DIGITAL SWITCHING SYSTEMS

DMS-100* FAMILY DATAPATH*

MSL/DMS-100* ASYNCHRONOUS ACCESS
OPERATIONS AND PERFORMANCE TESTING

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CONTENTS

TABLES

1. INTRODUCTION

1.01   This practice describes the operation of the MSL/DMS-100
        Asynchronous Interface Module (Fig. 1) and the methods by
which its on-line transmission performance can be tested.

1.02   The Asynchronous Access feature can be used in either
        DMS-100 offices or Meridian SL-100 PBXs. In either case,
Asynchronous Access is supported only on inside plant facilities.
It may not be extended to outside plant lines.   Throughout this
document, the telephone switch supporting Asynchronous Access is
referred to as the MSL/DMS-100.

1.03   The AIM is connected to AILC in the MSL/DMS-100 switch to
        provide 'switched mode' operation.

1.04   The AIM, in conjunction with an MSL/DMS-100 switch, the
        Datapath Feature and 'Keyboard Dialing' is used to make
intra or inter office data calls.

1.05   The AIM provides the interface between an RS-232-C compat-
        ible asynchronous DTE and the AILC.

1.06   The AIM may be desktop or wall mounted and is used to
        originate and to answer data calls.

CONTROLS

1.07   The AIM is equipped with a power on/off switch and a power
        on indicator lamp.

PRACTICE APPLICATION

1.08   The information in this Practice applies to offices with
        Batch Change Supplements 18-25 (BCS18-25) release soft-
ware. Unless reissued, the Practice also applies to any office
with subsequent BCS release software. The correspondence between
BCS releases and Northern Telecom Practice (NTP) issues is given
in "DMS-100 Master Index of Practices" (297-1001-001).

SOFTWARE IDENTIFICATION

1.09   Software applicable to a specific DMS-100 Family office is
        identified by a BCS release number and by Northern Telecom
(NT) Product Engineering Codes (PEC).   The significance of the
BCS number and the PEC is described in 297-1001-450 (section
450/32) and in the Office Feature Record D-190.

1.10   A display of the BCS number and PEC for the NT feature
        packages available in a specific office can be obtained by
entering the command string:

PATCHER;INFORM LIST;LEAVE

at a Maintenance and Administration Position (MAP).

REFERENCES

1.11   References listed as prerequisites are essential for an
       understanding of this Practice. Those listed as inform-
ative contain detailed information concerning other items men-
tioned in this Practice, but are not essential.   References are
inserted at the appropriate places in the text.

<u>Note:</u>   The documents listed may exist in more than one version.
See 297-1001-001 to determine the release code of the version
compatible with a specific release of software.

Prerequisite References

DOCUMENT NUMBER	TITLE
297-1001-100	System Description
297-2121-103	Asynchronous Access General Description

Informative References

DOCUMENT NUMBER	TITLE
297-1001-001	Master Index of Practices
297-2101-310	Service Order and Query System Reference Manual
297-2101-451	Customer Data Schema
297-2121-203	Asynchronous Access Installation

2. OPERATION PROCEDURES AND TESTS

PREREQUISITES

2.01   The Datapath Feature, AIM, AILC and terminal equipment
        installation should have been completed according to 297-
2121-203.

2.02   Ensure that commercial power is supplied at the appropri-
        ate outlets and that the power supply required for any AIM
is correctly installed (see 297-2121-203).

ABNORMAL OPERATIONS DURING TESTING

2.03   The operating procedures specify the manner in which the
        AIM should normally function. Should there be any devi-
ation in the specified operations when the equipment is operated
and tested, perform the following checks:

1. Verify that the data-related equipment is properly intercon-
    nected as per 297-2121-203 by checking the following con-
    nections:

    *   AIM power

    *   AIM-to-terminal

    *   AIM-to-AILC

    *   connections to the connecting block

    *   cross-connections at the MDF

    *   cable loading.

    Note: All cable loading must be removed. No bridge taps are
    allowed.

2. Verify that the appropriate assignments have been made in the
    data fill (297-2101-310 or 297-2101-451) to allow operation.

    *   Check AILC/AIM assignments.

    *   Check AIM feature assignments.

    *   Verify AIM key assignments.

    *   Check telephone-set line card assignments (if telephone
         is associated).

    *   Verify the AIM profile if this feature is assigned.

3. Verify that the AIM is not installed out of range from the
    terminal equipment:

    *   Check cable-distance between AIM and terminal (maximum 50
         ft or 16 m).

    *   Check cable-distance between AIM and AILC (maximum 4000
         ft or 1200 m of 24-gauge cable).

4. Verify the integrity of the terminal equipment connected to
    the AIM.

5. Verify that the AILC is properly configured:

    *   Check LCM line drawer installation.

OPERATION

2.04   Table A provides detailed action and response sequences
       for Keyboard dialing from the AIM.   The chart shows the
sequence of events that occur for test and normal modes of opera-
tion.

TABLE A
KEYBOARD DIALING FROM AIM DATA STATION

_____

_____

Keyboard dialing is only applicable to ASCII, asynchronous start
stop character mode, interactive terminals equipped with EIA RS-
232-C interface.

*   It is not available for synchronous or block mode terminals.

The AIM and KBD provides the following capabilities:

*   Call origination to local hosts and with restrictions to
    remote hosts

*   Ring Again capability

*   Auto Dial calling (Intra-office only)

*   Speed Calling

*   Resource calling (modem pool insertion)

*   Auto answer of incoming calls (note 1)

*   Far end loopback testing (note 2)

_____

Table Continued

TABLE A (Continued)
KEYBOARD DIALING FROM AIM DATA STATION

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* Data baud rates of 110, 150, 300, 600, 1200, 2400, 4800, 9600 and 19200

* 2 stop-bits for 110 baud and 1 bit for all other baud rates

* 8 data bits and no parity bit (or 7 data bits plus 1 parity bit)

Notes:

1. An incoming call is answered automatically and < on the DTE screen announces the call is connected.

2. The far end loopback is active for one call only and ! may be used to cancel the test before the call attempt. Input $+ to originate the call. A # sign on the screen indicates to input the test number. The ... and >- characters indicate the call progress. After the call is disconnected, the test is completed and normal calls can be made.

Miscellaneous:

* Ensure data terminal is on-line and that both terminal and AIM are turned on.

* User inputs may be in either lower or upper case.

* The call may be dialed by using the same alphanumeric combinations that exist on a standard dial pad i.e., ABC=2, etc. The * and # are accepted as is and treated as touch pad items. Illegal characters are not echoed and result in a beep (bell character) transmitted to the DTE.

* All valid inputs are echoed on the terminal screen. Beeps are returned if inputs are invalid.

* The input may not be edited. If a wrong digit is input, abort and place call again.

* All prompts during call set-up are preceded by a line feed and carriage return.

* ASCII terminals should be set to full duplex.

* The AIM and KBD are easy to use because user prompts guide you through the operating steps.

* The commands are in graphic characters, as follows:

Table Continued

TABLE A (Continued)
KEYBOARD DIALING FROM AIM DATA STATION

COMMANDS	MEANING
+	Dial or connect
!	Abort call prior to call connection
@	Autodial
=	Speed call
&	Network Resource
%	Ring Again
$	Far end loop-back test call
control-T	Request AILC self test
0-9, *, #	Digits
a-y, A-Y	Alphas as on keypad (q, Q, z, and Z are not allowed during KBD)

*   The prompts are preceded by CR and line feed (LF), and are in
    graphic characters as follows:

PROMPTS	MEANING
:	Input selection request
#	Enter number
...	Connection in progress
>	Call connected (with bell/beep)
<?	Incoming call manual answer (with bell/beep)
<	Incoming call connected (with bell/beep)
%?	Busy Ring Again? (with bell/beep)
+?	Idle Rering? (with bell/beep)
&?	NRS call progress (with bell/beep)

The > and < prompts are terminated with CR,LF.

STEP	ACTION	VERIFICATION OR TERMINAL PROMPT	COMMENT
	Normal Operation		
	Start Condition: power lamp on Terminal power on,		
1	Enter . (CR)	:	The .(CR) is necessary to initiate auto-baud- ing. : indicates KBD is initiated.

Table Continued

STEP	ACTION	VERIFICATION OR TERMINAL PROMPT	COMMENT
2	Enter +	#	Request to enter number
3	Auto Dial active?		If yes, go to step 14. If not, go to step 4.
4	Speed Call active?		If yes, go to step 17. If not, go to step 5.
5	Enter digits	...	Connection in progress. If a second # appears after 7 digits are in, enter the other digits.
	Called Party Idle		Go to step 9 if called party is busy.
6			No indication is given during call set-up.
7	Called party answers.	>	Data call established.
		MESSAGE	A greeting MESSAGE may or may not be received. It may contain a status line and a greeting message as determined by the called party.
8	Proceed with data session.		Data transfer takes place end-to-end. Go to step 21 for disconnect procedures.
	Called Party Busy		
9	Destination busy	%? bell heard	Enter % to establish Ring Again or ! (or no action) to abort call. If ! is entered or no action is taken, ! and : are received. Return to step 2.

Table Continued

STEP	ACTION	VERIFICATION OR TERMINAL PROMPT	COMMENT
10	Enter %	:	Wait or place new call.
11	Called party available.	+? bell heard.	Enter + (within 30 s) to continue or ! to abort call.
12	Enter +	#	
13	Enter %	...	Return to step 6.
	<u>Auto Dial Active</u>		Go to step 15 to program Auto Dial number.
14	Enter @	...	Return to step 6.
	<u>Program Auto Dial Number</u>		
			After step 1.
15	Enter @	#	Key in autodial number and <u>@</u>
16	Enter number and @	:	Return to step 1.
	<u>Speed Call Active</u>		Go to step 19 to program Speed Call number.
17	Enter =NN		Enter = and 1 or 2 digit speed call code.
18		...	Return to step 6.
	<u>Speed Call List Update</u>		
			After step 1.
19	Enter =	#	Key in speed call code, speed call number and =
20	Enter SC code, number and =	:	Return to step 5.

Table Continued

STEP	ACTION	VERIFICATION OR TERMINAL PROMPT	COMMENT
	Disconnect Procedures		
21	Log off if connected to a host	If host drops DTR, call is disconnected	
	OR		
	Operate DTE DTR switch to OFF (if equipped)	DTR in OFF position for 1.6 s causes break timeout at AILC (see Note 1)	
	OR		
	Power down DTE	If DTE is powered down for 1.6 s, break timeout occurs (see Note 1)	
	OR		
	Power down AIM	If AIM is powered down for 1.6 s, break timeout occurs (see Note 1)	
	OR		
	Send continuous break	Transmitting a BREAK character continuously for 1.6 s causes MSL/DMS-100 to release call (see Note 1)	
	OR		
	Use KBD Release Sequence	See note 2.	

Table Continued

STEP	ACTION	VERIFICATION OR TERMINAL PROMPT	COMMENT

Notes:

1. This procedure will disconnect the call connection in the MSL/DMS-100. However, the user logon data session at the host computer may not be ended. Ensure that the host computer equipment or Protocol Converter, if used, is configured to end the logon session under these circumstances.

2. The KBD sequence is as follows:

   *   during KBD (until > is received) or during speed call or auto dial programming, input an ! to return to idle mode.

   *   during a call, type three exclamation marks (!!!) with pauses between the characters of less than one second, and preceded and followed by a one second (minimum) guard time when nothing is typed, the AILC initiates a call disconnection via messaging to the MSL/DMS-100.

3. PERFORMANCE TESTING OPERATIONS

3.01   Many variables can degrade the data-transmission perform-
        ance of an AIM or other type DTE attached to the AILC that
might otherwise function satisfactorily from a call-processing or
feature standpoint.

3.02   Where excessive errors are introduced, three general ele-
        ments are attributable:

*   human error in operation/application

*   faults in the equipment hardware and software

*   faults in the connecting transmission facility.

3.03   Fault isolation is therefore a matter of identifying the
        involved elements by taking systematic corrective action.

3.04   The error-rate specification for MSL/DMS-100 Data feature
        transmission are:

*   In-House - 1 error in 10 M bits

*   Outgoing (RS 422) - 1 error in 100 K bits (modem dependent)

IN-HOUSE TESTING

3.05   In-house data calls are conducted from data stations to
        data stations and from data stations to AILC connected to
DTE.   Loopback testing can be performed from any data station to
an in-house facility to verify the integrity of the equipment
under test. Loopback testing from a known good data station can
also isolate faults to called AIM (or other type DTE) or to tran-
smission lines according to the desired test sequence or trans-
mission type in which it is used.

INTEROFFICE TESTING

3.06   Inbound and Outbound data calling through the MSL/DMS-100
        switching network is made possible by the provision of
digital trunks or modem pooling.

3.07   The modem pool allows data calls to be switched over
        voice-grade analog trunks to remote or local data facili-
ties.   This capability, while allowing efficient use of modems
and trunks, adds several variables to the error-source location
process.   Modem pool calls are subject to error introduced by
local modem faults, remote modem faults, and transmission gradi-
ents inherent in many DDD applications.

MODEM POOL VERIFICATION

3.08   Error isolation techniques for modem pool calls are
        dependent on the type of modems supplied in the modem
pool.   The local loopback facility is able to test interoffice
AIM connected to the modem pool.

DIGITAL TRUNK VERIFICATION

3.09   Error isolation techniques for digital trunks are depend-
        ent on the type of digital trunks supplied.

TABLE B
AIM TROUBLESHOOTING PROCEDURES

SYMPTOM	PROCEDURE
NO RESPONSE FROM AILC:	
AIM power indicator (LED) is dark.	* Check AIM power switch. * Ensure power transformer has an ac source. * Ensure AIM transformer is plugged in. * Ensure that transformer leads are properly connected to the AIM.
AIM power indicator (LED) is lit.	* Ensure terminal is powered up. * Ensure terminal is properly connected to AIM. * Ensure terminal is ON LINE. * Ensure terminal is ready for data transmission with the proper speed and other parameters correctly set up.
STILL NO RESPONSE FROM AILC:	
AIM power lamp is steadily lit.	* Ensure AIM is properly connected to AILC. * Verify that the wire pairs are not reversed. * Verify that there are no open leads.
Still no response from AILC.	* Use another AILC. * Use another terminal. * Use another AIM.
RESPONSES ARE RECEIVED FROM AILC:	
Characters are garbage.	* Check bit rate of terminal. * Check number of stop bits on terminal. * Verify that the wire pairs are not reversed. * Try a new terminal. * Try a new AILC.
Some characters are missing or garbage.	* Check parity setting on the terminal. * Ensure that terminal clock specifications meet +/-1% frequency tolerance requirements of AILC.

Table Continued

TABLE B (Continued)
AIM TROUBLESHOOTING PROCEDURES

SYMPTOM	PROCEDURE
A call can not be placed to a remote unit.	* Ensure that the database is properly programmed. * Ensure that the remote unit is capable of communicating with the originating terminal. * Try originating a call to another terminal. * Try a new AILC.

4. ABBREVIATIONS

AILC   Asynchronous interface Line Card

AIM   Asynchronous Interface Module

DDD   Direct Distance Dialing

DTE   Data Terminating Equipment

KBD   Keyboard Dialing

LCM   Line Concentrating Module

MDF   Main Distributing Frame