Update Report

LICENSEE EVENT REPORT

Previous Report Date 6-17-80

CONTROL BLOCK: [| | | | | |] (1)

(PLEASE PRINT OR TYPE ALL REQUIRED INFORMATION)

Line	Field	Entry
01	LICENSEE CODE (2)	N Y I P S 2
	LICENSE NUMBER (3)	0 0 - 0 0 0 0 0 - 0 0
	LICENSE TYPE (4)	4 1 1 1 1
	CAT (5)	
CON'T 01	REPORT SOURCE (6)	L
	DOCKET NUMBER (7)	0 5 0 0 0 2 4 7
	EVENT DATE (8)	0 6 0 3 8 0
	REPORT DATE (9)	0 9 0 5 8 0

EVENT DESCRIPTION AND PROBABLE CONSEQUENCES (10)

02 During normal plant operation, all off-site electrical power was
03 lost to the site. The reactor was shutdown by the operator via manual
04 turbine trip. The generator was subsequently shutdown by a direct
05 trip signal from the Buchanan Substation. The reactor was maintained
06 in a safe shutdown condition using natural circulation cooling until
07 restoration of off-site power. See attachment 1 for details.
08

09	SYSTEM CODE (11)	CAUSE CODE (12)	CAUSE SUBCODE (13)	COMPONENT CODE (14)	COMP. SUBCODE (15)	VALVE SUBCODE (16)
	E A	C	Z	E L E C O N	Z	Z

LER/RO REPORT NUMBER (17)	EVENT YEAR		SEQUENTIAL REPORT NO.		OCCURRENCE CODE	REPORT TYPE		REVISION NO.
	8 0	—	0 0 6	/	9 9	X	—	1

ACTION TAKEN (18)	FUTURE ACTION (19)	EFFECT ON PLANT (20)	SHUTDOWN METHOD (21)	HOURS (22)	ATTACHMENT SUBMITTED (23)	NPRD-4 FORM SUB. (24)	PRIME COMP. SUPPLIER (25)	COMPONENT MANUFACTURER (26)
B	Z	A	B	0 0 0 0	Y	N	L	Y 9 9 9

CAUSE DESCRIPTION AND CORRECTIVE ACTIONS (27)

10 A lightning strike on a system transmission tower resulted in the
11 sequential faulting of the three 138 KV feeders that supply off-site
12 power to the Indian Point Facility. After clearing the faulted
13 conditions, normal service was restored. See attachment 1 for details.
14

15	FACILITY STATUS (28)	% POWER (29)	OTHER STATUS (30)	METHOD OF DISCOVERY (31)	DISCOVERY DESCRIPTION (32)
	E	1 0 0	NA	A	Control Room Instrumentation

16	ACTIVITY RELEASED (33)	CONTENT OF RELEASE (34)	AMOUNT OF ACTIVITY (35)	LOCATION OF RELEASE (36)
	Z	Z	NA	NA

PERSONNEL EXPOSURES

17	NUMBER (37)	TYPE (38)	DESCRIPTION (39)
	0 0 0	Z	NA

PERSONNEL INJURIES

18	NUMBER (40)	DESCRIPTION (41)
	0 0 0	NA

LOSS OF OR DAMAGE TO FACILITY (43)

19	TYPE (42)	DESCRIPTION
	Z	NA

PUBLICITY

20	ISSUED (44)	DESCRIPTION (45)	NRC USE ONLY
	N	NA	

8009120381

NAME OF PREPARER John M. Makepeace PHONE: 914-739-8823

ATTACHMENT 1

Docket No. 50-247
LER-80-006/99X-1

Consolidated Edison Co. of NY Inc.
Indian Point Unit No. 2

At approximately 1454 hours on June 3, 1980, an electrical disturbance was experienced on the Con Edison system which resulted in a loss of all off-site power to the Indian Point Nuclear Facility and a shutdown of Indian Point Unit No. 2. The disturbance was attributed to a lightning strike on one of the 345 kV/138 kV transmission towers between the Buchanan and the Millwood Substations. A report describing the effects of this occurrence on the operation of Unit No. 2 and the sequence of events leading up to the loss of off-site power is presented below:

ON SITE

Prior to the loss of off-site power, a thunderstorm alert was put into effect by System Operations at 1410. As per normal procedures, preparations were being made to put Indian Point Gas Turbines 1, 2, and 3 in service. At the time of the system disturbance, GT-1 and GT-2 were in service with a combined load of 30 MW. GT-3 had been started but could not be synchronized due to a faulty synchronizing switch. The subsequent loss of 138 kV supply to Buchanan Substation resulted in automatic tripping of GT-1 and GT-2. The loss of all

outside power to Unit 2 deenergized 6.9 kV buses 5 and 6, and associated 480 V buses 5A and 6A. By design, the emergency diesel generators started upon loss of 6.9 kV buses 5 and 6. The loss of 480 V bus 5A resulted in a loss of power the Rod Position Indication System, and a turbine runback to 70% power was initiated from the rod drop protection system, resulting in an increase in the average reactor coolant temperature. As a result of the turbine runback, the condenser steam dump system operated, decreasing average reactor coolant temperature. (Ref: Attached Charts 1, 2, and 3.) Based on these indications, the operator initiated a plant shutdown using the manual turbine trip. This turbine tripping sequence is designed to delay the generator trip for 30 seconds, in order to dissipate stored energy in the reheaters and thereby limit turbine overspeeding. Relay targets indicate the Unit tripped as a result of a direct trip from Buchanan Substation at some time between the operator's action of manual turbine trip and the 30 second timing sequence delay.

Upon trip of the main generator, the emergency diesel generators, which had previosuly started, reenergized the 480 V buses and associated essential equipment. With power lost the 6.9 kV buses, the reactor coolant pumps tripped and residual heat removal was accomplished via natural circulation.

Subsequent to the Unit trip, an engineering safeguards sequence was initiated automatically be means of a signal from the protection circuitry provided to detect a steam line break. The signal was the result of a momentary imbalance in steam flow through the atmospheric steam relief system. All safeguards equipment performed normally, and after verification of the cause of the signal, the safeguards equipment was shutdown and the SI signal reset.

A decision was made not to reenergize IP-2 6.9 kV buses via the gas turbines, since restoration of normal 138 kV supply was imminent. At 1640, feeders 95331 and 95332 were restored, and shortly thereafter the 6.9 kV buses were reenergized. At 1725, No. 24 reactor coolant pump was returned to service, providing forced circulation to the reactor coolant system. By 0411, the following day, all four reactor coolant pumps were in service. Throughout the natural circulation phase of this incident, fixed incore thermocouple indications, the saturation meter, and other related instrumentation were monitored providing verification that adequate core cooling existed at all times.

With the loss of off-site power, some of the telephones available to the operator became inoperable. The private lines, which include the NRC "Emergency Notification System", were affected. The operator was able to communicate through the in-house dial system and the

737 exchange. A temporary service to the private lines was restored within an hour. Details of changes to the communications system to preclude recurrence of such an event including the installation of a new redundant inverter power supply have been provided in response to NRC IE Bulletin No. 80-15 by letter dated September 2, 1980.

OFF SITE

Buchanan Substation Shutdown

Figure 1 is a diagram of a portion of the bulk power system showing the feeders supplying Buchanan which were affected by the lightning strike and related events.

Ten principal operations occurred on the bulk power transmission system as a result of the disturbance. The faults were cleared promptly by the correct action of protective relays and circuit breakers except for one relay system that operated improperly causing a breaker at Buchanan Substation to open and disconnect a 345 kV feeder from Buchanan to Ladentown. This malfunction is being investigated further. Details of the principal operations are shown in the attached Appendix.

Figure 2 shows the physical arrangements of "rights-of-way" near Millwood Substation where the lightning strike occurred. It shows the tower configuration on these rights-of-way including the shield wires on the towers.

In the area just northwest of Millwood Substation, one 345 kV feeder crosses under two 138 kV feeders. A second 345 kV feeder crosses under not only these two 138 kV feeders, but also two 345 kV feeders. The feeders are all connected to Buchanan.

Failure of the First Shield Wire

Shield wires are designed to protect overhead feeders from direct lightning strikes and, in the event of a feeder fault, dissipate ground currents through properly grounded towers. Following the 1977 blackout, the tower grounding resistance of our 345 kV transmission towers was measured and an action program instituted to reduce all tower resistance, where practical, to 10 ohms or less. Corrective action on the towers near Millwood Substation was completed in April 1979.

At 1454, lighting struck a tower just northwest of Millwood West Substation. A 138 kV feeder between Millwood and Buchanan Substations flashed over to ground and protective relays operated to open the circuit breakers. The breakers reclosed automatically but one of two shield wires burned through its connector and fell on the feeder causing a short circuit.

On its downward path, the shield wire came in contact with and short circuited a 345 kV feeder from Millwood to Buchanan. It fell across

and deenergized another 345 kV feeder from Sprain Brook to Buchanan.

Subsequent investigation revealed that the shield wire became disconnected because the friction connector which attaches it to the tower failed due to thermo-mechanical deterioration.

Shield wire connections are visually inspected at least once every five years and would normally reveal surface deterioration. The connector that failed was last inspected in May 1979. Only laboratory testing would reveal the thermo-mechanical deterioration which we discovered after the failure.

Failure of the Second Shield Wire

The heavy surge of current resulting from the operations described above flowed through the downed shield wire and over the second shield wire. A splice on the second shield wire failed and the wire fell over another 138 kV feeder between Millwood and Buchanan Substations, short circuiting the feeder. Subsequent investigation revealed corrosion under the splice.

The splice was made from a friction grip consisting of a series of strands of wire formed to a specific conductor size and designed to wrap around and secure the sections to be joined. Our current construction practices no longer use friction splices but, instead, compression-type hardware.

There are no specific inspection programs for shield wire splices. As part of the normal monthly helicopter inspection and twice-annual walking inspection, the lines and connections are observed and any apparent deterioration is noted for more detailed inspection. During the Spring 1980 walking inspection and on subsequent helicopter inspections, there were no corrosion or other problems observed.

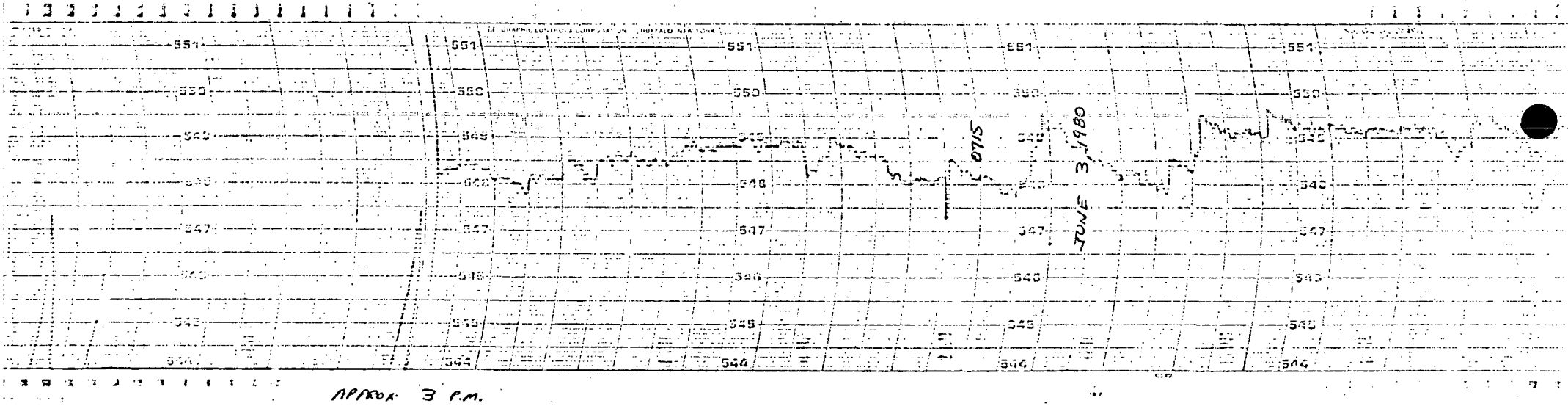
With the loss of all 138 kV supply to Buchanan Substation, Gas Turbines #1 and #2 were unable to supply the total station load and tripped, interrupting the last supply to Buchanan Substation.

Gas Turbine #1 was subsequently "black started" and placed on standby to assure its availability as back-up for the emergency diesels. No problems were experienced in starting the gas turbine and bringing it up to synchronous speed. Difficulties were encountered in holding the gas turbine in the standby mode at synchronous speed with no load connected. Details of planned actions to improve the reliability/availability of the three gas turbines at Indian Point are contained in our final response to Interim Action Items C.5(2) and (3), provided to NRC by letter dated August 27, 1980.

The events of June 3, 1980 were triggered by a lightning strike in a congested area of our transmission system where several 138 kV and 345 kV transmission circuits cross. The initiating event was caused by two mechanical failures involving the friction connector and the friction splice on two shield wires. In order to avoid a recurrence of this event, the following corrective actions are planned:

1. Install a jumper and bond to mechanically secure the shield wires at all locations with friction connectors.
2. Replace the friction splices on the shield wires with compression splices.
3. Disconnect Transformer TA-5 from 345 kV feeder W93 and reconnect to the north ring bus at Buchanan 345 kV Substation. This will provide a continuous supply of power in the event of a similar occurrence in the congested transmission line area.

TAVE NARROW RANGE T-12 A



APPROX. 3 P.M.

CHART 1.

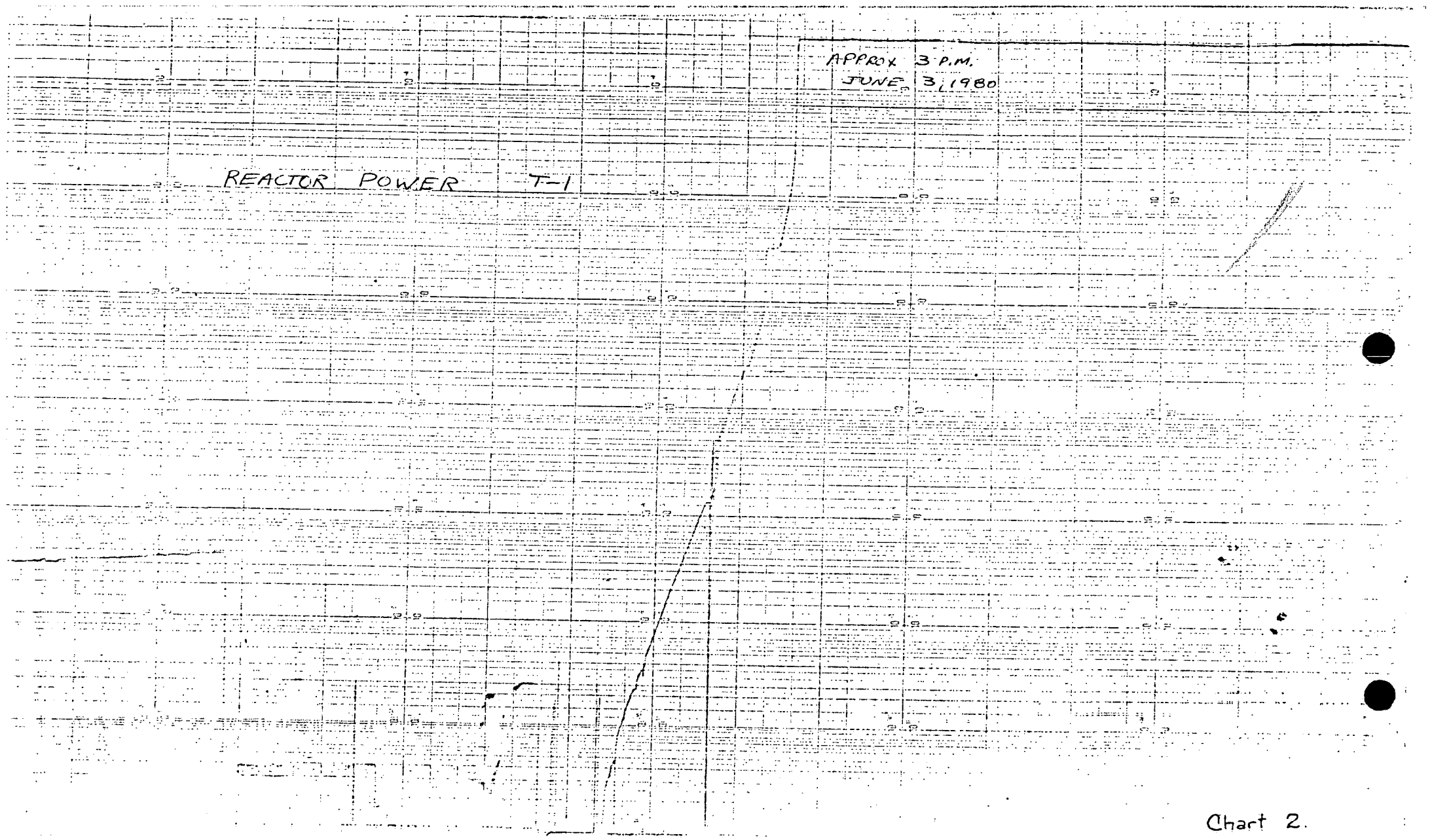


Chart 2.

CONDENSER VACUUM

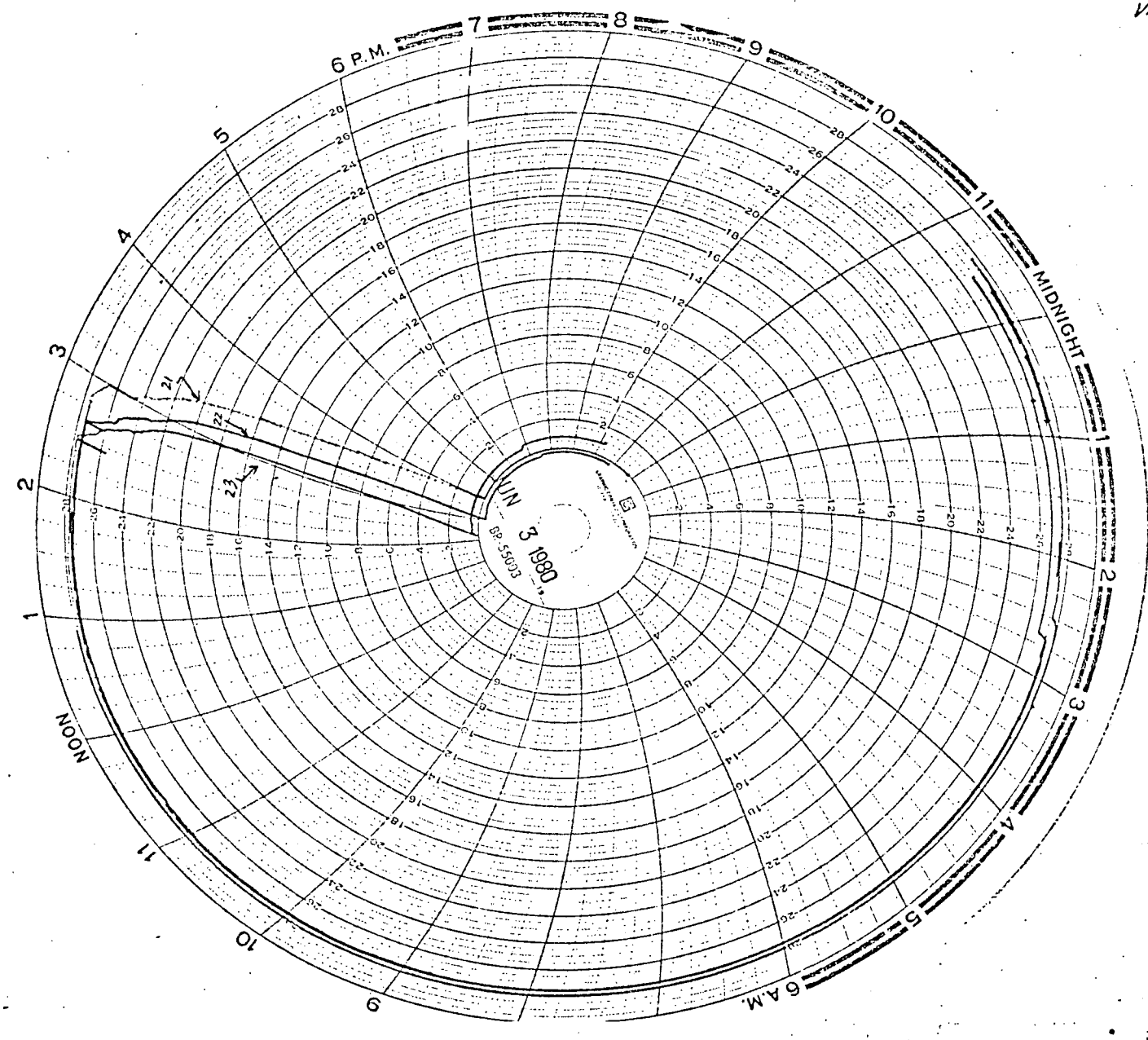


Chart 3.

345KV AND 138KV FEEDERS AFFECTED BY JUNE 3, 1980 SYSTEM DISTURBANCE

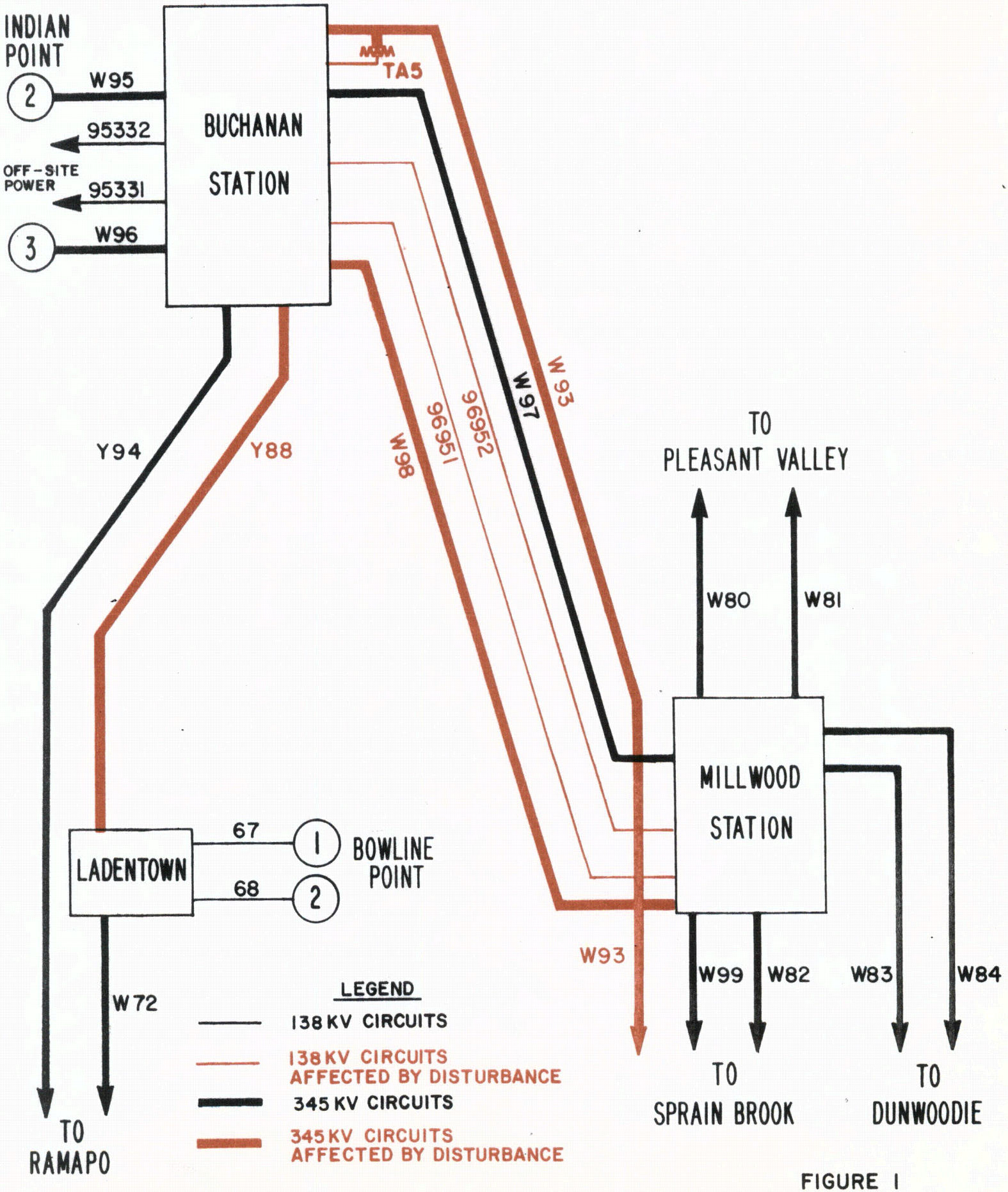


FIGURE 1

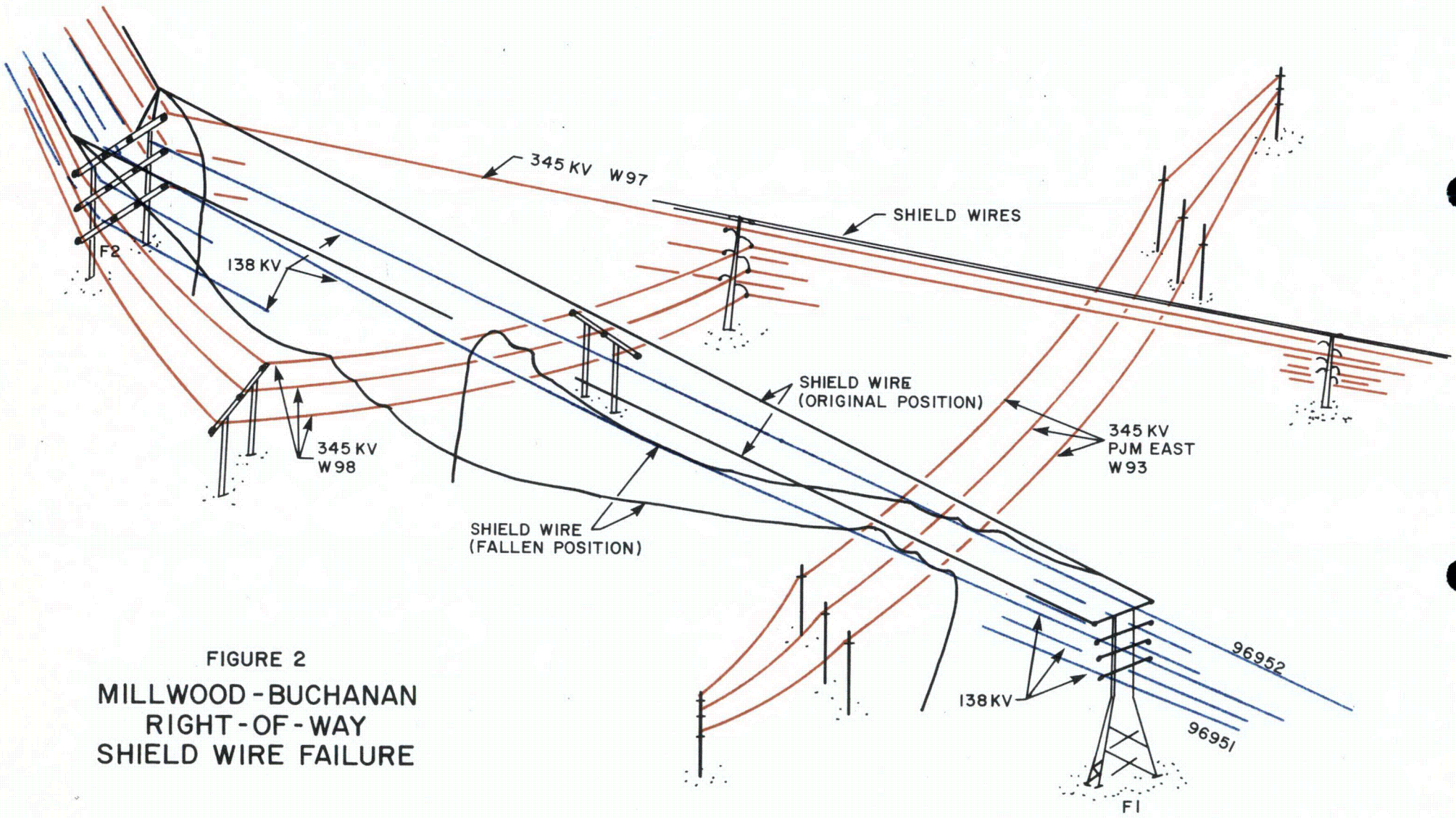


FIGURE 2

MILLWOOD - BUCHANAN
RIGHT - OF - WAY
SHIELD WIRE FAILURE

APPENDIX

PRINCIPAL OPERATIONS

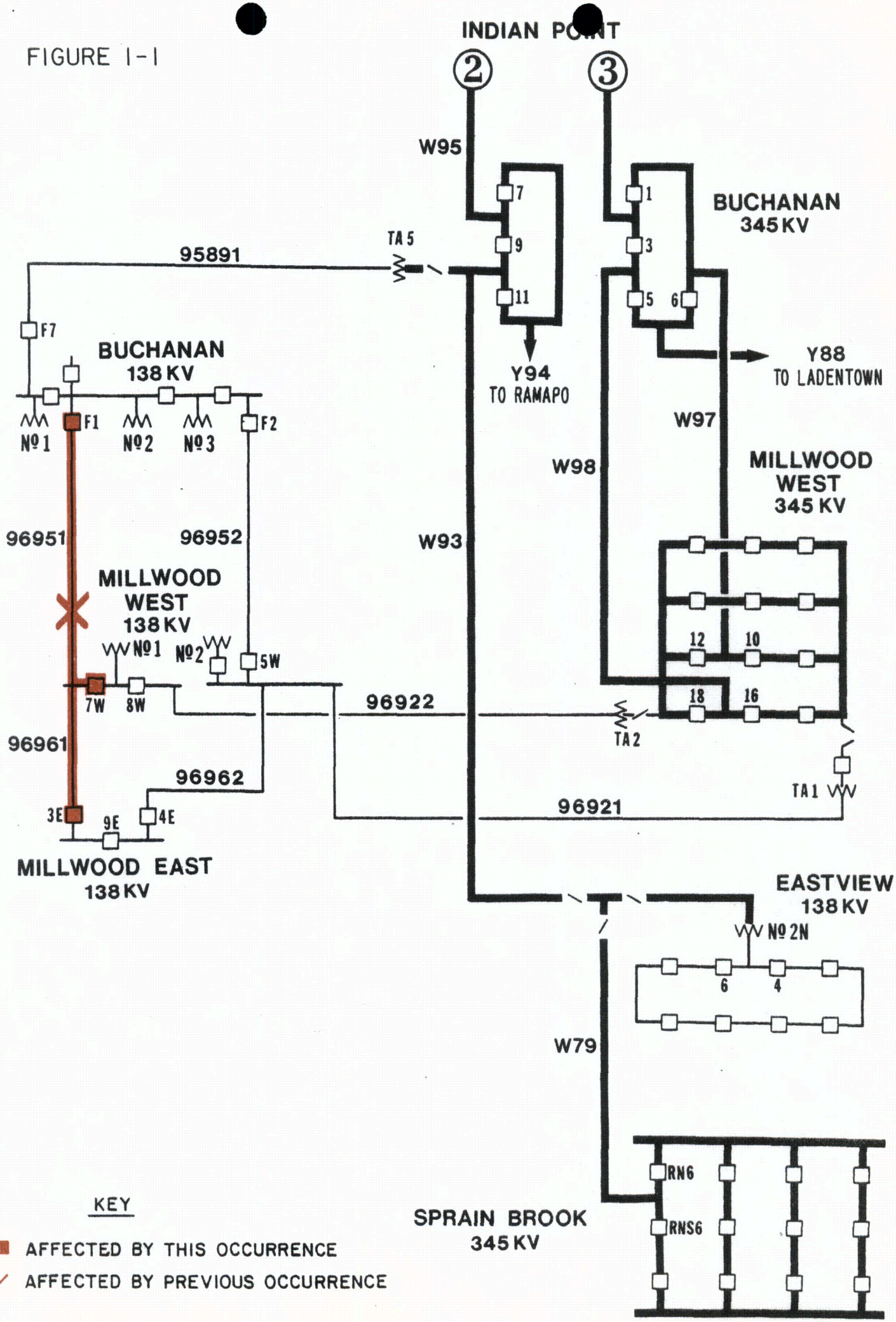
TRANSMISSION SYSTEM

JUNE 3, 1980

OPERATION 1 (Figure 1-1)

14:54 138 kV Feeder 96951 between Millwood and Buchanan Substations flashed over C phase to ground as a result of a lightning strike. Protective relays operated within 6 cycles to automatically open circuit breakers at Millwood West (7W), Millwood East (3E) and Buchanan (F1) and deenergized the feeder. Before the fault arcing byproducts could completely deionize, breakers F1 and 3E reclosed automatically at 0 + 24 cycles and 0 + 27 cycles respectively, energizing the feeder and reestablishing the C phase fault. The breakers reopened. Breaker 7W at Millwood West reclosed automatically at 0 + 145.5 cycles and reenergized Feeder 96951. At 0 + 157 cycles Feeder 96951 experienced a B phase to ground fault as a result of a failed shield wire deadend on tower F-1 that caused the shield wire to fall onto the feeder. Breaker 7W at Millwood West automatically opened to deenergize the feeder.

FIGURE 1-1



KEY

AFFECTED BY THIS OCCURRENCE

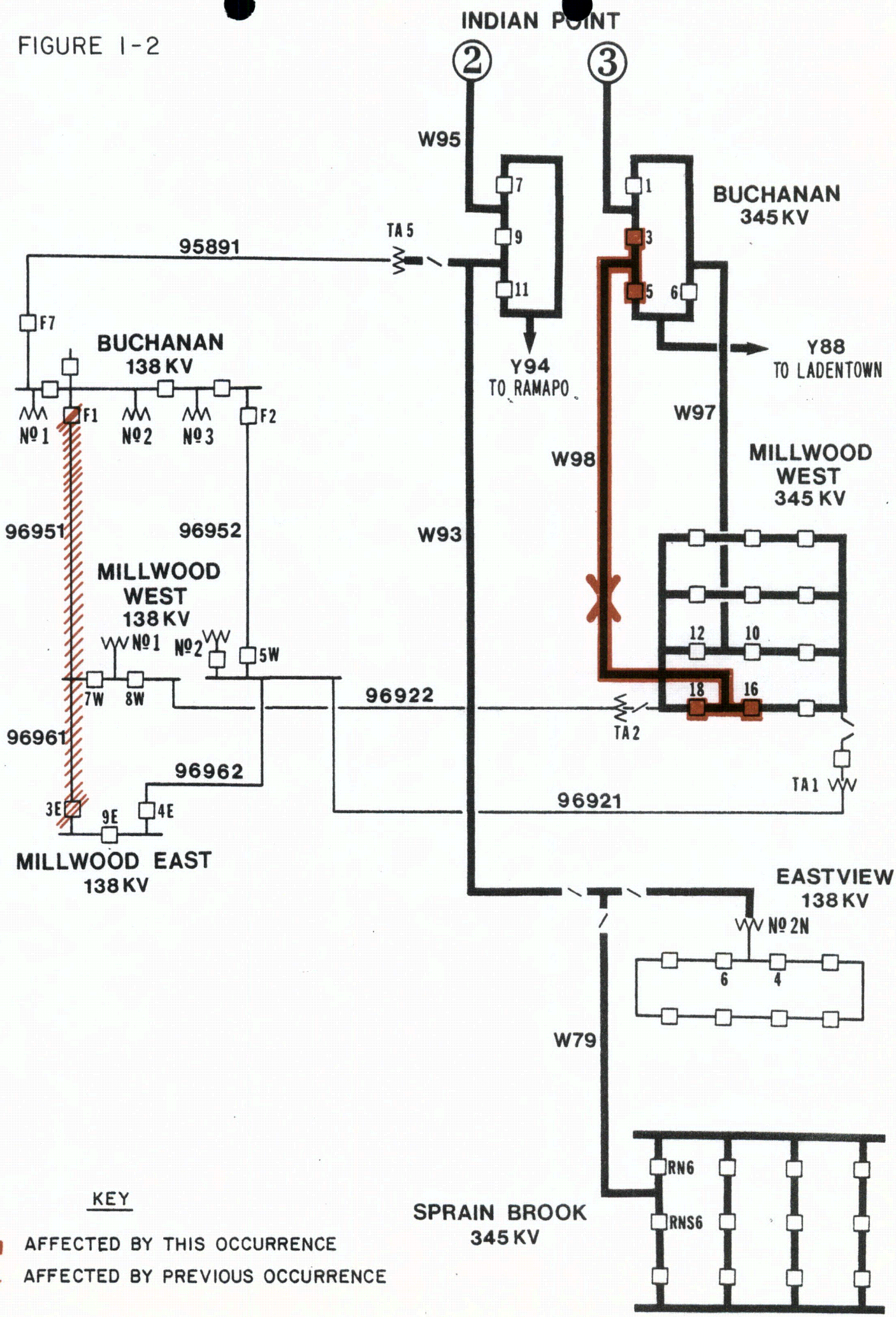
////// AFFECTED BY PREVIOUS OCCURRENCE

OPERATION 2 (Figure 1-2)

14:54 (0 + 213 cycles)

345 kV Feeder W98 experienced a C phase fault caused by the 96951 shield wire contacting the phase conductor. Protective relays automatically opened breakers at Buchanan (3 and 5) and Millwood West (16 and 18) to deenergize the feeder.

FIGURE 1-2


INDIAN POINT
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F7
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TO RAMAPO
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3E
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4E
MILLWOOD EAST
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EASTVIEW
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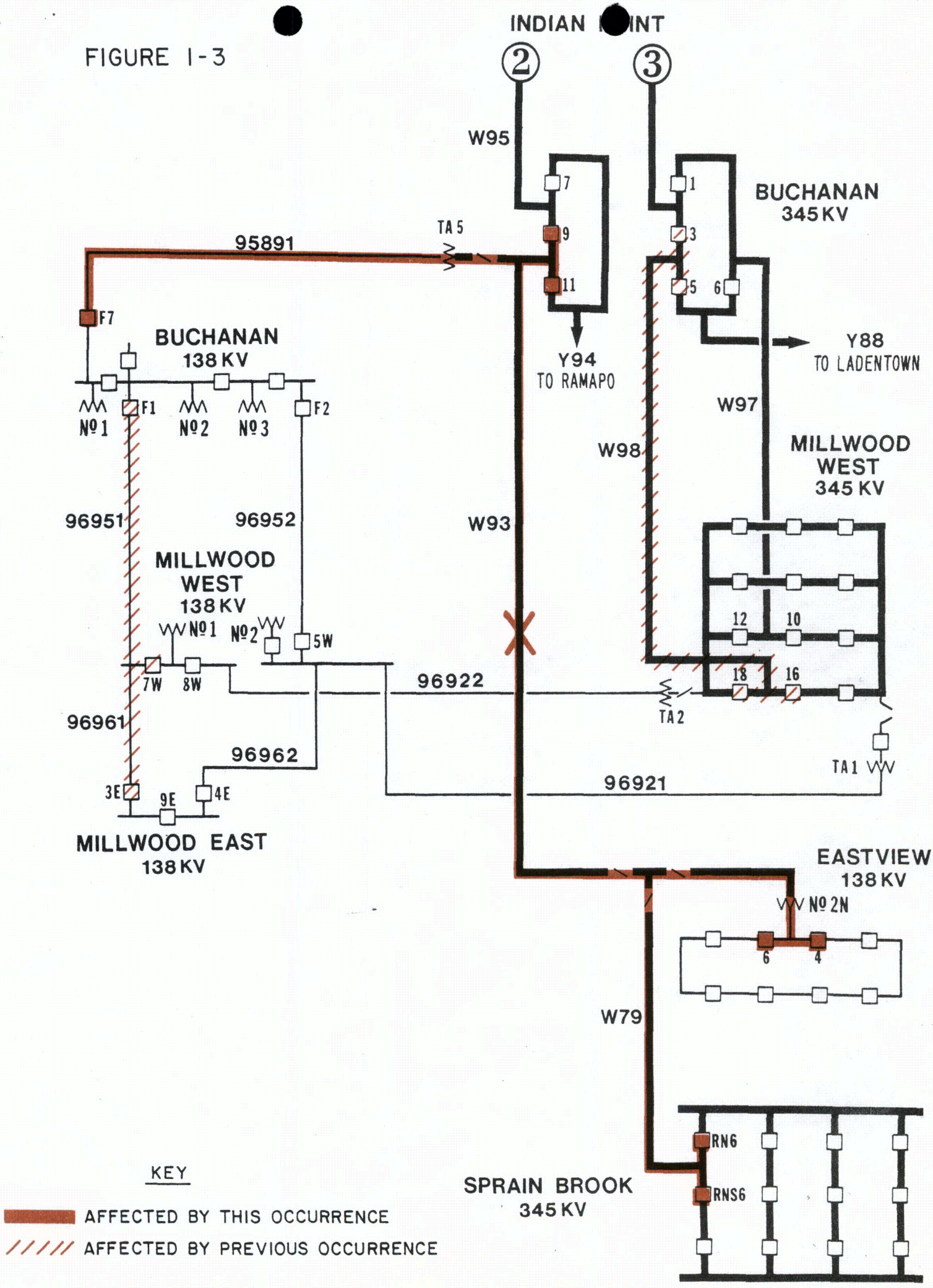
W79
RN6
RNS6
SPRAIN BROOK
345 KV
KEY
AFFECTED BY THIS OCCURRENCE
AFFECTED BY PREVIOUS OCCURRENCE

OPERATION 3 (Figure 1-3)

14:54 (0 + 236 cycles)

345 kV feeder W93/W79 experienced a B phase fault caused by the 96951 shield wire contacting the phase conductor. This quickly developed into a A-B ground fault before breakers at Buchanan (9, 11 and F7) and Sprain Brook (RN6 and RNS6) opened automatically. The shield wire fell across the three phases before the feeder was deenergized by breakers 4 and 6 at Eastview.

FIGURE 1-3



KEY

AFFECTED BY THIS OCCURRENCE

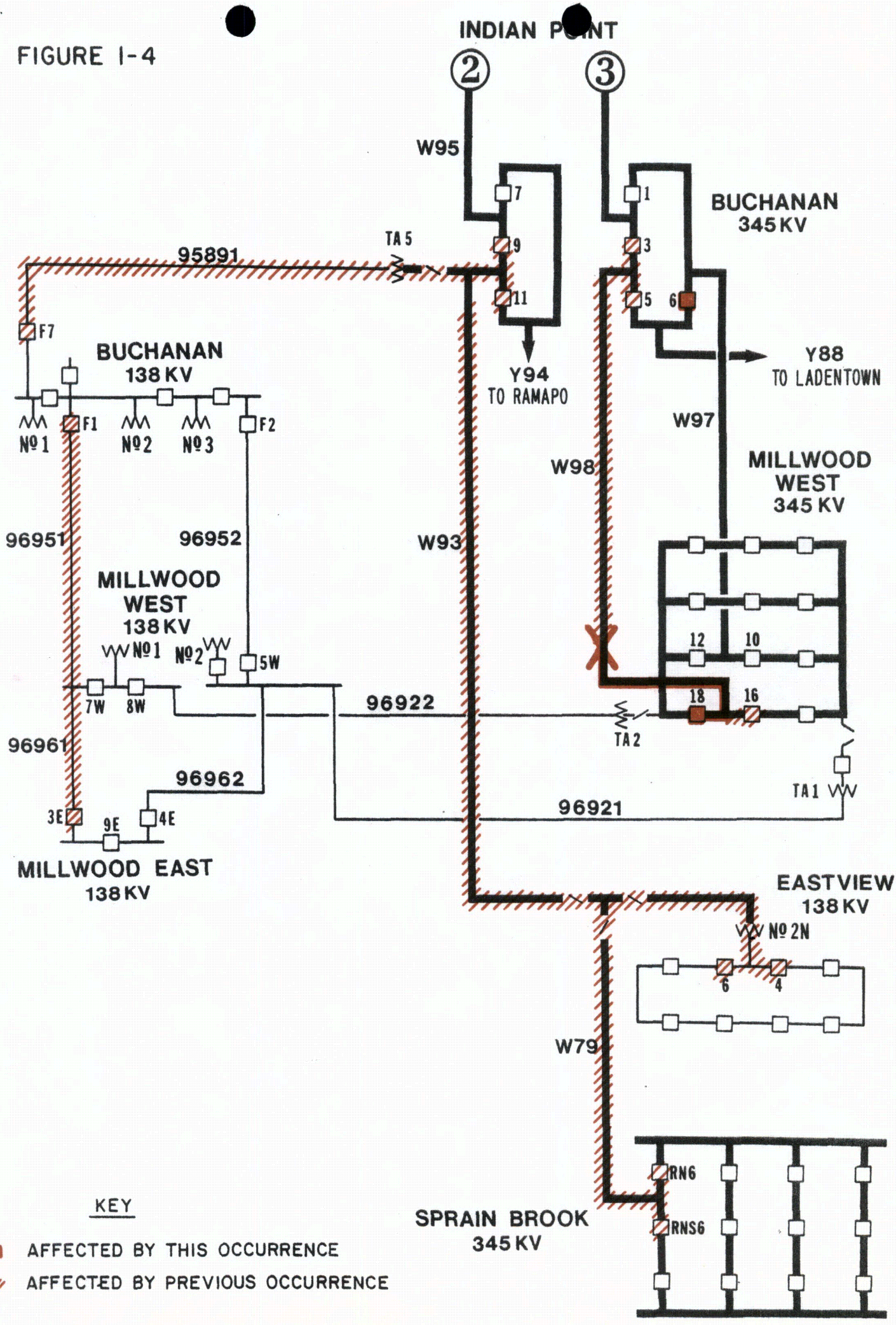
AFFECTED BY PREVIOUS OCCURRENCE

OPERATION 4 (Figure 1-4)

14:54 (0 + 314 cycles)

Feeder W98 breaker 18 at Millwood reclosed into a three phase fault and reopened. Breaker 6 at Buchanan opened auto via misoperation of line relaying at Buchanan on Feeder Y88. No trouble has been found to date. Additional equipment is being connected to monitor the protective relay system.

FIGURE 1-4


INDIAN POINT
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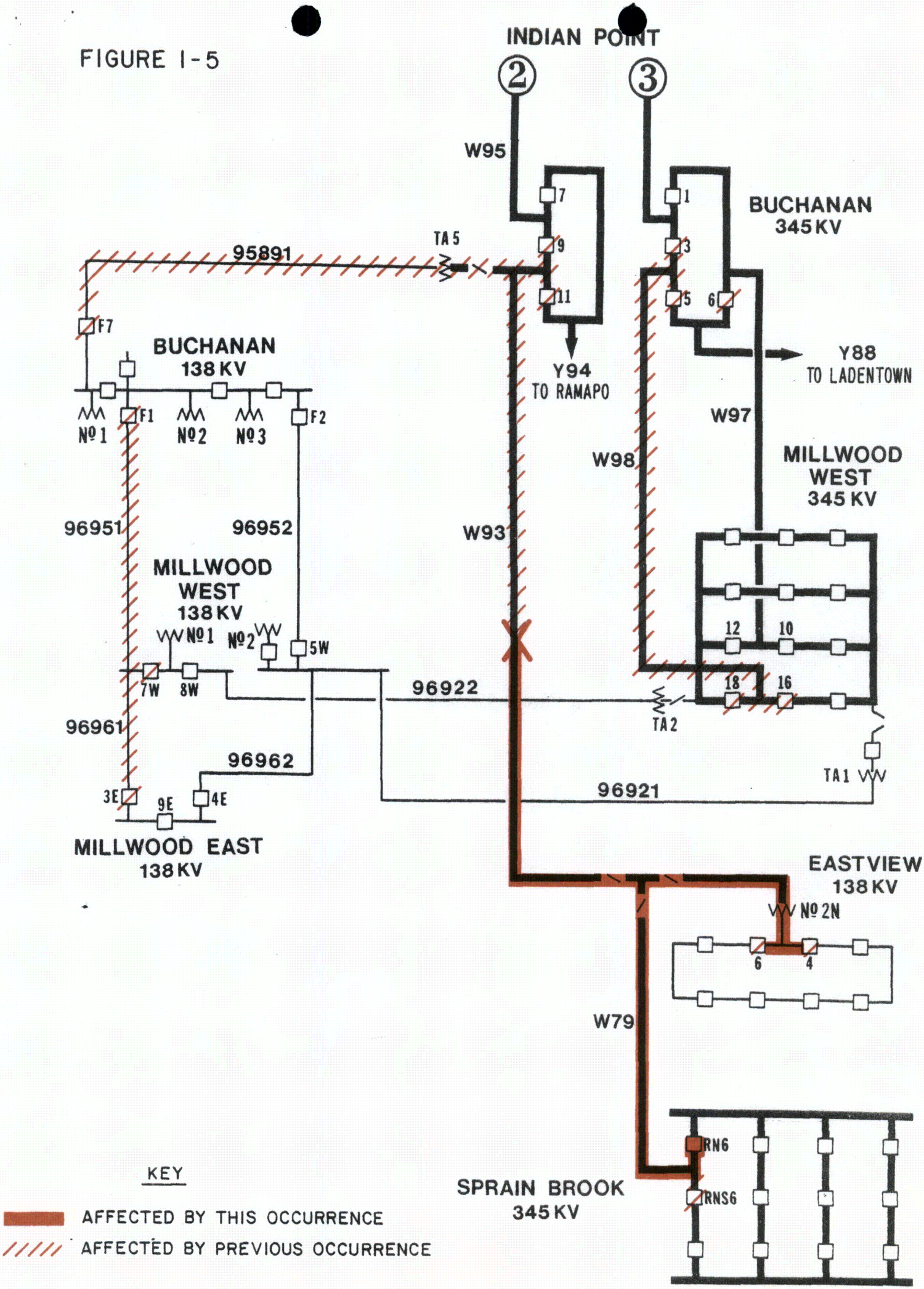
RN6
RNS6
SPRAIN BROOK
345 KV
KEY
AFFECTED BY THIS OCCURRENCE
AFFECTED BY PREVIOUS OCCURRENCE

OPERATION 5 (Figure 1-5)

14:54 (0 + 319 cycles)

Feeder W93/W79 breaker RN6 at Sprain Brook reclosed into a three phase fault and reopened.

FIGURE 1-5


INDIAN POINT
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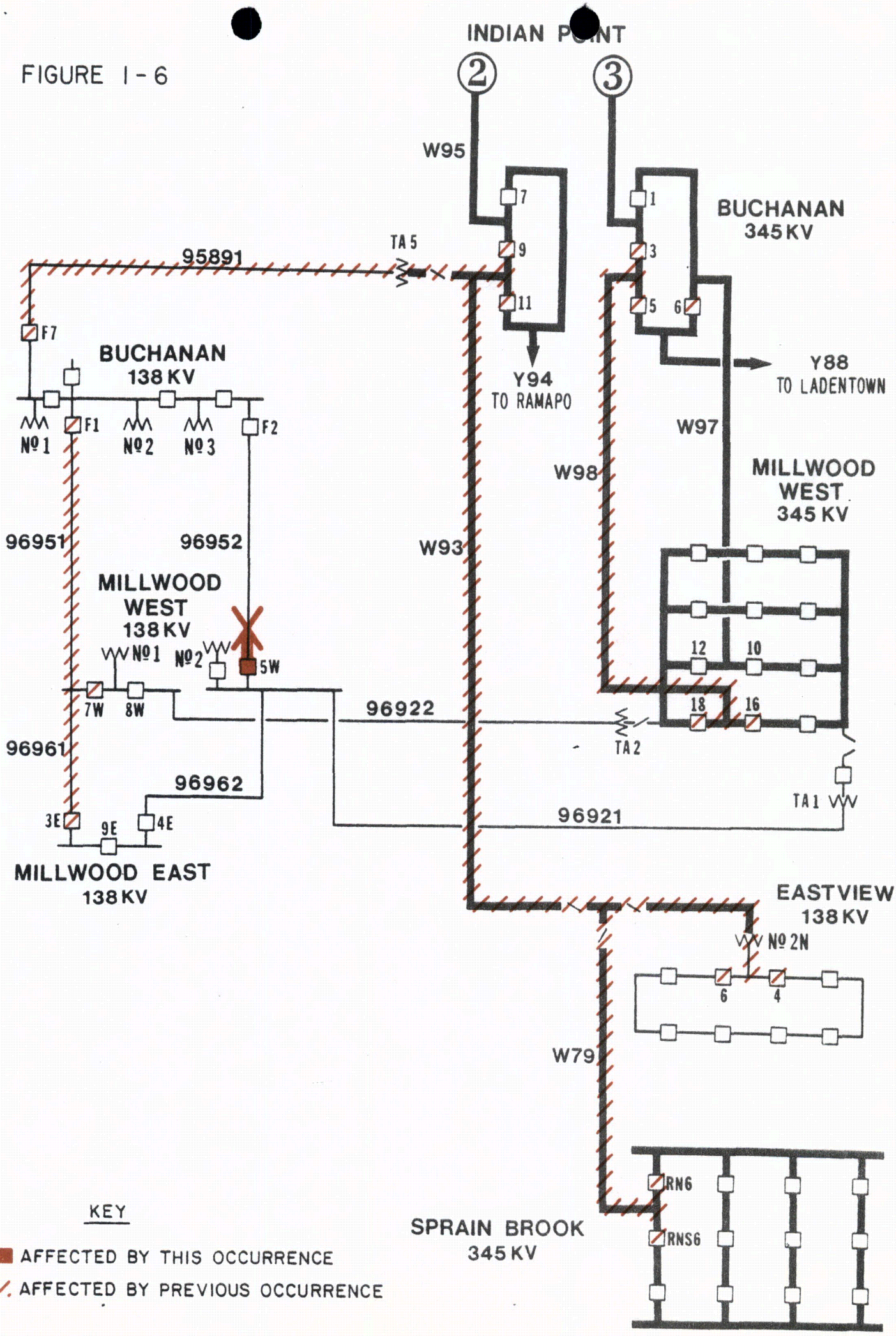
W79
RN6
RNS6
SPRAIN BROOK
345 KV
KEY
AFFECTED BY THIS OCCURRENCE
AFFECTED BY PREVIOUS OCCURRENCE

OPERATION 6 (Figure 1-6)

14:54 (0 + 660 ± 100 cycles)

138 kV Feeder 96952 experienced a B phase fault initiated by a splice failure that caused its shield wire to fall into the feeder. Protective relays opened breaker 5W at Millwood. The Buchanan breaker F2 remained closed because the Buchanan bus had no source for ground current to trip the breaker. Breaker 5W reclosed and reopened.

FIGURE 1-6



KEY

AFFECTED BY THIS OCCURRENCE

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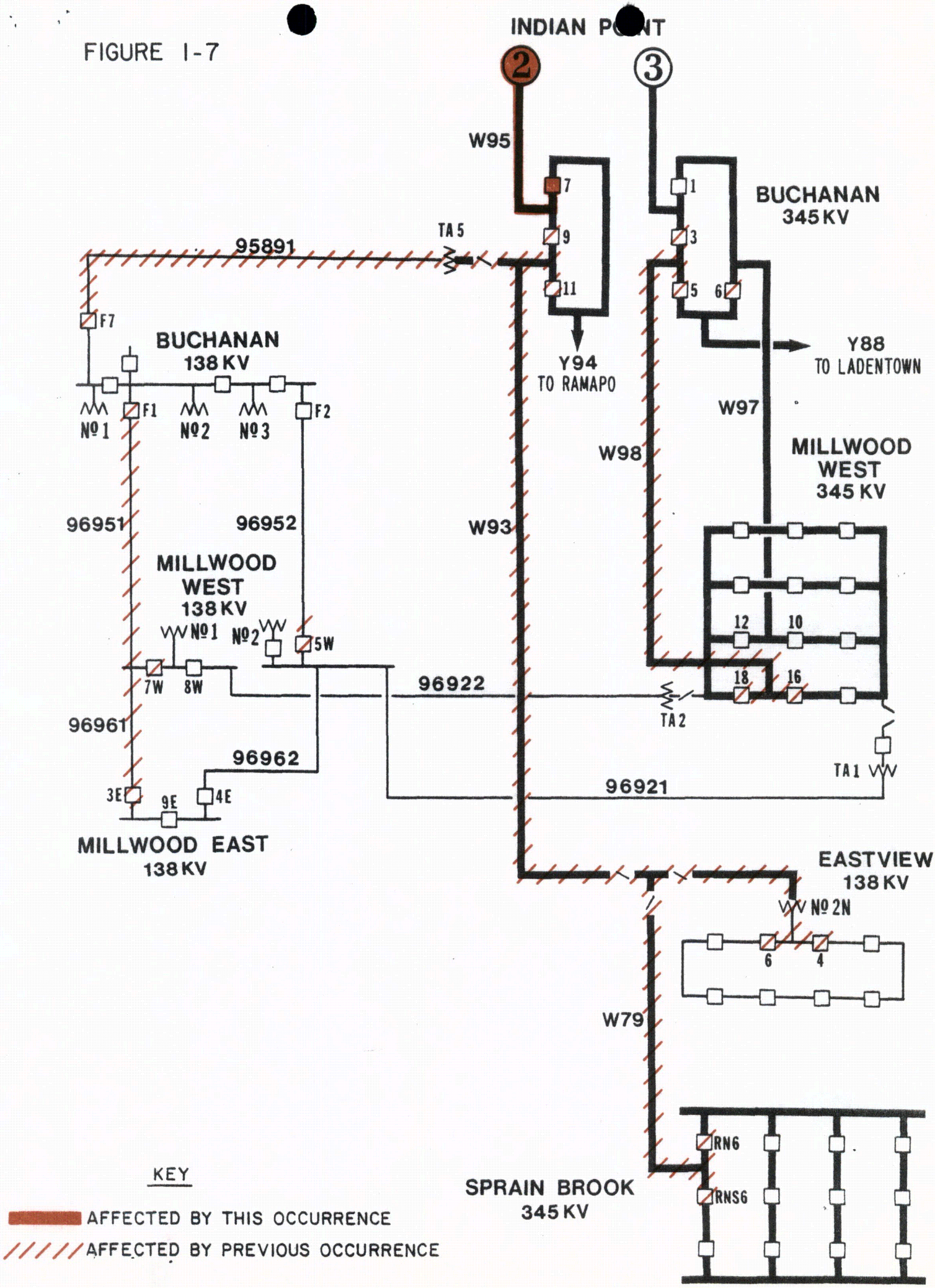
OPERATION 7 (Figure 1-7)

14:54 (0 + 50 to 75 seconds)

Operator tripped Indian Point #2 turbine. At sometime between the operator's action of manual turbine trip and the 30 second timing sequence, it was reported that the unit tripped as a result of a direct trip from the Buchanan Substation. Subsequent testing showed that the circuits were operating properly. Since it is possible that premature tripping may have occurred due to an auxiliary trip relay operating as a result of a battery surge, the auxiliary trip relay was desensitized to improve security against unwanted operation.

FIGURE 1-7



KEY

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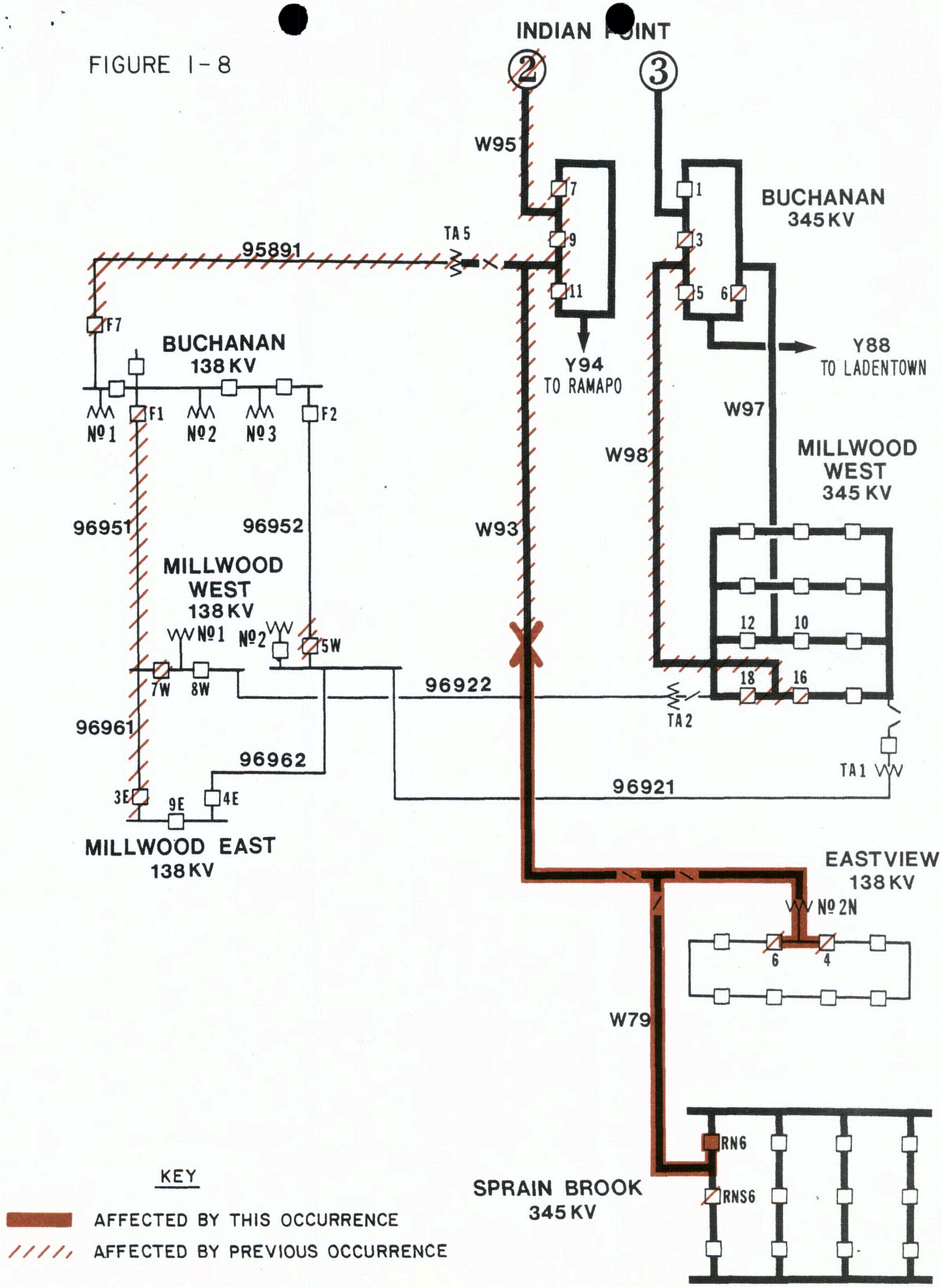
AFFECTED BY PREVIOUS OCCURRENCE

OPERATION 8 (Figure 1-8)

14:54 (0 + 90 ± 5 seconds)

Operator closed breaker RN6 at Sprain Brook via supervisory in an attempt to reenergize feeder W93/W79. Breaker RN6 opened auto due to the three phase fault caused by the dropped shield wires.

FIGURE 1-8


INDIAN POINT
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MILLWOOD
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96952
W93
MILLWOOD
WEST
138 KV
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Nº 2
5W
7W
8W
12
10
18
16
96922
TA 2
TA 1
96961
96962
96921
3E
9E
4E
MILLWOOD EAST
138 KV
EASTVIEW
138 KV
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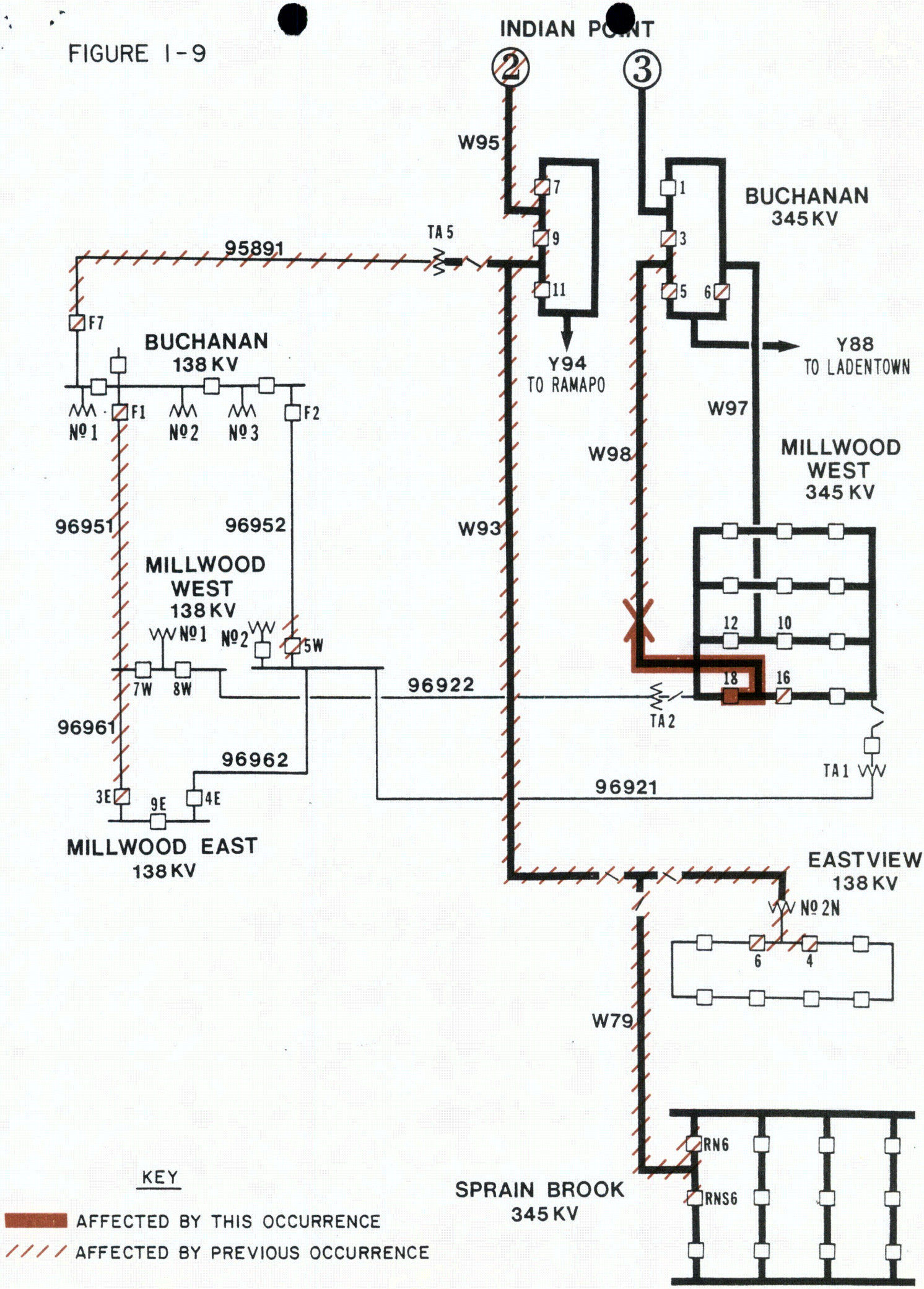
W79
RN6
RNS6
SPRAIN BROOK
345 KV
KEY
AFFECTED BY THIS OCCURRENCE
AFFECTED BY PREVIOUS OCCURRENCE

OPERATION 9 (Figure 1-9)

14:54 (0 + 95 ± 5 seconds)

Operator closed breaker 18 at Millwood via supervisory in an attempt to reenergize Feeder W98. Breaker 18 opened auto to the three phase fault caused by the dropped shield wires across Feeder W98.

FIGURE 1-9



KEY

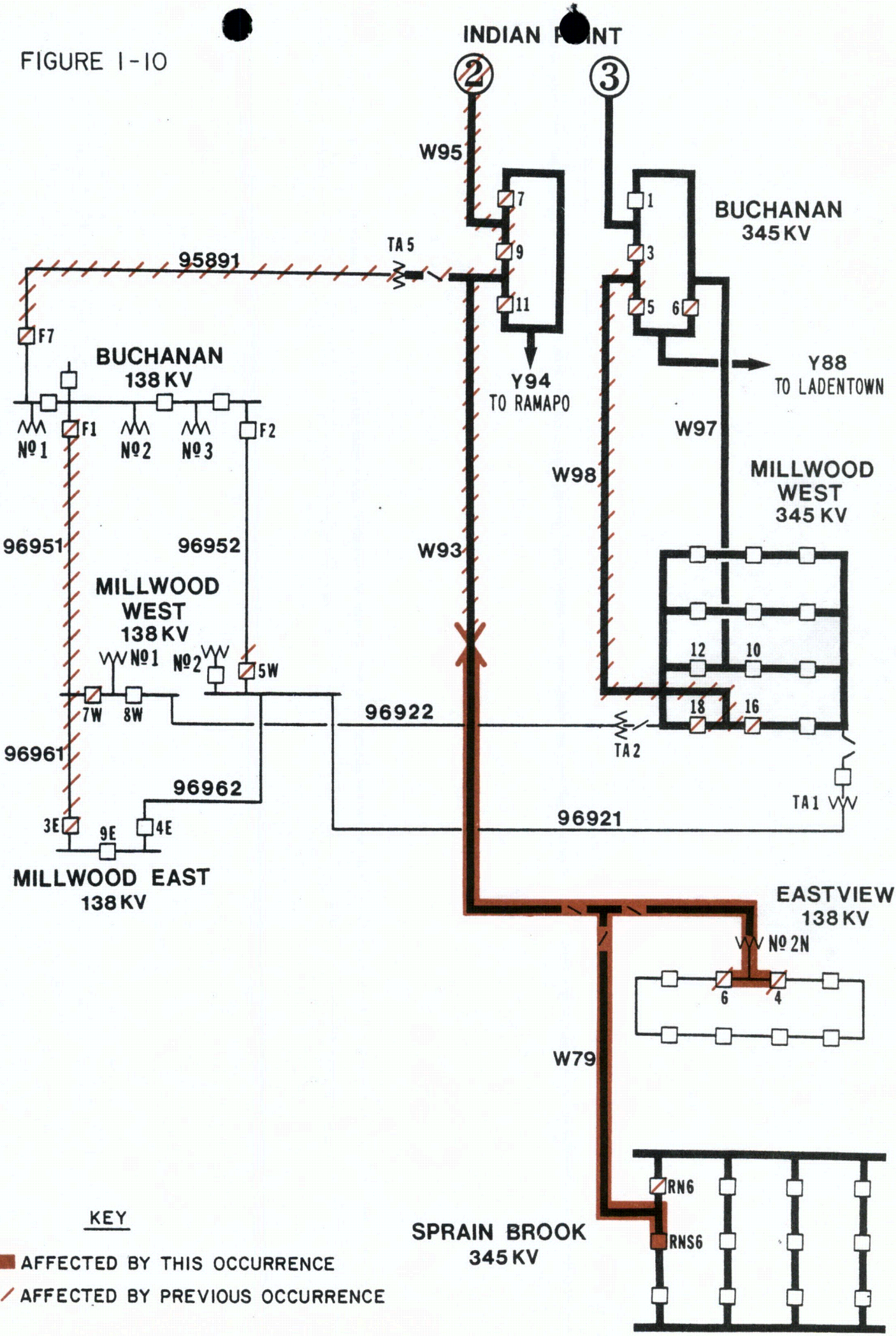
AFFECTED BY THIS OCCURRENCE

AFFECTED BY PREVIOUS OCCURRENCE

OPERATION 10 (Figure 1-10)

14:58 Operator closed breaker RNS6 at Sprain Brook in an attempt to reenergize Feeder W93/W79. Breaker RNS6 opened auto due to the three phase fault caused by the dropped shield wires across Feeder W93.

FIGURE I-10


INDIAN POINT
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Y88
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W98
MILLWOOD
WEST
345 KV
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96952
W93
MILLWOOD
WEST
138 KV
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Nº 2
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7W
8W
12
10
18
16
96922
TA 2
TA 1
96961
96962
96921
3E
9E
4E
MILLWOOD EAST
138 KV
EASTVIEW
138 KV
Nº 2N
6
4
W79
RN6
RNS6
SPRAIN BROOK
345 KV
KEY
AFFECTED BY THIS OCCURRENCE
AFFECTED BY PREVIOUS OCCURRENCE