05-140-90

REACTOR COOLANT SYSTEM FILLING AND VENTING

1.0 PURPOSE

This procedure provides instructions for filling and venting the Reactor Coolant System (RCS). Procedure instructions are included in the following sections:

4.1 Reactor Coolant System Filling

4.2 Reactor Coolant System Venting

4.3 RCS Filling And Venting If Pressurizer Level Has Not Been Less Than 25% As Indicated On 1-LI-0462

2.0 PRECAUTIONS AND LIMITATIONS

2.1 PRECAUTIONS

2.1.1 The Residual Heat Removal (RHR) System inlet from the RCS shall not be isolated unless a steam bubble exists in the pressurizer to ensure overpressure protection for the RCS during solid plant conditions.

2.1.2 During RCS filling, the nuclear instrumentation shall be monitored for unplanned increases of neutron count rate.

2.1.2.1 If an unplanned increase in neutron count rate occurs, the RCS filling operation shall be immediately terminated and the cause investigated.

2.1.3 Letdown from RHR 1-HV-0128 should be fully open when the RCS is brought water solid. This enhances RCS pressure control using Letdown Pressure Controller 1-PIC-0131.

2.1.4 Anticipate RCS pressure fluctuations whenever a Reactor Coolant Pump (RCP) is started with the RCS water solid.

2.2 LIMITATIONS

2.2.1 During operation in Mode 5 with the Reactor Coolant Loops filled or not filled, the operational requirements of RHR shall be observed per Technical Specification 3.4.1.4.1 and 3.4.1.4.2.

2.2.2 The RCS pressure and temperature shall be maintained within the limits of Technical Specification 3.4.9.1.

2.2.3 The water used for filling the RCS shall have a boron concentration greater than or equal to the boron concentration of the RCS.

2.2.4 With RCS pressure less than 100 psig, the No. 1 Seal Leakoff Isolation Valves shall be closed.

2.2.5 If using hose connected to the Pressurizer Steam Space Sample Line Vent, limit the RCS temperature to 200°F and pressure to 100 psig.

2.2.6 If using one of the Pressurizer Pressure Operated Relief Valves (PORV), RCS pressure should be maintained at 200 psig to enable valve operation.

3.0 PREREQUISITES AND INITIAL CONDITIONS

3.1 The 480V AC MCC 1ABE and 1BBE are energized and available to supply power to the PORV Block Valves.

3.2 Electrical power from 480V AC distribution is available to the Pressurizer Heaters.

3.3 The 125V DC MCC 1AD1M and 1BD1M are energized and power is available to the PORV's.

3.4 The RHR System is available to maintain the desired RCS temperature.

3.5 A Charging Pump is available for use in filling the RCS.

3.6 Reactor Makeup water at the necessary boron concentration is available for filling the RCS.

3.7 The Containment Pre-access Purge System is in service.

3.8 The Reactor Vessel Head is in place with the head bolts at least partially tensioned.

4.0 INSTRUCTIONS

4.1 REACTOR COOLANT SYSTEM FILLING

4.1.1 If required, ALIGN the RCS for filling per 11001-1, "Reactor Coolant System Alignment".

NOTE

The hoses used for venting should be routed to the Purge Ventilation System exhaust or to Portable Carbon Filter units.

4.1.2 VERIFY that the Blind Flange and suitable venting equipment has been installed at the following locations:

a. CVCS TO PRT FG-8099 ROOT 1-1208-U4-488,

b. PRZR SPRAY LINE VENT VALVE 1-1201-X4-084.

4.1.3 ENSURE the Tygon hose used for water level indication is in service and indicating RCS water level per 13005-1, "Reactor Coolant System Draining".

4.1.4 ESTABLISH continuous Tygon hose monitoring and communications with the Control Room.

4.1.5 PERFORM the following valve alignment:

a.	CVCS TO PRT FG-0899 ROOT	1-1208-U4-488	OPEN
b.	PRZR SPRAY LINE VENT VALVE	1-1201-X4-072	OPEN
c.	PRZR SPRAY LINE VENT VALVE	1-1201-X4-084	OPEN
d.	LETDOWN TO PRZR RELIEF TANK	1-HV-0442A	CLOSED
e.	LETDOWN TO PRZR RELIEF TANK	1-HV-0442B	CLOSED
f.	RX HEAD VENT TO LETDOWN ISOLATION VLV	1-HV-8095A	OPEN
g.	RX HEAD VENT TO LETDOWN ISOLATION VLV	1-HV-8096A	OPEN

h.	RX HEAD VENT TO LETDOWN ISOLATION VLV	1-HV-8095B	OPEN
i.	RX HEAD VENT TO LETDOWN ISOLATION VLV	1-HV-8096B	OPEN
j.	RX HEAD VENT TO EXCESS LETDOWN ISOLATION	1-HV-8098	CLOSED
k.	PRZR PORV 455A	1-PV-0455A	CLOSED
l.	PRZR PORV 456	1-PV-0456A	CLOSED
m.	PRZR SPRAY VALVE	1-PV-0455B	OPEN
n.	PRZR SPRAY VALVE	1-PV-0455C	OPEN
o.	RCP-1 #1 Seal Leakoff Isolation	1-HV-8141A	CLOSED
p.	RCP-2 #1 Seal Leakoff Isolation	1-HV-8141B	CLOSED
q.	RCP 3 #1 Seal Leakoff Isolation	1-HV-8141C	CLOSED
r.	RCP 4 #1 Seal Leakoff Isolation	1-HV-8141D	CLOSED

4.1.6 NOTIFY Maintenance to remove the spool piece in the common RCS DRAIN HEADER TO RCDT PMP SUCT 1-1901-U6-242.

4.1.7 ENSURE RHR letdown is in service per 13011-1, "Residual Heat Removal System".

4.1.8 ENSURE Charging and Seal Injection are established per 13006-1, "Chemical And Volume Control System Startup And Normal Operation".

4.1.9 INITIATE the RCS fill by placing the LOW PRESS LETDOWN CONTROLLER 1-PIC-0131 in AUTO at a set point of 350 psig.

4.1.9.1 ENSURE LOW PRESS LETDOWN CONTROLLER 1-PIC-0131 automatically closes.

4.1.9.2 If makeup is not available from the Reactor Makeup Control System, PERFORM the following:

a. OPEN RWST TO CCP A & B SUCTIONS 1-LV-0112D and 1-LV-0112E,

b. CLOSE VCT OUTLET ISOLATIONS 1-LV-0112B and 1-LV-0112C.

CAUTION

During RCS filling, the Nuclear Instrumentation shall be monitored. If an unexplained increase in neutron count rate occurs, the filling operation shall be immediately terminated and the cause investigated.

4.1.9.3 At the discretion of the Unit Shift Supervisor (USS), FILL from the RWST using the standby RHR train as follows:

a. ENSURE the standby RHR Heat Exchanger Train A(B) Bypass 1-FV-0618 (0619) is in MAN and CLOSED,

b. CLOSE the standby RHR Heat Exchanger Train A(B) Outlet 1-HV-0606 (0607),

c. ENSURE the standby RHR PMP A (B) DOWNSTREAM/UPSTREAM SUCTION FROM HOT LEG 1 (4) INLET ISOLATIONS 1-HV-8701A (8702A) and 1-HV-8701B (8702B) are CLOSED,

d. ENSURE the standby RWST TO RHR PUMP A (B) SUCTION 1-HV-8812A (8812B) is OPEN,

e. ENSURE OPEN RHR PUMP A(B) TO COLD LEG 1 & 2 (3 & 4) ISO VLV 1-HV-8809A (8809B),

f. VERIFY OPEN RHR Pump A (B) Minimum Flow Valve 1-FV-0610 (0611),

g. START the standby RHR Pump A (B),

CAUTION

Slowly increase flow as venting capability permits.

h. THROTTLE OPEN the standby RHR Heat Exchanger Train A (B) Bypass 1-FV-0618 (0619) to obtain the desired discharge flow rate.

4.1.10 VERIFY rising water level by observing the Tygon Hose Level Indicator or Pressurizer Level Indicator 1-LI-0462.

4.1.10.1 When a solid stream of water flows from the Reactor Vessel Head Vent Flow Gauge FG-8099, CLOSE 1-1208-U4-488.

4.1.10.2 CLOSE all Reactor Head Vent Letdown Isolations:

a. 1-HV-8095A,

b. 1-HV-8096A,

c. 1-HV-8095B,

d. 1-HV-8096B.

4.1.10.3 At 50% on 1-LI-0462, PERFORM the following:

a. ESTABLISH normal letdown flowpath as follows:

(1) OPEN the CVCS LETDOWN PIPE BREAK PROT ISOLATION 1-HV-15214 by holding the handswitch in OPEN until the valve indicates fully open; independent verification required,

(2) OPEN the RCS LETDOWN LINE ISO VLV IRC 1-HV-8160 by holding the handswitch in OPEN until the valve indicates fully open; independent verification required,

(3) OPEN the RCS LETDOWN LINE ISO VLV ORC 1-HV-8152 by holding the handswitch in OPEN until the valve indicates fully open; independent verification required,

(4) OPEN the Letdown Isolations 1-LV-0459 and 1-LV-0460 by placing their handswitches in OPEN until the valves indicate fully open; independent verification required,

(5) OPEN the Letdown Orifice Isolations 1-HV-8149A, 1-HV-8149B and 1-HV-8149C by holding their handswitches in OPEN until the valves indicate fully open; independent verification required.

b. CLOSE the RCS INTMD LEG #1 TYGON HOSE CONNECTION ISO 1-1201-U4-003,

c. CLOSE the RCS LOOP 1 DRAIN ISO 1-1201-U4-001,

d. CLOSE PRZR STEAM SPACE SAMPLE LINE VENT 1-1201-U4-100,

e. NOTIFY Maintenance to remove the temporary RCS level indication per:

(1) 54840-1, "Installation And Removal Instructions For RCS Temporary Tygon Tube", and

(2) 23985-1, "RCS Temporary Water Level System".

f. INITIATE removal of the tags placed on the Reactor Coolant Pump Breakers by 13005-1, "Reactor Coolant System Draining" and racking in of the breakers:

(1) RCP #1, 1AAA,

(2) RCP #2, 1BAB,

(3) RCP #3, 1CAC,

(4) RCP #4. 1DAD.

4.1.10.4 When a solid stream of water issues from the Pressurizer Spray Line Vent, CLOSE 1-1201-X4-084 and 1-1201-X4-072.

4.1.11 MONITOR RCS Pressure 1-PI-0408, 1-PI-0418, 1-PI-0428, and 1-PI-0438 and PERFORM the following:

NOTE

As the RCS fills solid, the pressure will start increasing.

4.1.11.1 ENSURE the LOW PRESS LETDOWN CONTROLLER 1-PIC-0131 automatically opens to maintain pressure at 350 psig ±25 psig.

4.1.11.2 ADJUST the LOW PRESS LETDOWN CONTROLLER 1-PIC-0131 and/or charging and seal injection as required to maintain Narrow Range RCS pressure at 350 psig ±25 psig.

4.1.11.3 OPEN the RCP #1 Seal Leakoff Isolation 1-HV-8141A, 8141B, 8141C, 8141D.

4.1.11.4 ENSURE Charging Pump suction is aligned to the Volume Control Tank:

a. ENSURE OPEN VCT Outlet Isolation 1-LV-0112B and 1-LV-0112C; independent verification required,

b. ENSURE CLOSED RWST to CCP A & B SUCTIONS 1-LV-0112D and 1-LV-0112E; independent verification required.

4.1.11.5 If the standby RHR train was used for RCS fill, RESTORE it to standby status per 13011-1, "Residual Heat Removal System".

4.2 REACTOR COOLANT SYSTEM VENTING

4.2.1 ENSURE that the Steam Generator secondary water temperature is less than 50°F above the T_c for each Reactor Coolant Loop as follows (desired maximum is less than 10°F to minimize potential for pressure fluctuations):

NOTE

Steam Generator Blowdown is placed in service to provide Steam Generator temperature indication.

a. INITIATE blowdown flow from all four Steam Generators per 13605-1, "Steam Generator Blowdown Processing System",

b. VERIFY that the Steam Generator secondary water temperature is less than 50°F above the T_c for each Reactor Coolant Loop by observing the following:

	SG	T_c
(1)	SG 1 Blowdown Temp 1-TI-1175 (ERF T-9883)	Loop 1 1-TI-0413B
(2)	SG 2 Blowdown Temp 1-TI-1176 (ERF T-9884)	Loop 2 1-TI-0423B
(3)	SG 3 Blowdown Temp 1-TI-1177 (ERF T-9885)	Loop 3 1-TI-0433B
(4)	SG 4 Blowdown Temp 1-TI-1178 (ERF T-9886)	Loop 4 1-TI-0443B

If any blowdown or TI not available, MEASURE the Steam Generator metal surface temperature with a concact pyrometer and RECORD pyrometer ID number in the Unit Control Log.

NOTES

a. If the hoses used for venting were routed to the ventilation system, they should be routed to the sump at this time to accommodate the volume of liquid effluent produced by the RCP Air Swecps.

b. If RCS level has not been less than the top of the lcops, the USS may reduce the number of RCP Air Sweeps required based on RCS pressure response.

c. Removal of the dilution flowpath tags initiated in Sub-subsection 4.2.5 may be initiated after the 30-second RCP air sweeps.

4.2.2 PERFORM the 30-second RCP Air Sweeps and RCS Vents per Checklist 1.

4.2.3 PERFORM the 1-minute RCP Air Sweeps and RCS Vents per Checklist 2.

4.2.4 PERFORM the 5-minute RCP Air Sweep and RCS Vent per Checklis' 3.

4.2.5 INITIATE removal of the dilution flowpath tags placed by 12006-C, "Unit Cooldown To Cold Shutdown" and restoration of the valves to the listed position where applicable:

a. CVCS BLENDER SUPPLY FROM RMWST ISO 1-1208-U4-175; OPEN,

b. CVCS RMWST SUPPLY HDR TO BLENDER AND CHG ISO 1-1208-U4-177; OPEN,

c. CVCS CHG CHEM MIXING TANK OUTLET 1-1208-U4-181; CLOSED,

d. CVCS RX M/U WTR TO CHEM MIX TANK ISO 1-1208-U4-176; CLOSED,

e. CVCS CHG RMWST SPLY TO CCP A ISO 1-1208-U4-183; CLOSED,

f. CVCS RX M/U WTR TO LTDN REHT HX LINE ISO 1-1208-U6-226; CLOSED.

4.2.6 NOTIFY I&C to align the RCS instrumentation per 23701-1, "Plant Instrument Valve Lineup".

4.2.7 Slowly CLOSE the LOW PRESS LETDOWN CONTROLLER 1-PIC-0131 and ADJUST charging and Seal Injection as required to raise RCS pressure to 350 psig ±25 psig.

4.2.7.1 At greater than 100 psig RCS pressure, OPEN the RCP #1 Seal Leakoff Isolations 1-HV-8141A, 8141B, 8141C, 8141D; independent verification required.

4.2.7.2 If desired, PLACE the LOW PRESS LETDOWN CONTROLLER 1-PIC-0131 in AUTO.

4.2.8 NOTIFY Chemistry to sample the RCS for boron concentration.

4.2.9 RE-ALIGN the RCS per Checklist 4.

4.3 RCS FILLING AND VENTING IF PRESSURIZER LEVEL HAS NOT BEEN LESS THAN 25% AS INDICATED ON 1-LI-0462

CAUTION

If using hose connected to the Pressurizer Steam Space Sample Line Vent, limit the RCS temperature to 200°F and pressure to 100 psig.

NOTES

a. This section of the procedure assumes the RCS is partially drained with pressurizer level greater than or equal to 25% as indicated by 1-LI-0462.

b. The hose used for venting should be routed to the Purge Ventilation System exhaust or to a Portable Carbon Filter unit.

c. At the discretion of the USS, either pressurizer PORV may be used for pressurizer venting. If this option is used, omit 4.3.1, 4.3.2a, 4.3.5.1a, 4.3.9.1a, and 4.3.10.

4.3.1 NOTIFY Maintenance to remove the Blind Flange and install suitable venting equipment downstream of Pressurizer Steam Space Sample Line Vent 1-1201-U4-100.

4.3.2 PERFORM the following valve alignment:

a.	PRZR STEAM SPACE SAMPLE LINE VENT	1-1201-U4-100	OPEN
b.	PRZR PORV 455A	1-PV-0455A	CLOSED
c.	PRZR PORV 456A	1-PV-0456A	CLOSED
d.	PRZR SPRAY VALVE	1-PV-0455B	OPEN
e.	PRZR SPRAY VALVE	1-PV-0455C	OPEN
f.	RCP 1 #1 Seal Leakoff Isolation	1-HV-8141A	CLOSED
g.	RCP 2 #1 Seal Leakoff Isolation	1-HV-8141B	CLOSED
h.	RCP 3 #1 Seal Leakoff Isolation	1-HV-8141C	CLOSED
i.	RCP 4 #1 Seal Leakoff Isolation	1-HV-8141D	CLOSED
j.	Letdown Isolation	1-LV-0459	OPEN
k.	Letdown Isolation	1-LV-0460	OPEN
l.	Letdown Orifice Isolation	1-HV-8149A	OPEN
m.	Letdown Orifice Isolation	1-HV-8149B	OPEN
n.	Letdown Orifice Isolation	1-HV-8149C	OPEN

4.3.3 ENSURE letdown flow from RHR is in service.

4.3.4 ENSURE normal charging, Letdown and Seal Injection are established.

4.3.5 INITIATE RCS fill by performing the following steps:

4.3.5.1 PLACE the LOW PRESS LETDOWN CONTROLLER 1-PIC-0131 in AUTO set as follows:

a. RCS pressure is to be set at 100 psig if hose at the Pressurizer Steam Space Sample Line Vent 1-1201-U4-100 is used for venting,

b. RCS pressure is to be set at 200 psig if one of the Pressurizer PORVs are used for venting.

4.3.5.2 ENSURE the valve automatically closes.

4.3.5.3 If makeup is not available from the Reactor Makeup Control System, PERFORM the following:

a. OPEN RWST TO CCP A & B SUCTIONS 1-LV-0112D and 1-LV-0112E,

b. CLOSE VCT OUTLET ISOLATIONS 1-LV-0112B and 1-LV-0112C.

CAUTION

During RCS filling, the Nuclear Instrumentation shall be monitored. If an unexplained increase in neutron count rate occurs, the filling operation shall be immediately terminated and the cause investigated.

4.3.6 VERIFY rising water level by observing Pressurizer Water Level Indicator 1-LI-0462.

4.3.7 If using the Pressurizer Steam Space Sample Line Vent for pressurizer venting, CLOSE 1-1201-U4-100 when a solid stream of water issues from the vent.

4.3.8 If using a pressurizer PORV to vent, when RCS pressure reaches 200 psig, vent the pressurizer by opening either 1-PV-0455A or 1-PV-0456A until PRT level increase is observed.

4.3.9 MONITOR RCS Pressure 1-PI-0408, 1-PI-0418, 1-PI-0428, and 1-PI-0438 and PERFORM the following:

NOTE

As the RCS fills solid, the pressure will start increasing.

4.3.9.1 ENSURE the LOW PRESS LETDOWN CONTROLLER 1-PIC-0131 automatically opens to maintain pressure as follows:

a. RCS pressure is to be maintained at 100 psig if hose at the Pressurizer Steam Space Sample Line Vent 1-1201-U4-100 is used,

b. RCS pressure is to be maintained at 200 psig if one of the Pressurizer PORVs are used.

4.3.9.2 ADJUST the LOW PRESS LETDOWN CONTROLLER 1-PIC-0131 and/or Charging and Seal Injection as required to establish Narrow Range RCS pressure at 350 psig ±25 psig.

4.3.9.3 OPEN the RCP #1 Seal Leakoff Isolation 1-HV-8141A, 8141B, 8141C, 8141D; independent verification required.

4.3.9.4 ENSURE Charging Pump suction is aligned to the Volume Control Tank:

a. ENSURE OPEN VCT OUTLET ISOLATION 1-LV-0112B and 1-LV-0112C; independent verification required,

b. ENSURE CLOSED RWST TO CCP A & B SUCTIONS 1-LV-0112D and 1-LV-0112E; independent verification required.

4.3.10 NOTIFY Chemistry to sample the RCS for boron concentration.

4.3.11 RE-ALIGN the RCS per Checklist 5.

5.0 REFERENCES

5.1 P&ID's

5.1.1	1X4DB111	Reactor Coolant System
5.1.2	1X4DB112	Reactor Coolant System
5.1.3	1X4DB113	RTD Bypass Reactor Coolant System

5.2 ELEMENTARY DIAGRAMS

5.2.1	1X3D-BD-B01J	Reactor Coolant System 1-1805-Q3-PC
5.2.2	1X3D-BD-B01K	Reactor Coolant System 1-1805-Q3-PB1
5.2.3	1X3D-BD-B01L	Reactor Coolant System 1-1805-Q3-PB2
5.2.4	1X3D-BD-B01M	Reactor Coolant System 1-1805-Q3-PB3
5.2.5	1X3D-BD-B02A	Reactor Coolant System 1-HV-8000A
5.2.6	1X3D-BD-B02B	Reactor Coolant System 1-HV-8000B
5.2.7	1X3D-BD-B02J	Reactor Coolant System Pressurizer Heater Cabling Block Diagram
5.2.8	1X3D-BD-B03A	Reactor Coolant System 1-HV-8032
5.2.9	1X3D-BD-B03F	Reactor Coolant System 1-PV-0456A

5.2.10	1X3D-BD-B03H	Reactor Coolant System 1-PV-0455A
5.2.11	1X3D-BD-B03K	Reactor Coolant System 1-HV-8145
5.2.12	1X3D-BD-B03R	Reactor Coolant System 1-PV-0455B/1-PV-455C
5.3	ONE-LINE DIAGRAMS	
5.3.1	1X3D-AA-E01A	480V Switchgear 1NB01
5.3.2	1X3D-AA-E08A	480V Switchgear 1NB08
5.3.3	1X3D-AA-E09A	480V Switchgear 1NB09
5.3.4	1X3D-AA-E10A	480V Switchgear 1NB10
5.3.5	1X3D-AA-F05A	480V Motor Control Center 1NBE
5.3.6	1X3D-AA-F06A	480V Motor Control Center 1NBF
5.3.7	1X3D-AA-F13A	480V Pressurizer Heater Panels
5.3.8	1X3D-AA-F24A	480V Motor Control Center 1ABE
5.3.9	1X3D-AA-F25A	480V Motor Control Center 1BBE
5.3.10	1X3D-AA-H01A	125V DC Class 1E Distribution Train A
5.3.11	1X3D-AA-H02A	125V DC Class 1E Distribution Train B
5.4	FSAR	
5.4.1	Section 5.1	Reactor Coolant System And Connected Systems
5.4.2	Section 5.2	Integrity of Reactor Coolant Pressure Boundary
5.4.3	Section 5.3	Reactor Vessel
5.4.4	Section 5.4	Component And Subsystem Design
5.5	TECHNICAL SPECIFICATIONS	

5.6	PROCEDURES	
5.6.1	11001-1	"Reactor Coolant System Alignment"
5.6.2	13429-1	"480V AC 1E Electrical Distribution System"
5.6.3	13430-1	"480V AC Non 1E Electrical Distribution System"
5.6.4	13405-1	"125V DC 1E Electrical Distribution System"
5.6.5	13003-1	"Reactor Coolant Pump Operation"
5.6.6	13004-1	"Pressurizer Relief Tank Operation"
5.6.7	13005-1	"Reactor Coolant System Draining"
5.6.8	13006-1	"CVCS Startup And Normal Operation"
5.6.9	13009-1	"CVCS Reactor Makeup Control System"
5.6.10	13011-1	"Residual Heat Removal System"
5.6.11	13120-1	"Containment Purge System"
5.6.12	13711-1	"Instrument Air System"
5.6.13	12006-C	"Unit Cooldown To Cold Shutdown"
5.6.14	23985-1	"RCS Temporary Water Level System"
5.6.15	54840-1	"Installation And Removal Instructions For RCS Temporary Tygon Tube"

END OF PROCEDURE TEXT

CHECKLIST 1

30-Second Air Sweep

1. START one RCP per 13003-1 "Reactor Coolant Pump Operation" and RUN the pump for 30 seconds.

2. Slowly OPEN the LOW PRESS LETDOWN CONTROLLER 1-PIC-0131 and ADJUST Charging and Seal Injection as required to reduce the RCS pressure to less than 100 psig.

3. At 100 psig RCS pressure, CLOSE the RCP #1 Seal Leakoff Isolation 1-HV-8141A, B, C, D.

NOTE

"Bubble free" is defined as the absence of large air bubbles. A steady stream of small "carbonated beverage" sized bubbles is acceptable when making the determination as to whether the venting is bubble free.

4. When RCS pressure is less than 100 psig, VENT the Reactor Vessel Head.

   a. OPEN the RX HEAD VENT TO LETDOWN ISOLATION VLVS 1-HV-8095A(B) and 1-HV-8096A(B),

   b. OPEN the CVCS TO PRT FG-8099 ROOT 1-1208-U4-488,

   c. When bubble free water is observed at 1-FG-8099, CLOSE 1-1208-U4-488,

   d. CLOSE the RX HEAD VENT TO LETDOWN ISOLATION VLVS 1-HV-8095A(B) and 1-HV-8096A(B).

5. VENT the pressurizer as follows:

   a. OPEN PRZR SPRAY LINE VENT 1-1201-X4-072 and 1-1201-X4-084,

   b. When bubble free water issues from the vent, CLOSE 1-1201-X4-072 and 1-1201-X4-084.

CHECKLIST 1

6. Slowly CLOSE the LOW PRESS LETDOWN CONTROLLER 1-PIC-0131 and ADJUST Charging and Seal Injection as required to raise the RCS pressure to 350 psig ±25 psig.

7. OPEN the RCP #1 Seal Leakoff Isolation 1-HV-8141A, B, C, D.

8. REPEAT Steps 1. thru 7. for each RCP.

9. When all RCP's have been run for 30 seconds and the RCS vented, GO TO Sub-subsection 4.2.3.

CHECKLIST 2

1-Minute Air Sweep

1. START one RCP per 13003-1, "Reactor Coolant Pump Operation" and RUN the pump for 1 minute.

2. Slowly OPEN the LOW PRESS LETDOWN 1-PIC-0131 and ADJUST Charging and Seal Injection as required to reduce the RCS pressure to less than 100 psig.

3. At 100 psig RCS pressure, CLOSE the RCP Seal #1 Leakoff Isolation 1-HV-8141A, B, C, D.

NOTE

"Bubble free" is defined as the absence of large air bubbles. A steady stream of small "carbonated beverage" sized bubbles is acceptable when making the determination as to whether the venting is bubble free.

4. When RCS pressure is less than 100 psig, VENT the Reactor Vessel Head.

   a. OPEN the RX HEAD VENT TO LETDOWN ISOLATION VLVS 1-HV-8095A(B) and 1-HV-8096A(B),

   b. OPEN the CVCS TO PRT FG-8099 ROOT 1-1208-U4-488,

   c. When bubble free water is observed at 1-FG-8099, CLOSE 1-1208-U4-488,

   d. CLOSE the RX HEAD VENT TO LETDOWN ISOLATION VLVS 1-HV-8095A(B) and 1-HV-8096A(B).

5. VENT the Pressurizer as follows:

   a. OPEN PRZR SPRAY LINE VENT 1-1201-X4-072 and 1-1201-X4-084,

   b. When bubble free water issues from the vent, CLOSE 1-1201-X4-072 and 1-1201-X4-084.

CHECKLIST 2

6. Slowly CLOSE the LOW PRESS LETDOWN CONTROLLER 1-PIC-0131 and ADJUST Charging and Seal Injection as required to raise the RCS pressure to 350 psig ±25 psig.

7. OPEN the RCP #1 Seal Leakoff Isolation 1-HV-8141A, B, C, D.

8. REPEAT Steps 1. thru 7. for each RCP.

9. When all RCP's have been run for 1 minute and the RCS vented, GO TO Sub-subsection 4.2.4.

Sheet 1 of 1

CHECKLIST 3

5-Minute Air Sweep

1. START all 4 RCP's per 13003-1, "Reactor Coolant Pump Operation" and RUN pumps for 5 minutes.

2. Slowly OPEN the LOW PRESS LETDOWN CONTROLLER 1-PIC-0131 and ADJUST Charging and Seal Injection as required to reduce the RCS pressure to less than 100 psig.

3. At 100 psig RCS pressure, CLOSE the RCP #1 Seal Leakoff Isolation 1-HV-8141A, B, C, D.

NOTE

"Bubble free" is defined as the absence of large air bubbles. A steady stream of small "carbonated beverage" sized bubbles is acceptable when making the determination as to whether the venting is bubble free.

4. When RCS pressure is less than 100 psig, VENT the Reactor Vessel Head.

   a. OPEN the RX HEAD VENT TO LETDOWN ISOLATION VLVS 1-HV-8095A(B) and 1-HV-8096A(B),

   b. OPEN the CVCS TO PRT FG-8099 ROOT 1-1208-U4-488,

   c. When bubble free water is observed at 1-FG-8099, CLOSE 1-1208-U4-488,

   d. CLOSE the RX HEAD VENT TO LETDOWN ISOLATION VLVS 1-HV-8095A(B) and 1-HV-8096A(B); independent verification required.

5. VENT the Pressurizer as follows:

   a. OPEN PRZR SPRAY LINE VENT 1-1201-X4-072 and 1-1201-X4-084,

   b. When bubble free water issues from the vent, CLOSE 1-1201-X4-072 and 1-1201-X4-084.

6. When the Reactor Vessel Head and the Pressurizer have been vented, GO TO Sub-subsection 4.2.5.

CHECKLIST 4

RCS ALIGNMENT

1. REMOVE and DRAIN all the hoses used during filling and venting.

2. REMOVE the Portable Carbon Filter unit, if used.

3. NOTIFY Maintenance to install the Blind Flanges at the following points:

   a. PRZR STEAM SPACE SAMPLE LINE VENT — 1-1201-U4-100

   b. PRZR SAFETY VALVE RELIEF HEADER VENT — 1-1201-U4-106

   c. CVCS TO PRT FG-8099 ROOT — 1-1208-U4-488

   d. PRT VENT TO ATMOSPHERE — 1-1201-U4-115

4. ENSURE the following valves are closed and the flanges or pipe caps, where applicable, are installed.

VALVE	DESCRIPTION	COND REQD	POS BY	IV
1-1201-X4-084	PRZR SPRAY LINE VENT VALVE	CLOSED & CAPPED	_____	_____
1-1201-X4-072	PRZR SPRAY LINE VENT VALVE	CLOSED	_____	_____
1-1201-U4-100	PRZR STEAM SPACE SAMPLE LINE VENT	CLOSED & FLANGED	_____	_____
1-1201-U4-102	PRZR SFTY VLV PSV-8010A LOOP SEAL DRAIN	LOCKED CLOSED	_____	_____
1-1201-U4-105	PRZR SFTY VALVE LOOP SEAL HEADER ISO	CLOSED	_____	_____
1-1201-U4-106	PRZR SAFETY VALVE RELIEF HDR VENT	CLOSED & FLANGED	_____	_____
1-1208-U4-488	CVCS TO PRT FG-8099 ROOT	CLOSED & FLANGED	_____	_____
1-1201-U4-001	RCS LOOP 1 DRAIN ISO	CLOSED	_____	_____

CHECKLIST 4

RCS ALIGNMENT

VALVE	DESCRIPTION	COND REQD	POS BY	IV
1-1201-U4-003	RCS INTMD LEG #1 TYGON HOSE CONNECTION ISO	CLOSED & CAPPED	_____	_____
1-1201-U4-115	RCS PRT VENT TO ATMOSPHERE	CLOSED & FLANGED	_____	_____
1-1201-U4-052	RCS INTMD LEG #2 DRAIN HEADER ISO	CLOSED	_____	_____
1-1201-U4-208	RCS INTMD LEG #2 DRAIN TO RCDT PUMP ISO	CLOSED	_____	_____
1-1201-U4-030	RCS INTMD LEG #3 DRAIN HEADER ISO	CLOSED	_____	_____
1-1201-U4-209	RCS INTMD LEG #3 DRAIN TO RCDT PUMP ISO	CLOSED	_____	_____
1-1201-U4-071	RCS INTMD LEG #4 DRAIN HEADER ISO	CLOSED	_____	_____
1-1201-U4-206	RCS INTMD LEG #4 DRAIN TO RCDT PUMP ISO	CLOSED	_____	_____

REVIEWED BY _____ DATE _____

Sheet 1 of 1

CHECKLIST 5

RCS ALIGNMENT

1. REMOVE and DRAIN all the Tygon hoses used during filling and venting.

2. REMOVE the Portable Carbon Filter unit.

3. NOTIFY Maintenance to install the Blind Flange at PRZR Steam Space Sample Line Vent 1-1201-U4-100

4. POSITION 1-1201-U4-100 as listed below:

VALVE	DESCRIPTION	COND REQD	POS BY	IV
1-1201-U4-100	PRZR STEAM SPACE SAMPLE LINE VENT	CLOSED & FLANGED	_____	_____

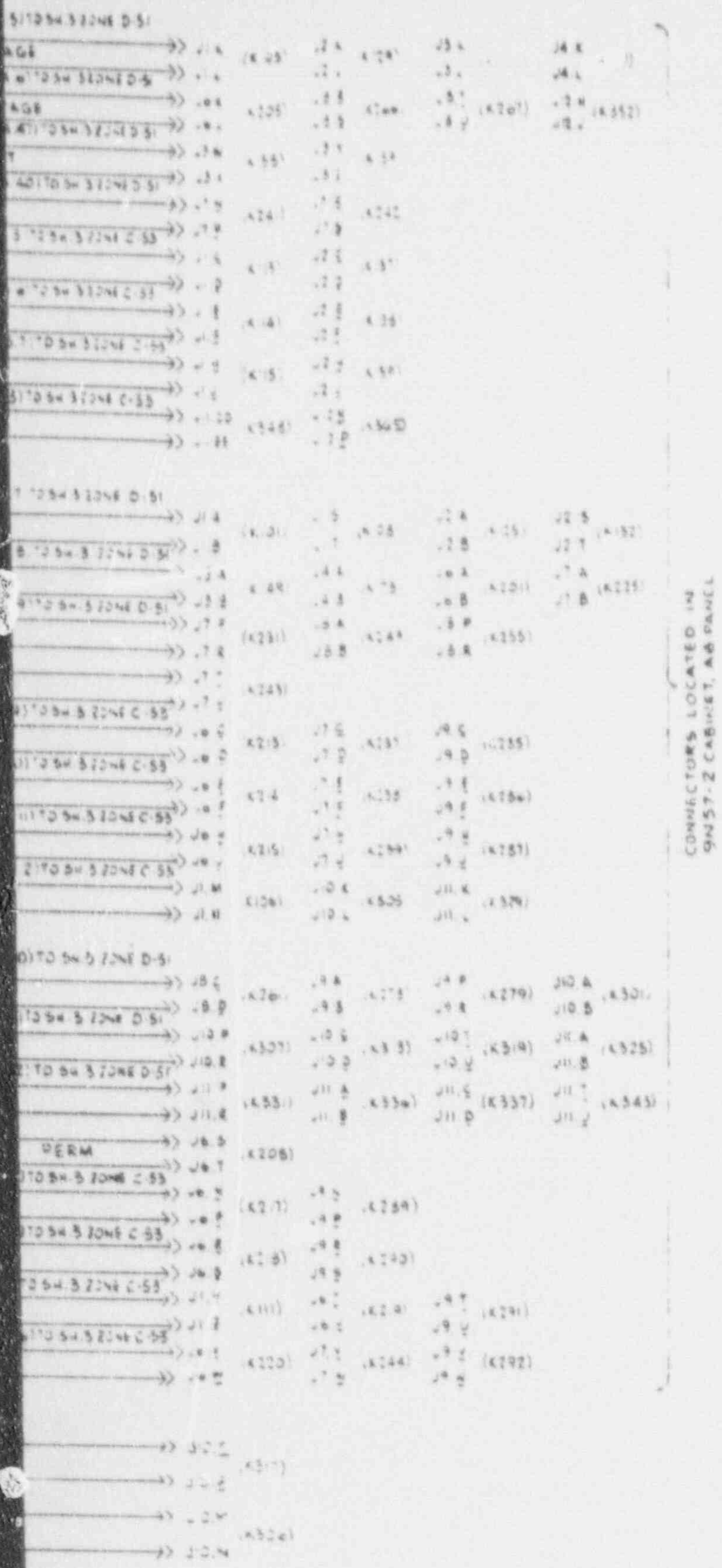
_____ _____ _____

REVIEWED BY DATE

+48V
48V RETURN
STEP DRIVER
6N 557
A4-9
RELAY DRIVER
6N 342
A5-1
RELAY DRIVER
6N342
A5-2
RELAY DRIVER
6N342
A5-3
RELAY DRIVER
6N432
A5-11
+28V
28V COM
CARD REMOVAL
N.C. 5TH CHANNEL ENABLE
ATI U/V INHIBIT IN

05-141-90

ZONE	LTR	DESCRIPTION	DATE	APPROVED
	1	RELEASE ON 9N53496	[illegible]	FJM
	A	EN53[illegible] SEE [illegible] DETAIL	[illegible]	FJM
	B	EN56[illegible] [illegible] SHTS 1,2 & 3	[illegible]	FJM
	C	EN57777 REV SED SHTS 1, 2 & 3 ADDED [illegible] AA-2 SHT 2	[illegible]	KRT
ACC	D	EN 58206 SHT 3 [illegible] FROM AA-1-2	[illegible]	KRT
	E	[illegible]	[illegible]	[illegible]
	F	[illegible]	[illegible]	KRT
	G	[illegible]	[illegible]	KRT
	H	[illegible]	[illegible]	KRT



NOTES

1. TO AND FROM ZONE LOCATIONS ARE NOT SPECIFIED IF BOTH LOCATIONS ARE ON THE SAME SHEET
2. SIGNAL AND CONTROL WIRING ARE EXPLICITLY ILLUSTRATED. POWER WIRING IS SHOWN FOR REFERENCE ONLY. REFER TO KT7314 (F SIZE) FOR POWER DISTRIBUTION WIRING
3. FOR SIGNAL WIRING REFER TO WL9N57-1, WL9N57-2, WL9N57-3, WL9N57-4, WL9N57-5 AND WLKF772

SI APERTURE CARD

Also Available On Aperture Card

REV STATUS	
SHT	
1	H
2	H
3	D

9202200459-01

CONSOLIDATED CONTROLS CORPORATION

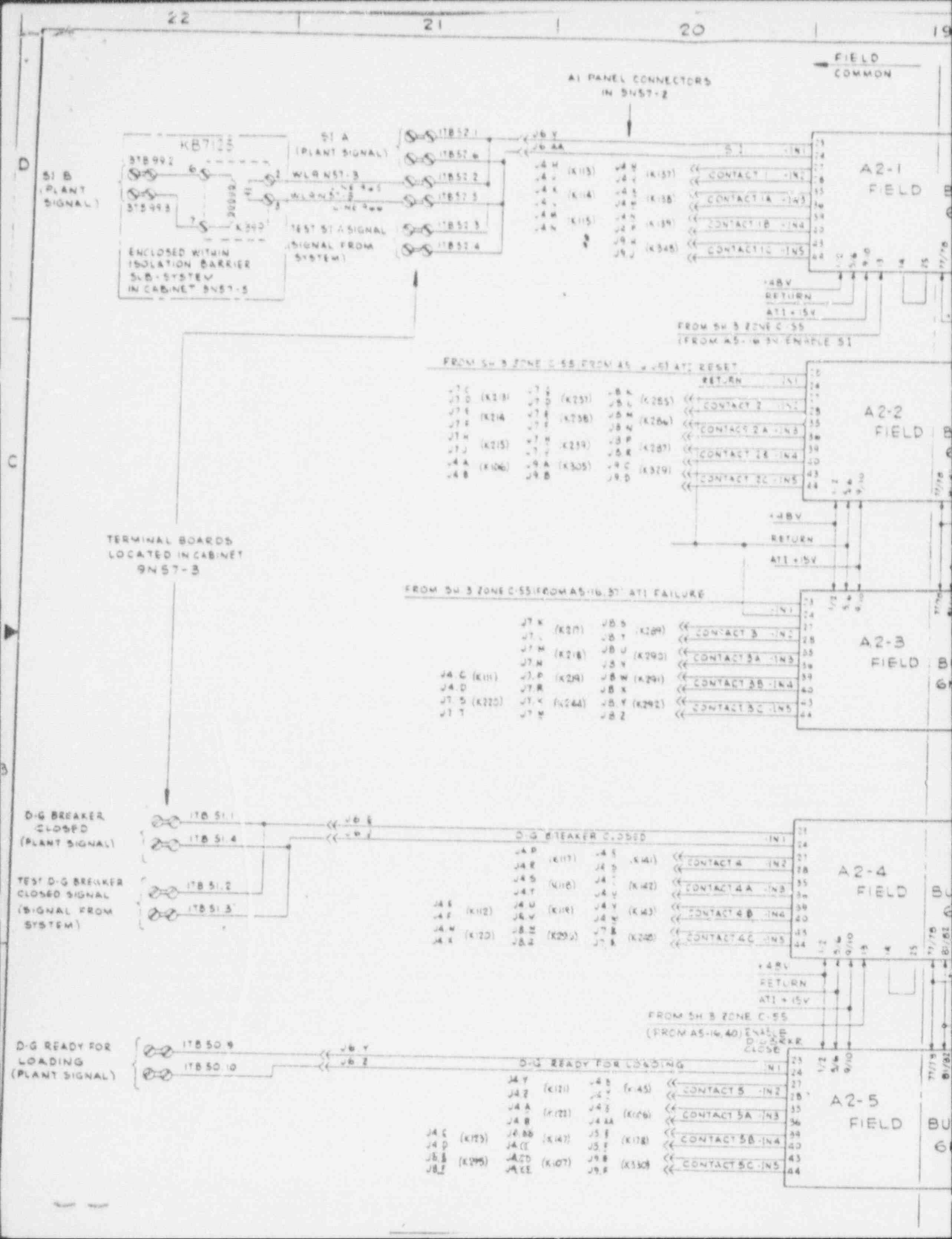
SYSTEM BLOCK DIAGRAM SAFETY FEATURES SEQUENCER SYSTEM

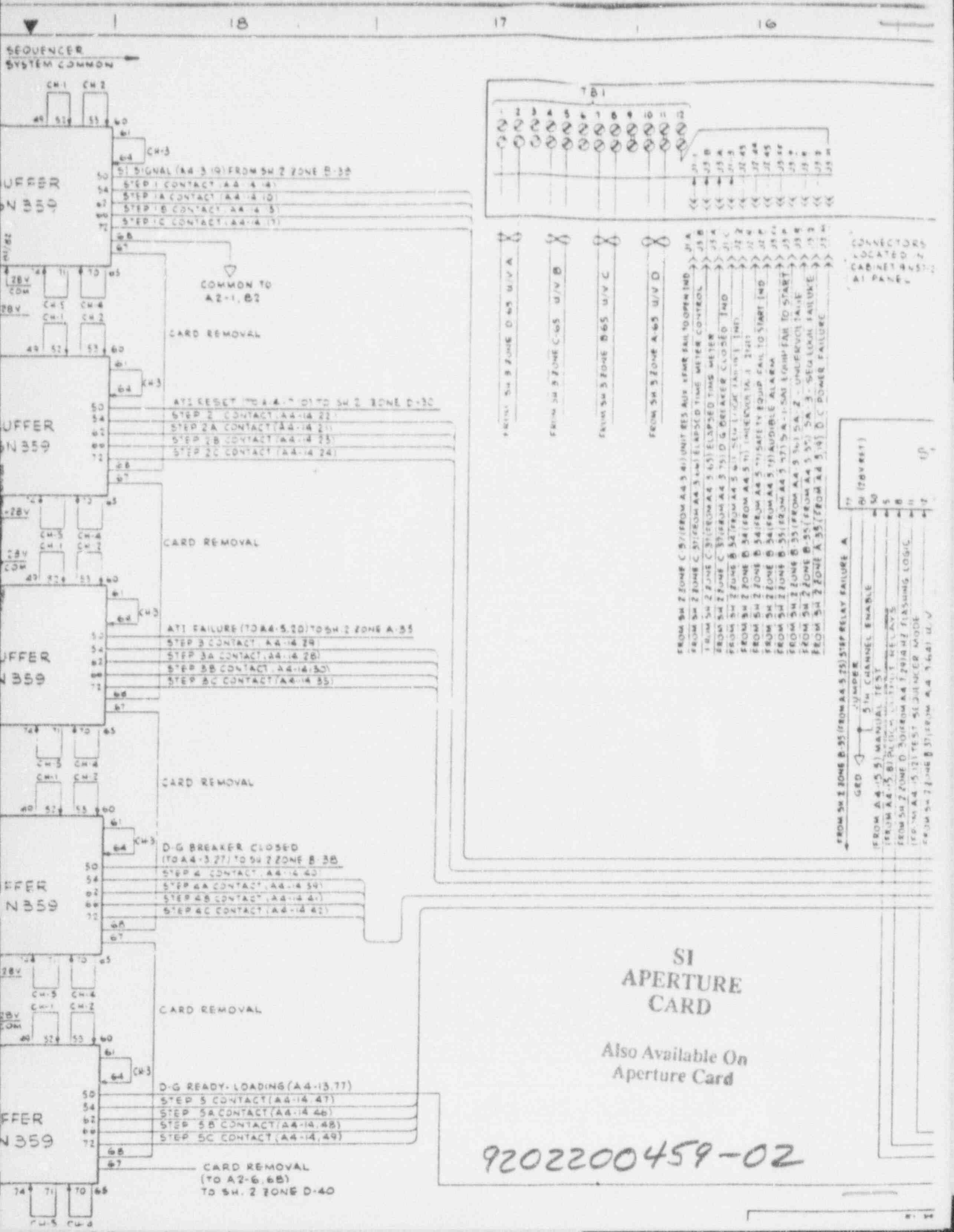
SIZE	CODE IDENT NO.	
H	02750	KGF 8909

SCALE ~ SHEET 1 OF 3

9N57

APPLICATION


22
21
20
FIELD
COMMON
A1 PANEL CONNECTORS
IN 9N57-2
KB7125
51 B
(PLANT
SIGNAL)
51 A
(PLANT SIGNAL)
TEST 51 A SIGNAL
(SIGNAL FROM
SYSTEM)
ENCLOSED WITHIN
ISOLATION BARRIER
SLB-SYSTEM
IN CABINET 9N57-3
CONTACT 1
CONTACT 1A
CONTACT 1B
CONTACT 1C
A2-1
FIELD
+48V
RETURN
ATI +15V
FROM SH 3 ZONE C-55
(FROM A5-16 39) ENABLE 51
FROM SH 3 ZONE C-55
RETURN
CONTACT 2
CONTACT 2A
CONTACT 2B
CONTACT 2C
A2-2
FIELD
TERMINAL BOARDS
LOCATED IN CABINET
9N57-3
+48V
RETURN
ATI +15V
FROM SH 3 ZONE C-55
CONTACT 3
CONTACT 3A
CONTACT 3B
CONTACT 3C
A2-3
FIELD
D-G BREAKER
CLOSED
(PLANT SIGNAL)
TEST D-G BREAKER
CLOSED SIGNAL
(SIGNAL FROM
SYSTEM)
D-G BREAKER CLOSED
CONTACT 4
CONTACT 4A
CONTACT 4B
CONTACT 4C
A2-4
FIELD
+48V
RETURN
ATI +15V
FROM SH 3 ZONE C-55
(FROM A5-16,40)
D-G READY FOR
LOADING
(PLANT SIGNAL)
D-G READY FOR LOADING
CONTACT 5
CONTACT 5A
CONTACT 5B
CONTACT 5C
A2-5
FIELD



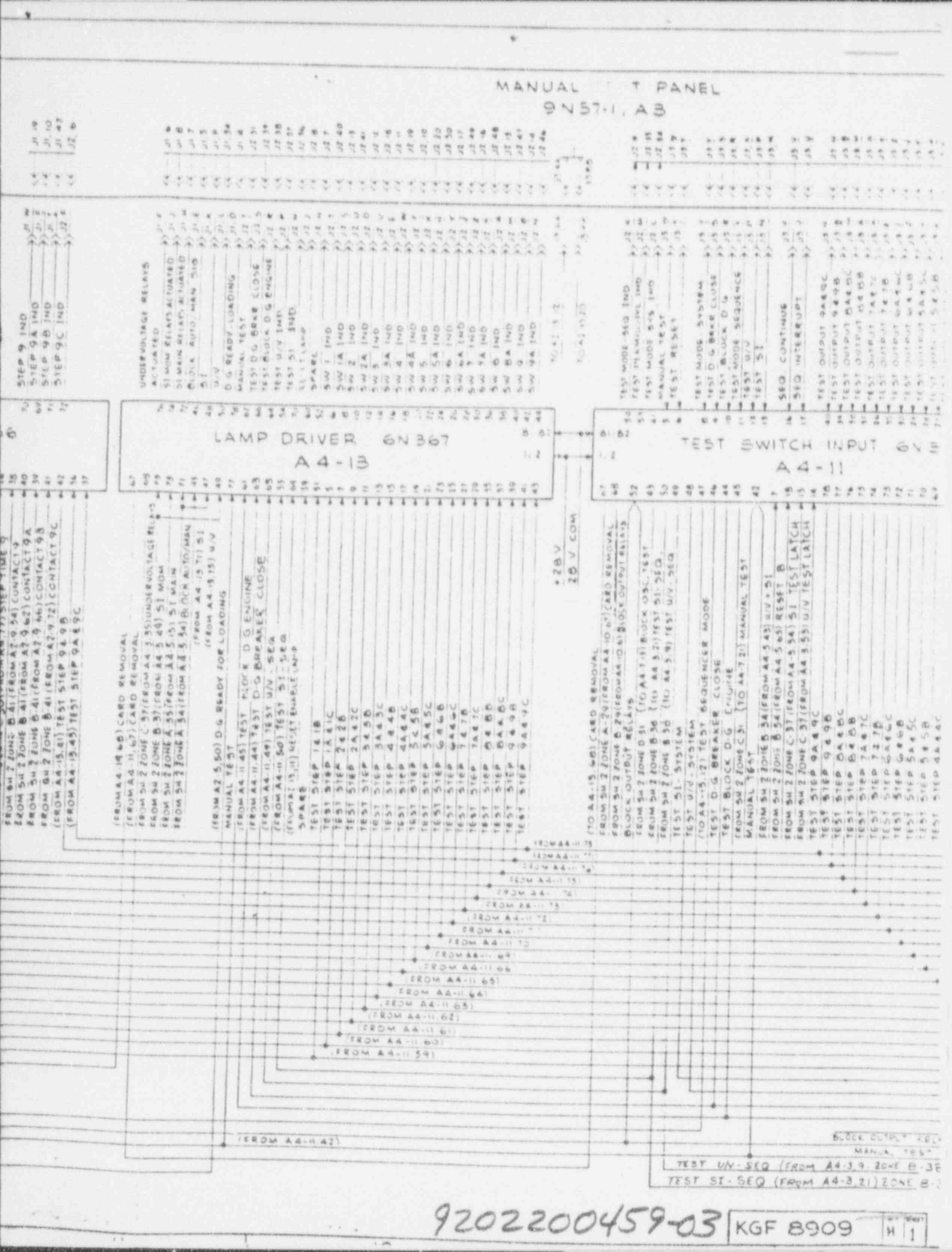
9202200459-02

MANUAL TEST PA
9N57-1, AB

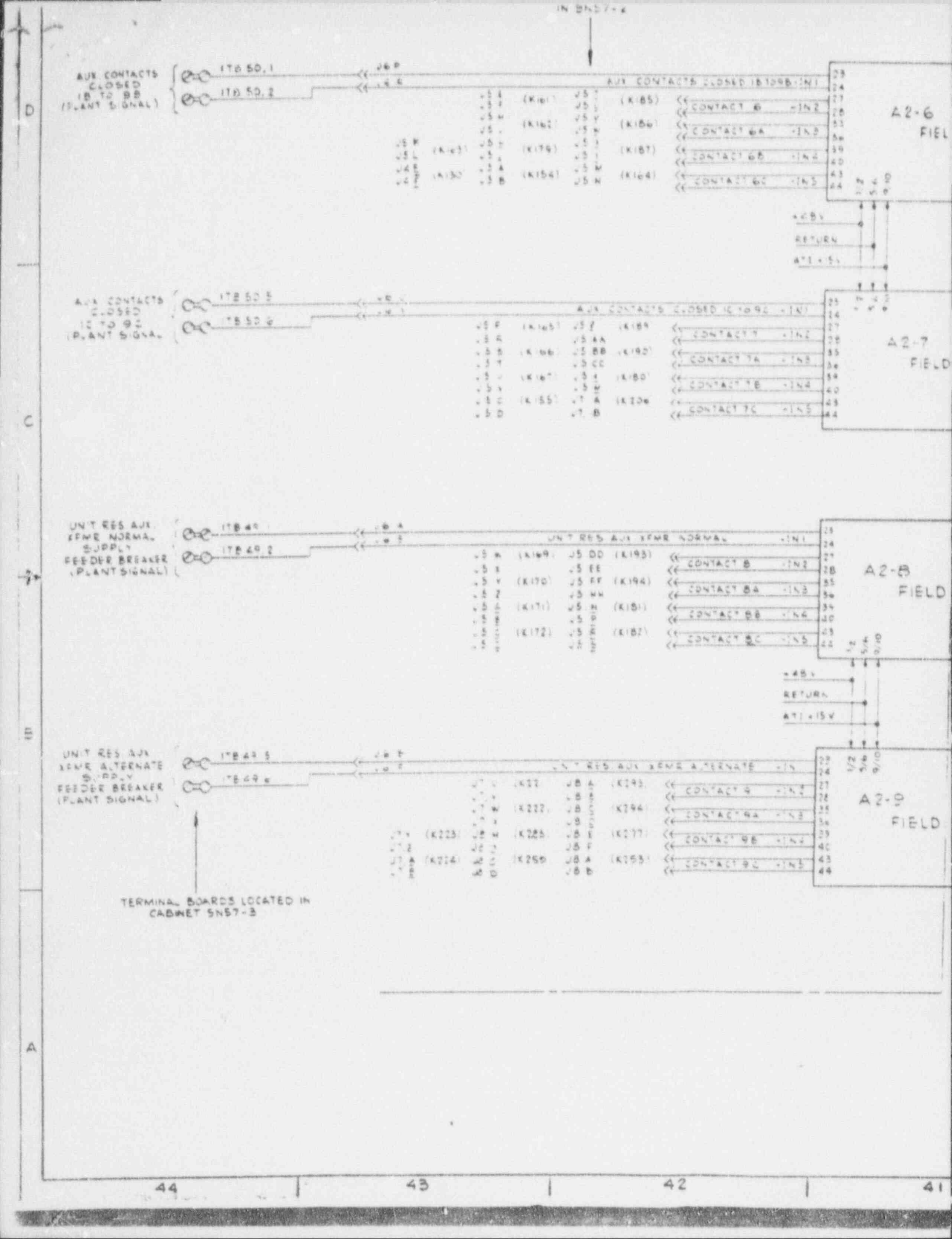
CONNECTORS LOCATED IN CABINET 9N57-2, A1 PANEL

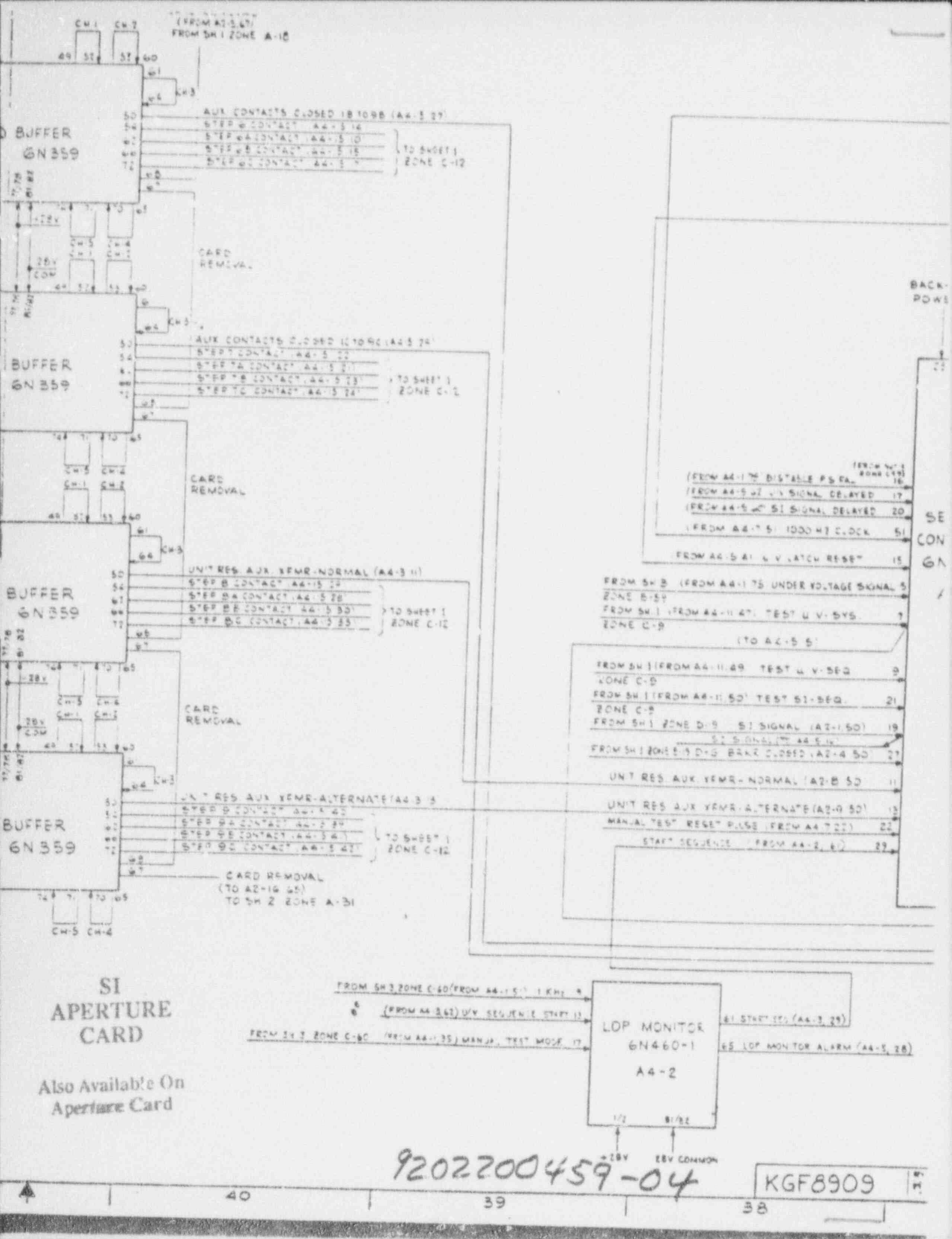
RELAY TROUBLE INDICATOR 6N35e
A4 - 14

STEP RELAY TROUBLE INDICATOR 6N
A4 - 15



920220045903 KGF 8909 H 1


IN SNS7-4
AUX CONTACTS CLOSED (B TO BB) (PLANT SIGNAL)
1TB50,1
1TB50,2
AUX CONTACTS CLOSED (B TO BB) -1N1
CONTACT B -1N2
CONTACT BA -1N3
CONTACT BB -1N4
CONTACT BC -1N5
A2-6 FIELD
+24V
RETURN
AT1 +5V
AUX CONTACTS CLOSED (C TO BC) -1N1
CONTACT Y -1N2
CONTACT YA -1N3
CONTACT YB -1N4
CONTACT YC -1N5
A2-7 FIELD
UNIT RES AUX XFMR NORMAL SUPPLY FEEDER BREAKER (PLANT SIGNAL)
1TB49,1
1TB49,2
UNIT RES AUX XFMR NORMAL -1N1
CONTACT B -1N2
CONTACT BA -1N3
CONTACT BB -1N4
CONTACT BC -1N5
A2-8 FIELD
+48V
RETURN
AT1 +15V
UNIT RES AUX XFMR ALTERNATE SUPPLY FEEDER BREAKER (PLANT SIGNAL)
1TB49,5
1TB49,6
UNIT RES AUX XFMR ALTERNATE -1N1
CONTACT A -1N2
CONTACT AA -1N3
CONTACT AB -1N4
CONTACT AC -1N5
A2-9 FIELD
TERMINAL BOARDS LOCATED IN CABINET SNS7-3
44
43
42
41

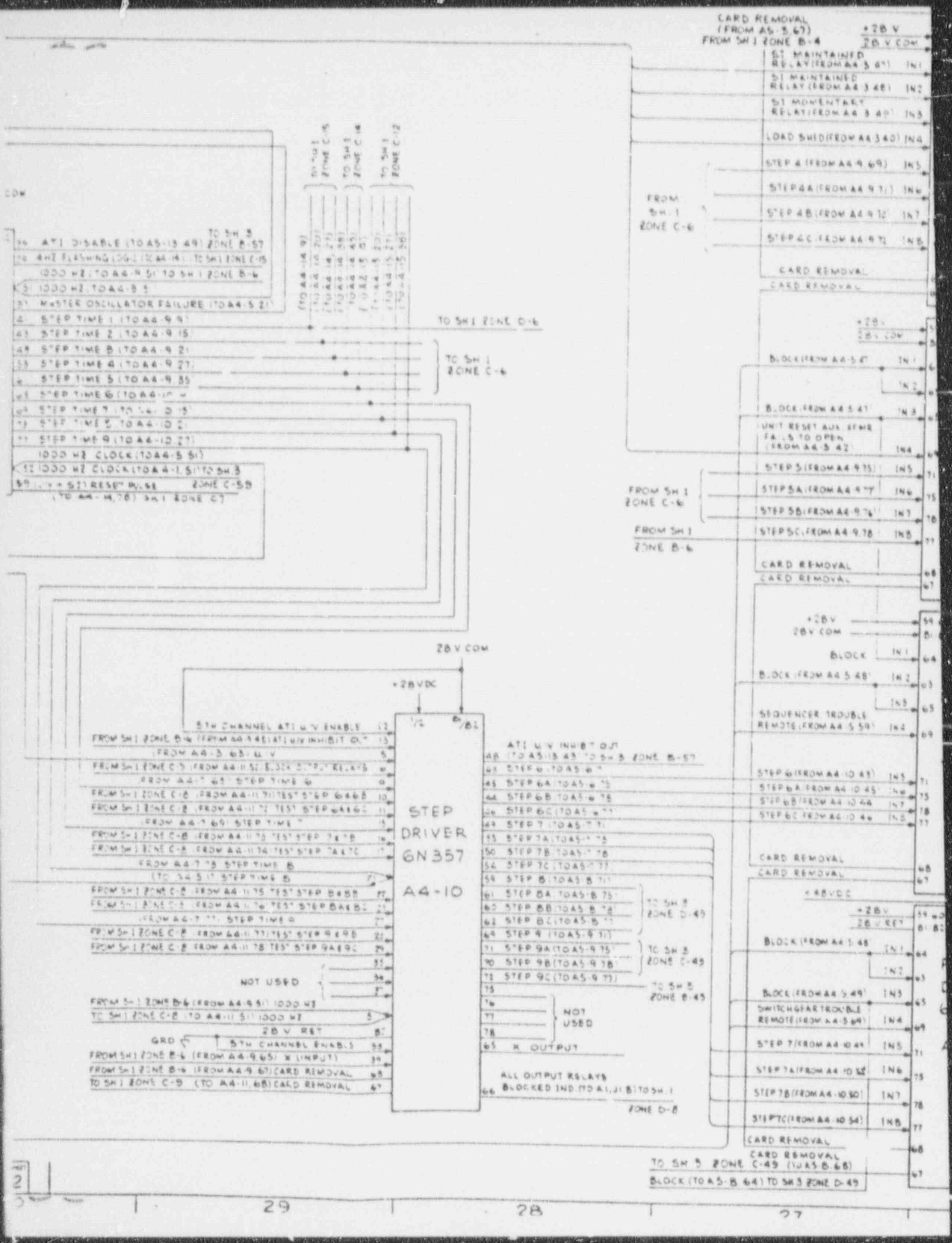


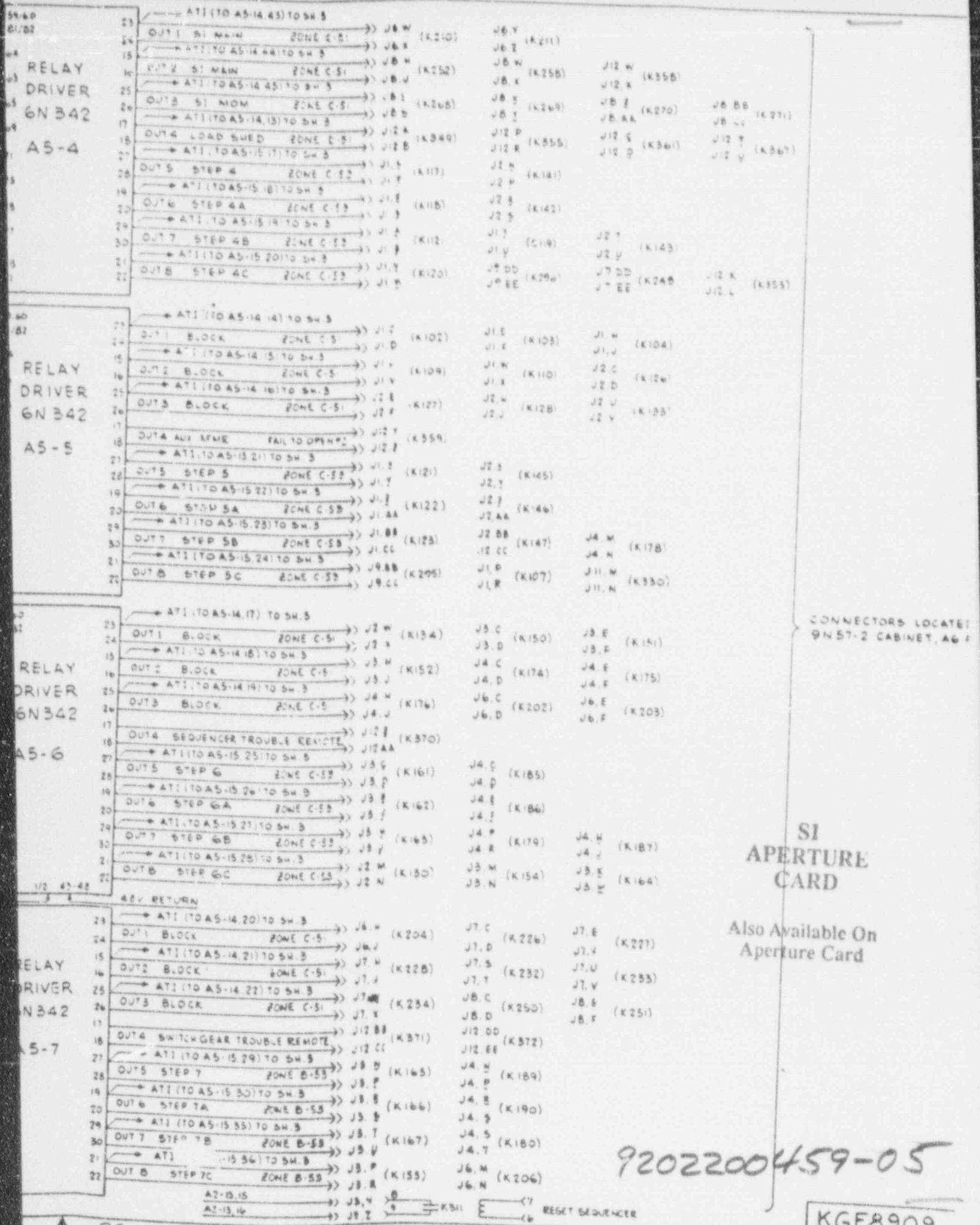
SI APERTURE CARD

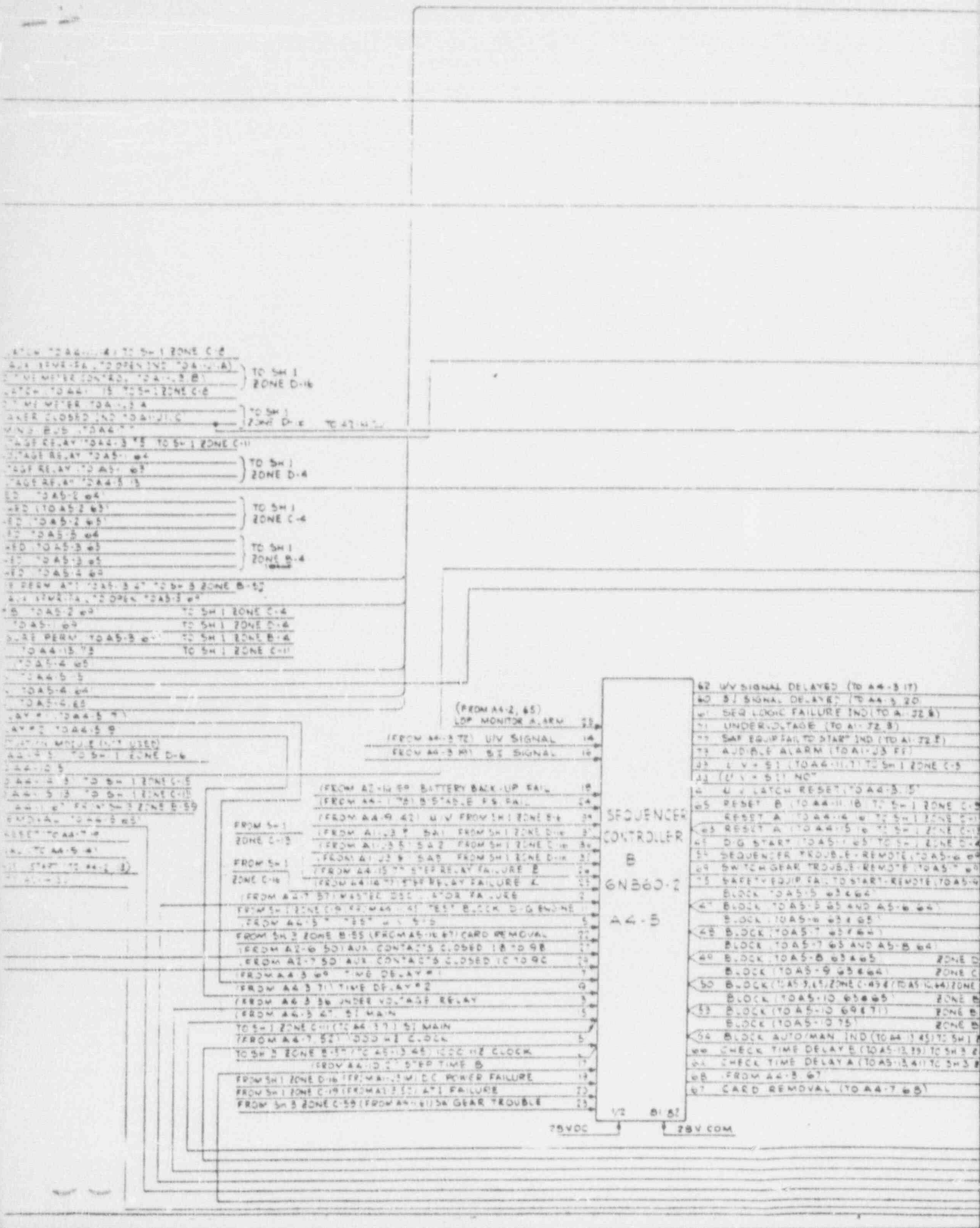
Also Available On Aperture Card

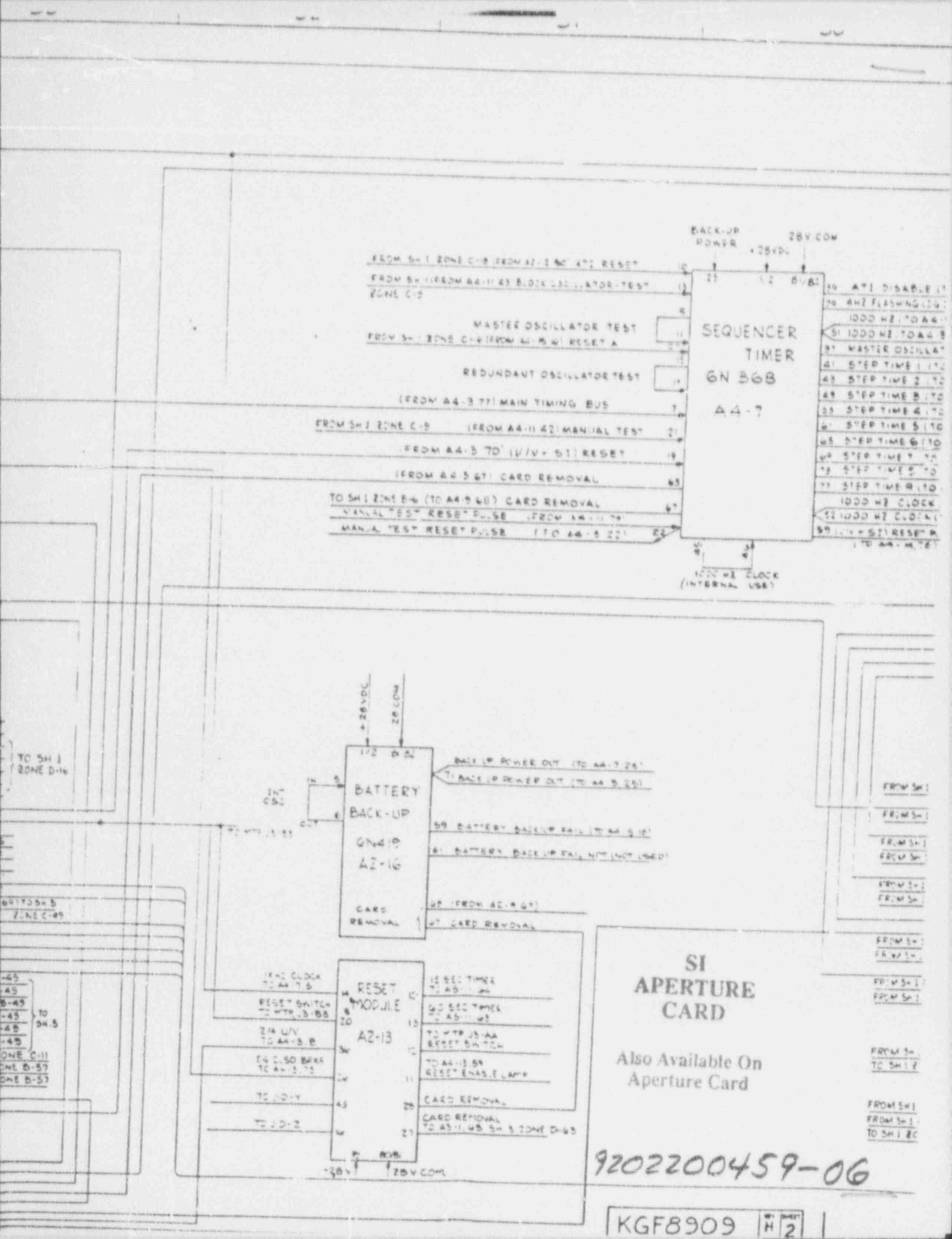
9202200459-04

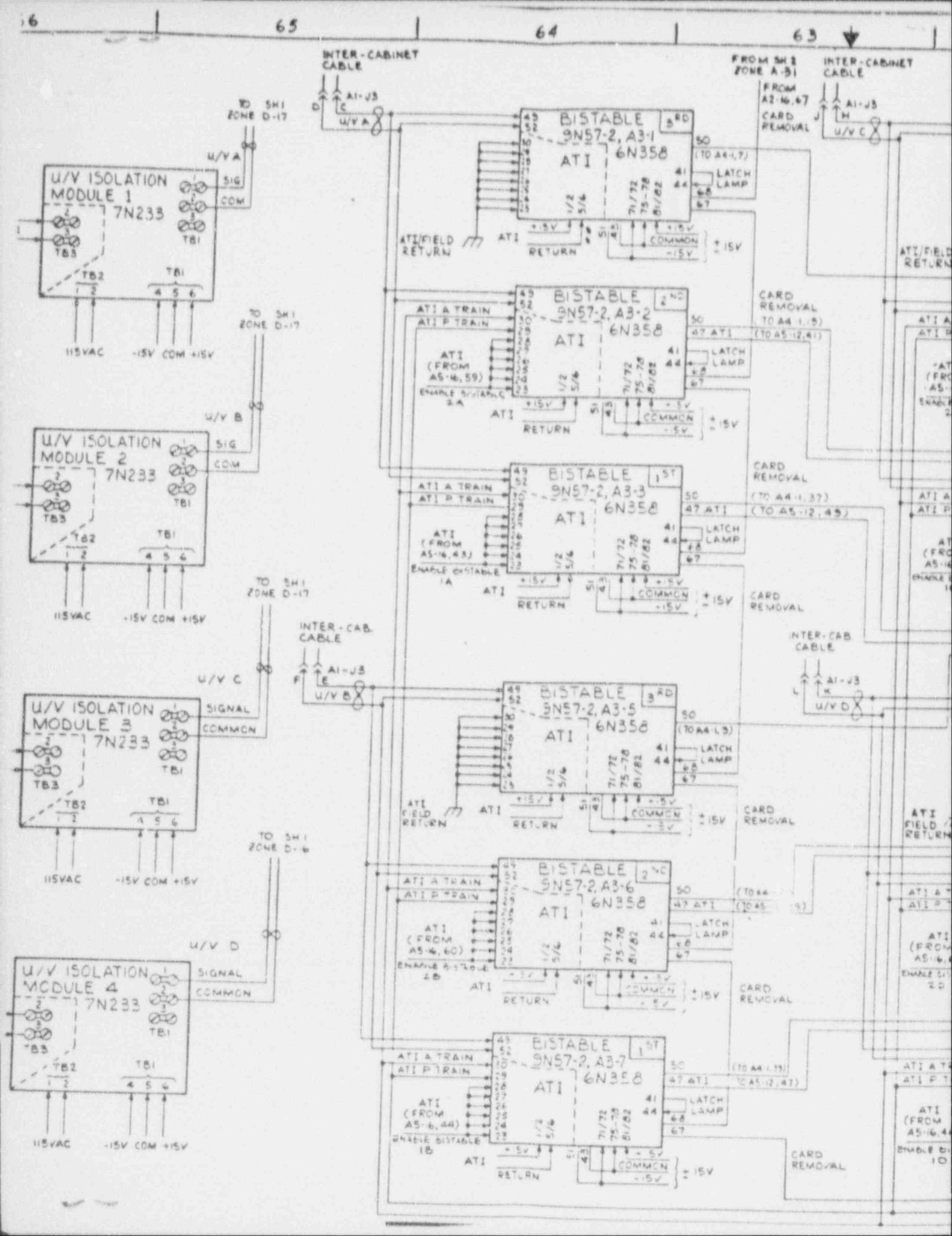
KGF8909

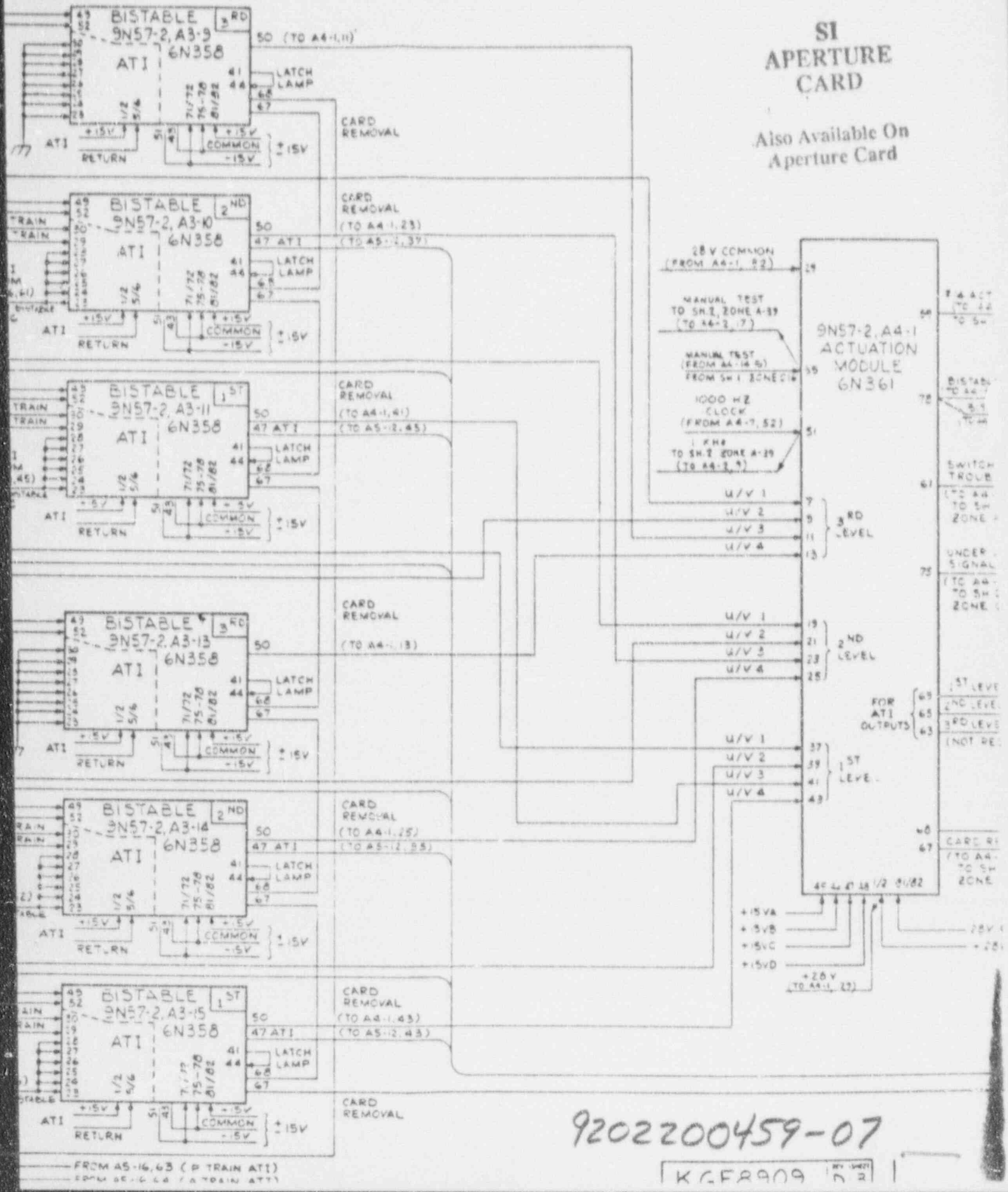

CARD REMOVAL (FROM A5-5,67) FROM SH 1 ZONE B-4
+28 V
28 V COM
ST MAINTAINED RELAY (FROM A4 3 67) IN1
ST MAINTAINED RELAY (FROM A4 3 48) IN2
ST MOMENTARY RELAY (FROM A4 3 49) IN3
LOAD SHED (FROM A4 3 40) IN4
STEP 4 (FROM A4 9 69) IN5
STEP 4A (FROM A4 9 71) IN6
STEP 4B (FROM A4 9 70) IN7
STEP 4C (FROM A4 9 72) IN8
FROM SH 1 ZONE C-6
CARD REMOVAL
CARD REMOVAL
+28V
28V COM
BLOCK (FROM A4-5 47) IN1
IN2
BLOCK (FROM A4 5 47) IN3
UNIT RESET AUX. REMOTE FAILS TO OPEN (FROM A4-5 42) IN4
STEP 5 (FROM A4 9 73) IN5
STEP 5A (FROM A4 9 74) IN6
STEP 5B (FROM A4 9 76) IN7
STEP 5C (FROM A4 9 78) IN8
FROM SH 1 ZONE C-6
FROM SH 1 ZONE B-6
CARD REMOVAL
CARD REMOVAL
+28V
28V COM
BLOCK IN1
BLOCK (FROM A4 5 48) IN2
IN3
SEQUENCER TROUBLE REMOTE (FROM A4 5 59) IN4
STEP 6 (FROM A4 10 43) IN5
STEP 6A (FROM A4 10 45) IN6
STEP 6B (FROM A4 10 44) IN7
STEP 6C (FROM A4 10 46) IN8
CARD REMOVAL
CARD REMOVAL
+48VDC
+28V
28 V RET
BLOCK (FROM A4 5 48 IN1
IN2
BLOCK (FROM A4 5 49) IN3
SWITCHGEAR TROUBLE REMOTE (FROM A4-5 69) IN4
STEP 7 (FROM A4 10 49) IN5
STEP 7A (FROM A4 10 51) IN6
STEP 7B (FROM A4-10 50) IN7
STEP 7C (FROM A4-10 54) IN8
CARD REMOVAL
CARD REMOVAL
TO SH 3 ZONE C-49 (TO A5-B 68)
BLOCK (TO A5-B 64) TO SH 3 ZONE D-49
28V COM
+28VDC
STEP DRIVER 6N357 A4-10
5TH CHANNEL ATI U/V ENABLE
FROM SH 1 ZONE B-6 (FROM A4 9 68) ATI U/V INHIBIT O/P
(FROM A4-3 63) U/V
FROM SH 1 ZONE C-5 (FROM A4 11 52, 8, 32) STEP RELAYS
FROM A4-7 65 STEP TIME 6
FROM SH 1 ZONE C-6 (FROM A4-11 71) TEST STEP 6A&B
FROM SH 1 ZONE C-8 (FROM A4-11 72) TEST STEP 6A&C
(FROM A4-7 69) STEP TIME 7
FROM SH 1 ZONE C-8 (FROM A4-11 73) TEST STEP 7A&B
FROM SH 1 ZONE C-8 (FROM A4-11 74) TEST STEP 7A&C
FROM A4-7 78 STEP TIME 8
(TO A4-5 1) STEP TIME 8
FROM SH 1 ZONE C-8 (FROM A4-11 75) TEST STEP 8A&B
FROM SH 1 ZONE C-8 (FROM A4-11 76) TEST STEP 8A&C
(FROM A4-7 77) STEP TIME 9
FROM SH 1 ZONE C-8 (FROM A4-11 77) TEST STEP 9A&B
FROM SH 1 ZONE C-8 (FROM A4-11 78) TEST STEP 9A&C
NOT USED
FROM SH 1 ZONE B-6 (FROM A4-9 5) 1000 HZ
TO SH 1 ZONE C-8 (TO A4-11 5) 1000 HZ
28 V RET
GRD
5TH CHANNEL ENABLE
FROM SH 1 ZONE B-6 (FROM A4-9 65) X (INPUT)
FROM SH 1 ZONE B-6 (FROM A4-9 67) CARD REMOVAL
TO SH 1 ZONE C-9 (TO A4-11 68) CARD REMOVAL
ATI U/V INHIBIT O/P (TO A5-13 49) TO SH 3 ZONE B-57
STEP 6 (TO A5-B 74)
STEP 6A (TO A5-B 75)
STEP 6B (TO A5-B 76)
STEP 6C (TO A5-B 77)
STEP 7 (TO A5-B 71)
STEP 7A (TO A5-B 73)
STEP 7B (TO A5-B 78)
STEP 7C (TO A5-B 72)
STEP 8 (TO A5-B 70)
STEP 8A (TO A5-B 75)
STEP 8B (TO A5-B 76)
STEP 8C (TO A5-B 77)
STEP 9 (TO A5-B 71)
STEP 9A (TO A5-B 75)
STEP 9B (TO A5-B 78)
STEP 9C (TO A5-B 72)
TO SH 3 ZONE D-49
TO SH 3 ZONE C-49
TO SH 3 ZONE B-49
NOT USED
X OUTPUT
ALL OUTPUT RELAYS BLOCKED IND. (TO A1, J1 B) TO SH 1 ZONE D-8
TO SH 1 ZONE C-5
TO SH 1 ZONE C-14
TO SH 1 ZONE C-12
COM
TO SH 3
ATI DISABLE (TO A5-13 49) ZONE B-57
4HZ FLASHING LOGIC (TO A4-14) TO SH 1 ZONE C-15
1000 HZ (TO A4-9 5) TO SH 1 ZONE B-6
1000 HZ (TO A4-B 5
MASTER OSCILLATOR FAILURE (TO A4-5 21)
STEP TIME 1 (TO A4-9 9)
STEP TIME 2 (TO A4-9 15)
STEP TIME 3 (TO A4-9 21)
STEP TIME 4 (TO A4-9 27)
STEP TIME 5 (TO A4-9 33)
STEP TIME 6 (TO A4-10 4)
STEP TIME 7 (TO A4-10 10)
STEP TIME 8 (TO A4-10 16)
STEP TIME 9 (TO A4-10 22)
1000 HZ CLOCK (TO A4-5 51)
1000 HZ CLOCK (TO A4-1 5) TO SH 3
+V + 5TH RESP'N PULSE ZONE C-59
(TO A4-14, 78) SH 1 ZONE C7
TO SH 1 ZONE C-6
TO SH 1 ZONE C-6
FROM SH 1 ZONE C-6
FROM SH 1 ZONE B-6
29
28
27


RELAY DRIVER 6N342 A5-4
ATI (TO A5-14.43) TO SW.3
OUT 1 SI MAIN ZONE C-5
ATI (TO A5-14.44) TO SW.3
OUT 2 SI MAIN ZONE C-5
ATI (TO A5-14.45) TO SW.3
OUT 3 SI MOM ZONE C-5
ATI (TO A5-14.13) TO SW.3
OUT 4 LOAD SHED ZONE C-5
ATI (TO A5-15.17) TO SW.3
OUT 5 STEP 4 ZONE C-55
ATI (TO A5-15.18) TO SW.3
OUT 6 STEP 4A ZONE C-55
ATI (TO A5-15.19) TO SW.3
OUT 7 STEP 4B ZONE C-55
ATI (TO A5-15.20) TO SW.3
OUT 8 STEP 4C ZONE C-55
RELAY DRIVER 6N342 A5-5
ATI (TO A5-14.14) TO SW.3
OUT 1 BLOCK ZONE C-5
ATI (TO A5-14.15) TO SW.3
OUT 2 BLOCK ZONE C-5
ATI (TO A5-14.16) TO SW.3
OUT 3 BLOCK ZONE C-5
OUT 4 AUX SPARE FAIL TO OPEN
ATI (TO A5-15.21) TO SW.3
OUT 5 STEP 5 ZONE C-55
ATI (TO A5-15.22) TO SW.3
OUT 6 STEP 5A ZONE C-55
ATI (TO A5-15.23) TO SW.3
OUT 7 STEP 5B ZONE C-55
ATI (TO A5-15.24) TO SW.3
OUT 8 STEP 5C ZONE C-55
RELAY DRIVER 6N342 A5-6
ATI (TO A5-14.17) TO SW.3
OUT 1 BLOCK ZONE C-5
ATI (TO A5-14.18) TO SW.3
OUT 2 BLOCK ZONE C-5
ATI (TO A5-14.19) TO SW.3
OUT 3 BLOCK ZONE C-5
OUT 4 SEQUENCER TROUBLE REMOTE
ATI (TO A5-15.25) TO SW.3
OUT 5 STEP 6 ZONE C-55
ATI (TO A5-15.26) TO SW.3
OUT 6 STEP 6A ZONE C-55
ATI (TO A5-15.27) TO SW.3
OUT 7 STEP 6B ZONE C-55
ATI (TO A5-15.28) TO SW.3
OUT 8 STEP 6C ZONE C-55
A6V RETURN
RELAY DRIVER N342 A5-7
ATI (TO A5-14.20) TO SW.3
OUT 1 BLOCK ZONE C-5
ATI (TO A5-14.21) TO SW.3
OUT 2 BLOCK ZONE C-5
ATI (TO A5-14.22) TO SW.3
OUT 3 BLOCK ZONE C-5
OUT 4 SWITCHGEAR TROUBLE REMOTE
ATI (TO A5-15.29) TO SW.3
OUT 5 STEP 7 ZONE B-55
ATI (TO A5-15.30) TO SW.3
OUT 6 STEP 7A ZONE B-55
ATI (TO A5-15.35) TO SW.3
OUT 7 STEP 7B ZONE B-55
ATI (TO A5-15.36) TO SW.3
OUT 8 STEP 7C ZONE B-55
A2-13.15
A2-13.16
K311
RESET SEQUENCER
CONNECTORS LOCATED ON 9N57-2 CABINET, A6 F
SI APERTURE CARD
Also Available On Aperture Card
9202200459-05
KGF8909


SEQUENCER
CONTROLLER
B
GN860-2
A4-5
(FROM A4-2, 65)
LOP MONITOR ALARM
UV SIGNAL
SI SIGNAL
UV SIGNAL DELAYED (TO A4-3 17)
SI SIGNAL DELAYED (TO A4-3 20)
SEQ LOGIC FAILURE IND (TO A1-J2 B)
UNDERVOLTAGE (TO A1-J2 B)
AUDIBLE ALARM
BLOCK (TO A5-8 63 & 65)
BLOCK (TO A5-9 63 & 64)
BLOCK (TO A5-10 69 & 71)
BLOCK (TO A5-10 75)
CARD REMOVAL (TO A4-7 68)
BATTERY BACK-UP FAIL
AUX CONTACTS CLOSED
TIME DELAY #1
TIME DELAY #2
UNDER VOLTAGE RELAY
SI MAIN
D.C. POWER FAILURE
GEAR TROUBLE
TO SH 1 ZONE D-16
TO SH 1 ZONE D-4
TO SH 1 ZONE C-4
TO SH 1 ZONE B-4
28VDC
28V COM


BACK-UP POWER
+28VDC
28V COM
SEQUENCER TIMER
6N 868
A4-7
MASTER OSCILLATOR TEST
REDUNDANT OSCILLATOR TEST
(FROM A4-3 77) MAIN TIMING BUS
FROM SH 1 ZONE C-8
(FROM A4-11 42) MANUAL TEST
(FROM A4-3 70) (W/V+ 51) RESET
(FROM A4-3 67) CARD REMOVAL
TO SH 1 ZONE B-6 (TO A4-9 68) CARD REMOVAL
MANUAL TEST RESET PULSE
1000 HZ CLOCK
(INTERNAL USE)
BATTERY BACK-UP
6N4-19
AZ-16
CARD REMOVAL
RESET MODULE
AZ-13
+28V
28V COM
SI APERTURE CARD
Also Available On Aperture Card
9202200459-06
KGF8909


66
65
64
63
INTER-CABINET CABLE
FROM SH1 ZONE A-31
FROM A2-16,67 CARD REMOVAL
TO SH1 ZONE D-17
U/V A
U/V ISOLATION MODULE 1
7N233
SIG
COM
TB3
TB1
TB2
115VAC
-15V COM +15V
BISTABLE 3RD
9N57-2, A3-1
6N358
ATI
(TO A4-1,7)
LATCH LAMP
ATI/FIELD RETURN
ATI RETURN
+15V COMMON -15V
±15V
U/V B
U/V ISOLATION MODULE 2
7N233
BISTABLE 2ND
9N57-2, A3-2
ATI A TRAIN
ATI P TRAIN
ATI (FROM A5-16,59)
ENABLE BISTABLE 2A
47 ATI
(TO A5-12,41)
CARD REMOVAL
(TO A4-1,9)
BISTABLE 1ST
9N57-2, A3-3
ATI (FROM A5-16,43)
ENABLE BISTABLE 1A
(TO A4-1,37)
(TO A5-12,45)
U/V C
U/V ISOLATION MODULE 3
7N233
SIGNAL
COMMON
INTER-CAB. CABLE
A1-J3
U/V B
BISTABLE 3RD
9N57-2, A3-5
(TO A4-1,3)
U/V D
U/V ISOLATION MODULE 4
7N233
BISTABLE 2ND
9N57-2, A3-6
ATI (FROM A5-16,60)
ENABLE BISTABLE 2B
BISTABLE 1ST
9N57-2, A3-7
ATI (FROM A5-16,44)
ENABLE BISTABLE 1B



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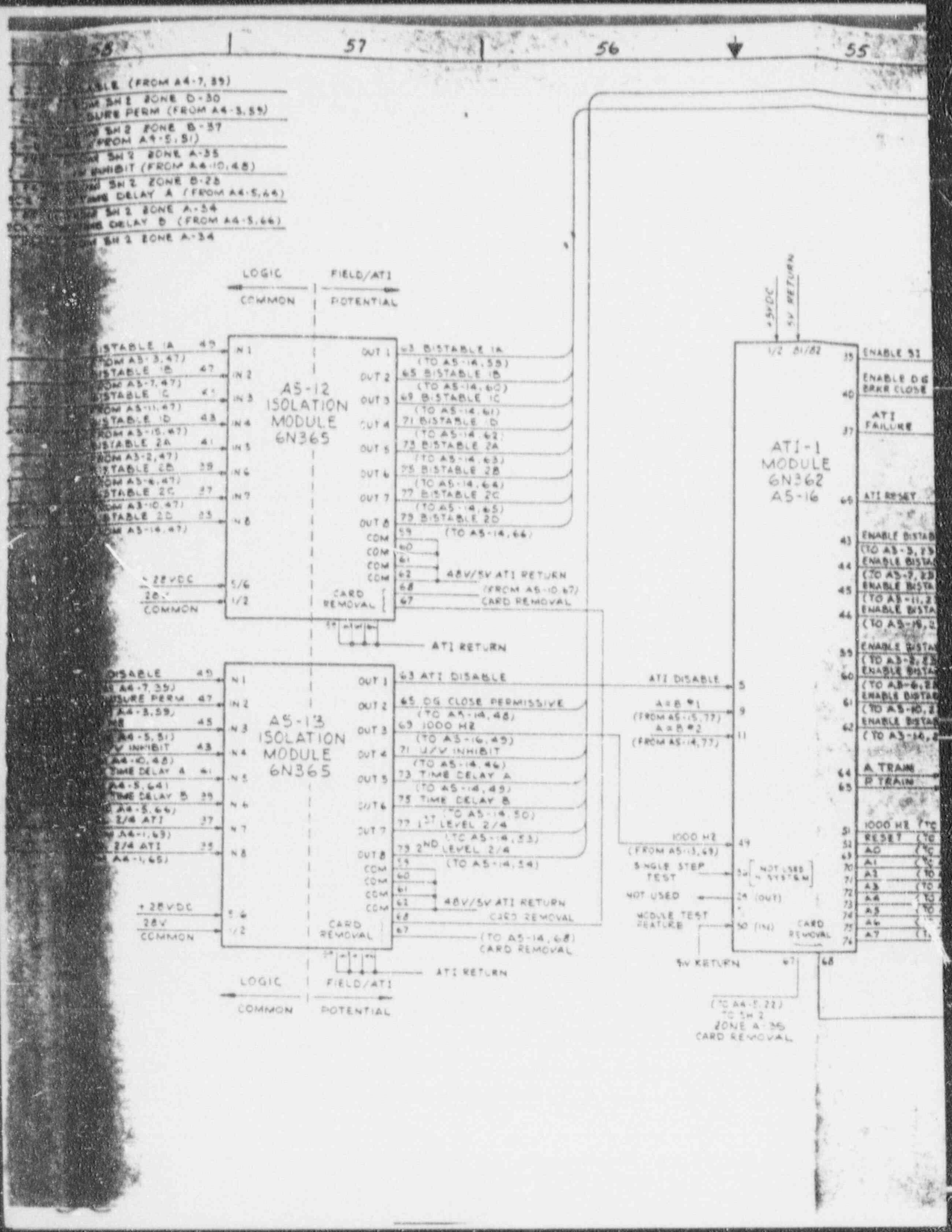
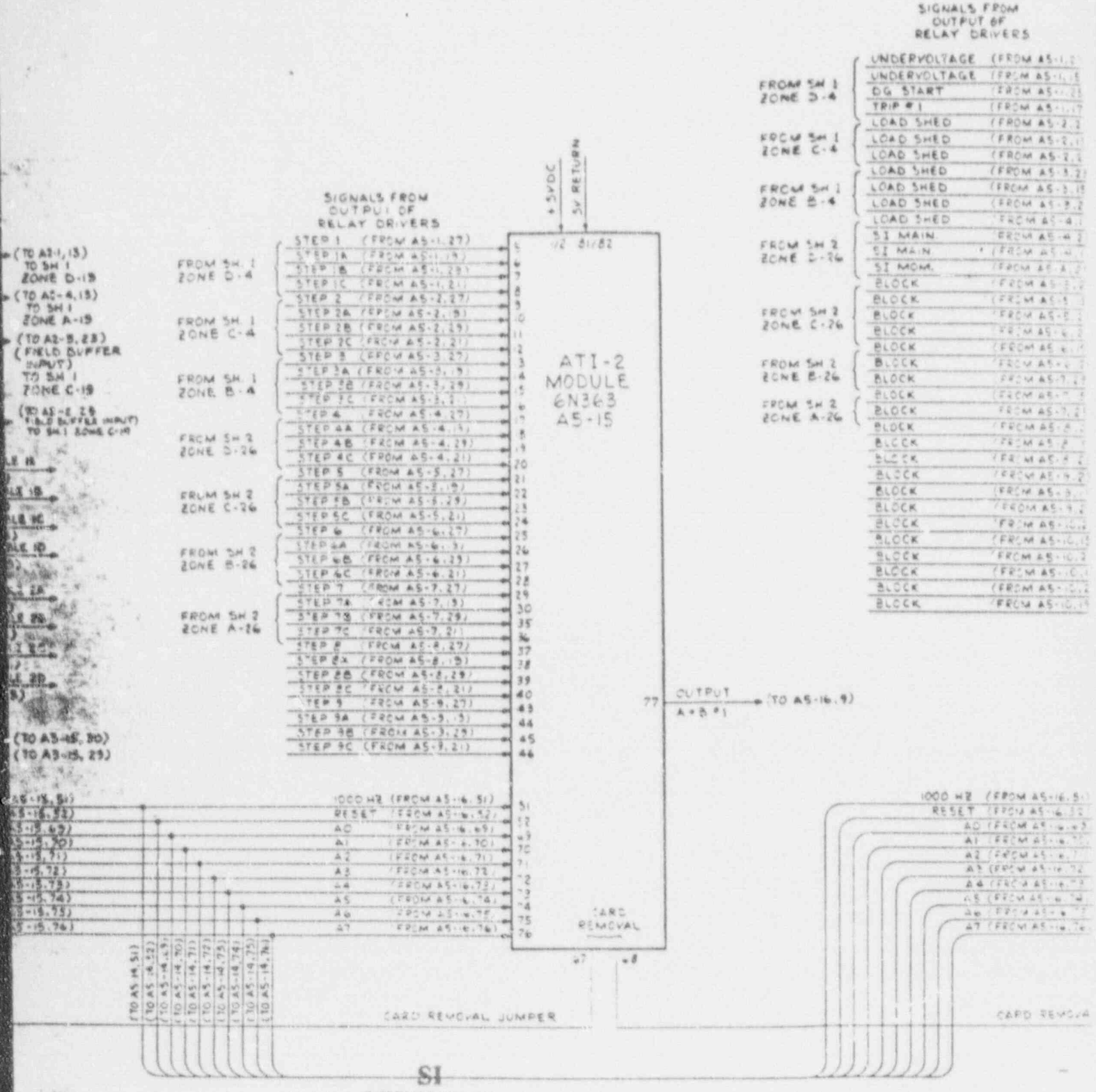
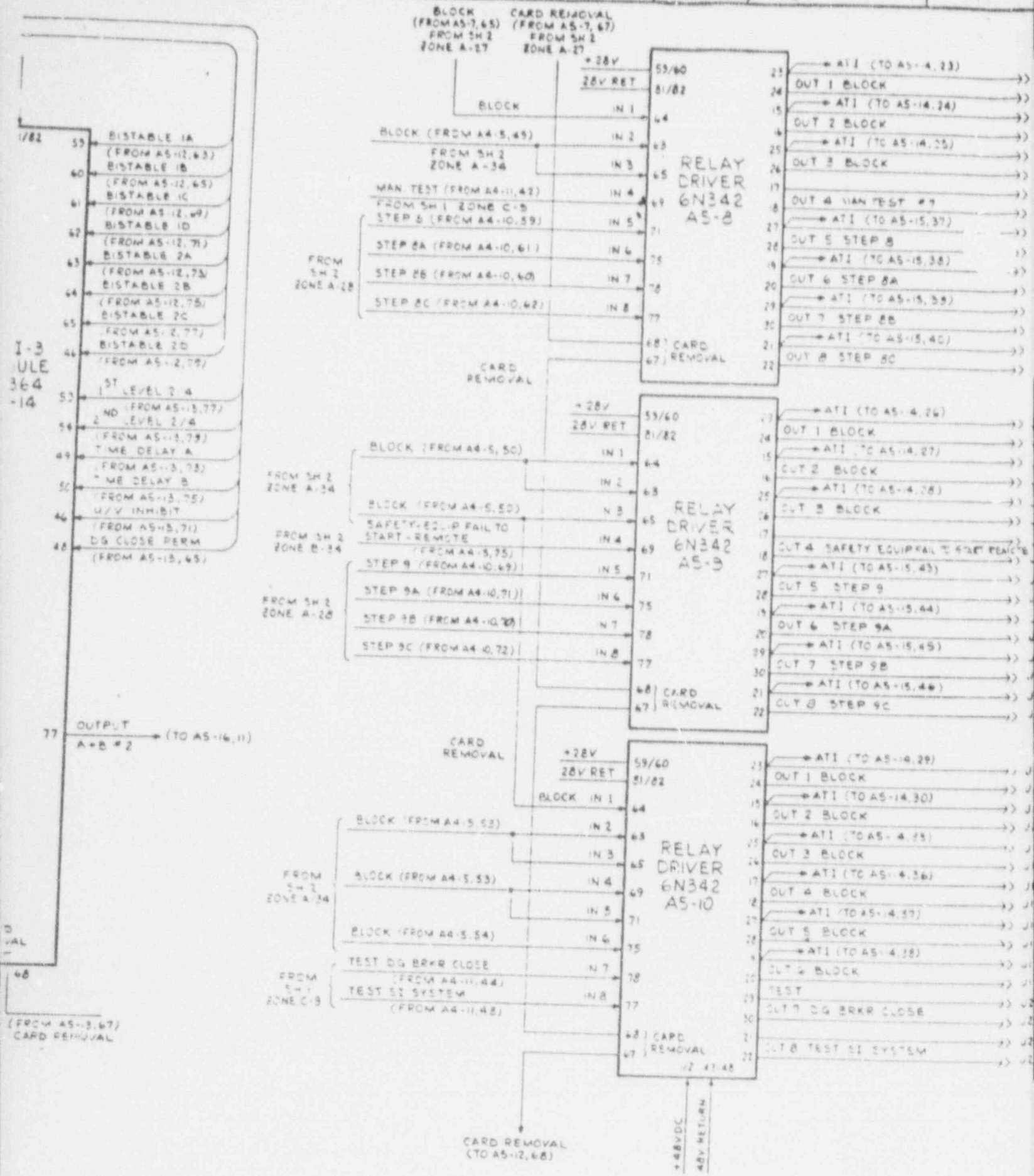

58
57
56
55
LOGIC COMMON
FIELD/ATI POTENTIAL
AS-12 ISOLATION MODULE 6N365
AS-13 ISOLATION MODULE 6N365
ATI-1 MODULE 6N362 A5-16
+5VDC
5V RETURN
CARD REMOVAL
ATI RETURN
48V/5V ATI RETURN
ATI DISABLE
1000 HZ
A TRAIN
B TRAIN
SINGLE STEP TEST
NOT USED
MODULE TEST FEATURE
ENABLE 52
ENABLE DG BRKR CLOSE
ATI FAILURE
ATI RESET
+28VDC
28V COMMON
(TO A5-14,55)
(TO A5-14,60)
(TO A5-14,61)
(TO A5-14,62)
(TO A5-14,63)
(TO A5-14,64)
(TO A5-14,65)
(TO A5-14,66)
(TO A5-14,48)
(TO A5-16,49)
(TO A5-14,46)
(TO A5-14,49)
(TO A5-14,50)
(TO A5-14,53)
(TO A5-14,54)
(TO A5-14,68)
(TO A4-5,22) TO SH 2 ZONE A-35 CARD REMOVAL




BLOCK (FROM A5-7,65) FROM SH 2 ZONE A-27
CARD REMOVAL (FROM A5-7,67) FROM SH 2 ZONE A-27
RELAY DRIVER 6N342 A5-8
RELAY DRIVER 6N342 A5-9
RELAY DRIVER 6N342 A5-10
+28V
28V RET
BLOCK
MAN TEST (FROM A4-11,42)
STEP 8 (FROM A4-10,59)
STEP 8A (FROM A4-10,61)
STEP 8B (FROM A4-10,60)
STEP 8C (FROM A4-10,62)
CARD REMOVAL
STEP 9 (FROM A4-10,69)
STEP 9A (FROM A4-10,71)
STEP 9B (FROM A4-10,70)
STEP 9C (FROM A4-10,72)
TEST DG BRKR CLOSE (FROM A4-11,44)
TEST SI SYSTEM (FROM A4-11,48)
OUTPUT A+B #2 (TO A5-16,11)
(FROM A5-3,67) CARD REMOVAL
CARD REMOVAL (TO A5-12,68)
+48V DC
48V RETURN

47 | 46 | 45

J8,S J8,T (K256)
J8,U J8,V (K257)
J8,E J8,F (K262)
J8,H J8,J (K263)
J8,K J8,M (K264)
J9,C J9,D (K274)
J9,E J9,F (K275)
J9,S J9,T (K280)
J9,U J9,V (K281)
J12,U J12,V (K357)
J3,X J3,Y (K169)
J4,X J4,Y (K193)
J3,Z J3,AA (K170)
J4,Z J4,AA (K194)
J3,BB J3,CC (K171)
J4,U J4,V (K181)
J3,DD J3,EE (K172)
J4,W J4,X (K182)
J10,C J10,D (K302)
J10,E J10,F (K303)
J10,S J10,T (K308)
J10,U J10,V (K309)
J10,W J10,X (K310)
J10,E J10,F (K314)
J10,X J10,Y (K321)
J10,H J10,J (K315)
J10,K J10,M (K316)
J10,Y J10,W (K320)
J10,Z J10,AA (K322)
J12,A J12,B (K340)
J9,X J9,Y (K293)
J9,Z J9,AA (K294)
J9,Y J9,Z (K285)
J9,K J9,L (K277)
J8,Y J8,Z (K259)
J8,K J8,L (K253)
J11,C J11,D (K326)
J11,E J11,F (K327)
J11,H J11,J (K328)
J11,S J11,T (K332)
J11,U J11,V (K333)
J11,W J11,X (K334)
J11,H J11,J (K338)
J11,K J11,M (K340)
J11,Z J11,AA (K346)
J12,C J12,D (K350)
J12,E J12,F (K351)
J12,E J12,F (K362)
J12,H J12,J (K363)
J12,Y J12,W (K348)
J12,K J12,Y (K349)
A B (K134) (FOR SYSTEM INPUT ITBS1-2 AND ITBS1-3)
Y Z (K135) (FOR SYSTEM INPUT ITBS2-3 AND ITBS2-4)

CONNECTORS LOCATED IN 3N57-2 CABINET, A6 PANEL

D C B A

05-143-90

D R A F T

ROOT CAUSE - 1A Diesel Shutdown

The team believes that the 1A diesel tripped because of a combination of an intermittent failure of a jacket water temperature switch and/or inconsistent calibration techniques of these switches during 1R2. Subsequent testing has shown that the 3/20/90 diesel annunciator indication could be reproduced on a high jacket water trip. The jacket water trip switches have proven reliable on these and similar engines between overhauls.

Key Lesson Learned and Recommendations

1. Calibration procedures should be reviewed with the vendor to ensure that calibrations are consistent, and switch performance is reliable.

2. Operator training should be revised to ensure that operators realize that an emergency reset will override the high jacket water trip.

3. Maintenance procedures should be revised to ensure that post overhaul control air leaks meet acceptance standards (bubble test performed).

4. The undervoltage start of the diesel should be changed to bypass non-essential engine trips to improve overall reliability.

Diesel Reliability

In 1989 Vogtle diesels have been more reliable than other nuclear industry diesels.

Safety System Performance (Emergency AC Power -- BWR & PWR)

	1987	1988	1989
US BQ	0.010	0.009	0.012
US MEDIAN	0.017	0.017	0.020
SISTERS	0.027	0.033	0.030
VOGTLE U1	0.04	0.05	0.006
VOGTLE U2			0.006

UNIT ONE D/G TRIP SENSOR HISTORY (SUMMARY)

MWO #	DATE	D/G	SENSOR	COMMENTS
18624684	12/22/86	1A	LO Turbo LO Press 1PSL-4749D	Called - failed - replaced
18806902	10/11/88	1A	TSH-19112 - JW Hi Temp	Found out of tol. during PM - recal.
18805581	10/18/88	1A	TSH-19112 - JW Hi Temp	Found defective - replaced
18807746	11/03/88	1A	TSH-19110 & 11 - [illegible] Hi Temp	Just PM'ed - found bad (out of cal.) - found 2 bad sensors from whse. - finally replaced w/good sensors
18806912	10/08/88	1B	1PS-19177 - LO LO Press 1PS-19183 - LO LO Press	Failed cal - wouldn't reset properly - replaced under 18807392
18807085	10/09/88	1A	Hi Main Brng Temp Sensors G, H, F	Replaced due to air leaks
18807637	10/27/88	1B	1TSH-19154 HI LO Temp 1TSH-19119 JW HI Temp	Re-calibrated OK Wouldn't cal - 1st new sw. from whse. also wouldn't cal - finally got one from whse. to cal OK
18807793	10/31/88	1B	1TSH-19117 & 18 JW HI Temp	Failed - had to replace w/new switches
18906313	12/13/89	1B	1TSH-19154 HI LO Temp	Spurious alarm on D/G 1B Control Panel - most likely intermittent switch

MWO #	DATE	D/G	SENSOR	COMMENTS
19000016	01/04/90	1B	1PSL-4859E Rt Bank Lo Turbo Oil Press	Found switch venting - replaced
19000439	03/01/90	1A	Various	PM of various trip sensors signed off 3/10/90
19000442	03/14/90	1B	1TSH-4857E Hi Temp Main Brng	Found out of cal high - replaced under normal PM
19000443	03/05/90	1A	1TSH-4747F Hi Temp Main Brng	Found out of cal high - replaced under normal PM
19001433	03/22/90	1A	1PS-4749A,B,C Lo LO Press	Post Event Investigation found A switch would not reset - replaced all 3
			1PSL-19114 Lo JW Press	Cal checked - OK
19001482	03/22/90	1B	1TSH-4850 Hi Temp LO	Would not cal to within tolerance - replaced
19001511	03/24/90	1B	1TSH-19117, 18, 19 Hi Temp JW	19117 and 19 were replaced - 18 recaled
			1TSH-19153 Hi Temp LO	Replaced
19001542	03/26/90	1B	1PSL-4903 P-3	Cal checked - OK
19001629	03/29/90	1A	1TSH-19110, 11, 12 Hi Temp JW	Cal checked - OK
			1TSH-19146 Hi Temp LO	Cal checked - acting sluggish - replaced
19001677	03/30/90	1A	1PSL-4749D,E Turbo LO Lo Press	Cal checked - OK
19001683	03/31/90	1A	1TSH-19111, 12 Hi Temp JW	Found venting - replaced

UNIT TWO D/G TRIP SENSOR HISTORY (SUMMARY)

MWO #	DATE	D/G	SENSOR	COMMENTS
28800543	01/24/88	2A	2X5-4746A Hi Vibration	Found venting - replaced
28800810	02/05/88	2A	2PSL-19114 JW Lo Press	Venting - found out of tolerance - recald
28800552	01/25/88	2A	2TSH-19146 Hi Temp LO	Cel checked when connected to D/G
28800918	02/05/88	2A	2PSL-4749 A,B,C LO Lo Press	Cal checked - OK
28800919	02/05/88	2A	2PSH-4744 Hi Crank case Press 2PSL-4749 D,E Lo Press Turbo LO	Cal checked - OK
28801450	02/26/88	2B	2TSH-19153 LO Hi Temp	Cal checked - OK
28801547	02/26/88	2B	2PSL-4859 A,B,C, Lo Press LO	Cal checked - OK
28001546	02/26/88	2B	2PS-4854 Crankcase Hi Press 2PSL-4859 D,E, LO Press Turbo LO 2PSL-19121 JW Lo Press	Cal checked - OK
28802648	04/13/88	2B	2XS-4856A D/G Eng Hi Vibration	Would not trip - Replaced
28803452	04/20/88	2B	2TSH-19119 JW Hi Temp	Found venting - calibrated
28805619	06/07/88	2B	2PSL-4859 A,B,C, Lo Press LO	Cal checked due to Calcon Part 21 - no adj. required
28805620	06/07/88	2A	2PSL-4749 A,B,C Lo Press LO	Cal checked due to Calcon Part 21 - no adj. required
28807390	07/21/88	2B	2TSH-19117, 18, 19 Hi JW Temp	Engine tripped due to 2 switches venting - recalibrated
28819595	12/08/88	2A	2XS-4745B Turbo Hi Vibration	Switch malfunctioned and tripped engine - replaced

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