4ESS™ Switch 1B Processor Diagnostic Program Application Description

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1. Overview

1.01 This document describes the 1B Processor diagnostic program application in the following terms:

- General description of 1B Processor diagnostic programs
- Frame control switch requests
- Common input message requests
- Interactive diagnostic options

1.02 This document is reissued to cover information about Program Store Expansion.

1.03 This document does not contain safety labels. Part 7 provides a list of abbreviations and acronyms with applicable terms used in this document.

1.04 For further descriptions of the software programs involved in the 1B Processor diagnostics (DGN), refer to AT&T 254-280-220 *Diagnostic Programs, Software Description.*

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1.08 This practice is developed by AT&T Network Systems Customer Education & Training Organization.

2. 1B Processor Diagnostic Programs—General Description

A. Common Diagnostic Procedures

2.01 The 1B Processor diagnostic programs and their program identification (pident), program number and unit type number assignments are listed in Table A. Each diagnostic results in either an all tests pass (ATP), conditional all tests pass (CATP), some tests failed (STF) or no tests run (NTR) message. In general, diagnostics are run only on out-of-service units, and the system configuration programs do not restore a unit to service unless the restore-unit-to-service input message provides the option of unconditionally restoring a unit to service without running the diagnostic. An unconditional restore should be used only when the necessity to force a unit back into service exists and when there is confidence that the unit can be forced into service without affecting system integrity.

2.02 In general, an ATP rather than CATP diagnostic result is needed before a unit can be declared fault-free. This is because a CATP result indicates that tests of some circuits had to be skipped because of system configuration restraints or other test restraints encountered at the time the diagnostic was run (for example, another unit needed as a test helper was out of service). When a CATP diagnostic result is obtained, the user should normally attempt to remove the testing restraint (for example, repair/restore the other unit needed as a helper) and rerun the diagnostic. A typical CATP output message is as follows:

DGN:CC 0 PH1 CATP (00000000 00010000)

The two octal words in parentheses indicate the CATP reason(s). The CATP bit assignments can be found in the I/O Manual Output Message under DGN for the unit diagnosed. In the previous example, bit 12 being set indicates that some tests in central control (CC) diagnostic were skipped because the Scan and Signal Distributor (SSD) was out of service.

2.03 Some 1B Processor diagnostics include one or more versions of tests that are conditionally executed (or skipped), depending on the member type (MT) or hardware version (HV) assigned (in office translations) to the unit under test. The MT value of a unit indicates that the unit is up to or beyond a particular hardware change Product Design Information (PDI) level. Member type (MT) is for Class A PDI and HV is for Non-Class A PDI.

B. Diagnostic Test Phases

2.04 Diagnostic tests are selected and grouped together to form test phases. The grouping criteria is highly dependent upon the method of testing and the circuitry under test. Table B shows how the CC phases are numbered and structured. The phases are ordered in a way as to gradually test circuitry in the unit under test. Thus, the first phases (phases 1 through 9) include tests of such things as power and clock circuits. The last phases (phases 90 through 99) are those which may require extensive interaction with the operating system or require assistance. These are demand phases which must be explicitly requested via input message or via a special request from other programs.

2.05 When a normal diagnosis is requested, all the nondemand phases for the unit/subunit are run. A normal unit/subunit diagnosis can be requested either manually or automatically (under program control).

(a) Manual requests for a normal unit/subunit diagnosis can be made from the unit/subunit power switch (see "Frame Control Switch Requests") or via input messages RST and DGN (see "Input Message Requests").

(b) Automatic requests for a normal diagnosis are made under control of such programs as fault recovery and routine exercise (REX).

2.06 The demand phases or portions of a normal diagnosis are normally requested manually via the DGN input message in which the desired phases are specified. The remainder of this document describes the basic frame control switch requests, input message requests and interactive diagnostic options that apply in general to all 1B Processor diagnostics.

3. Frame Control Switch Requests

3.01 The two scan points (A B) for a frame (unit/subunit) control power switch can be in one of four states.

- Normal Power-On (00)
- Request Out of Service (ROS) (10)
- Normal (Manual) Power-Off (01)
- Alarmed Condition (automatic) Power-Down (11).

3.02 The frame control scan points for 1B Processor units/subunits are connected to scanner rows in the SSD.

3.03 The acknowledge (ACK) and out-of-service (OS) lamps for most 1B Processor frames are controlled by signal distributor (SD) points from SD rows in the SSD.

3.04 The scan points are monitored; the SD points and CC pulse sources are controlled from the CC under program control.

3.05 The following scan point transition is a request to program control to remove the unit/subunit from service.

Normal Power-On → ROS

When this transition is detected, the ACK lamp is momentarily lighted to indicate that the request is recognized, the condition for removal from service is verified, the unit/subunit is removed from service and the OS lamp is lighted. The conditions for removal from service are the same as those for the RMV input message request (see "Input Message Requests").

3.06 The following scan point transitions trigger a diagnostic on the unit/subunit:

(a) Normal Power-off → Normal Power-on

(b) ROS → Normal Power-on

3.07 When one of the preceding scan point transitions is detected, the following events normally occur:

(a) The ACK lamp turns on and off to indicate that the transition is recognized.

(b) A normal diagnosis is run on the unit.

(c) The OS lamp extinguishes if the diagnosis is ATP or CATP, and the unit is restored in service.

Table A. Pident, Program and Unit Type Number Assignments

Diagnostic	Pident	Program No.		Unit Type No.	
		Oct	Dec	Oct	Dec
API	APDG	20	16	176	126
Central Control	CCDG	2	2	175	125
Call Store	MUDG	1	1	173	123
Program Store	MUDG	1	1	174	124
Data Unit Selector	ADDG	6	6	167	119
Tape Unit Controller	ADDG	6	6	167	119
MUP	MCDG	10	8	154	108
IOUS/IOUC	IODG	3	3	165	117
I/O Processor	I2DG	16	14	165	117
Call Store Bus	MBDG	11	9	163	115
Program Store Bus	MBDG	11	9	164	116
Auxiliary Unit Bus	ABDG	12	10	162	114
Power Conversion and Distribution Frame (PCD)	PFDG	14	12	157	111
Miscellaneous Power	XPDG	15	13	166	118
Scan & Signal Distribute	PDDG	14	12	153	107
Auxiliary Unit Interface	AIDG	7	7	155	109
Interface Bus	IFDG	21	17	156	110

Table B. CC Diagnostic Test Phase Structure

Phase Numbers	Restrictions
1-9	Use for power, clock circuits and general tests for global resource.
10-19 • • • • 80-89	Restriction on series 10-80 are left to the discretion of the diagnostic designer. • • •
90-99	Demand phase

4. Input Message Requests

A. Remove from Service (RMV)

4.01 The basic RMV format may be either of the following:

RMV:unit *i* **[,subunit** *j***]!**

Where *i* = member number of unit

j = member number of subunit

This format is used when a unit "*i* " *or a subunit "j* " associated with unit "*i* " can be removed from service.

RMV:unit *i* **, subunit** *j* **!**

This format is used when only a subunit "*j* " associated with unit "*i* " can be removed from service.

4.02 For specific units and subunits, see the Input Message Manual (IM-4B000-01).

B. Restore to Service (RST)

4.03 The basic RST format is as follows:

RST:unit *i* **[,subunit** *j* **] [;UCL] [:TLP]!**

The RST message triggers a diagnostic unless the UCL parameter is used. If the diagnostic is ATP/CATP or if UCL is used, the unit is restored unless some other system constraint exists.

4.04 For specific units and subunits, see the Input Message Manual (IM-4B000-01).

C. Diagnose (DGN)

4.05 The DGN input messages for a number of 1B Processor frames can include one or more unit/subunit unique options. Therefore, a basic format for the DGN input message cannot be provided that applies to all units/subunits. A general format for the DGN input message may be stated as shown on the following page.

DGN:unit i [,subunit j] [;RPT a] [,RDT b] [, RAW] [,UCL] [:PH c] [,TLP]

Where unit is the unit type and i is the unit member number. Subunit is the subunit type and j is the subunit member number.

RPT *a* This option causes the diagnosis to be repeated "*a* " times automatically. The maximum value of "*a* " is 255 times.

RDT *b* This option redirects the output messages to the channel specified by "*b* ". Without this option, output is on the input channel.

RAW When this is used, all the failing test results of each phase are printed out. Without this option, only the first five test failures of a failing phase are printed out.

UCL This option overrides the early terminate jumps in a diagnostic except in cases where it is dangerous to continue.

PH *c* This option causes part of a normal diagnostic or demand phase(s) to be run. The phase(s) run is determined by "*c* " which can be a single decimal number, a range (for example, *c-f*), a list (for example, *c, d,...*) or a combination of a range and list. A list or combination must be surrounded by parentheses.

NOTE:
If a range is used and if some phases in the range do not exist, an invalid phase message is printed; nevertheless, all existing phases in the range are run.

TLP This option triggers the automatic trouble location procedure (TLP) for the diagnostic.

4.06 See the Input Message Manual (IM-4B000-01) for specific 1B Processor Units.

D. Exercise

4.07 The exercise (EX) message is equivalent to the DGN message except additional interactive diagnostic options are provided as described in Part 5.

E. Diagnostic Audit

4.08 If the diagnostic encounters a software error in the diagnostic control program, an audit is generated. If this occurs, contact technical support for assistance.

5. Interactive Diagnostic Options

5.01 The interactive diagnostic capability allows the user to run the diagnostic in a conversational mode. This capability permits stopping inside a phase, stepping from one segment to another and allows looping over one or more segments.

A. Start and Stop

5.02 Messages used to start and stop are as follows:

EX:unit i;START!

Start interactive job. If helper units are needed, they are included in the preceding message.

STOP:MACLI,CLASS MTCE,SUBCLASS *i* **!**

Stop interactive job.

To determine which subclass is being used for your interactive job, use the following message:

OP:MACLI,CLASS MTCE!

B. Advance

5.03 To advance, use the following input messages:

EX:unit *i* **:PH** *x* **,ADR** *y* **!**

Advance/execute to phase "*x*" address "*y*".

EX:unit *i*:ADR *z*!

Advance/execute to address "*z*" in current phase.

Addresses "*y*" and "*z*" must be relative addresses of a SEGINIT macro index word (first word in expansion) in phase "*x*". If "PH *x*" is used, the tests in "PH *x*" from the start of the phase through address "*y*" are executed; then the diagnostic is suspended. If the second message is used, the tests in phase "*x*" from wherever it was suspended to address "*z*" is executed and then suspended. The first advance message used must contain a phase indication.

C. Step

5.04 To step, use the following input messages:

EX:unit *i*;STEP[*j*]:PH *x*!

Step/execute first "*i*" segments in phase "*x*"

EX:unit *i*; STEP[*j*]!

Step/execute test "*i*" segments.

The STEP command permits "*j*" segments in phase "*x*" to be executed. If the "*j*" is defaulted, only one segment is executed. If "PH *x*" is used, "*j*" segments in phase "*x*" starting with the first segment in the phase are executed and then suspended. If "PH *x*" is not used, "*j*" segments, starting from wherever the current phase was suspended, are executed. The first step message used must contain a phase indication. The advance and step messages can be used together to form a useful tool. An example follows.

EX:unit *i*:PH *x*,ADR *y*!

EX:unit *i*;STEP!

If it is known that phase "*x*" was sane up to the segment beginning at address "*y*" but was triggering an interject some place after "*y*," the user could advance to address "*y*" and then use the STEP command repeatedly until the interject occurs to determine which segment is causing the interject.

D. Looping

5.05 The loop command allows one or more segments of code to be repeatedly executed. The most common use is to execute one segment of code and display frame signals on an oscilloscope with a sync on a test in that segment. The looping messages are as follows:

EX:unit *i*:SYNC *y*!

Generate sync pulse at data table address "*y*".

EX:unit *i*:ENABLE *n*!

Enable sync generation only after test "*n*" results collected.

EX:unit i:PH *x*,ADDR *j-k*!

Start looping from data table address "*j*" to "*k*" in phase "*x*".

EX:unit *i*!

Stop looping.

The relative address "*y*" on the SYNC command must be the data table address of an index word (first word) of a test macro expansion. At execution time, the diagnostic task dispenser generates a pulse on the coax connector of the active CC labeled GCP SYN located in the back (right side) of the 1B Processor frame (Vert Pos. 20) just before calling the task routine specified by the index word at address "*y*". The user should be aware that if the SYNC command specifies an address in a diagnostic subroutine, a sync pulse is generated on every execution/call of the subroutine unless the ENABLE command is used to restrict the sync generation. By using the ENABLE command along with the SYNC command, the user can inhibit the generation of a sync at subroutine address "*y*" until

results for test number "*n*" (specified in the ENABLE command) have been collected; in effect, the user is inhibiting the sync generation on earlier calls of the subroutine because test numbers advance with each call of a subroutine.

5.06 The current implementation of the SYNC and ENABLE commands only provides for generating a pulse at the start of the execution of the task routine called at data table address "*y*". Some task routines generate results for more than one test number on a single call of the task routine. A sync can be obtained just before the first test number (that is, at the start of the task routine) but not as some intermediate test number within the execution of the task routine. An example is used to better describe the looping procedure. Assume that a user is trying to resolve a test failure in Phase 11 of the DUS diagnostic. The user decides to loop repeatedly over Test 67 at relative address 620 and scope a bus lead. It is determined that the segment containing Test 67 starts at address 577 and ends at address 674. The following input messages would be used.

EX:DUS *i*;START!

EX:DUS *i*;SYNC 620!

EX:DUS *i*:PH 11, ADR 577-675!

To stop, the following command would be used.

EX:DUS *i*!

5.07 The oscilloscope should be used as follows:

(1) Put the oscilloscope in the delayed time base mode.

(2) Feed the sync pulse into the main trigger input and the signal of interest into one of the vertical inputs.

(3) Adjust the delayed time (from the main trigger); observe the signal of interest by using the delayed time base.

Experimentally, repetition rates up to 80 ms or 90 ms can be observed satisfactorily without a memory scope. When multiple signals are displayed, the traces deteriorate more quickly as the repetition rate gets slower.

6. Processor Routine Exercise Schedule

6.01 The routine diagnostics found in the generic sensitive schedule in Table C apply to all Electronic Switching System (*ESS*™) offices equipped with the 1B Processor. These diagnostics are required to be performed daily and are automatically initiated according to this schedule. Certain restrictions are placed on the routine exercise schedule to ensure that all unit types are exercised each night. These restrictions do not mean that all members of each unit type are exercised.

Table C. 1B Processor Routine Exercise Schedule

	Exercise (Operational Unit)	Time
Start	Auxiliary Data System (ADS) (Data Unit Selectors and Tape Unit Controllers)	11:00 p.m.
Stop	ADS	11:30 p.m.
Run	Central Control (CC)	12:30 a.m.
Run	Program Store Bus (PSB)	-
Run	Call Store Bus (CSB)	-
Run	Auxiliary Unit Bus (AUB)	-
Run	Power Conversion and Distribution Frame	-
Start	Program Store (PS)	-
Stop	PS	1:00 a.m.
Start	Call Store (CS)	-
Stop	CS	1:30 a.m.
Run	Input/Output Unit Selectors	2:30 a.m.

6.02 The maintenance control program (MACP) may be inhibited from running automatically scheduled jobs in the maintenance class. The inhibit mode has two options.

INH:MACLI,CLASS MTCE; REX!

All routine exercises are inhibited for a maximum of 24 hours or until the "ALW" message is input.

INH:MACLI,CLASS MTCE; ALL!

All automatically scheduled jobs in the maintenance class are inhibited for a maximum of 24 hours or until the "ALW" message is input. This message inhibits fault recognition removals and is not a recommended way to run for any length of time.

The following message, accompanied by a spurt-minor alarm to alert the user that the MACP is being inhibited, is printed once every hour.

REPT:MACLI, CLASS MTCE INHIBITED

6.03 The MACP may be restored to its normal mode of operation at any time by manually requesting the allow message:

ALW:MACLI,CLASS MTCE!

To flush the system of jobs that have been queued while the MACP was inhibited, the clear message is input:

CLR:MACLI,CLASS *a* **!**

Where *a* = one of the following classes.

MTCE - maintenance
LIBU - library
GUTL - generic utility
ADMN - administration

6.04 Note that the ADS exercise is started at 11:00 p.m. and terminated at 11:30 p.m. During the time from 11:30 p.m. to 12:30 a.m., no exercise is scheduled. This is done to prevent any interference with automatic accounting procedures in some offices. Also note that both the program store and call store exercises have start and stop times. In large offices equipped with many stores, a complete exercise of all stores in the office could consume a large amount of time and, therefore, preclude the exercise of other units. To avoid this situation, a time period is selected which is long enough to exercise most of the stores but is short enough to allow other units to be exercised before the exercise period is terminated. The stores that were not exercised are scheduled for the next night.

Abbreviations and Acronyms

A

ACK
Acknowledge

API
Attached Processor Interface

ATP
All Tests Pass

AUB
Auxiliary Unit Bus

AUI
Auxiliary Unit Interface

C

CATP
Conditional All Tests Pass

CC
Central Control

CS
Call Store

CSB
Call Store Bus

D

DGN
Diagnostic

DUS
Data Unit Selector

E

ESS
Electronic Switching System

EX
Exercise

H

HV
Hardware Version

I

I/O
Input/Output

IFB
Interface Bus

IOUC
Input/Output Unit Controller

IOUS
Input/Output Unit Selector

M

MACP
Maintenance Control Program

MCC
Master Control Center

MT
Member Type

MUP
Maintenance Utility Processor

O

OS
Out of Service

P

PCD
Power Conversion and Distribution (frame)

PDI
Product Design Information

PS
Program Store

PSB
Program Store Bus

PUB
Peripheral Unit Bus

R

REX
Routine Exercise

RMV
Remove from Service

ROS
Request Out of Service

RST
Restore to Service

S

SD
Signal Distributor

SSD
Scan and Signal Distribute

STF
Some Tests Failed

T

TLP
Trouble Locating Procedure

TUC
Tape Unit Controller

U

UCL
Unconditional

How Are We Doing?

Document Title: ***4ESS*** Switch 1B Processor Diagnostic Program Application Description

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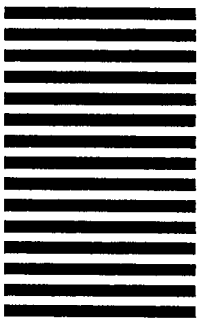

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