AT&T

DATAPHONE®

PRIVATE LINE MODEMS

Operator Information

IMPORTANT TELEPHONE NUMBERS

SALES

To contact your AT&T Sales Representative, call the toll free number 1-800-247-1212. Write your sales representative's name and telephone number here. _____

SERVICE

If your Modem needs service and **is** under lease or warranty or covered by an AT&T Maintenance Contract, call the toll free customer service number 1-800-242-2121. Write your service contract number here. _____ If **not** covered by lease, warranty, or maintenance contract, see PARTS explanation below.

PARTS

If you need replacement parts for your Modem or if your Modem needs service and **is not** under lease, warranty, or a maintenance contract, call the toll free National Parts Sales Center telephone number, 1-800-222-PART.

FCC WARNING STATEMENT

Federal Communications Commission (FCC) Rules require that you be notified of the following:

- This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause interference to radio communications.
- It has been tested and found to comply with the limits for Class A computing devices pursuant to Subpart J of Part 15 of the FCC Rules, which are designed to provide reasonable protection against such interference when operated in a commercial environment.
- Operation of this equipment in a residential area is likely to cause interference in which case the user at his own expense will be required to take whatever measures may be required to correct the interference.

AT&T DATAPHONE II

Modem Operator Information

999-100-206IS
Issue 2

ORDERING INFORMATION

To order copies of this manual:

Contact: Your AT&T Account Team

or

Call: AT&T on 800-432-6600

or

Write: AT&T Customer Information Center
P.O. Box 19901
Indianapolis, Indiana 46219

Order: Document No. 999-100-206IS

CONTENTS

LIST OF FIGURES

LIST OF TABLES

DATAPHONE II Service

Introduction

DATAPHONE® II service offers private line synchronous modems at rates of 2400, 4800, 7200, and 9600 bps (Figures 1 through 4), with extensive built-in diagnostic capabilities, and three optional diagnostic control devices for data communications network management. DATAPHONE II service includes two independent systems: the Network Diagnostic System (NDS) and the primary data transmission system. The modems make up the primary data transmission system and are the basic component of the NDS. The modems incorporate a diagnostic secondary channel that shares the voiceband facility used for the primary data transmission. This diagnostic channel is used as the communication channel for the NDS. The NDS provides centralized network control along with real-time system monitoring and extensive modem and transmission facility testing. The NDS components are interconnected at the central location by a control channel and between locations by the diagnostic secondary channel.

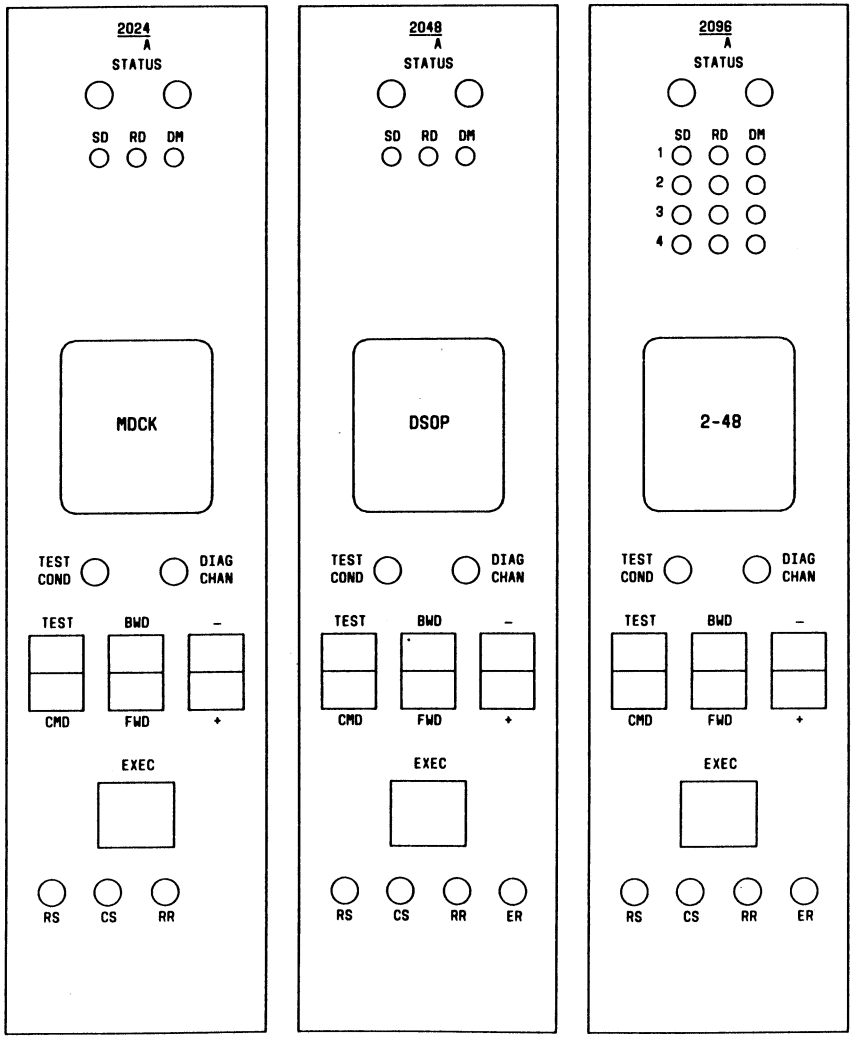

Figure 1. DATAPHONE II Modem Front Panels

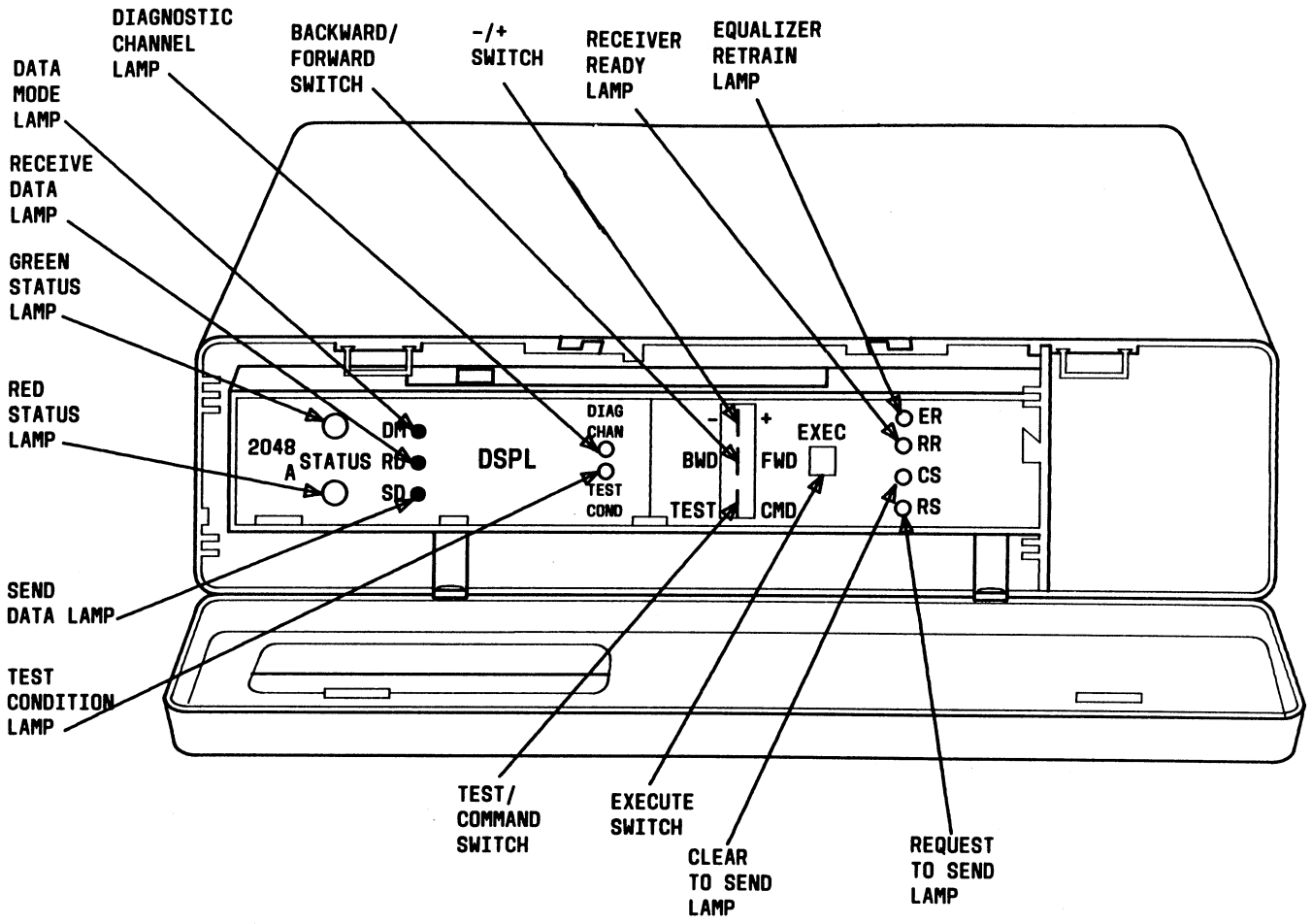

Figure 2. DATAPHONE II Modem in Stand-Alone Mounting

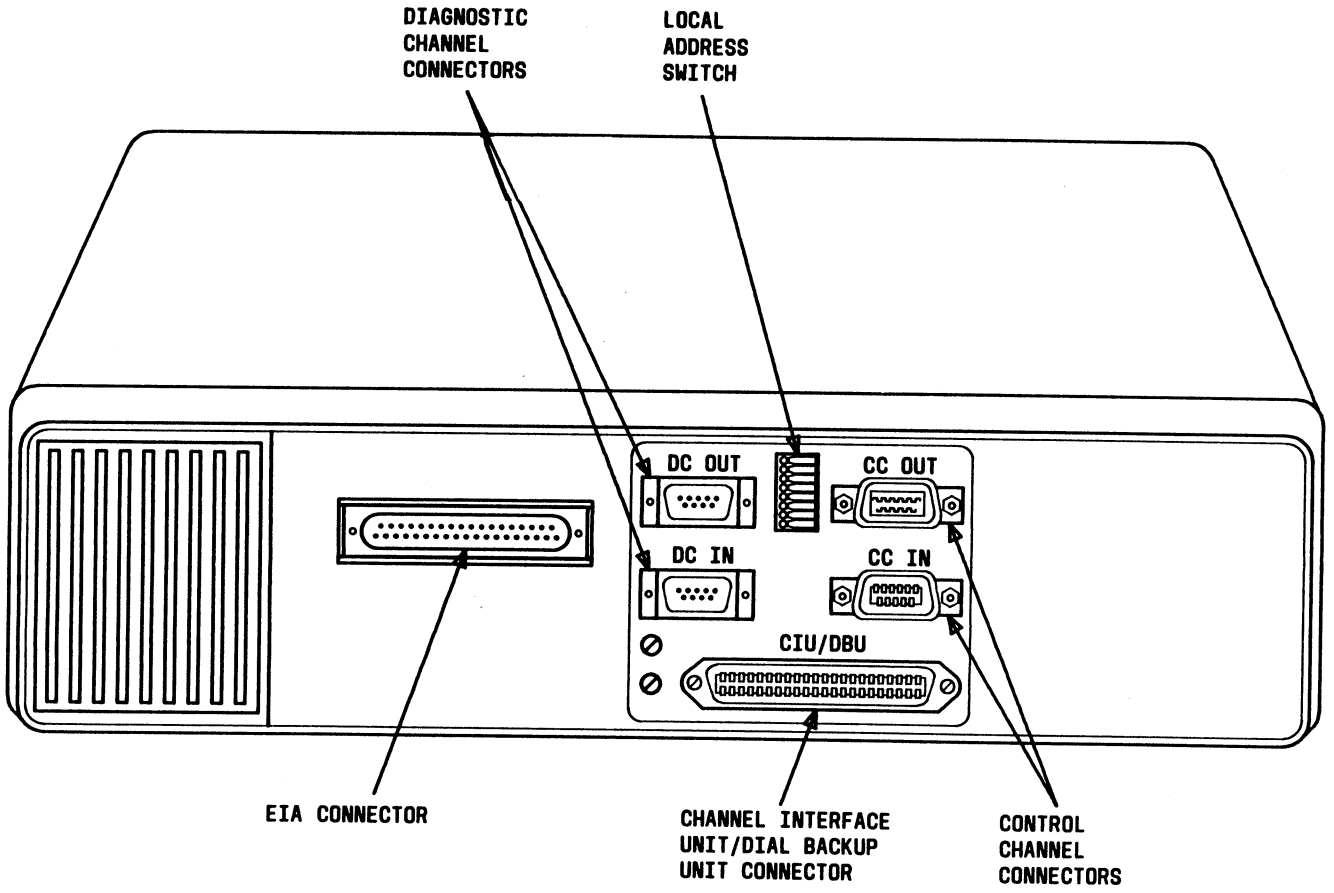

Figure 3. Rear View of DATAPHONE II Modem Stand-Alone Mounting (except 2096A)

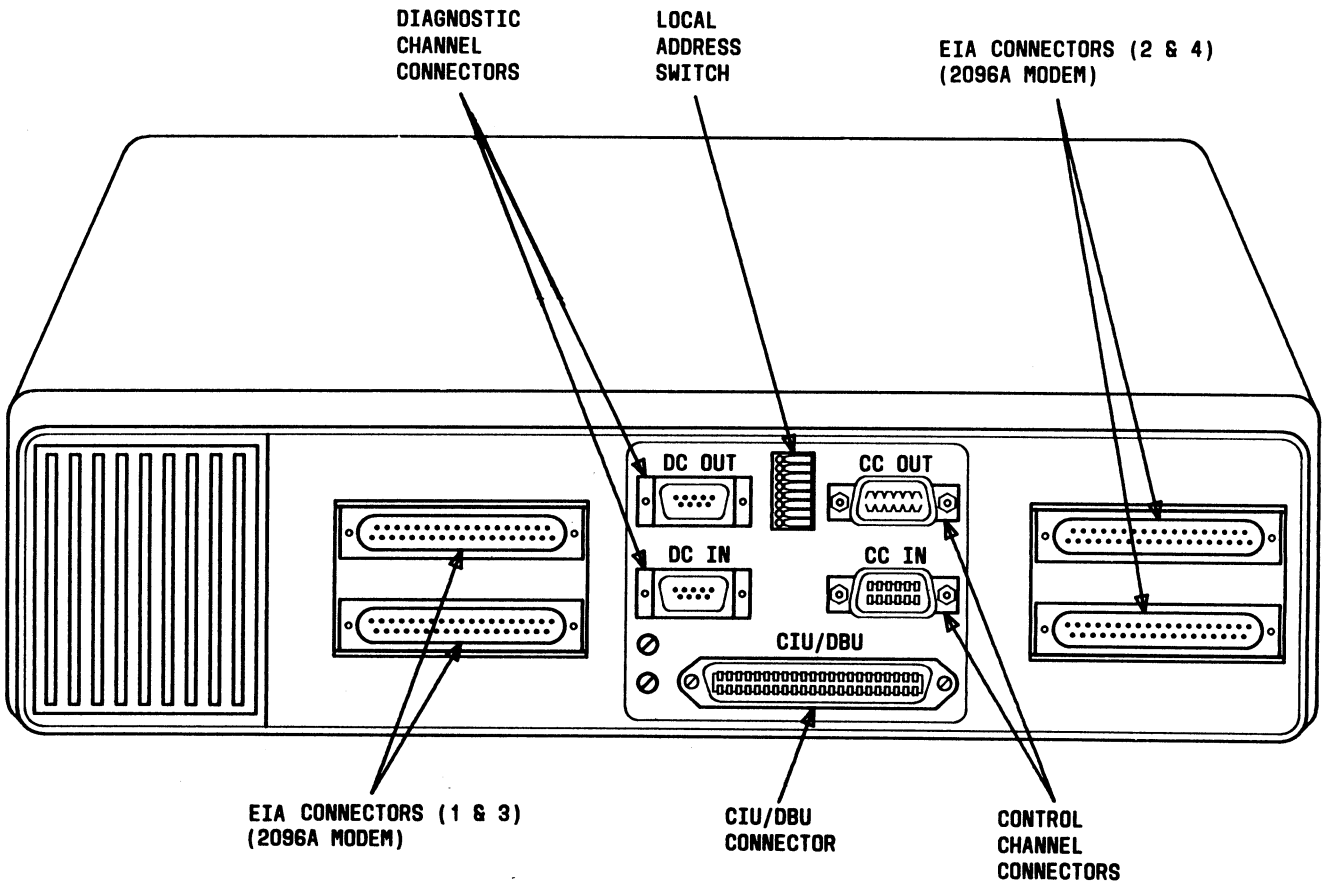

Figure 4. Rear View of DATAPHONE II 2096A Modem Stand-Alone Mounting

Primary Data Transmission System

The primary data transmission system consists of microprocessor-based DATAPHONE®II modems designed for private line point-to-point, private line multipoint, multiplexing, and extended service applications. These modems also incorporate the diagnostic circuitry that make up the basic component of the NDS. The primary system provides synchronous analog data transmission at rates of 2400, 4800, and 9600 bps.

Data rates of 2400 and 4800 bps are supported on point-to-point (Figure 5) and multipoint private line facilities by the 2024A, 2048A, and 2048C modems.

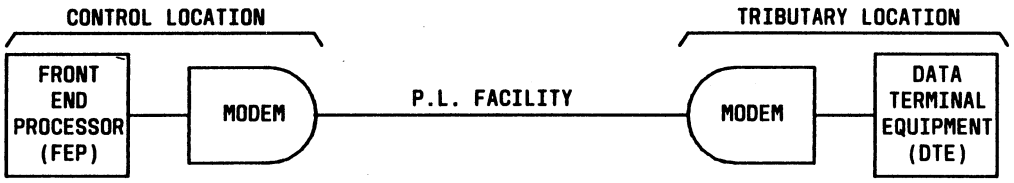

Figure 5. Point-to-Point Modem Arrangement

The 2096A modem provides multiplexing in addition to the above capabilities (Figure 6).

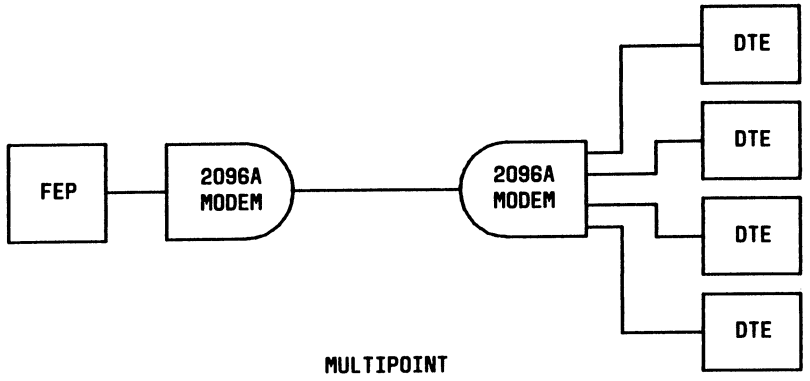

Figure 6. 2096A Modem Multiplexing Arrangement

It operates at a data rate of 9600 bps and uses Quadrature Amplitude Modulation (QAM) with automatic adaptive equalization and is intended for point-to-point applications. The 2096A modem provides multiplexing capabilities to serve up to four Data Terminal Equipments (DTEs) or extended links. The multiplexing capability of the 2096A modem provides data channels in multiples of 2400 bps up to 9600 bps. These multiplex modes are shown in Table 1.

Table 1. 2096A Modem Multiplex Modes

PORTS	MULTIPLEX MODES OF 2096A MODEM (SPLIT-STREAM PORT SPEEDS IN BPS)						
1	9600	7200	4800	4800	2400	4800	2400
2	—	2400	4800	2400	2400	—	2400
3	—	—	—	2400	2400	—	—
4	—	—	—	—	2400	—	—
Display Indicates	1-96	7224	2-48	4824	4-24	1-48	2-24

The 2096A modem may also be operated at half-speed (4800 bps). The fall-back multiplexer channel speeds are, one 4800-bps (1-48) or two 2400-bps channels (2-24). When the 2096A modem is used in a multiplex application, idle (unused) ports may be terminated. Electronic Industries Association (EIA) interfaces must not have a cable attached. For example, a point-to-point multiplexing application may use only three of the available channels, while the fourth channel is idle and unterminated.

The 2096A modem is line signal compatible only with other 2096A modems and is *not* line signal compatible with the 209A modem.

The 2096C modem is a quick start-up modem intended for use in a multipoint configuration. In multipoint networks it can be used as either a control or a tributary modem. The modem offers a

single port operating at either 9600, 7200 or 4800 bps.

The 2096C modem is not line signal compatible with the 209A modem.

The modems can be installed in a stand-alone mounting or a multiple mounting.

Network Diagnostic System

DATAPHONE II service provides centralized network control, real-time monitoring, and extensive testing capabilities via the Network Diagnostic System (NDS). This system consists of the diagnostic capabilities of the modems themselves plus optional enhancements provided by three Diagnostic Control Devices (DCDs): the Diagnostic Console (DC), the Network Controller (NC), and the System Controller (SC). These components provide the NDS with four levels of network control and diagnostic capability.

Level 1 Diagnostics

Level 1 is the basic offering (i.e., modems only) which includes in-service monitoring of overall system status, the ability to perform a comprehensive test of all modems connected on an analog circuit, and the ability to enter specific tests or commands, all from the front panel of the control modems. (A control modem is one whose options allow it to control the diagnostic channel on its analog circuit.)

Level 2 Diagnostics

Level 2 consists of the basic offering plus the Diagnostic Console (DC). The DC concentrates the diagnostic and control capabilities of all central site modems into a single user workstation It also expands these capabilities to include extended service networks and adds new features such as the ability to read and change options on remote modems. The DC has the ability to store up to 50 fault indications.

Level 3 Diagnostics

Level 3 consists of the basic offering plus the NC. The NC enhances the user capability of the Level 2 offering by adding more features such as the ability to perform multiple tests in a network, to queue tests for delayed execution, and to provide automatic trouble reporting (ATR) to the maintenance agency on an optional basis. In addition, the NC uses a data terminal (such as a DATASPEED® 4425 terminal) as the user's interface to the system. The essential operating features of the NC are listed below:

- Continuous real-time in-service monitoring of up to 256 modem networks.
- Selection of an extensive list of tests and commands.
- Entering a test request while another test is in progress.
- Execution of tests at a user specified time in the future.
- Capability to store a sequence of tests and commands in routines that can be selected for execution as a single entity.
- Capability to have routines repeated daily at the same time on specified modems.
- Capability to permit simultaneous operation by more than one user.
- Remote operation through a number of peripheral connections.
- Storage of system files and user-created files on a tape cartridge.
- Optional automatic trouble reporting to the maintenance agency.

Level 4 Diagnostics

Level 4 consists of the basic offering plus the SC. The SC is the most sophisticated of the DCDs designed for use in DATAPHONE II service. The SC provides eight control channels with centralized continuous fault and status monitoring. The SC further provides extensive databases for up to 3000 modems as well as numerous other advanced features. The following are the SC's essential operating features:

- Eight control channels with centralized continuous fault and status monitoring, each handling up to 256 networks of modems.
- Multiple user capability.
- Security through user logins and command permissions.
- Choice of result destinations.
- Expanded device addressing.
- More complex networks handled.

- Extensive databases (40 user profiles, 3000 device profiles, and fault history).
- Management reports.
- Selectable fault filters with user-definable filter values.
- Up to 30 personal routines per user and 60 system routines.
- Enhanced user interface (menu select, form-fill and use of color).
- Tape cartridge back-up system.
- Automatic Trouble Reporting (ATR) to multiple destinations (optional).
- Automatic processor alarming (optional).

Modem Diagnostics

The paramount diagnostic feature of DATAPHONE II modems is the ability to monitor circuit status and to thereby detect malfunctions automatically. The central site modem would be designated a control modem and all the remotes would be assigned unique addresses and designated tributaries (a tributary modem responds to requests from the control modem, but normally does not initiate any requests). Each modem monitors its own " health" plus the quality of the signal it is receiving from the facility. The control modem uses the diagnostic channel to interrogate each tributary connected to it. Each tributary modem responds with its own health and signal quality information to the control modem. The control modem uses the information gathered from itself and its tributaries to determine the network status. The indicators on the front panel show the condition (refer to Table 2). If there is a malfunction, the control modem will change the status indicator on its front panel from green to red and will indicate on its 4-character display whether the malfunction is within itself, within a remote tributary modem, or within the facility.

Table 2. Real Time Diagnostic System Displayed Faults

FAULT NAME	DISPLAY		REMARKS
	CONTROL MODEM	TRIBUTARY MODEM	
Modem Fault	MD or MDxx*	MD	
Facility	FA or FAxx*	FA	
Streaming Terminal	SRxx*	SR	
No Response	NRxx*	(none)	
Port X	PRTx†	(none)	Fault in extended network off port (2096A Modem)
Port 1	PRT1	(none)	Fault in extended network (2024A or 2048A Modem)

* "xx" will be two numeric characters representing the network address of the tributary modem.

† "x" will represent port number.

In addition to providing these indications, the control front panel of the modem also provides access to a list of tests and commands that can either be acted on locally or, if necessary, sent over the analog facility (via the diagnostic channel) to any tributary modem on that facility. The front panel

of a tributary modem normally provides access to only a portion of these tests and commands (mostly local tests) to prevent an operator at a tributary from disrupting operation of the entire circuit.

Modem Front Panel Controls and Displays

Table 3 describes all modem front panel controls and displays; not all are present on all types of modems. Figure 1 illustrates some typical front panels.

Table 3. Modem Front Panel Controls and Displays

LABEL	COMPONENT	DESCRIPTION
STATUS	Status lamps	The green STATUS lamp is lighted under normal conditions. The red STATUS lamp is lighted when the modem detects a fault condition.
DM	Data Mode lamp	This yellow lamp lights when the modem is available to send and/or receive data.
RD	Receive Data lamp	This yellow lamp lights when the modem is receiving information.
SD	Send Data lamp	This yellow lamp lights when the modem is sending information.
—	Display	This 4-character display is used to display fault messages, to select and execute tests and commands, and to display messages concerning modem mode.
DIAG CHAN	Diagnostic Channel lamp	This green lamp flashes whenever a signal is transmitted or received on the Diagnostic Channel.
TEST COND	Test Condition lamp	This red lamp lights whenever the modem is performing a test.
TEST/CMD	Test/Command switch	This is a 3-position, locking switch. During normal modem operation it is in the center position. It is used to select the test or command menu.
BWD/FWD	Backward/Forward switch	This is a 3-position, momentary-contact switch which is spring loaded to the center position. It is used to scroll through the test or command menu in either the backward or forward direction.

Table 3. Modem Front Panel Controls and Displays (Contd)

LABEL	COMPONENT	DESCRIPTION
-/+	Minus/Plus switch	This is a 3-position, momentary-contact switch which is spring loaded to the center position. It is used to scroll through submenu selections in either the backward or forward direction.
EXEC	Execute pushbutton	This momentary-contact pushbutton is used to initiate tests and commands.
ER	Equalizer Retrain lamp	This yellow lamp lights when the modem is not receiving good data.
RR	Receiver Ready lamp	This yellow lamp lights when data carrier is being received.
CS	Clear to Send lamp	This yellow lamp lights when the modem is available to transmit data.
RS	Request to Send lamp	This yellow lamp lights when the data terminal equipment has requested the modem to transmit data.

Tests and Commands

DATAPHONE II service provides extensive testing capabilities enabling you to test modems and the telephone facility. DATAPHONE II service commands permit you to control the modem network and the database associated with the network.

Summary

DATAPHONE II service provides a new high level of diagnostics, central site control, and greater monitoring and control capabilities to minimize downtime and improve performance.

Additional technical information about DATAPHONE II service can be ordered through your AT&T Account Team. If you have any technical questions about DATAPHONE II service, consult your Technical Consultant.

MODEM ADDRESSING

Introduction

The diagnostic communications on a DATAPHONE II modem network are accomplished using addresses selected and assigned at the time of modem installation. These addresses are assigned in such a way that a tributary modem can be uniquely identified by a control modem and a control modem by a DCD. The address used at the DCD is compound in that it is made up of addresses of one or more modems in the user network. This compound address defines a unique path to the modem of interest. The compound address, as seen at the DCD, takes the form of local address, port, network address 1, network address 2, network address 3. The compound address, as seen on the NC screen, uses the format:

LOCAL/PORT/NET1/NET2/NET3

At a modem the Display Local Address (dsla) and the Display Network Address (dsna) commands are used to show the specific address. These are the only address formats used for modem-to-modem identification.

These addresses are described below.

Local Address

The Local address is used only by the DCD to identify a modem connected to it via the control channel. The local address consists of three digits and is set by a switch on the rear of the modem mounting. Local addresses are uniquely assigned. There are 256 possible local addresses ranging from 011 to 328. However, the last digit can never be 0 or 9, e.g., 019 or 120 is not valid. The *dsla* command displays this address.

Port Address

This 1-digit number is a supplement to the local address and refers to the port or channel on a modem connected to the control channel that is being addressed. A 2096A modem can have up to four ports, while 2024A, 2048-type, and 2096C modems have only one port. Tests and commands can be directed to a specific port of a 2096A by including as a supplement to the local address a port number (1, 2, 3, or 4). If the modem is a 2024A, 2048-type, or a 2096C then no port number is required.

Network Address

This address is a diagnostic channel address and consists of two digits (01 to 80) associated with each modem. Whereas the local and port address define, for a DCD, the circuit that is of interest, a sequence of up to three network addresses is used to indicate the specific modem in this particular circuit that is being addressed by its control modem. The network address of tributary modems connected to the same control modem must be unique. The *dsna* command displays this address.

MODEM OPTIONS

Introduction

Options are important to the proper operation of the modems. They are used to define the role of the modem in your network. They allow you to custom-tailor the modems according to your specific applications.

Description of Option Categories

There are nine categories of options. Not all categories apply to all modem types. A description of each option category follows. Refer to Table 4.

Category A Options

The A options are network configuration options for private line point-to-point or multipoint networks.

Category B Options

The B options determine the source of the transmitter timing of the modem.

Category C Options

The C options are the carrier control options.

Category D Options

The D options affect the customer interface and 4-wire interface of the modem.

Category E Options

The E options are miscellaneous.

Category G Options

The G options are network configuration options for extended service networks and in networks using multiplexers or concentrators.

Category H Options

The H options are enabled in 2096A modems in extended service.

Category I Options

The I options control the independent receiver ready operation on the ports of 2096A modems.

Category J Options

The J options enable the diagnostic channel to be extended via the daisy chain in extended service modem operation.

Table 4. Modem Options

OPTION DESIG.	OPTION NAME	MODEM					REMARKS
		2024A	2048A	2048C	2096A	2096C	
A1	Category A – Service Offerings Point-to-Point Control	x	x		x		Mutually Exclusive with Cat. G Options Below
A2	Point-to-Point Tributary or Extended Point-to-Point Tributary	x	x		d		
A3	Multipoint Control	x	x	d		x	
A4	Multipoint Tributary or Extended Multipoint Tributary	d	d			d	
B1	Category B – Timing Control Internal Timing	d	d	d	d	d	Mutually Exclusive
B2	Slaved Timing	x	x		x	x	
B3	External Timing – Port 1	x	x	x	x	x	
B4	External Timing – Port 2				x		
B5	External Timing – Port 3				x		
B6	External Timing – Port 4				x		
C1	Category C – Carrier Control Continuous Carrier, Switched RS – Port 1	x	x	x	(x)	x	Mutually Exclusive
C2	Continuous Carrier, Switched RS – Port 2				x		
C3	Continuous Carrier, Switched RS – Port 3				x		
C4	Continuous Carrier, Switched RS – Port 4				x		
C5	Continuous Carrier, Continuous RS	x	x	d	d	x	
C6	Switched Carrier, Switched RS All Ports	d	d	x	ⓧ	d	
D1	Category D – Interface Control DM off in Analog Loop	x	x	x	x	x	
D2	Received Data Not Clamped in Modem Test	x	x	x	x	x	
D3	Signaling Rate Selector (SR) Used				x	x	
D4*	Antistream Timer – 3 seconds	x	x		x	x	

Table 4. Modem Options (Contd)

OPTION DESIG.	OPTION NAME	MODEM					REMARKS
		2024A	2048A	2048C	2096A	2096C	
D5*	Antistream Timer – 9 seconds	x	x		x	x	
D6*	Antistream Timer – 27 seconds	x	x		x	x	
D7	Data Auxiliary Set or TEK Leads Not Used	x	x	x	x	x	
D8	Disable Receive Signal Quality for Facility Health Monitor	x	x	x	x	x	
	Category E – Miscellaneous Options						
E1	Quick Start-Up		x	x		p	
E2	1-second Holdover Out	p	p	p	x	d	
E3	Transmit Soft Turn-Off	x	x	x			
E4	Receive Soft Turn-Off	x	x	x			
E5	Maximum Address – 16	x	x	x	x	d	
E6	Maximum Address – 32	x	x	x	x		
E7	Disable Secondary Channel	[x]	[x]	[x]	[x]	[x]	
E8	Disable Receive Signal Level for Facility Health Monitor	x	x	x	x	x	
	Category G – Extended Service						
G1	Double Extension Outboard Control	x	x		x		Mutually Exclusive with Cat. A Options Above
G2	Double Extension Outboard Tributary or M:1 Mux Tributary	x	x		x		
G3	Double Extension Backbone Control or M:1 Mux Tributary	x	x		x		
G4	Backbone Tributary or 1:M Mux Tributary	x	x		x		
G5	Extended Point-to-Point Control or 1:M Mux Control	x	x		x		
G6	Extended Multipoint Control or 1:M Mux Multipoint Control	x	x	x		x	

Table 4. Modem Options (Contd)

OPTION DESIG.	OPTION NAME	MODEM					REMARKS
		2024A	2048A	2048C	2096A	2096C	
	Category H – Elastic Stores						
H1	Elastic Store In – Port 1				(X)△		
H2	Elastic Store In – Port 2				x		
H3	Elastic Store In – Port 3				x		
H4	Elastic Store In – Port 4				x		
	Category I – Independent Receiver Ready Operation						
I1	Independent Rcvr Ready Operation – Port 1				x		
I2	Independent Rcvr Ready Operation – Port 2				x		
I3	Independent Rcvr Ready Operation – Port 3				x		
I4	Independent Rcvr Ready Operation – Port 4				x		
	Category J – Interface Control for Port Identification						
J1	Extended Service Addressing – Port 1	x	x	x	x	x	
J2	Extended Service Addressing – Port 2				x		
J3	Extended Service Addressing – Port 3				x		
J4	Extended Service Addressing – Port 4				x		

x Available option.

d Default option.

* Modem must be tributary with switched carrier.

p Permanently installed option.

(X)△ C1 option should not be used with H1

(X) 2096A with MUX option 1-96 or 1-48

[x] Only necessary in control modems operating in a mixed service configuration.

MODEM COMMAND MENU

The modem commands are described in Table 5.

Table 5. Modem Command Menu

COMMAND	DESCRIPTION	AVAILABILITY											
		2024A 2048A&C				2096A				2096C			
		C		T		C		T		C		T	
		N	M	N	M	N	M	N	M	N	M	N	M
ADPL (Add Poll List)	This command allows the tributary modem to add itself to the poll list of the control modem without having the control manned. This command does NOT DISRUPT the normal data transmission of the modem.				X				X				X
	If the network address of the tributary is already in the poll list of the control, then the tributary display will indicate "ERR." The assignment of tributary network address should be reviewed.												
AQPL (Acquire Poll List)	This command causes the control modem or, in extended service, the outboard or backbone tributary modem to poll every possible network address. (The maximum length of the poll list is optional.) Each network address address for which it receives a response will be added to the list. This command does NOT DISRUPT the normal data transmission of the modem.		X		X		X		X		X		
	The AQPL command is time-consuming. To add known addresses the Change Poll List (CHPL) command should be used.												
CHMX (Change Multiplexer Options)	This command is used to select one of the seven split-stream port speed configuration options allowable for the 2096A modem.						X		X				
	At the 2096C modem this command is used to select one of the three port speed speed operation options allowable for its single port.										X		X
	This command DISRUPTS normal data transmission.												
CHNA (Change Network Address)	This command is used to change the 2-digit network address (e.g., 03) currently assigned to the modem. This command does NOT DISRUPT the normal operation of the modem but will disrupt the Network Diagnostic System.		X		X		X		X		X		X
CHOP (Change Optional)	This command is used to add or delete options from the set of options currently installed in the modem. This command CAN DISRUPT the normal data transmission of the modem.		X		X		X		X		X		X

LEGEND: C = control T = tributary N = normal mode M = maintenance mode

Table 5. Modem Command Menu (Contd)

COMMAND	DESCRIPTION	AVAILABILITY											
		2024A 2048A&C				2096A				2096C			
		C		T		C		T		C		T	
		N	M	N	M	N	M	N	M	N	M	N	M
CHPL (Change Poll List)	This command enables the operator to manually add or delete network addresses from the poll list of a control modem or, in extended service, an outboard or backbone tributary modem. As with options, the network addresses currently on the poll list are displayed with a check mark opposite the numeric display. This command does NOT DISRUPT the normal data transmission of the modem.		X		X		X		X		X		
CLOP (Clear Options)	This command is used to clear all of the options installed in the modem. After this command is executed the modem is automatically placed in the Change Options (CHOP) command. This command CAN DISRUPT the normal transmission of the control modem and will DISRUPT normal data transmission of the tributary modem.		X		X		X		X		X		X
DSAB (Disable/ Enable)	This command is used to disable or enable the control modem or any of its tributary modems, or a tributary modem. When a modem is disabled its display will flash "DSAB" when the TEST/CMD switch is in the center position.												
	When a modem is enabled the display will indicate the present condition of the modem. This command DISRUPTS normal data transmission.	X		X		X		X		X		X	
DSLA (Display Local Address)	This command is used to display the 3-digit local address (e.g., 011) currently assigned to the modem. The local address cannot be changed from the front panel of the modem. This command does NOT DISRUPT the normal data transmission of the modem.	X		X		X		X		X		X	
DSNA (Display Network Address)	This command is used to display the 2-digit network address (e.g., 03) currently assigned to the modem. This command does NOT DISRUPT the normal data transmission of the modem.												
DSOP (Display Option)	This command is used to display the options installed in the modem. This command does NOT DISRUPT the normal data transmission of the modem.	X		X		X		X		X		X	

LEGEND: C = control T = tributary N = normal mode M = maintenance mode