

January 2, 1987

Docket No. 50-410

LICENSEE: Niagara Mohawk Power Corporation (NMPC)

FACILITY: Nine Mile Point Nuclear Station Unit 2 (NMP-2)

SUBJECT: SUMMARY OF MEETING WITH NMPC ON DECEMBER 18, 1986, CONCERNING LOGIC MODIFICATIONS TO THE MAIN STEAM ISOLATION VALVES ACTUATORS AT NMP-2

On December 18, 1986, the NRC staff met with representatives of NMPC and their consultants, Stone and Webster Engineering Corporation (SWEC), to discuss the logic modifications made to the main steam isolation valves (MSIVs) at NMP-2.

On December 3, 1986, a full scram occurred at NMP-2 as a result of a loss of power to both reactor protection system (RPS) scram sensor busses. This event was caused by an overcurrent resulting from the crossing of loads in the MSIV logic circuit.

Alerted by this event, the NRC requested NMPC to meet with them on December 18, 1986 to discuss the details of the logic modifications to the MSIVs.

During the meeting, NMPC provided details of the MSIV logic circuits for the original MSIV actuators, the modified actuators before the December 3 event, and the modified actuators following the December 3 event. Logic diagrams and circuit diagrams were provided in a handout from NMPC which is included as enclosure 1.

Because the revised MSIV actuator design eliminates the latching mechanism and relies on the hydraulic system to maintain the MSIVs in the open position, an automatic auctioneering circuit was installed on each of the solenoids to reduce the probability of inadvertent closure of the MSIVs. The hydraulic system solenoid valves open on loss of power, venting the hydraulic system and allowing the MSIVs to close from unbalanced spring forces. The automatic auctioneering circuit allows the solenoids to remain energized from power sources from either division, thereby reducing the chance of an inadvertent MSIV closure on loss of power from either division.

While the NRC staff agreed that inadvertent MSIV actuation was undesirable, the staff expressed concern that such an arrangement could permit a transfer of loads across power supplies. The NRC also noted that this design was specifically noted as being unacceptable in Regulatory Guide 1.6. The staff stated that the design was unacceptable and that NMPC should proceed with determining an alternate design for the MSIV actuator logic.

NMPC questioned what testing of the circuits could be performed to prove that the design was acceptable. The staff indicated that it could not state what, if any, test program of these circuits could provide the assurance needed to support the proposed logic circuitry.

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Niagara Mohawk Power Corporation

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In a subsequent conference call on December 22, 1986, the staff further clarified their concern stating that because the modified actuator control scheme allows the automatic transfer from one uninterruptable power supply (UPS) bus to its redundant counterpart for a single load, a potential for paralleling of the redundant power supply systems of the RPS is created. For this reason, the staff stated that the modified logic design does not meet the requirements of General Design Criterion (GDC) 21 of 10 CFR 50 Appendix A or the requirements of IEEE 279. NMPC was again requested to propose an alternate design for the MSIV actuator logic.

A list of meeting attendees for the December 18, 1986, meeting is included as enclosure 2.

/s/

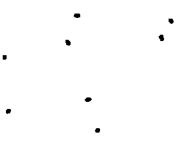
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BWR Project Directorate No. 3  
Division of BWR Licensing

Enclosure:  
As stated

cc: See next page

*M Haughey*  
BWD-3:DBL  
MHaughey/vag  
01/2/87

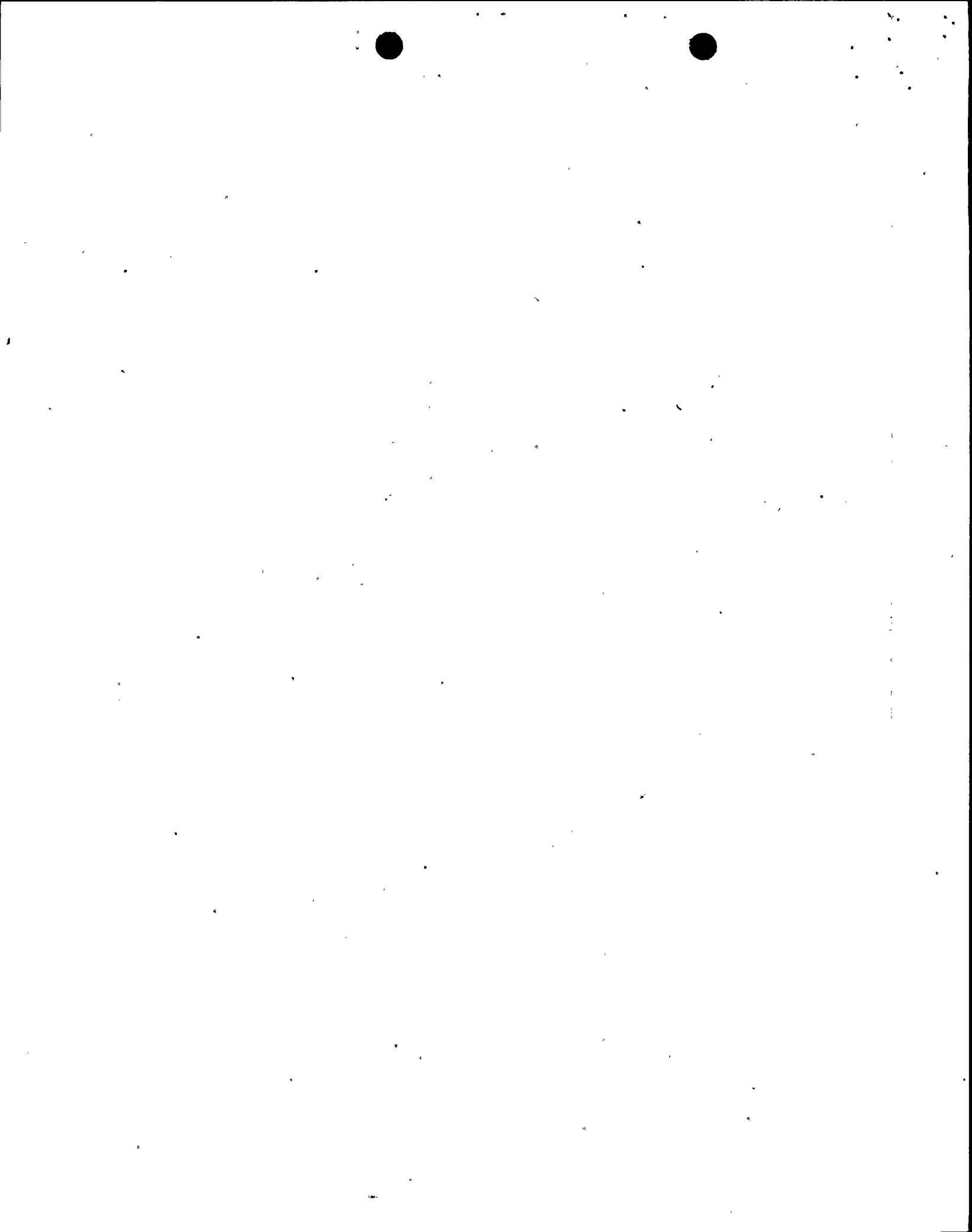
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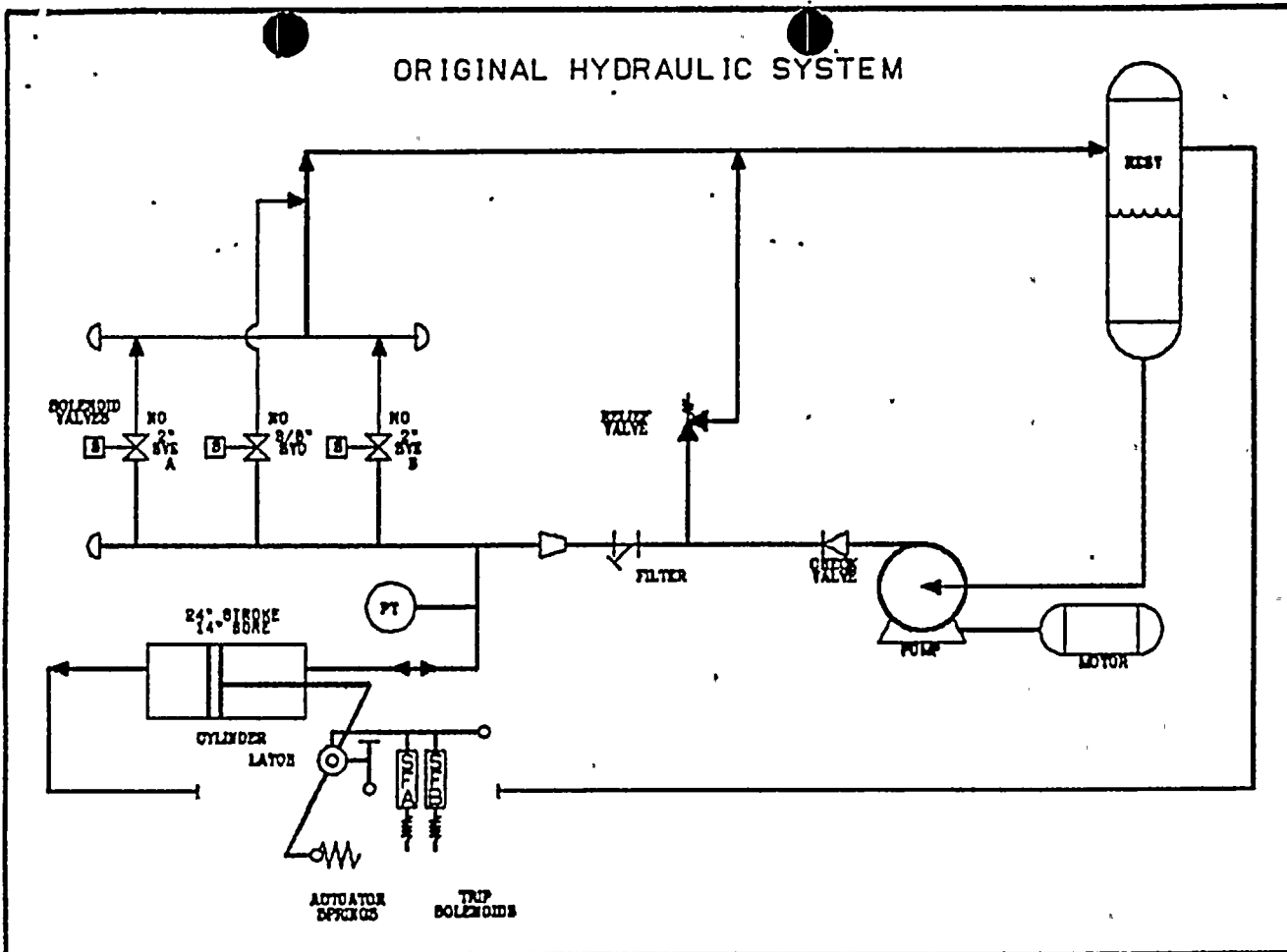
## MSIV ACTUATOR CONVERSION

- I DESIGN COMPARISON - ORIGINAL VS MODIFIED
- II SIGNIFICANT FUNCTIONAL DIFFERENCES
- III MODES OF OPERATION
  - NORMAL OPENING
  - NORMAL CLOSING
  - RPS TRIP TEST
  - EMERGENCY TRIP
- IV RPS/MSIV POWER SUPPLY
- V MSIV POWER SUPPLY
- VI HYDRAULIC SOLENOID POWER TRANSFER
- VII PLANT TRANSIENT EVALUATION
- VIII SUMMARY

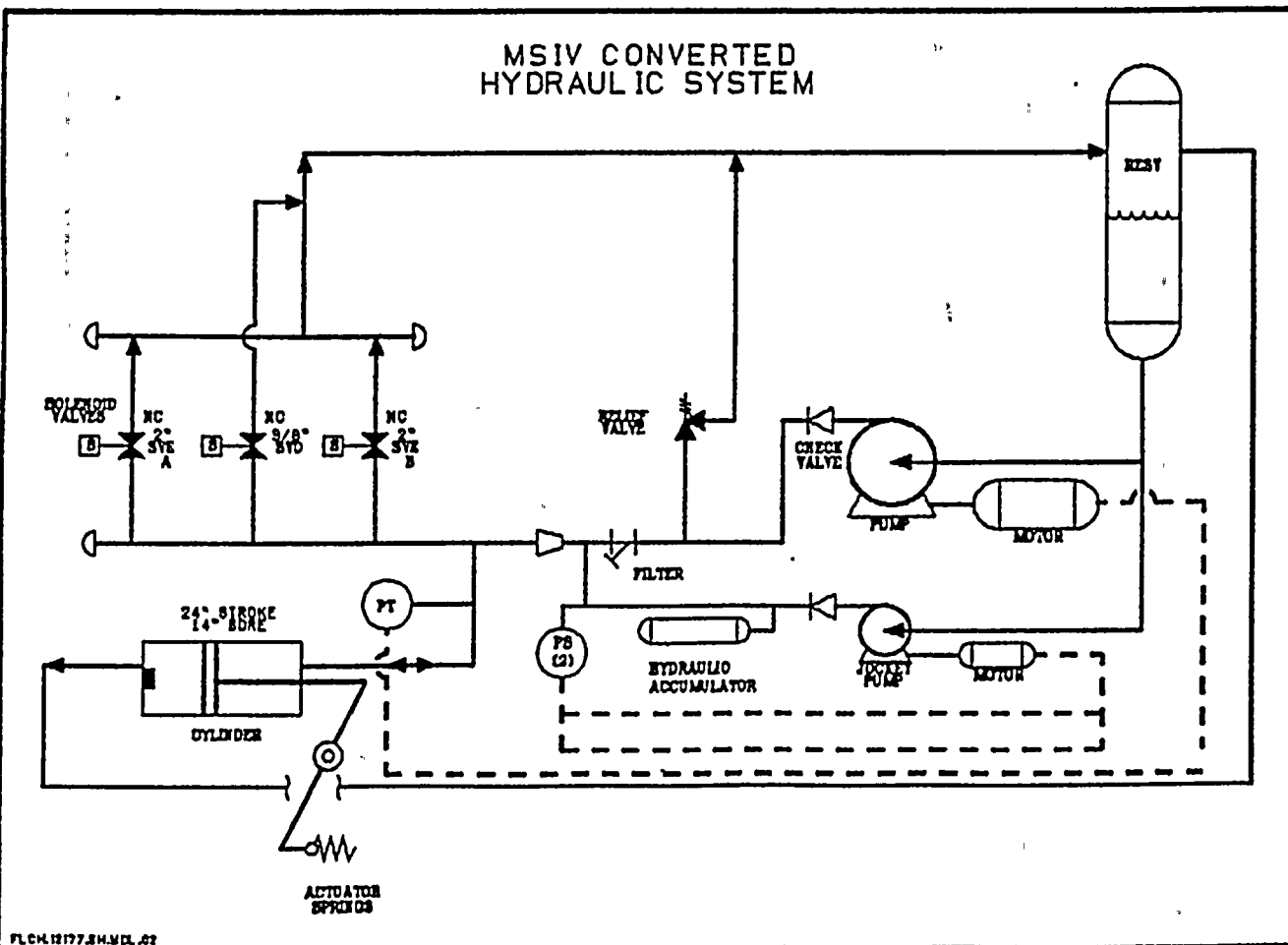


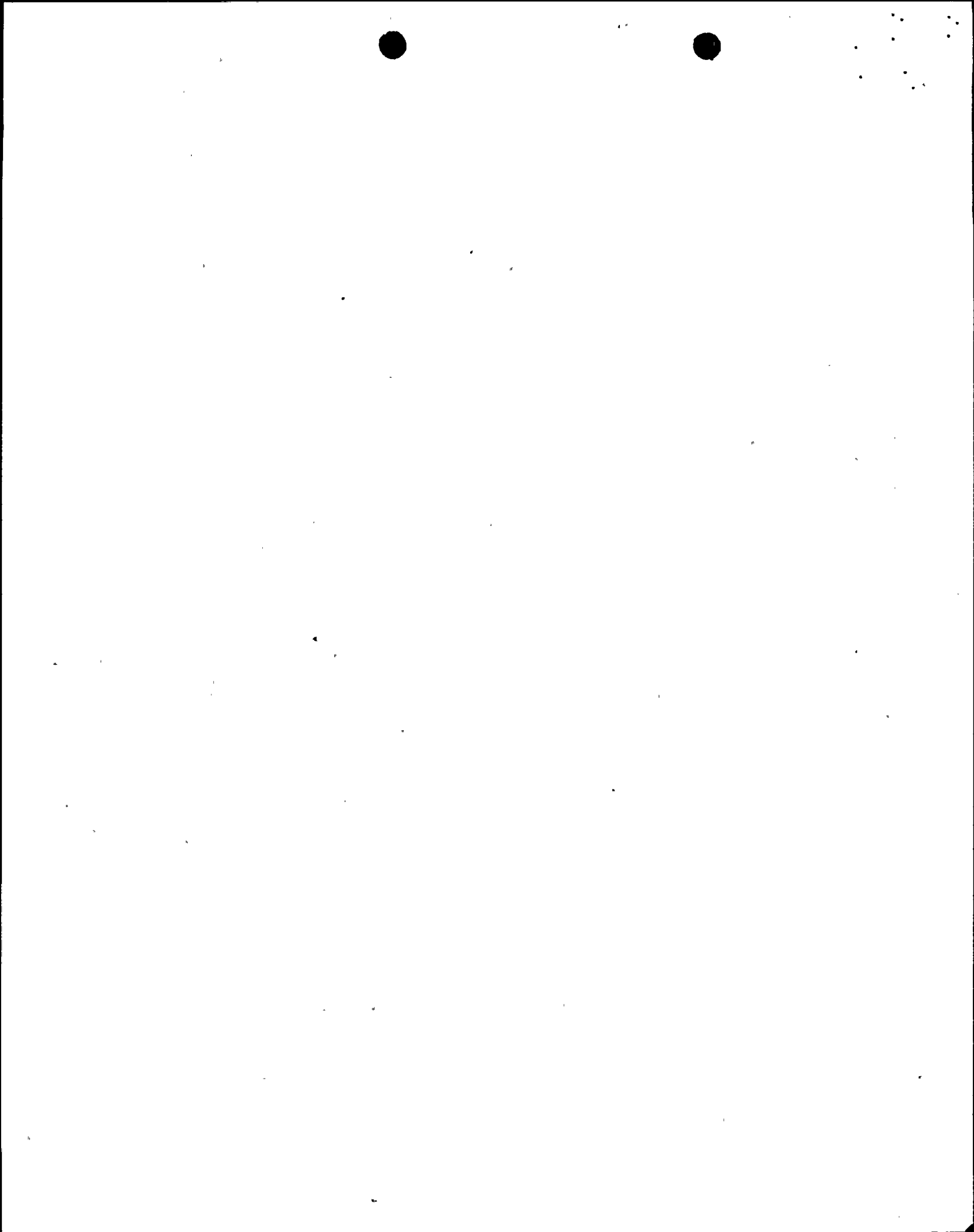


### ORIGINAL HYDRAULIC SYSTEM



### MSIV CONVERTED HYDRAULIC SYSTEM





## SIGNIFICANT FUNCTIONAL DIFFERENCES

- HYDRAULIC SOLENOID VALVES NORMALLY CLOSED
- ADDITION OF JOCKEY PUMP AND ACCUMULATOR
- RELIABILITY OBTAINED ELECTRICALLY VS MECHANICALLY
- BACK-UP PRESSURE CONTROL ON MAIN PUMP
- ALARMS FOR LOW HYDRAULIC PRESSURE / HIGH LEAKAGE
- ADDITION OF RPS TEST MONITORING / ABORT FEATURE
- ADDITION OF DUAL POWER SOURCES FOR HYDRAULIC SOLENOIDS
- ADDITION OF UPS POWER FOR TEST SOLENOID
- REVISION TO TEST RESET CIRCUITRY TO IMPROVE OPERATOR INTERACTION



# MSIV NORMAL OPENING

## PREREQUISITES

- CHANNEL 1 AND 2 CONTROL POWER AVAILABLE
- NO MANUAL OR AUTOMATIC EMERGENCY TRIPS

## ACTION

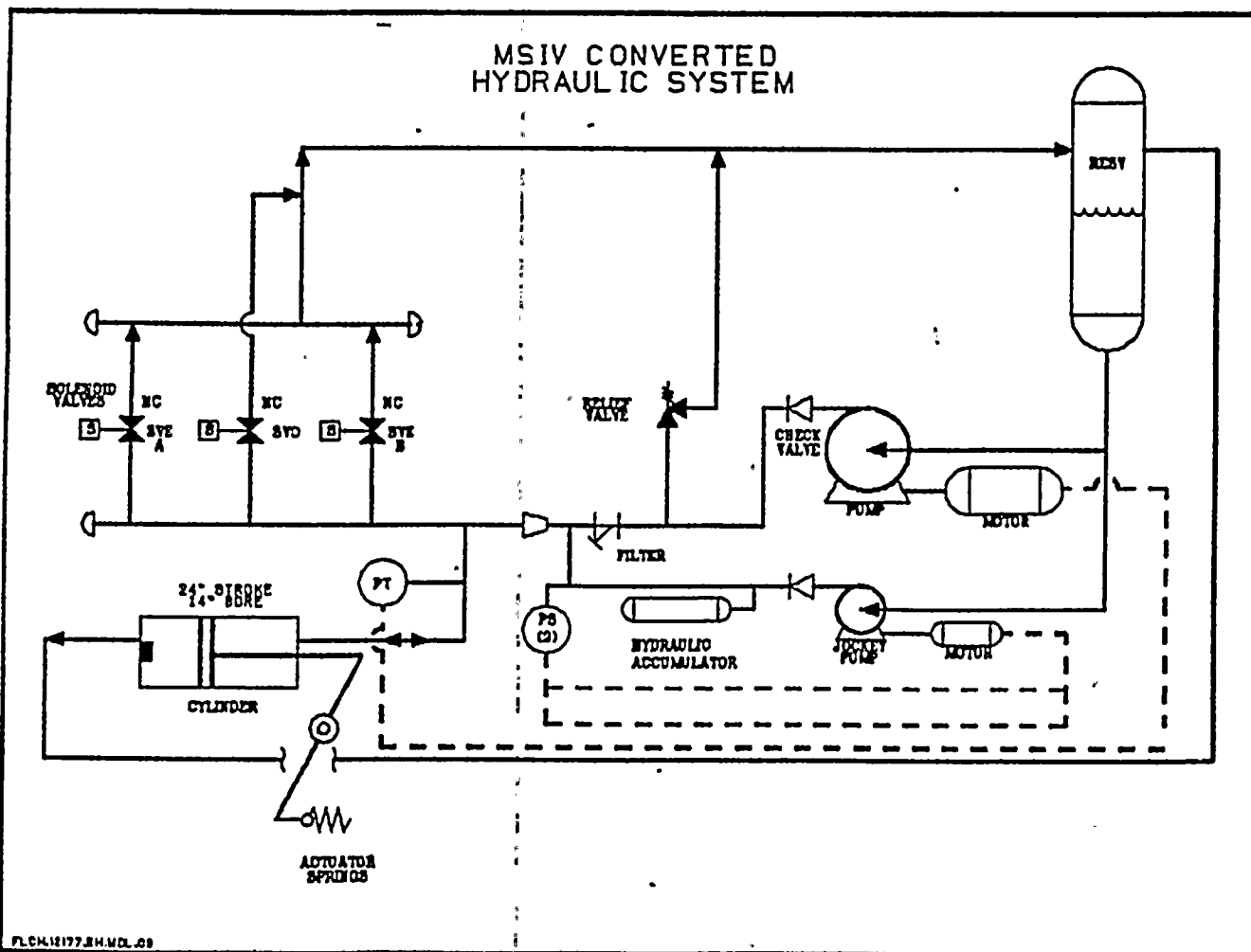
- TURN CONTROL SWITCH TO OPEN

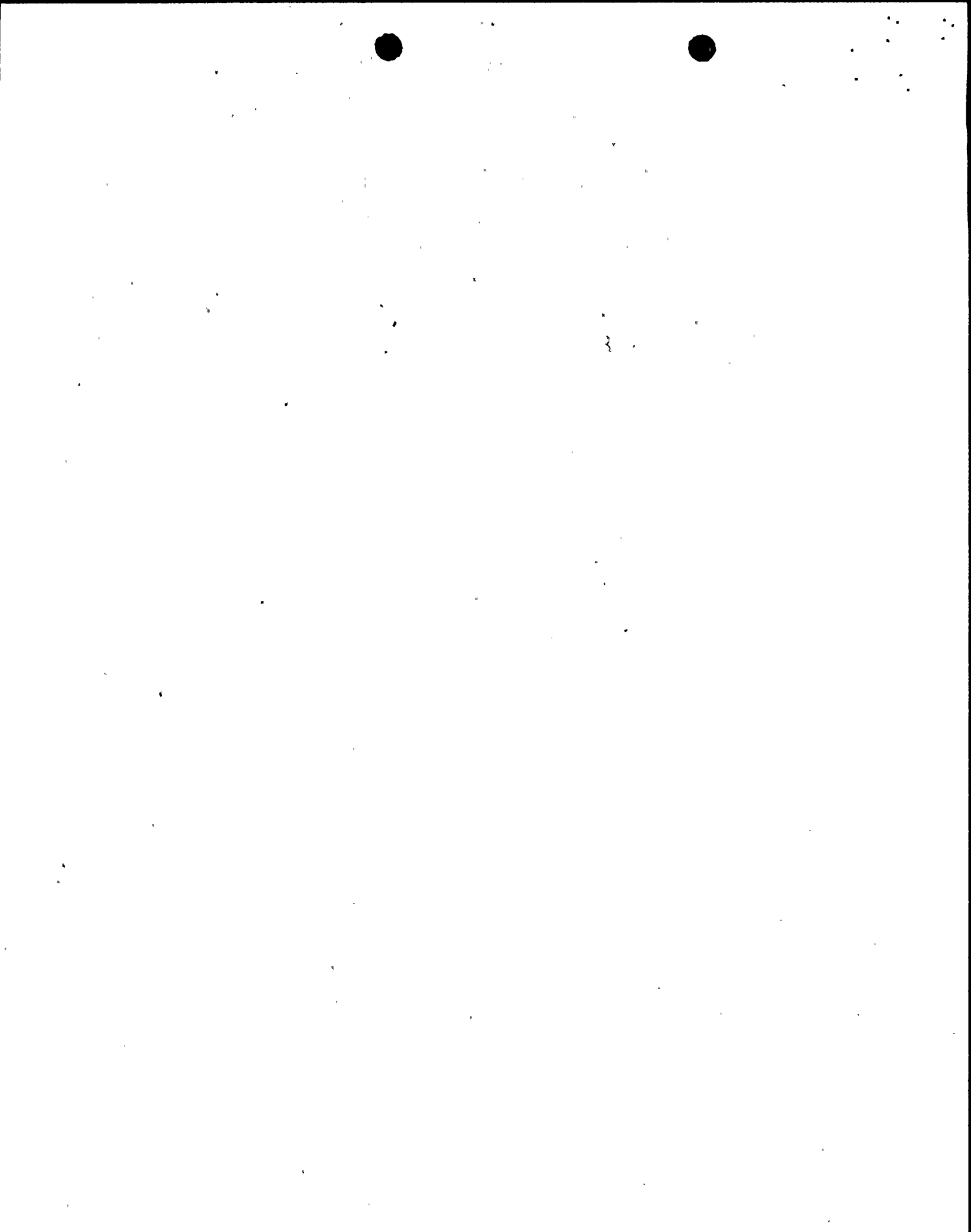
## RESULT

- ENERGIZE AND CLOSE SVE-A, SVE-B, SVC
- START MAIN PUMP
- START JOCKEY PUMP

## COMPLETION

- STOP PUMPS WHEN  $\geq 1300$  PSI





# MSIV NORMAL-CLOSING

## PREREQUISITES

- MSIV NOT OPENING

## ACTION

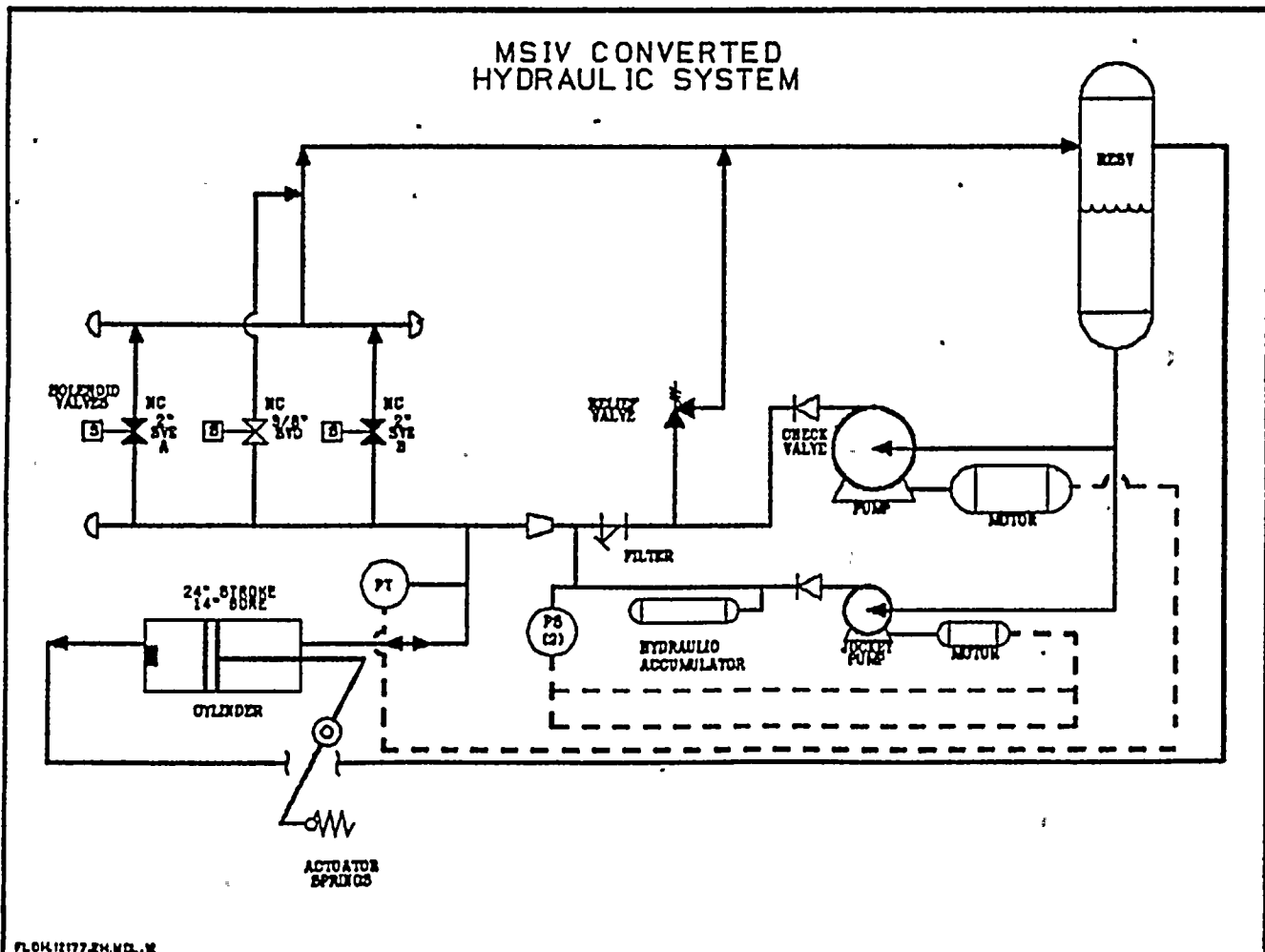
- TURN CONTROL SWITCH TO CLOSE

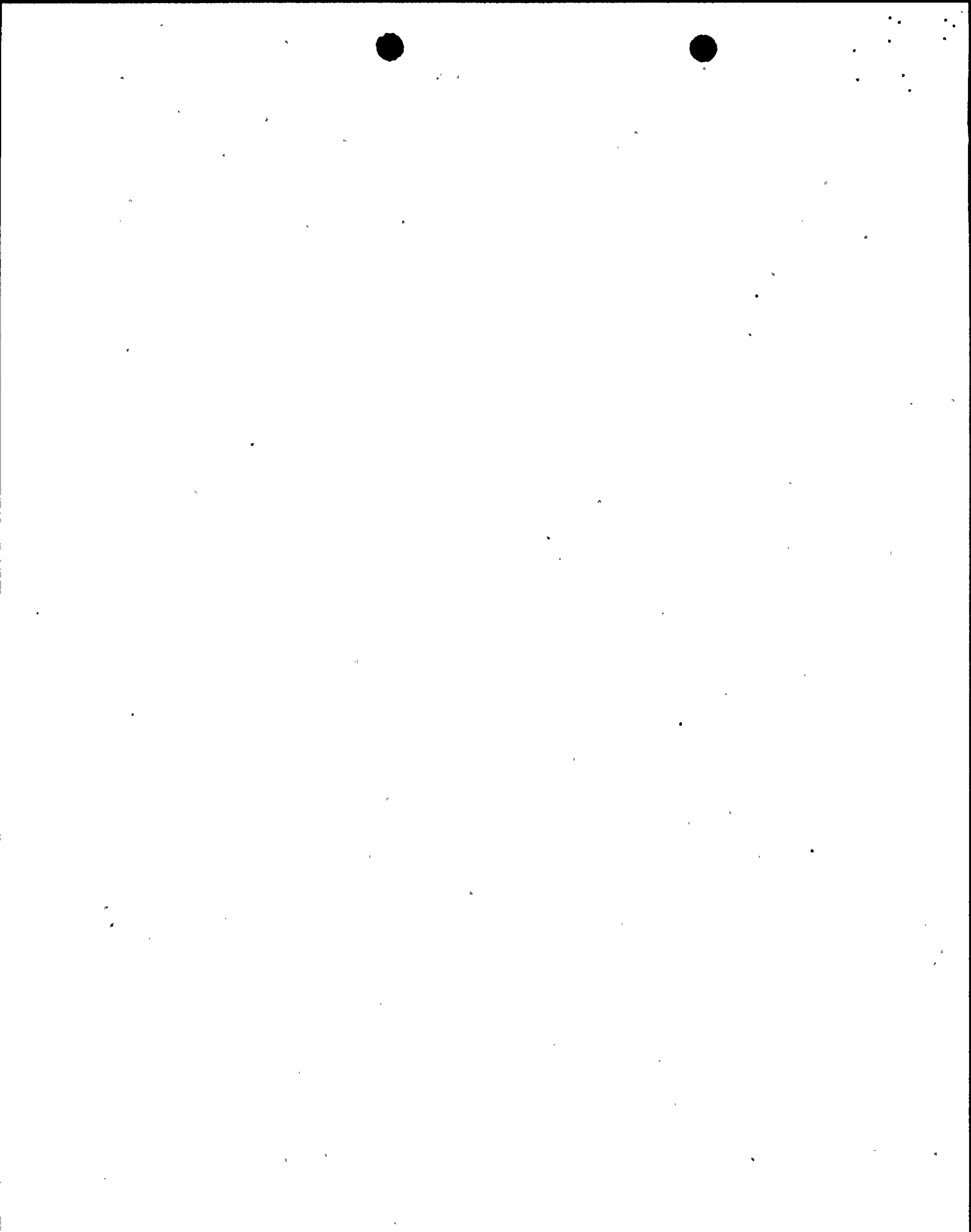
## RESULT

- DE-ENERGIZE AND OPEN SVC
- BLOCK START OF MAIN PUMP
- BLOCK START OF JOCKEY PUMP

## COMPLETION

- DE-ENERGIZE AND OPEN SVE-A, SVE-B, SVC
- DE-ENERGIZE MAIN PUMP
- DE-ENERGIZE JOCKEY PUMP







# RPS TRIP TEST

## PREREQUISITES

- MSIV IN FULLY OPEN POSITION
- CHANNEL 1 & 2 CONTROL POWER AVAILABLE
- NO MANUAL OR AUTOMATIC EMERGENCY TRIPS

## ACTION

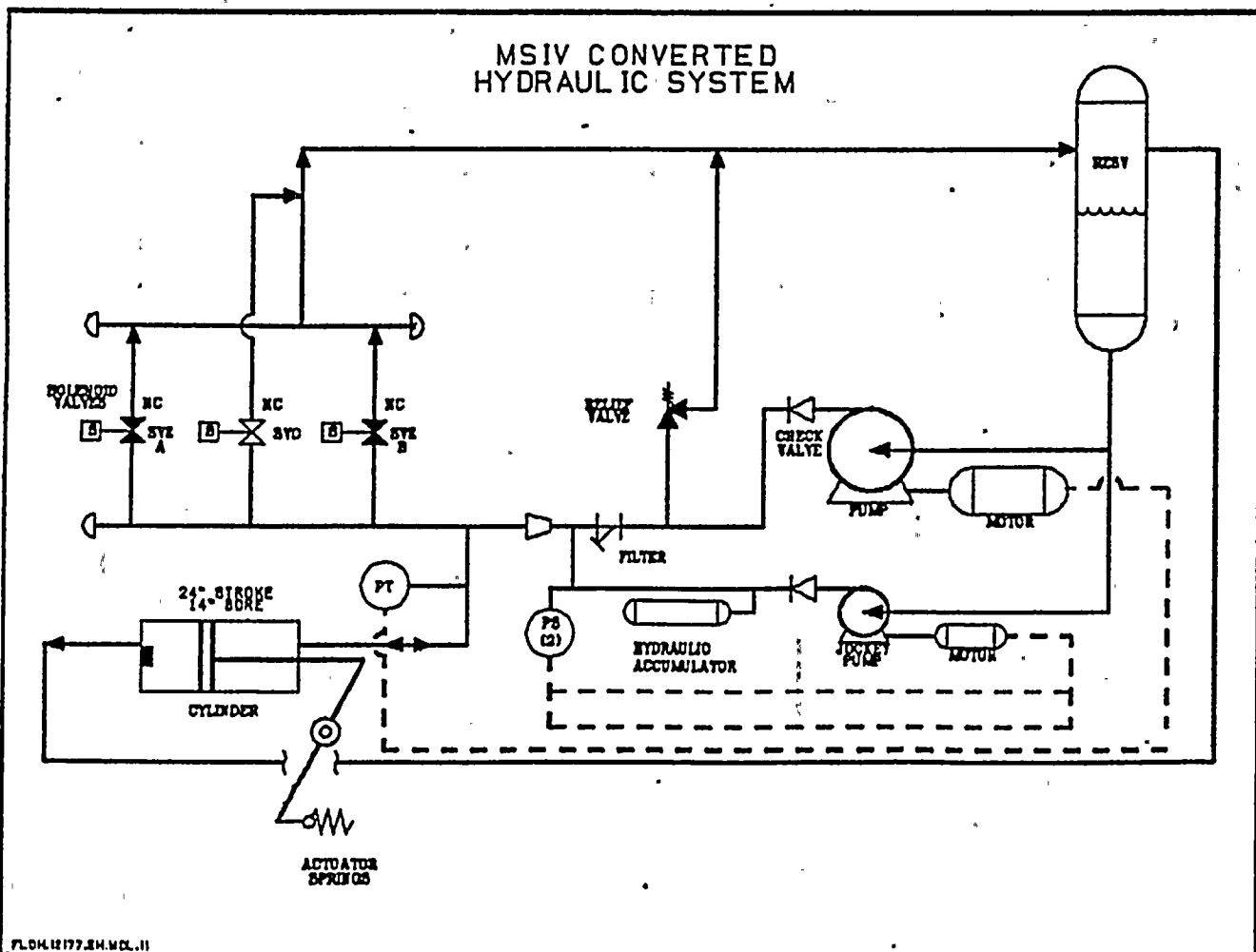
- PRESS RPS TRIP TEST PUSHBUTTON

## RESULT

- DE-ENERGIZE AND OPEN SOLENOID SVC
- BLOCK MAIN AND JOCKEY PUMP START
- MSIV COMMENCES SLOW CLOSURE UNTIL RPS TRIP POSITION IS REACHED OR UPON 25 SEC DURATION

## COMPLETION

- ENERGIZE & CLOSE SOLENOID SVC
- START MAIN PUMP
- START JOCKEY PUMP
- MSIV RETURNS TO FULL OPEN POSITION
- STOP PUMPS WHEN  $\geq 1300$ PSI





# EMERGENCY TRIP

## PREREQUISITES

- NONE

## ACTION

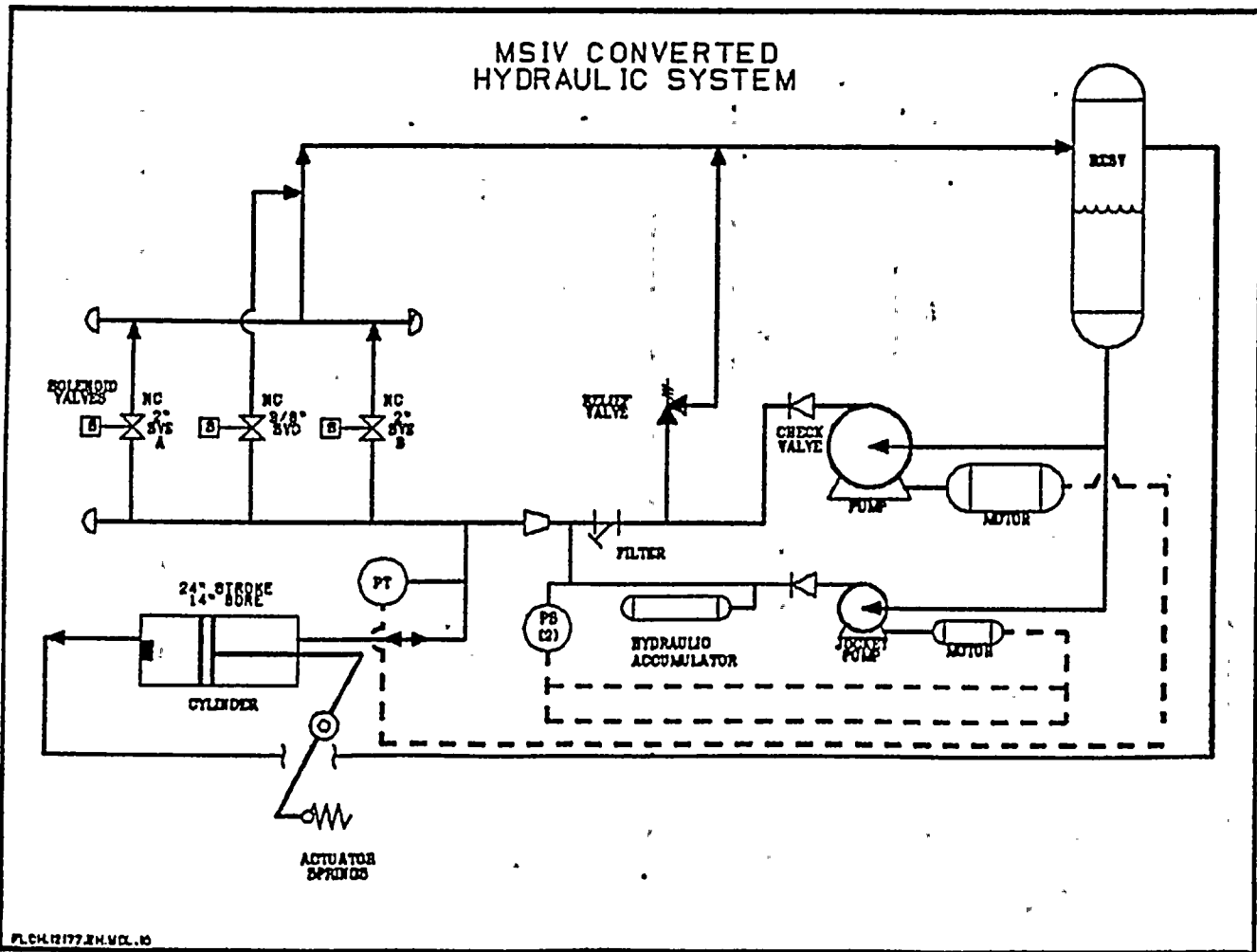
- PRESS CHANNEL 1 AND 2 EMERGENCY TRIP PUSHBUTTONS  
-OR-
- AUTOMATIC ISOLATION SIGNAL

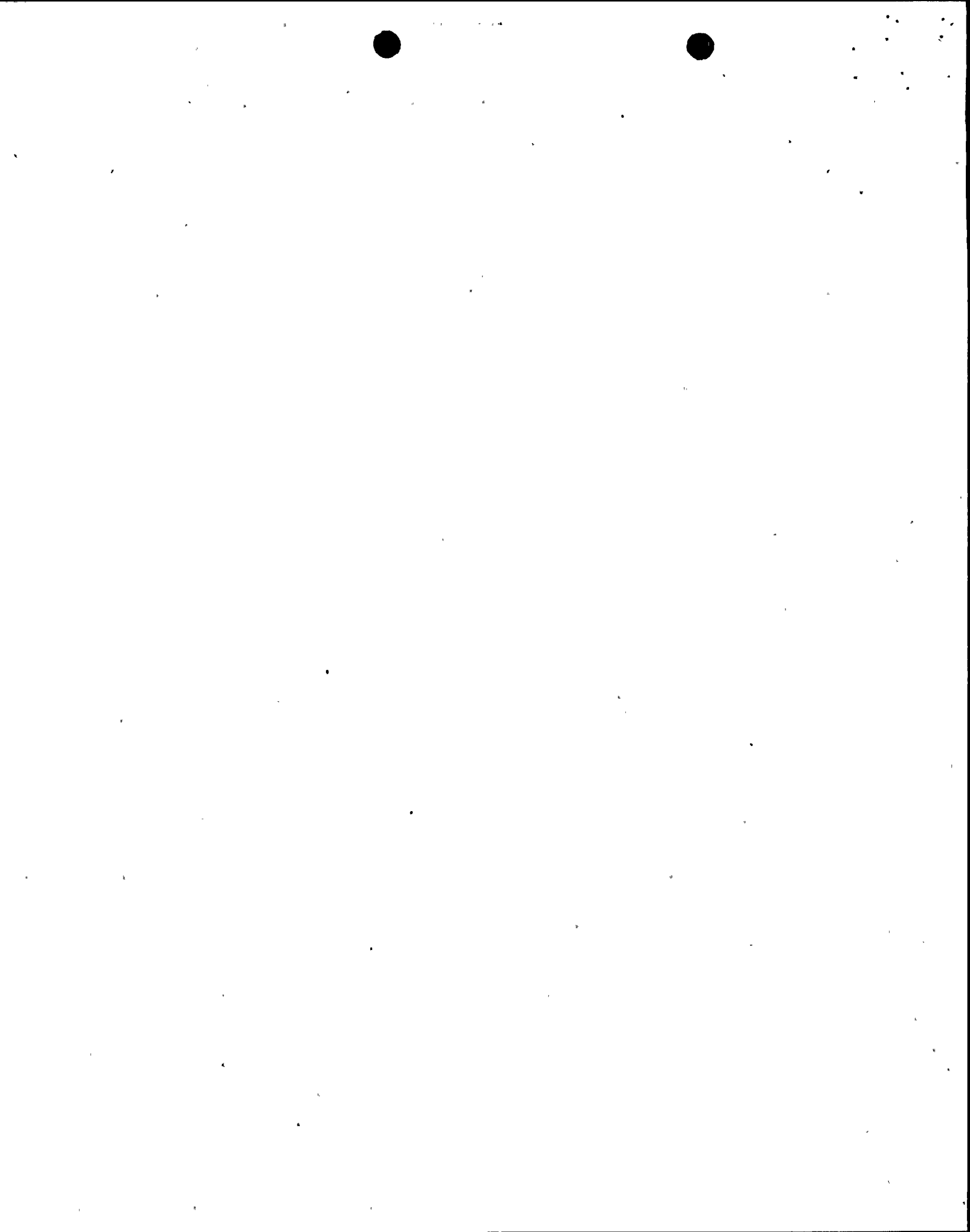
## RESULT.

- DE-ENERGIZE AND OPEN SVE-A, SVE-B, SVC
- TRIP AND LOCKOUT MAIN PUMP
- TRIP AND LOCKOUT JOCKEY PUMP

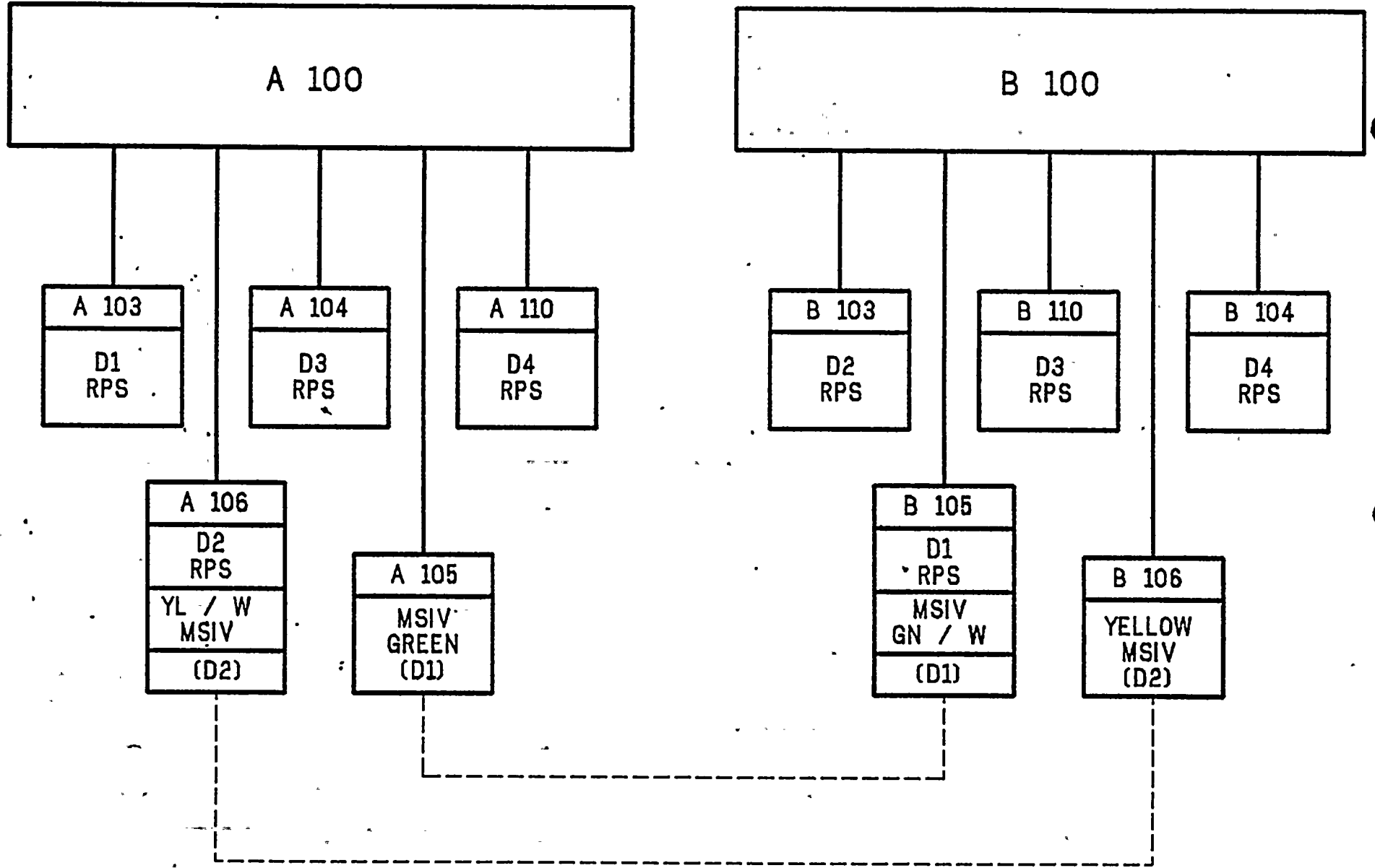
## COMPLETION

- DE-ENERGIZE AND OPEN SVE-A, SVE-B, SVC
- DE-ENERGIZE MAIN PUMP
- DE-ENERGIZE JOCKEY PUMP



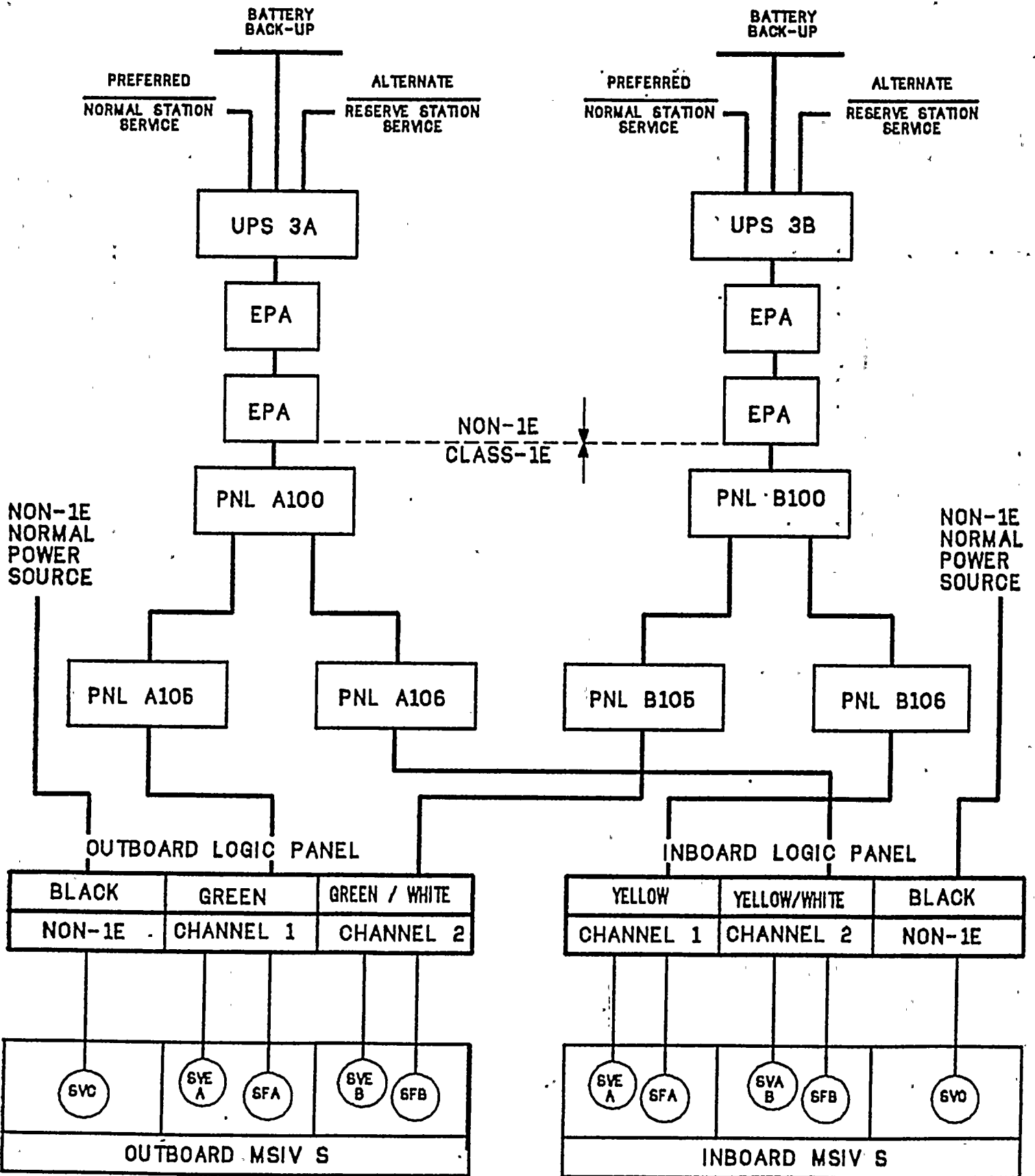


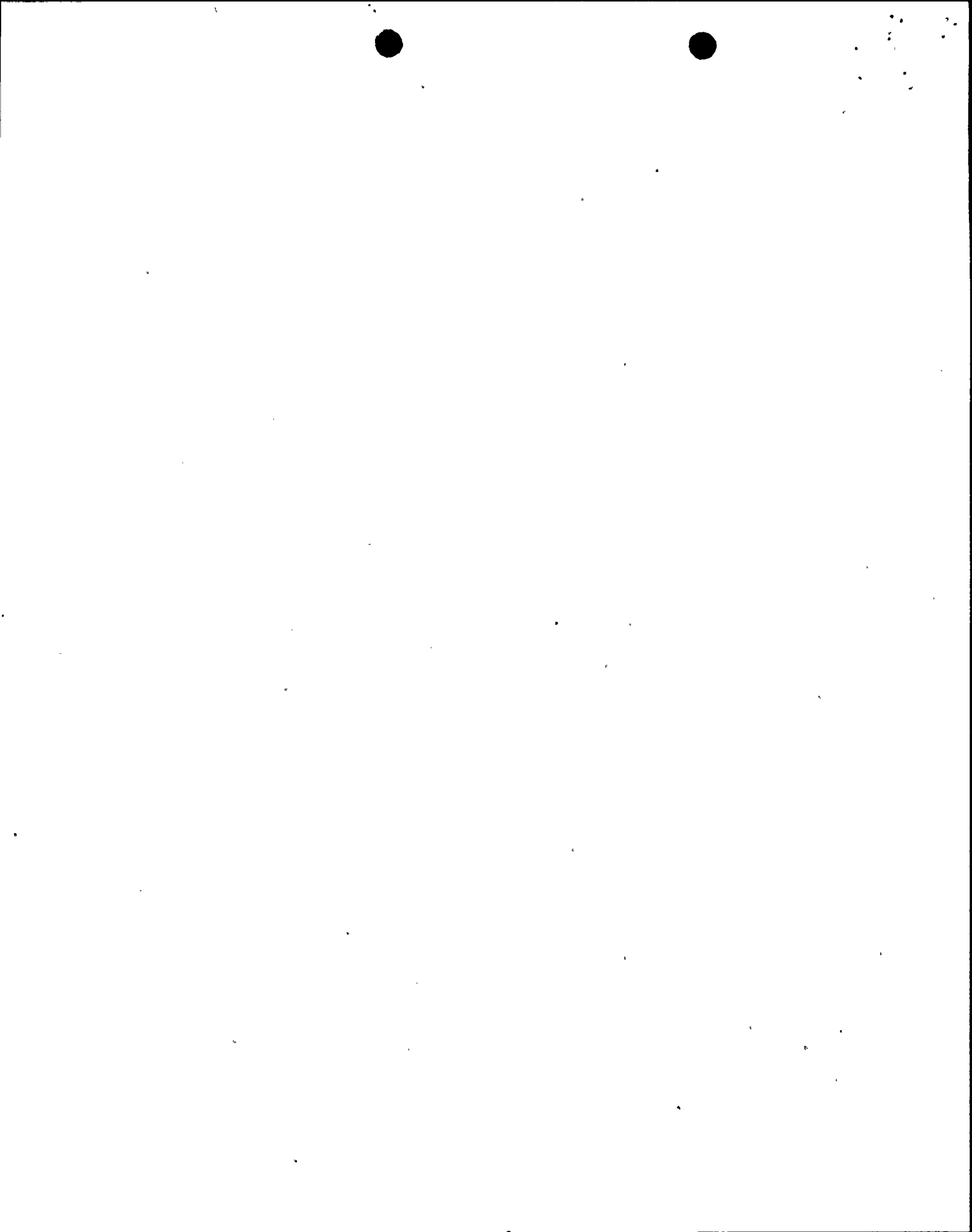
# RPS / MSIV POWER SUPPLY





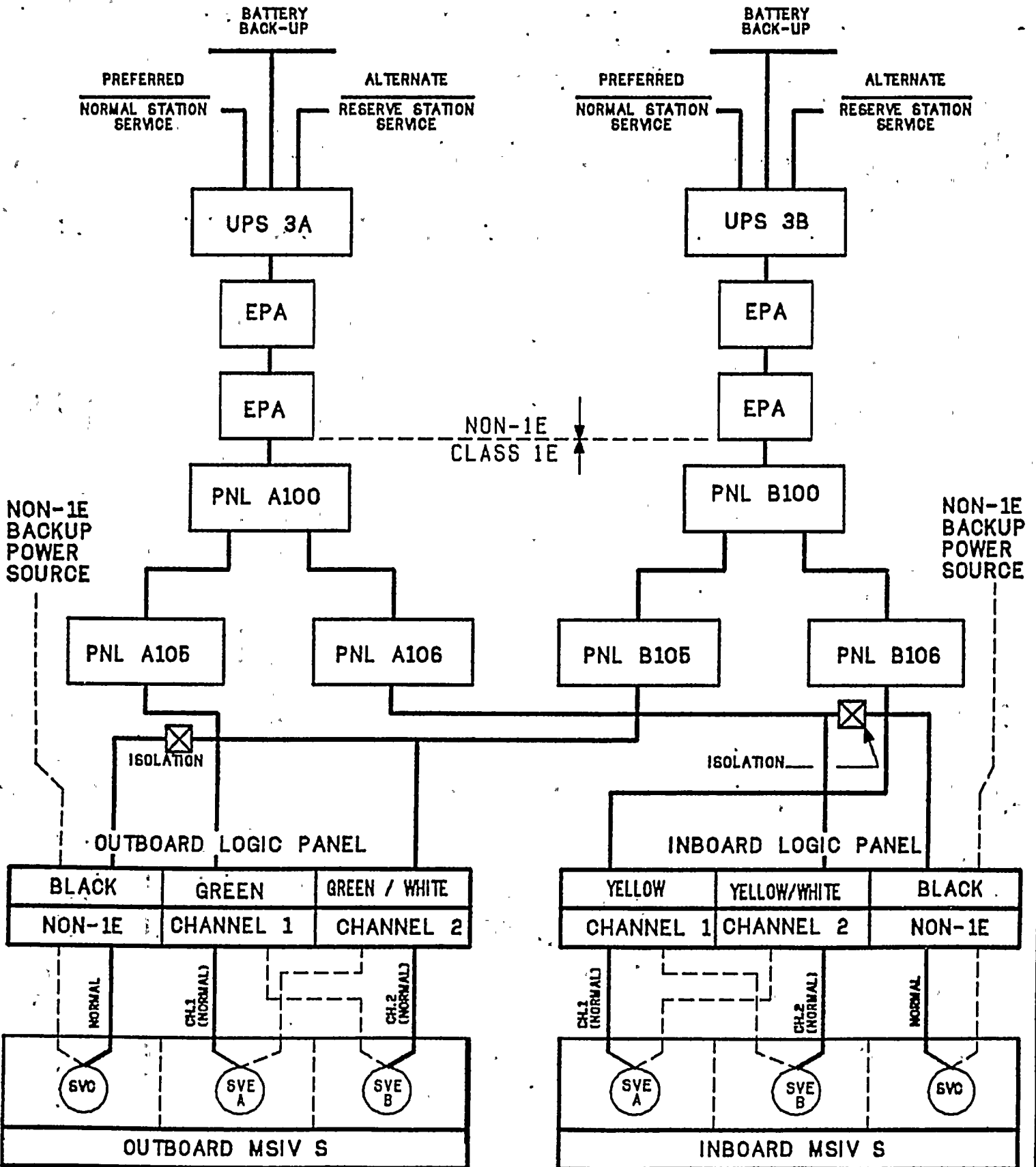
# MSIV ORIGINAL POWER SUPPLY

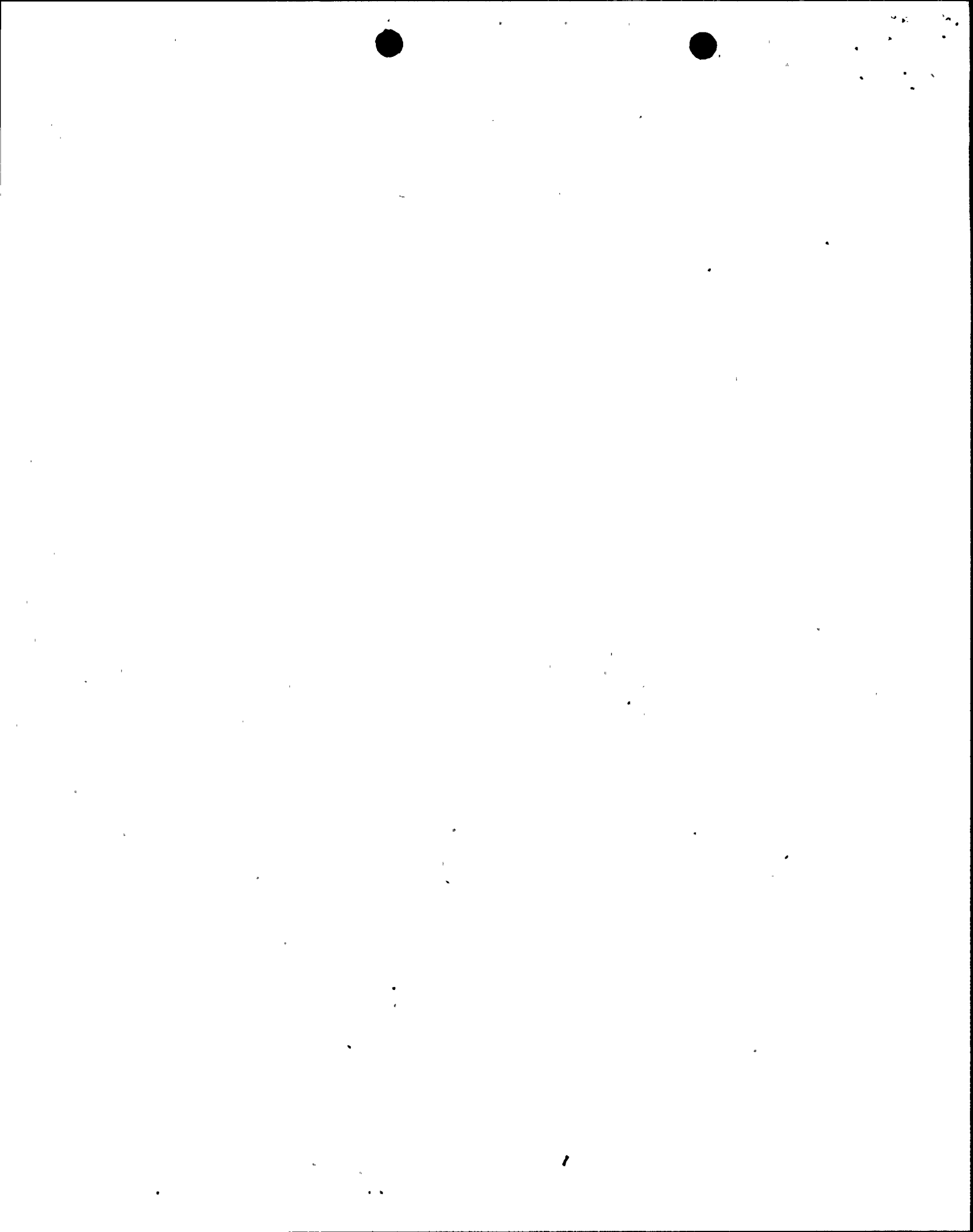






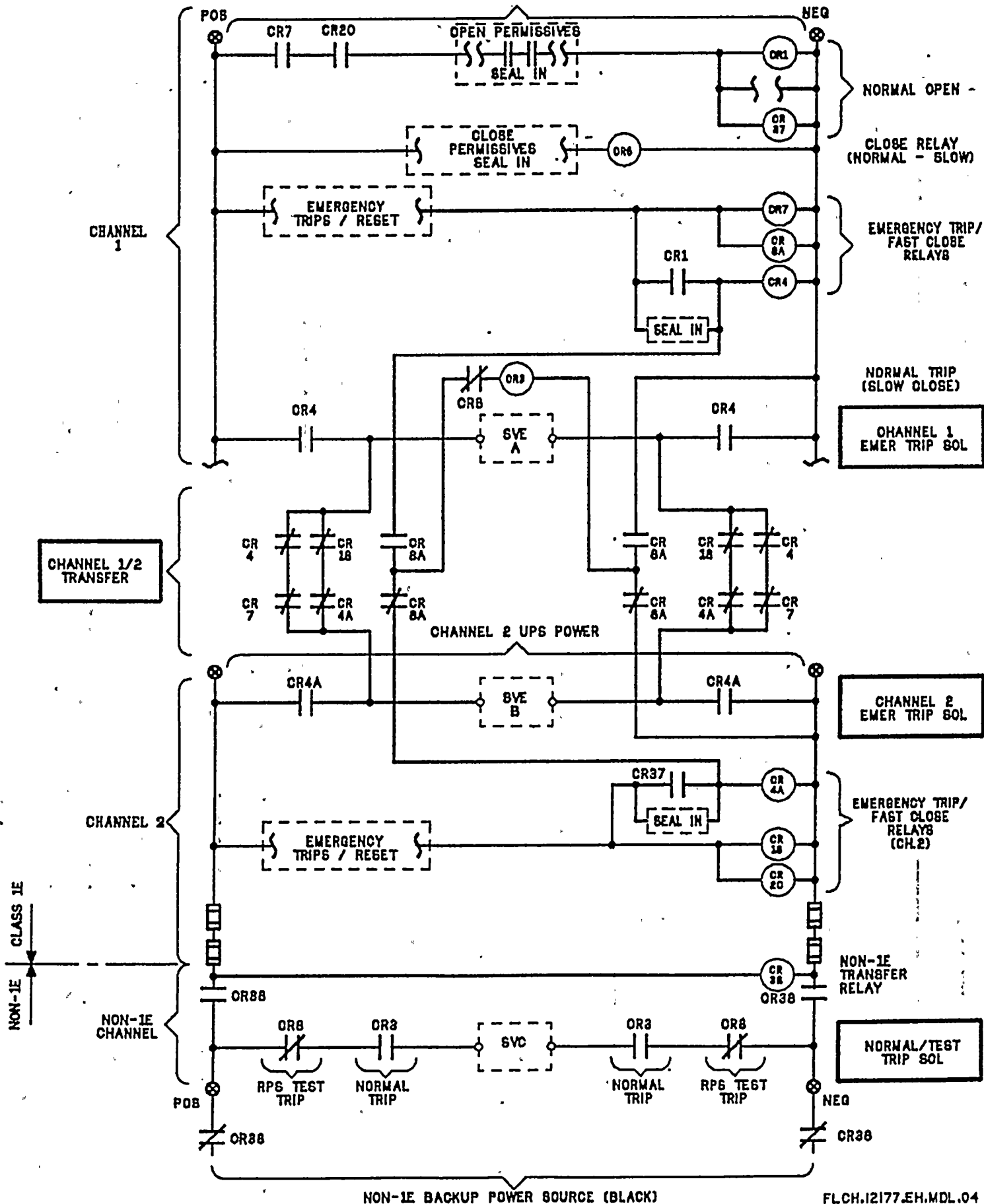
# MSIV MODIFIED POWER SUPPLY





# MSIV TRANSFER CIRCUITRY

CHANNEL 1 UPS POWER

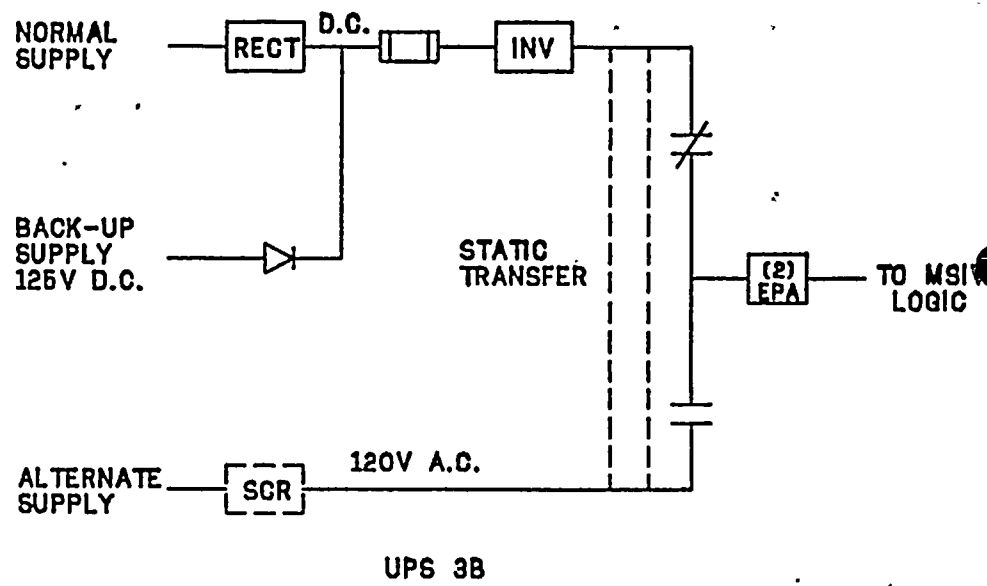
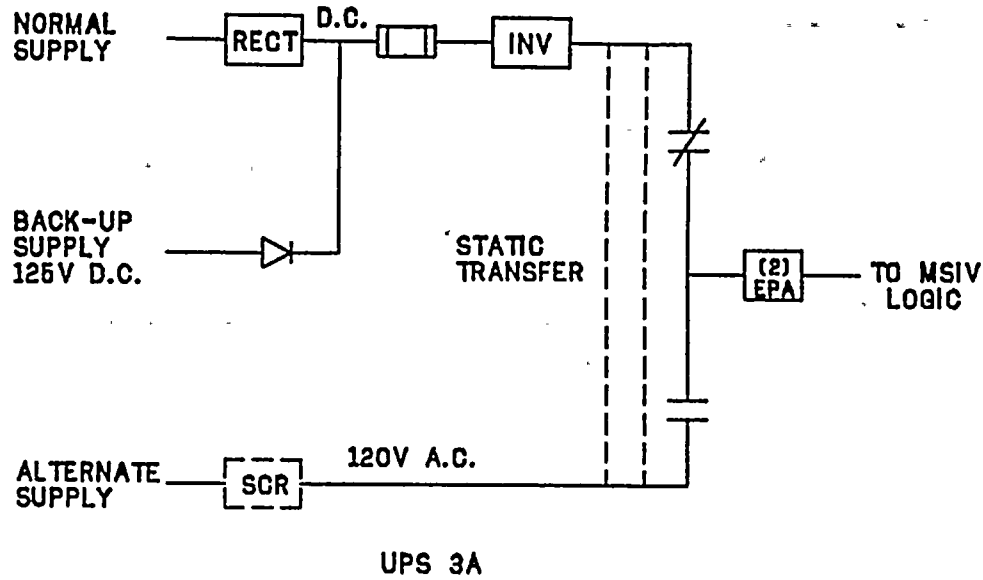


NON-1E BACKUP POWER SOURCE (BLACK)

FLCH.12177.EH.MDL.04



# UNINTERRUPTIBLE POWER SUPPLIES



## PLANT TRANSIENT

### UPS 3A

- T= 0-      132V++ ALTERNATE SUPPLY
- T= 0+      RELAY RACE, CROSS CONNECT UPS
- T= 0+      BLOWN FUSE, INPUT LEG STATIC SW.
- T= 0+      TRANSFER TO ALT. A.C.
- T= 3        EPA TRIP, OVERVOLTAGE

### UPS 3B

- LOSE ALT. A.C.
- INVERTER FUSE
- EPA TRIP, UNDER-VOLTAGE



## SUMMARY

- PRE-OP TESTING IN PROCESS CONFIRMING DESIGN
- MSIV RELIABILITY FEATURES HAVE BEEN MAINTAINED AND ENHANCED
- MSIV STROKE TIMING CONFIRMED
- MSIV MECHANICAL LATCH PROBLEMS OVERCOME
- MSIV ACTUATORS HAVE BEEN SUCCESSFULLY CONVERTED





12/18/86 MSIV LOGIC MEETING

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Jim Bunyon	NMPC Engineering
E. J. Hubner	Stone & Webster
C. E. Crocker	SWEC
J. J. Panchison	SWEC



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January 2, 1987

MEETING SUMMARY DISTRIBUTION

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