Installation Engineering Handbook 269
Western Electric
Northern Illinois Works

Section   **5 2 1**
                          10-27-78
       Replaces: Section 521
              dated 7-8-77

NO. 3 ESS
SYSTEM VERIFICATION
NETWORK FABRIC

CONTENTS

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1. GENERAL INFORMATION

1.1 Description

1.11 The Generic Network Fabric Exercise Test (NFEX) will be used to test the network fabric. This program is designed to test growth network fabric of an operating office as well as the network fabric of a newly installed office. This program is a nonresident program and therefore is paged into a buffer area reserved in the mainstore when it is requested via an input request from the maintenance teletypewriter (TTY).

1.2 Test Prerequisites

1.21 Prior to performing the network fabric tests, the Network Controller Tests[1] and the Scanner Tests[2] should be successfully completed on all controllers. Troubles in these two areas could adversely affect the result of the network fabric tests.

1.3 References

1.31 The following documents may be useful as references:

Document	Title
SD/CD-3H110-01	Peripheral Controller
SD/CD-3H120-01	15A Grid Circuit
SD/CD-2H121-01	15B Grid Circuit
SD/CD-3H122-01	First and Second Stage Access Circuit
SD/CD-3H130-01	15C Grid Circuit
SD/CD-3H131-01	Third Stage Access Circuit

Document (Cont.)	Title
SD/CD-3H901-01	Network Frame
SD/CD-3H902-01	Control Frame
→ IM/OM-3H300	No. 3 ESS Input/Output Message Manual
NFEX	Program Listing – Network Fabric Exercise Program

1.4 Records and Requirements

1.41 Records

1.411 The results of the tests of this section shall be recorded on forms SD-97-1313 and SD-97-1315. For detailed information on filling out test records, see Section 6B of Handbook 3.

1.42 Requirements

1.421 The tests in this section are based on the No. 3 ESS Performance Requirements, BSP 820-650-180.

1.5 Test Equipment

1.51 The following test sets may be required for troubleshooting purposes:

Amt.	ITE	Description
1	4659	Volt-Ohm-Milliammeter
1	4669	AC Current Probe & Amplifier
1	5237B	Tektronix Type 465 Oscilloscope

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[1] Refer to Section 520.12 for the description of the Network Controller Tests.

[2] Refer to Section 520.08 for the description of the Scanner Tests.

2. TEST PROCEDURE

2.1   Table B lists the steps necessary to perform the network fabric tests. Each network fabric test should result in an "ATP" printout with no errors indicated before proceeding to the next step.

2.2   If any of the tests result in an error message, refer to paragraph 4 for the description of the error and an aid in troubleshooting the fault found.

2.3   At the System Status Panel (SSP), check that the SELECT 0, SELECT 1, FORCE or LOCK functions are not enabled; i.e., associated lamps extinguished. Also check that neither CU is in MANUAL.

2.4   Using the present state of the CUs, enter Table A at the appropriate step and take the actions indicated to set up for the Network Fabric Tests.

3. TEST DESCRIPTION

3.1 General

3.11   The Network Fabric Exercise Test is designed to detect the following faults:

1. Transposition of control paths.
2. Slips of control paths.
3. Open tip and/or ring paths.
4. Stuck open crosspoints.
5. Stuck closed crosspoints.
6. Shorted tip and/or ring paths.
7. Tip and ring reversals.
8. Transposition of tip and ring paths.
9. Slip of tip and ring paths.

TABLE A

	SETUP PROCEDURE			
STEP	STATE OF CU	ACTION	RESPONSE	REMARK
1	CU 1 OUT-OF-SERVICE CU 0 ACTIVE	Type in: RST:CU!	RST CU COMPL	If successful, go to Step 4.
2	CU 0 OUT-OF-SERVICE CU 1 ACTIVE	Type in: RST:CU!	RST CU COMPL	If successful, go to Step 3.
3	CU 0 STANDBY CU 1 ACTIVE	Type in: SW:SYC;UCL!	OK	If successful, go to Step 4.
4	CU 0 ACTIVE CU 1 STANDBY			Continue test by following procedure in Table B.

TABLE B

	NETWORK FABRIC TESTING TEST PROCEDURE		
STEP	ACTION	RESPONSE	REMARK
1	EX:NW!	M tt EX NW ATP	If any other response is received, refer to paragraph 4.
2	SW:SYC;UCL!	OK	
3	EX:NW X,JSW!	M tt EX NW ATP	If any other response is received, refer to paragraph 4.

3.12   The primary detection devices used by this test are the line attending element (for loop start lines) and the FCG test circuit.

3.2   Test Sequence

3.21   The test is conducted on one cross point at a time. A sequence of orders will be sent in order to set up a path associated with this crosspoint and make the appropriate tests. Basically there are two tests performed on each crosspoint.

3.22   The first test is to detect shorts or foreign potentials on the tip and ring wiring of the path or a stuck closed crosspoint. All crosspoints in the path being tested are closed with the exception of the particular crosspoint under test. The FCG circuit is used as the detection device.

3.23   The second test is to detect opens in the tip and ring wiring of the path or a stuck open crosspoint. This test is performed by closing all crosspoints in the path under test, connecting the restore verify circuit and then scanning the line attending element. (The restore verify circuit should cause the saturation of the line attending element.)

3.24   The path is torn down after it has been tested. All crosspoints in one switch will be tested before proceeding to the next switch. The number and type of switches tested depends on the options specified in the TTY input request.

3.25   If no options are specified in the TTY input request, the test vertical, output and then the input switches will be tested, in order, in each concentrator group (from concentrator group 1 to the largest number of the equipped concentrator groups). After all concentrator groups have been tested, the junctor switch test is performed.

4.   TROUBLESHOOTING PROCEDURE

4.1   General

4.11   Since there is no TLM associated with the errors detected by this test, other means must be used to isolate faults. The main troubleshooting procedure is to use the Network Fabric Test itself.

4.12   The options available in the input request allow the test to be conducted in several modes of operation and also to specify a portion of the network fabric to be tested. Refer to Figure 1 for the description of the options available.

4.2   Error Message

4.21   There are two TTY messages generated when the Network Fabric Test detects an error. Refer to Figure 2 for the description of these messages.

4.22   The first message indicates the type of switch being tested, the equipment location of the switch being tested and the type of error detected. The second message contains the path under test when the error was detected.

4.23   The path information defines the TEN, A-link (ALNK) and B-link (either wire, BLNK, or junctor, JC) associated with input (ISW), output (OSW) and test vertical (TV) switch tests. Additional path information is printed for tests of junctor switches (JSW) and includes the other B-link and A-link used.

4.3   Input Request Options

4.31   When the test is requested with the unconditional option (UCL), a list of all of the faults will be generated. Because of the multiplicity of the paths tested, most faults (depending on the nature of the fault) will be detected in a number of these paths. By correlating the paths indicated in the error messages, the trouble may be isolated to a particular switch or link.

4.32   Once a particular switch is suspected of being at fault, the test of that switch may be requested repetitively (using the STEP or RPT option) and the appropriate test equipment (depending on the type of fault) used to further isolate the fault.

4.33   The ERR type of fault signifies that some error condition has occurred such that the FCG and/or RV tests could not be performed on the path indicated. Take the action indicated by the type of ERR fault to correct this condition. Refer to the Input Message Manual for conditions which may cause the type of ERR message generated.

4.34   Use input message CLR:RPT:STEP! to clear step and repeat functions.

FIGURE 1

NETWORK FABRIC INPUT REQUEST

EX:NW (n), (switch); (mode)!

where:

n = concentrator group (1-15). If not specified,
    test concentrator groups 1 through last
    equipped concentrator group.

switch = ISW cgs = input switch (ISW 000-127).

        c = concentrator (0-1). If not
            specified, test all input
            switches in concentrator group
            specified.

        g = group of 8 input switches (0-2).
            If not specified test all in-
            put switches in concentrator
            of concentrator group specified.

        s = switch (0-7). If not speci-
            fied, test group of 8 input
            switches in concentrator of
            concentrator group specified.

     = OSW cs = output switch (OSW 00-17).

        c = concentrator (0-1). If not
            specified, test all output
            switches in concentrator
            group specified.

        s = switch (0-7). If not speci-
            fied, test all output switches
            in concentrator of concentra-
            tor group specified.

      = JSW s = junctor switch (JSW 0-31).

        s = switch (0-31). If not speci-
            fied, test all junctor switches.
            Whether the switch is speci-
            fied or not, only those junc-
            tor switch crosspoints asso-
            ciated with concentrator
            group 1 through the concentra-
            tor group specified will be
            tested.

       = TV   = test vertical switches.

   mode = CDL = conditional test. Stop on
                 first error found. If no
                 mode is specified, this is
                 the mode used.

        = UCL = unconditional test. Print
                 failures and continue.

        = RPT = repeat test up to first error
                 found.

        = STEP = repeat test under control of
                 the "PF EXECUTE" button on
                 the SSP.

For the step and repeat modes, the results are
displayed on the PASS/FAIL lamps. Also, if the
failure repeats, the error message is suppressed.

➤ Arrows indicate new or
   changed information.

Reason for Reissue:
   Update.

FIGURE 2

NETWORK FABRIC ERROR MESSAGE

M tt EX NW (mode) (switch) XXXXXX (error type)

    TEN n cgsl ALNK n csl ($\frac{BLNK}{JC}$) n s

    [$(\frac{BLNK}{JC})$ n s ALNK n csl] *

where:

mode = STOPPED, if conditional test request.

     = FAULT, if unconditional test request.

switch = ISW, if input switch.
       = OSW, if output switch.
       = JSW, if junctor switch.
       = TV, if test vertical switch.

XXXXXX = equipment location of switch.

error type = FCG, if false cross or ground failure.
           = RVF, if restore verify failure.
           = ERR e, if miscellaneous failure.

n = concentrator group (1-15)

c = concentrator (0-1)

g = group of 8 input switches (0-2)

s = switch

l = level

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*This information is only provided if the
 failure is associated with a junctor switch
 test.

Manager, ESS Installation & Field Engineering
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