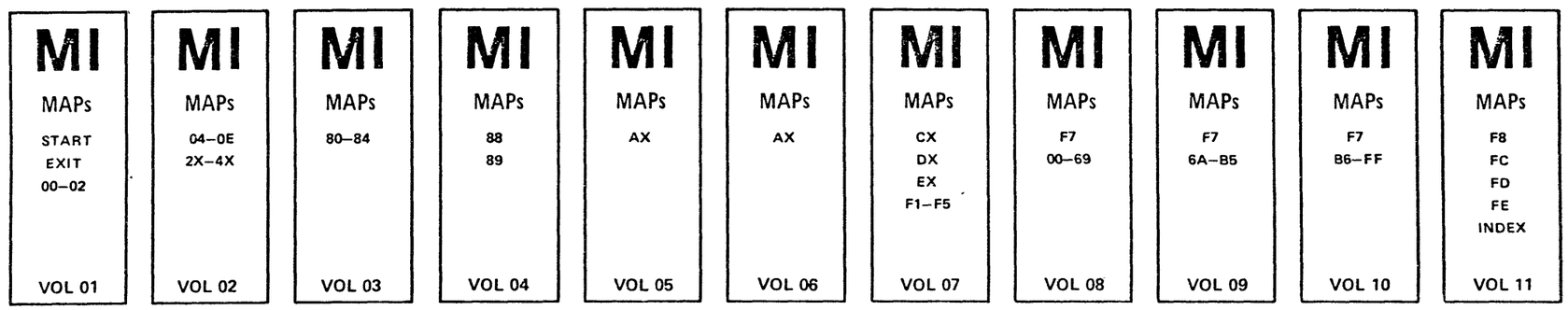
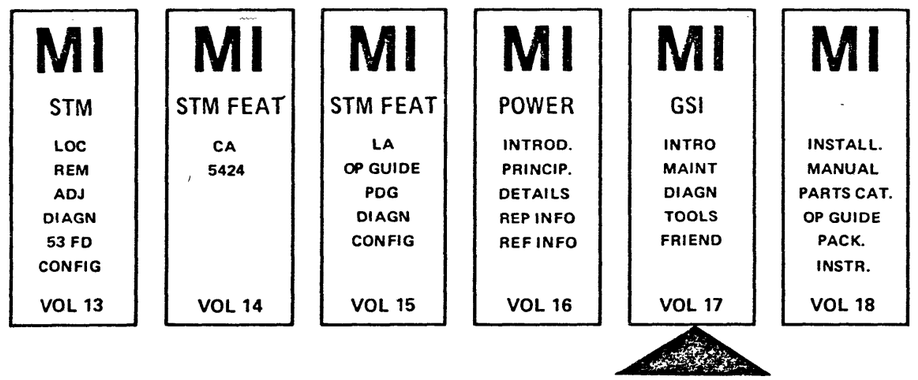
IBM Maintenance Information





IBM 4331 Processor General System Information

EC 366493
26 Oct 81

P/N 4687038
Page 1 of 2

0 100 F

GSI

Preface

This manual provides general information to the IBM 4331 Processor. The manual contains the following major items.

- Section 1 contains an overview of the system documentation, a high level description of the system and the support subsystem.
- Section 2 describes the maintenance concept of the system, and how to use the MAPs.
- Section 3 contains information about error logging.
- Section 4 describes tools.
- Abbreviation List (page 9970).

Each section has its own table of contents.

The reader is assumed to have a good basic understanding of IBM system concepts.

The manual is not intended as a self-study course but as a recall document. It may also be used as an introduction to the system by people interested in the philosophy and concepts of the system but not in detailed maintenance or how-it-works information.

Volume Table of Contents

Volume: 17
Title: MI GSI, FRIEND
Machine Type: 4331-2
Power Design Level: 4/5
B/M Number: 5683367

General System Information, Section 2: Maintenance Concept

Table of Contents

GSI

Maintenance Concept

- Maintenance of the system is based on continuous monitoring by the support processor.
- When an error is detected, the failure symptoms are analyzed automatically and a reference code is generated. This reference code is used as MAP entry. Troubleshooting is guided by MAPs.
- Preventive Maintenance (see page 2170).

Reference Code

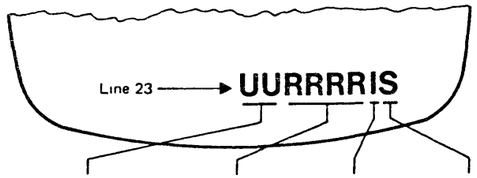
- The reference code is displayed on the screen, and is also logged onto the control diskette.
- The reference code provides:
  The entry to the MAPs, or IRECA, Reference data, and feedback to the development laboratory.

MAPs

- The MAPs contain either the name of the failing FRU (field replaceable unit), or procedures for further analysis down to the FRU.
- The MAPs also direct to diagnostic programs used for fault location, and to verify that the failing FRU was found and replaced correctly.

A short description of the diagnostic programs and their handling procedures is provided in Section 4 of the Supplement to MAPs (STM).

Reference Code Layout



Unit type indicates Basic Group and Detailed Groups of the MAPs (see Unit Type Table)

Reference data (may be used by PST-CE)

Log/ Test indicator
X'0' = Log
X'8' = Test

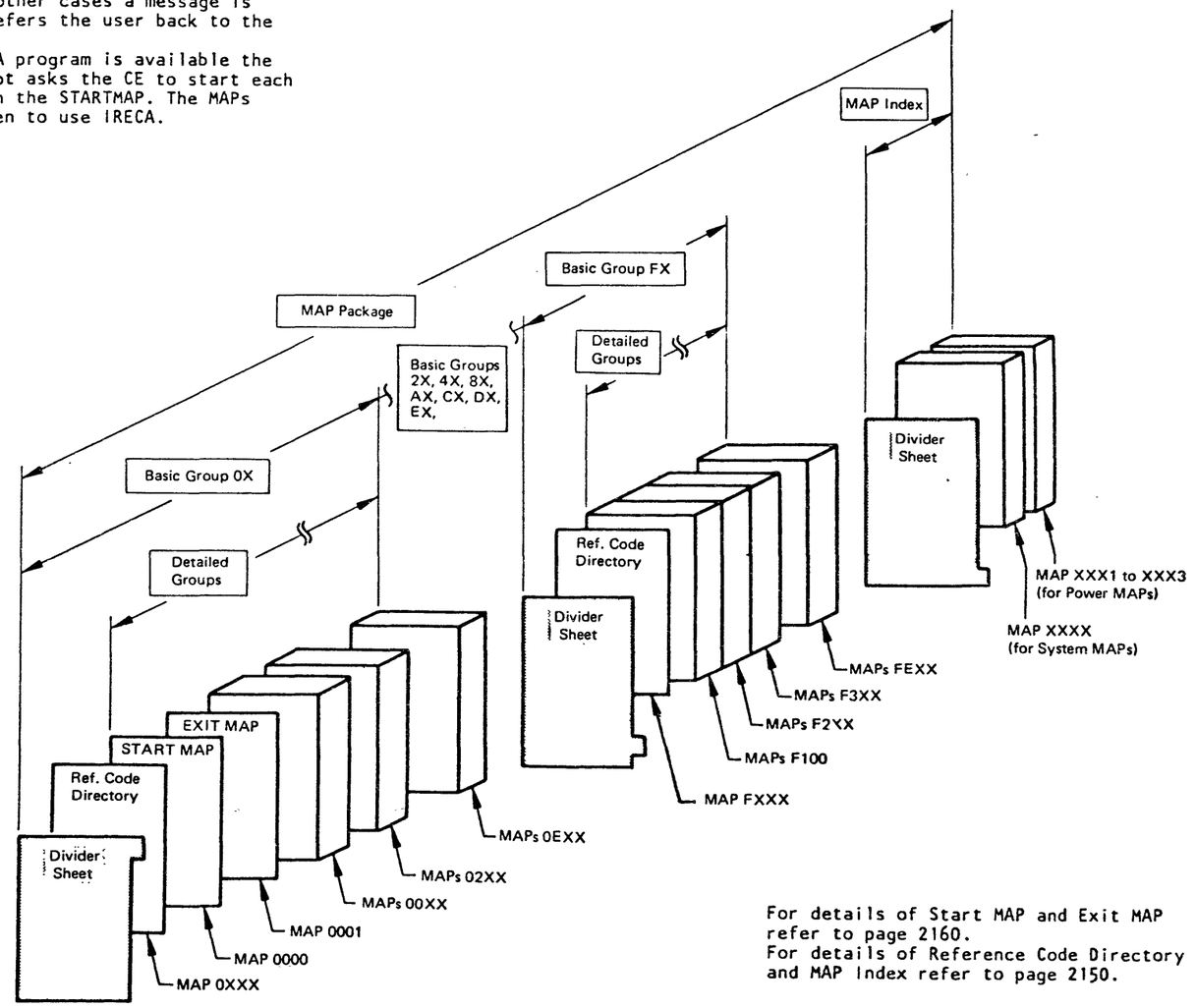
Reason Code
X'0' = Handling stop
X'1' = Error display
X'2' = Intervention required at device under test
X'3' = Intervention required due to error
X'F' = Abend (abnormal program termination)

IRECA

The integrated reference code analysis program (IRECA) assist the CE on his way through the Maps. The program should not be used as a stand alone tool.
The IRECA program resides on the diagnostic diskette. After selection any reference code generated by the system can be entered for analysis. But only those reference codes lead to an analysis result which do not need further manual intervention (such as signal probing). In all other cases a message is displayed which refers the user back to the MAP package.
Although the IRECA program is available the maintenance concept asks the CE to start each repair action with the STARTMAP. The MAPs than point out when to use IRECA.

Organization of the MAP Package

- The MAP package consists of a number of basic groups and the MAP Index. The basic groups are separated by divider sheets.
- Each basic group consists of several detailed groups (see Unit Type Table).
- Each detailed group contains the MAPs associated with a particular reference code.



For details of Start MAP and Exit MAP refer to page 2160.
For details of Reference Code Directory and MAP Index refer to page 2150.

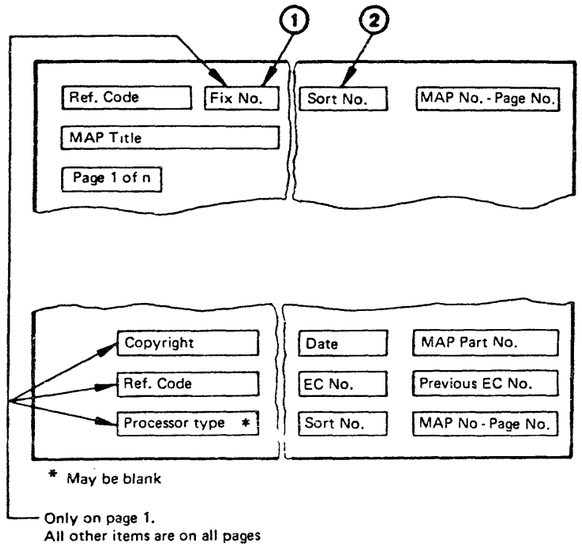
Unit Type Table

BASIC GROUP	DETAILED GROUPS	REMARKS
0X = No reference code on screen	00 = Introduction, Start MAP, Exit MAP, Call for Support MAP 01 = Procedures in STM 02 = Power problems 04 = IML problems 06 = Operator console failures 08 = Support subsystem 0C = Miscellaneous 0E = Operating system (DOS, EREP)	
2X = IC-bus 4331-1	None	4331-1 only
3X = IC-bus 4331-2	None	4331-2 only
4X = PU-BSM	49 = PU-BSM 4331-1 4B = PU-BSM 4331-2	4331-1 only 4331-2 only
8X = Channels	80 = BMPX 1 81 = BMPX 2 82 = HSC 84 = MPX 88 = CA channel checks 89 = CA unit checks	4331-2 only
AX = I/O Subsystem	A0 = Processor bus and adapter interfaces A1 = Processor A2 = I/O BBA (1) A3 = SCL adapter A8 = Loop adapter AA = 5424 adapter	

BASIC GROUP	DETAILED GROUPS	REMARKS
CX = Disk/Tape adapters	C0 = CTLI and interface adapters C1 = FTA1-CTLI C2 = FTA2-CTLI C3 = FTA3-CTLI C4 = FTA1 C5 = FTA2 C6 = FTA3 C8 =) reserved C9 =) CA =)	 4331-2 only 4331-2 only
DX = Disk/Tape ILTs	D0 = ILT monitor D8 = 8809 D9 = 3330 DA = 3340 DB = 3344 DD = 3310 DE = 3370	
EX = System related problems	E0 = IML problems / power on reset E1 = Timer damage E4 = PU programmed clock stop E6 = Customer manual operations E8 = Ambient recording EA = Internal program checks (excluding SPIL)	
FX = Support Subsystem	F0 = Processor bus and adapter interfaces F1 = Support Processor F2 = SP BBA (0) F3 = SBA/SCL adapter F4 = Transmit/receive F5 = SPIL program checks F7 = Power system F8 = Remote support F9 = DCA I/O counter overflow FC = Log-in and idle programs FD = Diskette drive adapter FE = Utilities	

MAP Page Layout

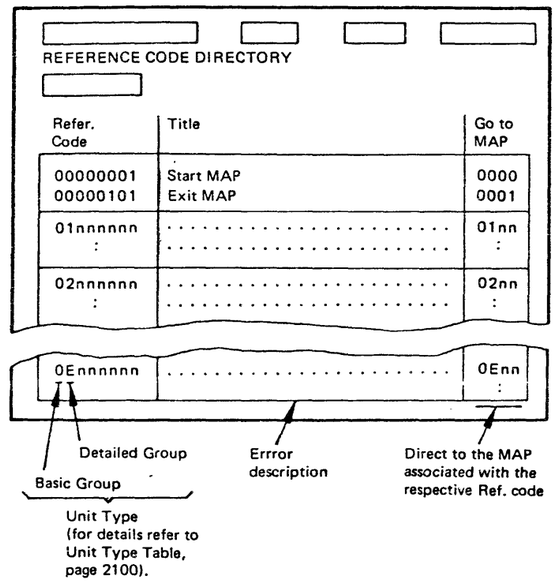
Common Parts



Reference Code Directory

The reference code directory in front of each basic group of the MAP package is used to find the appropriate MAP for troubleshooting.

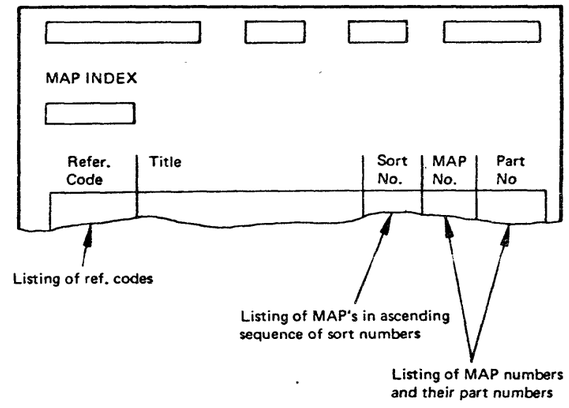
Example:



MAP Index

The MAP index is a table of contents of the entire MAP package. It is subdivided into two groups:

The first group is a listing of all system MAPs,
the second group is a listing of all power MAPs.



1 Fix Number

- Shows the number of fixes of the MAP. The CE has to update this number, whenever he inserts a fix.
- The fix number of a MAP updated by an engineering change shows the latest fix.

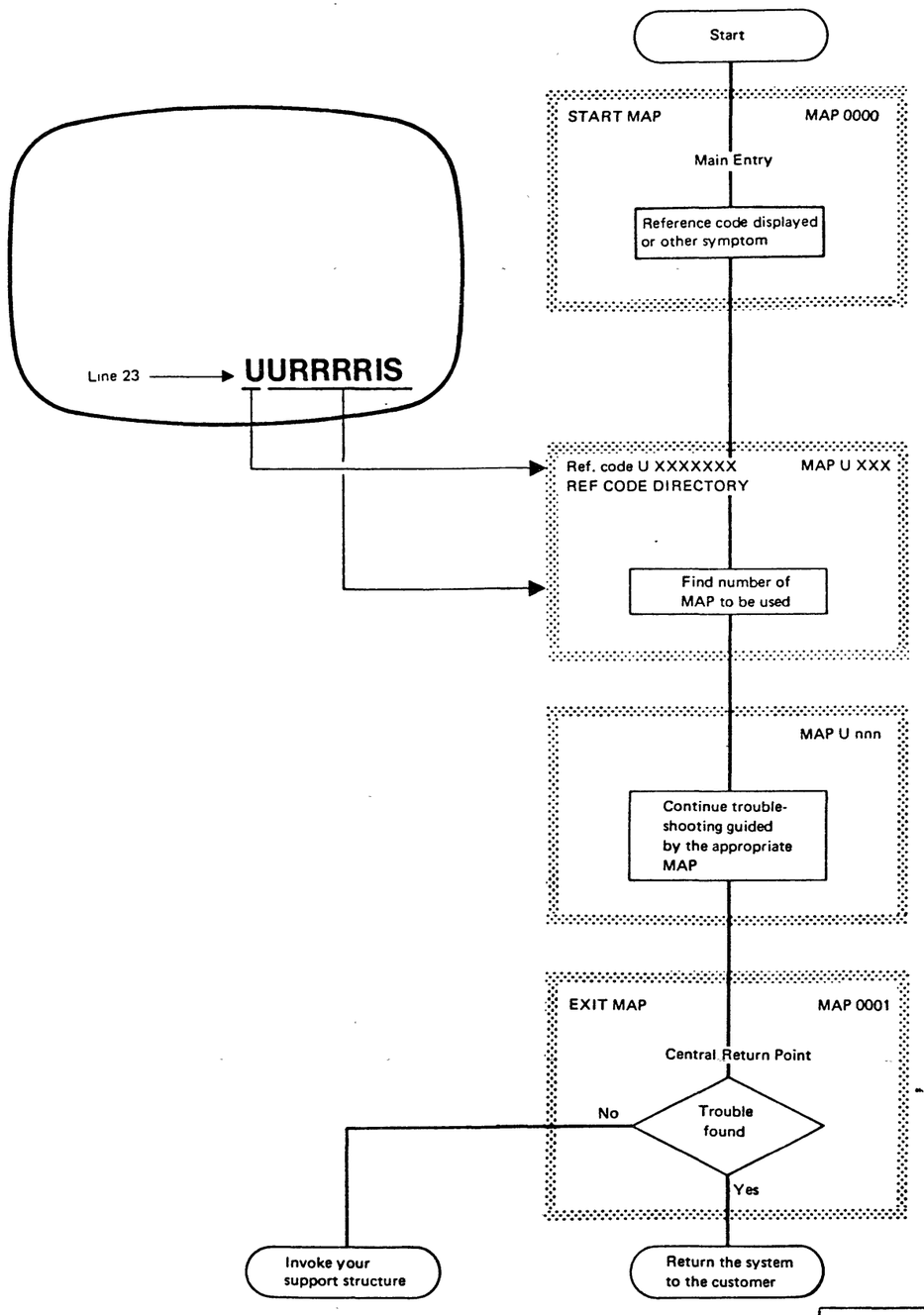
2 Sort Number

- The sort number is used to insert additional MAPs in the correct sequence.

The other items are self explanatory.

How to Use the MAPs

- Start troubleshooting always using the START MAP.
- Terminate troubleshooting always using the EXIT MAP.



The Start MAP contains:

- The main guidance and distribution to all other MAPs.
- The 'main entry' with information for troubleshooting.
- The start point for troubleshooting.

Whenever a signal has to be probed, use the General Logic Probe (GLP), described in Section 4 of this manual.

The Exit MAP contains:

- The 'central return point' after all CE activities.
- Procedures for final verification of all maintenance activities.
- Instructions to invoke support for a solution, if the MAPs fail.

GSI

Preventive Maintenance

The only preventive maintenance on the central electronic complex of the system has to be done on the air filters.
These filters are located in the front and back cover and should be maintained at least once a year. To do a proper maintenance the filters must be removed since dust and other particles which reduce air throughput collect on the inner side, see Figure B.
Clean or replace the filters.
In a very contaminated enviroment cleaning or replacement may be necessary more often.
After you have cleaned or replaced the filters make an entry in the inspection table, see Figure A.

Inspection Table

INSPECTION DATE	REPLACED	CLEANED
Air filter part no. 8483722		

Figure A

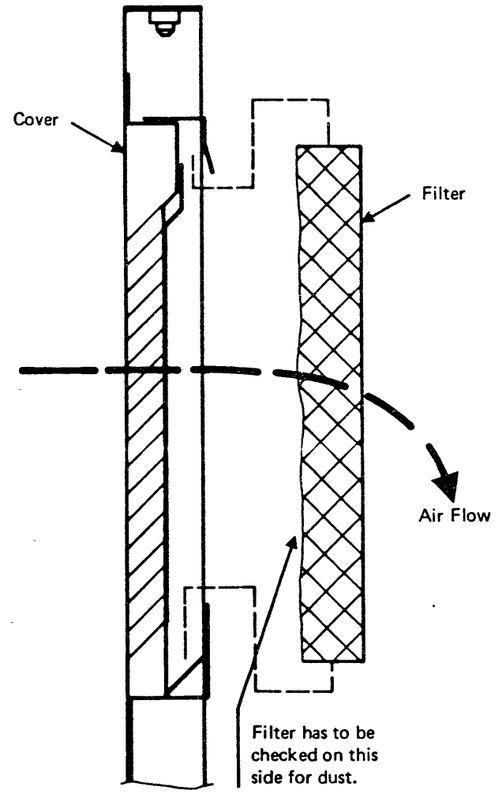


Figure B

General System Information, Section 4: Tools

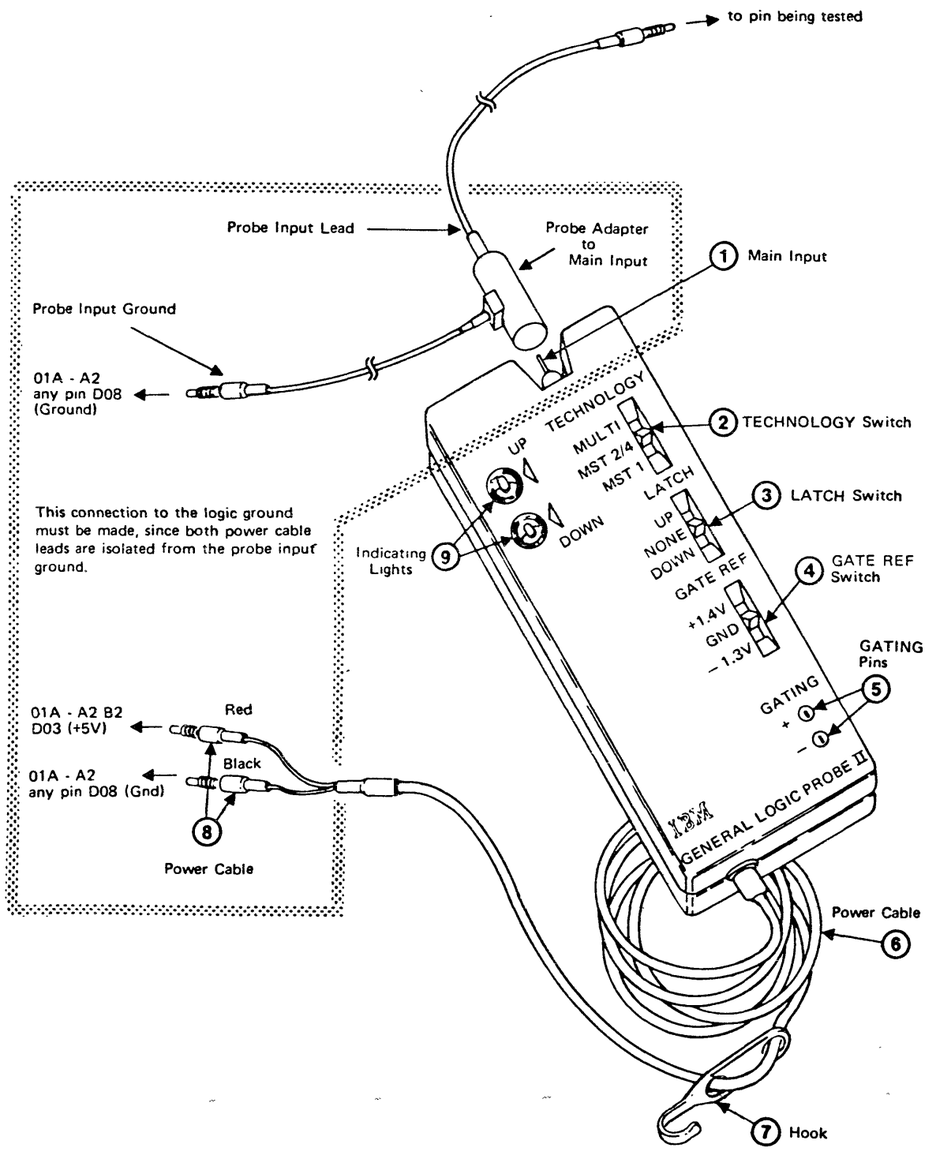
Table of Contents

General Logic Probe II (GLPII)

The GLPII is a tool used to detect logic signals. Its operation and maintenance are described in detail in the 'General Logic Probe II Manual', SY27-0127.
The GLPII can be used to check signals of two technologies in the system (Dutches and VTL), which are compatible; therefore the following guide applies to both technologies. It does not replace or override the instructions in the GLPII manual.

Preliminary Setup with Checking for Correct Operation

1. Connect cables as shown.
2. Set TECHNOLOGY switch 2 to MULTI.
3. Connect probe input lead to 01A-C2 F2 U02 (+osc. out):
   Both indicating lights 9 have to be on.
4. Connect probe input lead to 01A-B2J03, or D03, or U03 (+5V). Up indicator should be on. If the down indicator is on, it usually indicates a failure of the probe input around lead.

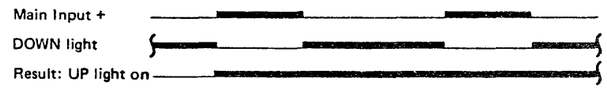


Latch Function

1. Perform preliminary setup with checking for correct operation.
2. Set TECHNOLOGY switch (2) to MULTI.
3. Set LATCH switch (3) to NONE.
4. Connect probe input lead to pin being tested.
5. If there is a valid static logic condition present, one of the indicator lights (9) is turned on:
   - If the UP light is on, set the LATCH switch to DOWN,
   - If the DOWN light is on, set the LATCH switch to UP.

   the light, which is off will be turned on, and both lights stay on.

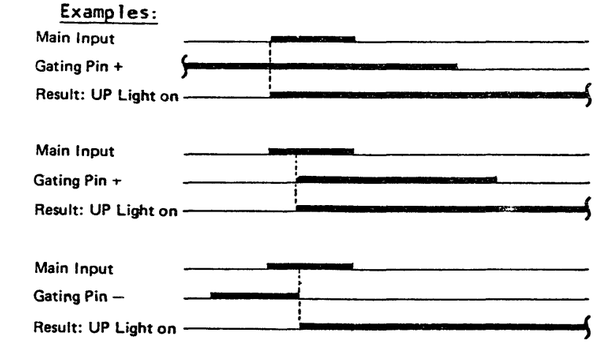
Example: The DOWN light was turned on in step 5, therefore the LATCH switch has been set to UP.



Latch Function with Gating

1. Perform preliminary setup with checking for correct operation.
2. Set TECHNOLOGY switch (2) to MULTI.
3. Set LATCH switch (3) to the expected level.
4. Set GATE REF switch (4) to +1.4 V.
5. Connect the board pin used for gating to the appropriate GATING pin (5).
6. Connect probe input lead to the pin being tested.
7. If there is no signal on the gate, the probe operates in the normal way.
   If, however, a signal is on the gate at the same time, a signal is present on the main input, the appropriate indicator light (9) is turned on.

Examples:



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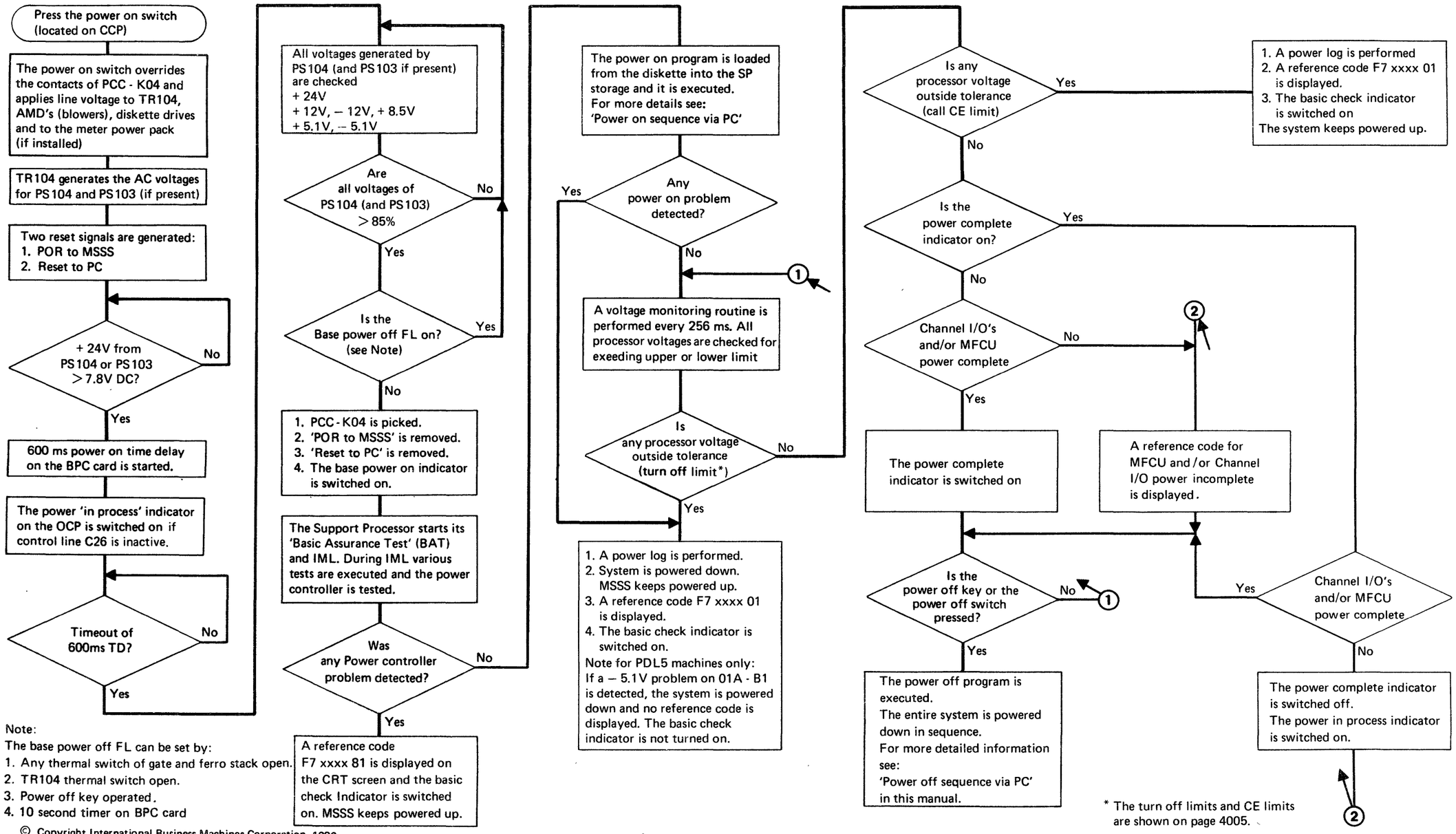
4331

Power

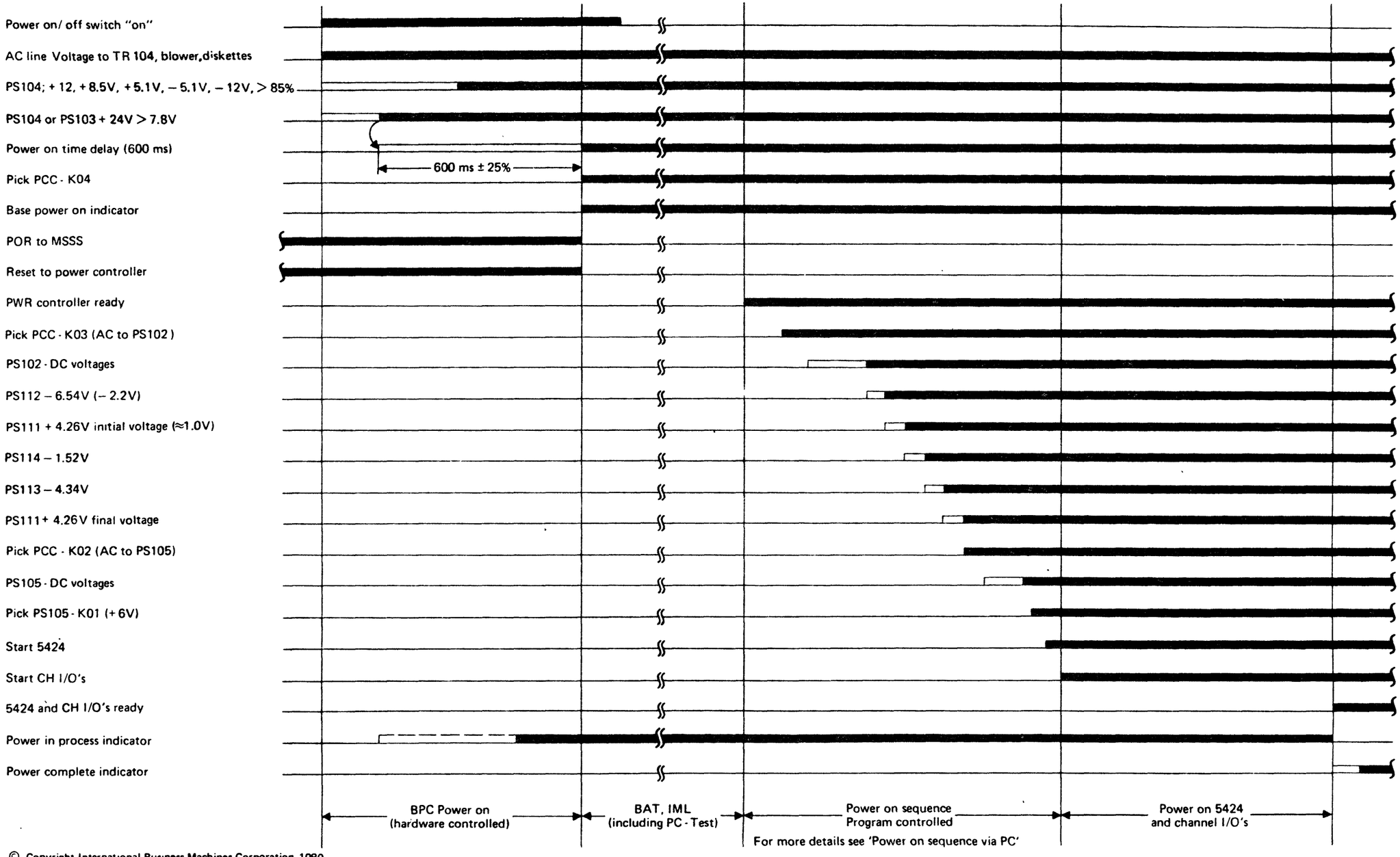
Power-On Sequence Flow Chart



Note:
The base power off FL can be set by:
1. Any thermal switch of gate and ferro stack open.
2. TR104 thermal switch open.
3. Power off key operated.
4. 10 second timer on BPC card

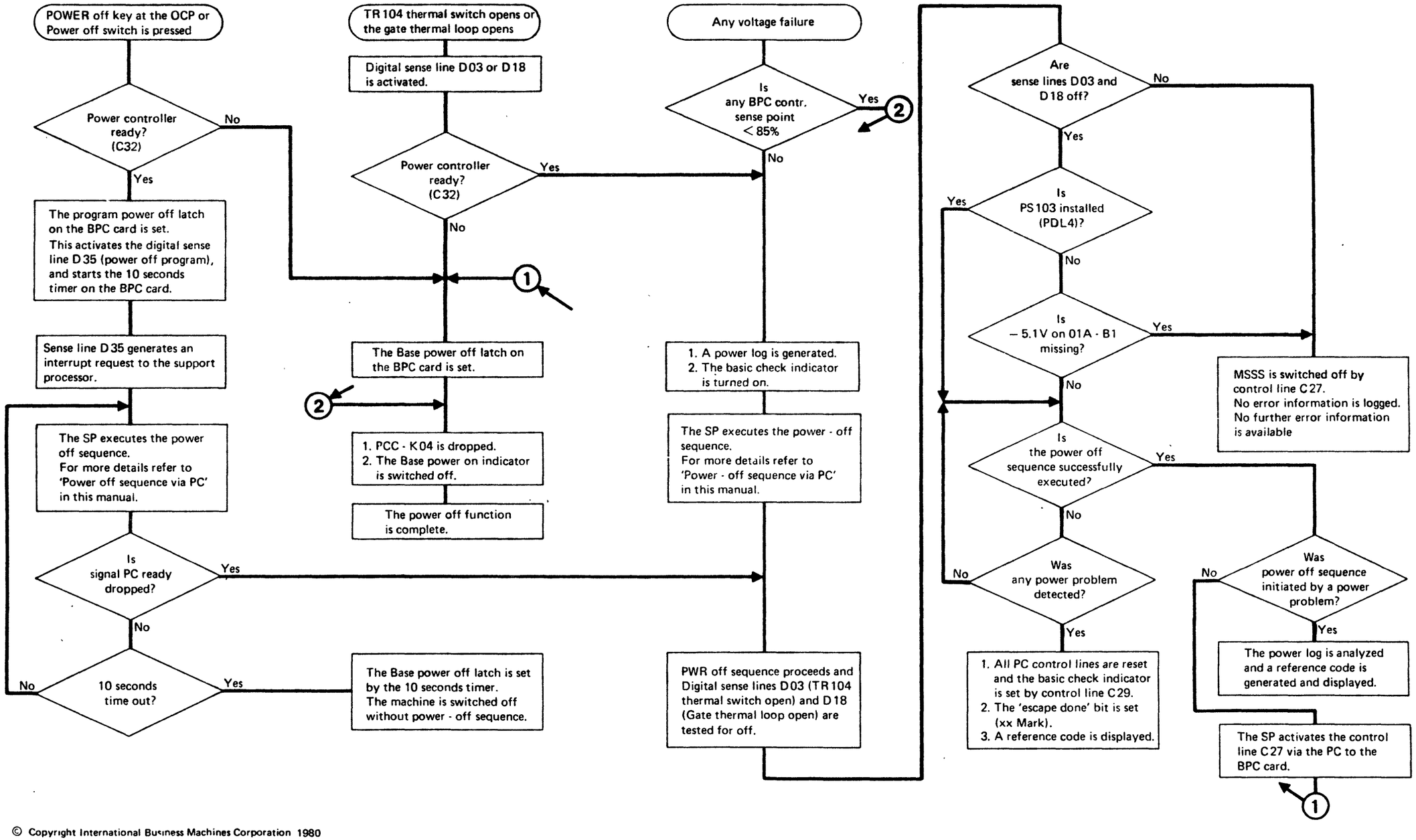
* The turn off limits and CE limits are shown on page 4005.

Power-On Sequence Timing Chart



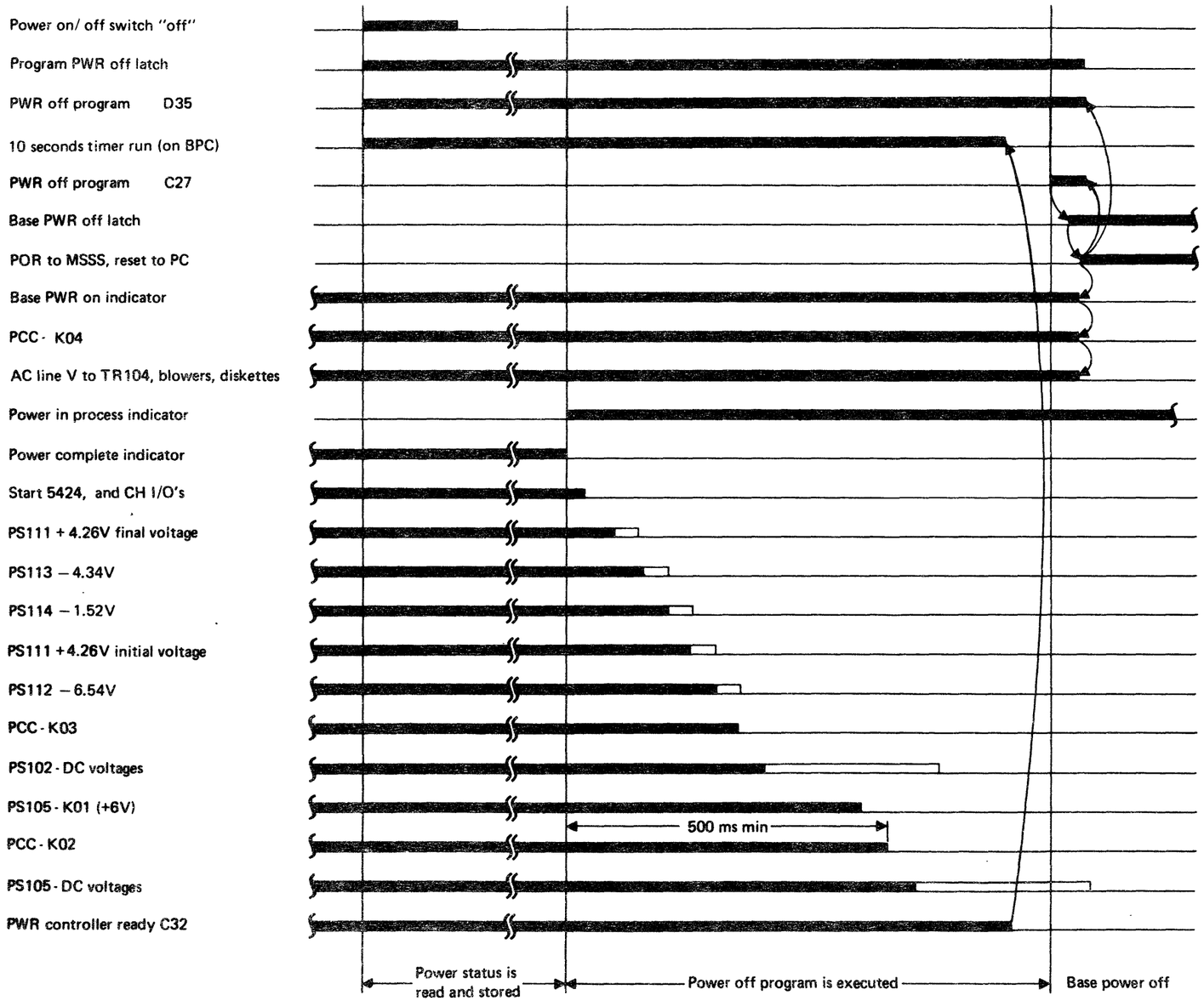
For more details see 'Power on sequence via PC'

Power-Off Sequence Flow Chart



Power-Off Sequence Timing Chart

(POWER CONTROLLER READY)



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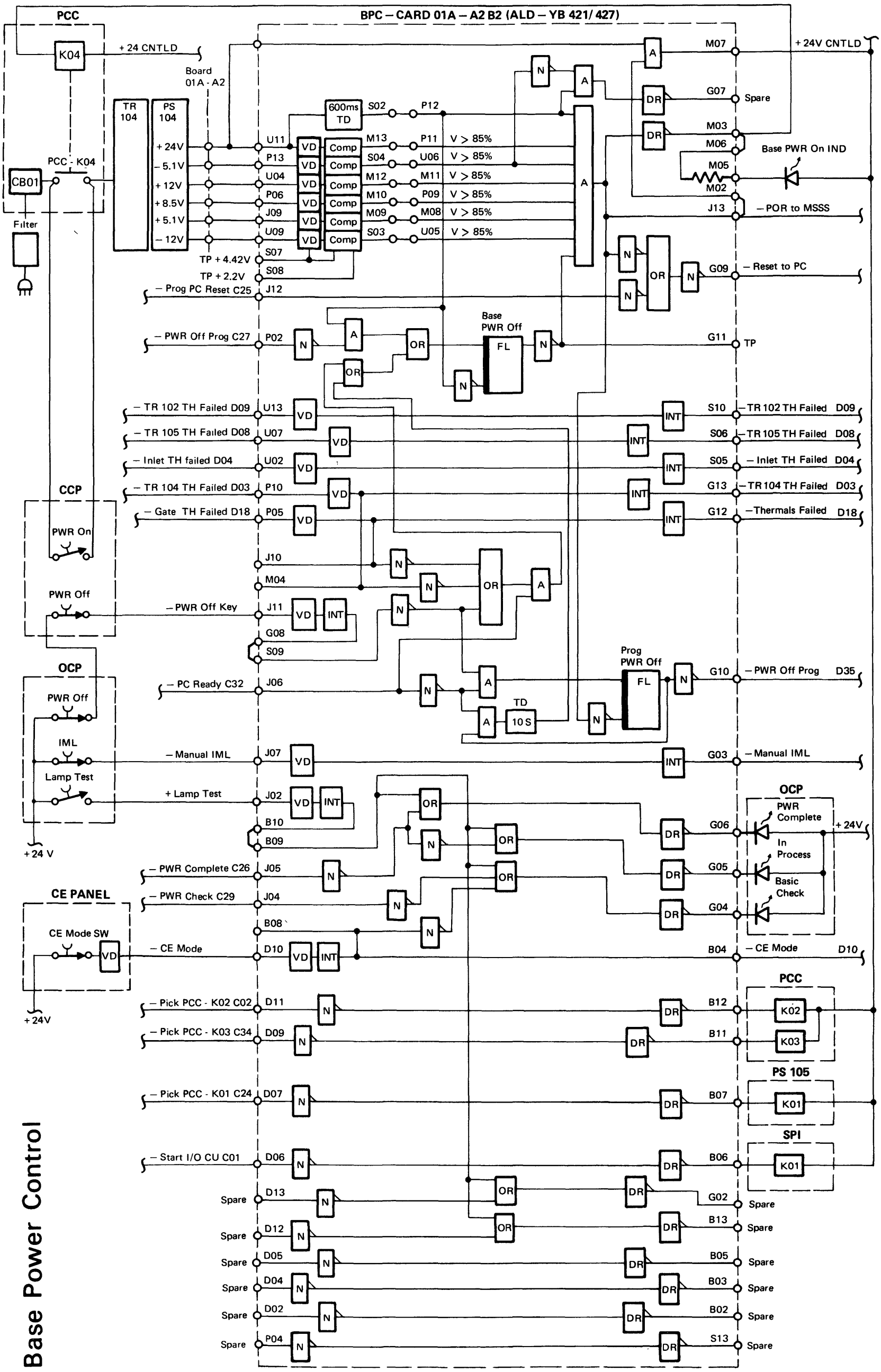

Base Power Control

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Power Controller Description

PC General Function

The power controller in an adapter is used for control and monitoring of the power complex. The PC is one byte wide and receives commands and data from the support processor via the processor bus 0.

Read data and interrupts are sent to the support processor via the processor bus 1.

The tag-bus signals are used for control and timing purposes.

The PC consists of three cards: One interface card and two sense cards.

Functions of the PC Interface Card

The following functions are performed by the interface card:

- Tag and response control for the processor bus.
- Input from processor bus 0 into the write-bus register.
- Parity check for bytes from bus 0.
- Address match test.
- Input control to the PC-command register.
- Command checking and decoding.
- Machine check and command check generation. (The checks are handled by the support processor.)
- Provides PC status (Machine check, command check and interrupt control bits).
- Read/write strobe generation.
- Register selection and sense byte selection on interface card and on both sense cards.
- Read data transfer control via the Read Bus Register to processor bus 1, including parity generation for read data.
- Interrupt request control to the support processor via the processor bus 1.

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Functions of the PC Sense Card

The PC sense cards are used for data input, output and interrupt request generation. Thirty-two analog sense lines and 27 digital sense lines can be wired to one sense card. Four registers (one byte wide) are located on each sense card. The registers, also called latch bytes (LB) receive data from the support processor via the PC interface card.

LB0 and LB1 are used for control signals for the power complex.

LB2 controls the 36ms timeout circuit, the interrupt mask, the byte test and address check. Byte test and address check are test functions used for the power controller diagnostics (see topic PC sense card).

The function of the interrupt generation is decribed under the topic: Voltage monitoring during normal system operation and interrupt generation.

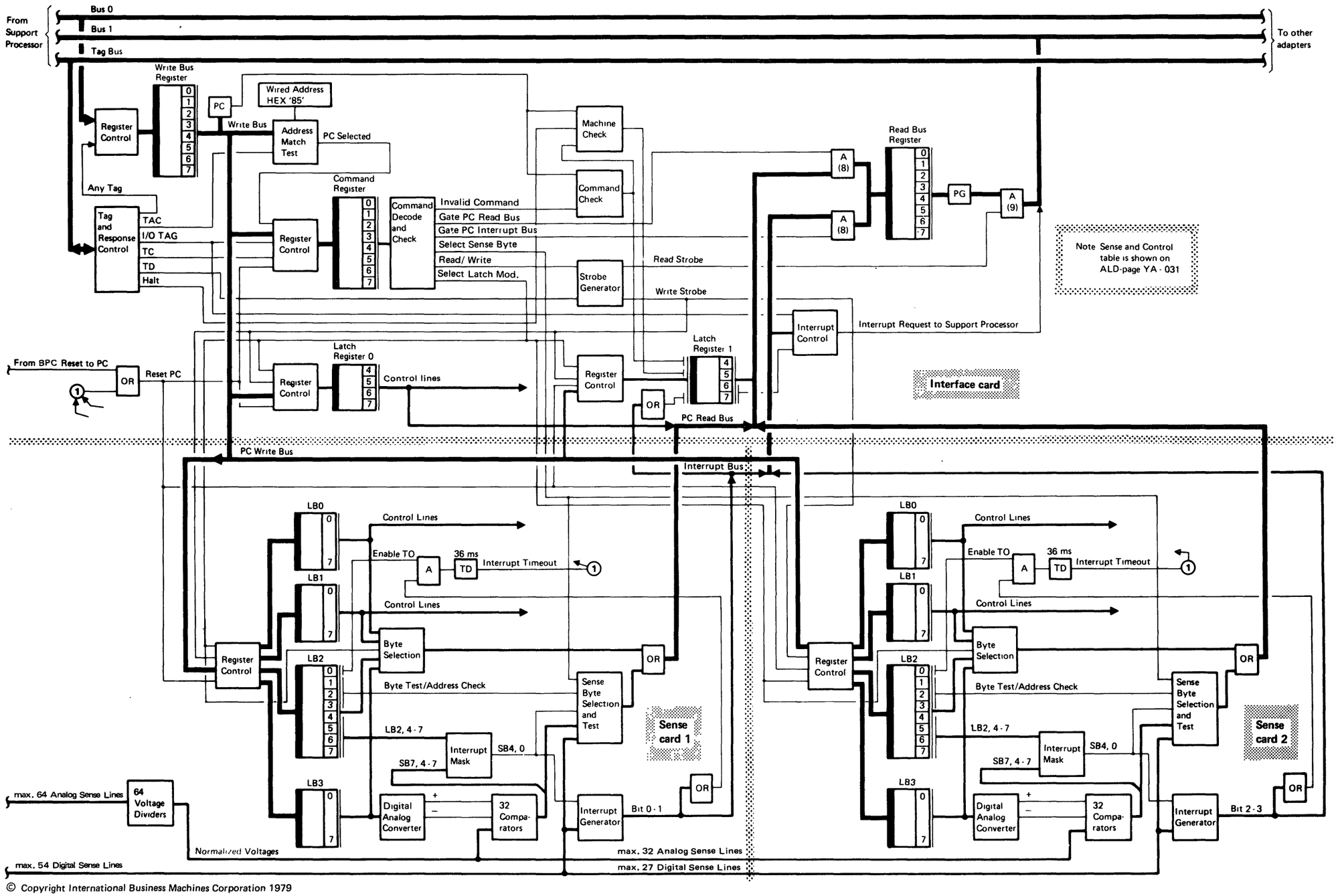
LB3 contains always the bit pattern for the digital input of the digital-analog converter (see topic analog measurements).

The contents of each register can be read by the support processor as well as the status of the digital sense lines and the output of the 32 comparators.

PC Sense Card 2

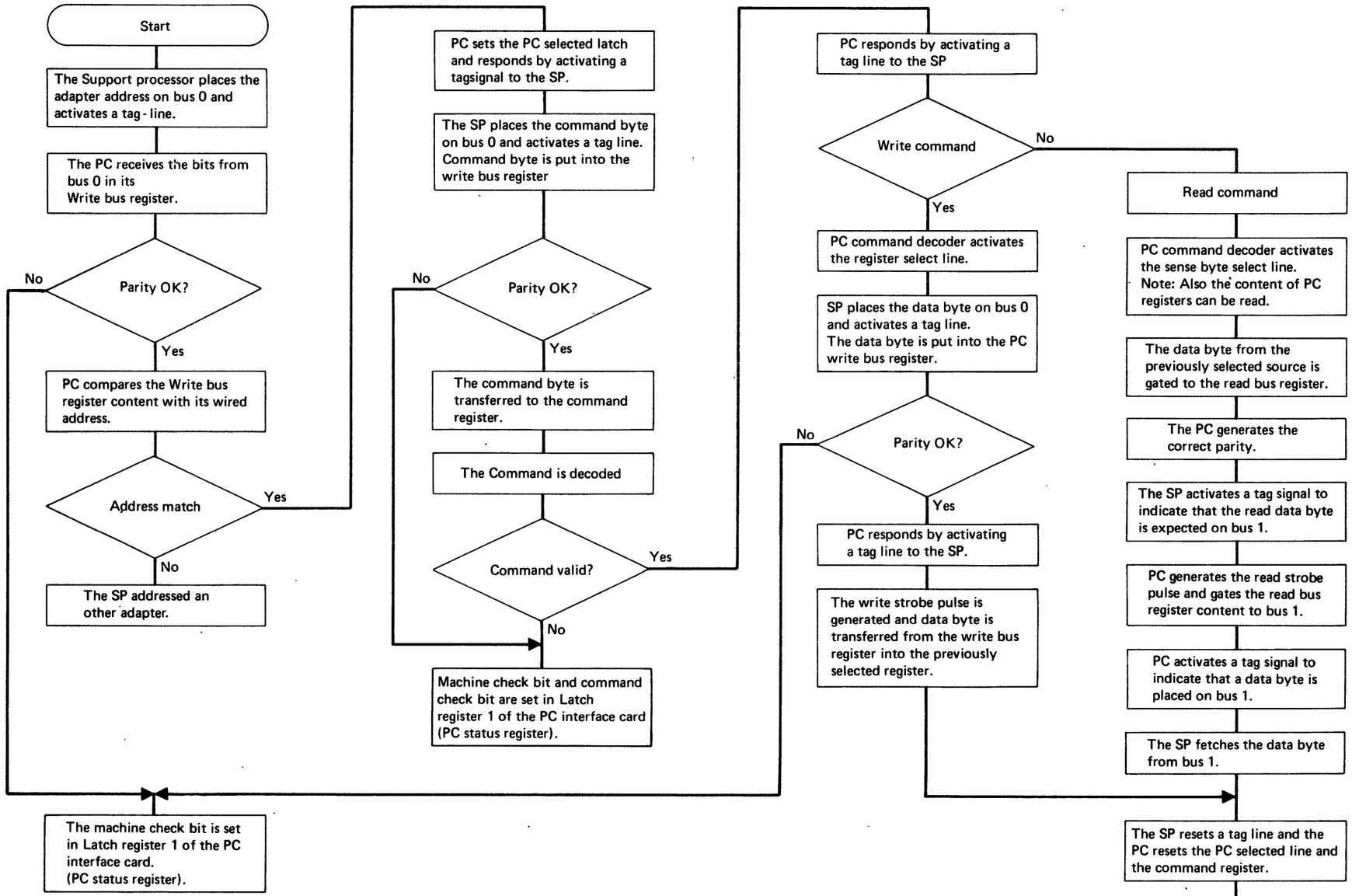
The PC-sense card 2 is used for the PU-identification and a limited number of power sense and control lines. Most of the sense - and control lines are spare (see sense and control table in this manual).

Power Controller Data Flow



DET

Power Controller Write/Read Operation



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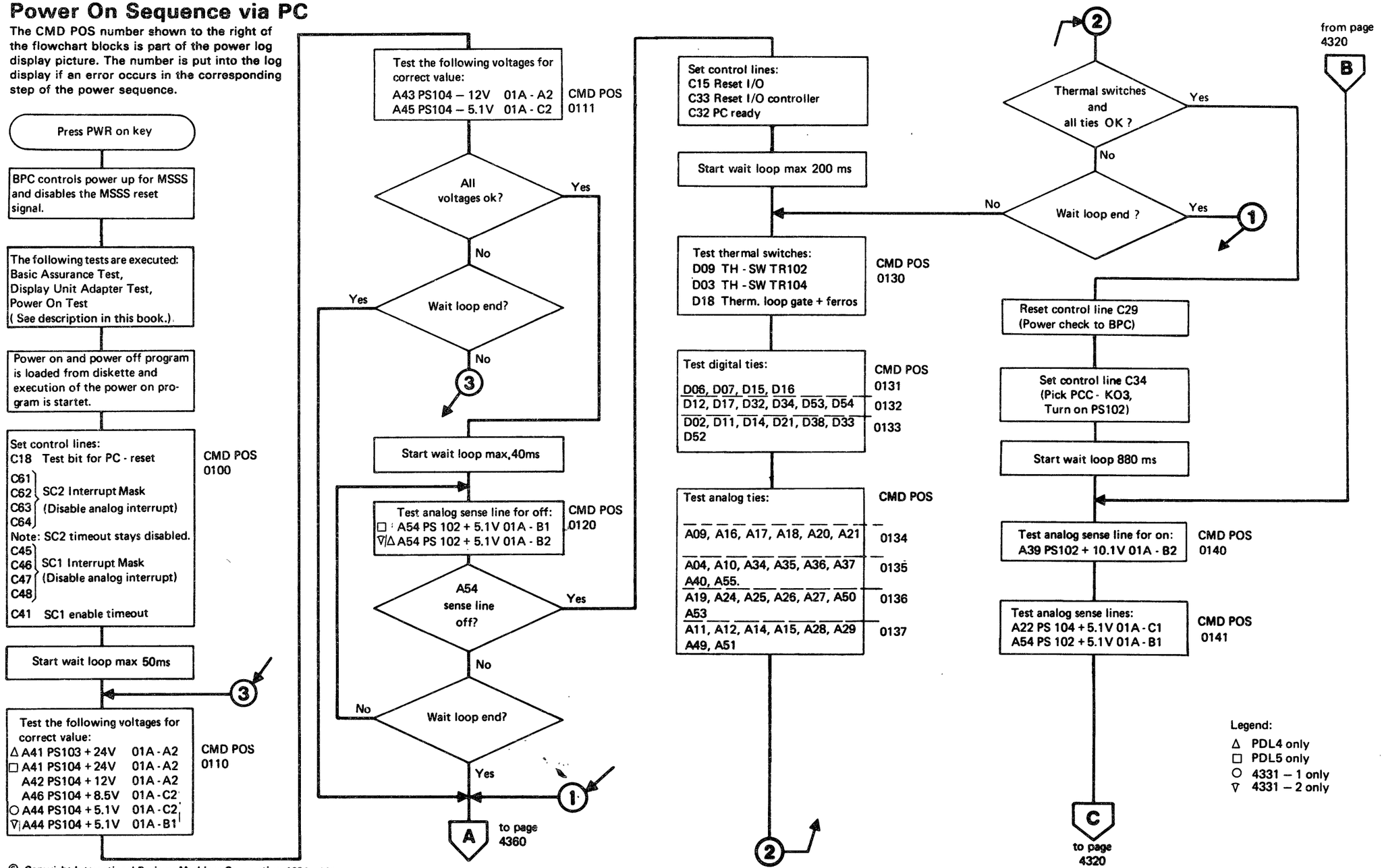
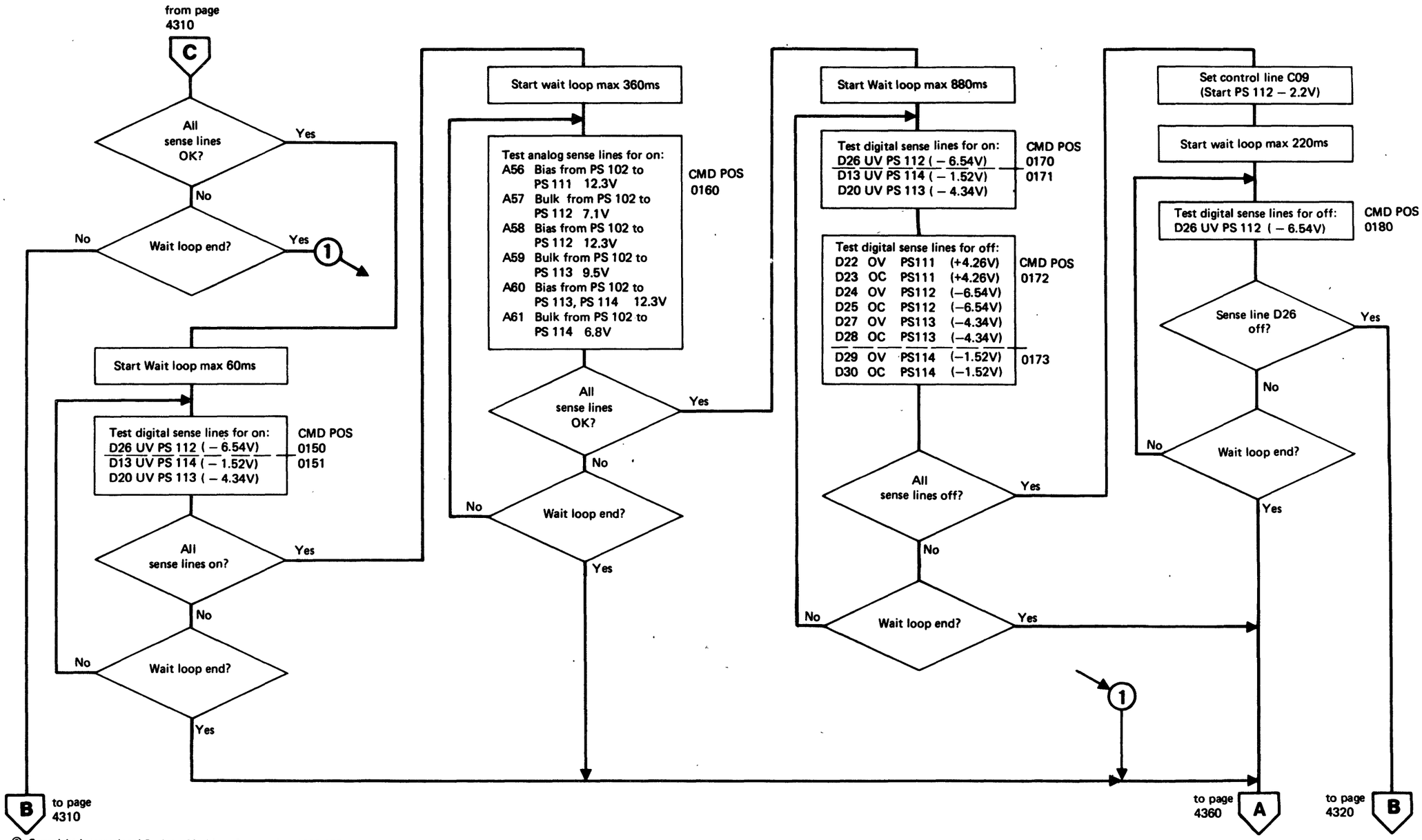
Power On Sequence via PC

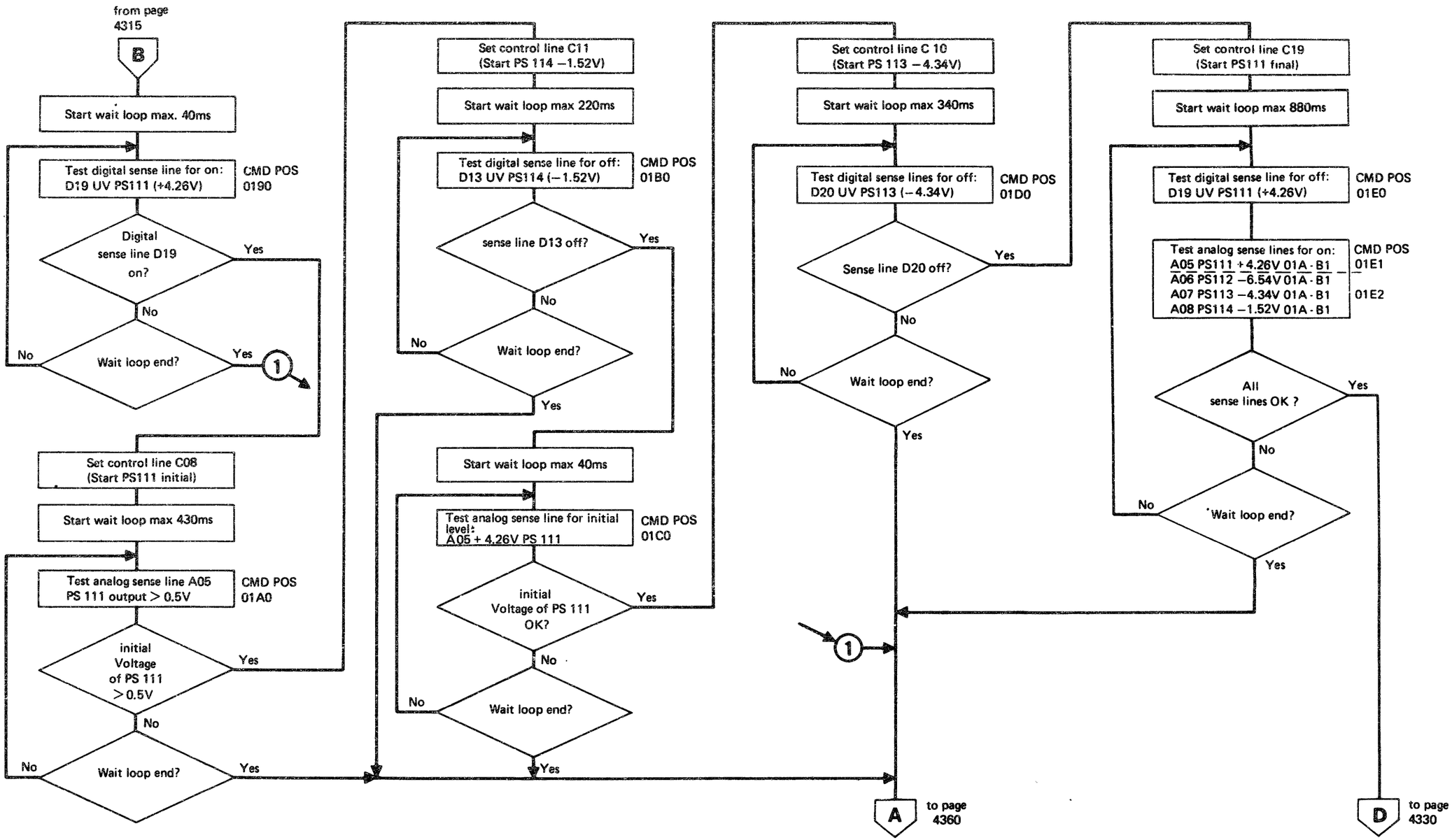
The CMD POS number shown to the right of the flowchart blocks is part of the power log display picture. The number is put into the log display if an error occurs in the corresponding step of the power sequence.



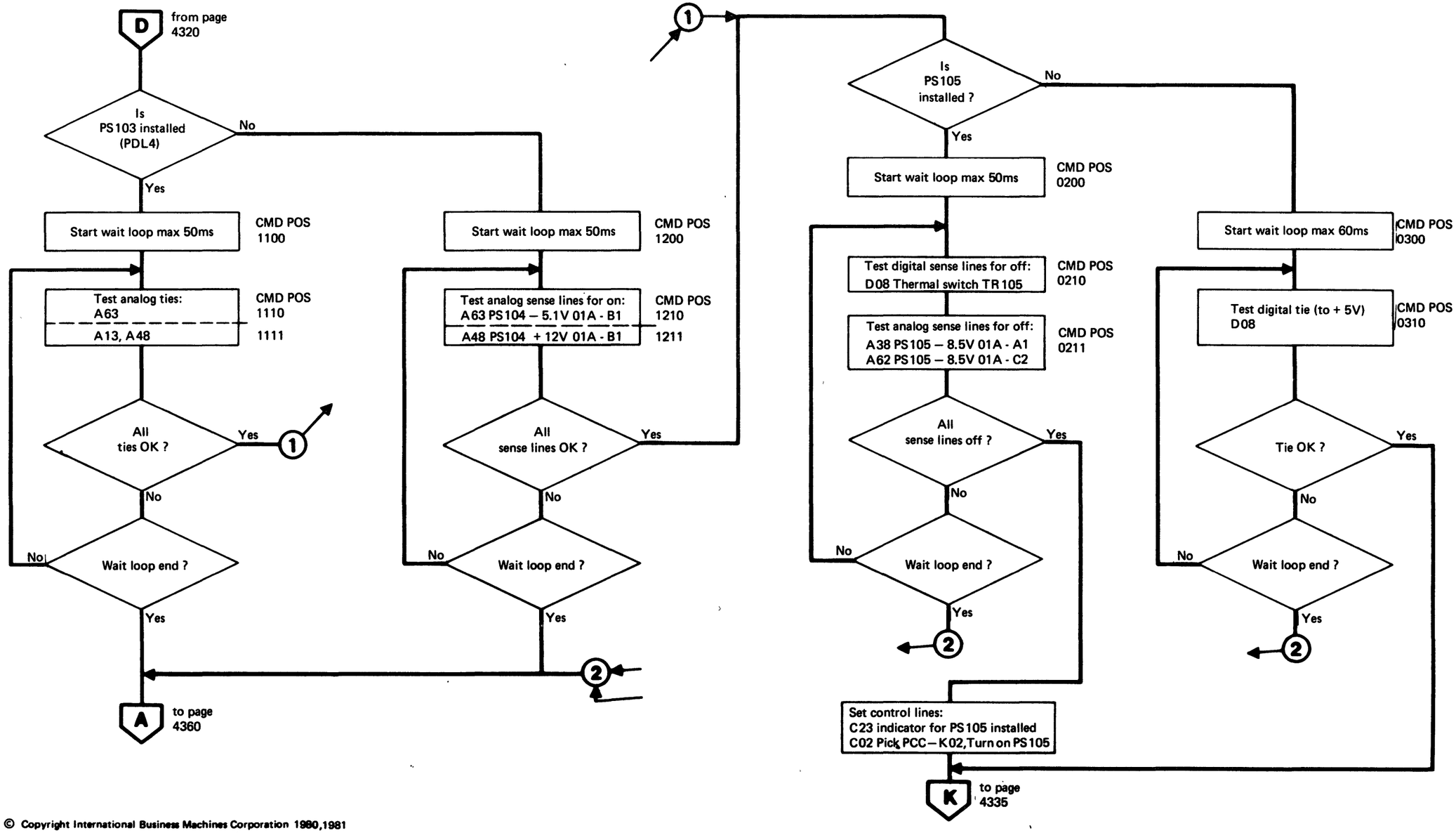
Power on Sequence via PC (continued)



Power on Sequence via PC (continued)

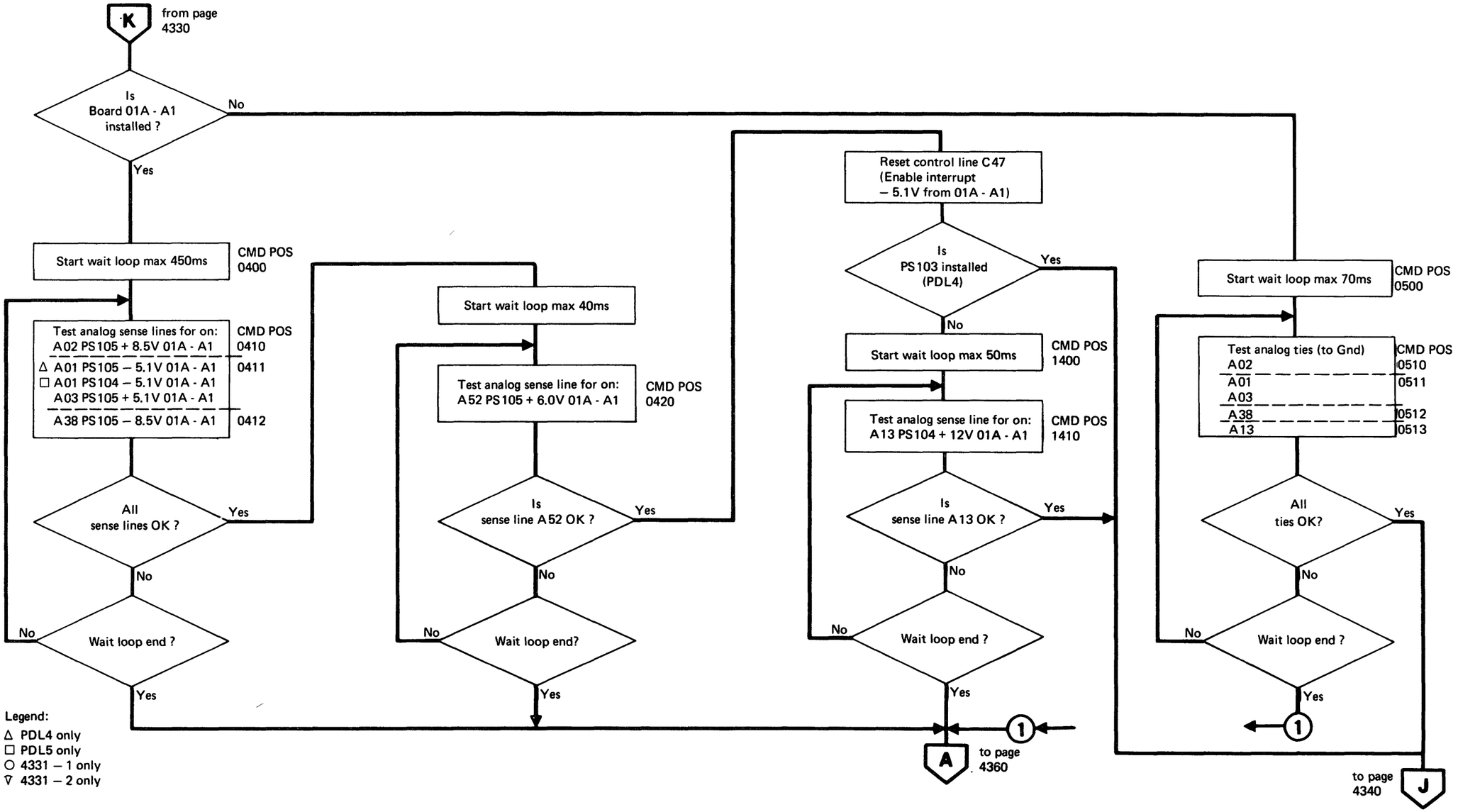


Power on Sequence via PC (continued)



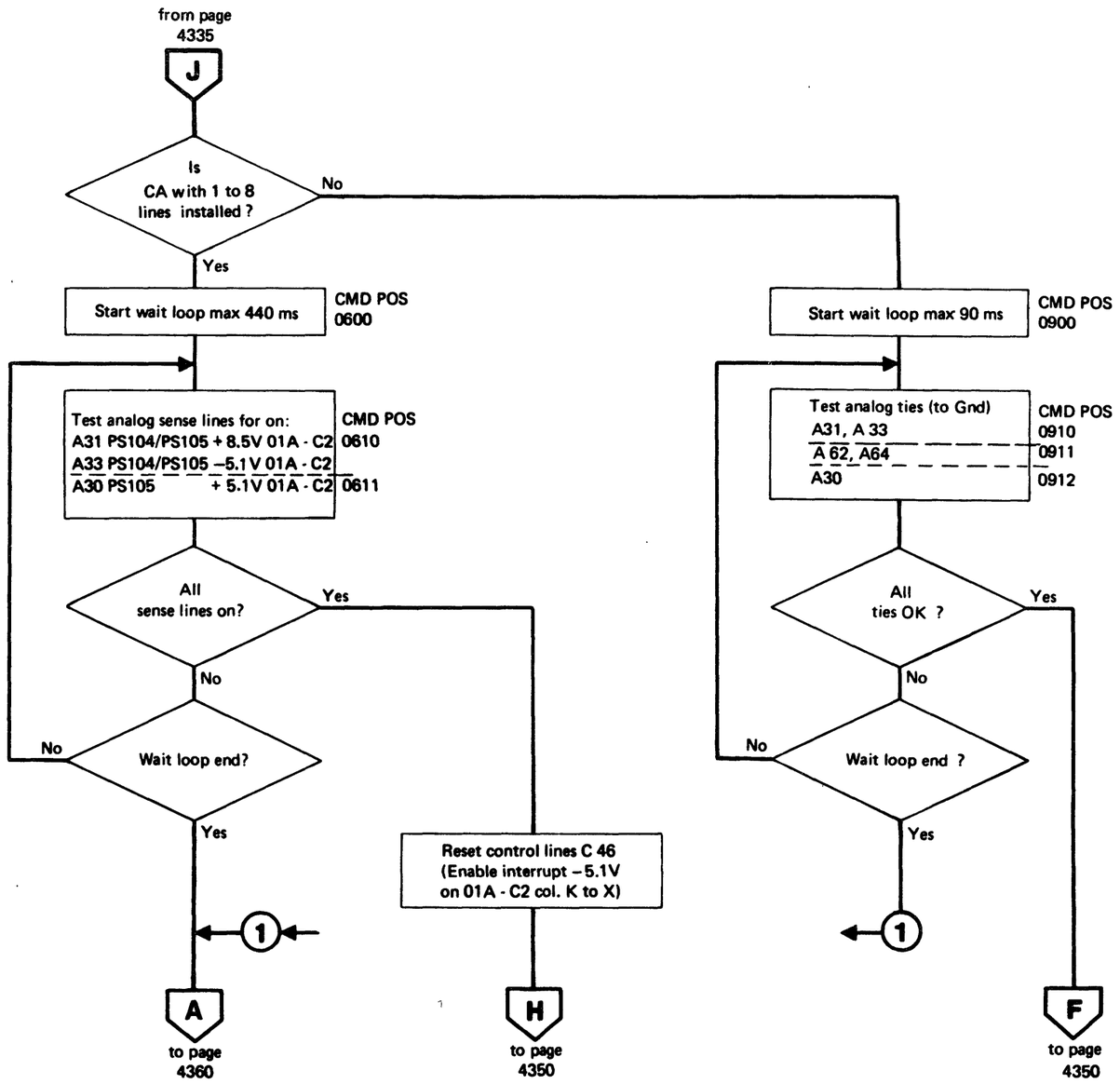
4331 PDL4/5 –A

Power on Sequence via PC (continued)

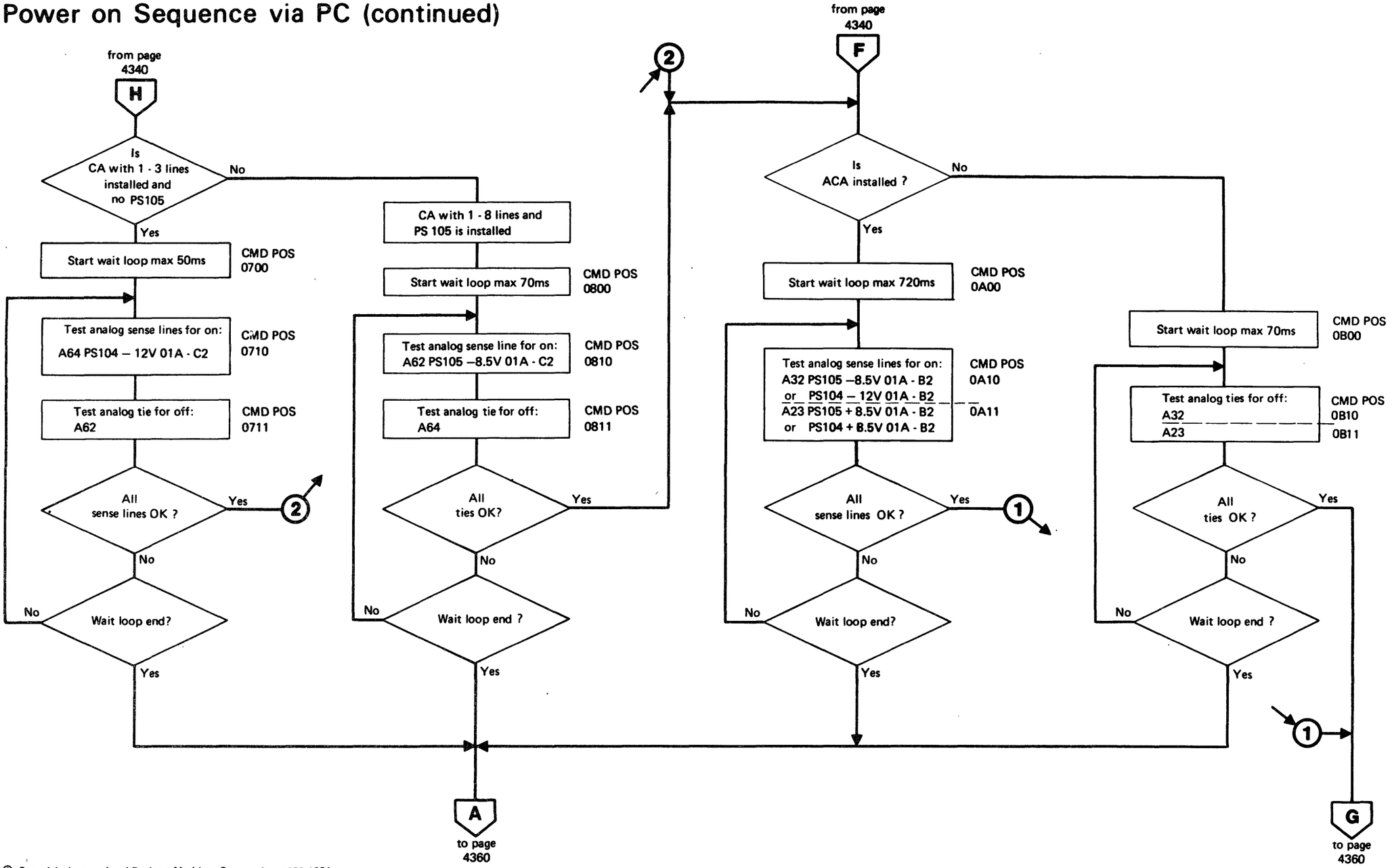


Legend:
△ PDL4 only
□ PDL5 only
○ 4331 – 1 only
▽ 4331 – 2 only

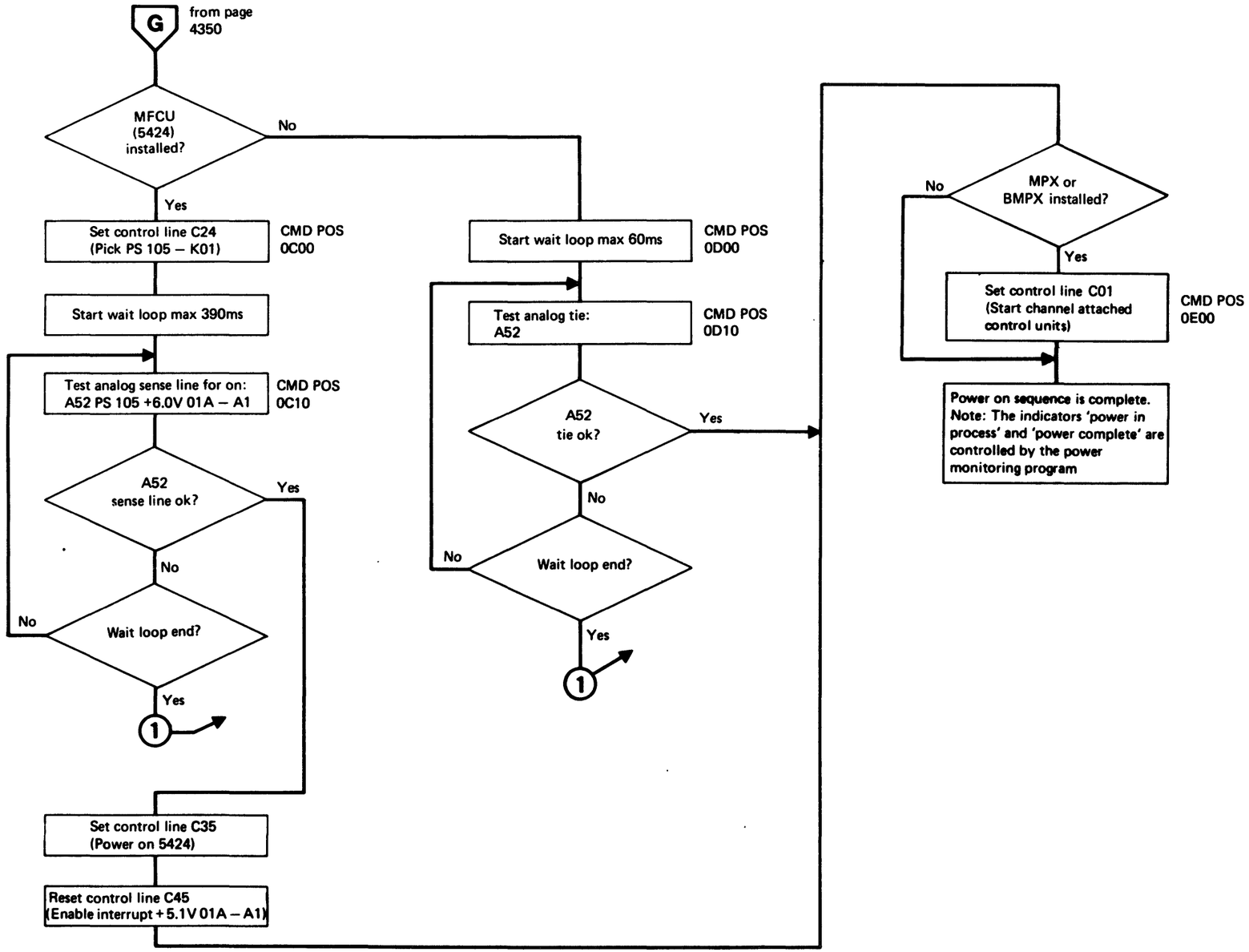
Power on Sequence via PC (continued)



Power on Sequence via PC (continued)



Power on Sequence via PC (continued)



Voltage Checking During Normal System Operation and Interrupt Generation

During normal system operation the SP operation control program performs a voltage monitoring routine every 256ms lasting about 20ms. For some voltages it is unacceptable to have a time gap without voltage checking. Therefore, the critical voltages generate an interrupt request to the SP if the voltage drops below a limit defined by the operation control program.
The interrupt generating voltages are shown on ALD page YA031.

Interrupt Generation

Note: The numbers in boxes refer to the numbers in the diagram on the next page.

At the end of each voltage monitoring routine, a bit pattern for a voltage tolerance of 80 percent is written into LB3 of the sense card [1]. The output of LB3 is used as digital input for the digital analog converter [2].

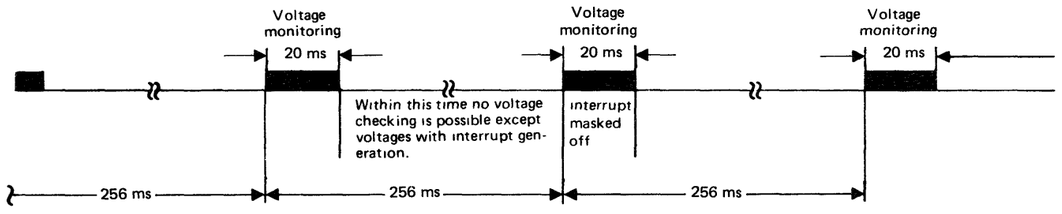
The DAC generates a voltage which is determined by its digital input. The DAC output is used by the 32 comparators [3]. The comparators compare the normalized voltages from the sense points with the voltage generated by the DAC, but the compare result is not transferred to the SP because the SP microprogram performs other tasks at this time (main sense loop). The comparator output of four important voltages per sense card, which must be continuously checked, is also wired to the interrupt mask circuit [4]. A four-bit mask is written by the SP into LB2 bits 4 through 7 [5] and the output of bits 4 through 7 is also connected to the mask circuit. If any of the monitored voltages drops below the limit (determined by the digital DAC input), the comparator output changes its level. If an interrupt request from this voltage is allowed by the mask in LB2 bits 4 through 7 [6], the interrupt mask circuit activates an interrupt bit [7]. The active interrupt bit passes the sense byte selection circuits [8] and enters the interrupt bus [9]. Any active bit on the interrupt bus sets the interrupt bit 7 in the status register [10].

An interrupt request to the support processor is only possible if previous SP operation control program steps have enabled an interrupt request by setting bit 6 in the status register.

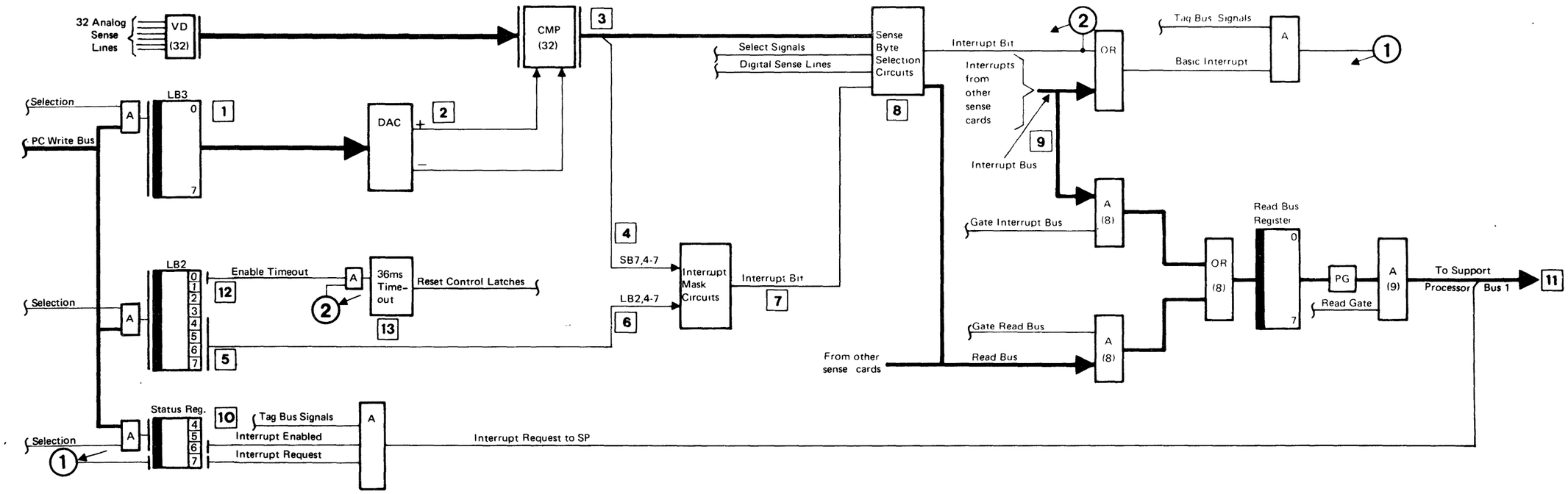
If status register bits 6 and 7 are on, an interrupt request to the SP is generated [11]. During interrupt handling, the SP operation control program fetches more detailed error information using PC senses.

Whenever an interrupt bit is activated and the timeout bit 0 in LB2 is on [12], the 36ms timeout circuit is started [13].

If the interrupt request to the SP is not handled within 36ms, all power controller control latches are reset. This function has the same effect as emergency power-off. (But PS103 and PS104 are still switched on.) The 36ms timeout circuit is used as backup timer to ensure machine power-off in case of support processor, power controller, or interface problems.



Voltage Checking During Normal System Operation and Interrupt Generation (continued)



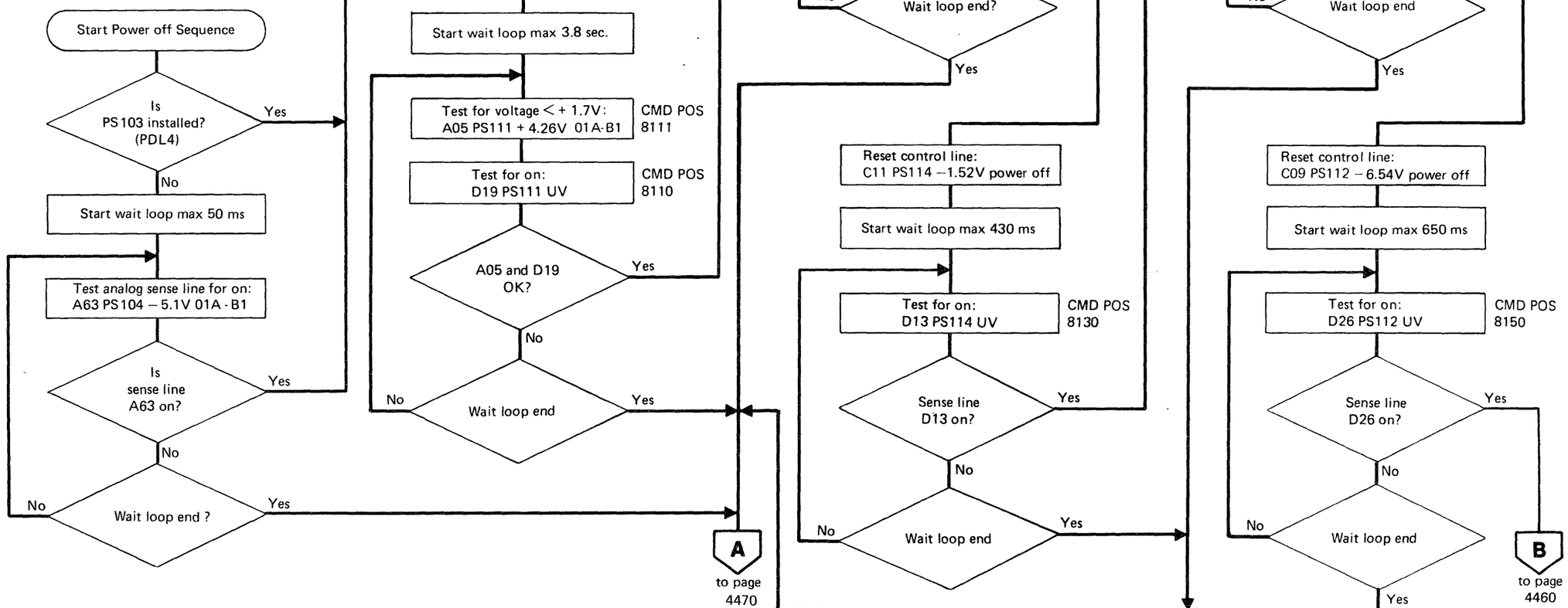
DET

Power-Off Sequence via PC

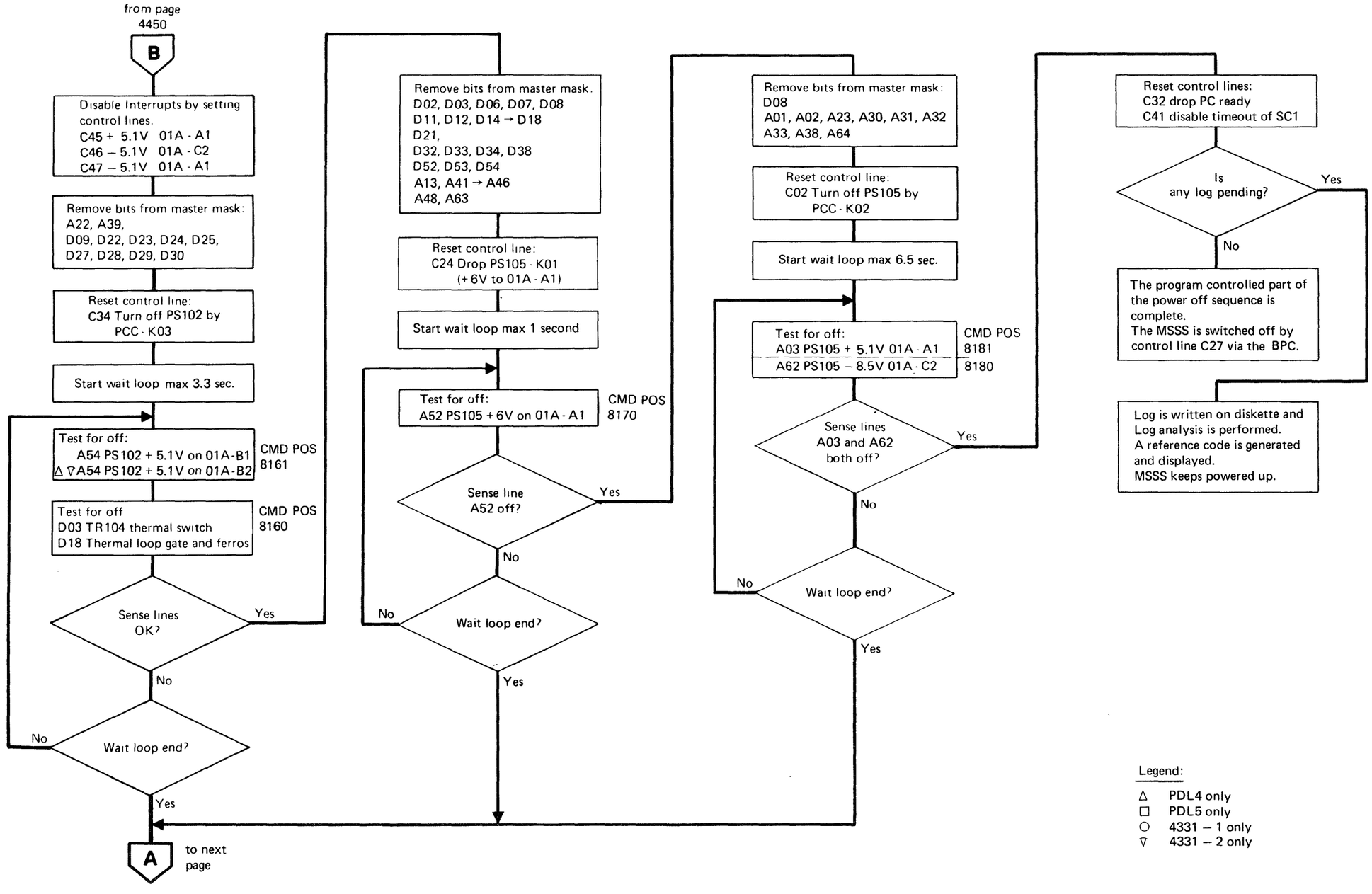
Pressing of the power-off key, or an error condition detected by the power on program, or by the power monitoring program, initiates the power off sequence. During execution of the power off program, there is also a power monitoring periodically performed. Only those voltages which have their corresponding bit in the master mask on are checked by power monitoring.

The CMD POS number shown to the right of some flowchart blocks, is part of the Power log display picture. The number is put into the log display if an error occurs in the corresponding step of the power sequence.

The power escape string shown on the last page of the power off sequence is used if a power off function failed. If a thermal failure or a -5.1 V failure on 01A-B1 is detected by the power escape string, the entire processor is switched off and no power log is available.



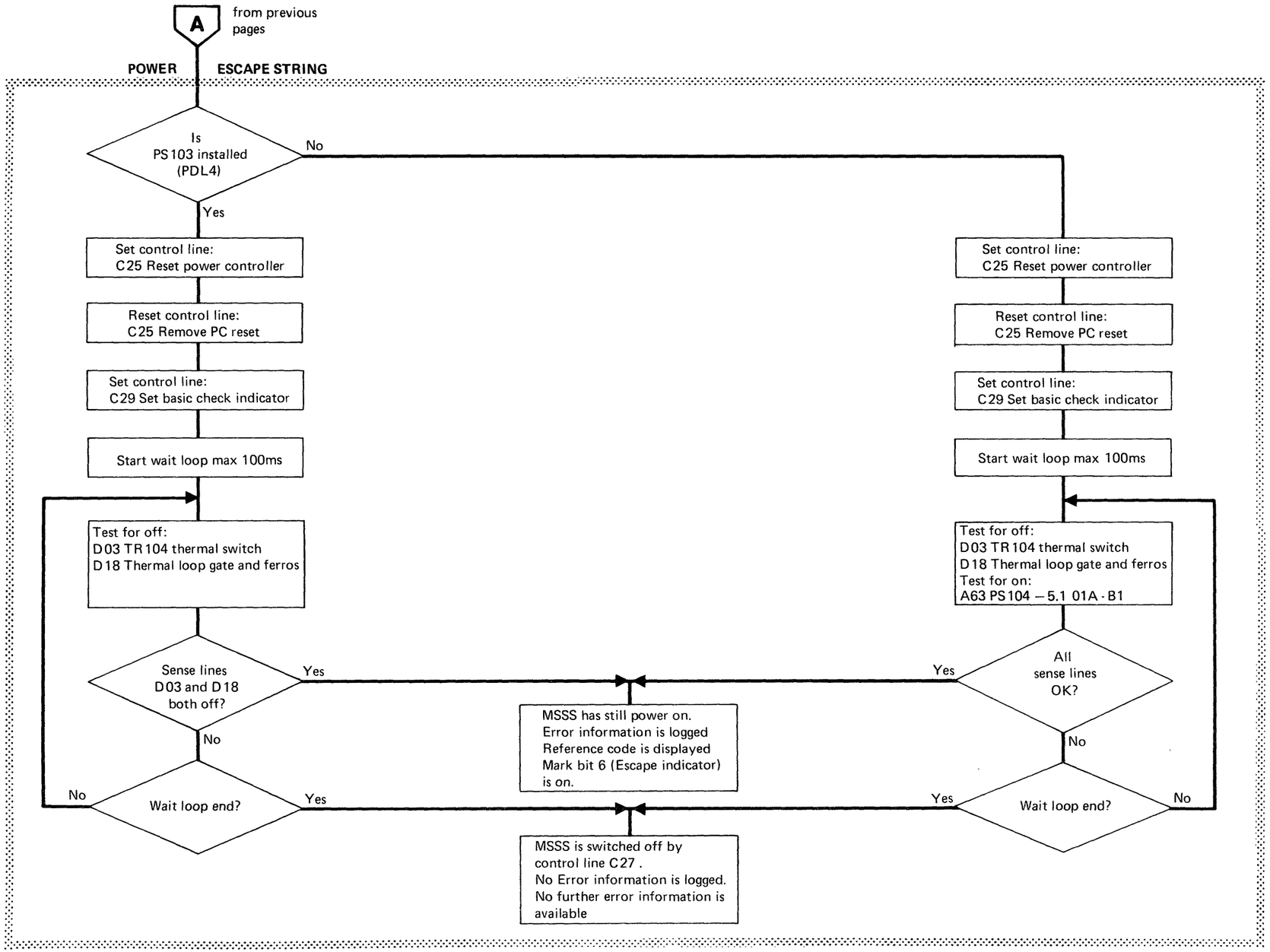
Power off Sequence via PC (continued)



Legend:

- △ PDL4 only
- □ PDL5 only
- ○ 4331 – 1 only
- ▽ 4331 – 2 only

Power off Sequence via PC (continued)



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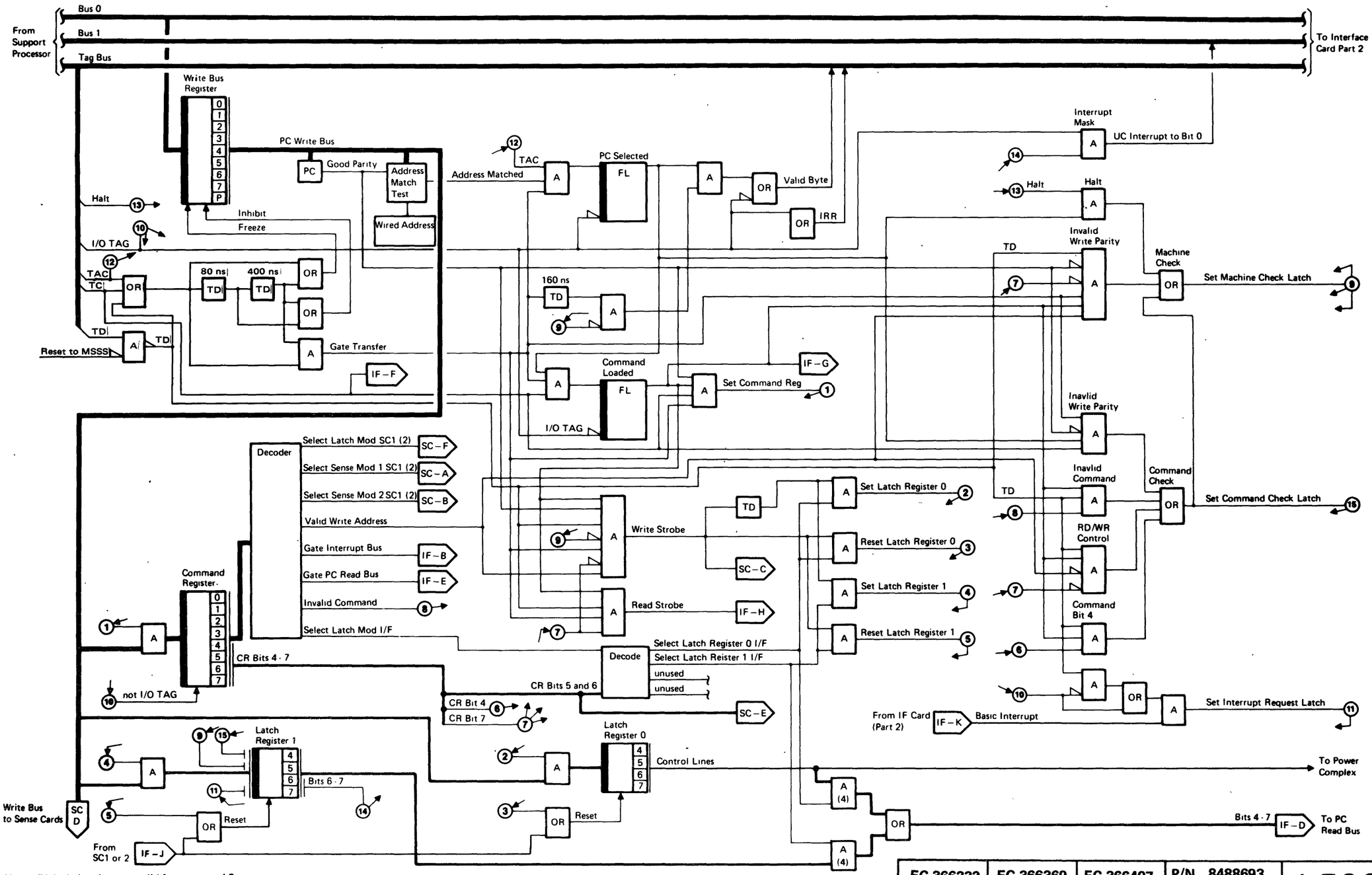
Power Controller Interface Card (Part 1 of 2)

Position 01A - E2, ALD YB 661/ 679



Note: Digits in brackets are valid for sense card 2

EC 366232 25 May 79	EC 366369 30 Nov 79	EC 366407 30 Jun 80	P/N 8488693 Page 1 of 4	4 500 F

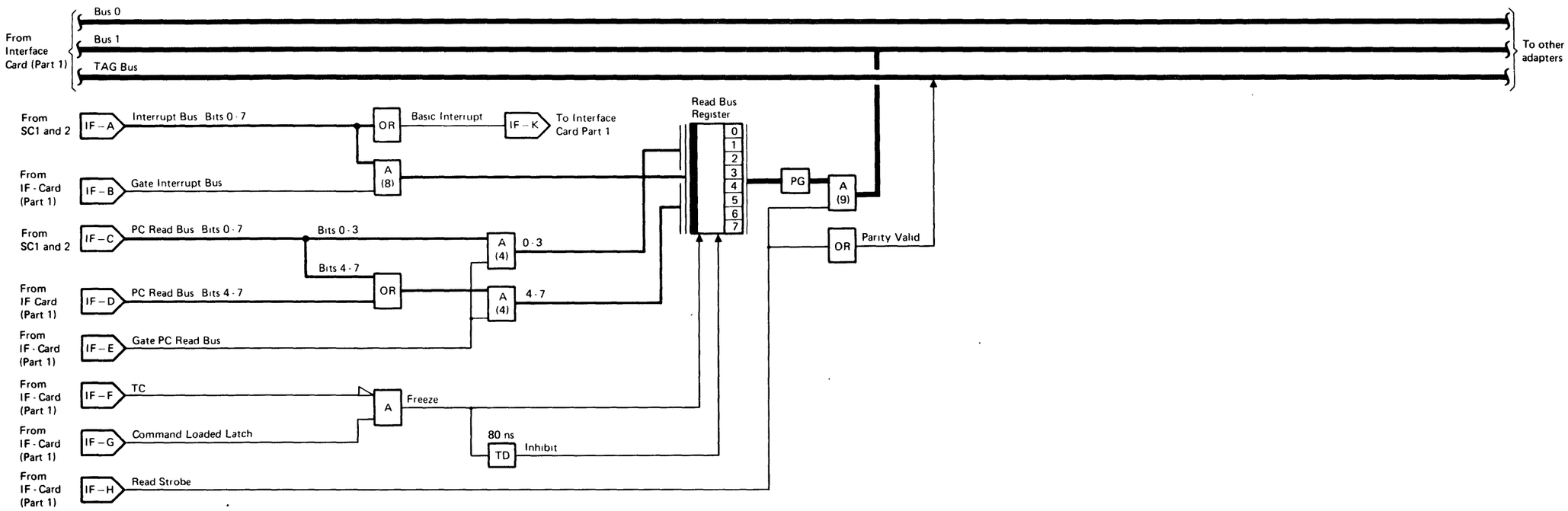
4331 PDL4/5 – A

Power

DET

Power Controller Interface Card (Part 2 of 2)

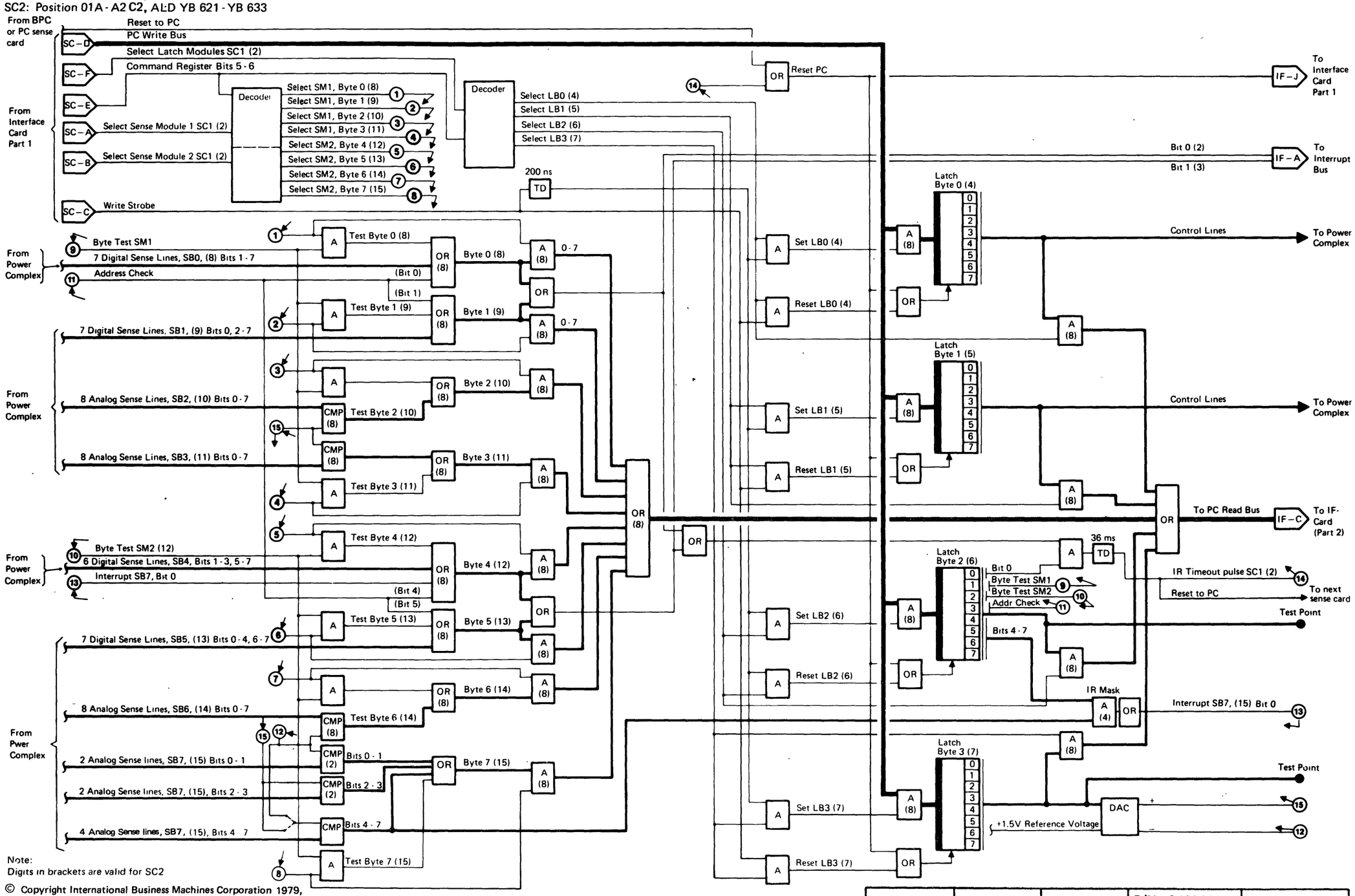
Position 01A - A2E2, ALD YB 661 - YB 679



Note:
Digits in brackets are valid for SC2

Power Controller Sense Card

SC1: Position 01A - A2D2, ALD YB 641 - YB 653
SC2: Position 01A - A2C2, ALD YB 621 - YB 633



Note:
Digits in brackets are valid for SC2

Power on Test

The power controller is automatically tested before the power-on sequence is executed.

The power on test is not performed during Re-IML

It is not possible to call the Power on test by the CE. To run the Power on test it is necessary to power down the machine and start a new power on sequence by pressing the power-on switch.

The Power-on test consists of eight single tests which run automatically in ascending order.

A reference code is displayed on the screen if any fault is detected. After an error stop, the test can be repeated by pressing the ENTER key of the keyboard. If a reference code is displayed the CE has the possibility to skip one or more tests and to continue with Power-on test execution. If one or more tests have been skipped the displayed reference code may be misleading or wrong.

Each reference code generated by the Power on Test 1 to 8 has the following format: F7TTXX81. TT is the number of the power on test.

The PC-functions tested by the Power on test are shown in the table on the right. For reference see also diagrams on pages 4500 to 4550.

Test number 8 is the ESD monitor test. This test is only executed if the current ESD sense level is not 0.
There are also machines in the field which have no ESD monitor installed. On those machines must the current ESD sense level always be 0.
For more details see 'ESD Monitor' and 'Ambient Recording Log Display' in this book.

Test No.	Tested function
1	1. Test single reset of control lines. 2. Write '00' to each control byte. Read each control byte and test for '00'.
2	1. Set diagnostic control bits on both PC-sense cards to force 'FF' in each sense byte. 2. Read 'FF' from each sense byte.
3	1. Test 1, Routine 2 is repeated. 2. Check address test lines for zero. 3. Set address test lines and check address check bits for on.
4	1. Test 1, Routine 2 is repeated. 2. Test for -5V present on both sense cards. 3. Test delta of both DAC readings for less or equal to 1.5.
5	1. Test 1, Routine 2 is repeated. 2. Enable analog interrupts. 3. Check if interrupt bit is on.
6	1. Test 1, Routine 2 is repeated. 2. Test if interrupt timeout occurs within specified limits.
7	1. Test 1, Routine 2 is repeated. 2. Test set/reset of control lines.
8	1. Test 1. Routine 2 is repeated. 2. ESD Monitor test. Set / Reset of ESD latches is tested.

Power Controller Control Table, Mark, Keys

Control Lines

	Address WR	Address RD	Bit 0	1	2	3	4	5	6	7	Card/ Byte
Interface Card	30	31					C 02 Pick PCC-K02	C 24 Pick PS105-K01	C 35 5424 Power on	C 01 I/O CU Power on	IFC/ LB0
	32	33					C 37 Command Check	C 38 Machine Check	C 39 Interrupt Enabled	C 40 Interrupt Request	IFC/ LB1
	34	35					Spare	Spare	Spare	Spare	IFC/ LB2
	36	37					Spare	Spare	Spare	Spare	IFC/ LB3
Sense Card 1	40	41	C 08 Initial pwr.on PS111	C 09 Power on PS 112	C 26 Power Complete	C 10 Power on PS 113	C 27 Power - off Program	C 11 Power on PS114	C 29 Power Check	C 19 Final pwr.on PS111	SC1/ LB0
	42	43	C 31 Power Warning to PU	C 15 Reset I/O	C 33 Reset I/O Controller	C 16 Metering in SP	C 17 PU Check Stop	C 32 PC Ready	C 25 Power controller reset	C 34 Pick PCC - K03	SC1/ LB1
	44	45	C 41 Enable Timeout SC1	C 42 Byte Test SM1, SC1	C 43 Byte Test SM2, SC1	C 44 Address Test SC1	C 45 Disable Interrupt + 5.1V/A1	C 46 Disable Interrupt - 5.1V/C2	C 47 Disable Interrupt - 5.1V/A1	C 48 Disable Interrupt +8.5V/C2	SC1/ LB2
	46	47	C 49 DAC 960.0mV=64%	C 50 DAC 480.0mV=32%	C 51 DAC 240.0mV=16%	C 52 DAC 120.0mV=8%	C 53 DAC 60.0mV=4%	C 54 DAC 30.0mV=2%	C 55 DAC 15.0mV=1%	C 56 DAC 7.5mV=0.5%	SC1/ LB3
Sense Card 2	50	51	C 18 Test bit for PC reset	C 23 Indic.for PS105 inst.	C 05 TOD Clock Indicator	C 06 Reset ESD monitor	C 21 Test ESD monitor	C 22 Spare	C 20 Spare	C 04 Spare	SC2/ LB0
	52	53	C 36 Spare	C 03 Spare	C 07 Spare	C 28 Spare	C 12 Spare	C 13 Spare	C 14 Spare	C 30 Spare	SC2/ LB1
	54	55	C 57 Enable Timeout SC2	C 58 Byte Test SM1, SC2	C 59 Byte Test SM2, SC2	C 60 Address Test, SC2	C 61 Interrupt Mask SC2	C 62 Interrupt Mask SC2	C 63 Interrupt Mask SC2	C 64 Interrupt Mask SC2	SC2/ LB2
	56	57	C 65 DAC 960.0mV=64% , SC2	C 66 DAC 480.0mV=32% , SC2	C 67 DAC 240.0mV=16% , SC2	C 68 DAC 120.0mV=8% , SC2	C 69 DAC 60.0mV=4% , SC2	C 70 DAC 30.0mV=2% , SC2	C 71 DAC 15.0mV=1% , SC2	C 72 DAC 7.5mV=0.5% , SC2	SC2/ LB3

Mark, Keys

Mark and keys are part of the power log display. The bits are saved together with the power status after occurance of an error. The mark and keys are also used for reference code generation, as well as control lines, digital- and analog sense lines. Some bits are only used for internal programming information, not for field usage.

	Bit 0	1	2	3	4	5	6	7
MARK	Power on and Monitor error	BPC off and Ref. code display	Power on/ off control error	Power on timeout	Early digital or analog LOG done	Power off timeout	Escape done	No interrupt possible by monitor error
KEY	Power on done	Permanent interrupt at the end of power on	Normal Mode error	Early power log	Power off key operated	Invalid string command	Any loop count zero	Monitor control error

For Physical Locations refer to ALD–YA 033

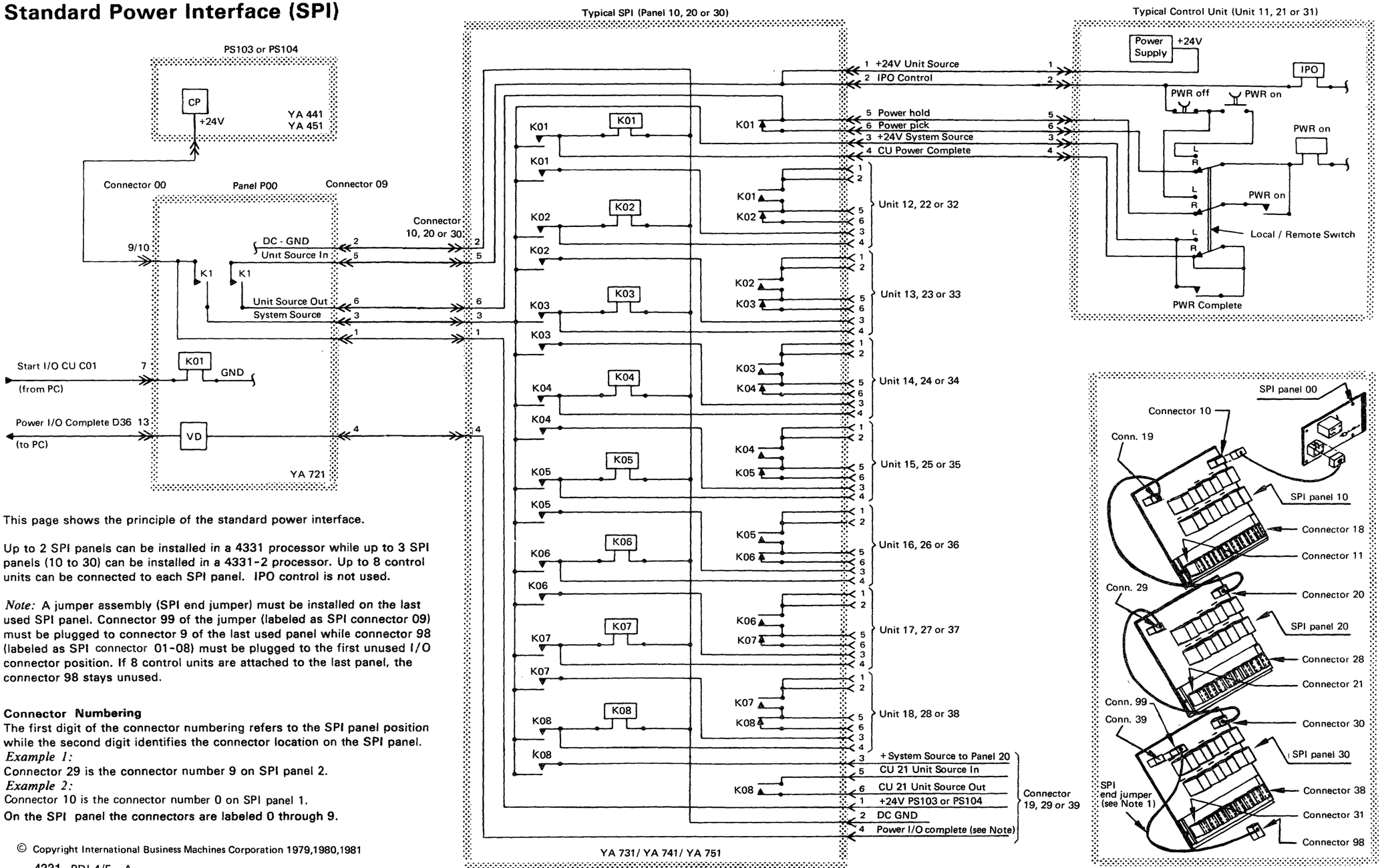
Power Controller Sense Table

Address WR	Address RD	Bit 0	1	2	3	4	5	6	7	Card/ Byte
—	11	Interrupt Request from Sense Byte 0 or 1	Interrupt Request from Sense Byte 4 or 5	Interrupt Request from Sense Byte 8 or 9	Interrupt Request from Sense Byte 12 or 13					SC1/ SC2
—	81	D 57 Address Test, Byte 0; SC1	D 22 0V P111 (+4.26V)	D 23 OC PS111 (+4.26V)	D 24 OV PS112 (-2.2V)	D 25 OC PS112 (-2.2V)	D 04 AIR INLET TEMP TOO HIGH	D 27 OV PS113 (-4.34V)	D 28 OC PS113 (-4.34V)	SC1/ SB0
—	83	D 36 I/O Power Incomplete	D 58 Address Test, Byte 1, SC1	D 10 CE Mode Switch on	D 05 ESD level 1	D 29 OV PS 114 (– 1.52V)	D 30 OC PS 114 (– 1.52V)	D 39 ESD level 2	D 01 MFCU power incomplete	SC1/ SB1
—	85	A 52 +6V PS 105, 01A - A1	A 41 +24V PS 104, 01A-A2	A 42 + 12V PS 104, 01A - A2	A 44 + 5.1V PS 104, 01A - B1	A 46 + 8.5V PS 104, 01A - C2	A 02 + 8.5V PS 105, 01A - A1	A 39 + 10.1V PS 102, 01A - B2	A 23 +8.5V PS104/105,01A-B2	SC1/ SB2
—	87	A 05* + 4.26V PS 111, 01A - B1	A 57 + 7.1V PS 102, 01A - C1	A 30 + 5.1V PS104/PS105, 01A - C2	A 56 + 12.3V PS 102, 01A - C1	A 58 + 12.3V PS 102, 01A - C1	A 60 + 12.3V PS 102, 01A - C1	A 59 + 9.5V PS 102, 01A - C1	A 61 + 6.8V PS 102, 01A - C1	SC1/ SB3
—	91	D 55 # Interrupt SB7 (4 - 7) SC1	D 26 # UV PS 112 (-2.2V)	D 19 # UV PS111 (+4.26V)	D 09 # TR102 THSW	D 59 # Address Test, Byte 4, SC1	D 08 # TR105 THSW	D 03 # TR104 THSW	D 18 # Thermal loop	SC1/ SB4
—	93	D 35 # Power off	D 06 # Spare	D 07 # Spare	D 15 # Spare	D 16 # Spare	D 60 Address Test, Byte 5, SC1	D 13 # UV PS114 (-1.52V)	D 20 # UV PS113 (-4.34V)	SC1/ SB5
—	95	A 32 –8.5V PS 105/–12V PS 104 on 01A-B2	A 63 – 5.1V PS 104, 01A - B1	A 06* – 6.54V PS 112, 01A - B1	A 07* – 4.34V PS 113, 01A - B1	A 08* – 1.52V PS 114, 01A - B1	A 62 – 8.5V PS 105, 01A - C2	A 38 – 8.5V PS 105, 01A - A1	A 64 – 12V PS104, 01A-C2	SC1/ SB6
—	97	A 43 – 12V PS 104, 01A - A2	A 45 – 5.1V PS 104, 01A - C2	A 54 + 5.1V PS 102, 01A - B1	A 22 +5.1V PS104, 01A-C1	A 03 # + 5.1V PS 105, 01A - A1	A 33 # – 5.1V PS104/PS105, 01A - C2	A 01 # – 5.1V PS 104,01A - A1	A 31 # +8.5V PS104/105, 01A-C2	SC1/ SB7
—	A1	D 61 Address Test, Byte 0, SC2	D 40 CPU ident. Hdrs. 8	D 41 CPU Idend. Hdrs. 4	D 42 CPU Ident. Hdrs. 2	D 43 CPU Ident. Hdrs. 1	D 44 CPU Ident. Tens 8	D 45 CPU Ident. Tens 4	D 46 CPU Ident. Tens 2	SC2/ SB0
—	A3	D 47 CPU Ident. Tens 1	D 62 Address Test, Byte 1, SC2	D 48 CPU Ident. Units 8	D 49 CPU Ident. Units 4	D 50 CPU Ident. Units 2	D 51 CPU Ident. Units 1	D 31 ESD level 3	D 37 ESD level 4	SC2/ SB1
—	A5	A 13 + 12V PS 104, 01A - A1	A 48 + 12V PS 104, 01A - B1	A 17 Spare	A 18 Spare	A 20 Spare	A 21 Spare	A 16 Spare	A 09 Spare	SC2/ SB2
—	A7	A 04 Spare	A 55 Spare	A 10 Spare	A 40 Spare	A 34 Spare	A 35 Spare	A 36 Spare	A 37 Spare	SC2/ SB3
—	B1	D 56 # Interrupt SB7 (4-7) Spare	D 34 # Spare	D 32 # Spare	D 53 # Spare	D 63 # Address Test, Byte 4, SC2	D 54 # Spare	D 17 # Spare	D 12 # Spare	SC2/ SB4
—	B3	D 52 # Spare	D 11 # Spare	D 14 # Spare	D 21 # Spare	D 38 # Spare	D 64 # Address Test, Byte 5, SC2	D 02 # Spare	D 33 # Spare	SC2/ SB5
—	B5	A 19 Spare	A 25 Spare	A 50 Spare	A 24 Spare	A 47 – 5.1V PS104 Voltage Check with A45	A 53 Spare	A 26 Spare	A 27 Spare	SC2/ SB6
—	B7	A 28 Spare	A 29 Spare	A 12 Spare	A 11 Spare	A 49 # Spare	A 14 # Spare	A 51 # Spare	A 15 # Spare	SC2/ SB7

Interrupt generating Sense Line
* Adjustable voltages

For physical locations refer to ALD - YA 033

Standard Power Interface (SPI)



This page shows the principle of the standard power interface.

Up to 2 SPI panels can be installed in a 4331 processor while up to 3 SPI panels (10 to 30) can be installed in a 4331-2 processor. Up to 8 control units can be connected to each SPI panel. IPO control is not used.

Note: A jumper assembly (SPI end jumper) must be installed on the last used SPI panel. Connector 99 of the jumper (labeled as SPI connector 09) must be plugged to connector 9 of the last used panel while connector 98 (labeled as SPI connector 01-08) must be plugged to the first unused I/O connector position. If 8 control units are attached to the last panel, the connector 98 stays unused.

Connector Numbering
The first digit of the connector numbering refers to the SPI panel position while the second digit identifies the connector location on the SPI panel.
Example 1:
Connector 29 is the connector number 9 on SPI panel 2.
Example 2:
Connector 10 is the connector number 0 on SPI panel 1.
On the SPI panel the connectors are labeled 0 through 9.

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Hints for Power Maintenance

DANGER

It is not allowed to remove subassemblies from the machine frame under power or to do any service on subassemblies under power outside of its machine frame mount.

Any power repair action should start with use of the corresponding MAP for the displayed reference code. If a power problem is suspected with no reference code displayed, always start with MAP 0200.

For use of the POWER MAPs, you should be familiar with the 'Important Hints for Power MAP Usage' in this section. Other paragraphs in this section give more information about wiring checking, intermittent problem analysis, and action when asked to 'call for assistance'.

Important Hints for Power MAP-Usage

(Valid for reference codes beginning with '02' or 'F7')

MAP Entering

Before entering the power MAP, make sure that all listed cards and cables in board 01A-A2 and 01A-C2 are plugged in and seated correctly.
Board 01A-A2: A2, B2, C2, D2, E2, YM and YD
Board 01A-C2: D2, E2, F2, G2, H2, J2, YJ and YK

Card Plugging

Never remove or insert a card with system power on. Before replacement of any card, check card connectors for bent or broken pins. Also check the wiring side of the board for damage.

Switching off the Line Voltage

Switch off PCC-CB01 before working in any system area where line voltage might be present.

DANGER

PCC-CB01 does not remove power from the convenience outlet circuits. Before working in the PCC-box or fuse replacement of PCC-F01 or PCC-F02 switch off additionally PCC-SW01 (switch for convenience outlet).

PCC-CB01 must also be switched off prior to replacement of transformers or power supplies.

Never remove a primary fuse of any transformer while PCC-CB01 is switched on.

Power-off Key Usage

When the MAP tells you to press the power-off key you have the choice of pressing the power-off key at the OCP (operator console panel) or of pressing the power-off switch at the CCP (customer console panel).

Probe Switch Setting

When the MAP tells you to 'probe pin XX', connect the main input of the General Logic Probe 2 (GLP2) to the pin XX using the following switch setting of GLP2:

- TECHNOLOGY switch: Multi
- LATCH switch: None
- GATE REF. switch: + 1.4V
- GATING input + and -: Unused

If another switch setting of the probe is required, the switch setting is shown in the MAP.

If the probe gating inputs are used, the gate reference switch must be set to +1.4V.

Connection of Probe Power Cable

The power cable of the probe must be connected to the following pins in card position 01A-A2B2:

- Red lead (positive) to D03, or J03, or P03, or U03
- Black lead (negative) to any D08 pin

IMPORTANT NOTES: There is no standby power present with system power off.

After pressing the power-on switch, both probe indicators will be lit for a short time when the supply voltage raises to its final level. This probe indication must be omitted.

The probe operates without any error approximately one second after the power-on switch was operated.

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REP

Hints for Power Maintenance (continued)

Probe main input

The probe main input must be connected to the measurement points called out in the MAP.

A special extension cable for the GLP2 can be used. The main input ground must be connected to DC-ground (usually the D08 pin of a logic card position). Never use a D08 pin in a cable connector position.

The basic shipping group no. 8481002 contains two extension wires which may be used for probe measurements.

Floating signal

If a probed pin does not show an indication on the GLP2, ensure that your GLP2 is operating correctly. Check power connections and apply logical up and down level to the main input of the probe.

For more details refer to 'General logic probe 2 manual' (form number SY27–0127).

If probe functions are ok and a probed pin called out in the MAP does not show an up or a down level indication, the probed pin is floating or the applied voltage level is out of the acceptable limits. In case of floating pin, refer to the ALD-page where the pin is shown and check board wiring and cabling of the floating signal. Apply the wiring check procedure shown in this book on page 5120.

If no wiring error was detected, replace the card which generates the failing signal.

Connectors

If a wiring error is suspected, ensure proper connector seating and good pin contact.

Before FRU-replacement, check the FRU-connectors.

Power controller Card replacement

If the MAP advises you to replace a power controller sense card in position 01A-A2C2 or 01A-A2D2 and no new card is available, you should exchange (swap) both cards and retry power on. If another reference code is displayed after card swap, the defective card has to be replaced before the machine is returned to the customer. If no reference code is displayed after card swap, the defective card has to be replaced as soon as possible. Return the machine to the customer until spare parts are available.

CE-meter accuracy check

1. To check the accuracy of the CE-meter, connect the plus lead of the meter to 01A-A2C2-S11 or 01A-A2D2-S11 '+3.0V output SCX' and the minus lead of the CE-meter to any D08 pin. The +3.0V voltage has a accuracy of +/-1.5 percent.
2. Remove the diskette from the diskette drive.
3. Press power on switch.
4. Check your meter reading (should be 3.0VDC).

Measurements at connectors

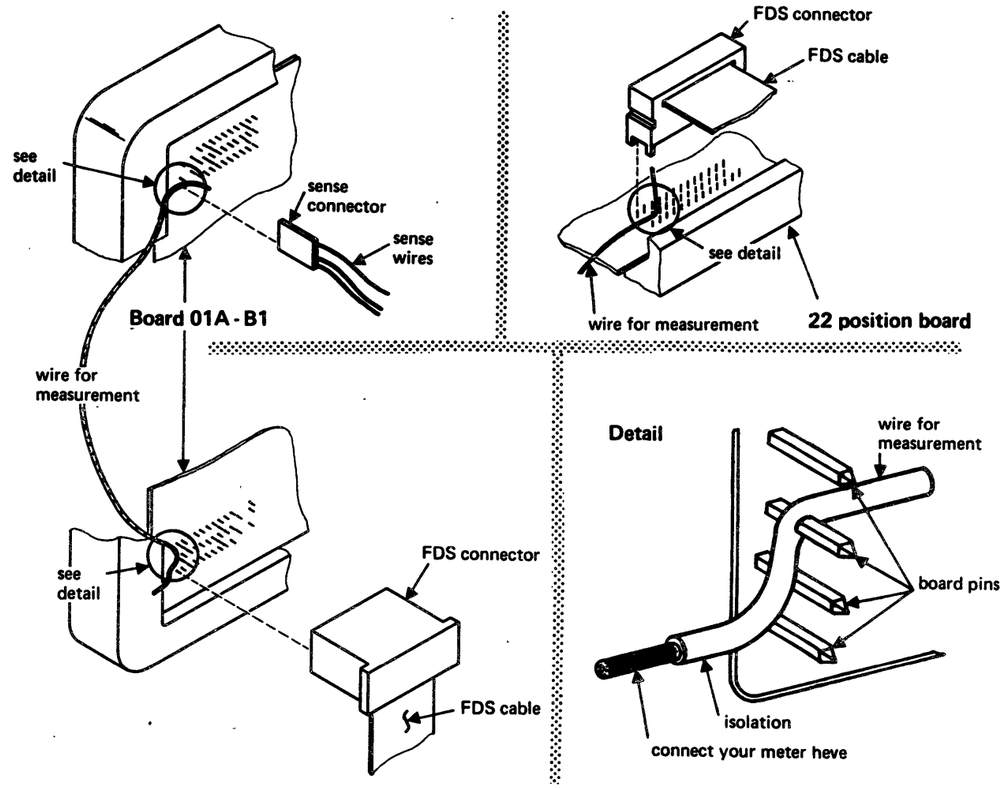
If the MAP advises you to connect the probe or your CE-meter to a connector pin, do not remove the connector from its position. The connector pins are accessible by the probe tip.

Before starting the measurement, ensure that the probe tip has good contact. For measurements on voltage feeding connectors of boards, the plastic cover of the connector has to be removed.

Measurement at board pins

If the MAP advises you to connect your CE-meter to a board pin which is already covered by an FDS connector or by a sense connector, apply the following procedure:

1. Disconnect FDS connector or sense connector.
2. Take a wire from the shipping group, punch a hole into it (use a needle or similar tool) and connect the wire to the pin to be measured as shown on this page. Make sure that the wire does not cause a short between two board pins.
3. Reconnect the previously removed FDS connector or sense connector.
4. Proceed as described in the MAP.



Hints for Power Maintenance (continued)

Signal names and reference

Measurement points used in the map have the format shown in the following example:

Connector PS102-02-003...connector 02 of PS102, pin 003
01A-A2F2-D06 . . . . . normal pin counting scheme.
'-power on PS113 C10' . . . signal name used in the ALD.
(ALD-YB441) . . . . . reference to ALD where the pin is shown.

Termination of repair action

After most repair actions, the map leads you to the MAP 0204. If your repairs were successful, the MAP 0204 leads to MAP 0275 for a final voltage check. Unsuccessful repairs bring you to further repair instructions (if several failures are present), or you return to the first repair instruction (if the trouble was not found and repaired).

If you come to the same repair instruction twice after answering all questions in the map correctly, refer to this power manual and try to isolate the faulty part using the ALD, power manual and power programs.

Also suspect an intermittent error (see paragraph 'Before calling for assistance').

If trouble cannot be found, see paragraph 'Before calling for assistance.'

Never change the error situation by swapping or replacing cards unless so stated in the MAP.

Never put cards from a machine back into your spare part set unless you are sure that the card was working properly.

Hints for Trouble Shooting Intermittent Power Problems

If an intermittent power failure is suspected, perform the following checks in sequence:

1. Check seating of the voltage feeding connectors on the board and the seating of the sense line connector of the failing voltage (see ALD-YC821 to YC873).
2. Special care should be taken when checking the paddle cards in board 01A-A2 column A.
3. Run voltage measurement program (see MAP 0275) and check for intermittent out of tolerance conditions.
4. Perform IPS service check (see MAP 0280).
5. At the beginning of each power MAP you find a list of the FRU's which might cause intermittent errors. Replace those FRU's step by step and check them for correct seating and good connections.
6. Intermittent errors may also occur if a diskette drive is exposed to electromagnetic waves. If you suspect those problems, keep the machine covers closed during machine power on time.
7. Perform all checks listed in the EMC check list in this book.
8. Perform the ground check procedure shown in the 'IBM 4331 Processor Installation Manual'.
9. Check all three blowers for correct operation and ensure that the airfilters are clean.

Wiring Check Procedure

Note: This procedure should be entered if MAP for reference codes beginning with 02 or F7 or E8 advises you to check and repair the wiring of a certain net.

1.0. The ALD must be used for every wiring check if the net is not shown in the MAP. The necessary ALD references and signal names are shown in the MAP.
If the net is shown in the MAP, the signal name is shown at the bottom of the net scheme.

2.0. Switch PCC-CB01 off before the wiring check is started.

3.0. Remove all cards and cables which are connected to the wiring net to be checked.
The physical locations are shown in the ALD.

4.0. Use your CE-meter (Range ohm X1) to check electrical connection between all pins which are part of the circuit to be checked. Special care should be taken to ensure good connection between parallel wired connectors used at transformer and power supply outputs. Use ALD references given in the Map. A bad contact may cause an intermittent out-of-tolerance voltage.

4.1. Connect one lead of your CE-meter (Range ohm X1) to any D08 pin (DC-Gnd), while the second lead is to be connected to any pin of the wiring net. There should be no electrical connection between the signal wiring and DC-Gnd.
If electrical connection exists between signal wiring and DC-Gnd, check carefully the signal wiring for any damage (including bent or broken pins and damaged cables).
If the reason for the trouble cannot be detected the board or cabling has to be replaced.

5.0. Use blue/white wires to repair a defective board net.

6.0. After completion of the wiring check, return to the MAP where you came from. If the wiring check was performed as a fix of the MAP go to MAP 0204, Entry Point A for final check.

7.0. If no wiring problem could be detected by the previous procedure, call for assistance (see hints on this page).

Before Calling for Assistance

This procedure should be followed after MAPs have failed.

1. Before calling for assistance read carefully the hints for Power MAP usage in this book and verify that you have followed each of them.

2. Special care should be taken to check for correct card and connector seating, proper plugging, and for bent or broken pins.

   ATTENTION: The power controller top connectors are not interchangeable and must be installed as shown on page 7010 of this book.

3. Ensure that the correct diskette is installed in your machine. Compare the machine serial number on the diskette label with the machine label.

4. Ensure that the power configurator on the diskettes is correct. To check the power configurator, carry out the following steps:
   > Call M/S PROGRAM SELECTION.
   > Key in the Selection for UTILITIES
   > Select DISKETTE IDENTIFICATION
   > Key in the subselection for DISPLAY CONFIGURATOR

   The bits of the power configurator have the following meaning:
   Bit 0 = Y ...PDL4 (Power Design Level 4)
   Bit 0 = N ...PDL5 (Power Design Level 5)
   Bit 1 = Y ...CEC (Must always be on)
   Bit 2 = Y ...ACA (Auto Call Adapter)
   Bit 3 = Y ...LA (Loop Adapter)
   Bit 4 = Y ...MFCU (5424)
   Bit 5 = Y ...CA 1-3 lines (Communication Adapter)
   Bit 6 = Y ...CA 4-8 lines (Communication Adapter)
   Bit 7 = Y ...MPX / BMPX (Channels)

5. Transformer and power supply outputs often use parallel wires and connector pins. If one voltage is out of tolerance (minus signs displayed), ensure that all parallel wired connectors have good electrical connection. Use ALD references given in the Maps.

6. Ensure that all blowers are running correctly and that all airfilters are clean.

7. If any measured signal that is supposed to change its level, remains up or down, even after cards have been replaced or after the wiring has been checked, suspect short circuit to the failing net. (See ALD references given in the MAP.) Use your CE-meter to isolate the short circuit according to the ' Wiring Check Procedure ' shown in this book.

8. Retry power on/power off using the diagnostic-diskette.

9. Call your branch office and ask for MAP chart updates via the reference code data bank.
   (The reference code of your failure is required.)

10. If all previous actions are not successful replace the power controller cards in positions 01A-A2C2, 01A-A2D2 and 01A-A2E2 and retry power on. If the previous action was not successful use this manual and the ALD and try to isolate the faulty unit.

11. If there is an undervoltage or out of tolerance condition of voltages generated by a ferro resonant power supply and the corresponding MAPS failed, suspect a defective capacitor in the transformer unit of the failing voltage. Replace the transformer unti and retry power on.

12. At the beginning of each power Map you find a list of FRU's which might cause the detected error. Check those listed FRU's for correct plugging, seating and good connections.

13. If there is an intermittent error, read the 'Hints for Trouble Shooting Intermittent Power Problems' in this book and follow those hints.

14. If no error could be detected, call your field support center for assistance.

Power Test Selection

The following picture appears on screen when you select 'POWER' from the 'IBM MAINTENANCE AND SERVICE PROGRAM SELECTION'.
To run one of the tests listed in this picture go to the respective handling procedure on the following pages.

```
                    POWER TEST SELECTION

                  -
                          (A)
                  2 =POWER CONTROLLER STATUS
                  3 =VOLTAGE MEASUREMENT

                  SELECTION: (B)
```

(A) Selection codes and names of available programs.

(B) The digits in front of the test name must be typed in behind the word SELECTION to select the appropriate test.

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intentionally left blank

Power Controller Status Display

Handling - Actions

Prerequisites:

1. MSSS power on or power complete
2. Diagnostic diskette or control diskette inserted

How to Select the Test

1. Call M/S PROGRAM SELECTION. Hold down ALT key and press DIAG key. [A]
2. Key in selection for 'POWER', press ENTER. [B]
3. Select 'POWER CONTROLLER STATUS', press ENTER. [C]

   The support processor performs a continuous reading of the power controller status, control lines, analog and digital sense lines, interrupt byte, mark and keys. (See sense and control tables in this book.)

Run Mode:

Looping

How to Terminate the PC Status Display

If you want to run another test return to M/S PROGRAM SELECTION. Select new test, otherwise perform the following steps:

1. Insert control diskette (if applicable)
2. Return machine

Display Description

The power controller status display shows the momentary power status. The program is continously looping while reading and displaying the current status of control lines, digital and analog sense lines, status and interrupt byte, and marks and keys.

Handling - Results

Screen displays:

[A] 'IBM MAINTENANCE AND SERVICE PROGRAM SELECTION'

[B] 'POWER TEST SELECTION'

[C] 'POWER CONTROLLER STATUS'

Example

```
LVL: 0001                    PWR CONTROLLER STATUS                    LOOPING

        STATUS                       CTRL          DIGITALS          ANALOG
      33: 00000010
                          CARD 1  41: 10100000   81: 00000000   85: 11111111
          INTRPT                  43: 00001101   83: 00000000   87: 10110100
      11: 00000000                45: 10000100   91: 00000000   95: 10111100
                                  47: 10100000   93: 00000000   97: 11111011
          MARK
        00000000
                          CARD 2  51: 11000010   A1: 00000000   A5: 00110000
          KEYS                    53: 11110001   A3: 00000000   A7: 01010000
        10000000                  55: 10001111   B1: 00000000   B5: 10001000
                                  57: 10100000   B3: 00000000   B7: 00000000
          MCNT
          0000            INTF  30: 00001000

                          TIMER: OFF                DATA:          ADDR:
                      TOD: SEC
```

CTRL=Control Line
1=Line active
0=Line inactive

Digitals=digital sense lines
1=Line active
0=Line inactive

Analog=analog sense lines
1=Voltage ok > 80%
0=Voltage < 80%

Sense and Control tables are shown on ALD pages YA031 and YA033 and on pages 4560 and 4570 of this book.

Voltage Measurement Program

Purpose

The voltage measurement program is a customer engineering tool. This program allows a CE to display all analog sense points on the display simultaneously. The measurement program is to be used for voltage adjustments of the IPS-voltages.

The program indicates when a voltage differs from the nominal value by displaying + or - signs on the screen. The greater the voltage difference, the greater the number of + of - signs displayed. Characters + and - are used to indicate whether the voltage is minus or plus with respect to the nominal value. When a measured voltage is exact 100 percent of nominal value neither + or - is displayed. See 'display - example'.

Only those voltage monitoring points represented in the 'Master Mask' can be displayed.

Handling

Select program from the power test selection menu.
When called, the program may loop while displaying all voltages.
To select a single voltage the ENTER key must be pressed to enter stop mode for selection.
After a single voltage has been selected, by typing address and bit of the voltage (see page 4570) press ENTER key to continue.
The program again loops, and spreads the voltage graph, as seen in the example.

When adjustment is complete, press ENTER key to return to the normal mode.

CE-Mode on

If a voltage exceeds the normal off limit, the machine will be powered down with CE-mode off. CE-mode on will raise the power down threshold to the component damage level. The displayed normal off threshold is not modified by the CE-mode.

Program Handling - Actions

Prerequisites:

1. MSSS power on for MSSS voltage measurement only
   or
   power complete for measurement of all system voltages.
2. Diagnostic diskette or control diskette inserted.

How to Select the Program

1. Call M/S PROGRAM SELECTION. Hold down ALT key and press DIAG key.
2. Key in selection for 'POWER', press ENTER.
3. Select Voltage Measurement and press ENTER.

How to Terminate the Measurement Program

1. Call M/S PROGRAM SELECTION if you want to run other tests
   or
   insert control diskette (if not inserted) and return machine to customer.

Program Handling - Results

Display-Description

(See display example on the next page.)

Voltage Adjustments

Only 4 voltages generated by the IPS are adjustable (see table on the next page).
The MAP 0279 shows the voltage adjustment procedure.

Physical Sense Points

See ALD pages YA821 to YA873 and YA031 to YA033. A sense point table is shown also on page 4005 of this manual.

Voltage Measurement Display Example

[1] If a voltage exceeds the CALL CE limit, a reference code is displayed and the error condition is logged. The machine is not powered down if the voltages are below the normal off limit.

[2] If any voltage exceeds the normal off limit, a reference code is displayed, the error condition is logged and the machine is powered down if CE-mode is off.
If the support processor voltages are ok, the MSSS keeps powered up.
With CE-mode on, the machine will be powered down if the component damage level of any voltage is reached or exceeded (see page 4005).

[3] The meaning of the command bits are shown in the sense table on page 4570 of this book.

[4] For expanded display enter command and bit here.

[5] Relative percentage above (+) or below (-) nominal value. Percentage per displayed sign varies from address to address.

[6] This information is not used for the voltage measurement program.

Adjustable voltages:

Command	Bit	Voltage	PS-No
87	0	+4.26	111
95	2	-6.54	112
95	3	-4.34	113
95	4	- 1.52	114

If -6.54V is out of tolerance, adjust -4.34V (95-3) first.
For adjustment procedure see MAP 0279.

Normal Display Example:

```
                            VOLTAGE MEASUREMENT DISPLAY
                       CARD1                                   CARD2
[2] --> NORM OFF
[1] --> CALL CE

                                     -            -
[5] -->         +  -    -          ----        +-
               -+ --    - +      - -----   +- - +-+
[3] --> BIT      01234567 01234567 01234567 01234567 01234567 01234567 01234567 01234567
    --> COMMAND     85       87       95       97       A5       A7       B5       B7
                 S T O P M O D E  : PRESS ENTER TO CONTINUE OR SELECT VOLTAGE
[4] --> COMMAND:    BIT:
[6] -->                       TIMER:OFF               DATA: 0000    ADDR: 000000
                          TOD:SEC

        3402
```

Expanded Display Example:

```
                            VOLTAGE MEASUREMENT DISPLAY

        NORM OFF
        CALL CE


                 +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
                 +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
        BIT      55555555555555555555555555555555555555555555555555555555555555555555555
        COMMAND     97       97       97       97       97       97       97       97
                         TO RETURN TO NORMAL MODE,PRESS ENTER KEY

                              TIMER:OFF               DATA: 0000    ADDR: 000000
                          TOD:SEC

        3402
```

Power Log Display

Log Handling - Actions

Prerequisites:

1. MSSS power on or power complete
2. Insert control diskette

How to Select the Log

1. Call M/S PROGRAM SELECTION. Hold down ALT key and press DIAG key. [A]
2. Key in selection for 'DETAILED LOG DISPLAY', press ENTER. [B]
3. Key in selection for 'POWER LOG', press ENTER [C]

How to Terminate the Log Display

1. Press ALT key and hold press DIAG key. The 'IBM MAINTENANCE AND SERVICE PROGRAM SELECTION' is displayed on the screen.

Log Handling - Results

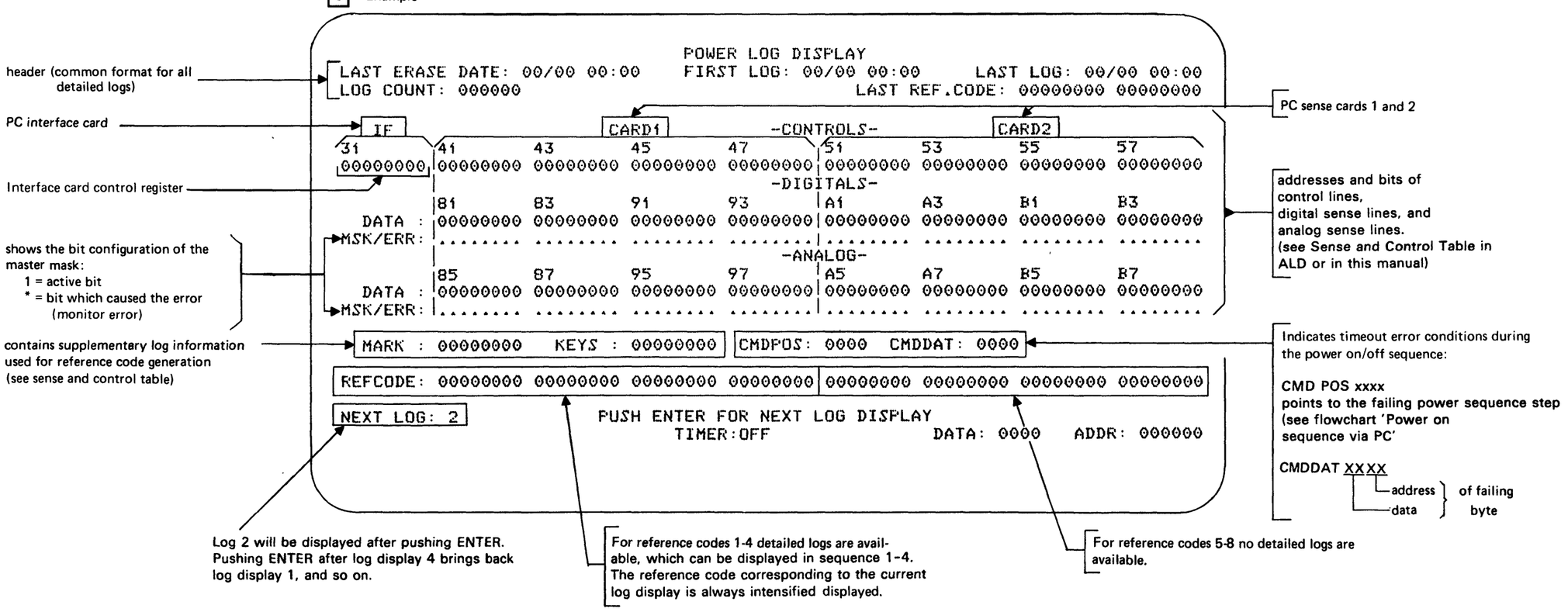
Screen displays:

[A] 'IBM MAINTENANCE AND SERVICE PROGRAM SELECTION'

[B] 'DETAILED LOG DISPLAY SELECTION'

[C] 'POWER LOG DISPLAY' (see example)

[C] Example



header (common format for all detailed logs)

PC interface card

Interface card control register

shows the bit configuration of the master mask:
1 = active bit
* = bit which caused the error (monitor error)

contains supplementary log information used for reference code generation (see sense and control table)

PC sense cards 1 and 2

addresses and bits of control lines, digital sense lines, and analog sense lines. (see Sense and Control Table in ALD or in this manual)

Indicates timeout error conditions during the power on/off sequence:

CMD POS xxxx
points to the failing power sequence step (see flowchart 'Power on sequence via PC'

CMDDAT XXXX
address, data } of failing byte

Log 2 will be displayed after pushing ENTER. Pushing ENTER after log display 4 brings back log display 1, and so on.

For reference codes 1-4 detailed logs are available, which can be displayed in sequence 1-4. The reference code corresponding to the current log display is always intensified displayed.

For reference codes 5-8 no detailed logs are available.

Ambient Recording Log Display

The ambient recording log display consists of two parts:

1. Up to 96 temperature logs are avaialable (see example on page 6150).

2. Up to 96 ESD incidents are logged and displayed as shown on page 6150.

The corresponding reference codes are not displayed in line 23 of the operator console screen.

Temperature and ESD incidents are added to the corresponding log area in ascending order. The latest log always has the highest sequence number. If 96 logs are already available and a new log is pending, all old logs are shifted and the new log is written into position 96.

If an ESD log is wrong (ESD latch missing which means a hardware failure) the ESD monitor is automatically disabled up to the next IML and the wrong ESD log is intensified displayed.

If the ESD monitor is disabled, a message is added to the Ambient Recording Log display:

'Currently no ESD monitoring'.

The ESD monitor can be manually disabled by setting the current ESD sense level to 0.

To enable the ESD monitor again after a manual disableing, select a valid ESD-sense level (1 to 4).

Log Handling - Actions

Prerequisites:

1. MSS power on or power complete

2. Insert control diskette (the diagnostic diskette may also be used).

How to Select the Log

1. Call M/S PROGRAM SELECTION. Hold down ALT key and press DIAG/MODE SEL key. [A]

2. Key in selection for 'DETAILED LOG DISPLAY', press ENTER. [B]

3. Key in selection for 'AMBIENT RECORDING' press ENTER. [C]

   The Temperature Log display on the screen shows up to 48 temperature logs. If more than 48 temperature logs are available, press ENTER for next temperature log display (see example on next page).

4. Press ENTER for ESD log display. [D]
   Up to 48 are shown in the ESD log picture. If more than 48 logs are available, press ENTER for next ESD log picture which shows the logs 49 to 96.

How to Terminate the Log Display

1. Press ALT key and hold press DIAG key. The 'IBM MAINTENANCE and SERVICE PROGRAM SELECTION' is displayed on the screen.

Log Handling - Results

Screen displays:

[A] 'IBM MAINTENANCE AND SERVICE PROGRAM SELECTION'

[B] 'DETAILED LOG DISPLAY SELECTION'

[C] 'AMBIENT RECORDING LOG DISPLAY'
(Temperature Log, see example on next page)

[D] 'AMBIENT RECORDING LOG DISPLAY'
(ESD LOG, see example on next page)

Ambient Recording Log Display (continued)

Temperature Log Display

```
 LV: 79123212                AMBIENT RECORDING LOG DISPLAY
LAST ERASE DATE: 04/06 09:10    FIRST LOG: 04/07 09:36   LAST LOG: 04/07 18:02
LOG COUNT: 000031                                LAST REF. CODE  E8000401 00000000
   TEMP DATE  TIME     TEMP DATE   TIME    TEMP DATE   TIME      TEMP DATE  TIME
   U..D MM/DD HH:MM    U..D MM/DD HH:MM    U..D MM/DD HH:MM      U..D MM/DD HH:MM
01*... 04/07 15:53  13.... ../.. ..:..  25.... ../.. ..:..    37.... ../.. ..:..
02...* 04/07 18:02  14.... ../.. ..:..  26.... ../.. ..:..    38.... ../.. ..:..
03.... ../.. ..:..  15.... ../.. ..:..  27.... ../.. ..:..    39.... ../.. ..:..
04.... ../.. ..:..  16.... ../.. ..:..  28.... ../.. ..:..    40.... ../.. ..:..
05.... ../.. ..:..  17.... ../.. ..:..  29.... ../.. ..:..    41.... ../.. ..:..
06.... ../.. ..:..  18.... ../.. ..:..  30.... ../.. ..:..    42.... ../.. ..:..
07.... ../.. ..:..  19.... ../.. ..:..  31.... ../.. ..:..    43.... ../.. ..:..
08.... ../.. ..:..  20.... ../.. ..:..  32.... ../.. ..:..    44.... ../.. ..:..
09.... ../.. ..:..  21.... ../.. ..:..  33.... ../.. ..:..    45.... ../.. ..:..
10.... ../.. ..:..  22.... ../.. ..:..  34.... ../.. ..:..    46.... ../.. ..:..
11.... ../.. ..:..  23.... ../.. ..:..  35.... ../.. ..:..    47.... ../.. ..:..
12.... ../.. ..:..  24.... ../.. ..:..  36.... ../.. ..:..    48.... ../.. ..:..

ALL TEMPLOGS DSIPLAYED  CURR. STATUS: E8000401  PRESS ENTER FOR ESD/LOG DISPLAY

CURRENT MINIMUM ESD-SENSE LEVEL: 3  CHANGE MINIMUM ESD-SENSE LEVEL TO:

                          TIMER: OFF          DATA:        ADDR:
                      TOD: SEC
```

Temperature exceeded upper limit (U = UP)

Temperature went back to normal (D = Down)

Time stamp
The difference between the first and second stamp is the duration of high ambient temperature.

Log numbering (48 per display)

Information wether additional logs exist or not

Current ambient status during Log display. Only the reference code is displayed. The information is not logged (see reference code directory E8XX).

ESD Log information (see next figure).

ESD Log Display

```
 LV: 79123212                AMBIENT RECORDING LOG DISPLAY
LAST ERASE DATE: 04/06 09:10    FIRST LOG: 04/07 09:36   LAST LOG: 04/07 18:02
LOG COUNT: 000031                                LAST REF. CODE  E8000401 00000000
  ESD  DATE  TIME     ESD  DATE   TIME    ESD  DATE   TIME      ESD  DATE  TIME
 4321 MM/DD HH:MM    4321 MM/DD HH:MM    4321 MM/DD HH:MM      4321 MM/DD HH:MM
01.*** 04/07 09:36  13.... ../.. ..:..  25.... ../.. ..:..    37.... ../.. ..:..
02**** 04/07 09:41  14.... ../.. ..:..  26.... ../.. ..:..    38.... ../.. ..:..
03.... ../.. ..:..  15.... ../.. ..:..  27.... ../.. ..:..    39.... ../.. ..:..
04.... ../.. ..:..  16.... ../.. ..:..  28.... ../.. ..:..    40.... ../.. ..:..
05.... ../.. ..:..  17.... ../.. ..:..  29.... ../.. ..:..    41.... ../.. ..:..
06.... ../.. ..:..  18.... ../.. ..:..  30.... ../.. ..:..    42.... ../.. ..:..
07.... ../.. ..:..  19.... ../.. ..:..  31.... ../.. ..:..    43.... ../.. ..:..
08.... ../.. ..:..  20.... ../.. ..:..  32.... ../.. ..:..    44.... ../.. ..:..
09.... ../.. ..:..  21.... ../.. ..:..  33.... ../.. ..:..    45.... ../.. ..:..
10.... ../.. ..:..  22.... ../.. ..:..  34.... ../.. ..:..    46.... ../.. ..:..
11.... ../.. ..:..  23.... ../.. ..:..  35.... ../.. ..:..    47.... ../.. ..:..
12.... ../.. ..:..  24.... ../.. ..:..  36.... ../.. ..:..    48.... ../.. ..:..

ALL ESD LOGS DISPLAYED  CURR. STATUS:  PRESS ENTER FOR TEMPLOG DISPLAY

CURRENT MINIMUM ESD-SENSE LEVEL: 3  CHANGE MINIMUM ESD-SENSE LEVEL TO:

                          TIMER: OFF          DATA:        ADDR:
                      TOD: SEC
```

ESD Level
4 = highest level
1 = lowest level
(see description of ESD Monitor in this book)

ESD incident level 3

ESD incident level 4

Log numbering (48 logs per display)

Time stamp
MM = month
DD = day
HH = hour
MM = minute

Shows the minimum ESD sense level. Sense level 3 means: No ESD incident below level 3 is logged. Only ESD incidents with level 3 and 4 will appear in the log picture.

Information for additional logs.

ESD sense level can be set to each valid level 0 to 4. Do not modify the sense level unless instructed to do so by MAP's or by an FSC specialist.

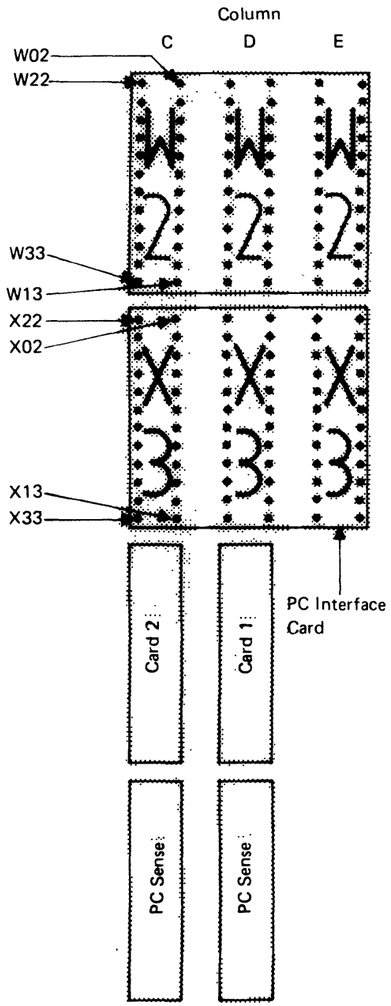
Current ambient status during log display.
Only the reference code is displayed (see Reference code directory (E8XX). The error information is not logged.

Connectors

PC Top Connectors

The interconnection of the power-controller interface card and sense cards is done by two different top connectors. The top connectors are labeled W2 and X3 and are not interchangeable. The connector identification can be seen through the slots of the top connector housing.

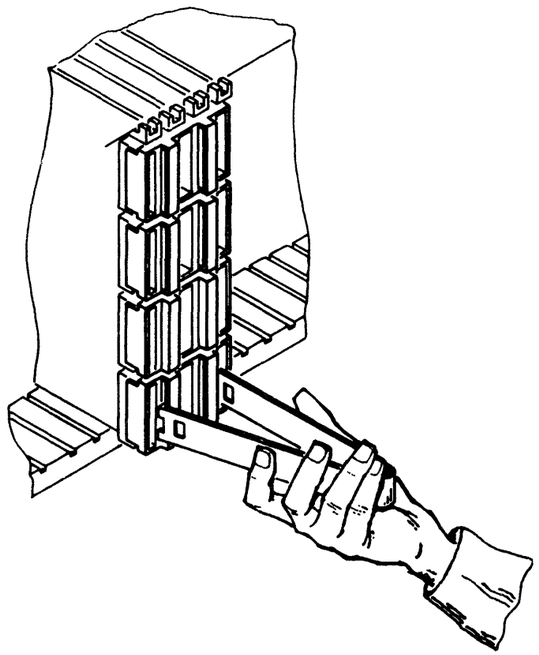
An additional pin identification is printed next to pins W22, W33, X22 and X33. The connectors must be plugged as shown on the following figure.



Top Connector Extraction

Top connectors can be easily extracted using the extraction tool P/N 454065 which was originally designed for extraction of wire contact relays.

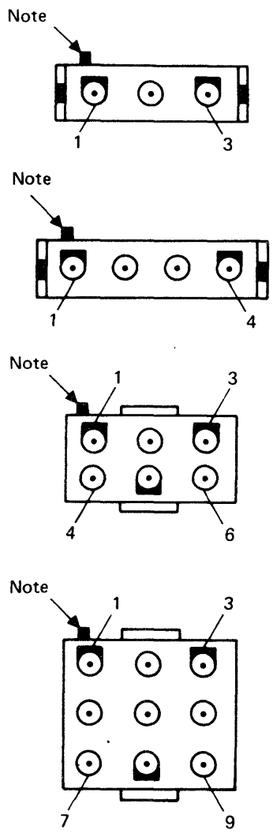
The tool is part of the CE tool set and should be handled as shown below.



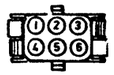
Power Connectors

The various Field Replaceable Units (FRU's) of the power complex are interconnected by connectors with up to 15 pins.

The pin counting scheme on the following figure shows the pin side view (male plug).



AC-Connector for Diskette Drives



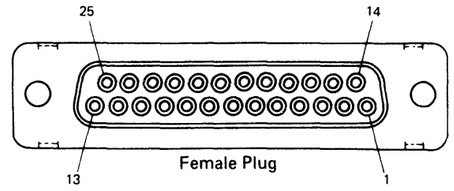
1,3 = line voltage
5 = Gnd

If the diskette drive motor or its AC cable must be replaced, ensure that the ground connectors have correct contact.

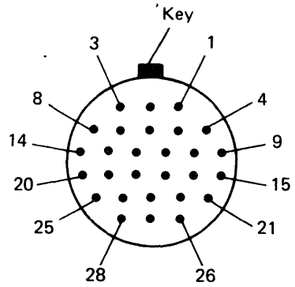
The pin counting scheme of connectors with more than 9 pins is similar.

Note: This mark on the connector housing identifies pin number 1. The identification is valid for male as well as for female plugs.

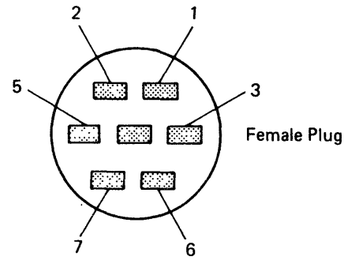
OCP-Connector (Located in Keyboard Housing)



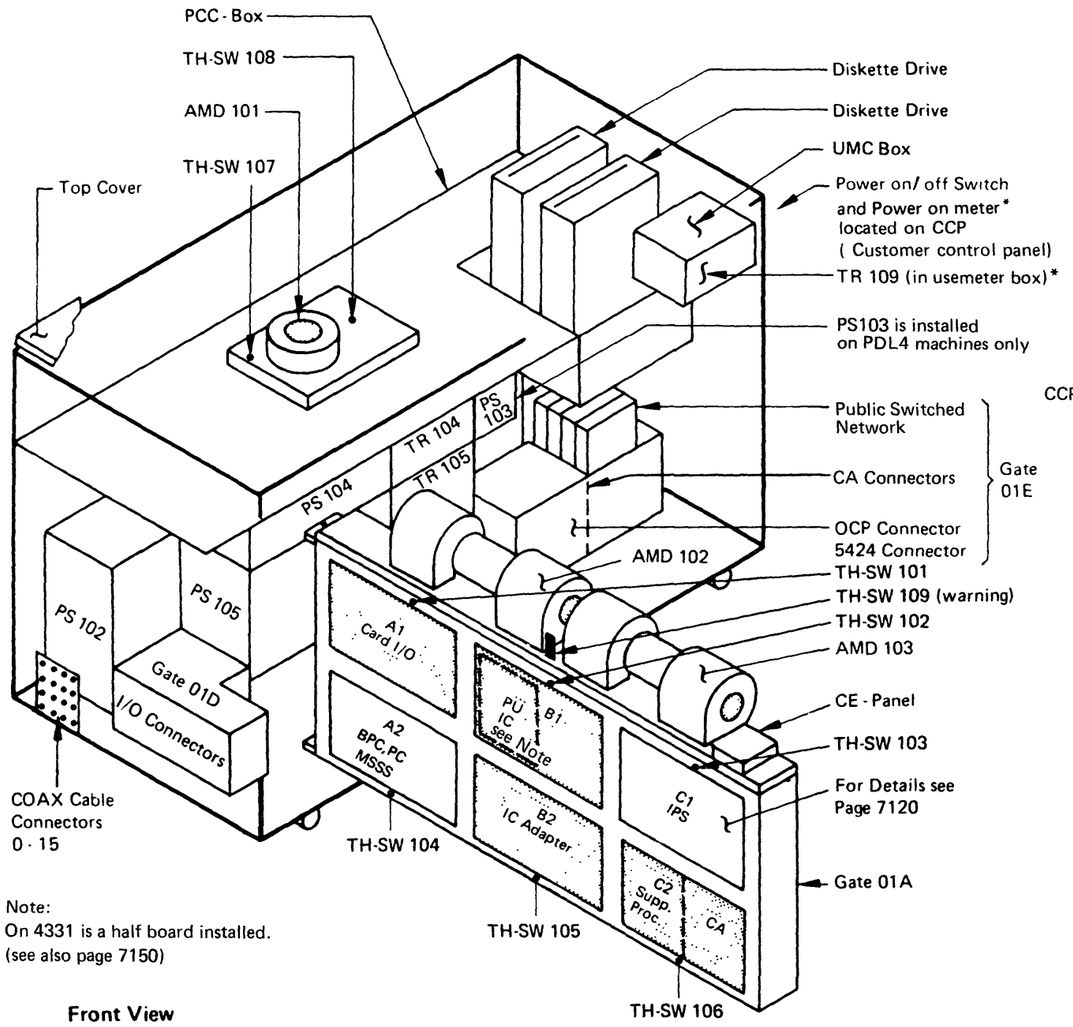
OCP-Connector (Located Next to Connector Compartment 01E)



MFCU DC-GND Connector

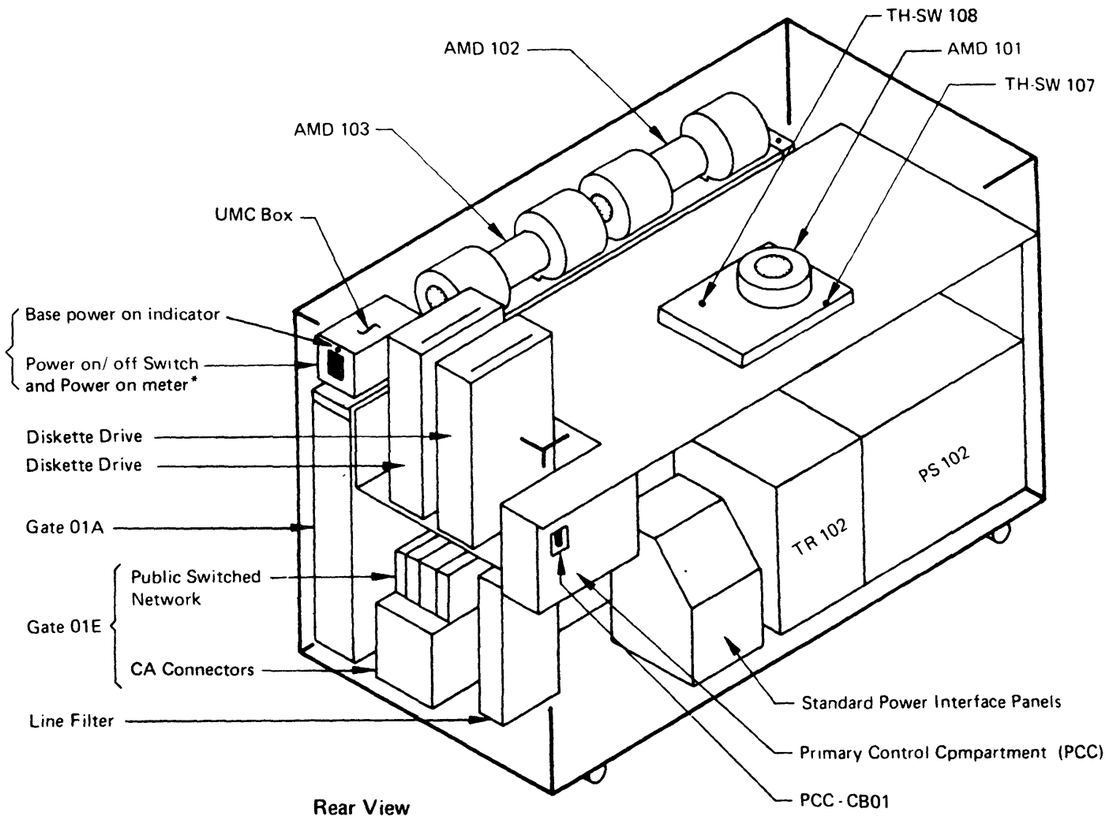


Physical Locations



Note:
On 4331 is a half board installed.
(see also page 7150)

Front View

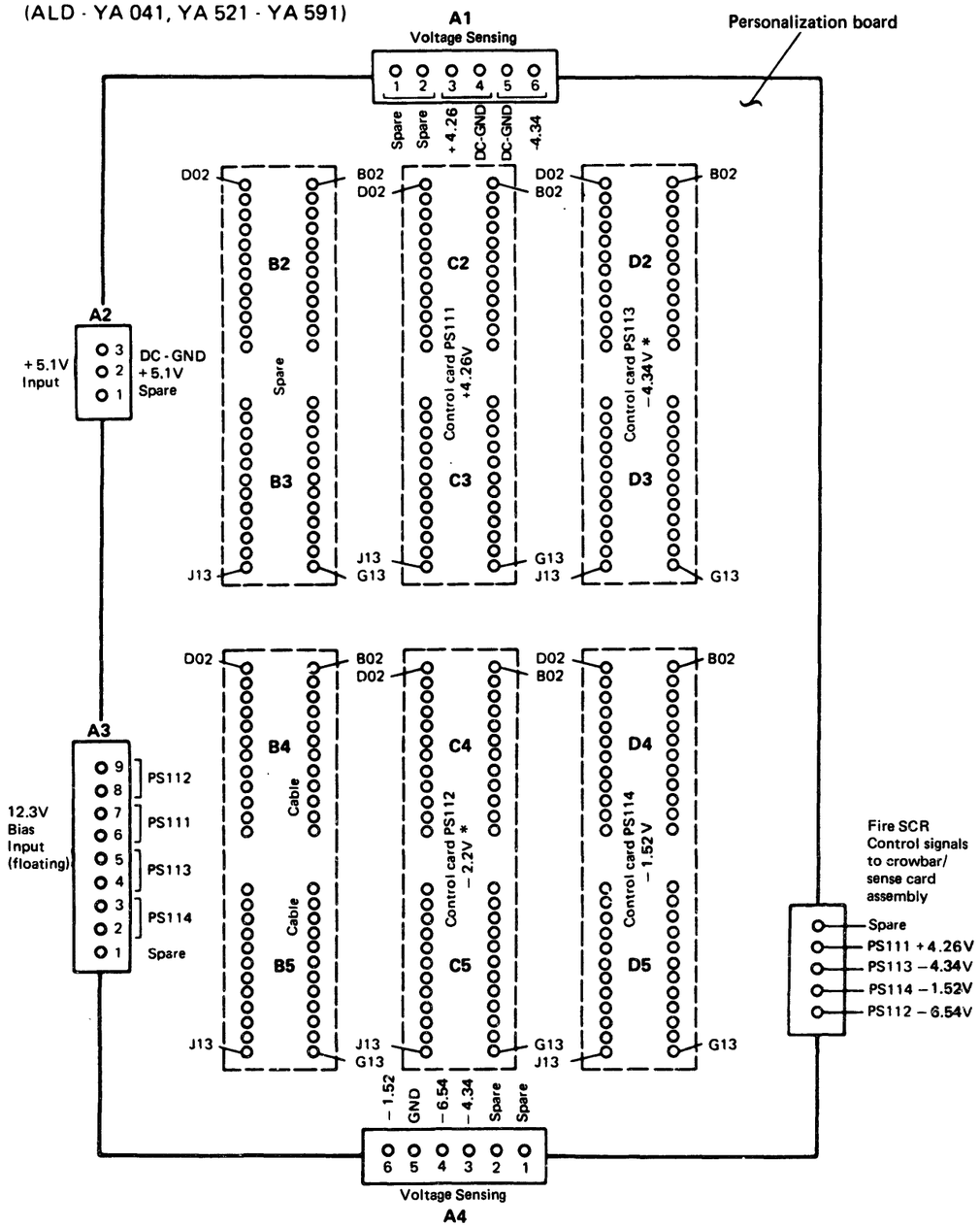


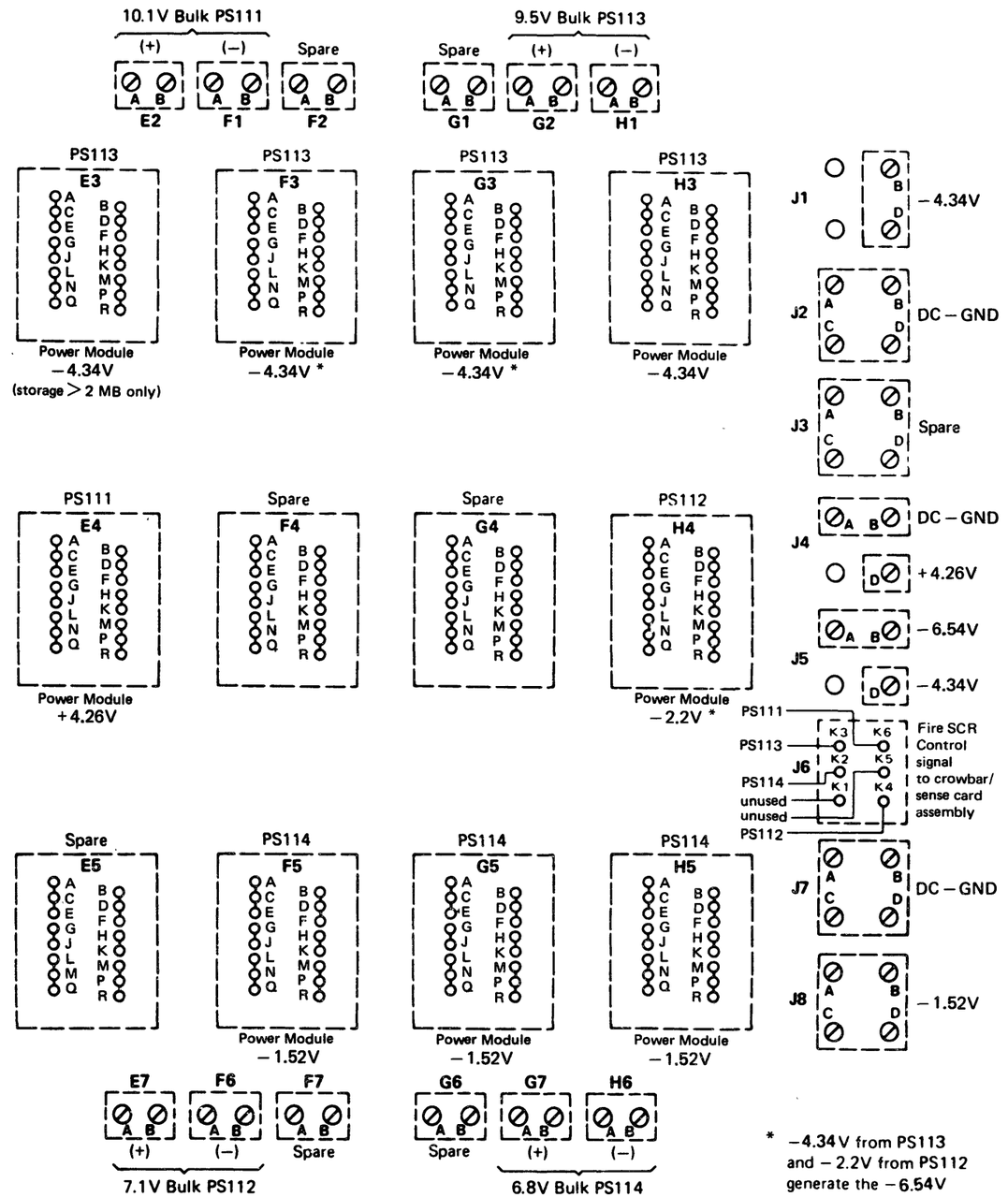
Rear View

* not installed in all machines

IPS Board 01A-C1 (Pin side view)

(ALD - YA 041, YA 521 - YA 591)



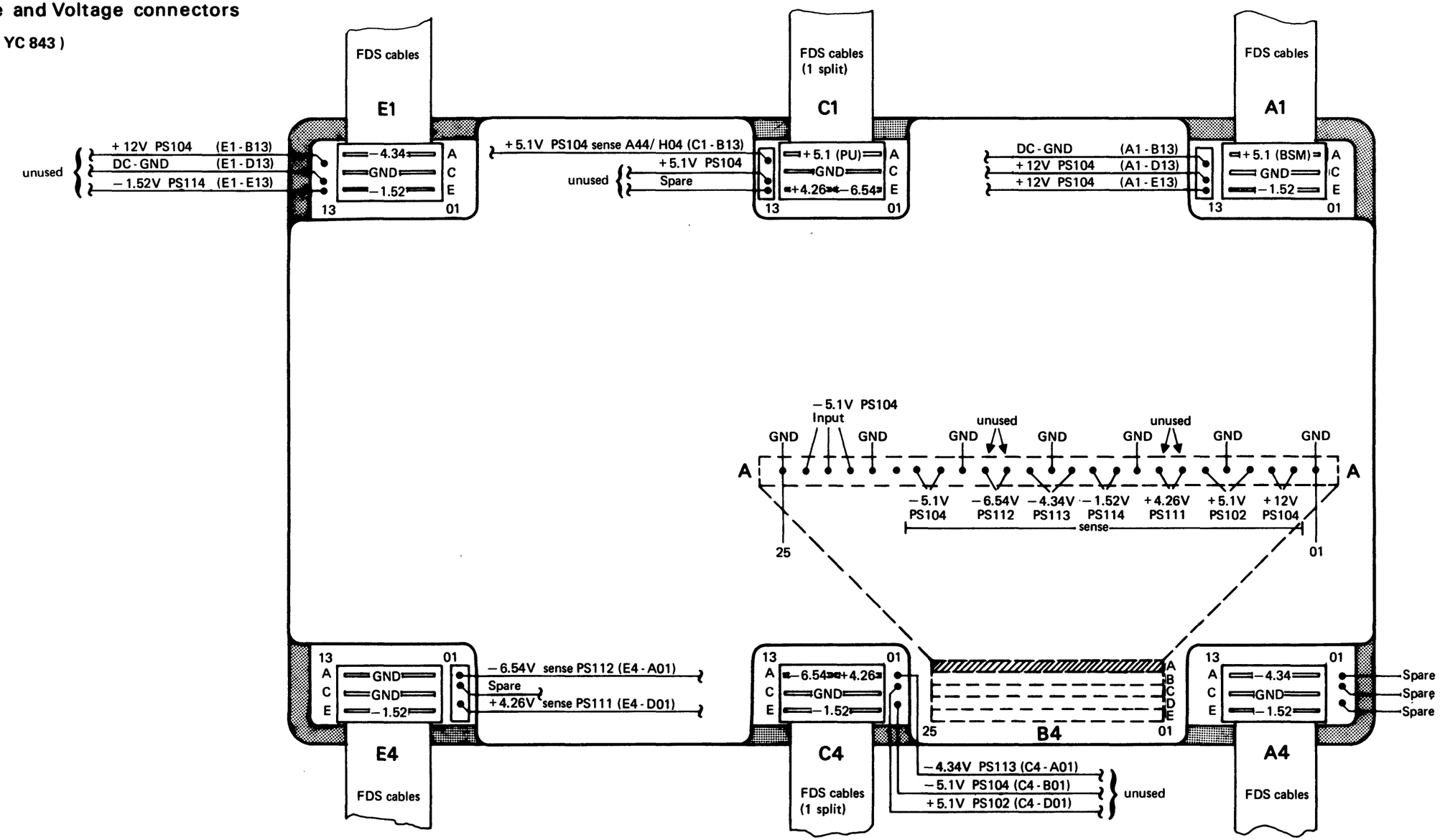


* -4.34V from PS113 and -2.2V from PS112 generate the -6.54V

Board 01A-B1 (Pin side view)

Sense and Voltage connectors

(ALD - YC 843)

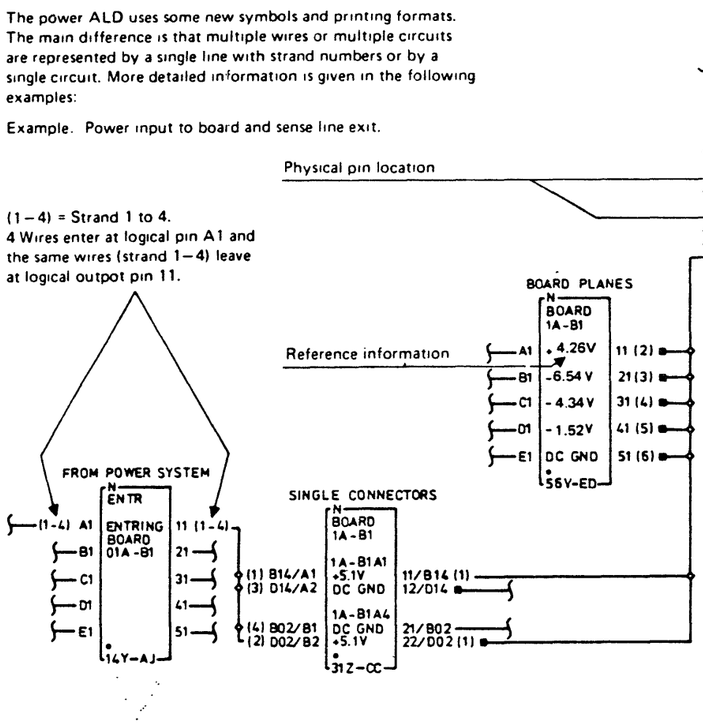


Hints for ALD Usage

1. Wiring

The power ALD uses some new symbols and printing formats. The main difference is that multiple wires or multiple circuits are represented by a single line with strand numbers or by a single circuit. More detailed information is given in the following examples:

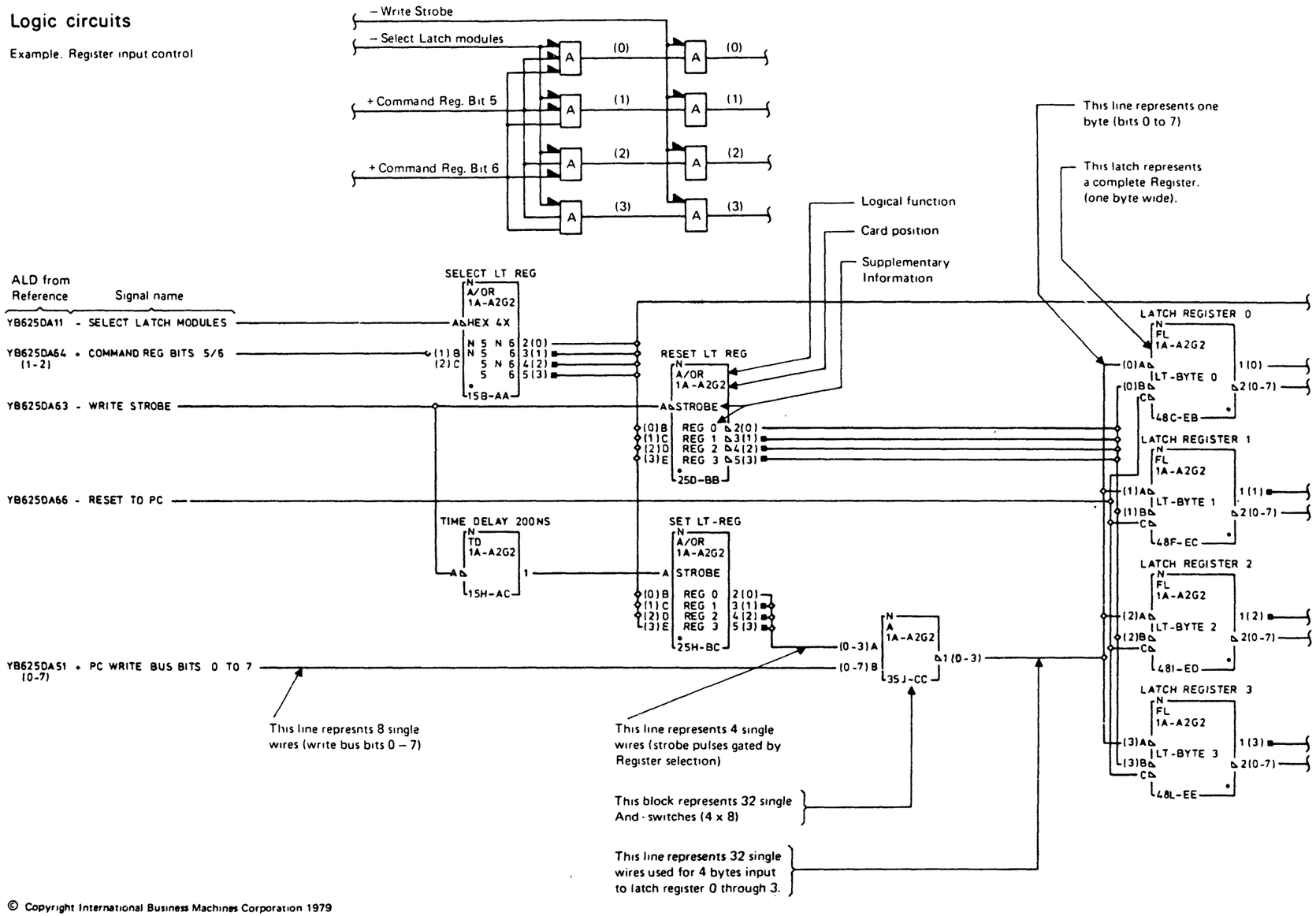
Example. Power input to board and sense line exit.



Hints for ALD Usage

Logic circuits

Example. Register input control



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REF

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Index (continued)

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