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PAGE INDEX NOTES

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SUPPORTING INFORMATION

CATEGORY	NUMBER
SCHEMATIC DRAWINGS	SD-3H110-01 SD-3H120-01 SD-3H121-01 SD-3H122-01 SD-3H130-01 SD-3H131-01 SD-3H902-01
INPUT MESSAGE MANUAL	IM-3H300-01
OUTPUT MESSAGE MANUAL	OM-3H300-01
TROUBLE LOCATING MANUAL	TLM-3H103-01

ELECTRONIC SWITCHING SYSTEMS

NO. 3

NETWORK TROUBLE-SHOOTING MANUAL

AT&TCo SPCS

PK-3H301-01-A1

56 PAGES

BELL LABORATORIES

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APPLICATION

1. INTRODUCTION

1.01 These procedures are written to minimize the loss of service caused by failures common to both network controllers. These failures are typically caused by defective circuit packs in both network controllers, or by faults in the common portion of the network fabric (that is, the remreed grids, the network access unit, the third stage access unit, or the cabling associated with the grids and access units).

1.02 Faults in the common portion of the network fabric that affect the gate lead multiple (the 149 gate leads that select the input switches, input levels, output switches, output levels, and multiple from the control frame to the networks) will typically cause diagnostic and call processing failures in all (or all but one) of the network frames.

1.03 Faults in the common portion of the third stage fabric that affect the third stage gate lead multiple (the 50 gate leads that selected the third stage switches, input levels, and output levels) will typically cause diagnostic and call processing failures in all third stage grids, and, in some cases, will also cause diagnostic and call processing failures in all the networks.

1.04 Inhibiting group checks on the active network controller will often restore a large percentage of the call processing capability when this type of fault is present.

1.05 These procedures should be used with caution since they will affect call processing. Therefore, the SCC, TAC, RTAC, or PECC should be consulted when using these procedures.

2. MAIN PROCEDURE

2.01 A common fault will normally be indicated by one or more of the following conditions:

(a) REPT MULT PC TRBL messages - indicating both peripheral controllers are in trouble.

(b) REPT NW xxxx TRBL messages - indicating network fabric trouble.

(c) REPT NWC cs TRBL messages - indicating group check or pulser OK failures on network orders.

(d) Network diagnostic failures on both network controllers.

2.02 Lock the active SYC on-line.

(a) Determine the extent of the service outage on the active SYC by attempting to draw dial tone in each input switch grid in all network frames on the affected control frame. Since there are six input switch grids per network frame, at least six lines per network frame should be checked for dial tone.

(b) Inhibit group checks on the active SYC using the INH:NGC cs! message, and then repeat the dial tone tests.

2.03 Switch SYCs and lock the active SYC on-line.

(a) Determine the extent of the service outage on the active SYC by repeating the dial tone tests.

(b) Inhibit group checks on the active SYC using the INH:NGC cs! message, and then repeat the dial tone tests.

2.04 Reconfigure the system to the configuration that provides maximum dial tone, and lock the active SYC on-line. Inhibit group checks on the active SYC if required for maximum dial tone.

2.05 Request FIOC diagnostics on the off-line FIOC. If FIOC diagnostics fail in phase 1, 2, or 3, repair the fault before continuing with this procedure.

2.06 Request network diagnostics on the off-line network controller in the unconditional mode. Running network diagnostics in the unconditional mode will provide information on all of the networks. This is especially useful when faults that affect the network gate lead multiple are present, since the first failure typically does not correctly identify the faulty network.

(a) If network diagnostics pass on the first request, but network trouble messages indicate pulser OK failures when this network controller is on-line, go to section 23 (POK Failure Procedure).

(b) If network diagnostics pass on the first request, but network trouble messages indicate group check failures when this network controller is on-line, go to section 25 (Group Check Failure Procedure).

(c) If phase 1 fails, go to section 3 (Phase 1 Failures).

(d) If phase 2 fails, go to section 4 (Phase 2 Failures).

(e) If faults in phases 1 and 2 have been cleared and the on-line network controller is providing minimal or no service, go to 2.03.

(f) If phase 3 fails, go to section 7 (Phase 3 Failures).

(g) If phase 4 or 5 fails, refer to TLM-3H103. Rerun network diagnostics in the unconditional mode after each circuit pack is changed.

(h) If the on-line network controller did not pass network diagnostics, go to 2.03.

3. PHASE 1 FAILURES

3.01 Failures in phase 1 of the network diagnostic indicate that one or more of the network controller circuit packs are defective, or that there are faults in the third stage access circuitry or grids.

3.02 Change the following circuit packs in sequence, rerunning the network diagnostic in the unconditional mode after each circuit pack is replaced.

FA999 at location _54-05
FA999 at location _54-04
FA1000 at location _54-07
FC219 at location _50-11
FC229 at location _50-10
FA1000 at location _54-06
FA998 at location _54-03
FA1001 at location _54-08

3.03 If phase 1 passes, go to 2.03.

3.04 If phase 1 is still failing after the above circuit packs are changed, go to section 4 (Phase 2 Failures).

4. PHASE 2 FAILURES

4.01 Run network diagnostics in the unconditional mode and use the Phase 2 Path Information Table in section 5 to determine which 15C grids are failing.

4.02 If a single 15C grid is failing, refer to TLM-3H103 for additional information.

4.03 If several 15C grids are failing, the fault is probably affecting the third stage gate lead multiple. In that case, it is normally impossible to determine which grid is defective from the four or five phase 2 failure printouts.

4.04 Follow the guidelines in section 26 to isolate network faults using the Network Pattern Analysis Program. If unsuccessful, continue with 4.05.

4.05 Use the following procedure to determine which 15C grid is defective:

(a) Repetitively execute the first failing test in phase 2 of the network diagnostic. The first failing test will normally be in the switch group 0L 15C grid if the fault is affecting the third stage gate lead multiple.

(b) Remove Berg connectors 310 (the stage 3 pulse paths and node leads) and 710 (the stage 3 switch gates) at terminal strip 1 on the rear of a 15C grid other than the one in which the repetitive test is executing. Note that terminal strip 1 is the middle terminal strip of three on the rear of a 15C grid. Also remove the FC190 circuit pack associated with the grid where the connectors were removed. Refer to the following table for FC190 circuit pack locations.

Stage 3 Switch Group	FC190 Location
0L	166-02
0H	166-24
1L	166-03
1H	166-26
2L	166-05
2H	166-27
3L	166-06

(c) If the repetitive test passes when the connectors are removed, the defective grid has been identified, and it should be replaced using the grid replacement procedure in section 24.

(d) If the failure mode of the repetitive test changes but does not pass, the fault may be in the other half of the same switch group. For example, if the connectors and FC190 were removed in the switch group 1L 15C grid and the failure mode changed, the fault may be in the switch group 1H 15C grid.

(e) If no change in the failure mode occurs when the connectors and FC190 are removed, replace them and repeat the procedure for each of the remaining 15C grids.

(f) If removal of the connectors on all but the 15C grid in which the repetitive test is executing does not change the failure mode, the grid in which the test is executing is defective or multiple faults may be present.

(g) To verify that the grid is defective, repetitively execute a failing test in another switch group. For example, if the switch group 0L 15C grid is suspect, execute a test in the switch group 1L 15C grid (refer to the Phase 2 Path Information Table for an appropriate test number). Remove the 310 and 710 Berg connectors and FC190 for the suspect grid. If the grid is defective, the test executing in the other grid will pass when the connectors are removed.

5. PHASE 2 PATH INFORMATION TABLE

5.01 The following table relates network diagnostic phase 2 test numbers to the third stage paths tested. For example, test number 2151 executes a 3O order in stage 3 switch group 2H, switch 7, input level 7, output level 7.

TEST NUMBER	PATH INFORMATION				
tuvw-tuvw	ORD	S3G	S3S	ILV	OLV
0001-0071	3O	0L	uv	uv	uv
0002-0072	3R	0L	uv	7-uv	RLS
0081-0151	3O	0H	uv-8	uv-8	uv-8
0082-0152	3R	0H	uv-8	15-uv	RLS
1001-1071	3O	1L	uv	uv	uv
1002-1072	3R	1L	uv	7-uv	RLS
1081-1151	3O	1H	uv-8	uv-8	uv-8
1082-1152	3R	1H	uv-8	15-uv	RLS
2001-2071	3O	2L	uv	uv	uv
2002-2072	3R	2L	uv	7-uv	RLS
2081-2151	3O	2H	uv-8	uv-8	uv-8
2082-2152	3R	2H	uv-8	15-uv	RLS
3001-3071	3O	3L	uv	uv	uv
3002-3072	3R	3L	uv	7-uv	RLS
3081-3151	3O	3H	uv-8	uv-8	uv-8
3082-3152	3R	3H	uv-8	15-uv	RLS

tuvw = 4-digit test number
RLS = output level for 3R order

6. 15C GRID TERMINAL STRIP CONNECTOR LAYOUTS

6.01 The following layouts detail what leads are on each connector on the rear of a 15C grid.

15C GRID TERMINAL STRIP 0 CONNECTOR LAYOUT

WT & WR LEVEL 4 S3S(0-7) TO NW 4 15B GRIDS 720	WT & WR LEVEL 4 S3S(0-7) TO OTHER CF 520	320	120
CT & CR LEVEL 3 S3S(0-7) TO NW 3 JUNCTOR UNIT 710	CT & CR LEVEL 2 S3S(0-7) TO NW 2 JUNCTOR UNIT 510	CT & CR LEVEL 1 S3S(0-7) TO NW 1 JUNCTOR UNIT 310	CT & CR LEVEL 0 S3S(0-7) TO NW 0 JUNCTOR UNIT 110
WT & WR LEVEL 0 S3S(0-7) TO NW 0 15B GRIDS 700	WT & WR LEVEL 0 S3S(0-7) TO OTHER CF 500	300	100

TS0 (03-06)

15C GRID TERMINAL STRIP 1 CONNECTOR LAYOUT

WT & WR LEVEL 6 S3S(0-7) TO NW 6 15B GRIDS 720	WT & WR LEVEL 6 S3S(0-7) TO OTHER CF 520	WT & WR LEVEL 5 S3S(0-7) TO NW 5 15B GRIDS 320	WT & WR LEVEL 5 S3S(0-7) TO OTHER CF 120
STAGE 3 SWITCH GATES ONS3S(0-7) INS3S(0-7) TO CF 710	510	PULSE PATHS PIL(0-7) POL(0-7) PRL NODE NN3 TO STAGE 3 ACCESS UNIT 310	110
WT & WR LEVEL 2 S3S(0-7) TO NW 2 15B GRIDS 700	WT & WR LEVEL 2 S3S(0-7) TO OTHER CF 500	WT & WR LEVEL 1 S3S(0-7) TO NW 1 15B GRIDS 300	WT & WR LEVEL 1 S3S(0-7) TO OTHER CF 100

TS1 (03-09)

15C GRID TERMINAL STRIP 2 CONNECTOR LAYOUT

720	520	WT & WR LEVEL 7 S3S(0-7) TO NW 7 15B GRIDS 320	WT & WR LEVEL 7 S3S(0-7) TO OTHER CF 120
CT & CR LEVEL 7 S3S(0-7) TO NW 7 JUNCTOR UNIT 710	CT & CR LEVEL 6 S3S(0-7) TO NW 6 JUNCTOR UNIT 510	CT & CR LEVEL 5 S3S(0-7) TO NW 5 JUNCTOR UNIT 310	CT & CR LEVEL 4 S3S(0-7) TO NW 4 JUNCTOR UNIT 110
700	500	WT & WR LEVEL 3 S3S(0-7) TO NW 3 15B GRIDS 300	WT & WR LEVEL 3 S3S(0-7) TO OTHER CF 100

TS2 (03-12)

7. PHASE 3 FAILURES

7.01 Follow the guidelines in section 26 to isolate network faults using the Network Pattern Analysis Program. If unsuccessful, continue with 7.02.

7.02 If FC575 gate driver test circuit packs are available, remove the FC307 circuit packs from locations _50-26, 28, 29, 32, and 33, and install FC575 circuit packs at locations _50-26 and _50-32. Rerun network controller diagnostics in the unconditional mode. The only failure that should occur is test number 05-1002-07 in phase 5. Any failures in phases 3 or 4 are due to faults within the network controller. Consult TLM-3H103 for additional information on these failures.

7.03 When the network controller diagnostic is passing phases 3 and 4 with the FC575s installed, remove them and reinstall the FC307s at locations _50-26, 28, 29, 32, and 33.

7.04 Rerun network diagnostics in the unconditional mode and partition the phase 3 failure printouts by network. The network number is the most significant digit of the 4-digit test number. Typically there will, be four to seven failure printouts per network.

7.05 Look up all failures on network 1 in TLM-3H103, and change any FC307 circuit packs listed for the failures.

7.06 Rerun network diagnostics in the unconditional mode. Defective FC307s typically cause identical failures on all networks, so replacement of defective FC307s will change the test failure printouts significantly.

7.07 Determine which grids and orders are involved in the failures for each network using the Phase 3 Path Information Table in section 11. This table defines the order and path used by each phase 3 test. Determine the following using the table:

(a) Tests t100-t380 (the input level tests) can be used to determine which input switch groups are failing.

(b) Tests t400-t580 (the output level tests) can be used to determine which output switch groups are failing.

(c) Tests t600-t815 (the input and output switch tests) can be used to determine which concentrators, input switch groups, and output switch groups are failing.

(d) Analyzing the failing tests in many cases will not pinpoint the failure to a particular grid since many faults will affect both concentrators and multiple input or output switch groups.

(e) The orders that are failing may pinpoint the fault to a particular portion of the pulse path or supporting circuitry.

7.08 Identification of the faulty network is often a difficult problem because faults that affect the gate lead multiple will cause failures on good networks. However, the failures on the faulty network will often be unique in some way. Some of the possible unique conditions that can identify the faulty network are as follows:

(a) One network has more group check bits failing.

(b) One network has fewer group check bits failing.

(c) One network has no failures, while all others are failing.

(d) One network is failing on different orders.

(e) One network is failing in different grids.

(f) Note: Always compare (1) identical tests or (2) tests with identical orders when doing this type of analysis. Do not, for instance, compare high-and-dry orders with FCG, A, or RLS2 orders since different pulse paths and circuitry are used for the high-and-dry orders.

(g) If the faulty network has been tentatively identified, go to section 8 (Partial Disconnect Procedure) and verify that the selected network is faulty.

(h) If the failures on all networks are identical, the faulty network cannot be identified. This situation is often caused by faults that are directly on the gate lead multiple. Go to section 8 (Partial Disconnect Procedure).

(i) If no pattern is obvious in the failures, multiple faults in grids and/or circuit packs may be the problem. If individual faulty networks cannot be identified, it will be necessary to disconnect networks from the gate lead multiple. Go to section 10 (Disconnecting Networks from the Gate Lead Multiple).

8. PARTIAL DISCONNECT PROCEDURE

8.01 Use this procedure to identify the faulty network when it cannot be identified from the diagnostic failure printouts.

8.02 Repetitively execute the first failing test in phase 3 of the network diagnostic.

8.03 Use the Network Pulse Path Diagram in section 28 to determine which failing group is nearest the negative pulser terminal. Attempt to change the failure mode of the test by disconnecting the failing group and the next group closer to the negative pulser terminal from the following networks per the Group Disconnect Table at 8.05.

(a) Typically, the first failing test will be in network 1. In that case, connectors should be removed at network 4 to disconnect networks 4 through 7 from the two groups.

Connectors should be removed at network 2 to disconnect networks 2 and 3 from the two groups.

(b) Disconnecting networks from the two groups may allow the failing group to pass; it sometimes may cause a group closer to the positive pulser terminal to fail. However, if the failing group passes when a connector is removed, the fault is in the group of networks that was disconnected by removing that connector.

(c) Sequentially reconnect networks in the disconnected group by reconnecting the connectors at the first network in the group and removing the corresponding connectors on the following network until a faulty network is identified.

(d) When a faulty network has been identified, go to section 9 (Network Fault Identification).

8.04 If the failure mode of the test does not change when all of the following networks are disconnected, the fault is within the network in which the test is executing. Go to section 9 (Network Fault Identification).

8.05 The Group Disconnect Table is used with 8.03.

GROUP DISCONNECT TABLE

ORDER	DISCONNECT GROUP FROM NW _ AND ABOVE	CONTROLLER 0 REMOVE BERG	CONTROLLER 1 REMOVE BERG
HD	GROUP 3 FOR ISG A	80-01-110	80-01-310
	GROUP 3 FOR ISG B	80-02-110	80-02-310
	GROUP 3 FOR ISG C	80-03-110	80-03-310
	GROUP 1 FOR ISG A	80-26-110	80-26-100
	GROUP 1 FOR ISG B	80-27-110	80-27-100
	GROUP 1 FOR ISG C	80-29-110	80-29-100
A, FCG, RLS2	GROUP 2 FOR OSG A	80-17-300	80-17-310
	GROUP 2 FOR OSG B	80-24-300	80-24-310
	GROUP 4 FOR OSG A	80-06-110	80-06-310
	GROUP 4 FOR OSG B	80-06-110	80-06-310
	GROUP 3 FOR ISG A	80-01-110	80-01-310
	GROUP 3 FOR ISG B	80-02-110	80-02-310
	GROUP 3 FOR ISG C	80-03-110	80-03-310
	GROUP 1 FOR ISG A	80-26-110	80-26-100
	GROUP 1 FOR ISG B	80-27-110	80-27-100
	GROUP 1 FOR ISG C	80-29-110	80-29-100

9. NETWORK FAULT IDENTIFICATION

9.01 If the results of section 8 (Partial Disconnect Procedure) indicate a faulty output switch group, go to 9.03.

9.02 If the results of section 8 (Partial Disconnect Procedure) indicate a faulty input switch group and both concentrators are failing, use the following procedure to determine which concentrator is faulty:

(a) Repetitively execute a failing test in the suspect input switch group and concentrator.

(b) Remove connectors 500 and 700 on the same input switch group in the other concentrator. This disconnects the pulse path leads that multiple between the two 15A grids in the input switch group.

(c) If the test passes or the failure mode changes, the fault is in the grid where the connectors were removed. If there is no change in the failure mode, the fault is either in the grid where the test is executing or possibly in the circuitry common to the grids (that is, the input level and high-and-dry pulse path leads, or the FC192 circuit pack in the network access unit).

(d) Replace the connectors at 500 and 700 that were removed in step (b).

9.03 Remove the suspect grid from service using the RMV:GRID message.

(a) Repetitively execute a failing test in the suspect grid.

(b) Use the Adjacent Groups Disconnect Table at 9.05 to disconnect the pulse paths between any failing group and its adjacent groups.

(c) Groups external to the grid should pass when they are disconnected from a defective grid. If they don't, there is a fault external to the grid.

(d) Groups internal to a grid (that is, the input or output switch groups) may pass when disconnected from adjacent groups external to the grid. This indicates a fault external to the grid.

(e) Typical faults external to a grid are (1) those on the pulse paths between the grids and the network access unit, (2) the A-link pulse paths between grids, or (3) defective circuit packs in the network access unit.

9.04 If a grid is defective, change it using the procedure in section 24 (Grid Replacement).

9.05 Use the following table when disconnecting the pulse paths between groups:

ADJACENT GROUPS DISCONNECT TABLE

ORDER	TO DISCONNECT PULSE PATH BETWEEN	REMOVE
HD	GROUP 6 AND 3	BERG 700 ON 15A GRID SEE NOTE BELOW
	GROUP 3 AND 1	BERG 500 ON 15A GRID
	GROUP 1 AND 5	80-23-310 FOR C0 80-23-110 FOR C1
A, FCG, RLS2	GROUP 6 AND 2	80-23-300 FOR C0 80-23-100 FOR C1
	GROUP 2 AND 4	BERG 700 ON 15B GRID SEE NOTE BELOW
	GROUP 4 AND 3	BERG 120, 320, 520, 720 ON 15B GRID OR BERG 110, 310, 510 ON 15A GRID
	GROUP 3 AND 1	BERG 500 ON 15A GRID
	GROUP 1 AND 5	80-23-310 FOR C0 80-23-110 FOR C1

Note: Removing connector 700 on the 15A grid will cause an input switch group check (group 3). If group 3 passes with the 700 connector removed, there is a fault within the grid or on the input level leads.

10. DISCONNECTING NETWORKS FROM THE GATE LEAD MULTIPLE

10.01 Multiple faults in the grids or circuit packs may so confuse the results of network diagnostics, that they are impossible to analyze. This procedure can be used to disconnect networks from the gate lead multiple until network diagnostics provide usable results.

10.02 A typical disconnect sequence would be as follows:

(a) Disconnect networks 4 through 7 at the control frame using section 17, and rerun network diagnostics in the unconditional mode. Diagnostics will now fail on networks 4 through 7, but the results on networks 1 through 3 may be usable if some of the faults affecting the gate lead multiple were in networks 4 through 7. The ABT:MSF! message can be used to abort the diagnostic when printouts are received on the first disconnected network.

(b) If the diagnostic results are still unusable, disconnect networks 2 and 3 using the procedure provided in section 18 (Disconnecting Network _ and above from the Gate Lead Multiple). Now networks 2 through 7 will fail diagnostics, but the results for network 1 will be usable.

(c) Repair faults until the connected networks are fault-free. Then reconnect networks in sequence, correcting faults that are introduced as they occur.

(d) The procedure in section 18 allows networks to be added sequentially if the connectors are reconnected on the network to be added to the gate lead multiple and then disconnected on the following network. For example, if networks 2 and 3 are disconnected, reconnect the connectors on network 2 per section 18 and remove the connectors on network 3 per section 18 to add network 2 to the gate lead multiple.

11. PHASE 3 PATH INFORMATION TABLES

11.01 The following tables relate network diagnostic phase 3 test numbers to the network paths tested. For example, test number 7612 executes an A order in NW7, concentrator 1, input switch group A, input switch 4, input level 0, output switch group B, output switch 4, output level 0. Both the cutoff and test vertical are selected open.

INPUT LEVEL TESTS

TEST NUMBER	PATH INFORMATION									
tuvw-tuvw	ORD	NW	C	ISG	ISW	ILV	CO	OSG	OSW	OLV	TV
t100-t171	HD	t	0	A	0	v	w	-	-	-	-
t180	FCG	t	0	A	0	F/R	-	A	0	0	0
t200-t271	HD	t	0	B	0	v	w	-	-	-	-
t280	FCG	t	0	B	0	F/R	-	A	0	0	0
t300-t371	HD	t	0	C	0	v	w	-	-	-	-
t380	FCG	t	0	C	0	F/R	-	A	0	0	0

OUTPUT LEVEL TESTS

TEST NUMBER	PATH INFORMATION										
tuvw-tuvw	ORD	NW	C	ISG	ISW	ILV	CO	OSG	OSW	OLV	TV
t400-t471	FCG	t	0	A	0	F/R	-	A	0	v	w
t480	RLS	t	0	A	0	F/R	-	A	0	RLS	-
t500-t571	FCG	t	0	A	0	F/R	-	B	4	v	w
t580	RLS	t	0	A	0	F/R	-	B	4	RLS	-

INPUT AND OUTPUT SWITCH TESTS

TEST NUMBER	PATH INFORMATION										
tuvw-tuvw	ORD	NW	C	ISG	ISW	ILV	CO	OSG	OSW	OLV	TV
t600-t603	A	t	0	A	vw	0	0	A	vw	0	0
t604-t607	A	t	0	A	vw	0	0	B	vw	0	0
t608-t611	A	t	1	A	vw-8	0	0	A	vw-8	0	0
t612-t615	A	t	1	A	vw-8	0	0	B	vw-8	0	0
t700-t703	A	t	0	B	vw	0	0	A	vw	0	0
t704-t707	A	t	0	B	vw	0	0	B	vw	0	0
t708-t711	A	t	1	B	vw-8	0	0	A	vw-8	0	0
t712-t715	A	t	1	B	vw-8	0	0	B	vw-8	0	0
t800-t803	A	t	0	C	vw	0	0	A	vw	0	0
t804-t807	A	t	0	C	vw	0	0	B	vw	0	0
t808-t811	A	t	1	C	vw-8	0	0	A	vw-8	0	0
t812-t815	A	t	1	C	vw-8	0	0	B	vw-8	0	0

F/R = input level for FCG and RLS2 orders.
RLS = output level for RLS2 order. tuvw = 4-digit test number.

11.02 A 0 in a CO or TV column indicates that the level that <u>opens</u> the crosspoint is selected. A 1 in a CO or TV column indicates that the level that <u>closes</u> the crosspoint is selected.

11.03 ISW and OSW switch numbers correspond to those used by the NETWORK EXERCISE and GRID UTILITY programs.

12. 15A GRID CONNECTOR LAYOUT

12.01 The following layout details what leads are on each connector on the rear of a 15A grid.

SCANNER COLUMNS 12 - 15 SA(12-15) SB(12-15) SC(12-15) SD(12-15) TO CONTROL FRAME 720	SCANNER COLUMNS 08 - 11 SA(08-11) SB(08-11) SC(08-11) SD(08-11) TO CONTROL FRAME 520	SCANNER COLUMNS 04 - 07 SA(04-07) SB(04-07) SC(04-07) SD(04-07) TO CONTROL FRAME 320	SCANNER COLUMNS 00 - 03 SA(00-03) SB(00-03) SC(00-03) SD(00-03) TO CONTROL FRAME 120
SCANNER ROWS INTA(0-3) INTB(0-3) TO CONTROL FRAME 710	A-LINK PULSE PATHS PA(61-65) PA(70-76) TO OSG 1 510	A-LINK PULSE PATHS PA(40-46) PA(50-56) PA(60,66) TO OSG 1 310	A-LINK PULSE PATHS PA(00-03) PA(10-13) PA(20-23) PA(30-33) TO OSG 0 110
HD PULSE PATH PH INPUT SWITCH NODES IN01, IN23 IN45, IN67 DIODES RPSP(4-7) GROUND G3A TO NW ACCESS UNIT 700	INPUT LEVEL PULSE PATHS ILPO(0-7) ILPN(0-7) F2GP TO NW ACCESS UNIT 500	INPUT SWITCH GATES 0INS(0-7) 1INS(0-7) TO NW ACCESS UNIT 300	-48V POWER B(0-3) -48V RETURN G(0-3) DIODES RPSP(0-3) GROUND G3A TO FUSE PANEL 100

TS0 (03-09)

12.02 Removal of connector 300 or 700 will cause input switch group checks (group 3).

12.03 Lead names are identical to those in the 15A grid drawing SD-3H120.

12.04 Refer to SD-3H901, sheet B10, for A-link pulse path interconnection information.

13. 15B GRID CONNECTOR LAYOUT

The layout on the following page details what leads are on each connector on the rear of a 15B grid.

15B GRID CONNECTOR LAYOUT

A-LINK PULSE PATHS OSW2, C1 PA(120-127) OSW3, C1 PA(130-137) TO C1 ISG(0-2) 720	A-LINK PULSE PATHS OSW0, C1 PA(100-107) OSW1, C1 PA(110-117) TO C1 ISG(0-2) 520	A-LINK PULSE PATHS OSW2, C0 PA(020-027) OSW3, C0 PA(030-037) TO C0 ISG(0-2) 320	A-LINK PULSE PATHS OSW0, C0 PA(000-007) OSW1, C0 PA(010-017) TO C0 ISG(0-2) 120
OUTPUT LEVEL TIP & RING TO 15C GRIDS 710	OUTPUT LEVEL TIP & RING TO 15C GRIDS 510	OUTPUT LEVEL TIP & RING TO JUNCTOR UNIT 310	OUTPUT LEVEL TIP & RING TO JUNCTOR UNIT 110
OUTPUT LEVEL PULSE PATHS OLPO(0-7) OLPN(0-7) PRLS TO NW ACCESS UNIT 700	TEST VERTICALS TCT, TCR TWT, TWR TO CONTROL FRAME 500	OUTPUT SWITCH GATES 0NOS(00-13) 0NOS(10-13) 1NOS(00-13) 1NOS(10-13) TO NW ACCESS UNIT 300	OUTPUT SWITCH NODE ON TEST VERTICAL SWITCH NODE 5N TO NW ACCESS UNIT 100

TS0 (03-09)

13.01 Removal of connector 100 or 300 will cause output switch group checks (group 4).

13.02 Lead names are identical to those in the 15B grid drawing SD-3H121.

13.03 Refer to SD-3H901, sheet B10, for A-link pulse path interconnection information.

14. NETWORK ACCESS UNIT CONNECTOR LAYOUT

14.01 The layout on the following pages details what leads are on each connector on the rear of a network access unit.

NETWORK ACCESS UNIT CONNECTOR LAYOUT

80-03

1NISC (00-15) TO CF OR PRECEDING NETWORK 310	0NISC (00-15) TO CF OR PRECEDING NETWORK 110
0/1NISC (00-07) TO 15A GRID C0 300	0/1NISC (08-15) TO 15A GRID C1 100

80-03

80-02

1NISB (00-15) TO CF OR PRECEDING NETWORK 310	0NISB (00-15) TO CF OR PRECEDING NETWORK 110
0/1NISB (00-07) TO 15A GRID B0 300	0/1NISB (08-15) TO 15A GRID B1 100

80-02

80-01

1NISA (00-15) TO CF OR PRECEDING NETWORK 310	0NISA (00-15) TO CF OR PRECEDING NETWORK 110
0/1NISA (00-07) TO 15A GRID A0 300	0/1NISA (08-15) TO 15A GRID A1 100

80-01

80-06

1NOSA/B (00-03) 1NOSA/B (10-13) TO CF OR PRECEDING NETWORK 310	0NOSA/B (00-03) 0NOSA/B (10-13) TO CF OR PRECEDING NETWORK 110
0/1NOSB (00-03) 0/1NOSB (10-13) TO 15B GRID B 300	0/1NOSA (00-03) 0/1NOSA (10-13) TO 15B GRID A 100

80-06

80-05

1NISC (00-15) TO SUCCEEDING NETWORK 310	0NISC (00-15) TO SUCCEEDING NETWORK 110
1NOSA/B (00-03) 1NOSA/B (10-13) TO SUCCEEDING NETWORK 300	0NOSA/B (00-03) 0NOSA/B (10-13) TO SUCCEEDING NETWORK 100

80-05

80-04

1NISA (00-15) TO SUCCEEDING NETWORK 310	0NISA (00-15) TO SUCCEEDING NETWORK 110
1NISB (00-15) TO SUCCEEDING NETWORK 300	0NISB (00-15) TO SUCCEEDING NETWORK 100

80-04

80-21

   310	0/1NINB 0/1NPHB TO 15A GRID B 110
0/1NINC 0/1NPHC TO 15A GRID C 300	0/1NINA 0/1NPHA TO 15A GRID A 100

80-17

1NOLVA (00-15) 1NRLS2A TO CF OR PRECEDING NETWORK 310	AOLPN (0-3) AOLPO (0-3) APRLS TO 15B GRID A 110
0NOLVA (00-15) 0NRLS2A TO CF OR PRECEDING NETWORK 300	AOLPN (4-7) AOLPO (4-7) TO 15B GRID A 100

80-14

1NOLVB (00-15) 1NRLS2B TO SUCCEEDING NETWORK 310	1NOLVA (00-15) 1NRLS2A TO SUCCEEDING NETWORK 110
0NOLVB (00-15) 0NRLS2B TO SUCCEEDING NETWORK 300	0NOLVA (00-15) 0NRLS2A TO SUCCEEDING NETWORK 100

80-26

AILPN (5-7) AILPO (4-7) AF2GP TO 15A GRID A 310	0NILVA (00-15) 1NF2GA TO CF OR PRECEDING NETWORK 110
AILPN (0-4) AILPO (0-3) TO 15A GRID A 300	1NILVA (00-15) 1NF2GA TO CF OR PRECEDING NETWORK 100

80-24

1NOLVB (00-15) 1NRLS2B TO CF OR PRECEDING NETWORK 310	BOLPN (0-3) BOLPO (0-3) BPRLS TO 15B GRID B 110
0NOLVB (00-15) 0NRLS2B TO CF OR PRECEDING NETWORK 300	BOLPN (4-7) BOLPO (4-7) TO 15B GRID B 100

80-23

0NPG(A-C) 0NPH(A-C) TO CF 310	1NPG(A-C) 1NPH(A-C) TO CF 110
0NPOA̅ 0NPOB̅ TO CF 300	1NPOA̅ 1NPOB̅ TO CF 100

NETWORK ACCESS UNIT CONNECTOR LAYOUT (CONT)

80-31

1NONA 1NONB 1N5NA 1N5NB TO CF 310	0NONA 0NONB 0N5NA 0N5NB TO CF 110
1NINA 1NINB 1NINC TO CF 300	0NINA 0NINB 0NINC TO CF 100

80-31

80-29

CILPN (5-7) CILPO (4-7) CF2GP TO 15A GRID C 310	0NILVC (00-15) 0NF2GC TO CF OR PRECEDING NETWORK 110
CILPN (0-4) CILPO (0-3) TO 15A GRID C 300	1NILVC (00-15) 1NF2GC TO CF OR PRECEDING NETWORK 100

80-29

80-27

BILPN (5-7) BILPO (4-7) TO 15A GRID B 310	0NILVB (00-15) 0NF2GB TO CF OR PRECEDING NETWORK 110
BILPN (0-4) BILPO (0-3) TO 15A GRID B 300	1NILVB (00-15) 1NF2GB TO CF OR PRECEDING NETWORK 100

80-27

80-33

0NILVC (00-15) 0NF2GC TO SUCCEEDING NETWORK 310	0NILVB (00-15) 0NF2GB TO SUCCEEDING NETWORK 110
1NILVC (00-15) 1NF2GC TO SUCCEEDING NETWORK 300	1NILVB (00-15) 1NF2GB TO SUCCEEDING NETWORK 100

80-33

80-32

0/1NON 0/1N5NA TO 15B GRID A 310	0NILVA (00-15) 0NF2GA TO SUCCEEDING NETWORK 110
0/1NONB 0/1N5NB TO 1JB GRID B 300	1NILVA (00-15) 1NF2GA TO SUCCEEDING NETWORK 100

80-32

15. CONTROL FRAME UNIT CONNECTOR LAYOUT

15.01 The layout on the following pages details what leads are on each connector on the rear of the control frame unit.

CONTROL FRAME UNIT CONNECTOR LAYOUT

_50-16

NPH(A-C)3 NPG(A-C)3 NPO(A,B)3 TO NW 3 310	NPH(A-C)1 NPG(A-C)1 NPO(A,B)1 TO NW 1 110
NPH(A-C)2 NPG(A-C)2 NPO(A,B)2 TO NW 2 300	NPH(A-C)0 NPG(A-C)0 NPO(A,B)0 TO NW 0 100

_50-16

_50-05

NIN(A-C)7 NON(A,B)7 N5N(A,B)7 TO NW 7 310	NIN(A-C)5 NON(A,B)5 N5N(A,B)5 TO NW 5 110
NIN(A-C)6 NON(A,B)6 N5N(A,B)6 TO NW 6 300	NIN(A-C)4 NON(A,B)4 N5N(A,B)4 TO NW 4 100

_50-05

_50-03

NIN(A-C)3 NON(A,B)3 N5N(A,B)3 TO NW 3 310	NIN(A-C)1 NON(A,B)1 N5N(A,B)1 TO NW 1 110
NIN(A-C)2 NON(A,B)2 N5N(A,B)2 TO NW 2 300	NIN(A-C)0 NON(A,B)0 N5N(A,B)0 TO NW 0 100

_50-03

_50-27

NILVA (00-15) NF2GA TO NW 4 310	NILVB (00-15) NF2GB TO NW 4 110
NISA (00-15) TO NW 4 300	NISB (00-15) TO NW 4 100

_50-27

_50-26

NILVA (00-15) NF2GA TO NW 1 310	110
NISA (00-15) TO NW 1 300	100

_50-26

_50-18

NPH(A-C)7 NPG(A-C)7 NPO(A,B)7 TO NW 7 310	NPH(A-C)5 NPG(A-C)5 NPO(A,B)5 TO NW 5 110
NPH(A-C)6 NPG(A-C)6 NPO(A,B)6 TO NW 6 300	NPH(A-C)4 NPG(A-C)4 NPO(A,B)4 TO NW 4 100

_50-18

CONTROL FRAME UNIT CONNECTOR LAYOUT (CONT)

50-31		50-29		50-28	
NILVC (00-15) NF2GC	NOSA (00-03) NOSA (10-13)	NILVC (00-15) NF2GC		NILVB (00-15) NF2GB	
TO NW 4	TO NW 4	TO NW 1		TO NW 1	
310	110	310	110	310	110
NISC (00-15)	NOLVA (00-15) NRLS2A	NISC (00-15)		NISB (00-15)	
TO NW 4	TO NW 4	TO NW 1		TO NW 1	
300	100	300	100	300	100
50-31		50-29		50-28	

50-34		50-33		50-32	
NOSB (00-03) NOSB (10-13)		NOSB (00-03) NOSB (10-13)		NOSA (00-03) NOSA (10-13)	
TO NW 4		TO NW 1		TO NW 1	
310	110	310	110	310	110
NOLVB (00-15) NRLS2B		NOLVB (00-15) NRLS2B		NOLVA (00-15) NRLS2A	
TO NW 4		TO NW 1		TO NW 1	
300	100	300	100	300	100
50-34		50-33		50-32	

16. DISCONNECTING NETWORKS 0 THROUGH 3 AT THE CONTROL FRAME

16.01 Disconnect the following connectors at the _50 level on the control frame:

CONNECTOR	LEAD NAMES
_50-03-100	NIN(A,B,C)0, NON(A,B)0, N5N(A,B)0
_50-03-110	NIN(A,B,C)1, NON(A,B)1, N5N(A,B)1
_50-03-300	NIN(A,B,C)2, NON(A,B)2, N5N(A,B)2
_50-03-310	NIN(A,B,C)3, NON(A,B)3, N5N(A,B)3
_50-16-100	NPH(A,B,C)0, NPG(A,B,C)0, NPO(A,B)0
_50-16-110	NPH(A,B,C)1, NPG(A,B,C)1, NPO(A,B)1
_50-16-300	NPH(A,B,C)2, NPG(A,B,C)2, NPO(A,B)2
_50-16-310	NPH(A,B,C)3, NPG(A,B,C)3, NPO(A,B)3
_50-26-300	_NISA(00-15)
_50-26-310	_NILVA(00-15), _NF2GA
_50-28-300	_NISB(00-15)
_50-28-310	_NILVB(00-15), _NF2GB
_50-29-300	_NISC(00-15)
_50-29-310	_NILVC(00-15), _NF2GC
_50-32-300	_NOLVA(00-15), _NRLS2A
_50-32-310	_NOSA(00-03), _N̄OSA(10-13)
_50-33-300	_NOLVB(00-15), _NRLS2B
_50-33-310	_NOSB(00-03), _N̄OSB(10-13)

17. DISCONNECTING NETWORKS 4 THROUGH 7 AT THE CONTROL FRAME

17.01 Disconnect the following connectors at the _50 level on the control frame:

CONNECTOR	LEAD NAMES
_50-05-100	NIN(A,B,C)4, NON(A,B)4, N5N(A,B)4
_50-05-110	NIN(A,B,C)5, NON(A,B)5, N5N(A,B)5
_50-05-300	NIN(A,B,C)6, NON(A,B)6, N5N(A,B)6
_50-05-310	NIN(A,B,C)7, NON(A,B)7, N5N(A,B)7
_50-18-100	NPH(A,B,C)4, NPG(A,B,C)4, NPO(A,B)4
_50-18-110	NPH(A,B,C)5, NPG(A,B,C)5, NPO(A,B)5
_50-18-300	NPH(A,B,C)6, NPG(A,B,C)6, NPO(A,B)6
_50-18-310	NPH(A,B,C)7, NPG(A,B,C)7, NPO(A,B)7
_50-27-100	_NISB(00-15)
_50-27-110	_NILVB(00-15), _NF2GB
_50-27-300	_NISA(00-15)
_50-27-310	_NILVA(00-15), _NF2GA
_50-31-100	_NOLVA(00-15), _NRLS2A
_50-31-110	_NOSA(00-03), _NOSA(10-13)
_50-31-300	_NISC(00-15)
_50-31-310	_NILVC(00-15), _NF2GC
_50-34-300	_NOLVB(00-15), _NRLS2B
_50-34-310	_NOSB(00-03), _NOSB(10-13)

18. DISCONNECTING NETWORK _ AND ABOVE FROM THE GATE LEAD MULTIPLE

18.01 Remove the following gate lead connectors at network access unit _:

CONNECTOR	LEAD NAMES
80-01-110	ONISA(00-15)
80-01-310	1INSA(00-15)
80-02-110	0INSB(00-15)
80-02-310	1INSB(00-15)
80-03-110	0INSC(00-15)
80-03-310	1INSC(00-15)
80-06-110	ONOSA(00-03), ONOSA(10-13) ONOSB(00-03), ONOSB(10-13)
80-06-310	1NOSA(00-03), 1NOSA(10-13) 1NOSB(00-03), 1NOSB(10-13)
80-17-300	ONOLVA(00-15), 0RLS2A
80-17-310	1NOLVA(00-15), 1RLS2A
80-24-300	ONOLVB(00-15), 0RLS2B
80-24-310	1NOLVB(00-15), 1RLS2B
80-26-100	1INLVA(00-15), 1F2GA
80-26-110	0INLVA(00-15), 0F2GA
80-27-100	1INLVB(00-15), 1F2GB
80-27-110	0INLVB(00-15), 0F2GB
80-29-100	1INLVC(00-15), 1F2GC
80-29-110	0INLVC(00-15), 0F2GC

19. TOTAL DISCONNECT OF NETWORK _

19.01 Disconnect the following connectors at network access unit _:

CONNECTOR	LEAD NAMES
80-01-100	ONISA(08-15), 1NISA(08-15)
80-01-300	ONISA(00-07), 1NISA(00-07)
80-02-100	ONISB(08-15), 1INSB(08-15)
80-02-300	ONISB(08-15), 1NISB(00-07)
80-03-100	ONISC(08-15), 1NISC(08-15)
80-03-300	ONISC(00-07), 1NISC(00-07)
80-06-100	ONOSA(00-03), 1NOSA(00-03) ONOSA(10-13), 1NOSA(10-13)
80-06-300	ONOSB(00-03), 1NOSB(00-03) ONOSA(10-13), 1NOSB(10-13)
80-17-100	AOLPN(4-7), AOLPO(4-7)
80-17-110	AOLPN(0-3), AOLPO(0-3), APRLS
80-21-100	ONINA, 1NINA, ONPHA, 1NPHA
80-21-110	ONINB, 1NINB, ONPHB, 1NPHB
80-21-300	ONINC, 1NINC, ONPHC, 1NPHC
80-24-100	BOLPO(4-7), BOLPN(4-7)
80-24-110	BOLPO(0-3), BOLPN(4-7), BPRLS
80-26-300	AILPO(0-3), AILPN(0-4)
80-26-310	AILPO(4-7), AILPN(5-7), AF2GP
80-27-300	BILPO(0-3), BILPN(0-4)
80-27-310	BILPO(4-7), BILPN(5-7), BF2GP
80-29-300	CILPO(0-3), CILPN(0-4)
80-29-310	CILPO(4-7), CILPN(5-7), CF2GP
80-32-300	ONONB, 1NONB, ON5NB, 1N5NB
80-32-310	ONONA, 1NONA, ON5NA, 1N5NA

20. CONSTRUCTING A NETWORK ORDER REQUEST

20.01 Decode the order data contained in word 1 of the network controller trouble printout using the layout on sheet D11 of SD-3H110. If the order is a stage 3 order, go to 20.12.

20.02 Decode the remaining network path information from words 1 and 2 using the layouts.

20.03 Construct the OEN (Office Equipment Number) from the decoded data. An OEN is defined by (CG)(C)(ISG)(ISW)(ILV). Verify the OEN using the VER:OE:OE (OEN)! input message.

20.04 Use the result of 20.03 to remove the line, trunk, or service circuit assigned to the OEN. Trunks should be removed with the DSA option.

20.05 Use the output switch, the output level data, and the B-Link/Junctor Table in section 22 to determine the B-link or junctor in the path. B-links and junctors are defined by (CG)(JSW).

20.06 Remove the B-link or junctor obtained in 20.05.

20.07 Use the output switch, the input switch group, the input switch data, and the A-link Multiple Table in section 21 to determine the A-link in the path. A-links are defined by (CG)(C)(OSW)(OSW ILV).

20.08 Remove the A-link obtained in 20.07.

20.09 Determine which order sequence has a primary order that is identical to the failing order in the network controller trouble printout.

20.10 If the order sequence selected closes the test vertical switch contact, use the RMV:TV JC (CG)! or RMV:TV BLNK (CG)! input message to remove the test vertical from service.

20.11 Input the ORD:NW request and execute.

20.12 Decode the remaining stage 3 path data from words 1 and 2 using the layouts.

20.13 The junctor switch number equals the least significant bit of the stage 3 switch group plus the stage 3 switch number. The junctor concentrator group equals the control frame bit plus the three least significant bits of the input level.

(a) If the stage 3 switch group equals 0 or 1, the B-link concentrator group equals the control frame bit plus the three least significant bits of the output level.

(b) If the stage 3 switch group equals 2 or 3, the B-link concentrator group equals the complemented control frame bit plus the three least significant bits of the output level.

20.14 Remove the B-link and junctor determined in 20.13.

20.15 Determine which order sequence has a primary order that is identical to the failing order in the network controller trouble printout.

20.16 Input the ORD:NW request and execute.

21. A-LINK TABLE

21.01 The table on the following page lists the A-link multiples. For example, A-link 1043 is in CG1, and connects concentrator 0, output switch 4, input level 3 to the following: concentrator 0, input switch group A, input switch 1, output level 4, and concentrator 0, input switch group B, input switch 3, output level 4, and concentrator 0, input switch group C, input switch 4, output level 4.

A-LINK TABLE

OSW ILV	0 ISG	0 ISW	1 ISG	1 ISW	2 ISG	2 ISW	3 ISG	3 ISW	4 ISG	4 ISW	5 ISG	5 ISW	6 ISG	6 ISW	7 ISG	7 ISW
	OUTPUT SWITCH OR INPUT SWITCH OUTPUT LEVEL															
0	A	0	A	0	A	2	A	1	A	3	A	2	A	1	A	0
	A	1	A	3	A	3	A	3	A	7	A	5	A	4	A	6
	A	2	A	4	A	6	A	5	B	0	B	7	B	7	B	7
1	B	0	B	0	B	2	B	1	B	3	B	2	B	1	B	0
	B	1	B	3	B	3	B	3	B	7	B	5	B	4	B	6
	B	2	B	4	B	6	B	5	C	0	C	7	C	7	C	7
2	C	0	C	0	C	2	C	1	A	0	A	7	A	7	A	7
	C	1	C	3	C	3	C	3	C	3	C	2	C	1	C	0
	C	2	C	4	C	6	C	5	C	7	C	5	C	4	C	6
3	A	3	A	2	A	1	A	0	A	1	A	0	A	0	A	1
	B	3	B	2	B	1	B	0	B	2	B	3	B	2	B	5
	C	3	C	2	C	1	C	0	C	4	C	1	C	6	C	2
4	A	4	A	1	A	0	A	2	A	2	A	3	A	2	A	5
	A	5	A	6	A	5	A	4	B	4	B	1	B	6	B	2
	A	6	A	7	A	7	A	7	C	5	C	4	C	3	C	3
5	B	4	B	1	B	0	B	2	A	4	A	1	A	6	A	2
	B	5	B	6	B	5	B	4	B	5	B	4	B	3	B	3
	B	6	B	7	B	7	B	7	C	6	C	6	C	5	C	4
6	C	4	C	1	C	0	C	2	A	5	A	4	A	3	A	3
	C	5	C	6	C	5	C	4	B	6	B	6	B	5	B	4
	C	6	C	7	C	7	C	7	C	1	C	0	C	0	C	1
7	A	7	A	5	A	4	A	6	A	6	A	6	A	5	A	4
	B	7	B	5	B	4	B	6	B	1	B	0	B	0	B	1
	C	7	C	5	C	4	C	6	C	2	C	3	C	2	C	5

21.02 A-links are defined by ALNK(a,bcd), where

a = concentrator group

b = concentrator

c = output switch

d = output switch input level

22. B-LINK/JUNCTOR TABLE

22.01 The table on the following page lists the output switch and output level for each junctor and B-link. The table also shows the crosspoint that will be closed in the third stage to connect the junctor and B-link. For example, if junctor 1,15 is connected to B-link 3,15, the third stage crosspoint closed is at switch group OH, switch 7, circuit level 1, wire level 3. Note that third stage switch groups 0 and 1 are used when the junctor and B-link are on the same control frame, and third stage switch groups 2 and 3 are used when the junctor and B-link are on different control frames, also the crosspoint operated is on the same control frame as the junctor.

B-LINK/JUNCTOR TABLE

STAGE 2			STAGE 3				STAGE 2		
OSW	OLV	JCT /JSW	CKT LVL	SW GRP	SW	WIRE LVL	BLNK /JSW	OLV	OSW
0	0 2 4 6	0 1 2 3	NW	0L OR 2L	0 1 2 3	NW	0 1 2 3	1 3 5 7	3
1	0 2 4 6	4 5 6 7	NW	0L OR 2L	4 5 6 7	NW	4 5 6 7	1 3 5 7	2
2	0 2 4 6	8 9 10 11	NW	0H OR 2H	0 1 2 3	NW	8 9 10 11	1 3 5 7	1
3	0 2 4 6	12 13 14 15	NW	0H OR 2H	4 5 6 7	NW	12 13 14 15	1 3 5 7	0
4	0 2 4 6	16 17 18 19	NW	1L OR 3L	0 1 2 3	NW	16 17 18 19	1 3 5 7	7
5	0 2 4 6	20 21 22 23	NW	1L OR 3L	4 5 6 7	NW	20 21 22 23	1 3 5 7	6
6	0 2 4 6	24 25 26 27	NW	1H OR 3H	0 1 2 3	NW	24 25 26 27	1 3 5 7	5
7	0 2 4 6	28 29 30 31	NW	1H OR 3H	4 5 6 7	NW	28 29 30 31	1 3 5 7	4

22.02 B-links and junctors are defined by BLNK(a,b) and JCT(a,b), where

a = concentrator group

b = junctor switch number

23. POK FAILURE PROCEDURE

23.01 Follow the guidelines in section 27 to isolate POK failures using the Network Grid Error Count. If unsuccessful, continue with 23.02.

23.02 Construct a network order request using the procedure in section 20.

23.03 Repetitively execute the failing order.

23.04 The order printout should indicate a POK failure. If the order aborts because of a POK failure on an operation other than the primary, select a new order sequence that has the first failing operation as its primary operation and initiate another order request specifying the new order sequence.

23.05 Refer to the Network Pulse Path Diagrams in section 28 and the appropriate grid and frame drawings to construct the pulse path through the network.

23.06 The following procedure can be used to isolate the open in the pulse path:

(a) Verify that the gate signals that select the switches and levels in the path are present.

(b) Stop order execution by pressing the execute key on the system status panel.

(c) Jumper across a portion of the pulse path.

(d) Start order execution by pressing the execute key on the system status panel.

(e) If the order passes, the open portion of the path has been jumpered. Repeat the procedure to isolate the open to the smallest possible portion of the path. While portions of the path are jumpered, minimize the time that the order is executing since jumpering some portions of the path can affect call processing.

(f) If the order is still failing, try jumpering another portion of the path and repeating the procedure.

24. GRID REPLACEMENT

24.01 To replace a 15A grid, use the following procedure:

(a) Remove the grid from service using the RMV:GRID a ISW bc! message, where

a = concentrator group (1 through 15)

b = concentrator (0,1)

c = switch group (0 through 2)

Wait for this reply: tt RMV GRID a ISW bc COMPL. Any other message should be checked in OM-3H300.

(b) Remove the fuses associated with the grid. Refer to SD-3H901, sheet D2, for fuse locations.

(c) Remove the Berg connectors on the rear of the grid. The connector at location 710 should be removed first; the others can be removed in any sequence.

(d) Remove the 951A connectors on the front of the grid.

(e) Replace the grid.

(f) Replace the 951A connectors on the front of the grid.

(g) Replace the Berg connectors on the rear of the grid. The connector at location 710 should be replaced last. Extreme care should be used when replacing the connector at location 100 since it supplies the -48 volts to the grid.

(h) Replace the fuses for the grid.

(i) Restore the grid to service using the RST:GRID a ISW bc! message.

24.02 To replace a 15B grid, use the following procedure:

(a) Remove the grid from service using the RMV:GRID a OSW d! message, where

a = concentrator group (1 through 15)

d = output switch (0 through 7)

Wait for this reply: tt RMV GRID a OSW d COMPL. Any other message should be checked in OM-3H300.

(b) Remove the Berg connectors on the rear of the grid.

(c) Remove the 951A connectors on the front of the grid.

(d) Replace the grid.

(e) Replace the 951A connectors on the front of the grid.

(f) Replace the Berg connectors on the rear of the grid.

(g) Restore the grid to service using the RST:GRID a OSW d! message.

24.03 To replace a 15C grid, use the following procedure:

(a) Remove the grid from service using the RMV:GRID a JSW e! message, where

a = concentrator group (1 through 15)

e = junctor switch (0 through 31)

Wait for this reply: tt RMV GRID a JSW e COMPL. Any other message should be checked in OM-3H300.

(b) Remove the Berg connectors on the rear of the grid.

(c) Remove the 951A connectors on the front of the grid.

(d) Replace the grid.

(e) Replace the 951A connectors on the front of the grid.

(f) Replace the Berg connectors on the rear of the grid.

(g) Restore the grid to service using the RST:GRID a JSW e! message.

25. GROUP CHECK FAILURE PROCEDURE

25.01 Follow the guidelines in section 26 to isolate network faults using the Network Pattern Analysis Program. If unsuccessful, continue with 25.02.

25.02 Group check failures that occur even though network controller diagnostics pass are most probably dependent on call processing activity. These group check failures can be caused by faults within a grid (such as leakage between a pulse path and a talk path). For example, suppose the talk path in the defective grid has some potential applied to it, which is coupled to the pulse path. In this case the current can flow from the gate leads to the pulse path even though the defective grid was not selected as part of the order being executed. The order that is executing will "group-check" because of the extra current being drawn by the defective grid. This causes a misleading situation, in which all networks except the one containing the defective grid are involved in the group check failures.

25.03 Analyze all the network trouble printouts using the layouts on sheet D11 of SD-3H110 to decode the information in words 1 and 2 of the failing network orders.

(a) Determine if all the networks except one are involved in the failures, or if one network is failing in a markedly different manner. This unique network probably contains the fault.

(b) Determine which grid is indicated by the failure printouts as faulty. Typically, either an output switch group or input switch group will be common to all of the failures.

25.04 Attempt to determine if the suspect grid is faulty. Use either of the following methods:

(a) Remove the grid from service or replace it and see if the network trouble failures stop.

(b) Run network exercises on the suspect grid and see if the network trouble failures increase.

25.05 Remove and replace grids using the procedure in section 24.

26. NETWORK PATTERN ANALYSIS PROGRAM

INTRODUCTION

26.01 The Network Pattern Analysis Program is designed to isolate network faults that cause group check failures. The analysis program is executed on the on-line processor, and attempts to send a set of maintenance network orders (no crosspoints affected) to both network controllers. It collects and stores the group check data from each order. When the set of orders has been completed on the on-line controller, a SYC switch is attempted, and the same set of orders is repeated on the new on-line controller. If the CU is locked, or the off-line is not available, the SYC switch is not performed.

26.02 The program then separately analyzes the group check data obtained from each network controller. Upon completion of the analysis, the results are automatically printed on the TTY with a major alarm (Figure 1).

FIG. 1

```
**43 REPT NW ANAL
     00 1ST  1 1 2 1
     00 2ND  - - - -
     00 3RD  - - -
     01 1ST  1 1 2 1
     01 2ND  - - - -
     01 3RD  - - -
     END OF REPORT
```

The results indicate the portion(s) of the network that is associated with a unique group check pattern relative to the rest of the network. Experience has shown that a unique group check pattern is often associated with the location of a fault.

26.03 The pattern analysis may be initiated either manually or automatically. Manual execution is initiated by the BEGIN:NW 0/1;ANAL! command,[1] or the BEGIN:NW;ANAL,CG(x,y)! command[2] (see input manual). An automatic start is initiated when a call processing network order fails on both network controllers with a nonzero group check. Once the analysis is executed, it is inhibited from automatically being started for 30 minutes, however it may be manually started at any time.

---

1. Analyzes the entire lineup for the specified control frame.
2. Analyzes the specified concentrator groups and the entire 3rd stage.

26.04 There are two methods of completely inhibiting the analysis, so it cannot be started manually or automatically. The first method is by the INH:MSF 12! command. This inhibits the multiscan function that the analysis runs under. The ALW:MSF 12! command enables the analysis so it will operate as described above. The second method for turning on(off) the pattern analysis is by the following command:

```
RC:OFFICE/
SET(RESET) 0/
END!
```

This command sets(resets) the NW_ANA feature bit which turns on(off) both the pattern analysis and the grid error count features. When turned on, the pattern analysis may be executed as described above. It cannot be executed if it is turned off.

Interpretation of Analysis Results

26.05 The pattern analysis isolates one or more portions of the network that have unique group check responses relative to the rest of the network. The portion of the network that is isolated may be a switch, a grid, or several grids. The isolated portion is usually associated with the location of a fault. Typical faults are pulse path or gate lead shorts, shorted diodes or PNPNs, or grounded nodes in a grid; faults on the cabling between grids; faults in nonduplicated circuit packs such as level select packs; or certain faults in duplicated controller circuit packs. The isolated portion of the network is expressed as concentrator group, input switch group, concentrator, etc. The respective grid(s) may be at fault, or associated circuit packs may be faulty.

26.06 The results of the pattern analysis are printed on the TTY with a major alarm via the REPT NW ANAL message. The most meaningful results are obtained when group checks from each network controller are analyzed. If the results of the analysis are identical from each controller, the fault is very likely to be in the nonduplicated portion of the network (network fabric). The location of the fault should be associated with the part of the network that was isolated. For example, shorts between the pulse path and ground (in the fabric) should always produce identical results from each controller. The results, however, may be different for certain faults. Some examples are:

(a) Shorts on the pulse path through a potential.[3]

(b) Shorted gate diodes.[4]

---

3. Usually identical results from each controller.

4. Usually different results from each controller.

(c) Shorted gate diode and PNPN.[4]

(d) Faults in duplicated controller circuit packs.[4]

26.07 One or more stages of the network may have some isolation in the results. This can occur for single and multiple faults (see Figure 2a). The three stages of the network should be investigated in the following sequence: 3rd stage; 1st stage, 2nd stage. If there is any isolation for the 3rd stage from either controller, investigate the 3rd stage first. If there is no isolation for the 3rd stage, investigate the 1st stage if there is any isolation from either controller for stage 1 (see Figure 2b). Finally, stage 2 is the last stage to be checked (see Figure 2c).

26.08 The network pattern analysis was designed for single-fault isolation, however, it may also isolate many multiple fault combinations. For the following discussion, assume that only fabric (nonduplicated part of the network) faults exist.

26.09 The analysis may sequentially isolate any number of faults for a given stage of switching, and it may simultaneously isolate one fault for each stage. For example, if there are three faults in the fabric, one in each stage, it is possible for the analysis to simultaneously identify all three faults after one pass of the program. This is called simultaneous fault isolation. There are hazards with interpreting the results in this manner, since a fault in one stage may produce some isolation in that stage and another stage. (e.g., A single fault in stage 1 may produce results similar to those in Figure 2b. This may appear to be two faults, but is actually just one.) As a result, it is more effective to investigate the three stages in sequence (stage 3, stage 1, then stage 2). Thus, all of the faults in stage 3 are cleared, then all of the faults in stage 1, and then stage 2.

```
      FIG. 2a                  FIG. 2b                  FIG. 2c

     3RD STAGE                1ST STAGE                2ND STAGE
       FAULT                    FAULT                    FAULT

**17  REPT NW ANAL      **47  REPT NW ANAL      **26  REPT NW ANAL
      00 1ST  2 - 0 -         00 1ST  2 - 2 -         00 1ST  - - - -
      00 2ND  - - - -         00 2ND  2 1 - -         00 2ND  2 - 1 -
      00 3RD  3 - -           00 3RD  - - -           00 3RD  - - -
      01 1ST  2 - 1 -         01 1ST  2 - 2 -         01 1ST  - - - -
      01 2ND  - - - -         01 2ND  2 1 - -         01 2ND  2 - 1 -
      01 3RD  3 - -           01 3RD  - - -           01 3RD  - - -
      END OF REPORT           END OF REPORT           END OF REPORT
```

Using the Analysis

26.10 The technique just described exploits the characteristics of sequential fault isolation. If there is more than one fault in a given stage of the network, one of the faults should be isolated on the first pass of the analysis. When the fault is cleared, the analysis is run again, and another fault in that stage should be isolated. This process should be repeated until all the faults in that stage are cleared. Then the following stages should be investigated.

26.11 The pattern analysis has been tested for a variety of single faults and multiple fault combinations. It should be understood that the rules described above are general in nature. They have been found to hold true for many fault conditions. However, it has been impractical to perform an exhaustive test of the analysis on all known faults, especially multiple faults. For the faults that have been tested, the analysis will generally be able to identify the grid with the fault, or identify two grids, one of which has the fault. A known exception to this is a fault on the A link pulse path. The analysis will identify the output switch grid, but the fault might be associated with the output switch or one of three input switches.

The analysis will generally not be able to detect or isolate open pulse path faults. The grid count function is the most useful tool for isolating these faults. The analysis is most useful for faults that cause nonzero group checks. The network controller should be operable to the point where words 1 and 2 of the network order pass, and the controller attempts to enable the pulse path gates.

26.12 It is important to initially obtain results from both controllers. This will help in verifying the extent of the damage (controller versus fabric only). Generally, identical results from both controllers indicate fabric faults, and different results indicate controller faults. The goal is to correct the controller faults first, and then the fabric faults. NOTE: -48 V shorts to the fabric may induce different group check patterns from each controller.

26.13 Once phase 1 of the network diagnostic passes, controller faults may still be present (e.g., shorted gate diodes). The results of the analysis should help to verify this. Figure 3a is an example of the analysis results for a single shorted gate diode (all of the controller circuit packs are good).

26.14 During the course of troubleshooting network problems, the on-line SYC may be locked. This inhibits recovery from periodically initializing the system if multiple peripheral controllers are out of service. The following procedure should be used to analyze both controllers when the SYC is locked.

FIG. 3a

```
BEGIN:NW 0;ANAL/IP

 51    REPT SYC 0 ACT

 51    REPT SYC 1 ACT

**51   REPT NW ANAL
       00 1ST  - - - -
       00 2ND  - - - -
       00 3RD  - - -
       01 1ST  - 1 2 6
       01 2ND  - - - -
       01 3RD  - - -
       END OF REPORT
```

FIG. 3b

```
BEGIN:NW;ANAL,CG(1,1)/IP

 54    REPT SYC 0 ACT

 54    REPT SYC 1 ACT

**55   REPT NW ANAL
       00 1ST  - - - -
       00 2ND  1 - - -
       00 3RD  - - -
       01 1ST  1 1 2 6
       01 2ND  - - - -
       01 3RD  - - -
       END OF REPORT
```

FIG. 3c

```
BEGIN:NW:ANAL,CG(2,2)/IP

 53    REPT SYC 0 ACT

 53    REPT SYC 1 ACT

**53   REPT NW ANAL
       00 1ST  - - - -
       00 2ND  2 - - -
       00 3RD  - - -
       01 1ST  2 1 2 6
       01 2ND  - - - -
       01 3RD  - - -
       END OF REPORT
```

FIG. 3d

```
BEGIN:NW;ANAL,CG(3,3)/IP

 54    REPT SYC 0 ACT

 54    REPT SYC 1 ACT

**54   REPT NW ANAL
       00 1ST  - - - -
       00 2ND  - - - -
       00 3RD  - - -
       01 1ST  3 1 2 6
       01 2ND  - - - -
       01 3RD  - - -
       END OF REPORT
```

(a) Enter BEGIN:NW x;ANAL! or BEGIN:NW;ANAL,CG(y,z)!

(b) IMMEDIATELY after the message is entered, unlock the SYC.

(c) The maintenance orders will be sent on the on-line, a SYC switch should occur, the maintenance orders are repeated on the new on-line, and a SYC switch should occur back to the original on-line.

(d) After the last SYC switch (original SYC on-line), lock the SYC before the REPT NW ANAL message is printed.

(e) Inhibit group checks if they were previously inhibited.

26.15 Peripheral unit recovery will not cause an initialization if this procedure is followed, since recovery is inhibited when the pattern analysis program is running. Note that if only one controller is analyzed, the group check inhibit mode is not affected. The group check inhibit mode is automatically cleared with a SYC switch.

26.16 If the two controllers yield identical results, subsequent runs of the analysis can be done on just the on-line until a fault is cleared. Then both controllers should be checked again.

Additional Techniques for 1ST and 2ND Stages

26.17 If the analysis is not successful at isolating the concentrator group, but it has isolated some other portion(s) such as input switch group, concentrator, or output switch group, further analysis using the CG option may be useful. Figure 3a illustrates the analysis results for a shorted gate diode on a first stage switch. The concentrator group was not isolated when the entire lineup was analyzed. Figures 3b-3d show the results when each frame was analyzed individually. Concentrator group 3 is the only one that does not isolate the CG field for controller 0, so the fault is in CG 3, concentrator 1, input switch group 2, controller 0 gate diode.

26.18 There is another technique that is useful if the concentrator group is isolated, but one or more of the other fields contradict the corresponding field(s) for the other controller. In this case, performing the analysis only on that concentrator group may provide identical results for the other fields and eliminate the discrepancy.

27. NETWORK GRID ERROR COUNT PROGRAM

Introduction

27.01 The Grid Error Count program will determine the number of network orders that have failed on each grid accessible from a control complex.[5] These numbers, when outputted, help in determining which area of the network is the probable cause of a network problem.

27.02 The grid count function may be initiated either manually or automatically. Recovery will start the grid count automatically when a network order fails the retry attempts, on both network controllers of a control complex. Once automatically started for a control complex, a failure on a different control complex will be ignored. The manual request

5. A control complex (control frame) is a pair of network controllers and associated grids isolated from other controllers and grids by the control (pulse) path.

will be accepted at all times and will cause a restart of the grid counts if the mechanism was previously active. Conversely, an automatic invocation will also restart the mechanism, if previously started manually, unless the automatic start is inhibited. In addition, the Grid Error Count and the Pattern Analysis features may be turned on(off) via the following command:

```
RC:OFFICE/
SET(RESET) 0/
END!
```

27.03 When the grid count is active, a counter for each grid accessed by each controller in the control complex will be maintained. These counters may be printed any time, while the grid count is active, via a manual request.

Automatic Operation

27.04 The grid count function will be started automatically when a network order has failed all retries. This could result in a multiple peripheral controller trouble (MULT PC TRBL) condition when manual intervention is taken. The conditions for an automatic start are as follows:

(a) Not inhibited and

(b) grid count not active because of a previous auto start.

Once started, all subsequent failures occurring on the same control complex will be pegged against the appropriate grids.

27.05 An auto started function may be terminated in one of two ways. These are:

(a) A manual restart or

(b) a manual reset.

In the case of a manual restart after an auto start, failures will be pegged for the control complex specified by the manual restart. However, if an order fails all retries, on the same control complex, specified by the manual restart, an auto restart will no occur and pegging will continue. If an order fails, all retries on a different control complex, an auto restart will occur, and the counts of the previous pegging will be printed.

27.06 If the grid count function has been started manually and the previous function start was SYSTEM NORMAL, an order failing all retries on the same or another control complex will cause an auto restart. For this situation, the results of the manual start will automatically be printed.

27.07 A reset will force the grid count into a system normal condition, thus allowing the grid count function to automatically lock on to the next order that fails all retries. It is intended to be used after a fault is removed from the network. This provides a means to prevent different faults from being combined in the counts and producing ambiguous results.

Manual Operation

27.08 The grid count function may be started manually via a TTY message at any time. This method of operation is useful in tracking down a transient problem in the network. However, if the grid count function is active because of a manual start, and the auto start is not inhibited, an order failing all retries on another control complex will cause an automatic restart.

27.09 A manual start or restart may be terminated in one of three ways. These are:

(a) An auto restart, if auto is not inhibited,

(b) another manual restart or

(c) a manual reset.

Once the grid count is started all failures will be pegged against the appropriate grids.

Teletype Messages

27.10 The following list of TTY messages provide all the necessary control of the grid count function.

(a) Input messages

BEGIN:NW C;COUNT!	This message will cause a manual start or restart of the grid count function. Where "c" is equal to the Control Complex (0 or 1).
RESET:NW;COUNT!	This message will force the grid count function to reset.
INH:NW;COUNT!	This message inhibits the automatic start or restart function.
ALW:NW;COUNT!	Allows the automatic start and restart function.

OP:NW;COUNT!	Will snapshot the counters and output the results.

(b) Output messages.

A tt NW COUNT AUTO START	This message indicates that an auto restart has occurred.

```
tt OP NW COUNT c s  date  time

      CONCENTRATOR 0    CONCENTRATOR 1    OUTPUT SW SP
CG        0     1     2     0     1     2     0     1
 0    12345     0     0     0     0     0     0     0
 1        0     0     0     0     0     0     0     0
 2        0     0     0     0     0     0     0     0
 3        0     0     0     0     0     0     0     0
 4        0     0     0     0     0     0     0     0
 5        0     0     0     0     0     0     0     0
 6        0     0     0     0     0     0     0     0
 7        0     0     0     0     0     0     0     0

                         STAGE 3
         0L    1L    0H    1H    2L    3L    2H    3H
      12345     0     0     0     0     0     0     0
```

This output message represents what will be printed for one controller. When an auto restart occurs, a printout for each controller in the control complex will occur. The date and time printed, indicate when the counting was started. This provides a means by which the results of several outputs may be chronologically ordered. The date and time also correlate to the date and time of the auto start message. Refer to the input and output manuals for further details.

<u>Interpretation of Grid Error Count Results</u>

27.11 The Grid Error Count is useful in determining the location of a faulty grid or grids. This is done by analyzing the counters. The faulty equipment may be associated with counters that have excessive counts or counters with no failures.

27.12 Before analyzing the results, a decision must be made as to which set of counters will be used. Since there is a set of counters for each controller, the set that yields the most definitive results should be considered first. This will usually be the set associated with the controller that has been on-line for the longer period of time.

27.13 To determine the portion with the fault, all the counters associated with a controller must be considered. This is done by searching the counts for anomalies. Some guidelines for using the grid count are given below.

27.14 In example 1, the counters for input switch group 0 in both concentrators for concentrator group 2 have errors and the rest of the counters are dramatically lower or zero (see below). In this case, one of the two 15A grids and/or the associated access circuit packs are at fault.

Example 1

tt OP NW COUNT 0 0 5/26/80 09:12:32

	CONCENTRATOR 0			CONCENTRATOR 1			OUTPUT SW GP	
CG	0	1	2	0	1	2	0	1
1	0	0	0	0	0	0	0	0
2	26	0	0	22	0	0	0	0
3	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0

STAGE 3

0L	1L	0H	1H	2L	3L	2H	3H
0	0	0	0	0	0	0	0

27.15 In example 2, all the counters show relatively equal totals but all the counters for concentrator group 2 are zero (see below). For this example, concentrator groups 1 thru 3 are equipped. This would indicate that concentrator group 2, with no failures, as being the portion with the fault. Since all possible concentrator groups for a control complex are always printed, unequipped groups should not be considered when the results are interpreted.

Example 2

tt OP NW COUNT 0 1 5/26/80 10:25:05

	CONCENTRATOR 0			CONCENTRATOR 1			OUTPUT SW GP	
CG	0	1	2	0	1	2	0	1
1	19	15	7	8	11	19	22	24
2	0	0	0	0	0	0	0	0
3	7	9	14	12	11	8	22	21
4	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0

STAGE 3

0L	1L	0H	1H	2L	3L	2H	3H
0	0	0	0	0	0	0	0

27.16 One or more stages of the network may be indicated by the results of the counters. This can occur for single and multiple faults. The three stages of network should be considered in this order: 3rd stage; 1st stage; 2nd stage. If there is any third stage indications, investigate the third stage first. If there is no third stage failures indicated but the first and second stage do indicate failures, the first stage should be investigated. Then finally the second stage.

27.17 It is possible for the grid count to indicate more than one fault for a given control complex. Because there are hazards with interpreting the results to find all the anomalies, the most outstanding one should be pursued first. Therefore, after some corrective action is taken for a problem, the grid count should be restarted or reset. This will help separate the faults.

Using The Grid Error Count

27.18 The techniques described above, provide the guidelines to interpret the results of the Grid Error Count function. When a fault is cleared, the grid count should be restarted on the same control complex. This will allow the grid count to accumulate new totals so additional faults may be found. If this process is repeated until all the faults in a stage of the network are cleared, other faults in some other stage become more apparent.

27.19 The Grid Error Count has been tested for a variety of faults. It should be understood that the guidelines are general in nature. They have been found to hold true for many fault conditions. However, it has been impractical to perform an exhaustive test of the grid count on all known faults, especially multiple faults. For the faults that have been tested, the grid count will be helpful in identifying the grid or a set of grids, one of which has the fault. Such a condition is a fault on the A-link pulse path. (See Example 3 below.) The grid count will indicate a 15B and one or all three 15A grids, the fault may be associated with the 15B or one of the 15As.

Example 3

tt OP NW COUNT 1 0 5/26/80 11:34:20

	CONCENTRATOR 0			CONCENTRATOR 1			OUTPUT SW GP	
CG	0	1	2	0	1	2	0	1
8	11	14	9	0	0	0	0	29
9	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0

STAGE 3

0L	1L	0H	1H	2L	3L	2H	3H
0	0	0	0	0	0	0	0

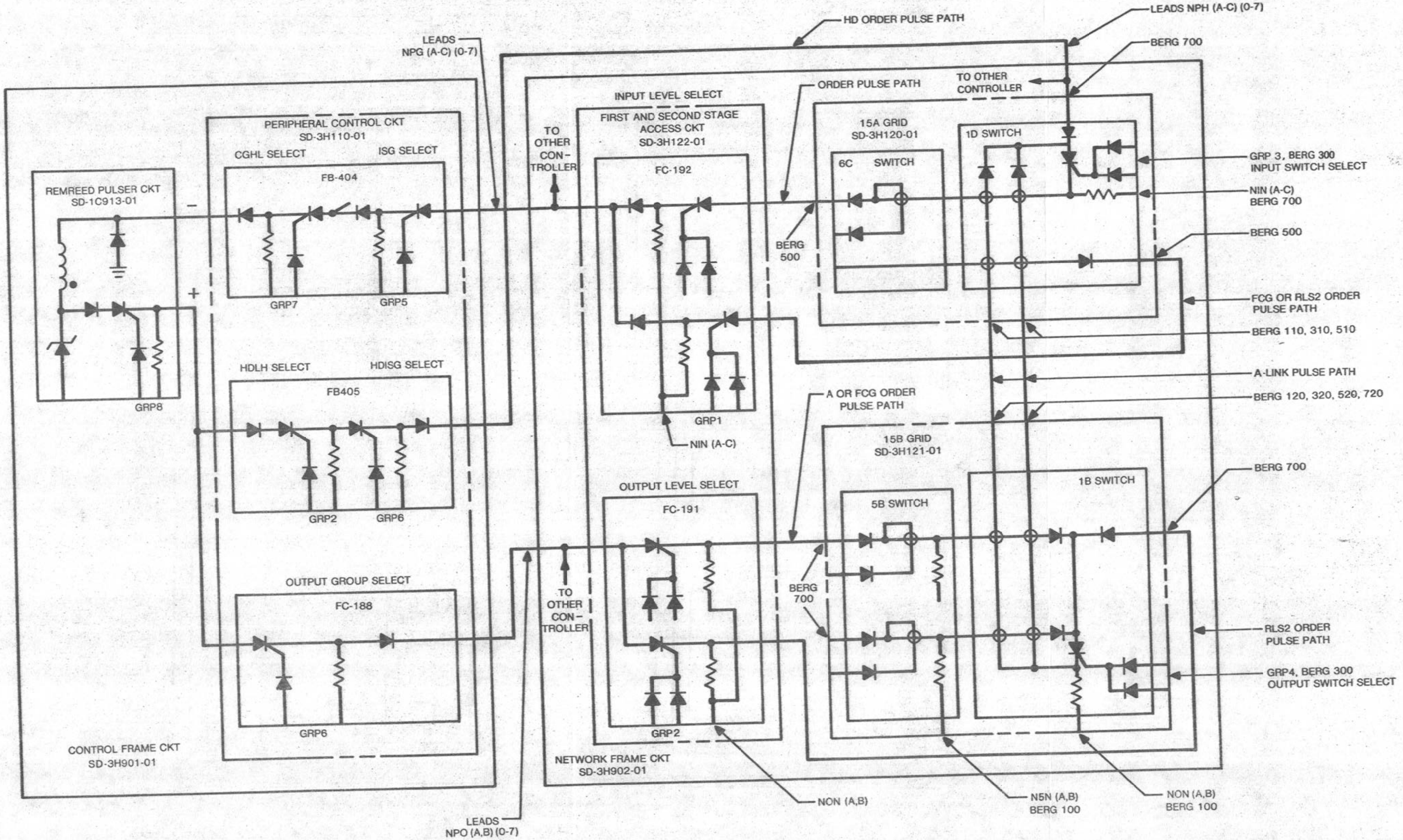
27.20 In the face of a single fault, such as an open pulse path, the grid count provides an invaluable diagnostic tool. However, in the face of a single or multiple faults(s), that results in a wide spread propagation of the fault, the Pattern Analysis is more useful.

27.21 For the grid count to provide accurate results, the network controller should be operable to the point where words 1 and 2 of the network order pass, allowing the controller to enable the pulse path gates. This implies that phase 1 of the network controller diagnostic ATPs.

It is important to retain the results of the grid count each time the counters are printed. This will help in building a history as to how the fault or faults are affecting the control complex. It should also be noted, that locking a system control (SYC) on-line, and/or inhibiting group checks on a controller, will not affect the operation of the Grid Error Count function once it has been started. The only action other than a restart or reset of the grid count that will affect the counters, is a stable clear.

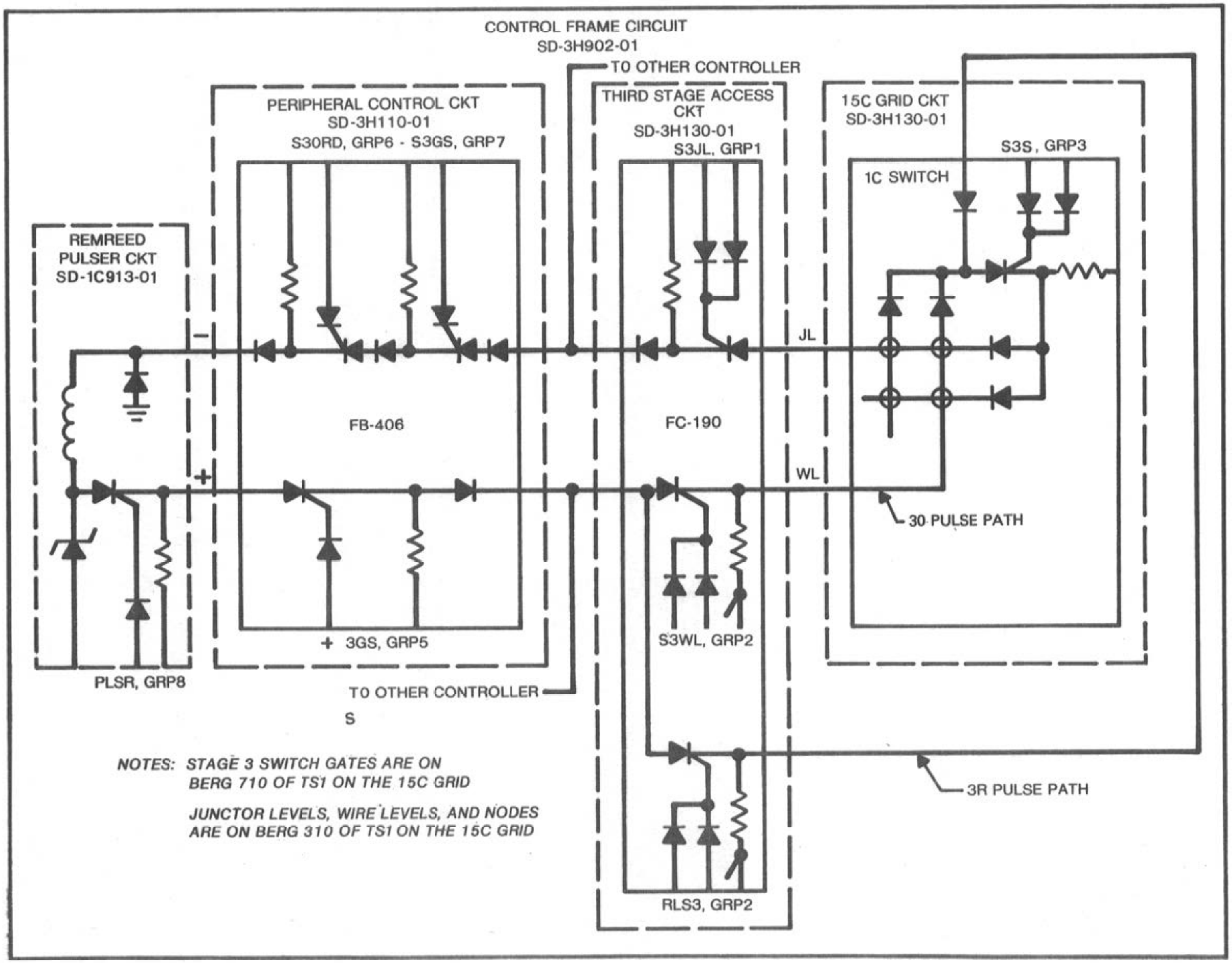
28. NETWORK PATH PULSE DIAGRAMS

28.01 Use the Network Pulse Path Diagrams to determine which failing group is nearest the negative pulser terminal. The diagram is used with the procedure in paragraphs 8.03 and 23.05.



Pulse Paths for Concentrator Group Orders

PULSE PATHS FOR THIRD STAGE ORDERS



NOTES: STAGE 3 SWITCH GATES ARE ON BERG 710 OF TS1 ON THE 15C GRID

JUNCTOR LEVELS, WIRE LEVELS, AND NODES ARE ON BERG 310 OF TS1 ON THE 15C GRID