NETWORK MAINTENANCE

SOFTWARE SUBSYSTEM DESCRIPTION

2-WIRE NO. 1 AND NO. 1A ELECTRONIC SWITCHING SYSTEMS

CONTENTS PAGE

CONTENTS PAGE

FIGURES PAGE

TABLES PAGE

1. GENERAL

INTRODUCTION

1.01 This document describes the functional operation of the Network Maintenance Software Subsystem in the No. 1 and No. 1A Electronic Switching Systems.

1.02 When this section is reissued, the reason for reissue will be stated in this paragraph.

1.03 Refer to Part 6 for abbreviations used in this section.

PURPOSE OF SUBSYSTEM

1.04 The network maintenance software subsystem programs provide the means by which maintenance personnel may perform testing, repairing, and replacing faulty components in the network fabric. The program routines provide the capability by establishing partial paths in the network.

SCOPE OF DOCUMENT

1.05 This section provides:

(a) Functional Description of Network Maintenance Subsystem

(b) Brief Description of PIDENTs (Network Fabric Routines—NMFA; Network Failure Maintenance Action—NMFL)

(c) PIDENT Interface

(d) PIDENT Functional Description.

2. BRIEF DESCRIPTION OF PIDENTS

NETWORK FABRIC ROUTINES (NMFA)

2.01 The NMFA routines provide the means for removing portions of the network fabric from service and to test the suspect equipment by setting partial paths in the network. The network links are removed from service by setting the appropriate bits in the network map to a busy state. This action prevents disturbance of the existing talking paths during test procedures.

2.02 The program provides the capability for testing crosspoints and switches via TTY input messages. The messages (see paragraphs 5.31, 5.32, and 5.33) provide the maintenance personnel with data on incoming trunks, links, and switches for diagnostic procedures. The messages allow the maintenance personnel to manually check the network path for continuity in order to isolate the faulty section of the network fabric.

NETWORK FAILURE MAINTENANCE ACTION (NMFL)

2.03 The NMFL program is requested when a hardware failure or redundant Signal Distributor (SD) operation occurs during the execution of the Peripheral Order Buffer (POB). The rate at which peripheral orders are sent to the peripheral units is controlled by the POB execution program. During every fifth J-level interrupt, the POB execution program sends the orders to the appropriate peripheral unit. If during the execution of a peripheral order a failure condition occurs, the POB is deactivated and its orders placed on the Maintenance Unexpected Result Link List (MURL).

2.04 The POB fault recognition action is initiated by:

(a) Hardware failures causing F-level interrupts upon execution of orders to the following peripheral controllers:

(1) Network

(2) SD

(3) Central Pulse Distributor (CPD)

(4) Scanner

(b) Hardware failures causing F-scan failures on execution of network or SD orders

(c) Redundant SD actions usually caused by a faulty program that has lost the current state of a SD applique circuit

(d) Per-network path or per-call maintenance test failures which are loaded in the POB as POB subroutines.

2.05 The POB includes identifying the source of the POB failure, isolating the failing unit for actions [paragraph 2.04(a) and (b)] completing the execution of the failing order. When this is not possible, or if actions (c) and (d) are initiated, the failing POB is normally entered on the MURL for continued treatment on the base level.

2.06 The NMFL program checks the MURL for a Peripheral Order Head Cell (POH). When found, the POB is checked to determine which of the following network control operations is the probable cause of failure:

(a) Network Controller

(b) SD Controller

(c) Scan Failure

(d) Maintenance Interrupt (Network or SD)

(e) False Cross Ground (FCG) Failure

(f) Transfer of Supervision Scan Failure

(g) Power Cross Failure

(h) Line Security Scan Failure

(i) Restore Verify Failure

(j) Maintenance Interrupt (Not Network or SD)

3. PIDENT INTERFACE

3.01 The NMFL and NMFA PIDENT global subroutines are identified in Tables A and B, respectively. These subroutines are accessed via the vector tables. Table A lists the subroutine number with a brief description.

3.02 Table C lists the global subroutines of PIDENTs which are used by NMFL. These subroutines are identified by PIDENT GLOBAL and the software subsystem description number which contains the functional description of the pident.

3.03 Global subroutines used by NMFA are identified in Table D by PIDENT and software subsystem description number.

TABLE A

NMFL PIDENT GLOBAL SUBROUTINES

PIDENT GLOBAL	DESCRIPTION
LTPRT	Entered from programs ORDL and RING on L-CDPR supervisory, linkage scan, ringing current scan, and audible TRSF failures. Prints line-to-trunk path.
NMALLR	Places LEN (loop start lines) on list for testing.
NMCMCK	Checks CAMA procedures.
NMDSFL	Checks list. If counter = 1, the switches are removed from list; otherwise, the counter is decremented.
NMHIDY	Loads high-and-dry orders to LSF for LEN.
NMLATP	Prints LT01 output message.
NMLDDN	Loads print buffer with DN and major class for non-MLH lines and terminal numbers for MLH lines.
NMLKLN	Places LEN (GS COIN lines) on PSPD low priority list and prints failing LEN.
NMLLRB	Entered via PSPD PT table. Prints LLR (GS PBX lines) and places LEN on LLR LEN list.
NMLRES	Entered from ALIT program. Prints LLR LEN list.
NMLTST	Entered from ECMP program every 5 minutes. Audits list of COIN LENs which have failed LLR test.
NMLT03	Prints LLR list.
NMPRTL	Prints list.
NMPUKC	Prints line-to-trunk supervisory path.
NMRCFL	Searches LEN list for failures.
NMRFCS	Dumps failures and zeroes failure counters.
NMRMVL	Removes LEN from list.
NMSSCN	Entered from ORDL program. Prints showering line failures path, places LEN on permanent signal list, and idles the POB.
NMTTPR	Prints trunk-to-trunk path.
NMTYP1	Performs F01 check.
PQPOBM	Unloads MURL.

TABLE B

NMFA PIDENT GLOBAL SUBROUTINES

PIDENT GLOBAL	DESCRIPTION
GASB1	Obtains associated B-link address.
GASB2	Obtains associated B-link address.
LJBCSA	Determines CSA and mask for LJ B-links.
LJCCSA	Determines CSA and mask for LJ C-links.
LJJCSA	Determines CSA and mask for LJ J-links.
LSACSA	Determines CSA and mask for LSF A-links.
LSBCSA	Determines CSA and mask for LSF B-links.
NMBIDL	Checks trunk busy condition. Make busy 8-trunk switches.
NMCJBI	Sets up mask for BCJ links.
NMFCON	Entered from main program every 500 ms to complete cells.
NMFFSG	Return point from printing NN06 heading.
NMFIDT	Locates idle TNN.
NMFNSG	Entered from TTY print program after status/periodic segment is printed.
NMFREM	Removes requested link(s) from service by marking B-I bits busy in network map (FAB-MB message).
NMFRES	Restores link(s) previously taken out of service which were made idle in network map (FAB-STATUS).
NMFSTA	Prints network status report.
NMMHSR	Prints hourly status report.
NMNN17	Prints (input message FAB-ICT) list of incoming TGNs (Network, Frame, Grid).
NMNTST	Sets up network messages.
NMRBSY	Entered upon removal of junctor from list. Resets J-bits in map to indicate busy condition.
NMSAE2	Entered from SAMP program. Locates all A-links in line-to-trunk network.
NMSAE3	Entered from SAMP program. Searches for type of link and network.
NMSAIN	Initialize Map Audit routine.

TABLE B (Contd)

NMFA PIDENT GLOBAL SUBROUTINES

PIDENT GLOBAL	DESCRIPTION
NMTNSG	Checks to see if all ICTs have been printed.
NM17SG	Finds incoming trunk TNNs and prints list.
OTHJNN	Determines line-to-trunk, trunk-to-line, line-to-line, trunk-to-trunk.
TJBCSA	Determines CSA and mask for TJ B-links.
TJJCSA	Determines CSA and mask for TJ J-links.
TSACSA	Determines CSA and mask for TS A-links.
TSBCSA	Determines CSA and mask for TS B-links.

TABLE C

GLOBALS USED BY NMFL

PIDENT	SSD SECTION	PIDENT GLOBAL
ALIT	231-045-235	ALTNML
CICS	231-045-120	CICTNN, CICXAM
CSFR	254-280-310	CSFRADCK
DSUB	231-045-120	DSLSN9, DSTSNA, DSTSNU, DSTDNA, DSMSN9
ECMP	231-045-100	ECNRSO, RETURN
IOCP	254-280-111	IOCPPRNT, IOCPIACK, IOCPMVCL, TTMEMN, IOCPMVAR
MCMP	231-310-250	MCSDEC
NCIN	231-045-120	NELTTT, NE11BN, NE11KN, NERVC1, NE11AT, NELEN5, NE20AN, NE11AP, NE02AN, NEPMFI, NERSTC
NEJR	231-045-145	NEJLJ2, NEJNNS, NEJSNN, NEJTJG, NEJTJ2
NMLI	231-045-205	NMBLLN
NTWK	231-045-120	NEJQCB, NETLCB, NEJAPL, NELLPB, NETAPT, NELTPB, NEIN10, NETAT2, NETTPB, NEIN01
OGTC	231-045-115	OGTN08, OGTIMO, OGTTNN
PAIR	231-045-200	DEBUG2W, PATTPCHK
QEPR	231-045-120	PQALRN, PQHARN, PQIDWL, EAUDIT
SADT	231-045-215	SAPNJL
SARG	231-045-215	SAHEP1
TERA	231-045-230	TERAPC
TNKC	231-045-230	TNIDLE, TNOFTL, TNPTML
TNLS	231-045-230	NMBLTK, TNHWDL, JNBLTK, NMUMBY, NMENTR
TRBL	231-045-145	TRENDC, TRENAA, TRLPPW, TRENEN, TRTWDN, TRFCDN
TRBD	231-045-145	TRDNBC, TRDNTZ
TRBT	231-045-145	TRTNGM, TRTNGN, TRRDAA, TRCPDN, TRMSNA, TRTSNU
TRCE	231-045-145	NETRCL
TVMN	231-045-145	TRCVLN
YAHA	231-045-145	YARLPS, YACJM1, YACJ10

TABLE D

GLOBALS USED BY NMFA

PIDENT	SSD SECTION	PIDENT GLOBAL
ECMP	231-045-100	ECE001
IOCP	254-280-111	IOCPIACK, IOCPPRNT, IOCPSCHK
MACR	231-045-200	MACP05, MACS02, MACS03, MACS06, MACS07, MACS24
NEJR	231-045-145	NEJLJ2, NEJTJ2
NETG	231-045-255	NEBLJS, NEBLSB, NEBTJS, NEBTSF, NEITJS, NEITSF, NEILJS, NEILSB
NMMX	231-045-220	MYTIME
NMRF	231-045-210	NMERC3
PAIR	231-045-200	PATTPCHK
TMAC	231-045-230	TMS50, TMS55
TNKC	231-045-230	TNMBSY, TNMIDL, TNTBRH
TNLS	231-045-230	NMTRST
TRBT	231-045-145	TRTNGN, TRUTYN
YAHA	231-045-155	YALENL

4. FUNCTIONAL DESCRIPTION OF NETWORK MAINTENANCE SUBSYSTEM

4.01 The No. 1/1A ESS switching network consists of links and switches through which talking or signaling paths are established. The links and switches are controlled via the POB execution programs. When a certain failing condition is encountered during the execution of a POB, the network failure action program is entered to process the POB containing the failure. The POB is deactivated, and its pointer is placed on the maintenance unexpected result list. The network failure action program then performs a series of checks or failure options, depending upon the type of failure, as indicated by the result of specific scan points. In the case of an SD failure, a client register is associated with the POB. All trunk network numbers (TNNs) associated with the failing POB are obtained, and from the TNNs all SD orders are reconstructed. If a match is obtained, a diagnosis of the associated trunk is requested, and the program then returns to the client failure address (CFA). If a match is not obtained between the reconstructed SD orders and the failing SD order, the program transfers to the CFA without a trunk diagnostic request.

4.02 The Network Fabric Subsystem consists of two PIDENTs, namely: (1) Network Failure Maintenance Action (NMFL, PR-6A044), and (2) Network Fabric Routines (NMFA), PR-6A044).

4.03 When an entry is made to NMFL, the POBs are unlinked from the MURL and tests are performed to determine the faulty link and switch which caused the peripheral order failure. The program causes appropriate printouts of the faulty switching unit.

4.04 The NMFA program performs maintenance actions that remove portions of the network

fabric from service and establish partial paths in the network which allows the maintenance personnel to make tests, repairs, and replacements of the faulty component(s). The program is activated via TTY input messages.

5. PIDENT FUNCTIONAL DESCRIPTION

NETWORK MAINTENANCE ACTION PROGRAM (NMFL)

5.01 Peripheral orders, that control the operation of peripheral switching units (links, switches, network, and SD controllers), are loaded in a buffer called the POB. Periodically, the POB execution program sends the orders to the appropriate unit. If a switching unit failure condition occurs during the execution of a peripheral order, the POB is deactivated and its POH is placed on the MURL. Figure 1 depicts an overview of the MURL maintenance function. The POB execution program is activated at every fifth J-level interrupt, but the responding failure action is executed on the base level. The POB failure action program is controlled by the POB failure option which was loaded by the POB client program. The program performs the following actions:

(a) Identification of the failure activator

(b) In-depth testing, further isolation, or retrial on per-path and per-call POB maintenance test failures

(c) Generation of teletype output messages for notifying office maintenance personnel of the failure

(d) Error analysis of network switches involved in certain types of POB failures

(e) Isolation of failure trunks, and request of automatic diagnosis

(f) Isolation of a failing line and certain failures of automatic line tests

(g) Restoral of nonfailing trunks

(h) Restoral of supervision to all lines

(i) Idling of POB.

5.02 Entry to NMFL is at global PQPOBM. The POB, which contains the failure, is unlinked from the MURL and checked for an Intermediate Failure Address (IFA) entry between the failing entry and the end of the POB. If it is found, it is stored at the end of the POB. Figure 2 illustrates the loading of IFAs in a POB.

5.03 The second word of the POB is then checked to determine the type of failure option specified. If failure option 0 is specified, the routine NMF00 is entered. The maintenance actions taken for failure option 0 are depicted in Fig. 3. This routine checks to see if the trouble was due to either controller failure, scan failure, maintenance interrupt, or an FCG failure. If the failure is due to a network controller, transfer is made to the CFA. Whenever a POB is returned to this address, it usually indicates a queue execution failure that could not be overcome by the Network Maintenance Program. If an SD failure is indicated and the failure option is 0 (Subtype 5), the trunk is made maintenance busy and is placed on the trunk maintenance list (TML). If the failing order matches the reconstructed SD order, a trunk diagnostic is requested. However, if the POB does not have a client register (CR) associated with it, the program transfers to the CFA without a trunk diagnostic request being made.

5.04 If a controller is not at fault, the TRANTR routine is entered. This routine first checks to see if the failure was due to maintenance interrupt. If it was, transfer is made to subroutine MITMP; otherwise, the failure is further checked to see if it was an FCG failure. If this is the condition, transfer is made to subroutine NMFOKA. If the failure was not an FCG, the table containing the orders is searched for a match with the address of the failing entry. If a match cannot be found between the failing entry address and table address, transfer is made to the subroutine BOMB, indicating a possible program error. The subroutine BOMB makes a transfer to the Audit Program (SARG) if the first word of the POB is equal to the CFA.

5.05 If the failure option is not 0, transfer is made to subroutine TYPFA. These maintenance actions are depicted in Fig. 4. This routine checks for eight possibilities which might have caused the POB failure. Table E lists the cause and subroutine to which the program transfers for processing.

Transfer of Supervision Scan Failure

5.06 If it is determined that the POB failure was associated with a transfer of supervision scan, subroutine NMSUPF is entered which makes

a check to see if the failure occurred on a trunk-to-trunk path. A supervision scan failure usually indicates that a network path does not have continuity. A transfer of supervision for a network terminal is transferred during the course of a call. For example, the supervision point for the originating line is transferred from the audible ringing circuit ferrod to a ferrod in a junctor circuit when answer occurs in a junctor on an interoffice call. If this condition is indicated, subroutine NMGUARD then checks for a supervision scan failure. If the supervision scan is found to be normal, normal failure actions are taken. If the supervision scan passes, a TN08 output message is printed and the call is retried by the client program. If an IFA is associated with the failure, a printout of the path is made. A transfer is made to subroutine TAKEFA in both of the above cases.

5.07 If the transfer of supervision failure is not associated with a trunk-to-trunk or an IFA, a search is made in the POB of all SD orders that were executed following the network orders. The state of the magnetic latching relay is returned to its original condition before the POB was activated and the POB loaded with orders to restore the line cutoff ferreed switches to the customer line. The customer line is then scanned for an on-hook condition. If the ferrod indicates that the customer line is still off-hook, the call is not abandoned and a failure is recorded. The supervision order is reloaded in the POB and the POB is reactivated.

Power Cross Scan Failure

5.08 If subroutine TYPFA determines that the POB is due to a power cross scan, the NMLPXQ subroutine is entered. A translation is made on the enable address to unit type and member number. If the failure occurred on a line-to-trunk connection, the trunk is placed on the trunk maintenance list. If the failure occurred on line-to-line, the failing switch is placed on the list of failing switches and the failing path is printed. Flags are set to prevent the restoring of the line ferrod to the line. The line is then placed on the high-and-dry list. The routine then transfers to the subroutine TAKEFA.

M-Lead Scan Failure

5.09 The E and M leads are associated with certain trunks and are used for supervisory signaling. If the TYPFA routine check indicates the POB failure is due to an M-lead scan, the failing path is printed and a transfer is made to subroutine TAKEFA.

Line Security Scan Failure

5.10 Line security scan is associated with 2-party service. It verifies that the correct party will be billed for the call. Upon origination by a particular party, the scanned information is stored and checked against a second scan. If the second scan information does not match the first, a line scan failure is recorded, the failing path is printed, and a transfer is made to subroutine TAKEFA.

Maintenance Interrupt Failure

5.11 If the routine TYPFA determines that the POB failure was due to a maintenance interrupt, a transfer is made directly to the TAKEFA routine.

False Cross Ground Failure

5.12 The FCG circuit is associated with the no-test vertical of the junctor switching frames, and is capable of detecting battery and/or ground on the tip-ring leads of the network path. If the routine detects a FCG failure, a check is made by FCFFA to determine if the FCG failure was produced on a Line Junctor Switching Frame (LJSF) or a Trunk Junctor Switching Frame (TJSF). If the failure occurred on a LJSF, a check is made to determine if the path is a line-to-line or a line-to-trunk. If the path is line-to-line, the failure is printed out on the TTY. If the path is line-to-trunk, the trunk is placed on the trunk maintenance list and the path is printed.

5.13 If the failure occurred on a TJSF, both the trunk network numbers are made maintenance busy. The failing path is printed out on the TTY and a transfer is made to routine TAKEFA.

Network or SD Failure

5.14 When the POB failure is caused by a malfunction of a network or SD controller, the common routine TAKEFA is entered. The routine first makes a check to determine what failure option, 1, 2, or 3, is specified.

5.15 If failure option 1 is specified, and there is an associated client register, a check is made

FAILURE OPTION	SUBTYPE	EXTEND OF FAULT RECOGNITION ACTION AND SPECIAL TREATMENT K-LEVEL IN SP GENERICS J-LEVEL IN CC GENERICS		FINAL POB STATUS
0	0	F-SCAN FAILURES	ORDER RETRIED ONCE	POB REACTIVATED IN ALL CASES
		F-LEVEL INTERRUPT FAILURES	COMPLETE FAULT RECOGNITION ACTION INCLUDING REDUNDANT SD TEST IF NECESSARY	POB REACTIVATED IN ALL CASES
	1	COMPLETE FAULT RECOGNITION ACTION: EXCEPT NO REDUNDANT SD TEST IS MADE ON SD FAILURES. IF FOR ACTION IS UNSUCCESSFUL, THE POSITION OF THE FAILING ENTRY WILL BE MARKED IN WORDS 64-65. OR 66 DECIMAL OF POB. IF SOURCE WAS F-LEVEL, REDUNDANT SD TEST IS MADE.		POB REACTIVATED IN ALL CASES
	2	RESERVED FOR MACS10 (ENTRY POINT IN PIDENT MACR)		
	3	COMPLETE FAULT RECOGNITION ACTION EXCEPT REDUNDANT SD TEST IS MADE ONLY WHEN FAILURE SOURCE IS F-LEVEL		IF FOR ACTION IS SUCCESSFUL: POB REACTIVATED. OTHERWISE: POB LOADED ON MURL SUBTYPE CHANGED TO 0
	4	COMPLETE FAULT RECOGNITION ACTION INCLUDING REDUNDANT SD TEST WHEN NECESSARY. IF FAULT RECOGNITION IS UNSUCCESSFUL IN EXECUTING AN SD ACTION, MESSAGES SD01 OR SD02 ARE PRINTED TO IDENTIFY THE SD POINT FAILING. MN02 N & SD MESSAGE NOT PRINTED		SUCCESS: POB REACTIVATED. FAILURE: FAILURE OPTION CHANGED TO 0 AND POB REACTIVATED (NOTE 1)
	5	COMPLETE FAULT RECOGNITION ACTION. REDUNDANT SD TEST NOT MADE UNLESS SOURCE OF FAILURE WAS F-LEVEL INT AND TEST IS NECESSARY.		SUCCESS: POB REACTIVATION FAILURE: POBSA DECREMENTED BY 1 AND POB REACTIVATED (NOTE 1) SUBTYPE CHANGED TO 0
	6	NO FAULT RECOGNITION. THE POSITION OF THE FAILING FCG ORDER IS MARKED IN WORDS D(61-63) OF THE POB IF THE FAILURE WAS AN FCG FAILURE. THE POSITIONS OF THE FAILING ORDERS ARE MARKED IN WORDS 64-66.		POB IS LEFT ACTIVE UNLESS THE FAILURE WAS AN F LEVEL INTERRUPT IN WHICH CASE IT IS DEACTIVATED AND LOADED IN MURL. SUBTYPE CHANGED TO 0
1.2, & 3	NOT USED	COMPLETE FAULT RECOGNITION ACTION. IN ADDITION TO FAULT RECOGNITION FAILURE THE FOLLOWING WILL ALSO CAUSE POB TO BE LOADED IN MURL: A) MORE THAN ONE ORDER FAILING IN POB IN A NTWK CYCLE. B) REDUNDANT SD ORDER PRINT MN02 N & SD MESSAGE C) FCG FAILING ORDER FAILS ON RETRY WITH COMPLEMENTARY ROUTES.		FAULT RECOGNITION SUCCESS: POB REACTIVATED FAILURE OR CASES (A), (B), OR (C): POB LOADED IN MURL.

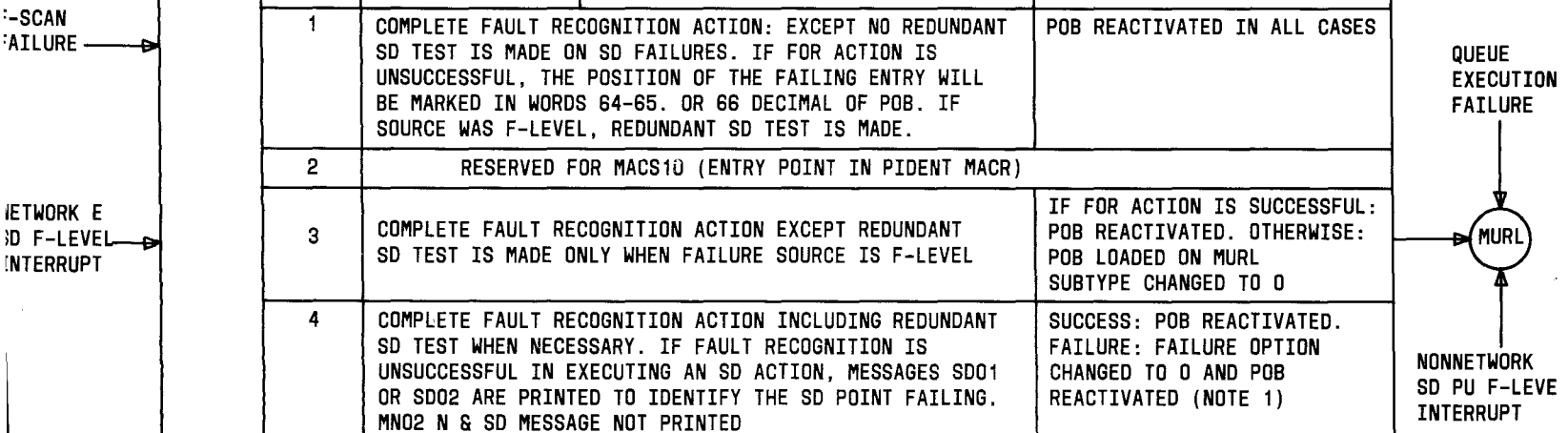
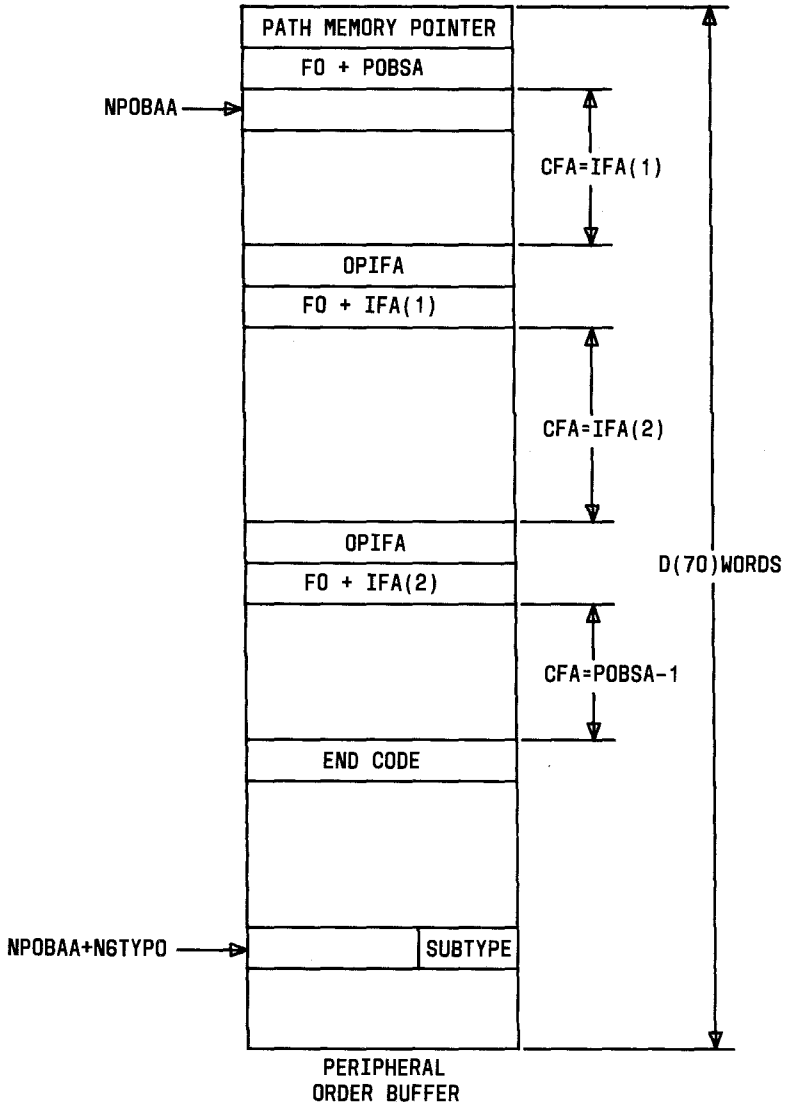


Fig. 1—POB Status Resulting From Failure Optior Action



NOTE 1:
THE CLIENT FAILURE ADDRESS WHEN INTERMEDIATE FAILURE ADDRESSES HAVE BEEN LOADED IN THE POB IS THE IFA IMMEDIATELY FOLLOWING THE FAILING ORDER. THE CFA FOR FAILING ORDERS NOT FOLLOWED BY AN IFA IS POBSA-1. THE ARROWS ON THE DIAGRAM INDICATE LOCATIONS WHERE. SHOULD A FAILURE OCCUR, A PARTICULAR IFA IS USED.

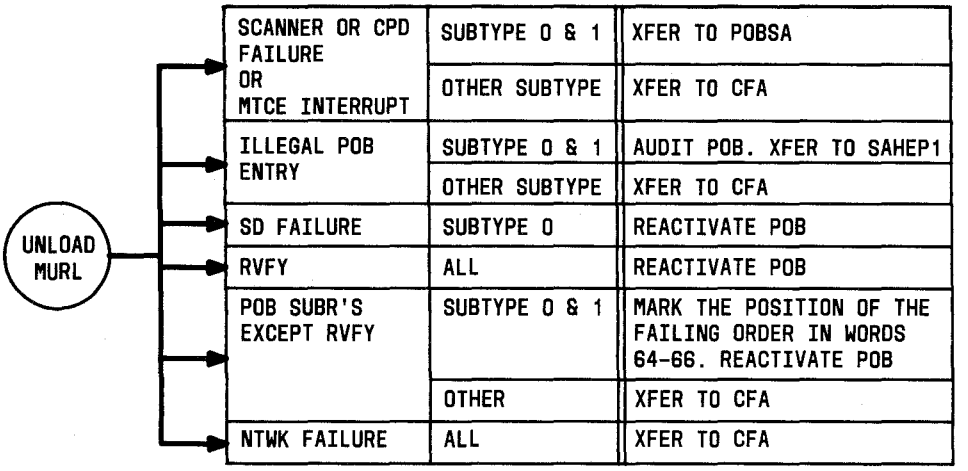
Fig. 2—Example of Loading IFAs in a POB

to determine if the failure was caused by an SD. If it was not, the relays associated with the trunk and junctor circuit are released. If it was caused by an SD, a request is made for a trunk diagnosis. The path is abandoned by restoring the lines, a request for a diagnosis of junctor circuits, and incoming trunks are placed on high-and-wet list. A transfer is then made to the CFA.

5.16 If a client register is not associated with the failure option, the routine NMNOCR checks the first word in the POB to see if the path is line-to-line, line-to-trunk, trunk-to-trunk, or line equipment number.

5.17 If it is a line equipment number, the POB is idled and a transfer is made to the CFA. If the associated path is a line-to-trunk and an SD failure occurs, a request for trunk diagnosis is made. All relays of the trunk circuit are released, the line ferrod is restored to the line, and the path is abandoned. In the case of an incoming trunk, the trunk is placed on the high-and-wet list. The high-and-wet list is used to determine if this is an origination or an abandonment. The POB is idled and the program transfers to the CFA.

5.18 If the path is a trunk-to-trunk and if an SD controller failure occurs, a request is made



SCANNER OR CPD FAILURE OR MTCE INTERRUPT	SUBTYPE 0 & 1	XFER TO POBSA
	OTHER SUBTYPE	XFER TO CFA
ILLEGAL POB ENTRY	SUBTYPE 0 & 1	AUDIT POB. XFER TO SAHEP1
	OTHER SUBTYPE	XFER TO CFA
SD FAILURE	SUBTYPE 0	REACTIVATE POB
RVFY	ALL	REACTIVATE POB
POB SUBR'S EXCEPT RVFY	SUBTYPE 0 & 1	MARK THE POSITION OF THE FAILING ORDER IN WORDS 64-66. REACTIVATE POB
	OTHER	XFER TO CFA
NTWK FAILURE	ALL	XFER TO CFA

Fig. 3—Network Maintenance Failure Actions—Failure Option 0

for a trunk diagnostic. The SD points are released and the path is abandoned. The POB is idled and transfer is made to the CFA.

5.19 When the path is line-to-line, the junctor circuit is released, the scanner ferrods are restored, a request for a junctor circuit diagnostic is made, and the path is abandoned. The POB is idle and transfer is made to the CFA.

5.20 If failure option 2 is specified, and the failure was due to an SD point, the failure is printed out on the TTY and a transfer is made to the routine for option 1 (see paragraph 5.15).

5.21 If failure option 3 is specified, the SD points are returned to their original states. If the POB failure is caused by a scan, the program returns to the CFA. If not a scan failure, the trunk network number is made busy and the program transfers to the CFA.

Showering Line Test

5.22 The routine NMSSCN is entered when an origination is detected but no digits are received which indicates an abandonment. Even if, after the line is restored and the line indicates off-hook, the trunk circuit ferrod indicates on-hook, the line is said to be in a showering condition. This routine causes a printout of the path, places the line equipment number on permanent signal list, and idles the POB. Showering line conditions are caused when on-hook loop resistances are between 2.6k and 4.8k ohms. This condition exists because the trunk and junctor supervisory ferrods (type 1C) are less sensitive than the line ferrods (type 1B).

Restore Verify Failure

5.23 Whenever a call is being disconnected, a check is made to see if the customer line ferrod is restored. The check is made by closing a network path between the line ferrod and the restore verify circuitry in the LJSF. The LJSF restore verify circuit places a resistive load across the line ferrod. Subroutine NMRVZT reads the line ferrod for a saturated condition to determine if it is connected to the customer's line. If the test fails the path, the failing switches are printed out. The POB is then reactivated and a transfer is made to the main program.

Hourly Routine

5.24 NMFL contains two routines, NMDSFL and NMRFCS, which are performed on an hourly basis. Whenever a failing path is printed out on the TTY, the switches associated with the path are stored on the list of failing switches. The routine NMDSFL is entered from the main program and checks the list of failing switches. If one or more of the switches is already on the list, its counter is incremented. If the counter indicates that a switch has failed for a total of six times, the last path containing the switch is printed out. If a

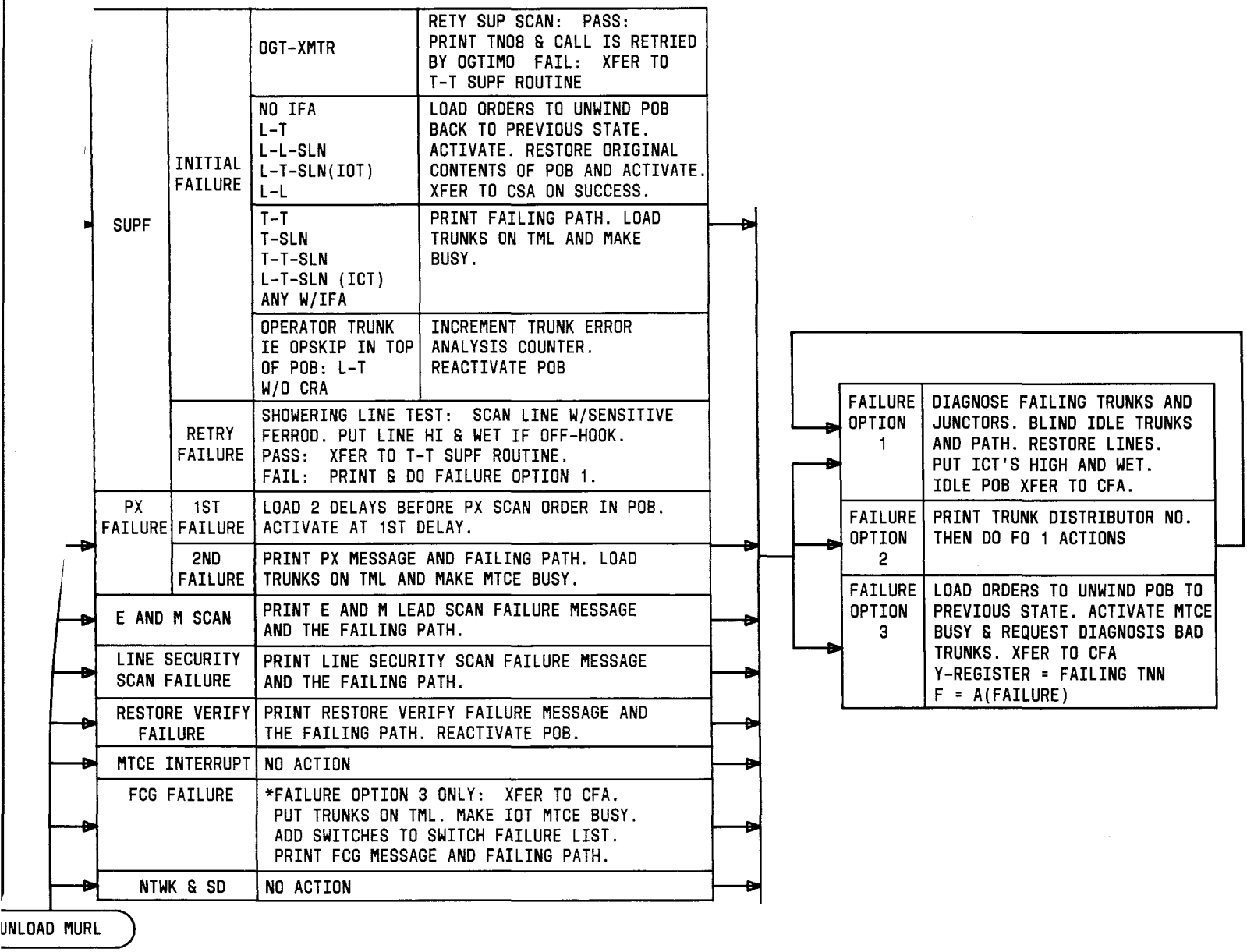


Fig. 4—Network Maintenance Failure Actions—Failure Options 1, 2, and 3

TABLE E

POB FAILURE SUBROUTINES

FAILURE CAUSE	SUBROUTINE
Transfer of Supervision Scan Failure	NMSUPF
Power Cross Scan Failure	NMLPXQ
M-Lead Scan Failure	TAKEFA
Line Security Scan Failure	TAKEFA
Maintenance Interrupt	TAKEFA
False Cross Ground Failure (Option 3)	FCFFA
Network/Controller Failure	TAKEFA
Restore Verify Failure	NMRVZT

switch counter indicates a failure count of 1, the switch is removed from the list.

5.25 The routine NMRFCS is entered from program MACR every hour to print the number of network failures which have occurred since the last printed report. A transfer is then made to the main program.

NETWORK FABRIC ROUTINES (NMFA)

5.26 The primary purpose of the NMFA program is to aid the maintenance personnel in testing, repairing, and replacing faulty crosspoints in the network fabric. The routines provide the ability to remove portions of the network fabric from service via the TTY to allow testing of the suspect equipment. This is accomplished by manipulating the network map.

5.27 A block of CS memory called the network map is utilized for administering the TTY requests. The program attempts to remove the link(s) from service by marking the appropriate bits busy in the network map. If the TTY input request cannot be complied with because talking paths are using some of the specified links, the program will update the associated cell. Completed requests are printed on the TTY. When links or switches are restored, the appropriate links in the network map are idled and the associated cell is released.

5.28 The network map is checked by the SARG periodically for inconsistances. SARG requires all links that are busy in the map to be associated with a valid path. The network map is searched every time the map is audited. The routine NMSAIN is entered when one of the various network map audits is in progress.

5.29 NMFA performs the following major functions:

(1) Network Map Audit Interface

(2) NN17 ICP Print Generation

(3) FAB Status and Set Requests

(4) Concentrator Replacement Routine.

Network Map Audit Interface

Global NMSAIN is entered for the network map audit interface routines. The routine functions include:

(a) Initialization for matching B-links on a given network

(b) Initialization for matching C- and J-links on a given network.

5.30 The SAMP Audit program [see Part 7, reference A(10)] transfers to global NMSAE2 after having built a copy of the network map from the path memory. Global NMSAE3 is entered from SAMP which starts a search for the type of link and network initialized by NMSAIN.

NN17 ICT Print Generation

5.31 Subroutine NMNN17 is entered when the input TTY message FAB-ICT is typed. This message is a request for a list of incoming trunks assigned to the specified trunk switch frame and grid. A check is performed to determine is another input message is in process. If one is being processed, an output message is printed indicating the input message would be repeated later. If the input message is accepted, an NN17 TTY output message is printed. The incoming trunks are listed by TNN and TGN to facilitate their location in the trunk group record and their identification to the far end control office.

FAB Status and Set Requests

5.32 NMFA provides the interface for input TTY messages to activate certain subroutines and cause TTY output messages regarding the network fabric. The following input messages provide means by which the network links and switches may be removed from service, restored to service, displayed, and tested:

FAB-MB — Entry is made at global NMFREM which makes busy and removes the links from service by marking the B-I bits busy in the network map. As a result the links are no longer available to the call processing programs. An OK system response is returned if the request is accepted. An NN05 output message is printed. If the input message was to busy a trunk switch frame, an NN06 output message is printed when all A-links and TNNs connected to that switch have been busied.

FAB-RESTORE — Global NMFRES is entered to restore link(s) which have been previously taken out of service when the B-I bits were made idle in the network map. The A-, B-, C-, and J-links are audited.

FAB-SET — Entered at NMNTST which performs tests on suspected crosspoints and switches. The purpose of the message is to establish a partial path in a network frame. The message is accepted only if all links in the specified path have been busied. The controller then sends an order to the frame to connect the path, and the controller order used to make the connection is printed. This action permits manual checking of the path in order to locate a faulty crosspoint. When the path is set, a NN04 output message is returned.

FAB-STATUS — Global NMFSTA is entered which causes a display of the map. The present condition (ie, talking, idle, or out of service) of the link or switch specified is displayed. If the request is accepted and the link or switch is either busy or out of service, a NN05 message is printed. If the link or switch is idle or entered on a cell but not yet on the out of service list, a NN06 message is printed.

Concentrator Replacement Routine

5.33 When TTY input message ASWS-INH is typed, the concentrator replacement routine NMLSCN is entered to prevent F-level interrupts from occurring when removing a concentrator from a line switch frame.

6. ABBREVIATIONS

CR — Client Register

CFA — Client Failure Address

CPD	Central Pulse Distributor
FCG	False Cross Ground
LJSF	Line Junctor Switching Frame
MACR	Maintenance Control Program
MURL	Maintenance Unexpected Result List
NMFA	Network Fabric Routine
NMFL	Network Failure Maintenance Action
POB	Peripheral Order Buffer
POH	Peripheral Order Head Cell
SARG	Audit Program
SD	Signal Distributor
TTY	Teletypewriter
TJSF	Trunk Junctor Switching Frame
TML	Trunk Maintenance List

7. REFERENCES

A. Bell System Practices

(1) 231-045-100	Operational Software Subsystem Description
(2) 231-045-115	Outpulsing Software Subsystem Description
(3) 231-045-120	Peripheral Control Software Subsystem Description
(4) 231-045-145	Translations Software Subsystem Description
(5) 231-045-155	Queue and General Purpose Software Subsystem Description
(6) 231-045-200	Maintenance Control Software Subsystem Description
(7) 231-045-205	System Verification and Recovery Software Subsystem Description
(8) 231-045-215	Audits Software Subsystem Description
(9) 231-045-220	Peripheral Diagnostic and Exercise Software Subsystem Description
(10) 231-045-230	Trunk and Service Circuit Maintenance Software Subsystem Description
(11) 231-045-235	Trunk and Line Test Software Subsystem Description Subsystem Description
(12) 231-310-250	Master Control Center Software Subsystem Description
(12) 231-310-250	Master Control Center Software Subsystem Description
(13) 254-280-111	Input/Output Programs-Description-1A Processor
(14) 254-280-310	Fault Recovery Programs-Description-1A Processor

B. Other References

(1) IM-6A001	Input Message Manual
(2) OM-6A001	Output Message Manual
(3) PR-6A044	Network Fabric Routines
(4) PR-6A044	Network Failure Maintenance Action
(5) 5352-750418.02	A Guide to POB Failure Options, K. L. Knipper