the ASCII "U" and ENQ (^Q/control-e) should be displayed repeatedly on the terminal CRT. The characters will appear approximately every four seconds and the sequence is one ASCII "U" followed by four ENQs (control-e).

If this message was not received, try to isolate the faulty equipment by stepping through the individual sections again.

NOTE:
The carriage return and line feed characters may be evidenced only by the change of cursor position.

(7) If this message was received, installation of COP on the XTC side is complete.

(8) Put the installation modem in the command state by entering +++. This command may take several seconds to be executed. When it has been executed, an **OK** response will be sent by the installation modem.

Hang-up the modem by entering **ATH** <RETURN>. When the command has been executed, the modem will return a response of **OK**.

(9) At this point, the installation modem and temporary line are no longer needed and can be removed.

(10) It is also recommended that the temporary line phone number and password programmed into the security callback device be removed from the security callback device's memory (refer to the devices manual).

Installation of COP Equipment (PC Side)

4.09 The following installation procedure verifies the operation of the serial port on the PC and the COP controller side modem, and completes the installation of the COP equipment. If a modem or serial communications port which plugs into an expansion slot of the PC is to be used, but has not been installed, install that unit now. Consult the product's user manual for information on how to install the unit. Applications using a modem which plugs into the PC do not require the following section on the serial communications port.

4.10 Equipment installed on the PC side will be installed using the COP controller software. This software has the capability to communicate with COM 1 or COM 2. The COM port to be used will depend on how the modem or serial port has been installed in the PC. Changing the port to which the software is communicating can be done using the **F1** function key.

A. Verification of Serial Port Operation

(1) If an *IBM* PC is used, install the serial communications port PWB if it has not already been installed. Consult the serial port user's manual for installation information.

(2) Connect the RS-232 loopback connector to the serial communications port of the PC. The gender changer cable will have to be used.

(3) Power up the PC.

(4) If not already installed, install the COP Controller Software.

(5) Activate the COP software (see the Centralized Operations and Provisioning User's Guide).
Response: "SET-UP ACTIVE" screen is displayed along with the function key selections.

(6) Enter several characters from the PC. These characters will be printed out on the PC CRT. If they did not print:

(A) Check the loopback connector.

(B) Verify that the serial port of the PC has been installed properly if using an *IBM* PC.

(C) Verify that the COP controller software has been installed correctly and the correct COM port is being used.

(7) If the characters were returned, disconnect only the RS-232 loopback connector and proceed to the modem installation section.

B. Verification of Modem Operation

(1) Proceed to Section 7 — *Equipment Programming* and perform the necessary switch setting and programming. A gender changer is required at the PC if not previously installed.

(2) If an external modem is used, connect the serial port of the COP controller PC to the RS-232 port of the modem by means of cable W6. See the XTC SD (SD-7C127-01), Issue 5M or later, CAD 90 for cabling information. A gender changer is required at the PC if not previously installed.

(3) Power up the modem.

(4) Analog Loopback Test:

(A) AT&T Models 4000 and 4112 modems:

(1) Dial up line applications only, enter the following command by means of the PC: **ATE0** <RETURN>.

(2) The characters **ATE0** sent to the modem will be echoed back to the PC along with a response of **OK**. If this response does not occur:

(a) Verify that the correct COM port is being used.

(b) Verify that the modem is set to echo incoming characters.

(c) Check the switch settings of the modem.

(d) Check the cable between the modem and the PC.

(e) Consult the user's manual of the modem.

(f) Consult the modem manufacturer.

(3) Enter the following command: **AT&T1** <RETURN>. The modem responds with **OK**.

(4) Once in the Analog Loopback Mode all characters entered on the PC keyboard will be displayed on the PC CRT. If this response does not occur:

(a) Check the execution of the Analog Loopback Command.

(b) Check the switch settings of the modem.

(c) Check the cable between the modem and the PC (not used with 4112).

(d) Consult the user's manual of the modem.

(e) Consult the modem manufacturer.

(5) Return the modem to the command state by entering +++. The modem responds with **OK**.

(6) Disable the the Analog Loopback Mode by entering **AT&T0** <RETURN>. The modem responds with **OK**.

(B) *Hayes Smartmodem 1200* and *Smartmodem 1200B* modems:

(1) Enter the following command by means of the PC: **ATE0** <RETURN>

(2) The characters sent to the modem will be echoed back to the PC along with **OK**.

If this response does not occur:

(a) Check the switch settings of the modem.

(b) Check the cable between the modem and the PC.

(c) Consult the user's manual of the modem.

(d) Consult the modem manufacturer.

(3) Put the modem into the Analog Loopback (Answer) Mode by entering the following command: **ATS16=1A** <RETURN>

⇒ **NOTE:**
These characters will not be echoed back to the PC CRT.

The modem will respond with **CONNECT**.

(4) The following LEDs must be lighted on the front of the external modem, if used, and all characters entered on the PC keyboard will be displayed on the terminal CRT:

HS	High Speed
AA	Auto-Answer (if provided)
CD	Carrier Detect
OH	Off-Hook
TR	Terminal Ready
MR	Modem Ready

If this response does not occur:

(a) Check the execution of the Analog Loopback Command.

(b) Check the settings of the terminal.

(c) Check the switch settings of the modem.

(d) Check the cable between the modem and the terminal.

(e) Consult the user's manual of the modem.

(f) Consult the modem manufacturer.

(5) Return to the command mode by entering the escape command **+++**.
The modem responds with **OK**.

(6) Take the modem out of the Analog Loopback Mode by entering the command: **ATH** <RETURN>.
The modem responds with **OK**.

(7) Put the modem into the Analog Loopback (originate) Mode by entering the following command: **ATS16=1D** <RETURN>.
The modem responds with **CONNECT**.

(8) The following LEDs must be lighted on the front of the external modem, if used, and all characters entered on the PC keyboard will be displayed on the terminal CRT:

HS	High Speed
AA	Auto-Answer (if provided)
CD	Carrier Detect
OH	Off-Hook
TR	Terminal Ready
MR	Modem Ready

If this response does not occur:

(a) Check the execution of the Analog Loopback Command.

(b) Check the switch settings of the modem.

(c) Check the cable between the modem and the terminal.

(d) Consult the user's manual of the modem.

(e) Consult the modem manufacturer.

(9) Return to the command mode by entering the escape command **+++**.
The modem responds with **OK**.

(10) Take the modem out of the Analog Loopback Mode by entering the command **ATH** <RETURN>.
The modem responds with **OK**.

C. Verification of the Data Link to the XTC

(1) Connect a telephone line to the PC side modem (internal or external) by means of cable W4 (ED-7C698). See the XTC SD (SD7C127-01), Issue 5M or later, CAD 88 for more information.

(2) Dial up the XTC by using the **F7** function key of the PC.

> **NOTE:**
> After depressing the **F7** function key, the instructions will be menu driven.

(3) When the software prompts **ENTER TELEPHONE NUMBER FOR THE MODEM**, enter the XTC modem's phone number.

The modem responds with **CONNECT** or **CONNECT 1200** when the line between the modems has been established.

(4) Using the PC's keyboard, enter a "^K" (control-f) and a "!". The message sent will be echoed back to the PC along with the message appearing in Figure 12.

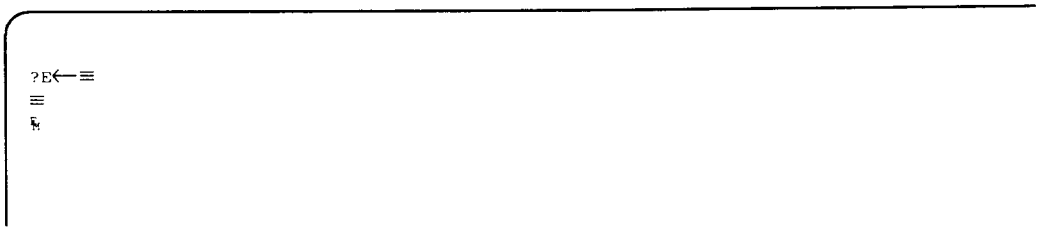


Figure 12. Terminal CRT Display

If this message was not received, try to isolate the faulty equipment by stepping through the individual sections again.

> **NOTE:**
> The carriage return and line feed characters may be evidenced only by the change of cursor position.

(5) If the message was correct, installation of the COP controller equipment is complete.

5. Private Line Installations

5.01 Before beginning, acquire all necessary additional equipment (refer to Section 8 — *Necessary Equipment*). You will also need an XDLU2 plug-in and the COP software.

5.02 Figure 13 shows the third method of connecting the COP controller. This method bypasses the central office switch and requires two private line modems.

5.03 ***Modem requirements for this configuration:*** Minimum requirements for private lines used for the COP controller modems must be of 3002 Voiceband Channel quality. Optional channel conditioning may be used, but it is not necessary.

At the PC:

— The device must be switch settable for continuous call originate or continuous call answer.

— The device must operate with transmission equipment between it and the remote site, for example, repeaters and trunk lines, as well as with a metallic pair.

— The device should be transparent once transmission has been established.

At the XDLU:

— The device must not require active DTR, RTS, or other RS-232 signal leads (excluding transmit and receive) to operate.

— The device must be switch settable for continuous call originate or continuous call answer.

— The device must operate with transmission equipment between it and the remote site, for example, repeaters and trunk lines, as well as with a metallic pair.

— The device should be transparent once transmission has been established.

Vendor Equipment Needed

5.04 As a guide to the user, Tables M, N, and O provide a list of vendor equipment samples which appear to provide satisfactory performance. Appearance on the list of a particular product is not an endorsement of the product or a guarantee of its usefulness. Equipment manufactured by other vendors is likely to provide equivalent performance but has not been evaluated because of limitations of time and facilities.

5.05 The equipment listed in the Tables M, N, and O can be used in any combination (mix and match).

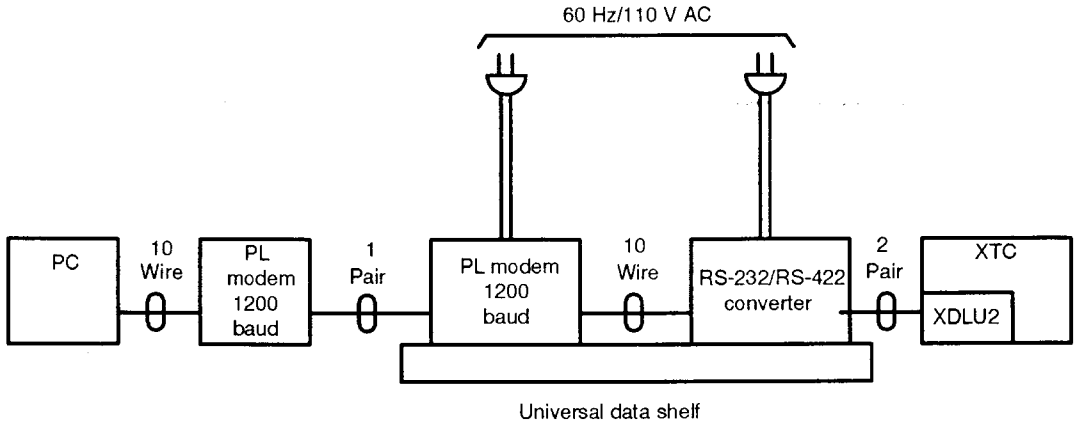


Figure 13. COP Controller Configuration Using a Private Line

Table M. Personal Computers

PC	Manufacturer
PC 6300 (or PC 6300 WGS) or PC 6386 SX/EL WGS with 10 Megabyte hard disk, 640K RAM and *MS-DOS* * Version 2.1 or later.	AT&T
PC XT with 640K RAM and *MS-DOS* Version 2.1 or later. If an external modem is used, the PC must be equipped with a serial port - COM 1 or COM 2.	*IBM* †

* Registered trademark of Microsoft Corp.

† Registered trademark of International Business Machines Corporation.

Table N. Modems

Location	Modem	Manufacturer
XDLU Side - Private Line	212A (2-wire only)	Universal Data Systems (UDS) 5000 Bradford Drive Huntsville, AL 35805-1953
PC Side - Private Line	212A (2-wire only)	Universal Data Systems (UDS) 5000 Bradford Drive Huntsville, AL 35805-1953

Table O. Protocol Converters

Converter	Manufacturer
RS-232 <> RS-422 interface converter	Black Box Corporation Box 12800 Pittsburgh, PA 15241
*ARK** RS-232/422 interface adapter	ARK Electronics Products Inc. 1500 West Nasa Blvd. Melbourne, FL 32902-2169

* Registered trademark of ARK Electronic Products, Inc.

Installation of COP Equipment (XTC Side)

A. RS-422 to RS-232 Converter Installation

5.06 The following installation procedure verifies the operation of the converter box and then the data link from the RS-232 port of the converter box to the XTC.

RS-422 to RS-232 Converter Unit Test By Itself

(1) Configure the terminal according to Table P.

(2) Configure the converter as shown in Section 7 — *Equipment Programming.*

(3) Connect the RS-449 loopback connector, listed in Section 8 — *Necessary Equipment*, to the RS-422 port of the converter as shown in Figure 14.

(4) Connect the terminal to the RS-232 port of the converter by means of the null modem, listed in Section 8 — *Necessary Equipment*, as shown in Figure 14.

Table P. Terminal Configuration

Feature	Option Settings
Speed or Baud	1200
Parity	Even
Duplex	Full
Monitor Mode	On
Bits Per Character *	7
Stopbit-Length *	1

* Some terminals do not allow for the setting of these parameters. Having a terminal which allows you to change these parameters will make installation easier but is not necessary.

NOTE:
Enabling Monitor Mode means that the terminal screen will display the special ASCII control characters such as ENQ, ACK, EOT, and so forth.

(5) Power up the converter unit.

(6) From the terminal keyboard, type in several characters.

If the characters typed are not displayed on the terminal CRT:

(A) Check the configuration of the converter box.

(B) Check the cabling from the terminal to the converter box.

(C) Check the loopback connector.

(D) Consult the converter box user's manual.

(E) Consult the manufacturer.

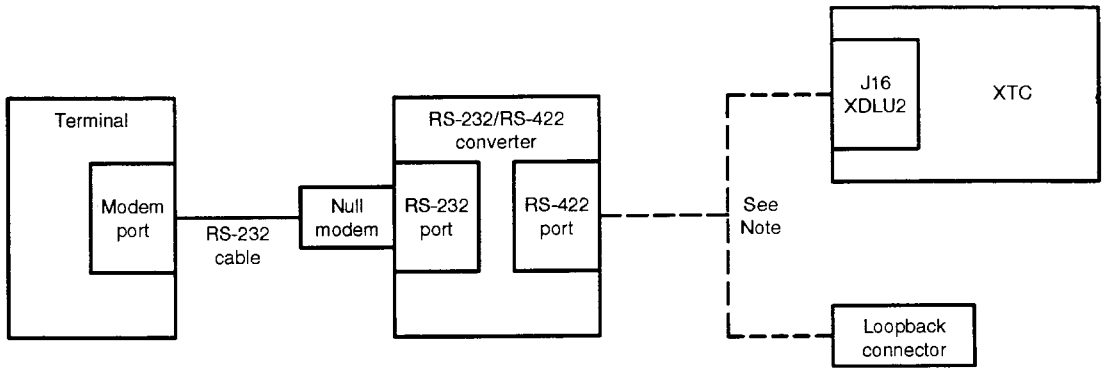
(7) Disconnect the loopback connector on the RS-422 port.

RS-422 to RS-232 Converter Box Installation to the XTC

(1) Install the cable W1 (ED-7C697-20, G1) between the XTC's XDLU2 (J16 connector) and the RS-422 port of the converter box. See the XTC SD (SD-7C127-01), Issue 5M or later, CAD 86 for more information.

(2) Plug in the XDLU2.

(3) When the XDLU2 comes out of reset an ASCII "U" and "ENQ" (Control-e) should be displayed repeatedly on the terminal CRT. The characters will appear



Note: The loopback connector is used first to test the converter box by itself. After the converter has been tested, the connection will then be made to the XTC.

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Figure 14. Protocol Converter Test Connections

approximately every four seconds and the sequence is one ASCII "U" followed by four "EQ"s. If no characters or "garbage" characters are displayed:

(A) Check the terminal settings.

(B) Check the continuity of the cable between the XTC and the converter box.

(C) Replace the XDLU2.

(D) Repeat the loopback test for the converter.

(4) Once the characters are displayed on the terminal CRT, use the terminal keyboard to enter an "AK" (control-f) and a "!".

(5) The two characters typed in will be echoed back to the terminal CRT along with the message appearing in Figure 15.

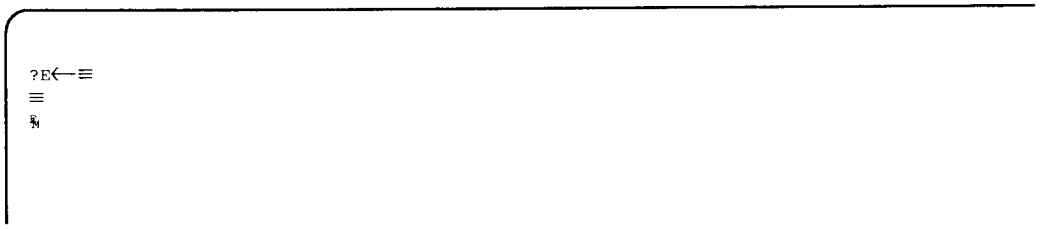


Figure 15. Terminal CRT Display

Then, the ASCII "U" and "EQ" should be displayed repeatedly and in the same sequence as stated previously in Step 3.

NOTE:
The carriage return and line feed characters may be evidenced only by the change of cursor position.

(6) If the preceding display was not returned to the terminal CRT:

(A) Check the continuity of the cable between the XTC and the converter box.

(B) Replace the XDLU2.

(C) Repeat the loopback test for the converter.

(7) Remove the null modem and the terminal cable from the RS-232 port of the converter box.

B. Modem Installation XTC Side

5.07 The following installation procedure verifies the operation of the modem by itself and then in conjunction with the converter box and the XTC.

Verification of Modem Operation

(1) Configure the terminal according to Table Q if not previously configured.

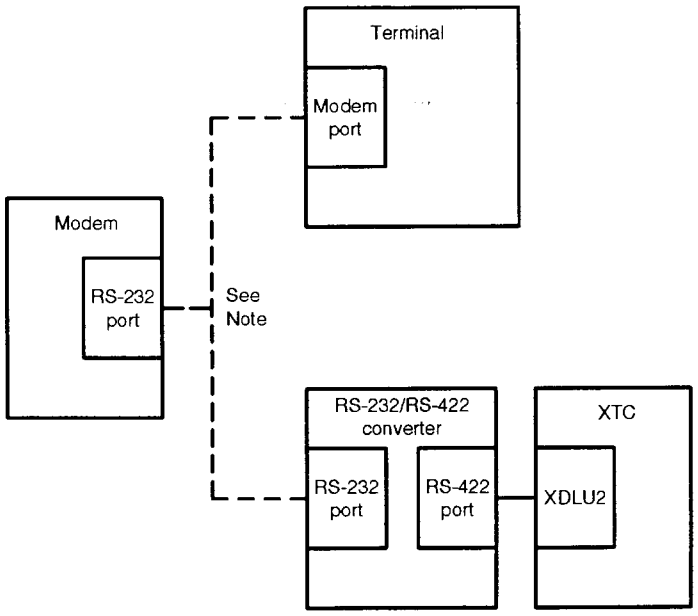
Table Q. Terminal Configuration

Feature	Option Settings
Speed or Baud	1200
Parity	Even
Duplex	Full
Monitor Mode	On
Bits Per Character *	7
Stopbit-Length *	1

* Some terminals do not allow for the setting of these parameters. Having a terminal which allows you to change these parameters will make installation easier but is not necessary.

NOTE:
Enabling the Monitor Mode means that the terminal screen will display the special ASCII control characters such as ENQ, ACK, EOT, and so forth.

(2) Connect the terminal to the RS-232 port of the modem as shown in Figure 16.



Note: When verifying the operation of the modem, the terminal will be connected to the RS-232 port of the modem. When the operation of the modem has been verified, the RS-232 port of the modem will be connected to the RS-232 port of the converter unit.

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Figure 16. Modem Test Connections

(3) Analog Loopback Test:

UDS 212A

(A) Set the switches on the modem as shown in Section 7 — *Equipment Programming.*

(B) Power up the modem.

(C) Put the modem into the Analog Loopback Mode by placing the rotary switch on the front panel in the **AL** position.

(D) Once in the Analog Loopback Mode, all characters entered on the keyboard will be displayed on the terminal CRT.

If this response does not occur:

(1) Check the execution of the Analog Loopback Command.

(2) Check the settings of the terminal.

(3) Check the switch settings of the modem.

(4) Check the cable between the modem and the terminal.

(5) Consult the user's manual of the modem.

(6) Consult the modem manufacturer.

(E) Place the rotary switch on the front of the XTC modem into the **DATA** position.

(4) Remove the terminal cable from the RS-232 port of the XTC modem.

(5) Connect the RS-232 loopback connector listed in Section 8 — *Necessary Equipment* to the RS-232 port of the XTC modem.

(6) Connect the terminal to the RS-232 port of the modem listed in Section 8 — *Necessary Equipment.*

NOTE:
Set the switches on the installation modem as shown in Section 8 — *Necessary Equipment.*

(7) Connect the RJ-11 jack of the XTC modem to the RJ-11 jack of the installation modem.

NOTE:
The installation modem should be set-up for private line operation (call originate) and the XTC modem must be set-up for private line operation (call answer).

(8) The connection is established when the two RJ-11 jacks have been cabled together. No message will be sent to the terminal when the connection is established.

(9) Power up the installation modem.

(10) Enter random characters from the terminal keyboard. The characters entered will be displayed on the terminal CRT. If this response does not occur:

(A) Verify that the connection has been made.

(B) Check the RS-232 loopback connector.

(C) Check the settings of the terminal.

(D) Check the switch settings of the modems.

(E) Check the cable between the modem and the terminal.

(F) Consult the user's manual of the modem.

(G) Consult the modem manufacturer.

(11) Remove the RS-232 loopback connector.

Modem Installation to Converter Box and XTC

(1) Connect the RS-232 port of the XTC modem to the RS-232 port of the converter box by means of cable W2 416-1(M-M) INMAC. See the XTC SD (SD-7C127-01), Issue 5M or later, CAD 87 for more information.

(2) A connection to the XTC is now established.

(3) Enter a "^K" (control-f) and "!" when the XTC sends a "^Q" (control-e) or an ASCII "U". The message sent will be echoed back to the terminal CRT along with the message appearing in Figure 17 from the XTC.

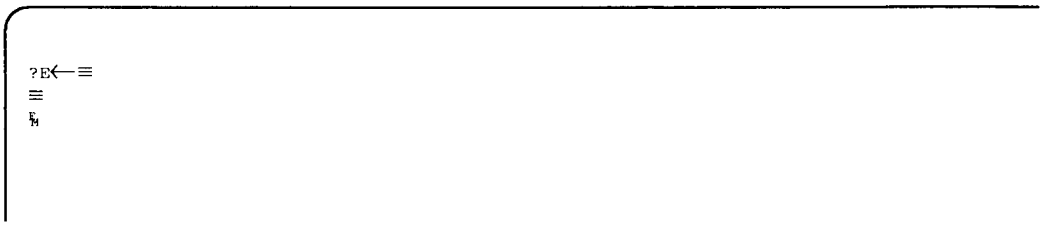


Figure 17. Terminal CRT Display

Then, the ASCII "U" and "^Q" should be displayed repeatedly on the terminal CRT with the characters appearing approximately every four seconds in the following sequence: One "U" followed by four "^Q"s.

If this message was not received, try to isolate the faulty equipment by stepping through the individual sections again.

NOTE:
The carriage return and line feed characters may be evidenced only by the change of cursor position.

(4) If this message was received, installation of COP on the XTC side is complete.

(5) Remove the installation modem and temporary line between the installation modem and the XTC modem.

Installation of COP Equipment (PC Side)

5.08 The following installation procedure verifies the operation of the serial port on the PC and the COP controller side modem, and completes the installation of the COP equipment. If a serial communications port which plugs into an expansion slot of the PC is to be used, but has not been installed, install that unit now. Consult the product's user manual for information on how to install the unit.

Equipment installed on the PC side will be installed using the COP controller software. This software has the capability to communicate with COM 1 or COM 2. The COM port to be used will depend on how the modem or serial port has been installed in the PC. Changing the port to which the software is communicating can be done using the **F1** function key.

A. Verification of Serial Port Operation

(1) If an *IBM* PC is used, install the serial communications port PWB if it has not already been installed. Consult the serial port user's manual for installation information.

(2) Connect the RS-232 loopback connector to the serial communications port of the PC. The gender changer cable will have to be used.

(3) Power up the PC.

(4) If not already installed, install the COP Controller Software.

(5) Activate the COP Controller Software (see Centralized Operations and Provisioning User's Guide).

Response: "SET-UP ACTIVE" screen is displayed along with the function key selections.

(6) Enter several characters from the PC. These characters will be printed out on the PC CRT. If they did not print:

(A) Check the loopback connector.

(B) Verify that the serial port of the PC has been installed properly if using an *IBM* PC.

(C) Verify that the COP Controller Software has been installed correctly and the correct COM port is being used.

(7) If the characters were returned, disconnect only the RS-232 loopback connector and proceed to the modem installation section.

B. Verification of Modem Operation

UDS 212A:

Connect the serial port of the COP controller PC to the RS-232 port of the modem by means of cable W6. See the XTC SD (SD-7C127-01), Issue 5M or later, CAD 90 for cabling information.

(1) Set the switches on the UDS 212A modem as shown in Section 7 — *Equipment Programming.*

(2) Power up the modem.

(3) Put the modem into the Analog Loopback Mode by placing the rotary switch on the front panel in the **AL** position.

(4) Once in the Analog Loopback Mode, all characters entered on the keyboard will be displayed on the PC CRT. If this response does not occur:

(A) Check the execution of the Analog Loopback Command.

(B) Check the switch settings of the modem.

(C) Check the cable between the modem and the PC.

(D) Consult the user's manual of the modem.

(E) Consult the modem manufacturer.

(5) Place the rotary switch on the front of the modem into the **DATA** position.

(6) Connect the private line between the PC and XTC modems.

A connection to the XTC will be established when the line is connected.

C. Verification of the Data Link to the XTC

(1) Using the PC's keyboard, enter a "^K" (control-f) and a "!". The message sent will be echoed back to the PC along with the message appearing in Figure 18.

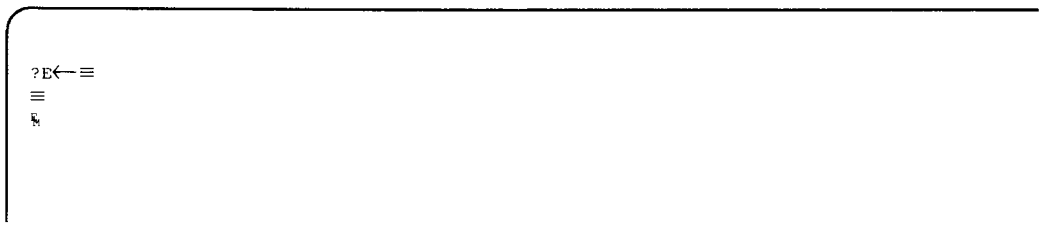


Figure 18. Terminal CRT Display

If this message was not received, try to isolate the faulty equipment by stepping through the individual sections again.

NOTE:
The carriage return and line feed characters may be evidenced only by the change of cursor position.

(2) If the message was correct, installation of the COP controller equipment is complete.

6. Direct Connections

6.01 Before beginning, acquire all necessary additional equipment (refer to Section 8 — *Necessary Equipment*). You will also need an XDLU2 plug-in and the COP software. You will not need an installation modem or a temporary phone line.

6.02 Figure 19 shows the final method of connecting the COP controller. This method bypasses the central office switch and connects the PC directly to the protocol converter on the universal data shelf.

Vendor Equipment Needed

6.03 As a guide to the user, Tables R and S provide a list of vendor equipment samples which appear to provide satisfactory performance. Appearance on the list of a particular product is not an endorsement of the product or a guarantee of its usefulness. Equipment manufactured by other vendors is likely to provide equivalent performance but has not been evaluated because of limitations of time and facilities.

6.04 The equipment listed in Tables R and S can be used in any combination (mix and match).

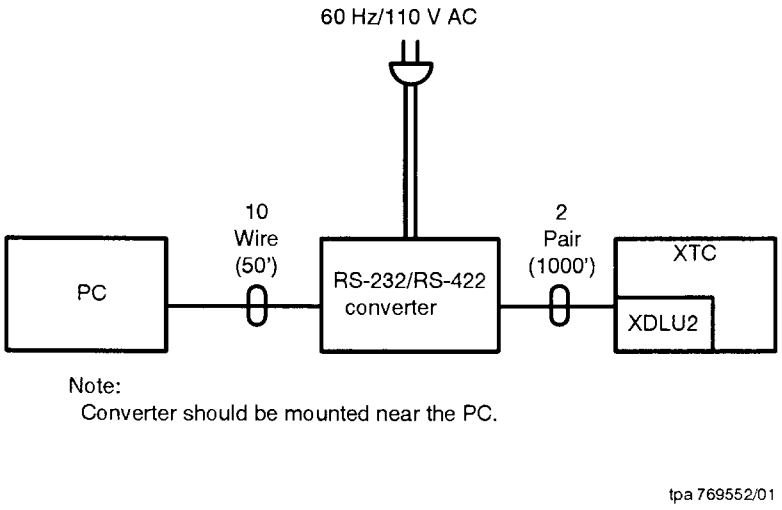


Figure 19. COP Controller Configuration Using a Direct Connection

Table R. Personal Computers

PC	Manufacturer
PC 6300 (or PC 6300 WGS) or PC 6386 SX/EL WGS with 10 Megabyte hard disk, 640K RAM and *MS-DOS* * Version 2.1 or later.	AT&T
PC XT with 640K RAM and *MS-DOS* Version 2.1 or later. If an external modem is used, the PC must be equipped with a serial port - COM 1 or COM 2.	*IBM* †

* Registered trademark of Microsoft Corp.

† Registered trademark of International Business Machines Corporation.

Table S. Protocol Converters

Converter	Manufacturer
RS-232 <> RS-422 interface converter	Black Box Corporation Box 12800 Pittsburgh, PA 15241
ARK * RS-232/422 interface adapter	ARK Electronics Products Inc. 1500 West Nasa Blvd. Melbourne, FL 32902-2169

* Registered trademark of ARK Electronic Products, Inc.

Installation of COP Equipment (XTC Side)

A. RS-422 to RS-232 Converter Installation

6.05 The following installation procedure verifies the operation of the converter box and then the data link from the RS-232 port of the converter box to the XTC.

RS-422 to RS-232 Converter Unit Test By Itself

(1) Configure the terminal according to Table T if not already configured.

Table T. Terminal Configuration

Feature	Option Settings
Speed or Baud	1200
Parity	Even
Duplex	Full
Monitor Mode	On
Bits Per Character *	7
Stopbit-Length *	1

* Some terminals do not allow for the setting of these parameters. Having a terminal which allows you to change these parameters will make installation easier but is not necessary.

NOTE:
Enabling the Monitor Mode means that the terminal screen will display the special ASCII control characters such as ENQ, ACK, EOT, and so forth.

(2) Configure the converter as shown in Section 7 — *Equipment Programming*.

(3) Connect the RS-449 loopback connector, listed in Section 8 — *Necessary Equipment*, to the RS-422 port of the converter as shown in Figure 20.

(4) Connect the terminal to the RS-232 port of the converter by means of the null modem, listed in Section 8 — *Necessary Equipment*, as shown in Figure 20.

(5) Power up the converter unit.

(6) From the terminal keyboard, type in several characters. If the characters typed are not displayed on the terminal CRT:

(A) Check the configuration of the converter box.

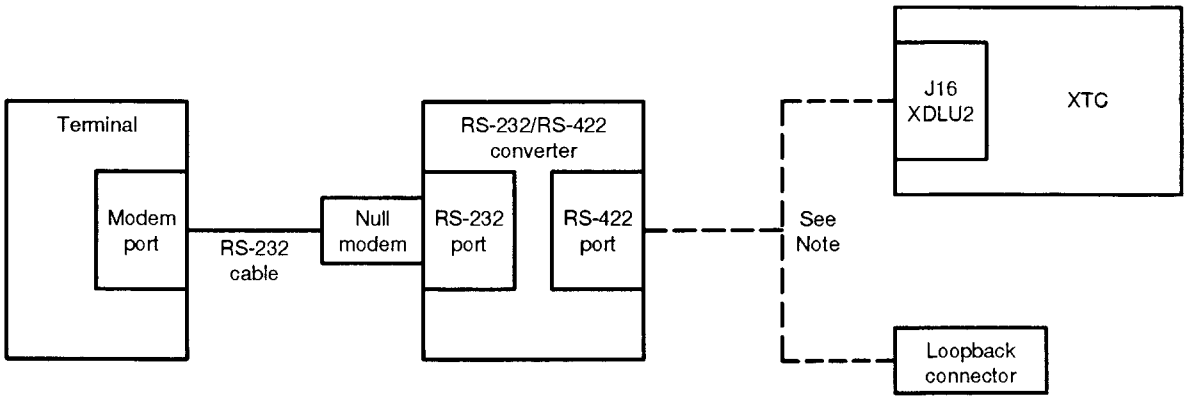
(B) Check the cabling from the terminal to the converter box.

(C) Check the loopback connector.

(D) Consult the converter box user's manual.

(E) Consult the manufacturer.

(7) Disconnect the loopback connector on the RS-422 port.



Note: The loopback connector is used first to test the converter box by itself. After the converter has been tested, the connection will then be made to the XTC.

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Figure 20. Protocol Converter Test Connections

RS-422 to RS-232 Converter Box Installation to the XTC

(1) Install the cable W1 (ED-7C697-20, G1) between the XTC's XDLU2 (J16 connector) and the RS-422 port of the converter box. See the XTC SD (SD-7C127-01), Issue 5M or later, CAD 86 for more information.

(2) Plug in the XDLU2.

(3) When the XDLU2 comes out of reset an ASCII "U" and "EQ" (Control-e) should be displayed repeatedly on the terminal CRT. The characters will appear approximately every four seconds and the sequence is one ASCII "U" followed by four "EQ"s. If no characters or "garbage" characters are displayed:

   (A) Check the terminal settings.

   (B) Check the continuity of the cable between the XTC and the converter box.

   (C) Replace the XDLU2.

   (D) Repeat the loopback test for the converter.

(4) Once the characters are displayed on the terminal CRT, use the terminal keyboard to enter an "AK" (control-f) and a "!".

(5) The two characters typed in will be echoed back to the terminal CRT along with the message appearing in Figure 21.

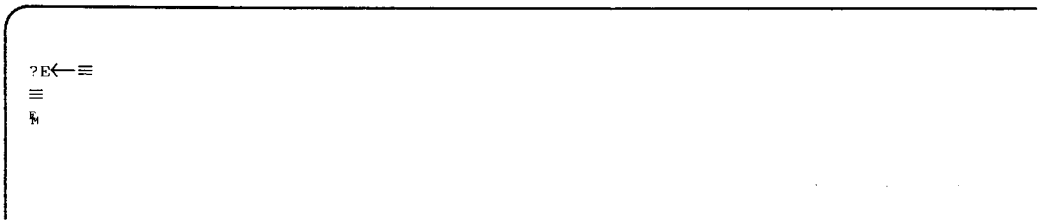


Figure 21. Terminal CRT Display

Then, the ASCII "U" and "Q" should be displayed repeatedly and in the same sequence as stated previously in Step 3.

NOTE:
The carriage return and line feed characters may be evidenced only by the change of cursor position.

(6) If the preceding display was not returned to the terminal CRT:

(A) Check the continuity of the cable between the XTC and the converter box.

(B) Replace the XDLU2.

(C) Repeat the loopback test for the converter.

(7) If the preceding display was returned, installation of the COP controller on the XTC side is complete.

(8) Remove the terminal cable only from the RS-232 port of the converter.

Installation of COP Equipment (PC Side)

6.06 The following installation procedure verifies the operation of the serial port on the PC and completes the installation of the COP equipment. If a serial communications port which plugs into an expansion slot of the PC is to be used, but has not been installed, install that unit now. Consult the product's users manual for information on how to install the unit.

6.07 Equipment installed on the PC side will be installed using the COP software. This software has the capability to communicate with COM 1 or COM 2. The COM port to be used will depend on how the serial port has been installed in the PC. Changing the port to which the software is communicating can be done using the **F1** function key.

A. Verification of the Serial Port Operation

(1) If an *IBM* PC is used, install the serial communications port PWB if it has not already been installed. Consult the serial port users manual for installation information.

(2) Connect the RS-232 loopback connector to the serial communications port of the PC. The gender changer cable will have to be used.

(3) Power up the PC.

(4) If not already installed, install the COP Controller Software.

(5) Activate the COP Controller Software (see Centralized Operations and Provisioning User's Guide).

Response: "SET-UP ACTIVE" screen is displayed along with the function key selections.

(6) Enter several characters from the PC.

(7) These characters will be printed out on the PC CRT. If they do not print:

A. Check the loopback connector.

B. Verify that the serial port of the PC has been installed properly if using an *IBM* PC.

C. Verify that the COP Controller Software has been installed correctly and the correct COM port is being used.

(8) Disconnect the loopback connector only on the RS-232 port.

B. Verification of the Data Link to the XTC

(1) Connect the PC to the RS-232 port of the converter by means of the null modem, listed in Section 8 — *Necessary Equipment*, as shown in Figure 20. A gender changer is required at the PC if not previously installed.

(2) Using the PC's keyboard, enter a "^K" (control-f) and a "!". The message will be echoed back to the PC along with the message appearing in Figure 22.

Figure 22. Terminal CRT Display

If this message was not received, try to isolate the faulty equipment by stepping through the individual sections again.

NOTE:
The carriage return and line feed characters may be evidenced only by the change of cursor position.

(3) If the message was correct, installation of the COP controller equipment is complete.

7. Equipment Programming

7.01 This section provides programming and option switch setting information specifically for the equipment that may be included in the COP arrangement.

Black Box

7.02 The dip shunts provided with the Black Box must be plugged into sockets XW1B - XW3B and sockets XW4A and XW5A as shown in Figure 23. This configures the RS-422 port for communication as a DCE device and the RS-232 port for communication as a DTE device. No programming is necessary.

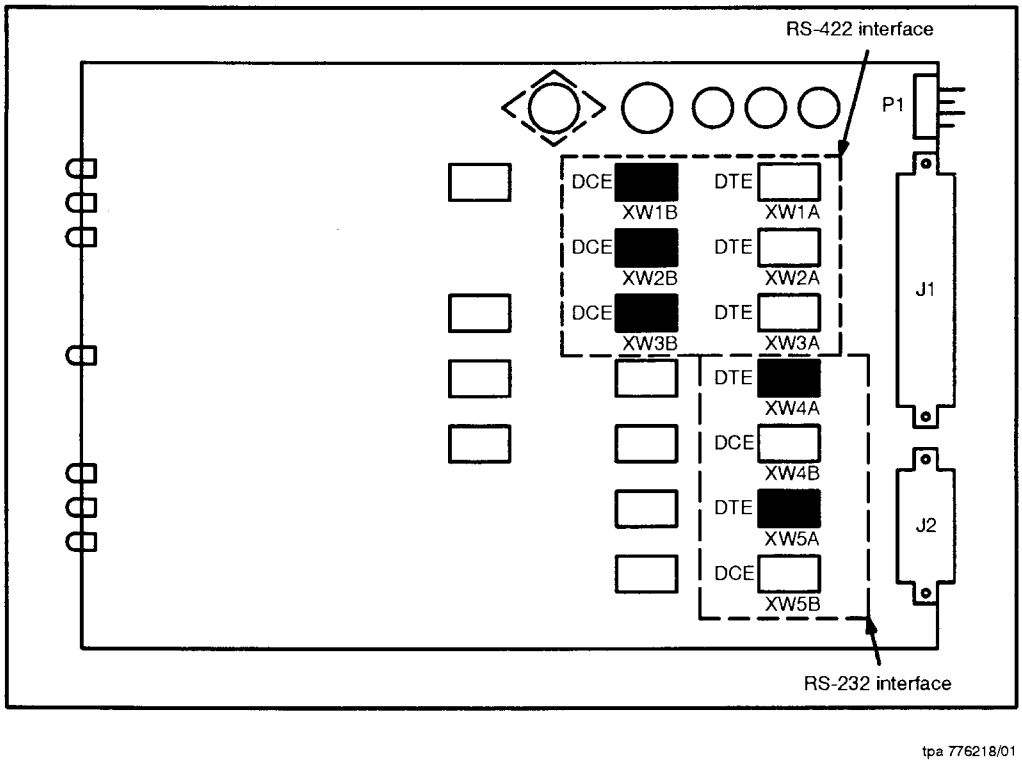


Figure 23. The Black Box Configuration

ARK RS-232/422 Interface Adapter

7.03 The *ARK* RS-232/422 Interface Adapter comes factory ready and has no switches or plugs to set.

Hayes Smartmodem 1200 Modem

7.04 No programming is necessary for the *Hayes Smartmodem 1200* modem; however, before powering-up this modem, the switches presented in Table U must be set. These connections are for dial-up applications with security callback. This modem reads switch settings only when powering-up.

Table U. Switch Settings for the *Hayes Smartmodem 1200* * Modem

Switch #	Setting	Function
S1	UP †	Do not ignore DTR
S2	UP	Word results codes displayed
S3	UP ‡	Results codes not sent
S4	DOWN ‡	Characters not echoed in command state
S5	UP	Auto-Answer enabled
S6	UP	RS-232C carrier detect not always on
S7	UP	Single line RJ-11 phone jack
S8	DOWN	Enables commands
S9	UP	Compatible with Bell 103/212A modems
S10	UP	Modem reset when turned on

* Trademark of Hayes Microcomputer Products, Inc.

† For 2-wire subscriber line applications only, switch S1 should be "DOWN" on the extended test controller (XTC) side only.

‡ S3 and S4 should be set opposite the setting shown if the modem is used on the PC side.

AT&T Model 4000

7.05 The AT&T Model 4000 is used as an external modem on the PC side for subscriber line applications. No programming or switch setting is necessary, but for convenience, the autoanswer function should be turned on.

AT&T Model 4112

The AT&T Model 4112 is used as an internal modem on the PC side for subscriber line applications. No programming is necessary, but the switch settings in Table V must be made.

Table V. Switch Settings for the AT&T Model 4112 Modem

Switch #	Setting	Function
S1	ON	COM Port 1 *
S2	OFF	Disable slot 8 setting for *IBM*† PC XT
S3	OFF	Single line telephone
S4	ON	Carrier detect true only when carrier detected

* Communications (COM) Port 2 must be used for the AT&T PC 6300.

† Registered trademark of International Business Machines Corporation.

Hayes Smartmodem 1200B Modem

7.06 No programming is necessary for the *Hayes Smartmodem 1200B* modem; however, before powering-up this modem, the switches listed in Table W must be set. This modem is used for dial-up applications only. Switch settings are read only when powering-up.

Table W. Switch Settings for the *Hayes Smartmodem 1200B* * Modem

Switch #	Setting	Function
S1	RIGHT	Communications Port 1 †
S2	LEFT	Connection to an RJ-11 type jack
S3	RIGHT	Enables detect of remote modem carrier
S4	LEFT	Do not ignore DTR status

* Trademark of Hayes Microcomputer Products, Inc.

† Communications (COM) Port 2 must be used for the AT&T PC 6300.

Universal Data Systems 212A

7.07 The Universal Data Systems (UDS) 212A can be used on both the PC side and the XDLU side for 2-wire private line application. The UDS 212A may also be used on the XDLU side for subscriber line applications when no security device is installed. No programming is necessary, however, before powering-up the UDS 212A, the switch settings and jumper options presented in Tables X and Y, respectively, must be set. These settings are for private-line applications on the XDLU-side. This modem reads jumper options and switch settings only on power-up. Refer to Figure 24 for locations of jumpers and switches.

Table X. Private Line Switch Settings for the UDS 212A Modem

Switch #	Setting	Function
S1-1	ON *	Force answer
S1-2	OFF	Normal operation mode
S1-3	OFF	Disable analog loop test
S1-4	ON	Enable carrier fail disconnect
S1-5	ON	Automatic answer enable
S1-6	OFF	DTR disconnect disabled
S1-7	OFF	Disable long space disconnect
S1-8	ON †	Enable private line operation
S2-1	OFF *	Normal operation mode
S2-2	—	Unused
S2-3	—	Unused
S2-4	—	Unused
S2-5	—	Unused
S2-6	—	Unused
S2-7	OFF	7 bits ASCII even parity
S2-8	ON	7 bits ASCII even parity
S3-1	ON *	Force DTR active
S3-2	OFF	Disable external speed control
S3-3	OFF	Disable external speed indication
S3-4	OFF	Disable analog loop test ext. control
Front panel switches	DATA	Rotary function switch
	HI	HI/LO speed switch

* S1-1 and S3-1 should both be OFF for the modem on the PC side for private line use.

† S1-8 should be OFF for the modem on the XDLU side when a subscriber line is used.

Table Y. Jumper Options for the UDS 212A Modem

Function	Setting	Description
Internal clock	IN	Use internal clock for sync
Transmit level	INT	−9 dBm, permissive
Telset polarity	NOR, NOR	Normal polarity
Ground	GND	Signal ground is used
Telset	TELSET	Telset connector operates normally

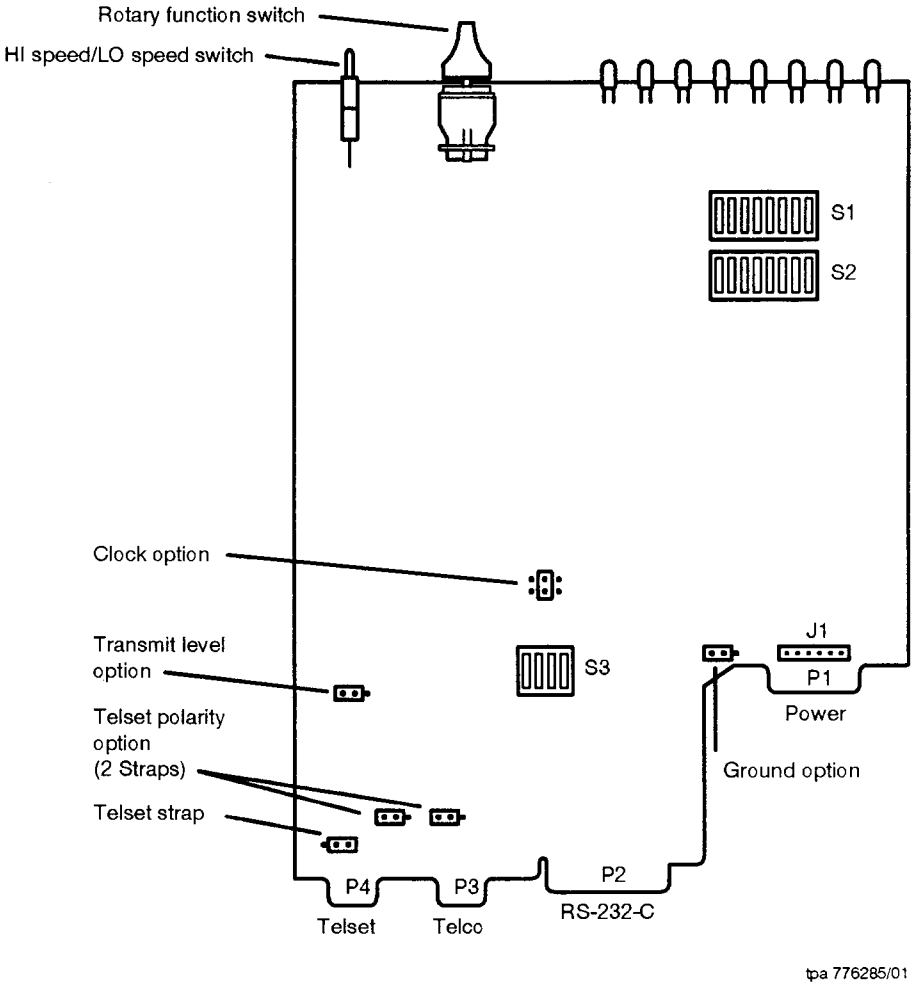
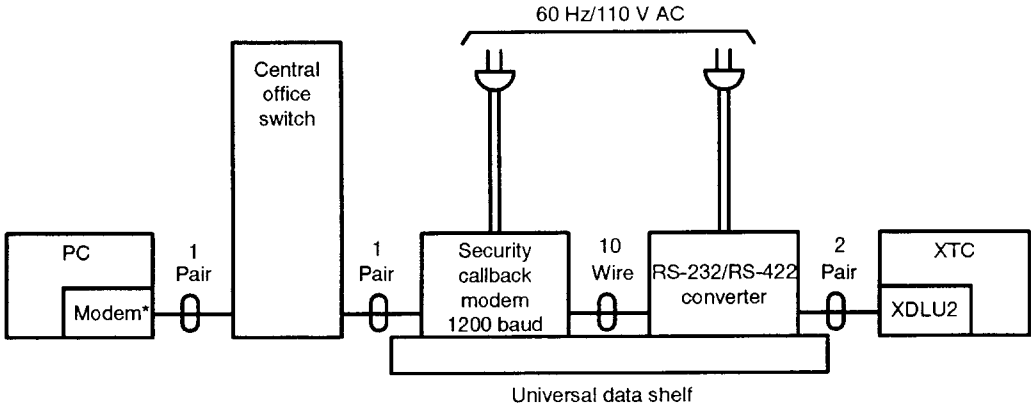


Figure 24. UDS 212A Jumper Option and Switch Setting Locations

NEC N2420/30S

7.08 The NEC model N2420/30S is a modem with built-in callback ability. It is used in subscriber-line applications on the XDLU-side. In Figure 25, the N2420/30S represents both the modem and the security callback device on the universal data shelf. Remote programming is not allowed. The switch settings and programming presented in Table Z are required (refer to Figure 26 for switch locations).



* Modem may be external to PC.

tpa 769549/01

Figure 25. COP Controller Configuration Using a 2-Wire Subscriber Line with Security Callback

7.09 Program the NEC N2420/30S modem as follows:

1. Connect the terminal to the RS-232 port of the N2420/30S (monitor mode should be off).
2. Power up the modem.
3. Enter **ATO** <RETURN>.
   The modem responds with a prompt:].
4. Enter **WP** <RETURN>.

Table Z. Switch Settings for the NEC N2420/30S Modem

Switch #	Setting	Function
1-1	ON	Battery enabled
1-2	OFF	Auto-dial mode = 'AT'/NEC
1-3	—	Reserved for future use (should be left off)
1-4	OFF	Forced CD disabled
2-1	OFF	Auto-dialer enabled
2-2	ON	DTR forced enabled
2-3	ON	Transmit timing - internal (synchronous mode)
2-4	OFF	EIA control of RDL disabled
2-5	OFF	EIA control of ALB disabled
2-6	OFF	Transmit timing - internal (synchronous mode)
2-7	ON	Transmit timing - internal (synchronous mode)
2-8	ON	Manual speed select - front Sw
3-1	ON	Async overspeed tolerance (1.0%)
3-2	ON	10 Bits per character
3-3	OFF	10 Bits per character
3-4	ON	CS follows CD
3-5	ON	103 mode enabled
3-6	ON	212 mode enabled
3-7	OFF	MR LED on in ALB
3-8	OFF	CS follows CD
4-1	OFF	Answer back tone bell 2,225 Hz
4-2	ON	Answer back tone bell 2,225 Hz
4-3	OFF	RCU space disconnect enabled
4-4	OFF	Loss of carrier disconnect enabled
4-5	OFF	Enable send space disconnect
4-6	OFF	Enable response to RDL test
5-1	ON	Answer mode indication - RI norm
5-2	OFF	Auto-dial mode answer enabled
5-3	—	Reserved for future use (should be left off)
5-4	OFF	Answer speed select - automatic
5-5	ON	Auto retrain time - 1.2 sec.
5-6	ON	Answer speed select - automatic
5-7	ON	Answer speed select - automatic
5-8	—	Reserved for future use (should be left off)

Continued on next page

Table Z. — *Continued*

Switch #	Setting	Function
6-1	OFF	EIA control of ALB and TM ALB25/TM N.C.
6-2	ON	EIA control of ALB and TM ALB25/TM N.C.
6-3	OFF	EIA control of ALB and TM ALB25/TM N.C.
6-4	OFF	EIA pin speed indicator select disable 12
6-5	OFF	EIA pin speed indicator select disable 11
6-6	—	Reserved for future use (should be left off)
7-1	OFF	Transmit output level perm. −10 dBm
7-2	OFF	Transmit output level perm. −10 dBm
7-3	ON	Transmit output level perm. −10 dBm
7-4	—	Reserved for future use (should be left off)
Rear panel switch	CMD or A - Force CS (CO) on in command mode (Set to A)	
Front panel switches	Depress the following switches: 12 / ASY	

5. The terminal displays the current password followed by a "carriage return" and a "line feed." Enter the new password. The password should be easy to remember so that the directory contents can be changed easily if necessary. This password must be different from any other password that will be put into the directory. When enforced, this password tells the modem that it is in security callback mode.
6. At the prompt,], enter **wn**, where **n** is the directory location number. This number can be from 1 through 96.
7. The unit prompts for a password.
   Enter your password (use only alpha characters).
8. The unit prompts for a phone number.
   Enter your phone number.
9. At the prompt,], enter **Dn**, where **n** is the directory location number where your phone number and password are stored.
   (The preceding command checks to see that your password and phone number are stored correctly.)
10. At the prompt,], enter **x** <RETURN>.
    The dialing prefix is displayed.
11. Enter **T** to indicate that tone dialing will be used.
    or
    If a "9" must be dialed before an outside call can be made, enter **T9**.

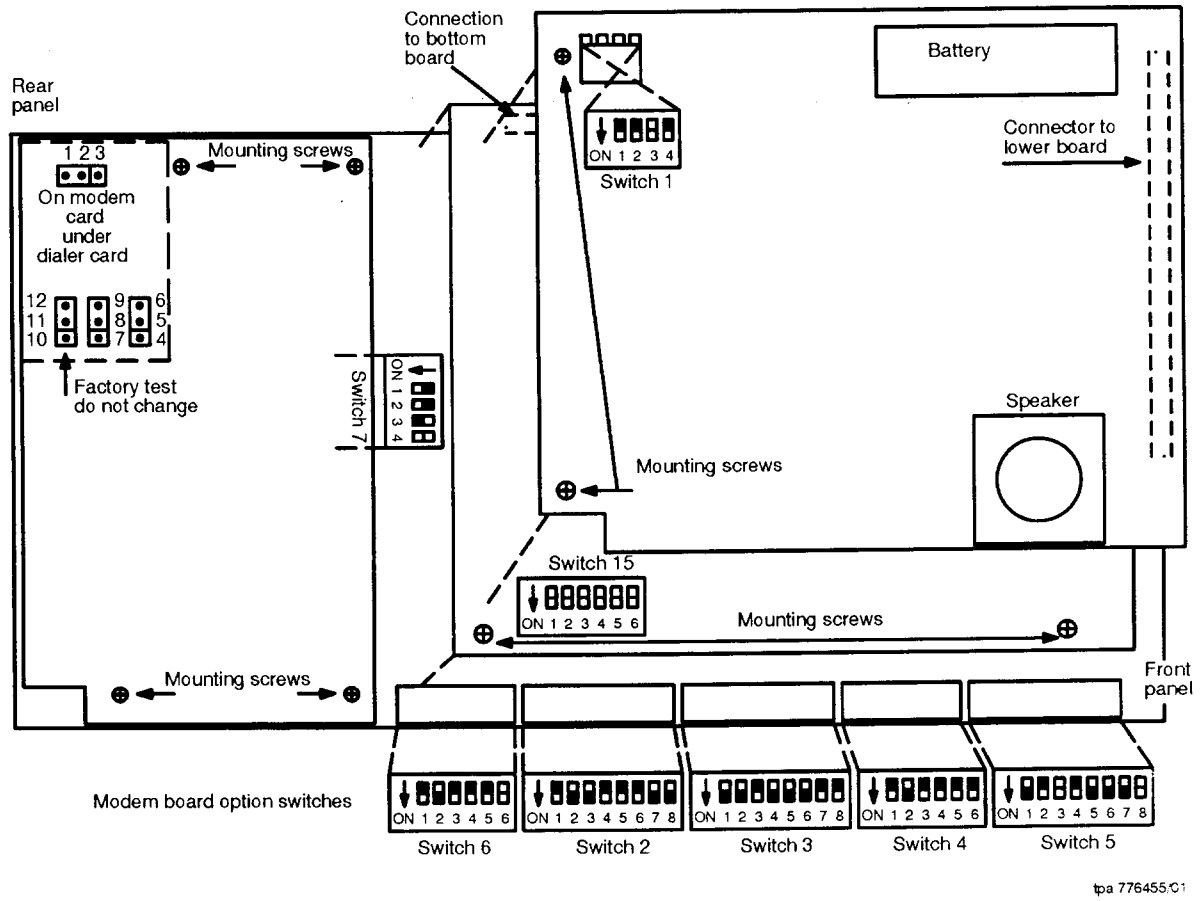


Figure 26. NEC N2420/30S Switch Locations

12. At the prompt, I, enter **F7E** <RETURN>. This indicates 7-bits per character, even parity transmission.
13. At the prompt, I, enter **EN** <RETURN>. This indicates character echoes will not be enabled.
14. At the prompt, I, enter **RN** <RETURN>. This indicates echoes to the remote terminal are disabled.
15. Programming is now complete.
    At the prompt, I, enter **Q** <RETURN>.
    The unit is ready for use.

NEC N9635E/2

7.10 The NEC N9635E/2 universal modem with the security callback option is used in subscriber-line applications on the XDLU-side. In Figure 25, the N9635E/2 represents both the modem and the security callback device on the universal data shelf. The following switch settings and programming are required (refer to Figure 27 for switch locations):

A. *Switch Settings*

Two 8-position dual in-line package (DIP) switches are used to set communications options. Switch SW1 (Main) on the main card is accessed under the display/control (D/C) module. Switch SW4 (Main) is also located on the main card. Verify the following settings:

- SW1 — All positions OFF except SW1-8
- SW4 — All positions OFF except SW4-2.

B. *Programming Information*

1. Connect the terminal to the RS-232 port of the N9635E/2 (set terminal parameters to 1,200 bps, EVEN parity, FULL duplex, monitor mode OFF, stop bit = 1, and characters = 7).
2. Power up the modem.
3. Enter **AT$b** <RETURN>.
   The modem responds with ENTER PASSWORD.
4. Enter **N9635CBS** <RETURN>.
   The modem responds with OK.
5. Enter **ATI3** <RETURN>.
   The modem responds with the current firmware (verify that the firmware revision is V2.15 or higher).
6. Enter **AT&f** <RETURN>.
   The modem responds with OK.
   (This returns all options to factory default.)
7. Enter **AT%b3** <RETURN>.
   The modem responds with OK.
   (This sets the maximum DTE rate to 1,200 bps.)

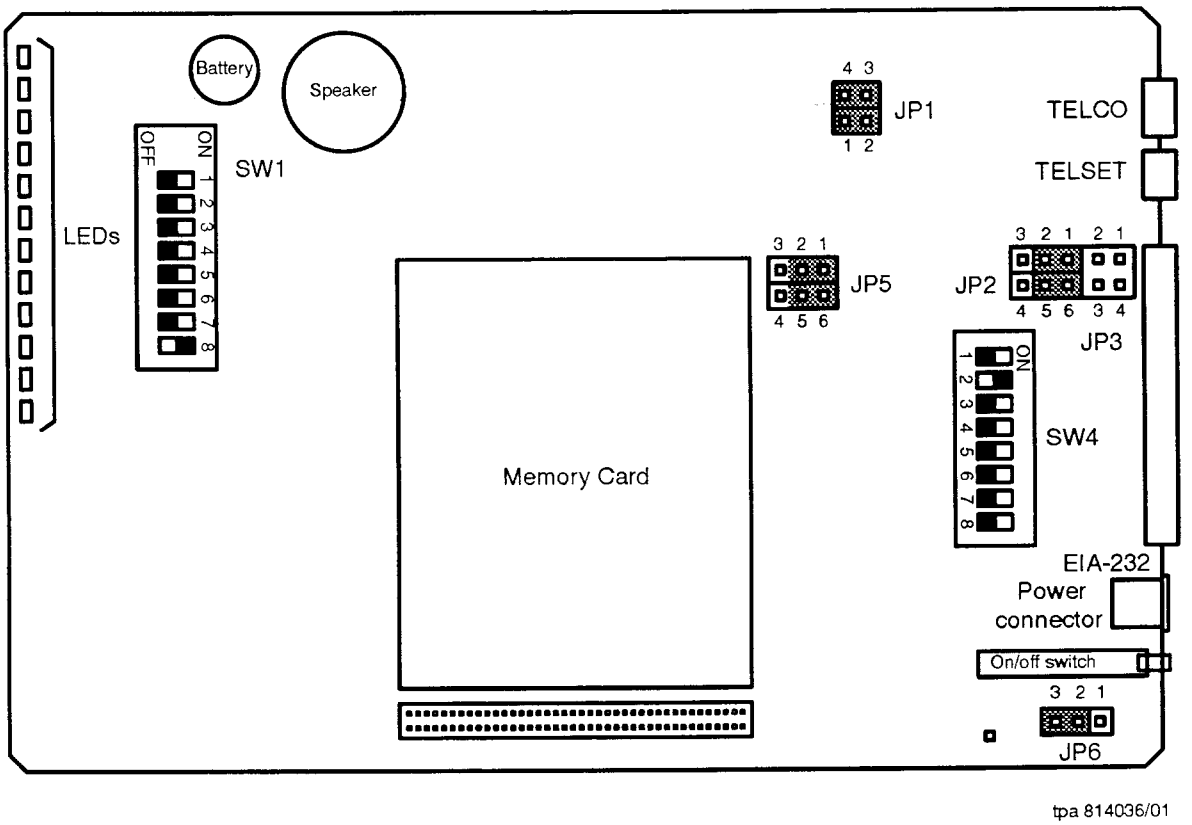


Figure 27. NEC N9635E/2 Switch Locations

8. Enter **AT&W** <RETURN>.
   The modem responds with OK.
9. Enter **AT*S1** <RETURN>.
   The modem responds with a display of the main menu.
10. Select Option 3 (Set/Edit Entry).
    The modem responds with ENTER RECORD NUMBER.
11. Enter a record number (for example, 00, 01, 02, etc.) <RETURN>.
    The modem responds with ENTER USER ID.
12. Enter all pertinent information followed by <RETURN>.
13. Enter **ESC**.
    The modem returns to the main menu.
14. Select Option 5.
    The modem responds with submenu 5.1.

15. Select Option 8 (Enable CBS).
16. Enter **ESC.**
    The main menu is displayed.
17. Select Option 7.
    The modem responds with OK.
18. Programming is now complete.
    The unit is ready for use.

8. Necessary Equipment

8.01 This section describes a sample centralized provisioning installation including tests. The following equipment is needed to install the COP controller.

1. *Terminal* - Teletype 5410 or equivalent for use as a test vehicle.
2. *Modem* - For dial-up and 2-wire private line applications the INMAC Clear Signal 212A or equivalent can be used. Refer to Table AA for switch settings for the INMAC Clear Signal 212A.
3. *Null Modem Connector* - INMAC, null modem, model No. 303-1 M-F or equivalent. If a null modem from a different distributor is used, make sure that it is wired the same way as the INMAC 303-1 M-F (see Figure 28).
4. *Gender Changer Connector* - INMAC, gender changer, model No. 330 F-F or equivalent.
5. *RS-232 Loopback Connector* - INMAC, EIA DB25 loopback connector, model No. 858-1 male or equivalent (see Figure 29).
6. RS-232 cable with DB25 male connectors on both ends (INMAC and other distributors usually carry these cables).
7. RS-449 (Amphenol 117 - Male) or equivalent connector. The installer must short together pins 4 and 6, and pins 22 and 24 (see Figure 30).
8. A temporary phone line for applications using dial-up lines.
9. SD-7C127-01, Issue 5M or later. In the event of a difference between the information presented in this practice and the information presented in the current issue of SD-7C127-01, the SD- takes precedence.

Table AA. Private Line Switch Settings for the INMAC Clear Signal 212A

Switch #	Setting	Function
S2-1	ON *	Leased line
S2-2	ON	–10 dBm transmission level
S3-1	ON	Carrier detect high only when carrier detected
S3-2	OFF	Follow DTR
S3-3	OFF	Single line
S3-4	ON †	Originate mode
S3-5	OFF	Respond with word codes
S3-6	OFF	1,200 bps
S3-7	OFF	Do not send result codes
S3-8	OFF	Autodialer suppressed

* S2-1 must be set OFF for dial-up lines.

† S3-4 should be OFF (auto-answer) for 2-Wire Subscriber Line Installation with Security Callback Modem applications.

The **DATA/TALK** switch on the front panel should be set to **DATA**.

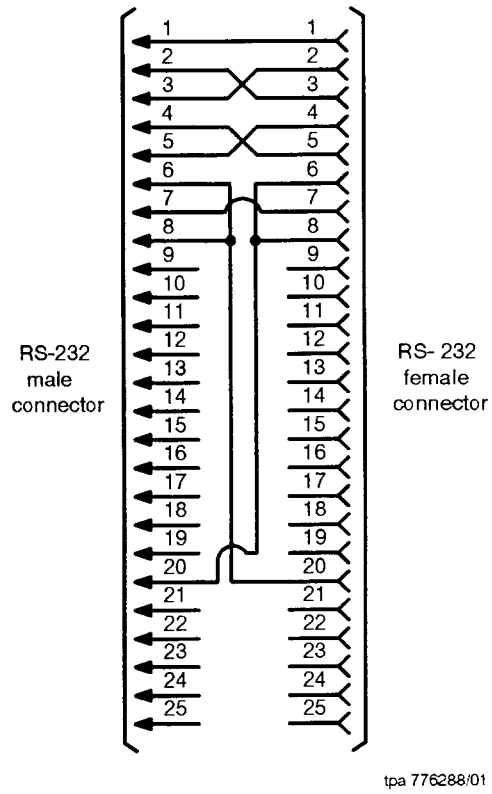


Figure 28. Null Modem Connections

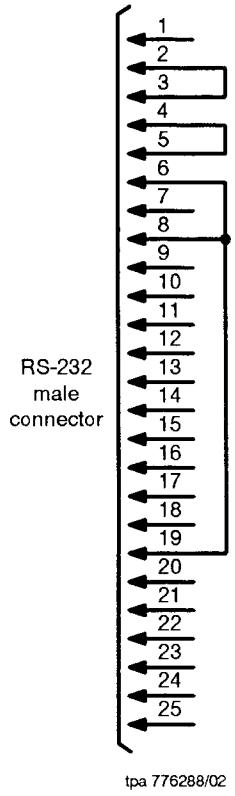


Figure 29. RS-232 Loopback Connections

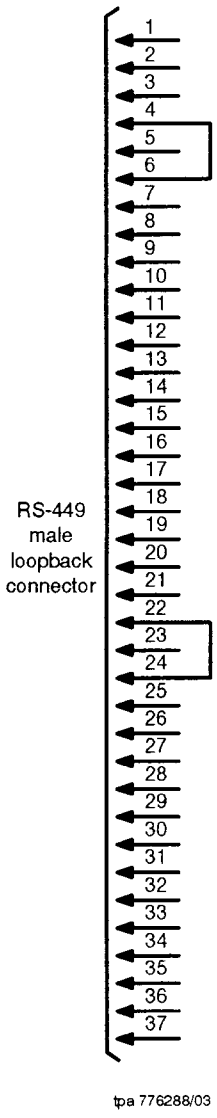


Figure 30. RS-449 Loopback Connections

Abbreviations and Acronyms

A

AA
Auto-Answer

ACU
Automatic Calling Unit

ASCII
American Standard Code for Information Interchange

C

CAD
Cable Assembly Drawing

CD
Carrier Detect

CIU
Craft Interface Unit

CO
Central Office

COP
Centralized Operations and Provisioning

CRT
Cathode Ray Tube

D

D/E
Display/Control

DCE
Data Communication Equipment

DIP
Dual In-line Package

DTE
Data Terminal Equipment

DTR
Data Terminal Ready

E

EEPROM
Electronically Erasable Programmable Read Only Memory

H

HS
High Speed

L

LED
Light-Emitting Diode

M

MR
Modem Ready

N

NEBS
New Equipment Building Standards

O

OH
Off-Hook

P

PC
Personal Computer

PWB
Printed Wiring Board

R

RTAC
Regional Technical Assistance Center

RTS
Ready To Send

S

SD
Schematic Drawing

T

TOP
Task Oriented Practice

TR
Terminal Ready

U

UDS
Universal Data Systems

X

XCU
XTC Controller Unit

XDLU
XTC Data Link Unit

XTC
Extended Test Controller

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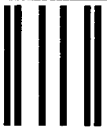

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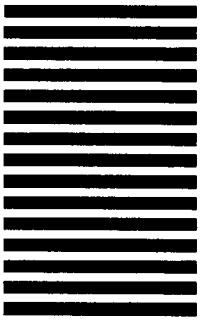

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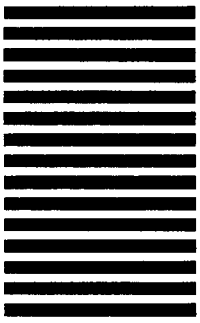

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