

digital

INTEROFFICE MEMORANDUM

TO: Andy Knowles MR2-2/A52

DATE: February 27, 1976
FROM: Ken Olsen
DEPT: Administration
EXT: 2300
LOC/MAIL STOP: ML12-1/A50

SUBJ: MARKETING THE LSI-11

The Marketing Seminar was very good. I think it opened up the whole idea of marketing for the Company. It showed us that we do not have to invent everything ourselves but that the outside world has done many of these things and we can get help.

What do you think about asking one of these professors to come in and help us review the alternative ways of marketing the LSI-11? We have the best product and the customers need it and we have them available. We ought to list all the ways of marketing it, and take advantage of the best ideas.

/ma



INTEROFFICE MEMORANDUM

TO: Distribution List

DATE: December 26, 1973

FROM: Steve Teicher

DEPT: Small 11 Engineering

EXT: 3175 LOC: 1-3

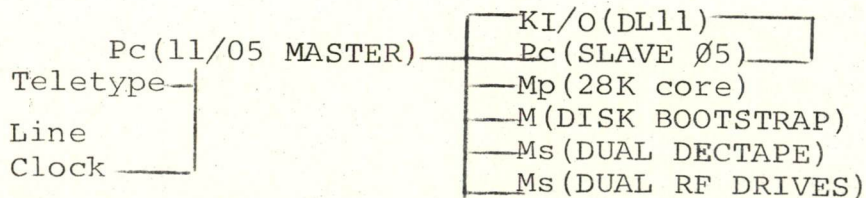
SUBJ: New Products in Less Than 6 Months

During the PDP-11 Woods Meeting, Ken suggested that we consider new products which could be shipped in less than 6 months in anticipation of increased competition due to U.S. economic conditions becoming less lucrative than present. I suggest that we put some intense effort into examining the technical and marketing aspects of multi-processor 11/05's.

Facts:

1. PDP11/05 processors shipped after 11/73 are capable of being changed from bus masters to bus slaves by the addition of a single number.
2. Slave 11/05's perform DATI's, DATIP's, and DATI's by requesting NPR's. A slave does not arbitrate bus requests except those from its own serial line or line clock.
3. A slaves serial line or line clock can be used as a method of communication between master and slaves.
4. A slaves vectors can be altered by rather simple microprogram changes and in some cases by the addition of a chip which was provided for in the layout.
5. A slaves memory map can also be altered by simple module ECO's.
6. It has been predicted that when 3, 11/05 CPU's are added to the bus there is a theoretical gain of 2.7 in processing power. The gain is liable to be much more for some specific tasks involving real time processes. RT11 background foreground might really benefit from a multi-processor configuration.
7. OEM's such as Applicon might really be turned on by a multi-processor system.

A two processor PDP11/05 has been set up for programming use on 1-3. The configuration is as follows:



*continued to next page...

New Products in Less Than 6 Months

Steve Teicher

Page Two

Ms (RK11D-RK05) ← → being added
— KI/O-TLP11
— P (Kell)
— KI/O-T_{PC}11

How about some discussion on this and some more ideas now.

Distribution List:

• Bill Dimmer
Bob Puffer
Bruce Delagi
Gordon Bell
Dick Clayton
Andy Knowles
Bill Long
Mike Tomasic
Dave Peters
Nate Teichholz
Ed Kramer
Ralph Platz
George Thissell
Ken Olsen
Brad Vachon
Stu Wecker
Art Cambell
Ted Johnson
Win Hindle
Steve Rothman
Ken Ellson
Jim Bell
Dave Stone
Bob Savell
Bob Armstrong
Dick Spencer
Charlie Spector
John Holz
Jaga Aralpragasam

/kj

TO: Allan Kent
Cc: Dave Peters
Bob Puffer

DATE: January 16, 1974

FROM: Ken Olsen

DEPT: Administration

EXT : 2300

SUBJ: HOW CAN WE MAKE A PDP8 OR AN 11/05 MOST RELIABLE?

Will you assign one Engineering Committee meeting to question how we can make a PDP8 or an 11/05 most reliable. One time we looked into this and concluded that by slowing down the machine slightly we could increase the reliability enormously. People are catching this idea now, and I would like to have their plans reviewed by a critical Engineering Committee. We should do this soon because the 8 and 11/05 are well under way and we should force them to organize their thoughts.

It would be good also to ask them what they are doing to make testing easier. Testing should be thought out during the design of the machine and not turned over to a professional test maker afterward. If it is thought out during the design, points can be brought out, maybe extra equipment included to make testing possible and easy.

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INTEROFFICE MEMORANDUM

11/05 2-3 DEC 3 1973 1211

Products Committee
TO: Engineering Committee
MFG/ENG Committee
cc: Dick Best
Bob Armstrong
John Fisher
Gordon Bell

DATE: November 20, 1973
FROM: Steve Teicher *S.T.*
DEPT: Small 11 Systems Engineering
EXT: 3175 LOC: 1-3

G. Bell

SUBJ: Production Release

I hope this gets solved

I have been informed by Dick Best that we can never production release the 11/05 CPU modules because they are tested on an XOR tester which is operated by a different cost center than the cost center which builds the module.

I am willing to write any reasonable procedures or to take any other action to complete the 11/05 documentation if it is not satisfactory. However, I cannot cure this administrative problem without a ruling on the meaning of production release. I believe that we should not continue to ignore the production release mechanism; but today I have no choice given that we desire to build and to ship computers.

I suggest that the phases of production build-up be defined as follows:

1. Evaluation Run - First units built by production employees in facilities that are identical to those which will be used for the first units to be shipped. Evaluation run units must not be shipped to customers for consideration. All engineering documentation should be available and under ECO control including specifications, test, and acceptance procedures. It will be understood that changes to the test and acceptance procedures will occur as a result of the evaluation run. It is further understood that design engineers will closely monitor the evaluation units and will specify test procedures by which evaluation units will be exercised.
2. Release for Shipment - Products released for shipment must conform to the appropriate DEC standards for workmanship, reliability, and general appearance. All documentation including manuals must be printed according to DEC standards. It will be understood that products released for shipment may not be produced at the projected price because the production procedures may not have been debugged and the appropriate tooling may not be effectively used.
3. Production Release - Production release occurs when the product manager, the project engineer, the production engineer, and key line supervisors agree that the product performance, cost, and quality meet agreed upon goals. Furthermore, for products produced in a quantity of greater than 100 per month and/or which represent greater than \$2M

in sales revenue per year a plan must be submitted to the MFG/ENG Committee listing the manufacturing goals. The MFG/ENG Committee may request personal appearances of the appropriate people to defend the plan.

For products which account for 2% or greater of company revenue or which ship in excess of 300 units/month a presentation must be scheduled before the MFG/ENG Committee in which the product manufacturing plans are discussed.

The MFG/ENG Committee must establish rules for production release. However, these rules may be amended case-by-case with the approval of the committee of a product manufacturing plan.

/kj

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INTEROFFICE MEMORANDUM

TO: Andy Knowles
Cc: Gordon Bell

DATE: March 12, 1974

FROM: Ken Olsen

DEPT: Administration

EXT: 2300 LOC: 12-1

SUBJ: CHEAP, SIMPLE 10½" CABINET FOR 11/05

For three years I have been trying to get people to make cheap, simple 10½" cabinets to take the 11/05. I feel that by making the 11/05 10½" high and being sloppy with space one could make it a lot cheaper and make the power supply wide open for maintenance. No one was interested because if they had a 10½" panel they wanted to put twice as many modules in it and they always wanted to get just one more module than could be cooled well and the cost was much higher instead of much cheaper.

With your new Product Lines it might be worth doing a quick job of engineering a simple, straightforward, fast, inexpensive, ugly cabinet for the 11/05 as we know it today. If you put it into the normal mechanical engineering shop, it might take forever and take a lower priority because there is only a small number of guys doing all the projects and they can do only a little work on every one each week. But if it is important, and if it really can be done cheaply and quickly, one way or another, we could subcontract it or draft someone to get it done.

If it is as cheap as I dream about, it could make a significant contribution to your Product Line and it would leave an open pan for power supplies that would be easy to maintain.

/a

(attached: memo of Dec. 4, 1973)

FEB 7 1974

TO: Ken Olsen

DATE: February 6, 1974

FROM: Steve Teicher

DEPT: *Steve*
Small Systems 11 Engineering

EXT: 3175 LOC: 1-3

SUBJ: Problems with 11/05's in Japan

• The problems with 11/05's shipped to Japan were two or more fold:

1. In order to ship machines to Japan, it is necessary to disassemble them into pieces and reassemble them in Japan. At first, this was done without the knowledge of engineering or anyone else that I have spoken with in Maynard. We have since developed, in conjunction with Field Service, the attached manuals, and this has helped quite a bit.
2. Our Japanese customers apparently use the machine at the high temperature end of our specification and we experience a higher than normal failure rate between 40°C and 50°C. This is a general problem everywhere, but is worse in 50Hz countries where the fans run slower. We are instituting a special screening procedure for Japan and intend to monitor the effect on failures there. See attached note from Don Zeresky. No 11/05's will be shipped to Japan until we are satisfied that they will work (or at least we'll loose sleep trying.)
3. We have been having general quality problems and test problems with the 11/05's recently. I believe these are due to a misunderstanding on the part of engineering of the type of tools needed by manufacturing. I believe that a closer tie between manufacturing and engineering would be useful and will attempt to achieve this.

PS: Motorola is happy now. Ask Andy Knowles.

/ssb

file

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INTEROFFICE MEMORANDUM

TO: STEVE TEICHER
 DATE: JANUARY 30, 1974

CC: WAYNE GRUNDY
 YU HATA
 KOJI KANEKO
 RON SMART
 ART ZINS

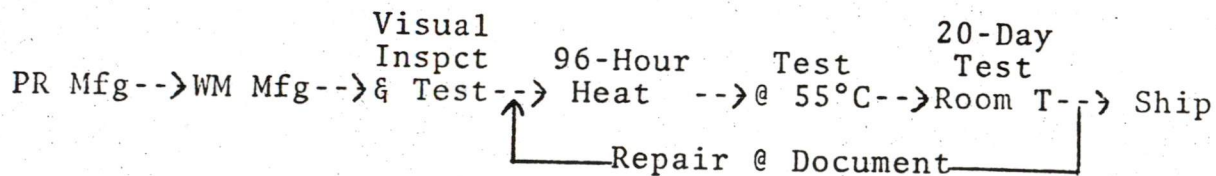
FROM: DON ZERESKI
 DEPT: GIR & SERVICES ADMIN
 EXT : 2479

SUBJ: 11/05 TESTING FOR JAPAN

* The purpose of this memo is to document our conclusions and action items concerning the 11/05 reliability problems for Japan.

The 11/05 reliability problem in Japan has been very difficult to pin down due to the constant changes in procedure, the lack of quality control in Puerto Rico, and the communication problems. As a result, the following plan was devised:

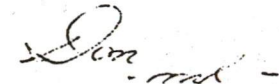
1. All 11/05's for Japan will undergo additional testing after Puerto Rico Manufacturing. The specifics of the test will be defined by Wayne Grundy and Kaneko-san. The basic test flow is as follows:



2. The procedure defined in Step 1 will be reviewed by 11/05 Engineering and implemented by them. Product Support (Wayne Grundy et al) will help monitor the testing but cannot be responsible for implementing it.
3. It should be noted that we already have a precedent for establishing the extended testing in that Motorola is currently receiving a similar test on all 11/05's with good results. In addition, we should try to dispel any rumors or notions of destructive testing. Digital purchases its components to a minimum specification of 70°C case temperature ambient in free air. That means any component with additional cooling should be able to exceed the 70°C spec. Since we only test to 55°C, we should not be damaging any components.
4. The reporting procedure for future data collection will be explicitly defined by Wayne Grundy and Kaneko-san. Kaneko-san will insure the system is understood and implemented 100% in Japan. Harry Dugas will insure that the system is followed and, with Hata-san's help, insure that the OEM's maintain consistent serial numbers.

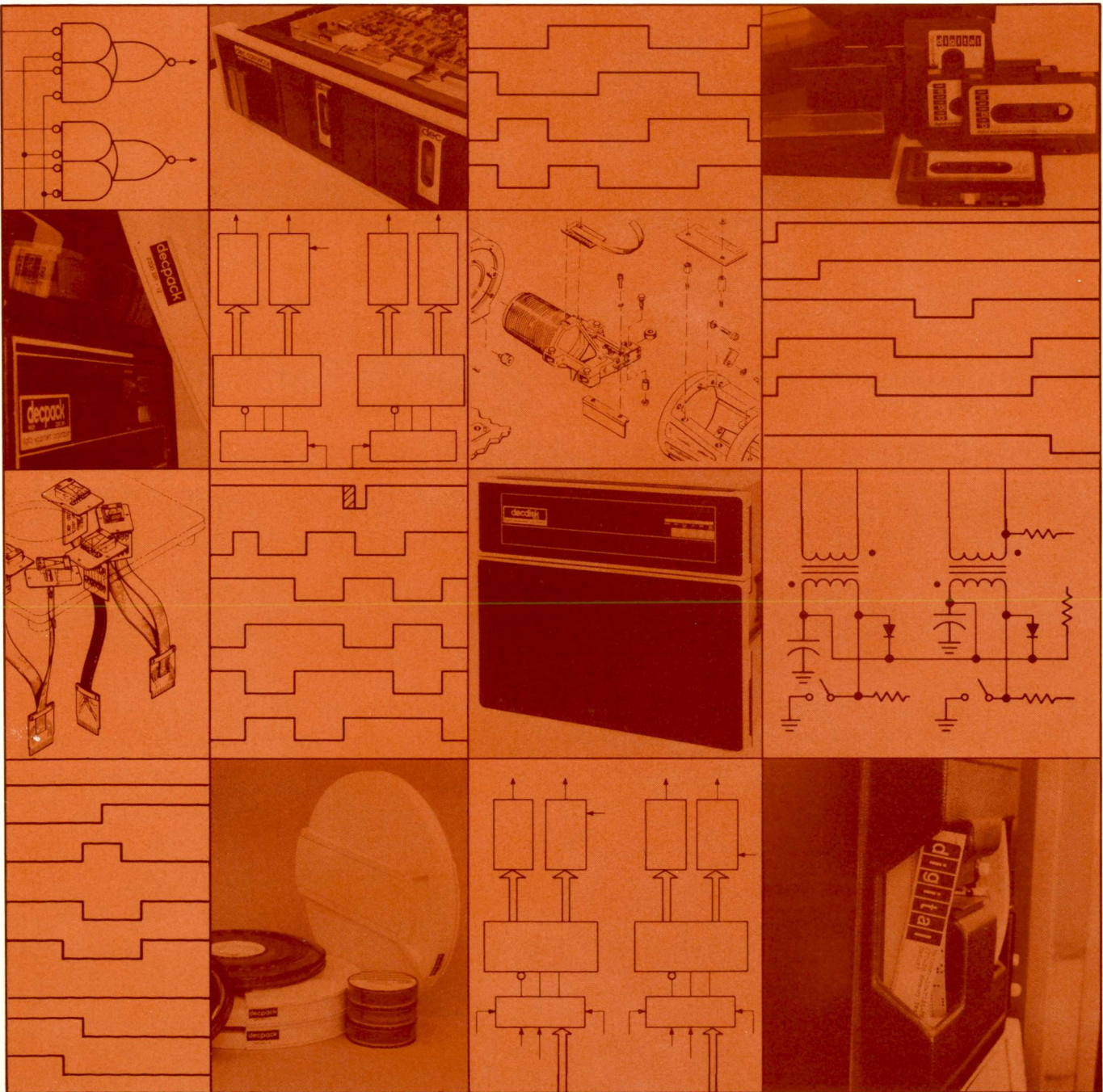
5. All future 11/05 knockdown systems will be shipped directly to DEC Japan for assembly and test. They will not go to the OEM. Harry Dugas will insure proper facilities for the assembly and test, and the author will get the funds from the product line.
6. Customers that can use the new 10" box should be encouraged to place future orders for the 11/05 in the 10" box. It will be far easier to install additional cooling in this unit if it is later deemed necessary. We will not convert current systems to the 10" box unless it is proven absolutely necessary. The new super 10" box will not be available until Q1 with the new supply and fans.
7. The knockdown procedures are at the printers. Wayne Grundy will insure that Hata-san has copies to take back to Japan by Tuesday, February 5.
8. The general 11/05 reliability/manufacturing meeting is held on Mondays at 10:30 A.M. in the 1/2 conference room. Wayne Grundy and Kaneko-san will attend to monitor our situation and present any relevant data.
9. The 11/05 hold will not be released until machines have successfully completed the extended testing by Engineering as defined in Step 1.

Regards,



Don
DZ:m1

digital



11/05
disassembly
procedure

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SCOPE

To provide total information for the disassembly of PDP-11/05's for shipment to Japan. This includes list of labels needed, part numbers for packing materials, and detailed instructions with pictures.

PREREQUISITES TO DISASSEMBLY

All 11/05's that are to be broke down, must be accepted, ready to ship units. If they have been out of acceptance for more than 48 hours, then they must be "Quick Verified" before disassembly. This can be done either of two ways. Using the Quick Verify of a DAUGHTER STATION or by running the following tapes:

1. T17 w/core expanded 2 passes
2. T15 2 passes
3. 0-124K Exerciser 2 passes

No 11/05 w/o cooling #46 installed, shall be part of a Japan shipment. Do not substitute packing materials or alter any part of procedure w/o permission of Engineering or Product Support.

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DIGITAL EQUIPMENT CORPORATION MAYNARD, MASSACHUSETTS

DATE 11-30-73

TITLE BASIC 11/05 BREAKDOWN PROCEDURES

REVISIONS

REV	DESCRIPTION	CHG NO	ORIG	DATE	APPD BY	DATE

ENG	<i>[Signature]</i>	APPD	SIZE	CODE	NUMBER	REV
			A			

DEC FORM NO. DRA 107A

SHEET 1 OF 6

TITLE BASIC 11/05 BREAKDOWN PROCEDURES

1.0 SCOPE

1.1 This specification established the minimum procedures which must be performed to breakdown a basic 11/05 into pieces suitable for shipment and reassembly. The procedure has been written specifically for one set of shipping regulations and may not apply in the general case.

2.0 SET-UP

2.1 Locate the allocated quantity of fully accepted 11/05's in the breakdown area providing enough space to disassemble and pack each individual piece.

2.2 Packing material should be forecast and ordered in advance of breakdown. For quantity and type of materials see section 5.0. Labels for parts should be no wider than 3.8".

2.3 Assign a unique "allocation number" to each computer. The DEC serial number should be used as the allocation number. Two labels must be made for each part. One showing the designated name of the part, i.e., BJ11A, MBJ11A, etc. The other showing the allocation number. These labels shall be placed in the appropriate position as shown in the photos included in the breakdown procedure. The labels should be typed or printed. They must be legible. If slot is indicated, include on label with allocation number.

2.4 Each step of the procedure shall be performed on all machines in the breakdown group before progression to the next step.

3.0 BREAKDOWN PROCEDURE

NOTE: All pieces must be marked so that they need not be unwrapped to determine the designation and allocation number (See photos in breakdown procedure).

3.1 Remove G727 modules, label (designation, allocation number, and slot number) and pack in mailite envelope.

3.2 Remove M930 modules, label, (designation, allocation number, and slot number), and pack in mailite envelope.

<i>[Handwritten Signature]</i>	SIZE A	CODE	NUMBER	REV
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TITLE BASIC 11/05 BREAKDOWN PROCEDURES

3.3 Remove H214 stack, label (designation, allocation number) & pack in individual stack module box. (bookpack)

NOTE: When attaching labels to modules do not place label over numbers that may be stamped on module handle.

3.4 Remove G231 module, label and pack with first electro-magnetic shield in standard module box. If two or less units use bookpack. (see packing reference chart)

3.5 Remove G110 module, label and pack with second shield in module box.

3.6 Remove M7261 module, label and pack in module box.

3.7 Unplug console cable from M7260 module carefully. Remove M7260 module, label and pack in module box.

3.8 Remove KY11J as follows: (console assy)

CAUTION --Do not allow console to hang by wires while removing etch board.

3.8.1 Unscrew 4 mounting screws, separate console from chassis, replace screws in console (note location of spacers). For reassembly see photo of spacers.

3.8.2 Remove 6 screws mounting console etch board to bezel. Separate etch board from bezel, disconnect console cable from console etch board.

3.8.3 Remove red/black console power wires from console etch boards, red transformer wires and blue/black power control wires from key switch. Replace module and 6 screws.

3.8.4 Remove 11/05 silk-screened panel, replace with plain unmarked panel.

3.8.5 Label and pack two per compresso carton. Plastic console protectors can be discarded.

3.9 Remove BC05 as follows:

3.9.1 Unplug BC05 MAT-N-LOK

3.9.2 Cut tie wraps holding power cord, remove TTY cable, put cable aside, coil power cord and secure with one tie wrap.

<i>[Handwritten Signature]</i>	SIZE	CODE	NUMBER	REV
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TITLE BASIC 11/05 BREAKDOWN PROCEDURES

3.9.3 Remove BC05, replace 2 mounting screws, label and pack in mailite envelope. Pack all BC05's in same cardboard box if possible.

3.10 Remove 5409728 as follows: (regulator board)

3.10.1 Unscrew 6 mounting screws, note different lengths to replace.

3.10.2 Lift each board sufficient to unplug the two MAT-N-LOK connectors on bottom of board.

3.10.3 Remove 5409728

3.10.4 Replace 6 screws in mounting box.

3.10.5 Label and place in sleeve being careful not to bend any of the components, wrap in bubble pack. Pack in cardboard box.

CAUTION When removing power dist.harness from logic, be sure that small orange wire and small brown wire do not have broken connectors. Replace if broken, before packing chassis.

3.11 Disconnect power distribution harness from logic. Disconnect double +5V and Gnd tabs as units. Remove power control connectors from slots in rear of chassis. Be sure to restore male part of power control connectors after removal from slot. Remove transformer AC harness from guides along chassis wall.

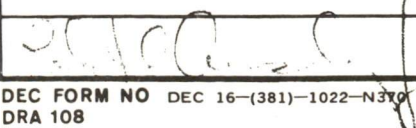
NOTE Depending on type of fan used, the rear fan grill may have to be removed in order to disconnect fan.

Unplug rear chassis fan AC wires. The short ground wire going from the backplane mounting screw to the ground lug on backplane should be unplugged at logic.

3.12 Remove power supply chassis as a subassembly (5309816, transformer, harness, fan), label, and wrap in bubble pack. Several may be packed in one cardboard box. (Mounting screws should be replaced in chassis).

3.13 Unplug 5409949 TTY cable from logic pins, leave stuck to chassis floor.

3.14 Remove logic assembly. Replace mounting screws in chassis. The short black ground wire attached to one of the backplane mounting screws should be left with chassis.

	SIZE A	CODE	NUMBER	REV
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TITLE BASIC 11/05 BREAKDOWN PROCEDURES

- 3.15 Remove module guides, replace screws, label each guide, and wrap both together in bubble pack. Package containing two module guides, left and right, should be labeled on outside as HJ11A and allocation number. Several of these bundles may be packed in one box for placement in large D or F container.
- 3.16 Gather all 7008360 TTY cables, label with just designation, wrap quantity in bubble pack, pack in cardboard box.
- 3.17 Remove metal serial number plate from rear of chassis and configuration sticker from chassis cover. Generate a new configuration sticker and duplicate serial number plate. Care must be taken not to alter serial number when making duplicate plate. Put serial number plate and configuration sticker in envelope for Field Service. This envelope should not go in the shipping container (D or E). Replace cover and side on chassis, label and pack in 11/05 shipping box.

4.0 FINAL PACKING

- 4.1 Place all boxes in the D container in the following order so that the first items are on the bottom of the container.
 - 4.1.1 11/05 chassis (shipping box)
 - 4.1.2 Power supply chassis (cardboard box)
 - 4.1.3 Module boxes (M7260, M7261, G110, G231).
 - 4.1.4 EC05s (cardboard box)
 - 4.1.5 5409728 (cardboard box)
 - 4.1.6 Module Guides (cardboard box)
 - 4.1.7 7008360 (cardboard box)
 - 4.1.8 KYJ11JA consoles (compresso cartons)
 - 4.1.9 Logics (compresso cartons)
 - 4.1.10 H214 stack boxes
 - 4.1.11 Module envelopes (G727, M930)
- 4.2 Roll bubble pack to fill all spaces in the container so that nothing is loose.
- 4.2 Close and seal the D container. This container is not to be reopened until the reassembly without the knowledge and consent of the breakdown supervisor.

<i>PC 11/05</i>	SIZE A	CODE	NUMBER	REV
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ENGINEERING SPECIFICATION

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CONTINUATION SHEET

TITLE BASIC 11/05 BREAKDOWN PROCEDURES

4.4 Software kits for 11/05's may be returned to stock room all but one, This one should be shipped under separate cover, as part of the disassembled 11/05 shipment.

5.0 PACKING MATERIALS FOR ONE 11/05

Part Description	Material	Qty.	Part No.
Power supply chassis	Bubble Pack	--	-----
11/05 Chassis Box	Shipping Box	1	99-05185
TTY cable	Bubble Pack		
Logic Assy	Compresso carton	½	99-05016-4
Power Reg Board	Cardboard tube	1	99-05202
Power Reg Board	Bubble pack	--	-----
Console	Compresso carton	½	99-05016-4
AC Input box	Mailite envelope	1	7" x 8"
M7260 *	Module box	1/18	See note 1
M7261 *	Module box	1/18	"
G231 *	Module box	1/18	"
G110 *	Module box	1/18	"
M930	Mailite envel.	1	4" x 6"
G727	Mailite envel.	1	4" x 6"
H214	Bookpack	1	99-05072
Bolts & Plates	Bubble pack		(These are the module guides)

* If disassembling two or less units use 99-05241 (bookpack) for modules instead of module box.

NOTE 1 Module Box is made up of:

1-99-05114	Box
1-99-05113	Pad
1-99-05115	18 Module divider

NOTE 2 One roll of bubble pack will pack about 12-15 units

NOTE 3 Also needed are cardboard boxes to hold parts wrapped in bubble pack or mailite envelopes. Parts of same kind should be packed together in one box. See section 4.1 (final packing)

<i>[Handwritten Signature]</i>	SIZE	CODE	NUMBER	REV
	A			

Packing Reference Chart

11/05 Part Description	Packing Material		Number of Units				
	Material	Number	1	2	3	4	5
Power Supply Chassis	Bubblepack	_____	_____	_____	_____	_____	_____
11/05 Chassis Box	Shipping Box	99-05185	1 Box	2 Box	3 Box	4 Box	5 Box
TTY Cable	Bubblepack	_____	_____	_____	_____	_____	_____
Logic Panel	Compresso Box	99-05016-4	1 Box	1 Box	2 Box	2 Box	3 Box
Regulator Board	Cardboard Tube	99-05202	1 Tube	2 Tube	3 Tube	4 Tube	5 Tube
Regulator Board	Bubblepack	_____	_____	_____	_____	_____	_____
Console	Compresso Box	99-05016-4	1 Box	1 Box	2 Box	2 Box	3 Box
AC Input Box	Mailite Envelope	7 in. x 8 in.	1 Envelope	2 Envelope	3 Envelope	4 Envelope	5 Envelope
M7260	Bookpack Module Box	99-05241 See Note 1	1 Bookpack	2 Bookpack	1 Module Box	1 Module Box	1 Module Box and 2 Bookpacks
M7261	Same as M7260		1 Bookpack	2 Bookpack	Pack in M7260 Box	Pack in M7260 Box	Pack in M7260 Box
G231	Same as M7260		1 Bookpack	2 Bookpack	Pack in M7260 Box	Pack in M7260 Box	Pack in M7260 Box
G110	Same as M7260		1 Bookpack	2 Bookpack	Pack in M7260 Box	Pack in M7260 Box	Pack in M7260 Box
M930	Mailite Envelope	4 in. x 6 in.	1 Envelope	2 Envelope	3 Envelope	4 Envelope	5 Envelope
G727	Mailite Envelope	4 in. x 6 in.	1 Envelope	2 Envelope	3 Envelope	4 Envelope	5 Envelope
H214	Bookpack	99-05072	1 Bookpack	2 Bookpack	3 Bookpack	4 Bookpack	5 Bookpack
Module Guides	Bubblepack	_____	_____	_____	_____	_____	_____

Note 1

Module Box is made up of:
 1-99-05114 Box
 1-99-05113 Pad
 1-99-05115 18 Module Divider

LABELS NEEDED FOR ONE UNIT

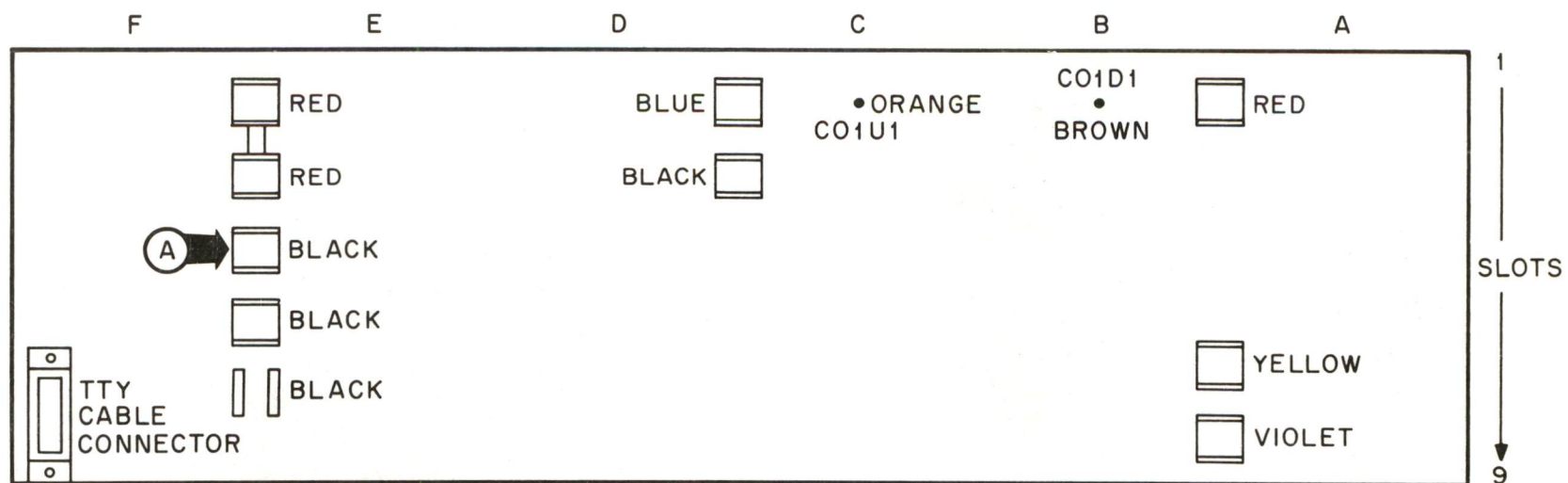
Description	Designation	Qty	Allocation #	Qty.
Grant Card	G727JA	4	xxxxx*	4
Bus Terminator	M930JA	2	XXXXX*	2
Core Stack	H214JA	1	XXXXX*	1
Memory Driver	G231JA	1	XXXXX*	1
Memory Control	G110JA	1	XXXXX*	1
CPU Control	M7261JA	1	XXXXX*	1
Data Paths	M7260JA	1	XXXXX*	1
Programmer Console	KYJ11JA	1	XXXXX	1
AC Input Box	BC05H	1	XXXXX	1
Power Supply Reg.	5409728JA	1	XXXXX	1
Power Supply Chassis	BJ11A	1	XXXXX	1
Wired Logic Assy.	7008843JA	1	XXXXX	1
TTY Cable	5409949JA	1		0
Module Guides (bolts & plates)	HJ11A	2	XXXXX	2
11/05 Chassis Box	MBJ11A	1	XXXXX	1

* The slot number must be included with the allocation number on these 7 labels only.

11/05 PARTS BREAKDOWN

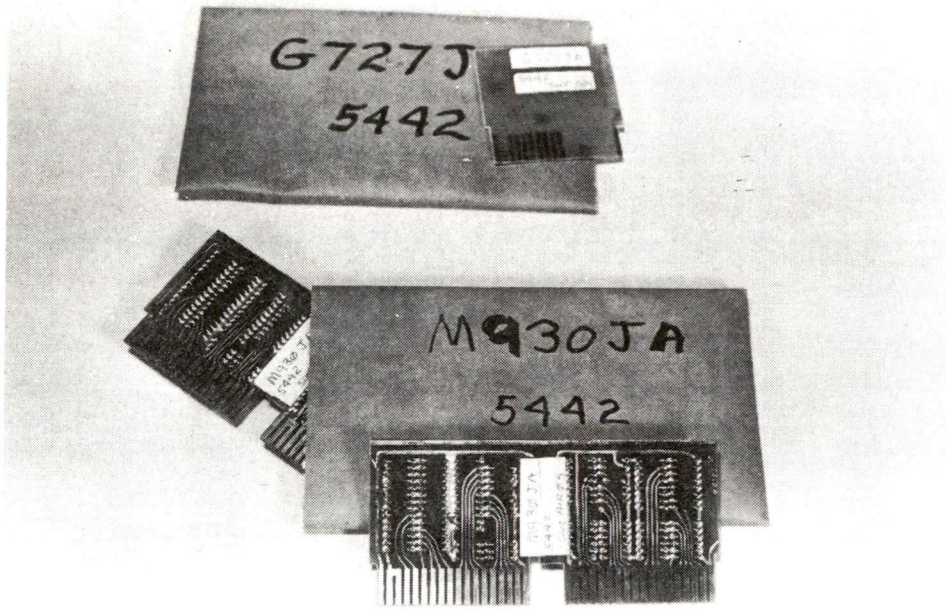
BJ11A	Power Supply chassis w/transformer fan & harness
MBJ11A	11/05 Box w/tty cable (flat grey) & console cable
5409949JA	Tty cable (berg to mate-n-lok)
7008843JA	Wired logic assy.
5409728	Power regulator board
KYJ11JA	Front console w/blank logo
BC05H	A/C power input box w/power cord
M7260JA	Data path board
M7261JA	Register & control
M930JA	Bus terminator
G727JA	Grant continuity
H214 JA	Core Memory Stack
G231 JA	Memory Driver
G110 JA	Memory Control
HJ11A	Module Guides (Bolts & Plates)

BACK PANEL POWER WIRING CHART

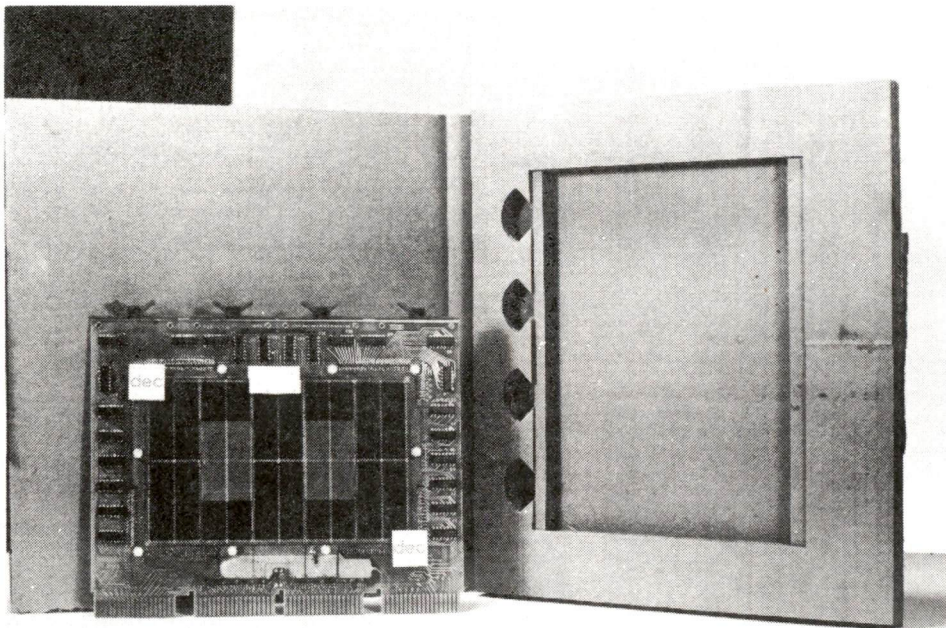


BACK PANEL LOOKING AT PINS

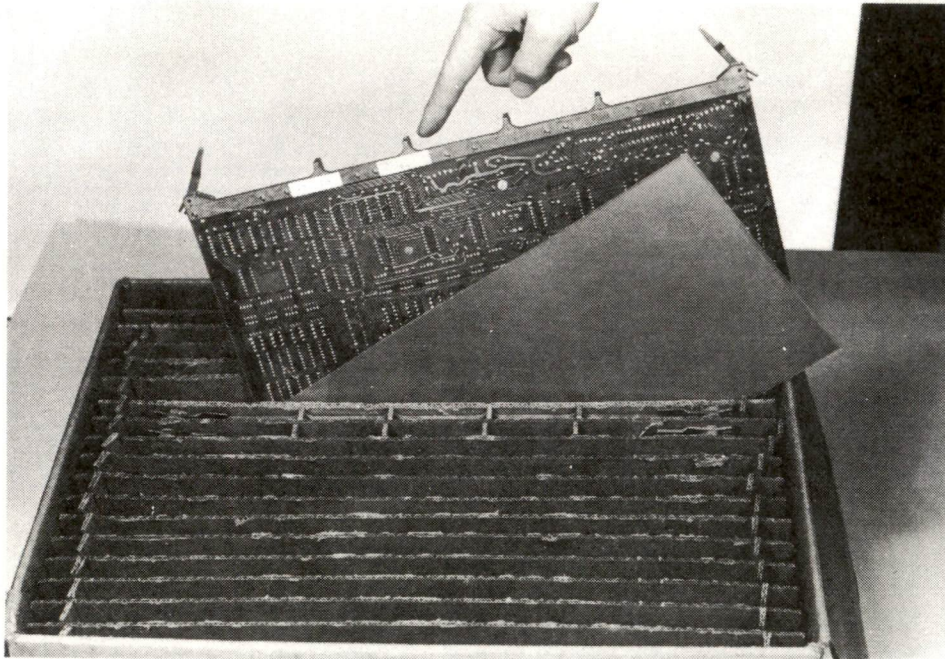
- (A) SHORT BLACK WIRE GOES FROM THIS TERMINAL TO ONE OF THE MOUNTING SCREWS OF THE BACK PANEL



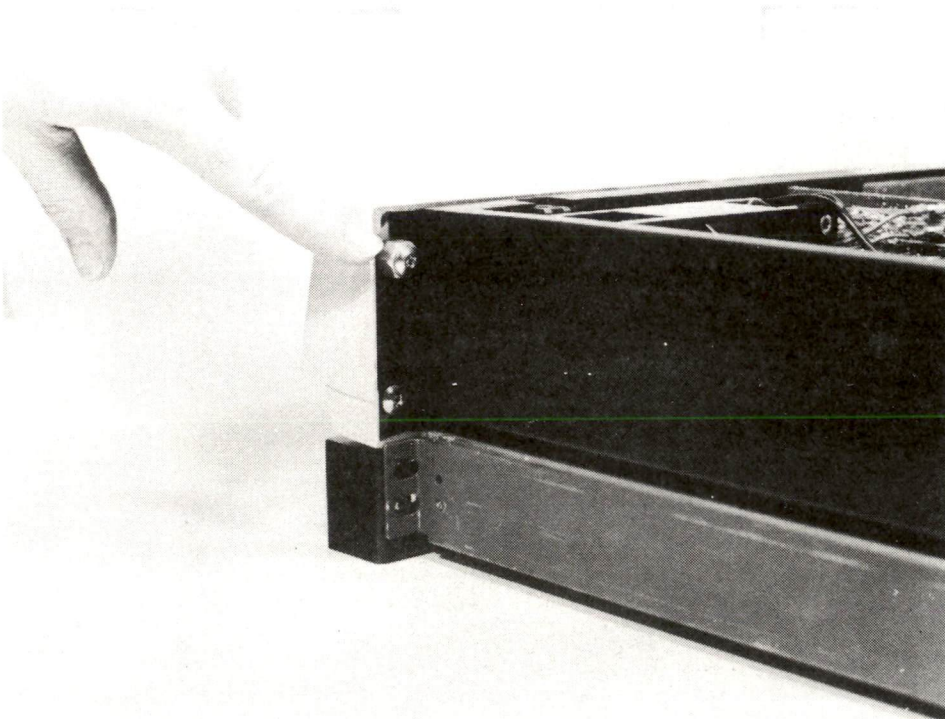
1. GRANT CARDS & BUS TERMINATORS
IN 4 x 6 MAILITE ENVELOPES



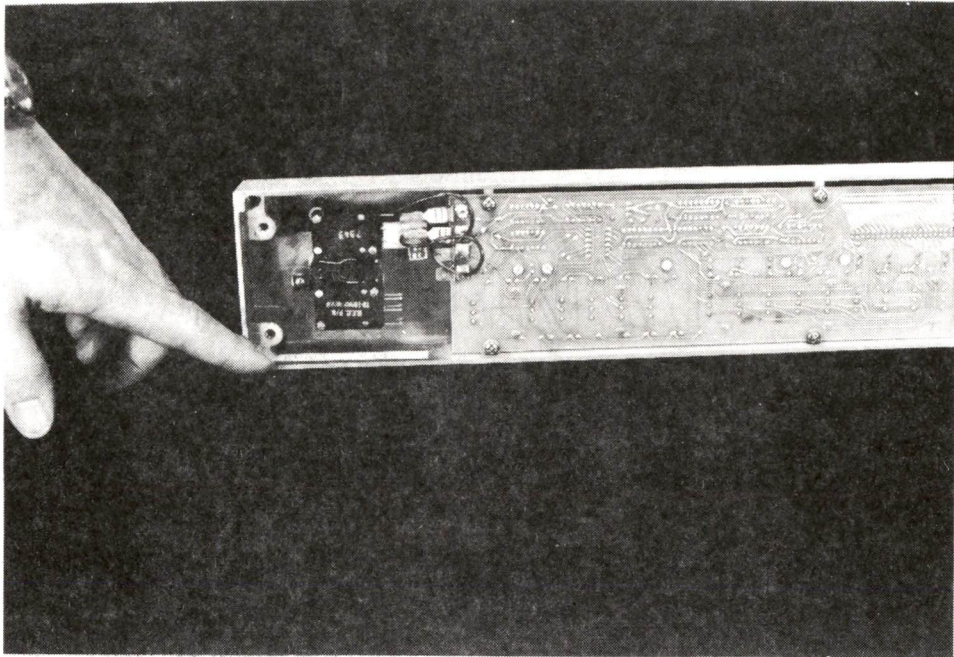
2. H214JA & QUAD BOOKPACK



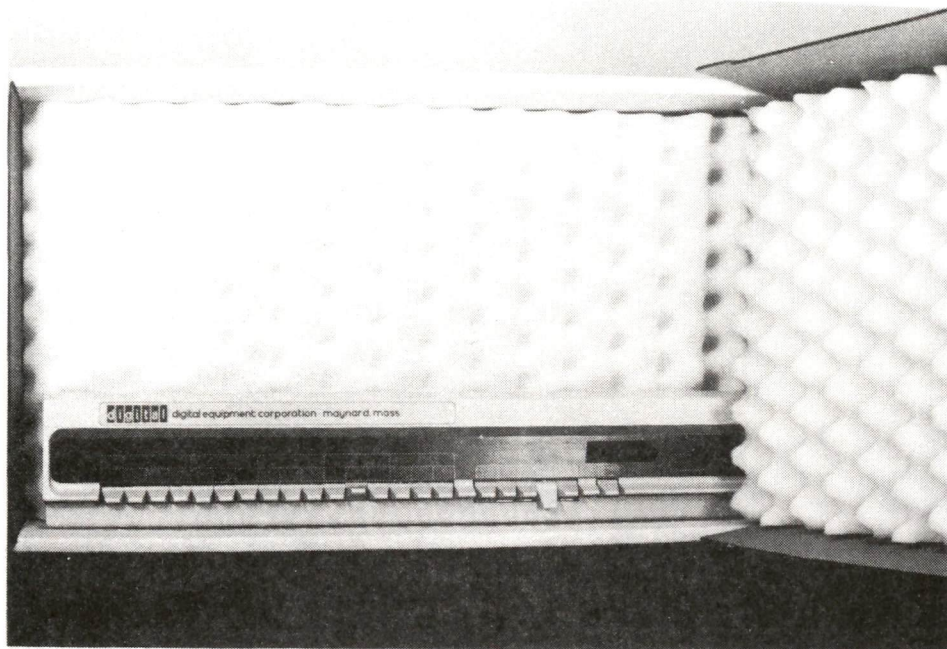
3. G231 JA & STANDARD MODULE BOX



4. POSITION OF CONSOLE SPACER



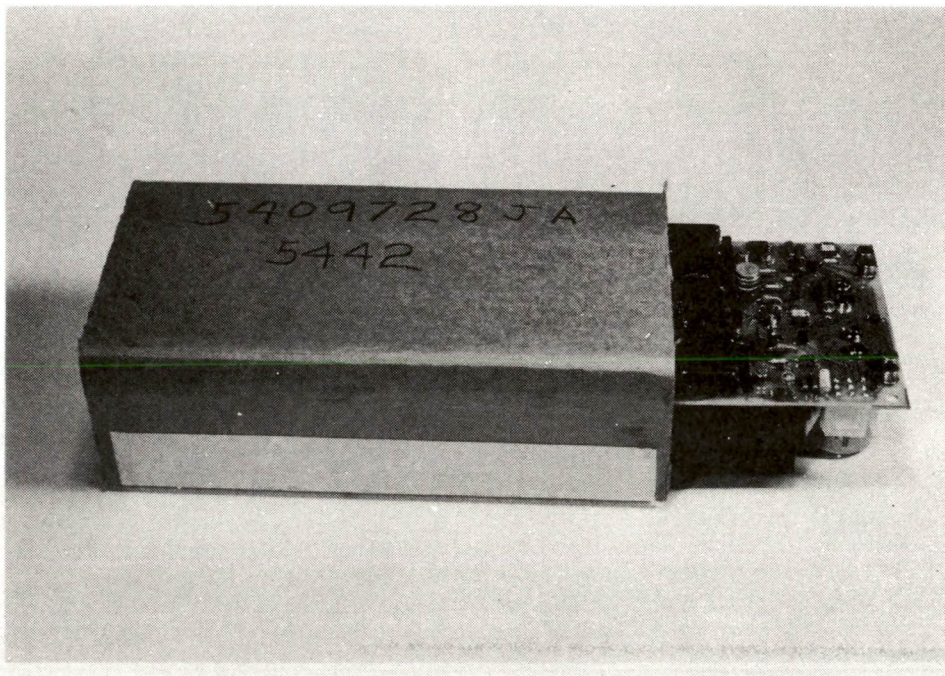
5. POSITION OF LABELS ON CONSOLE



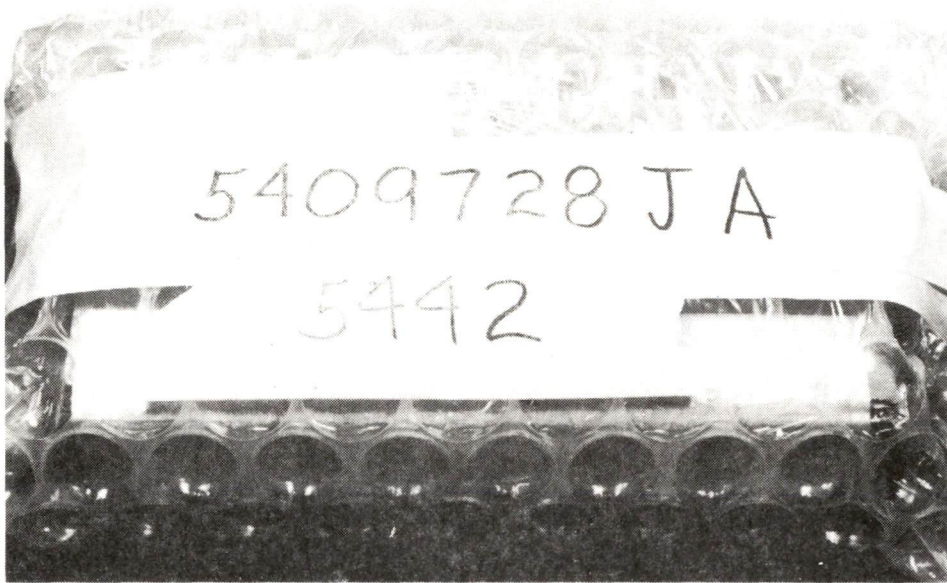
6. CONSOLE IN COMPRESSO CARTON



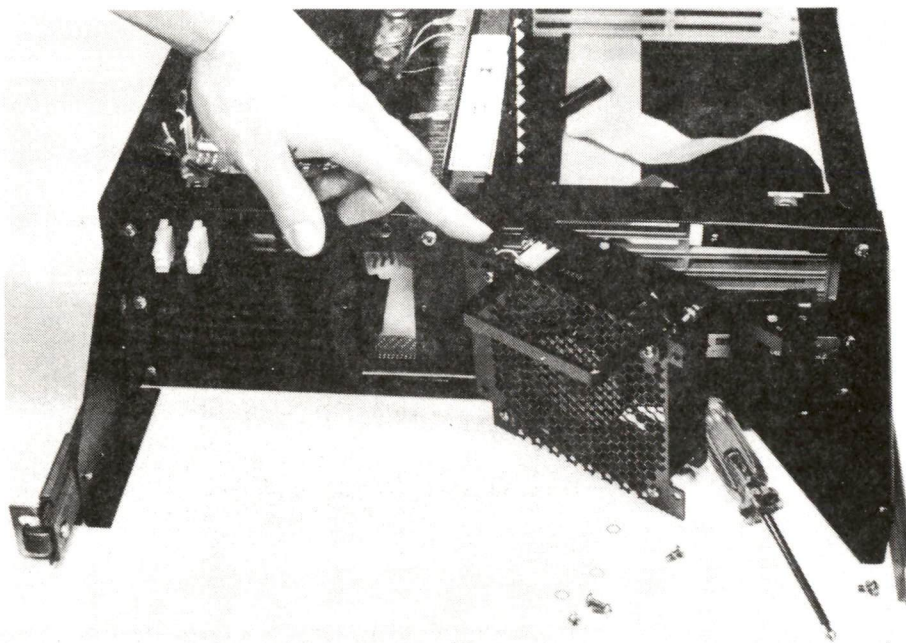
7. BC05H & 7 x 8 MAILITE ENVELOPE



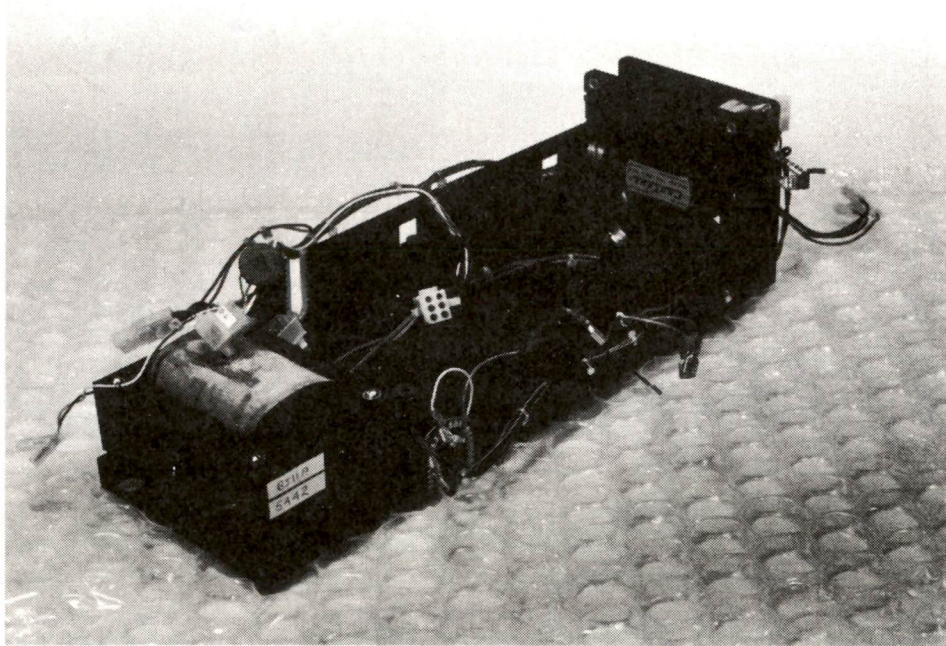
8. REG BOARD IN CARDBOARD SLEEVE



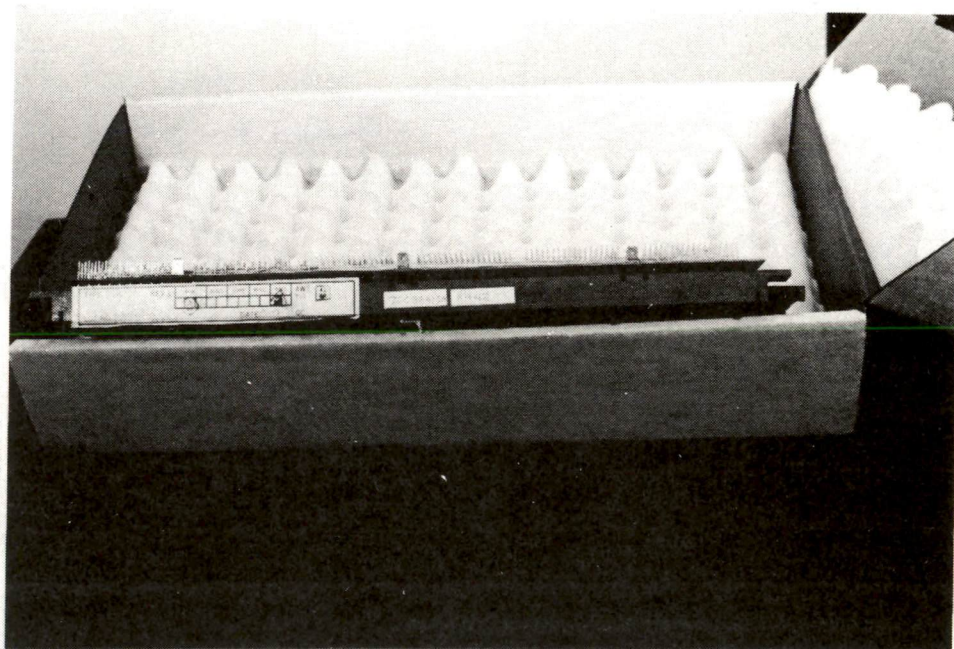
9. REG BOARD IN BUBBLE PACK AND MARKED



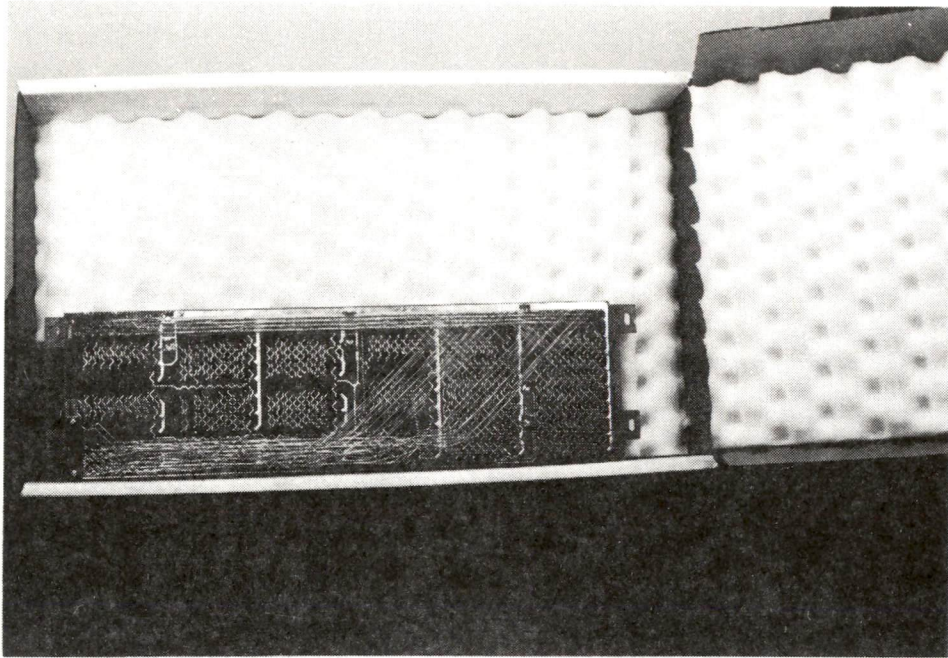
10. REMOVAL OF FAN AC WIRES



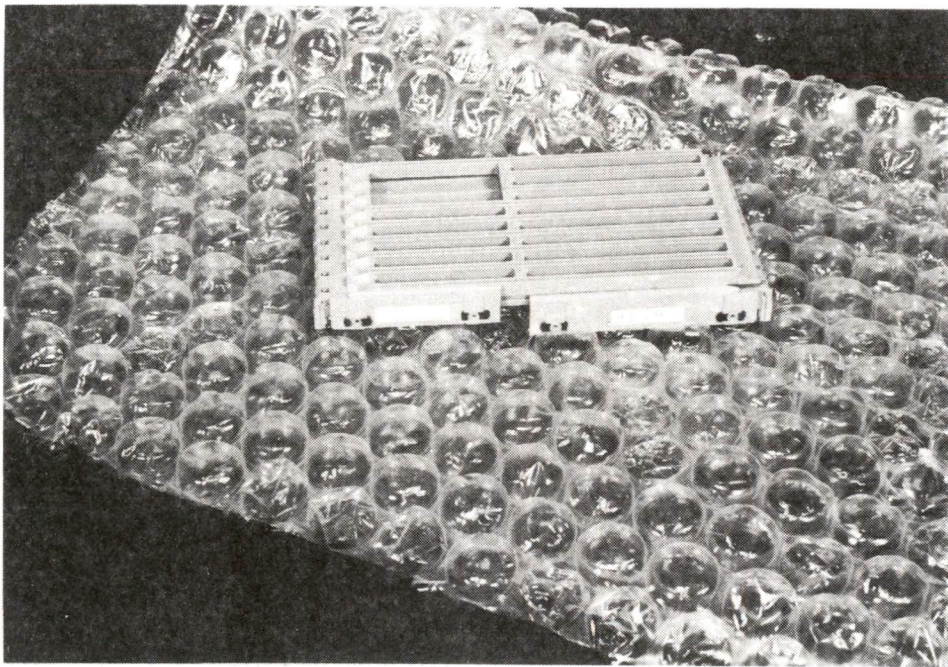
11. P/S CHASSIS ASSY



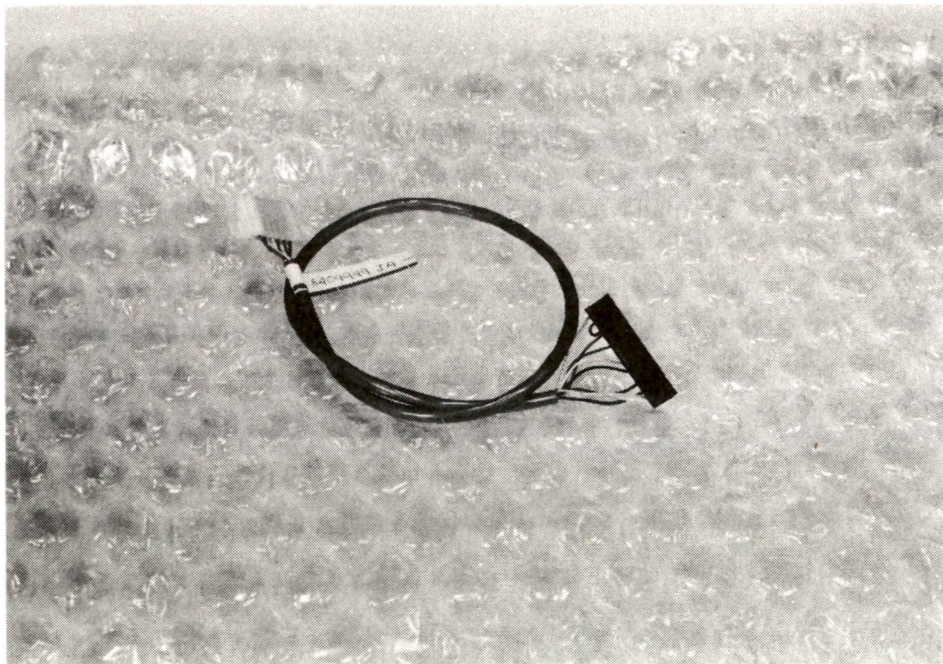
12. POSITION OF LABELS ON BACK PANEL



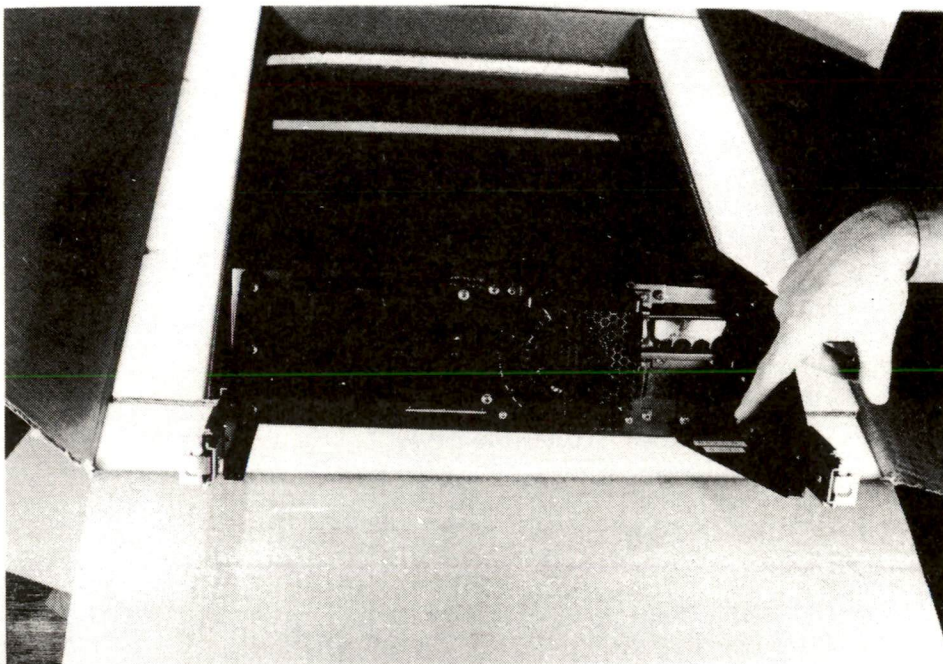
13. BACK PANEL IN COMPRESSO CARTON



14. LEFT & RIGHT MODULE GUIDES (BOLTS & PLATES)

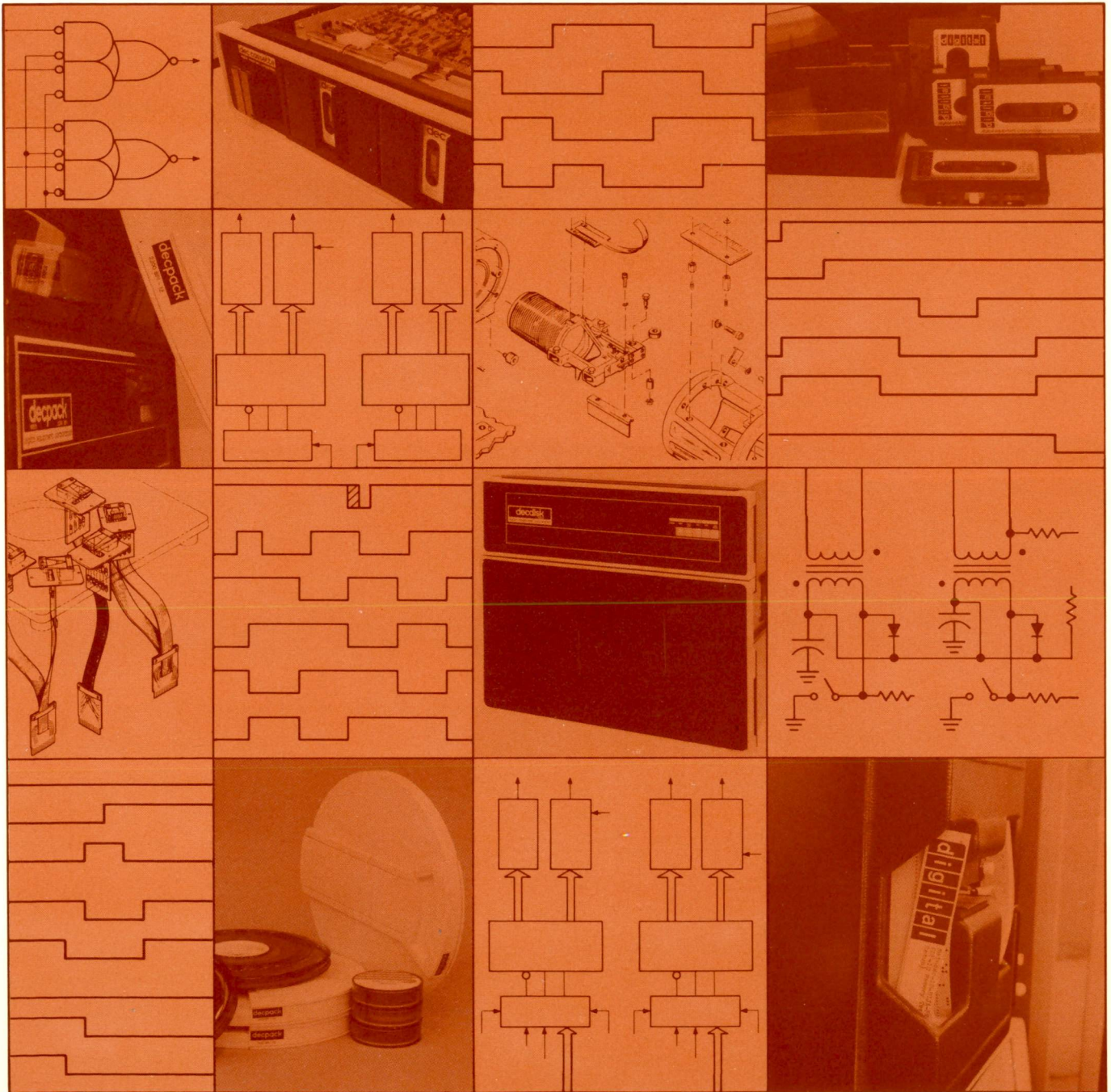


15. POSITION OF LABEL ON TTY CABLE



16. POSITION OF LABELS ON 11/05 CHASSIS

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**11/05
reassembly
procedure**

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DIGITAL	COMPUTER LAB
UNIBUS	

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1.0 Scope

- 1.1 This reassembly procedure gives all necessary information to enable the reader to reassemble a PDP11/05 that has been dissembled, using the document titled "11/05 DISASSEMBLY PROCEDURE WITH PICTURES (written 12-12-73)".

2.0 Set Up

- 2.1 Locate the required parts for reassembly using the "PARTS REQUIRED CHART".
- 2.2 All bundles of parts have been marked with a DESIGNATION and an allocation number (serial number). The designation identifies the part or subassembly i.e. KYJ11JA is the 11/05 console w/blank logo.

The allocation number is the CPU serial number and assures that each CPU is reassembled exactly as it was accepted in the U. S. A. An example of a bundle marked with both designation and allocation number is shown in the picture titled REG BOARD IN BUBBLE PACK AND MARKED.

- 2.3 The CPU and memory modules may come packed in one of two ways or a combination of both ways. If two or less CPU's were sent in one shipment then the modules will be packed in individual backpack cartons (see picture titled H214JA & Quad BOOKPACK).

If more than two CPU's were sent in one shipment, then modules will be packed in a STANDARD module box. (See picture titled "G231JA & STANDARD MODULE BOX). The standard module box holds 18 modules. If enough CPU's are shipped at once, some overflow of modules may be packed in individual backpacks.

- 2.4 All parts are individually marked with two stick-on labels. One with the part designation and the other with the CPU serial number or allocation number. Note that modules have the slot number included on the serial number label. (See picture titled "Grant CARDS & BUS TERMINATORS IN 4 x 6 MAILITE ENVELOPES").

2.0 Set Up (continued)

2.5 Two items for each CPU are sent separate from the CPU's.

1. Configuration sticker

This is the square white sticker normally attached to the rear of the top cover listing what is included in the CPU box.

2. Metal serial number plate

This is the metal stickon plate normally attached to the rear of the CPU chassis just to the right of the fan grill.

These two items are removed during disassembly and are shipped in a separate container.

2.6 Compresso cartons and Bookpacks are reusable and should not be discarded. (See picture titled "Position of labels on back panel" to identify the compresso carton.)

2.7 The following list is the order in which the Large D type container was packed in the U. S. A. The first items are on the bottom of the container.

- 2.7.1 11/05 Chassis (shipping box)
- 2.7.2 Power Supply Chassis (cardboard box)
- 2.7.3 Module Boxes (M7260, M7261, G110, G231)
- 2.7.4 BC05s (cardboard box)
- 2.7.5 5409728 P/S Regulators (cardboard box)
- 2.7.6 Module Guides (bolts & plates) (cardboard box)
- 2.7.7 5409949JA TTY Cable (cardboard box)
- 2.7.8 KYJ11-JA Consoles (compresso cartons)
- 2.7.9 7008843JA Wired Logic Assy (compresso carton)
- 2.7.10 H214 Core stack (bookpack)
- 2.7.11 Module envelopes (G727, M930)

3.0 Reassembly Procedure

3.1 Remove the 11/05 chassis (MBJ11A) from packing box and install the metal serial number plate and configuration sticker in their proper place on the chassis.

Note

Be sure that the number on the metal tag and configuration sticker match the serial number on label as shown in picture titled "Position of labels on 11/05 chassis".

3.0 Reassembly Procedure (continued)

- 3.1.1 The configuration sticker and metal serial number plate will be sent to Field Service separate from the hardware.
 - 3.1.2 The serial number plate should be located just to the right of the rear fan on the back of chassis.
 - 3.1.3 The white configuration sticker should be located at the rear of the top cover in the middle.
- 3.2 Install the module guides in the 11/05 chassis. Note that there is a left and a right guide. Guides should be packed one set to a bubblepack bundle, and marked HJ11A (Bolts & Plates).

Note

Always match serial numbers of all parts to 11/05 chassis serial number. This will insure reassembly exactly as accepted in U. S. A.

3.3 Logic Assembly (70088434JA)

- 3.3.1 Remove back panel logic assembly from compressor carton and install in chassis. Note that there is a short black wire attached to one of the logic assembly mounting screws. This wire will attach to a faston tab on the logic assembly as shown in the "Back panel power wiring chart".
- 3.3.2 Plug the gray tty cable, that is stuck to the floor of the chassis, into the logic assembly.

3.4 Power supply chassis (BJ11A)

- 3.4.1 Remove the P/S chassis subassembly and install in 11/05 chassis.
- 3.4.2 Connect the power distribution harness to the logic. See back panel power wiring chart. Install the two power control connectors in the slots provided in the rear of 11/05 chassis.

Note

The power control connectors are shown just to the left of the hand in the picture titled "Removal of fan AC wires".

- 3.4.3 Place transformer AC harness in plastic retainers attached to side wall of 11/05 chassis.

3.0 Reassembly Procedure (continued)

3.4.4 Attach the AC wires for the rear fan. Depending on the type of fan used, the fan may have to be removed in order to connect AC wires. (See picture titled "Removal of fan AC wires".)

3.5 Power supply regulator (5409728JA)

3.5.1 Remove from bubblepack and cardboard sleeve the P/5 regulator board. Mount regulator board in power supply chassis. The two mat-n-lok connectors located on bottom of board must be connected before board is lowered into P/5 chassis. Note that the six mounting screws are not all the same length.

3.6 AC Power Input Box (BC05H)

3.6.1 Remove the AC power input box from mailite envelope and install in 11/05 chassis. Connect the BC05H to the mat-n-lok from the power supply.

3.7 Console (KYJ11JA)

3.7.1 Remove the console from compresso carton. Remove the etch board from console casting (6 screws). Connect the console cable to console etch board. Replace etch board on console casting and attach wires. Lower two faston tabs on etch board are for red and black power wires. The wires with square plastic connectors attach to the console switch.

The top two switch terminals that are nearest to the front of the console take the black wire on the top and the violet wire on the next down terminal. The top two switch terminals toward the rear of the console take the two red wires. The bottom terminals are not used.

3.7.2 Attach the console to the 11/05 chassis (4 screws). Install the two spacers as shown in picture titled "Position of console spacer".

3.0 Reassembly Procedure (continued)

3.8 M7260JA

3.8.1 Remove module from packing material. Inspect for physical damage and clean the pins if necessary.

Note

Inspect and clean if necessary the pins of all modules.

3.8.2 Plug the console cable into the M7260JA module and install module in slot called out on label attached to module.

3.9 M7261JA

Inspect and install module in proper slot in back panel. An electromagnetic shield goes between M7261 and G110. This shield will be packed with the G110 module.

3.10 G110JA

Inspect and install module in proper slot in back panel.

3.11 G231JA

Inspect and install module in proper slot in back panel. An electromagnetic shield will be packed with this module. Place it on top of the core stack H214JA.

3.12 Memory core stack (H214JA)

Remove the stack from backpack and install in proper slot in back panel.

3.13 M930JA

Remove bus terminators from mailite envelopes and install in proper slot in back panel.

3.14 G727JA

Remove Grant cards from mailite envelopes and install in proper slots in back panel.

4.0 Final Check Before Power Up

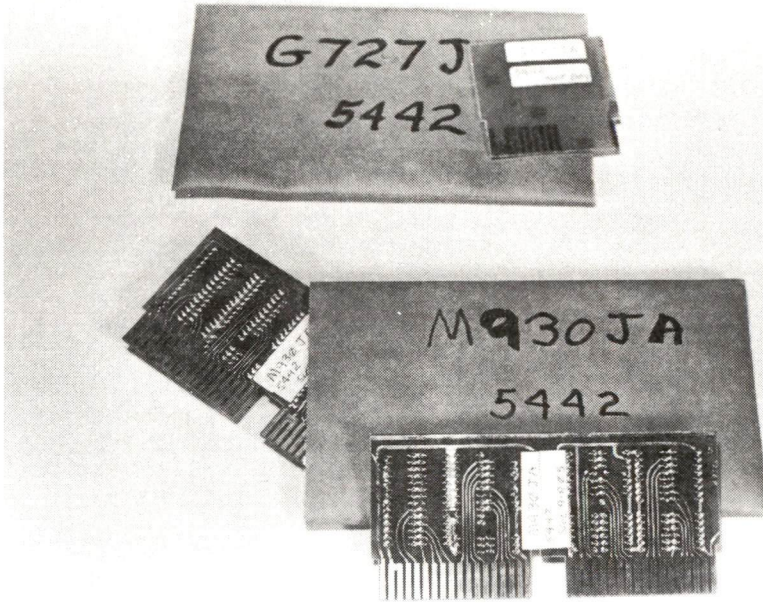
- 4.1 Recheck all power wiring on logic assembly (back panel) using Back Panel Power Wiring Chart. Double check the pin numbers for the orange wire and brown wire going to logic pins on the back panel.
- 4.2 Inspect logic assembly for bent and shorting pins. Check that tty cable is firmly in socket on pack plane.
- 4.3 Power up machine. Quickly check that both fans are turning.
- 4.4 Carry out normal in field acceptance for OEMS.

(ALL) = All of specified parts needed
for one CPU

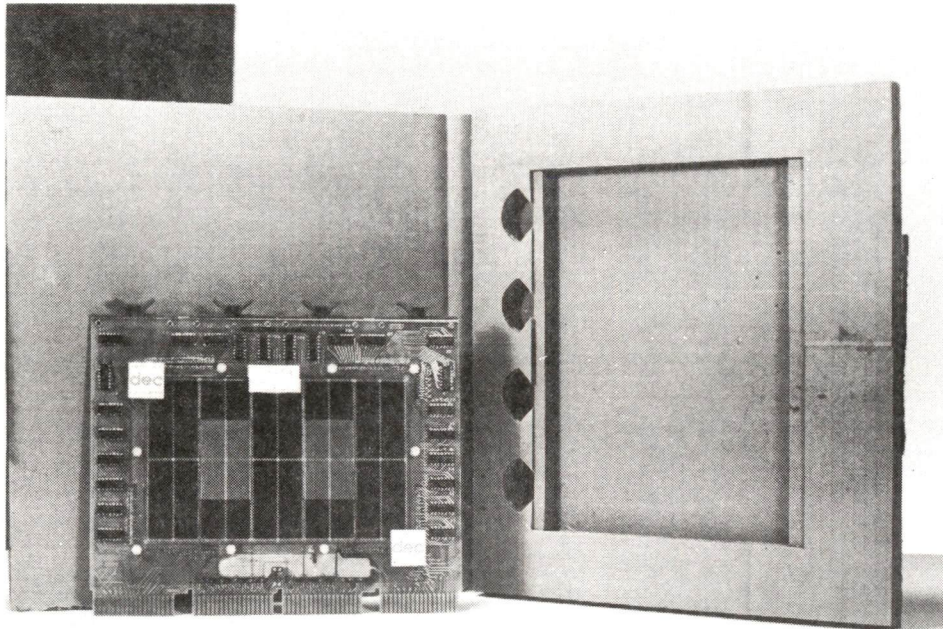
PARTS REQUIRED CHART (ONE CPU)

Part #	Description	How Packed	Needed for 1 CPU
G727JA	Grant Card	(ALL) packed in one 4x6 mailite	1 to 4
M930JA	Bus Terminator	(ALL) packed in one 4x6 mailite	2
H214JA	Core Stack	One per bookpack	1
G231JA	Memory Driver	Standard Module Box or Bookpack	1
G110JA	Memory Control	Standard Module Box or Bookpack	1
M7261JA	CPU Control	Standard Module Box or Bookpack	1
M7260JA	Data Paths	Standard Module Box or Bookpack	1
KYJ11JA	Console	Packed 2 in a compresso carton	1
BC05H	AC Input Box	Packed one in a 7x8 mailite	1
5409728JA	P/S Regulator	One per sleeve wrapped in Bubblepack	1
BJ11A	P/5 Chassis	Each one wrapped in Bubblepack	1
7008843JA	Wired Logic Assembly	Packed 2 in a compresso carton	1
5409949JA	TTY Cable	Several packed in bubblepack	1
HJ11A	Module Guides (Bolts & Plates)	(ALL) packed in one bubblepack	2 (left & right)
MBJ11A	11/05 Chassis Box	Packed In Std. 11/05 shipping box	1

NOTE: All basic bundles of parts are marked on outside of bundle with CPU serial number and part designation.



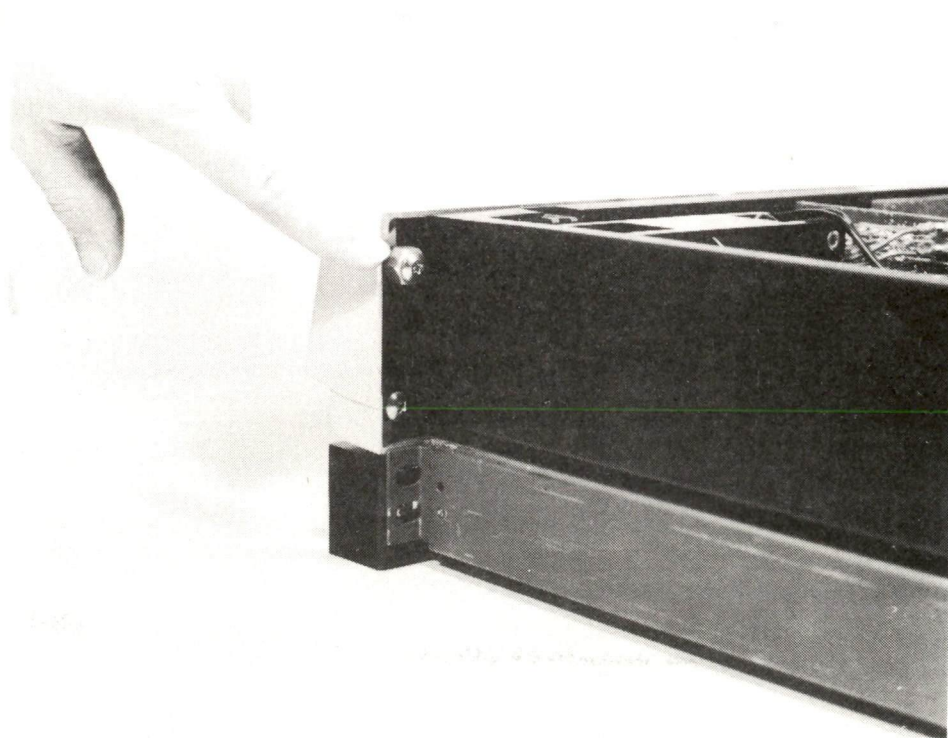
1. GRANT CARDS & BUS TERMINATORS
IN 4 x 6 MAILITE ENVELOPES



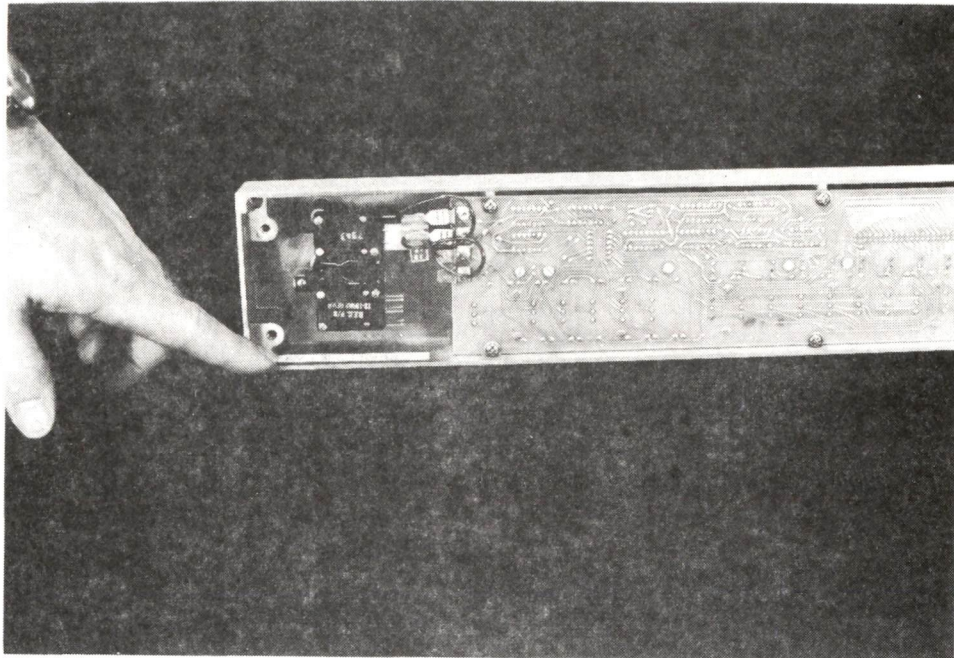
2. H214JA & QUAD BOOKPACK



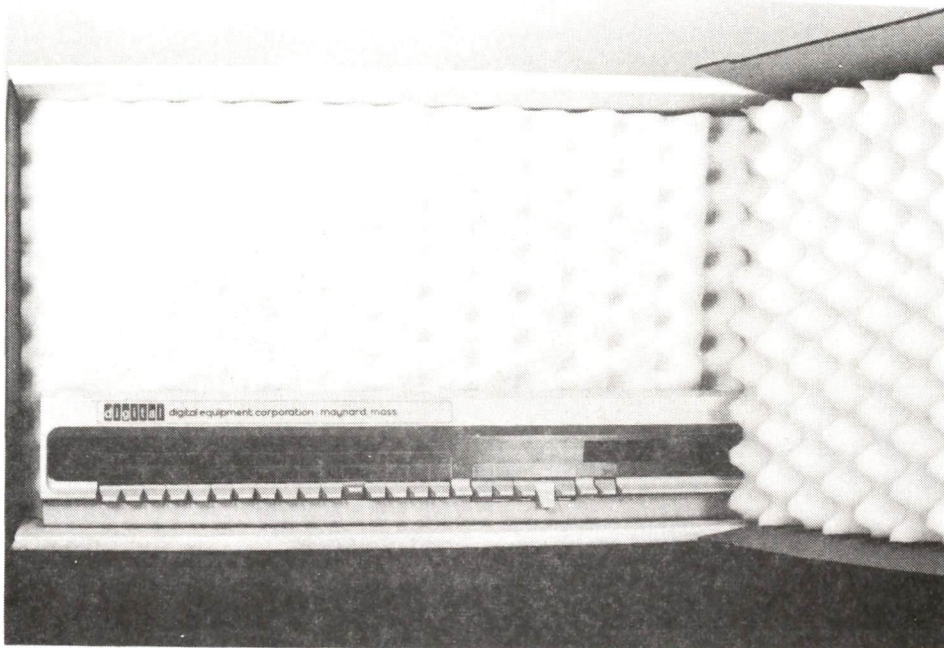
3. G231 JA & STANDARD MODULE BOX



4. POSITION OF CONSOLE SPACER



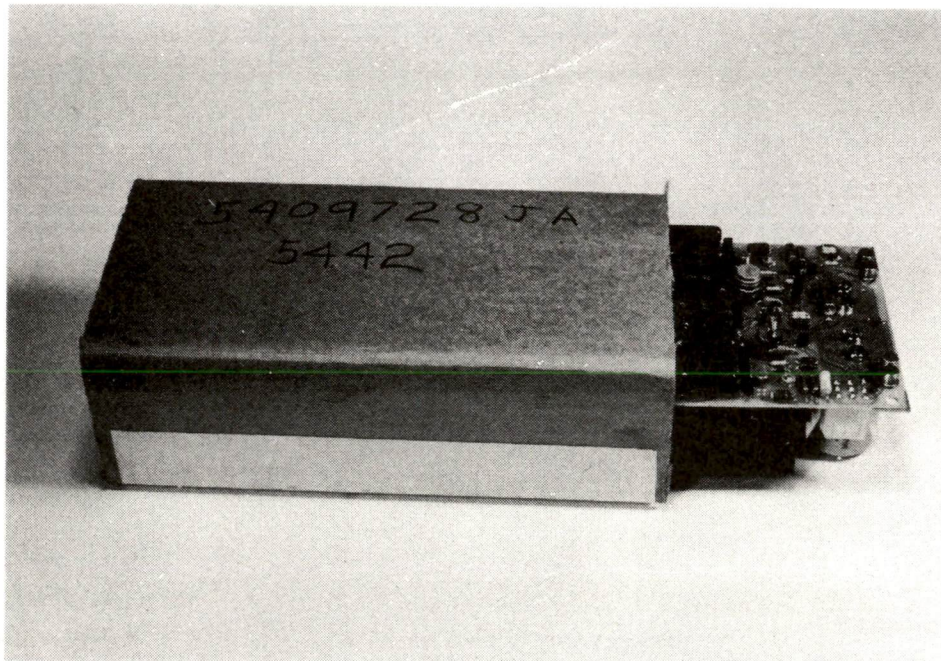
5. POSITION OF LABELS ON CONSOLE



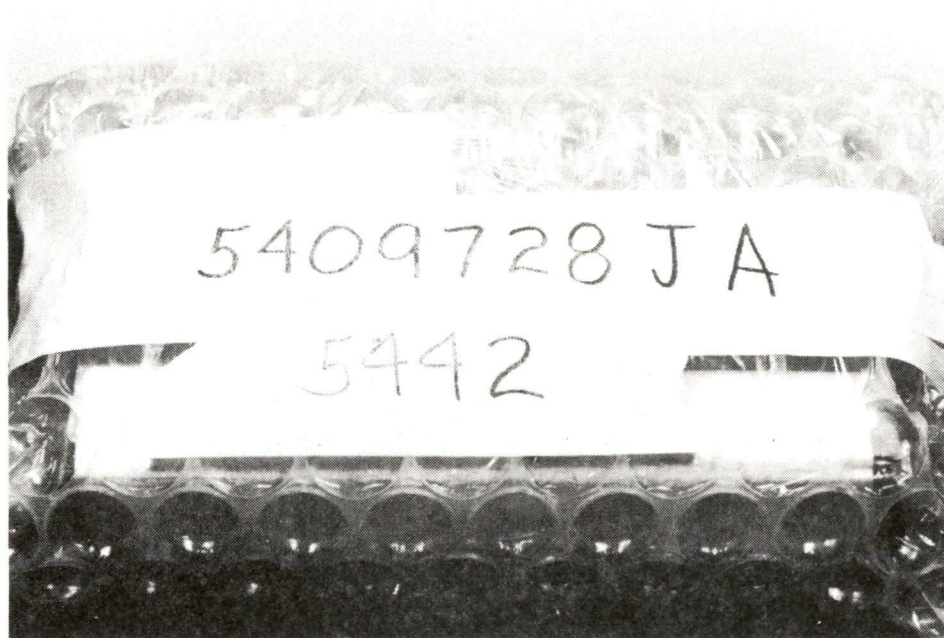
6. CONSOLE IN COMPRESSO CARTON



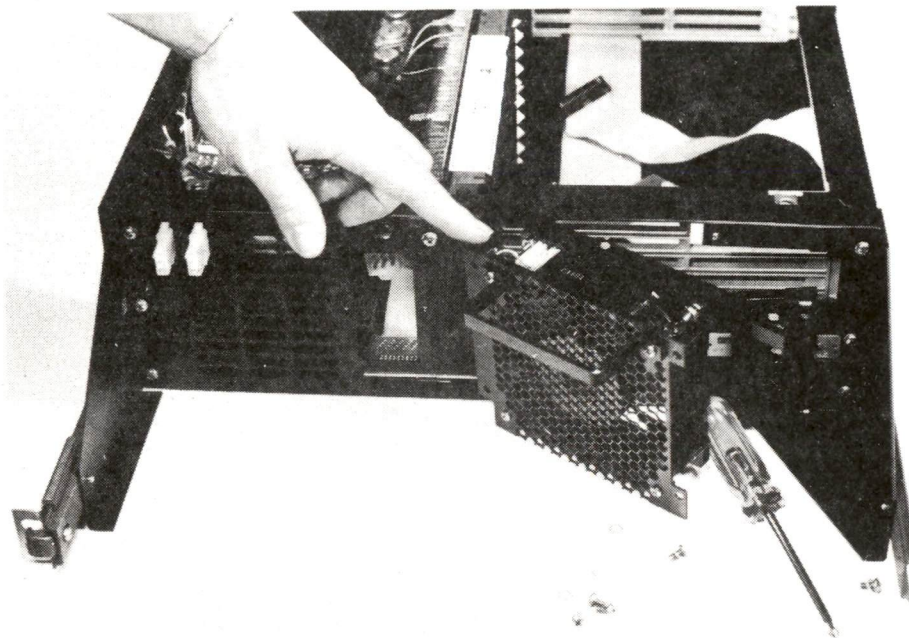
7. BC05H & 7 x 8 MAILITE ENVELOPE



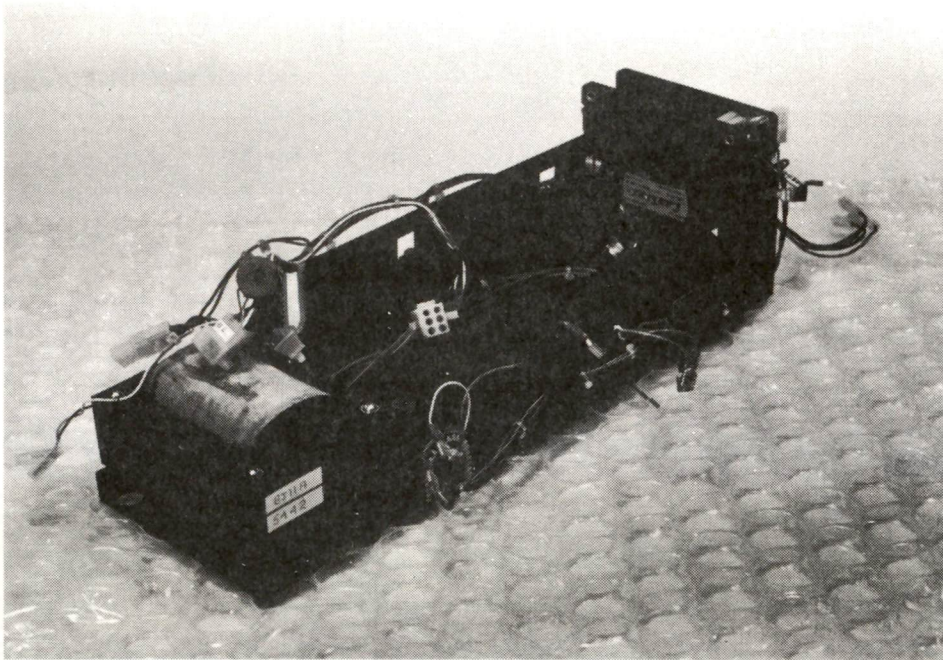
8. REG BOARD IN CARDBOARD SLEEVE



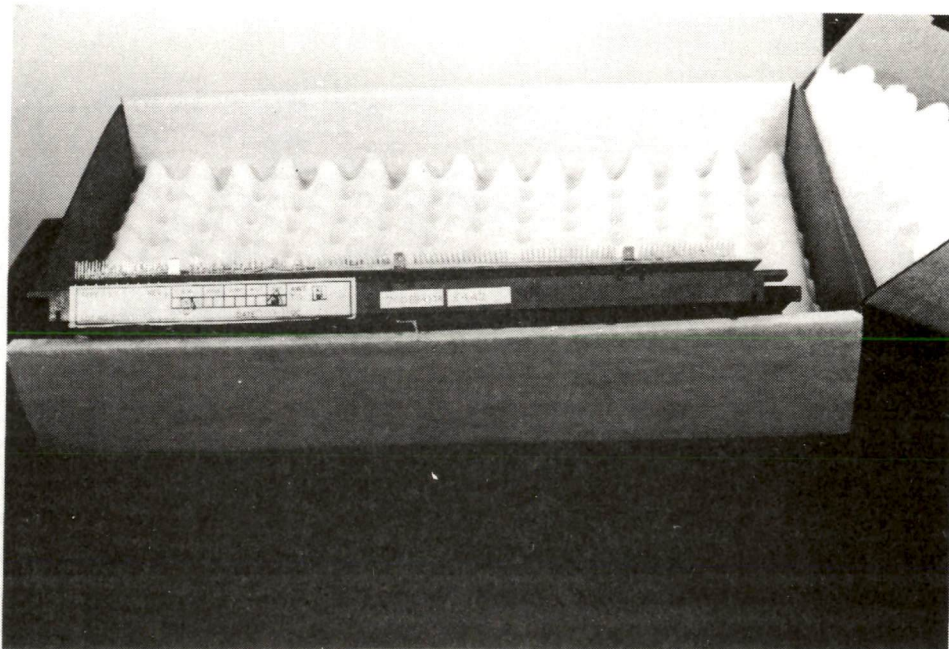
9. REG BOARD IN BUBBLE PACK AND MARKED



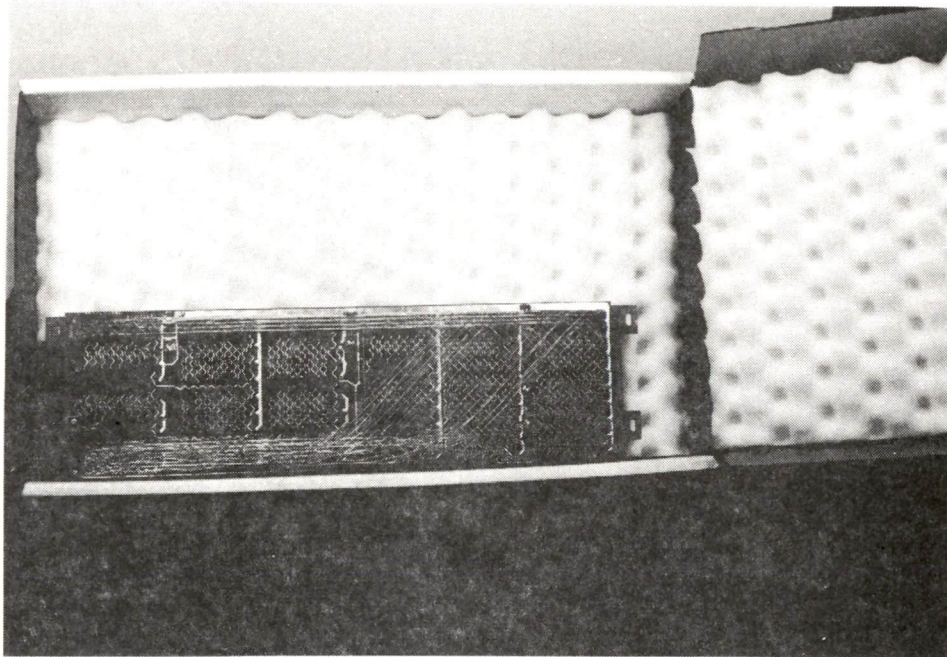
10. REMOVAL OF FAN AC WIRES



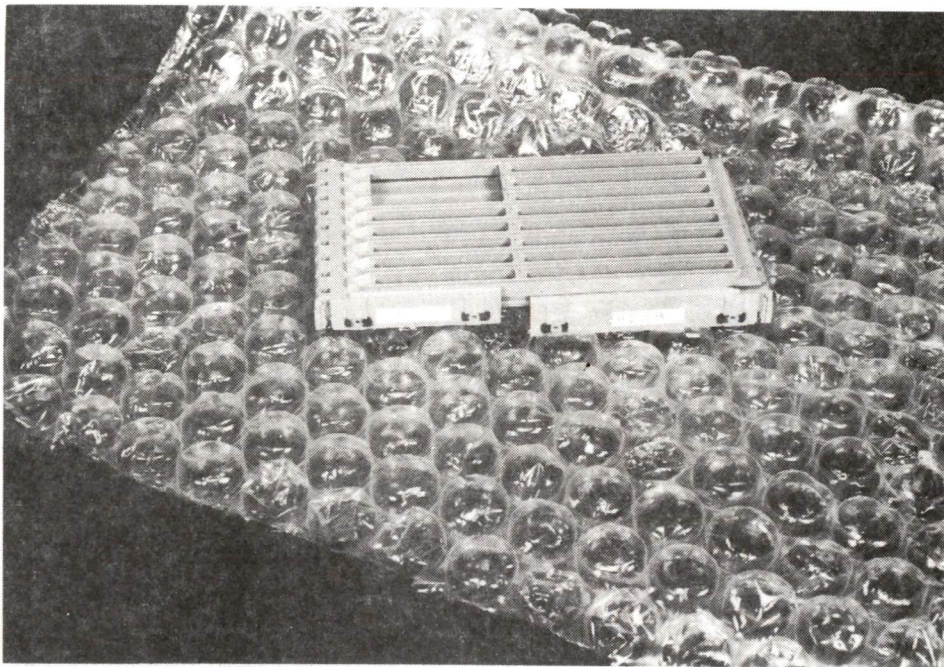
11. P/S CHASSIS ASSY



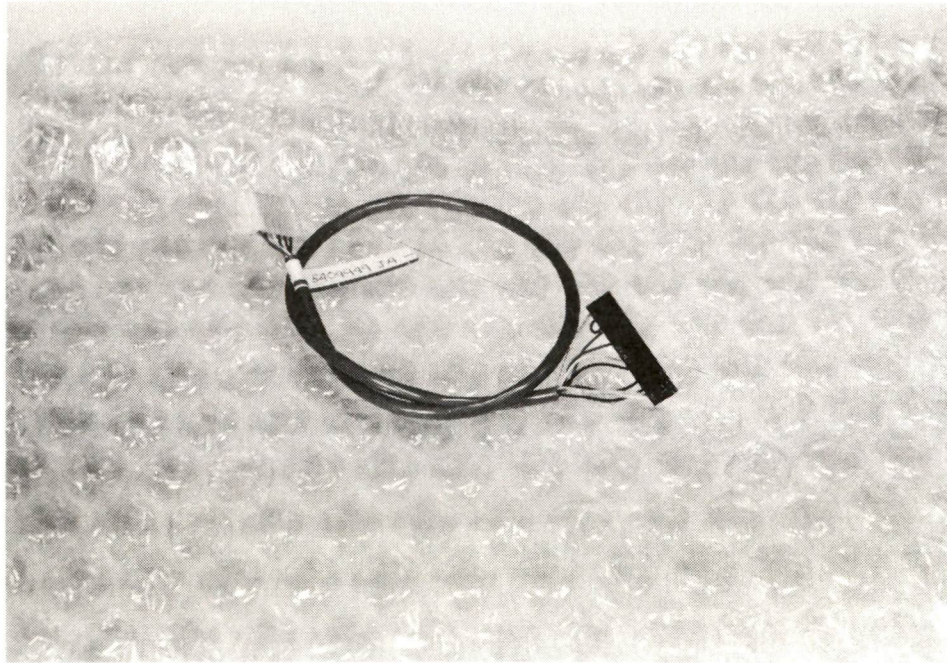
12. POSITION OF LABELS ON BACK PANEL



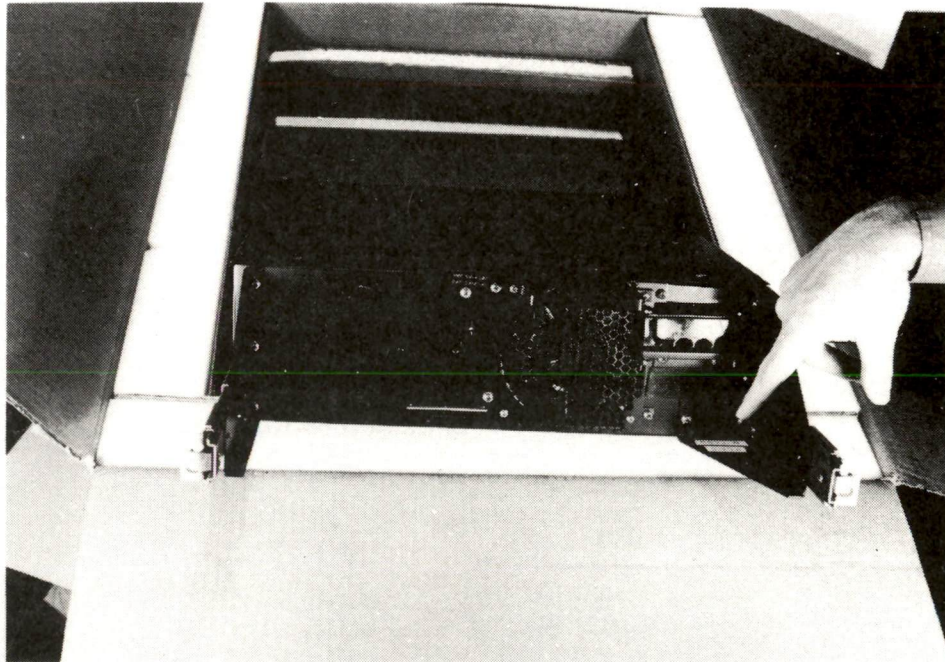
13. BACK PANEL IN COMPRESSO CARTON



14. LEFT & RIGHT MODULE GUIDES (BOLTS & PLATES)



15. POSITION OF LABEL ON TTY CABLE



16. POSITION OF LABELS ON 11/05 CHASSIS

file

digital

INTEROFFICE MEMORANDUM

TO: Gordon Bell

DATE: September 18, 1973

FROM: Ken Olsen

DEPT: Administration

EXT : 2300

SUBJ: CHEAP 11/05

I would suggest that the first job you put Roger Cady on is to propose the cheapest, safest, quickest 11/05 that we can build without any new developments.

It seems to me that if we build the cheap, simple sheet metal box that Dave Nevala has been talking about and put into it only the number of modules that conveniently fit into it and the cheapest, simplest power supply, we should make a useful improvement in the price of the 11/05.

/a



INTEROFFICE MEMORANDUM

TO: Joe St. Amour

DATE: August 10, 1973

FROM: Ken Olsen

DEPT: Administration

EXT : 2300

SUBJ:

What has happened to the printed circuit backpanel wiring with inserted pin contacts that we were looking at a year ago to replace the Sylvania connectors in the 11/05?

/d



INTEROFFICE MEMORANDUM

TO: Jack Smith

DATE: August 10, 1973

FROM: Ken Olsen

DEPT: Administration

EXT : 2300

SUBJ:

On a basic 11/05, do we have to take the cables out the side of the module in the same way that we take them out the top of the module in the 11/45? I am thinking of putting the modules crosswise in the cabinet. Taking the cables out the side is a chore, but taking them out the top is very convenient.

How many slots should an 11/05 have to take all the standard options? At what point do slots become useless because the options take those aluminum castings in order to put in options?

If we are able to get the PDP-8 on one hex board and maybe put 8K on a hex board, how many slots should an 8 have? Could we get by with 12 slots?

/d

digital

INTEROFFICE MEMORANDUM

TO: Ken Olsen

DATE: September 21, 1972

FROM: Jack Smith *JS*

DEPT: Computer Production

SEP 22 1972

SUBJ: 1105 TEST CAPACITY

Attached is an outline of the basic 1105 test line concept. Cosmetically we're not quite there on 1-5 due to space constraints. We have a straight line layout for installation at Puerto Rico that should be quite impressive.

Systems line flow is currently being documented and will be available this week. Current thoughts are to produce three to five standard configurations off this line which should just about cover our total OEM business in this area. Complex integration will be separated from this line.

Is it possible for a computer to be kicked down two flights of stairs, dropped 8 feet on its nose and come up running? Come on up, select a random unit from the line and let us demonstrate a solid machine.

pjs
Attachments

digital

INTEROFFICE MEMORANDUM

TO: Manufacturing Committee
cc: Andy Knowles
Roger Cady

DATE: September 21, 1972

FROM: Jack Smith

DEPT: Computer Production

SUBJ: 1105

Attached is Jim Black's summary of the basic 1105 concept of isolation testing. We are currently running two 10 hour shifts. The line as outlined has a potential capacity of 15 units per day per 8 hour shift once we get over the normal start up problems.

Would appreciate you comments and invite you to tour the line.

pjs
Attachments



INTEROFFICE MEMORANDUM

TO: Jack Smith
Dick Bradley
cc: George Bundy

DATE: September 18, 1972

FROM: Jim Black

DEPT: 1105 Production

SUBJ: 1105

Attached is a copy of how the 1105 is organized today. This memo is meant as a brief outline to explain what is done in each area. Also attached is a copy of the 1105 checkout procedure as it exists today.

By the end of this week, I should have the assembly procedure complete and the only documentation left to finish will be the Xor tester.

Now that the line flow has settled down and our isolation concept of flow testing has been proven successful we must fine tune line flow and operation. Each work station will be analyzed for methods improvement; ie. power tools, carrier improvement, operation work convenience, etc.

pjs
Attachment

ASSEMBLY -- Builds basic 8K and 16K boxes. One wireman is capable of 5 boxes per day.

BOX TEST -- In this area a good set of modules is plugged into an assembled box and the box should run! The following areas are tested:

- a. Power Supply
- b. Console
- c. Logic
- d. TTY Interconnection

To accomplish this task takes one wireman 20 minutes per box.

M7260/M7261
Power Check -- A power to gnd. check is run on the modules after assembly; approximate time 70 minutes.

M7260/M7261
Xor Test -- The modules are subjected to Xor test; approximate test and repair time 1 hour.

M7260/M7261
Verify -- The modules are run on a daughter station and repaired as required to insure a 100% tested module; approximately test time 2 hours.

CPU TEST -- The box is shipped from box test with no modules and a known good set is installed. This step checks the previous one performed by the box test area. Next the known good CPU boards are replaced one at a time to create a new CPU. The approximately test time is 20 minutes per CPU.

MEMORY TEST -- The box is received from CPU Test with modules. A known good memory is plugged in and the CPU test is verified. Next an unknown memory from Memory Test is put in and tested. We now have a running 1105 and memory. Approximate test time 20 minutes.

VIBRATION TEST -- The CPU memory is subjected to vibration as specified in the acceptance test procedure. Approximately test time 10 minutes.

BUS TEST -- Using a PDP-11 bus tester the 1105 bus timing is verified. Approximate test time 30 minutes.

QUICK VERIFY -- Prior to being placed in heat the 1105 is placed on a daughter station and runs all PDP-1105 diagnostics. Approximate test time 30 minutes.

HEAT TEST -- This is a 48 hour enviromental test at 50^oF to 120^oF running test 17.

QUICK VERIFY -- The 1105 is removed from the heat test and checked to insure that the machine will run all PDP-11 diagnostics. Approximate test time 30 minutes.

· ACCEPTANCE TEST

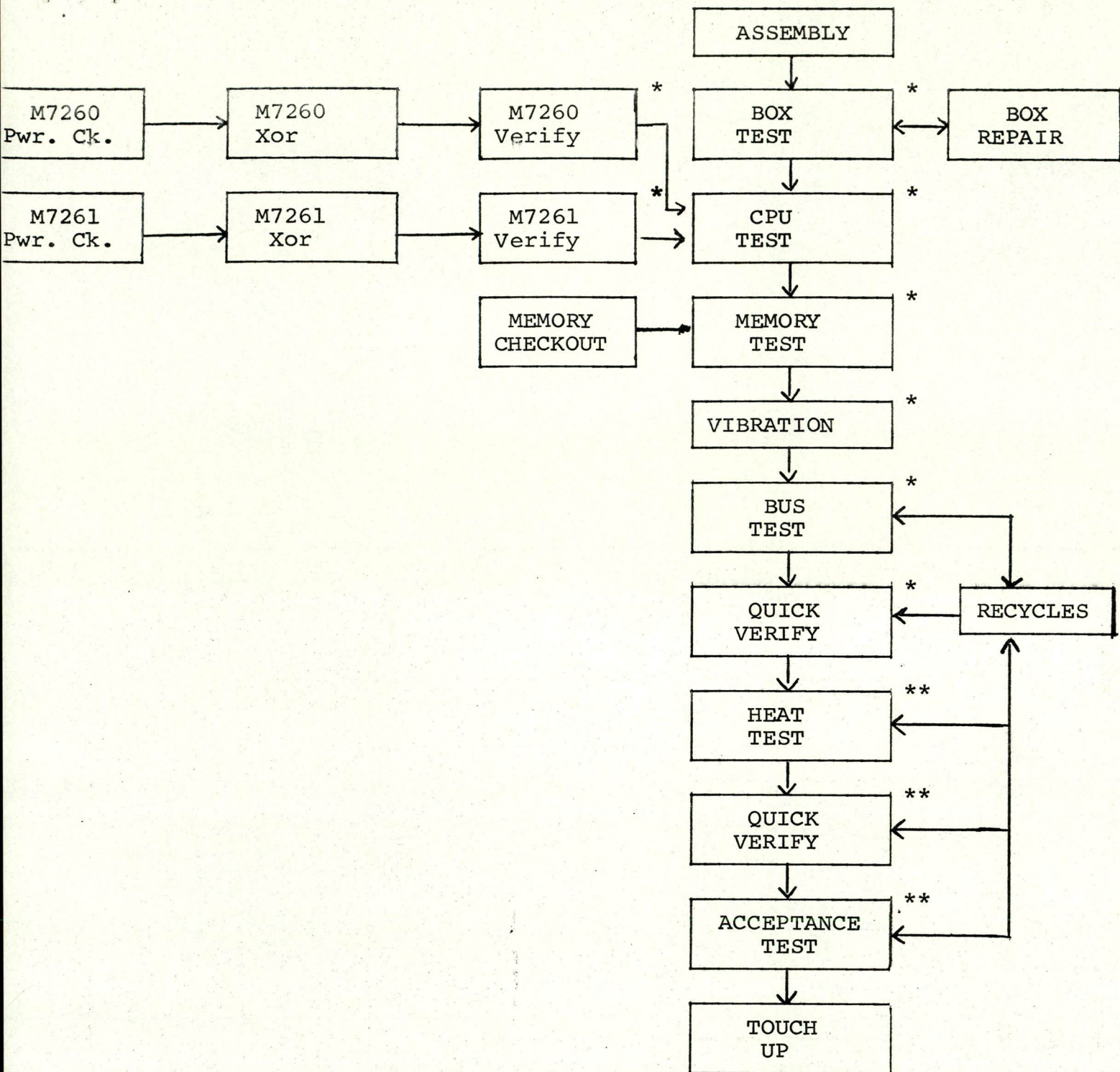
-- The 1105 is subjected to Q.C. and operational checks to insure that the machine will pass all specifications. Approximate test time 4 hours.

TOUCH UP

-- The machine is mechanically touched up - T17 is run and the machine is boxed in its shipping container. Approximate test time 2 hours.

RECYCLES

-- This area repairs boxes that are complete and have failures; such as, heat failures, intermittent failures, etc.



PDP 1105 AREA FLOW

* PDP 1105 Checkout Procedure

** Included in the Acceptance Procedure

PDP-11/05 BASIC CHECKOUT PROCEDURE

SUMMARY

I 7260/7261 CHECKOUT PROCEDURE

- 1.0 Visual inspection
- 2.0 Check power and gnd. for shorts
- 3.0 Adjust +5V to +5.1V
Adjust -15V to -15.0V
- 4.0 M7261 set clock to 310ns @ E5504
- 5.0 Check console initialize
- 6.0 Check load address
- 7.0 Check deposit and examine
- 8.0 Run a branch dot
- 9.0 Run T~~0~~ - T13
- 10.0 Ballpark adjust teletype clock
- 11.0 Check teletype printer
- 12.0 Run T14 (2 passes)
- 13.0 Run T15 with bit 11 set (2 passes)
- 14.0 Fine adjust teletype clock using T17
- 15.0
- 16.0 Checkout low speed reader
- 17.0
- 18.0 Checkout power fail
- 19.0 Run quick verify

II 11/05 TEST BOX

- 1.0 Purpose
- 2.0 Equipment required for testing
- 3.0 Basic station setup
- 4.0 Visual inspection
- 5.0 Basic power on check
- 6.0 Logic test and checkout

III CPU CHECKOUT

- 1.0 Equipment required
- 2.0 Basic checkout station
- 3.0 Checkout of PDP-11/05 CPU
- 4.0 M7260 checkout
- 5.0 M7261 checkout

IV 11/05 MEMORY TEST

- 1.0 Purpose
- 2.0 Equipment required for testing
- 3.0 Memory test

V 11/05 VIBRATION TEST

- 1.0 Purpose
- 2.0 Test equipment required
- 3.0 Verification test
- 4.0 Vibration test

PDP-11/05 BASIC CHECKOUT PROCEDURE

SUMMARY

VI 11/05 BUS TEST

- 1.0 Purpose
- 2.0 Equipment required
- 3.0 Test and checkout

VII QUICK VERIFY (PRIOR TO HEAT)

- 1.0 Purpose
- 2.0 Equipment required
- 3.0 Quick verify

VIII HEAT TEST

- 1.0 Purpose
- 2.0 Test equipment required
- 3.0 Heat test of the PDP-11/05
- 4.0 Pass fail criteria
- 5.0 At the completion of 48 hours, remove the 11/05 from the heat chamber and fill out all applicable logs.

IX QUICK VERIFY (AFTER HEAT)

X APPENDIX

- 1.0 Processor clock adjustment
- 2.0 TTY connection to 11/05
- 3.0 Teletype clock adjustment
- 4.0 Power supply adjustment
- 5.0 The patch to run only the factory bus tester portion of the bus tester.

I M7260/M7261 CHECKOUT PROCEDURE

1.0 VISUAL INSPECTION

- a. Inspect board for solder shorts, etc. In high density etch areas use an ohmeter to check for shorts between adjacent etch runs. These may not be visible.

NOTE: Each minute spent on this step may save hours later.

2.0 POWER CHECKS

- a. Using an ohmeter insure there are no shorts between A2 and B2, B2 and C2 and A2 and C2. This must be done on each slot.

3.0 VOLTAGE ADJUSTMENTS

- a. With the M7260 and M7261 inserted adjust the +5V supply to 5.1V.
b. Insure the voltage @ F01B2 is -15V.

4.0 AT E5504 SET THE CPU CLOCK @ 310 ns. (Not required on M7260)

5.0 CONSOLE INITIALIZE

- a. Press start with the halt switch depressed. The MPC lights on the maintenance board should indicate 302.

6.0 LOAD ADDRESS

- a. Depress the load address key and one by one lift up SR 0-15 insuring that only the correct leds light.

7.0 DEPOSIT AND EXAMINE

- a. Deposit 177777 into 177700 and 177701 and examine.
b. Deposit 177777 into memory location 0000 and examine.
c. Repeat a and b with all zeros deposited instead of ones.

8.0 RUN A BRANCH DOT

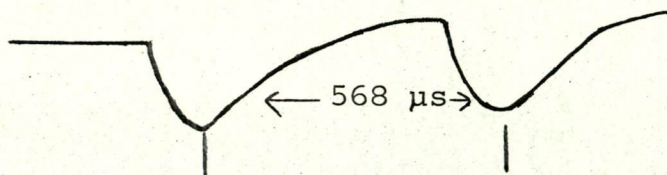
- a. Deposit 777 into location 0. Press start

9.0 Run T0 through T13. Since these programs make a complete pass in seconds it is sufficient to run each one \approx 15 secs.

10.0 BALLPARK ADJUST TELETYPE CLOCK

- a. The clock can be accessed at 8 \sim resistor located below the pot.
b. With the scope set at .1 ms/cm insure the pot can adjust the period from 200 μ s to 650 μ s.
c. Adjust the clock to 568 μ s.

TTY clock
110 baud



11.0 TELETYPE PRINTER

- a. Deposit 101 into 177566. This should print an "A".
- b. Deposit 077 into 177566 and a "?" should be printed.
- c. Examine 177564 and insure only bit 7 is set.

12.0 RUN T14 2 passes

13.0 RUN T15 WITH SR = 14000 (2 passes)

NOTE: The second pass of T15 will differ from the first in that the trace trap will be set after each instruction.

14.0 TELETYPE CLOCK FINE ADJUST

- a. Run T17 with only teletype selected (SR = 177776). Turn the teletype clock pot clockwise until the printout starts failing. Note number of turns counterclockwise it takes to fail, then set the pot midway between the failure settings.

15.0 TELETYPE READER

- a. Put the absolute loader into the reader with the leader code over the pins.
- b. Press start with the halt switch down to generate a machine initialize.
- c. Examine reader status (177560) and insure it is cleared.
- d. Deposit 00001 into 177560, the absolute loader should advance one character.
- e. Examine 177560. It should contain 200. (Done bit set)
- f. Examine 177562, it should contain 351.
- g. Examine 177560 and insure examining 177562 cleared bit 7.

16.0 RUN T17 WITH READER AND PRINTER

- a. With the teletype in local, punch a foot of blank leader and place in reader.
- b. Place punch off-line before putting teletype back on-line to avoid punching an extraneous character.
- c. Put reader on start.
- d. Set SR = 4000 and run 1 pass.

17.0 REPEATED DUMP/POWER FAIL FROM MOTHER

- a. Setup test station
 - type = 1105-1
 - mode = processor
 - repeat set
 - function = dump
 - switch register = 1016

- b. Press initialize
- c. Mother will repeatedly dump and start T15.
- d. Let run \approx 30 secs. then release the repeat switch and allow T15 to complete a pass.

18.0 POWER FAIL DIAGNOSTIC

- a. Start each test and turn the power off/on as indicated.

<u>TEST</u>	<u>START ADDRESS</u>	<u>OFF/ON</u>	<u>PC AT NORMAL HALT</u>
1	200	5	Should not halt
2	204	1	1024 press continue - halt 1064
3	210	1	1142
4	220	1	1560
5	224	1	1754
6	230	1	2144

19.0 RUN 1 PASS OF QUICK VERIFY

II 11/05 BOX TEST

1.0 PURPOSE

To test the basic 11/05 box and insure the proper operation of the following areas:

- a. Power supply
- b. Console
- c. CPU - backpanel
- d. TTY cable
- e. AC input boxes
- f. Fans
- g. ACLO-DCLO
- h. On-off panel lock assembly

2.0 EQUIPMENT REQUIRED FOR TESTING

- a. Multimeter
- b. M7260
- c. M7261
- d. 4-G727's
- e. 2-M930's
- f. TTY
- g. MM11K, or MM11L
- h. Known good 11/05 CPU box

3.0 BASIC STATION SETUP

- a. The known good 11/05 CPU box is used for the control memory system, the MM11 is plugged into the appropriate slots and bussed to the box under test by a 5 foot cable.

- b. The diagnostic used during box test is T17.

4.0 VISUAL INSPECTION

Inspect the box for the following:

- a. Proper key alignment (on-off)
- b. Switch register alignment
- c. Proper routing of power harnesses
- d. All mechanical connections to chassis
- e. Cracked or broken logic blocks
- f. Metal filings in the box

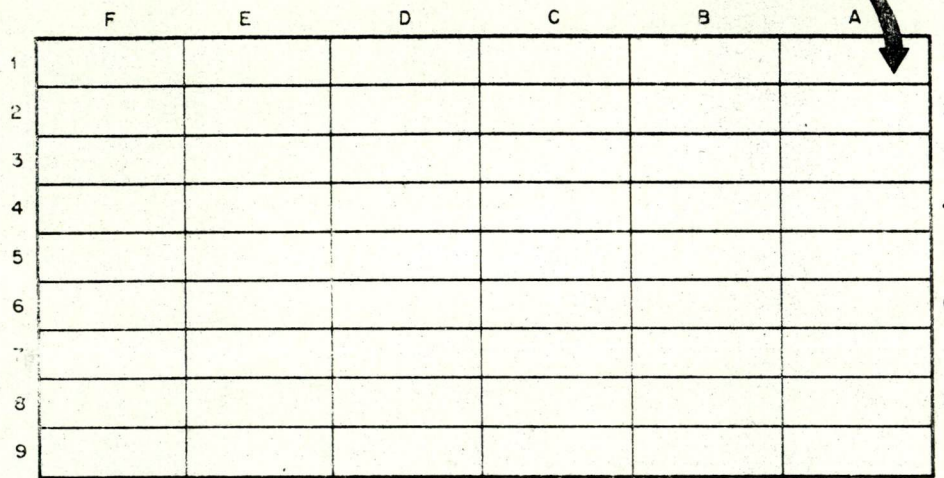
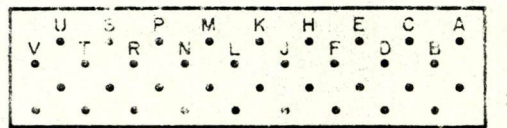
5.0 BASIC POWER ON CHECK

- a. + 5V power F01A2 ± .05VDC
- b. -15V power F01B2 ± .1VDC
- c. +15V power C01U1 ± .1VDC
- d. Fans rotate in proper direction
- e. All leds should be lit with no modules installed
- f. Power on-off switch is not loose or misaligned in the power on position

6.0 LOGIC TEST AND CHECKOUT

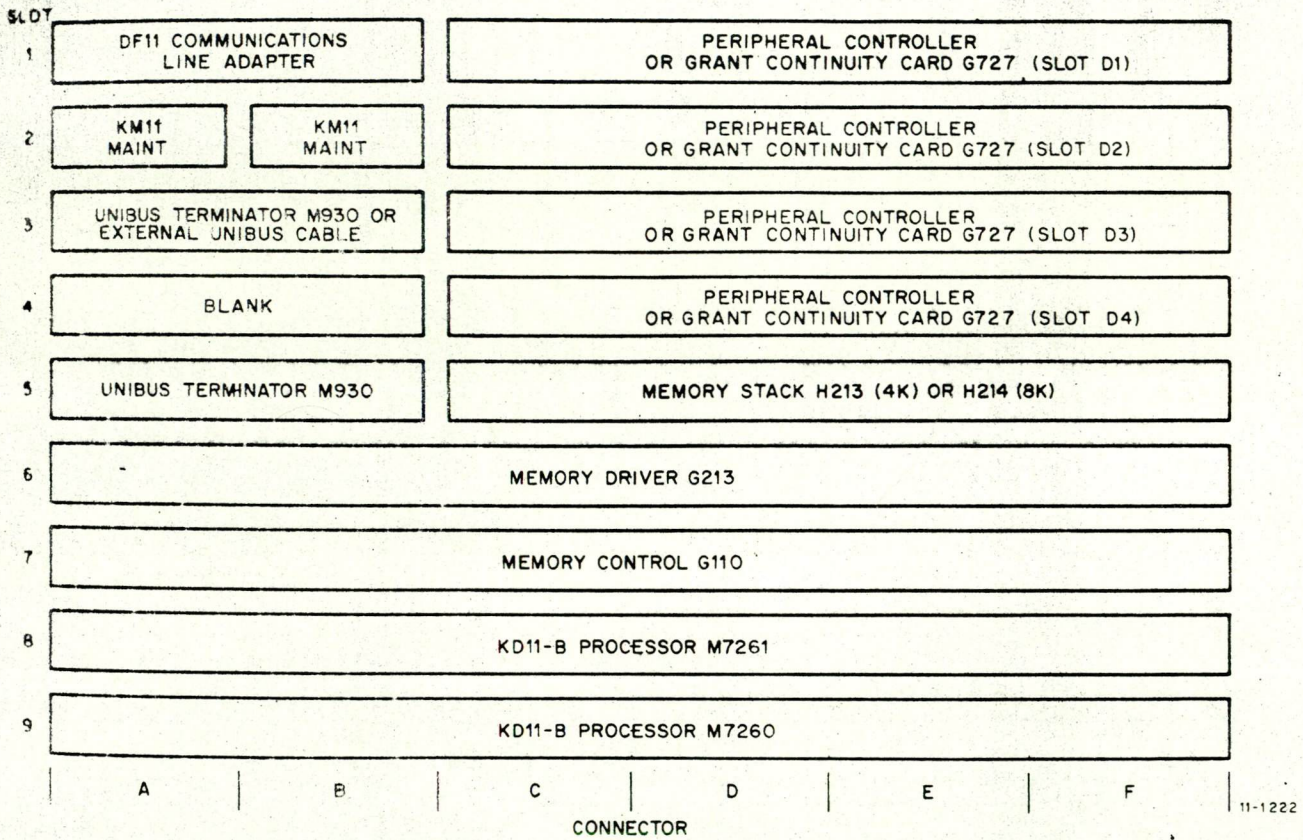
- a. With the box powered down plug in the following modules in the proper slots for configuration #1 or configuration #2 as required. (Fig. # 1, 2 & 3)
 - 1. M7260
 - 2. M7261
 - 3. 4-G727's
 - 4. 1-M930
 - 5. Unibus cable from test memory to the box under test.
- b. With the halt switch enabled, preform the following checks:
 - 1. Apply power to the CPU.
 - 2. Load address 00000.
 - 3. Deposit 125252.
 - 4. Examine should equal Loc 0, 125252.
 - 5. Load address 200.
 - 6. With the halt switch still enabled, depress continue. The indicators should show 202.
 - 7. Disable halt, all data switches equal to 0, depress continue, the program should run.
 - 8. The program will run for 55 sec, stop typing for 5 seconds and continue.
 - 9. Panel lock -- while the program is running out the power switch in the panel lock position, now depress halt, the program should continue.
 - 10. Power down the unit, remove the M7260, M7261 and unibus test cable; tag the unit box OK.
 - 11. Complete the log on any problems encountered.

PIN LAYOUT PER BLOCK
A

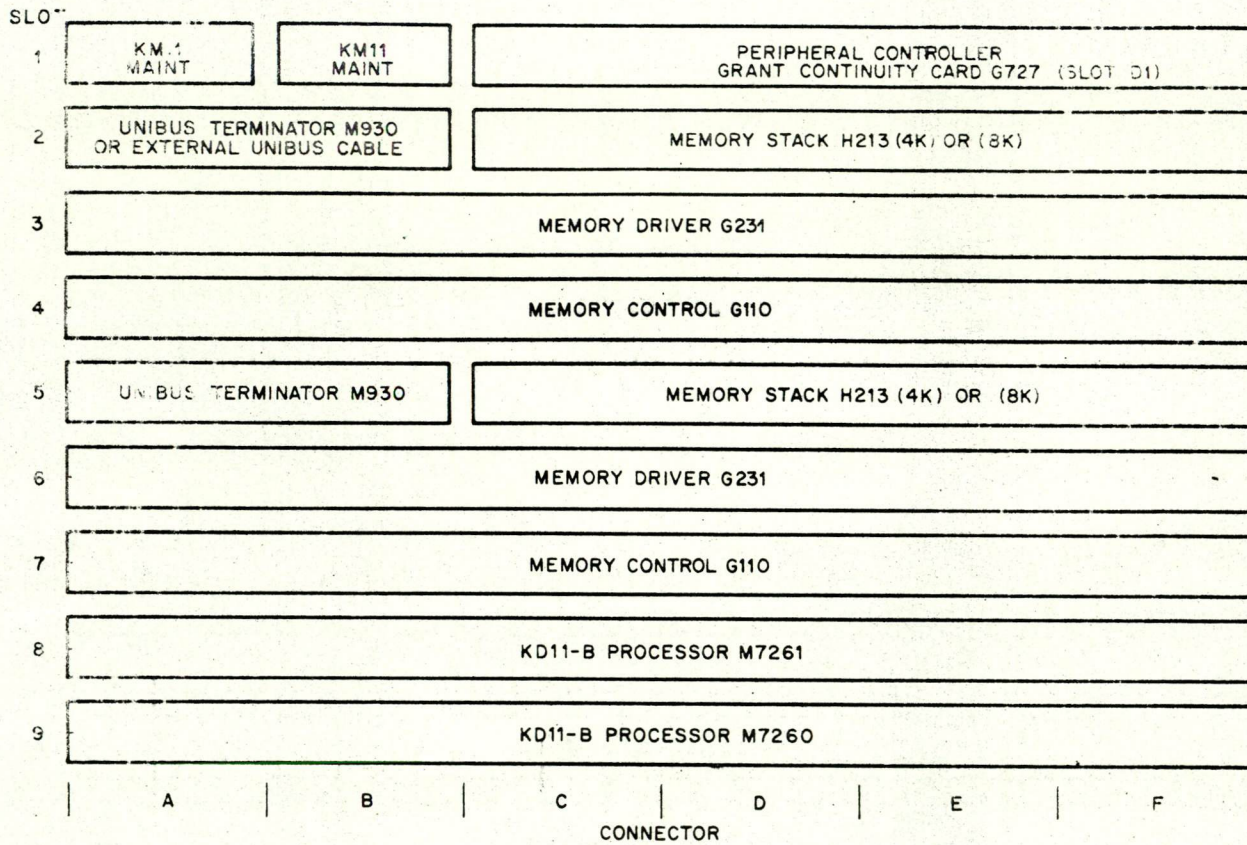


VIEW FROM WIRE WRAP PIN SIDE

Computer Backplane Connector and Pin Designations



Module Utilization Diagram For Configuration 2 (8K)



11-122

Module Utilization Diagram For Configuration 1 (16K)

CPU CHECKOUT

The purpose of the CPU test is to integrate CPU boards into a known good box and insure the proper operation of the basic.

1.0 EQUIPMENT REQUIRED

- a. Good basic 11/05 box
- b. PC05
- c. PC11
- d. 453 O'scope
- e. Known good M7260
- f. Known good M7261
- g. Memory (MM11L, MM11K)
- h. Teletype

2.0 BASIC CHECKOUT STATION

- a. Basic setup of the CPU station is identical to the box station. In addition, a PCO and control is included in the station test stand for read-in.

3.0 CHECKOUT OF PDP-11/05 CPU

- a. Buss the box under test to the 11/05 test stand.
- b. Plug in the known good 11/05 CPU modules into the box under test.
- c. Check the +5V, -15V, +15V, power supplies and adjust as required:

+5VDC	F01A2	± .05VDC
-15VDC	F01B2	± .1VDC
+15VDC	C01D1	± .1VDC
- d. Load in test 17, start address 200/ switch register should be set for 004354.
- e. The CPU should run error free for 3 minutes.

4.0 M7260 CHECKOUT

- a. Power down the 11/05 system, remove the known good M7260 and replace with a new M7260. Perform the following tests:
 1. Deposit ALT. 1's and 0's in location Ø.
 2. Examine location Ø for correct data.
 3. Load address 200 and start test 17, the switch register should equal 004354. Allow the 11/05 to run for 3 minutes error free.
 4. Read punch test.
 - A. Using T17 as described above, run the reader and punch and adjust the TTY clock as required for error free operation. This test should run 5 minutes error free.

5.0 M7261 CHECKOUT

- a. Power down the 11/05 system and remove the known good M7261 and replace with a new M7261. Repeat the tests performed previously during the M7260 checkout.
- b. Power Fail Test
 1. After the 11/05 has run for a minimum of 3 minutes, with the halt switch disabled, power down the 11/05 and power back up. The 11/05 should continue to run after power up. The error report on the TTY should correlate with the diagnostic write up for T17 and indicate a power fail has occurred. (I.O. is not restarted till the end of the pass). The TTY may report errors on the next pass due to the TTY paper tape reader not being restarted on blank leader. Power down, and disconnect the unit under test. Complete all logs and mark the unit CPU test OK.

IV 11/05 MEMORY TEST

1.0 PURPOSE

To integrate a memory system into a checked out PDP-11/05 CPU box.

2.0 EQUIPMENT REQUIRED FOR TESTING

- a. Multimeter
- b. PC05
- c. PC11
- d. Known good memory

3.0 MEMORY TEST

- a. Insert a know good memory into the 11/05 to be tested.
- b. Insert the PC11 control in the DD11 slot at the top of the 11/05 logic.
- c. Power up the 11/05 system.
- d. Toggle in the 11/05 bootstrap loader for the high speed reader.
- e. Load in absolute loader from the PC05.
- f. Load in PDP-11 memory diagnostic "RANDAT" using the PC0.
- g. Load address 200 and start; the 11/05 should run error free for 5 minutes.
- h. Power the 11/05 down and insert a new memory into the 11/05.
- i. Repeat steps C to G.
- j. Using absolute loader, read in T17, load and start at address 200. The switch register should equal 004354.

- k. Allow the 11/05 to run for 3 minutes and power down and back up. The computer should continue to run and report only the power failure typeout at the end of pass.
- l. Enable the halt switch and power down the 11/05.
- m. Complete all checkout logs and mark the system memory test OK.

V

11/05 VIBRATION TEST

1.0 PURPOSE

To insure that the 11/05 is mechanically secure and can reasonably withstand damage in shipping.

2.0 TEST EQUIPMENT REQUIRED

- a. Vibration table -- Model, SECO #860D

3.0 VERIFICATION TEST

- a. Mount the PDP-11/05 on the vibration table.
- b. Plug in and power up the 11/05 CPU.
- c. The 11/05 switch register should be 104000.
- d. The 11/05 should run error free for 4 minutes.

4.0 VIBRATION TEST

- a. After verifying the proper operation of the PDP-11/05 perform vibration as follows:
 1. Main circuit breaker on.
 2. Shaker power on.
 3. Sweep control on.
 4. Mode control to sweep.
 5. Speed control 5.5
- b. The vibration test is a 2 minute test of the 11/05 as follows:
 1. 0 to 60 cycles, sweep, 1 minute
 2. 60 to 0 cycles, sweep, 1 minute
- c. Depress start on the vibration table. The 11/05 should run the vibration cycle with no failures.
- d. Power down the vibration table as follows:
 1. Shaker power off.
 2. Sweep control off.
 3. Main circuit breaker off.
- e. Remove the 11/05 from the vibration table and complete all applicable logs and data sheets.

VI

11/05 BUS TEST

1.0 PURPOSE

To test that the basic PDP-11/05 is capable of error free bus operation.

2.0 EQUIPMENT REQUIRED FOR TESTING

- a. PDP-11 bus tester
- b. Bus tester diagnostic
- c. TTY
- d. PC05
- e. PC11

3.0 TEST AND CHECKOUT

- a. The 11/05 as received from vibration test should be loaded with T17.
- b. Cable the 11/05 up to the bus tester.
- c. Plug the PC11 control into the PDP-11/05.
- d. Power up the system and insure that the 11/05 runs T17 error free.
- e. Load in the bootstrap and absolute loaders.
- f. Load in the bus tester.
- g. Load address 200, and start the 11/05, should run this test for 15 minutes error free.
- h. Upon completion of step 7, load in T17 diagnostic and insure it runs error free from 15 minutes with data switch 11 on a one.
- i. Load in T17 and insure error free operation for 3 minutes.
- j. Halt the CPU and power the system down. Disconnect the PC11 and bus tester from the 11/05.
- k. Fill out all required paperwork and system logs.

VII QUICK VERIFY (PRIOR TO HEAT)

1.0 PURPOSE

To insure that the PDP-11/05 will pass all CPU and memory tests.

2.0 EQUIPMENT REQUIRED

- a. PDP-11/05 daughter station

3.0 QUICK VERIFY

- a. Bus the PDP-11/05 to be tested to a daughter station.
- b. Power up the 11/05, insure the halt switch is 0.
- c. Set the switches on the daughter station as follows:
 1. Switch register as required
 2. Function switch - quick verify
 3. Type switch - 11/05

4. Mode - processor
5. Repeat switch - repeat
6. Online switch - on line

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
	Run T17					Auto Re- Start (in Dump)			Type Prog to be Run					Memory Size	

- d. Depress the initialize switch. The machine will now run quick verify and type out upon a pass complete.
- e. Using dump mode, load T17 into the 11/05 under test.
- f. Fill out all applicable paperwork and disconnect the 11/05 system from the test stand.

VIII HEAT TEST

1.0 PURPOSE

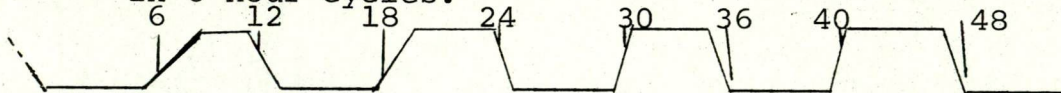
To verify that the 11/05 will pass all environmental specifications.

2.0 TEST EQUIPMENT REQUIRED

- a. Heat box capable of being cycled from 50°F to 120°F and timed for 6 hour cycles.

3.0 HEAT TEST OF THE PDP-11/05

- a. The PDP-11/05 should contain test 17.
- b. The test cycle for heat is 48 hours of heat and cold in 6 hour cycles.



- c. The PDP-11/05 is placed in the heat chamber with the the following switch settings

<u>SWITCH</u>	<u>PURPOSE</u>
15	Halt on error
0	Inhibit TTY input
1	Inhibit TTY output

4.0 PASS FAIL CRITERIA

- a. The 11/05 system under test may be restarted as required if the program has not been destroyed.
- b. If the diagnostic is destroyed, one reload of the diagnostic is allowed.
- c. The 11/05 must run the last 24 hours of the environmental test error free (type error, component failure, blown program, etc.)

5.0 At the completion of 48 hours, remove the 11/05 from the heat chamber and fill out all applicable logs.

IX QUICK VERIFY (AFTER HEAT)

This test is a repeat of section 7 of the 11/05 checkout procedure. In addition, the bus test as outlined in section VI is also repeated. Upon completion, sign off all applicable logs and submit the computer to acceptance.

X APPENDIX

1.0 PROCESSOR CLOCK ADJUSTMENT

Location E55-08 (M7261) adjust the clock for 310NX (E55 is the fifth chip counted from the pot along the handle). This adjustment can be checked without the use of extenders.

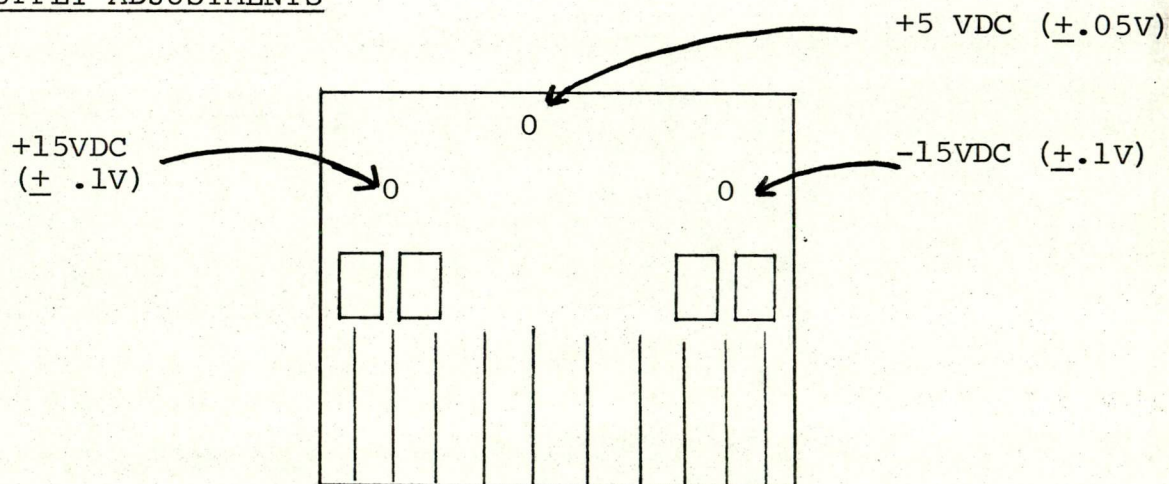
2.0 TTY CONNECTION TO 11/05

The MATE-N-LOC to Berg teletype cable is inserted into the Berg connector at the rear of the cabinet, with the lettering facing up.

3.0 TELETYPE CLOCK ADJUSTMENT

Load and start T17 with switch reg = 177776. Turn the pot on the M7260 clockwise until the print out fails. Turn the pot counter clockwise (noting the number of turns between failing points).

4.0 POWER SUPPLY ADJUSTMENTS



5.0 The patch to run only the factory bus tester portion of the bus tester.

Diagnostic is

<u>LOC</u>	<u>DATA</u>
11416	137
11420	11136

Load and start at address 11136.

PDP-11/05 PRODUCTION CHECKLIST

	<u>BADGE NO.</u>	<u>DATE</u>
1. BOX TEST	_____	_____
2. CPU TEST	_____	_____
3. MEMORY TEST	_____	_____
4. VIBRATION TEST	_____	_____
5. BUS TEST	_____	_____
6. QUICK VERIFY	_____	_____
7. HEAT TEST	_____	_____
8. QUICK VERIFY	_____	_____
9. BUS TEST	_____	_____
10. ACCEPTANCE TEST	_____	_____
11. TOUCH UP	_____	_____

digital

INTEROFFICE MEMORANDUM

TO: Manufacturing Committee
Andy Knowles
Roger Cady
Joe Meany

DATE: September 22, 1972

FROM: Jack Smith

DEPT: Computer Production

SUBJ: 1105 SYSTEMS FLOW

Attached are our current thoughts on systems flow for the 1105. We have carried over into the systems area our concept of straight line flow isolation testing. As with the basic line we anticipate work stations will be staffed with operators and not technicians. Procedures are currently being documented and will be available for review within a couple of weeks. Multi-shift operation would seem to be quite feasible.

Would appreciate your comments, especially in the area of planned configurations and station assignments, we are thinking of combining some of the stations. Mock up of a typical test station is being assembled by Jim in Westminster, have included a sketch for your review.

pjs
Attachment



INTEROFFICE MEMORANDUM

TO: Jack Smith

DATE: September 21, 1972

FROM: Jim Black

DEPT: 1105 Production

SUBJ: 1105 SYSTEMS TEST

Attached is a copy of the plan for organizing 1105 systems test around the methods used in the 1105 basic checkout area.

Initially I would like to start small and add other options and peripherals over the next 90 days. The options I will start with are listed below.

1. DR11 General Purpose Interface
2. BM792 Bootstrap Loader
3. MM11 Memory Expansion
4. KW11P Programmable Clock
5. PC11 Paper Tape Reader and Punch
6. KI11 Communications Interface
7. DL11 Communications Interface
8. LA30 Serial and Parallel Printers

The above options account for about 60-70% of the 1105 systems business today. These options will also give us a good look at problems we may encounter when we start to do disks, magtapes, etc. using this concept.

pjs
Attachments

PRODUCT FLOW 1105 SYSTEMS

TYPE I

TYPE II

BASIC

BASIC

MEM EXP (16K)

MEM EXP (8K)

(1) PERF. SLOT

4 PERF. SLOT

STANDARD SYSTEMS LINE

COMPLEX SYSTEMS

<u>CONF I</u>	<u>CONF II</u>	<u>CONF III</u>	<u>CONF IV</u>	<u>CONF V</u>
Type I	Type II	Type II	Type I	Type I
KW11P	DR-11	PCO	BM792	TU-60
LA-30	LA-30	BM792	RS64	RF/RS
			TU-56	LA-30
			LA-30	

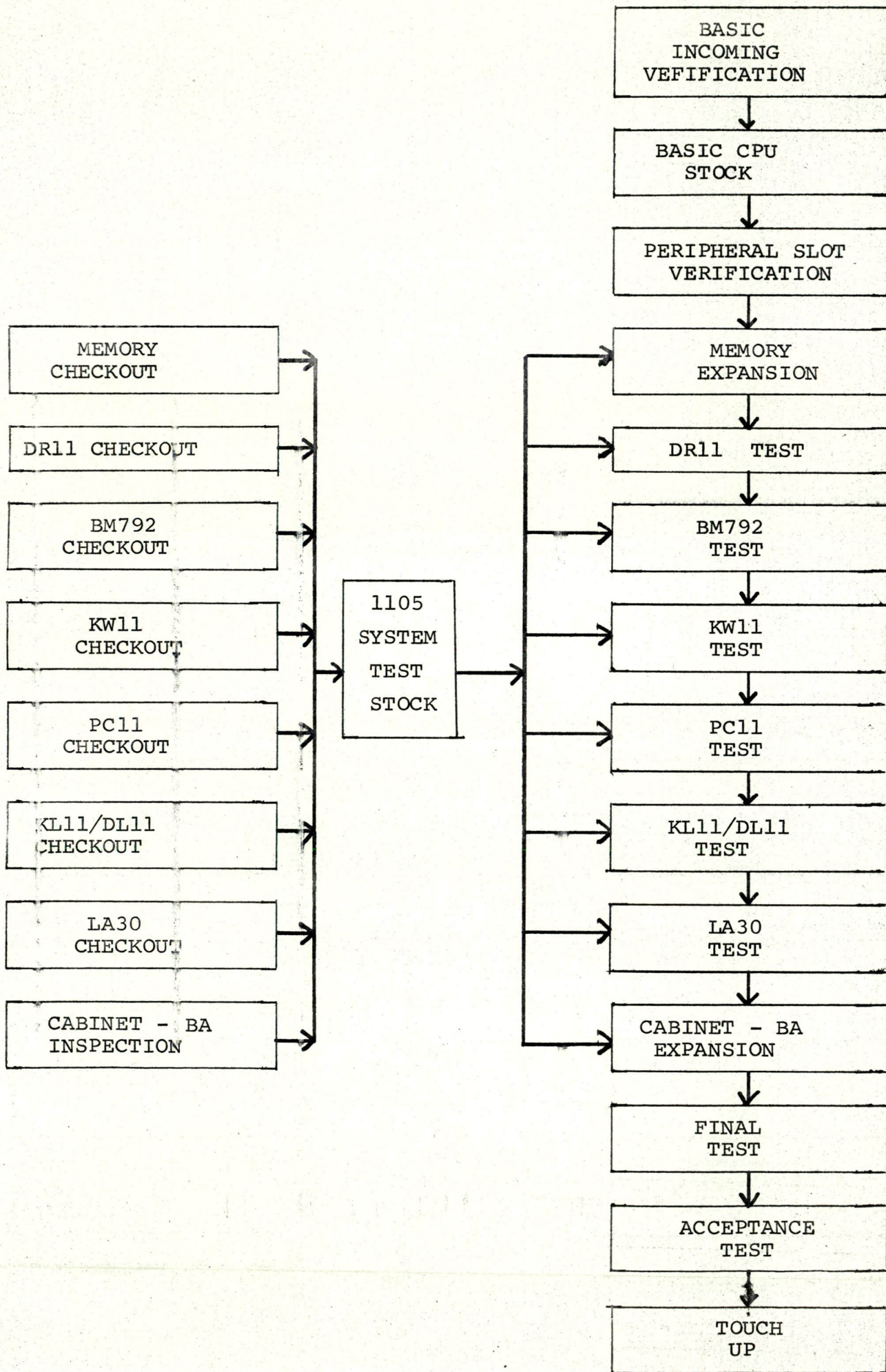
MISC.

NOTES:

1. We anticipate configurations I, II and III to cover 70% of the OEM business.
2. Anticipate negligible complex systems. Price strategy place most of this type in the 20 and 40 areas.

PRODUCT LINE FLOW

1105 SYSTEMS



PDP-1105 SYSTEMS TEST AREA

Below is a brief outline of the function of each block in the 1105 systems test plan.

- INCOMING VERIFICATION -- An abbreviated re-acceptance of the PDP-1105 would be done here upon receipt of the computer from Puerto Rico.
- BASIC CPU STOCK -- Basic 1105's would come from Puerto Rico and be tested as received in then be put into stock.
- MEMORY CHECKOUT -- Memory expansion kits would be tested and put into stock as "1105 tested" 4K and 8K memory systems. ME11 expanders would also be tested at this point.
- DR11 CHECKOUT -- DR11AS and DR11C's would be pre-tested and repaired as required using an 1105. These also go to stock as tested units.
- KW11P CHECKOUT
PC11 CHECKOUT
BM792 CHECKOUT
KL11/DL11 CHECKOUT
LA-30 CHECKOUT -- Each of these areas would pre-test options for the 1105 system test group in the same manner as DR11 checkout.
- CABINET AND BA EXPANSION
BOX INSPECTION -- This would be an electrical and mechanical inspection of BA boxes prior to entering the 1105 systems test area.
- PERIPHERAL SLOT VERIFICATION-- This test requires the use of 4-DR11's and a bus tester. The 1105 small peripheral slots are tested and the CPU bus timing to insure that there are no failures in the basic CPU hardware or wiring.
- MEMORY EXPANSION
DR11A TEST
KW11P TEST
PC11 TEST
BM792 TEST
KL11/DL11 TEST
LA-30 TEST -- A CPU passes through each area and depending on the customer receipt, receives the required option. The testing is performed as follows:

If the machine requires a KW11P a known good KW11P is put in and tested for a minimum amount of time. Next a KW11P from stock is plugged in and "should run" if it does not, we get another KW11P from stock. Then a check is made to insure proper operation and the system is passed to the next area.
- CAB's and BA EXPANSION -- If a small system requires a cabinet and additional BA boxes they will be added at this point.

FINAL TEST

-- This will be a final systems test by a technician to insure that all the system works together.

ACCEPTANCE TEST

-- Final verification by field service prior to shipment.

TO: Operations Committee

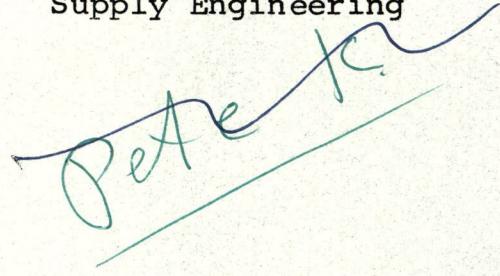
DATE: October 4, 1972

cc: R. Cady D. Tahmoush
F. Cassidy S. Teicher
R. Hamel M. Titelbaum
D. O'Connor W. Vaillancourt
R. Savell

FROM: Dick Manion

DEPT: Memory and Power
Supply Engineering

SUBJ: 11/05 MEMORY FAILURES



I have experienced the following problems in getting enough information from different departments.

1. The 11/05 Production Line has been slow in getting the required information on memory failures that occur on the Mini Line.
2. Memory Test has failed to generate the required daily failure reports.
3. Component Engineering was unable to evaluate bad components.

The information from these three areas is very important and is needed to effectively solve the 11/05 memory problems.

Because of the insufficient data, I personally evaluated 22 rejected systems from the 11/05 line.

1. 4 or 18% failed because of component failures.
2. 4 or 18% failed because the ground jumper on G110 shorts to a transformer.
3. 14 or 64% failed because of poor workmanship and testing in the memory test area.

The failure rate on the 11/05 line went up substantially on the Mini Line. The rate went from 12% to 31%. The major reason for this increase can be attributed to the 11/05 line reworking modules. Ron Marchetti and Don Tahmoush have agreed to send all modules back to memory test for repairs.

Production yield for memories.

<u>DATE</u>	<u>VERIFICATION</u>		<u>MINI LINE</u>		<u>HEAT BOX</u>		<u>QUICK VERIFY</u>		<u>ACCEPTANCE</u>	
	<u>Total</u>	<u>Failed</u>	<u>Total</u>	<u>Failed</u>	<u>Total</u>	<u>Failed</u>	<u>Total</u>	<u>Failed</u>	<u>Total</u>	<u>Failed</u>
9/22 → 9/24	33	9	30	7	50	0	40	0	28	2
9/25 & 9/26	<u>34</u>	<u>10</u>	<u>25</u>	<u>10</u>	<u>39</u>	<u>1</u>	<u>13</u>	<u>0</u>	<u>76</u>	<u>5</u>
TOTALS	67	19	55	17	89	1	53	0	104	7
FAILURE RATE	28.4%		31%		1.1%		0%		5.7%	

11/05 Memory Failure Report.

Date: 9/26/72

Total returned from 11/05 line19
 Total tested on 11/05 Q.V. tester.....17
 Total passed on 11/05 Q.V. tester..... 7
 Total returned memories tested on 2223
 and Macrodata..... 7
 Could not confirm problem..... 1
 Memory test area errors..... 1
 Required repairs: 5
 Marginal stacks (V_t)..... 0
 Bad stacks..... 0
 Components..... 1
 Mechanical..... 4
 Others..... 0

Number of components replaced..... 1 4008

Number of components given to Component
 Engineering.....Not known

Number of retested systems returned
 to the 11/05 Line.....14

11/05 MEMORY FAILURES

Dick Manion

Page 3

A concentrated effort is being made by Memory Engineering to find out why memory systems are failing at the Initial Verification and Mini Line Test Stations. I am monitoring these stations closely.

My findings thus far are as follows:

Findings at 11/05 Initial Verification and Mini Line.

# of Failing Memories	Date	Component Failures	Wrong Component	Missing Component	Mis-aligned	Short	Other
9 Initial Verification	9/28/72	1-7380	1-74H74	1-0672 3-Missing Jumpers		1-Gnd Jumper	2-Needs ECO 1-Poor looking Current, changed DL-1
5 Initial Verification	9/29/72	1-2501 1-74H01-1				3-Gnd Jumper 3-Possible solder shorts on G110	1-Missing ECO 1-Current Loop Broken
5 Mini Line	9/29/72	1-74H01-1 1-7380 (Both on G110)			1-G110	1-Gnd Jumper 1-G110	1-Dirty Pins
3 Initial Verification	9/30/72						2-Wrong Jumper Cut 1-Poor Solder Connection

11/05 MEMORY FAILURES

Dick Manion

Page 4

At the Initial Verification and the Mini Line Test Stations the sample of systems that I have looked at shows the following:

Four out of twenty-two failed because of component failures.

Four out of twenty-two failed because of ground jumper shorts.

Fourteen others failed because of poor Q.C.ing of modules or poor testing.

/p

TO: Steve Teicher

DATE: February 26, 1973

FROM: Ken Olsen

DEPT: Administration

EXT : 2300

SUBJ: 11/05 CHANGES

Last week, Andy asked you to set up a meeting to review possibilities of redoing the 11/05 with some quick but rather drastic changes.

I would like to meet with you soon, before that meeting, and have you go over once again for my edification some of the details that we have to consider. I would like to hear your guess, sometime in the next few days, of what power supply specs we would need and how much heat we would have to remove if we fill a 10 inch box up with sockets. It would be good to give these specs to the power supply group to see if it is worth having one standard supply that would drive anything you put in the box, or should we have one or two power supplies.

I would also like to see a list of peripheral controllers that we might want to redo with some way of estimating how much stuff would be in the controller and how difficult it would be to put them on one hex board with or without daughter boards. I also would like to know what would be involved in putting memory on a single board and an estimate of what that would do to the costs.

If we had this dream machine, with every unit on a single board, could we print a standard back panel?

I personally like the idea of each controller on a board, but it can be quite high so that there is the room of several boards without the cost of several boards.

I would also be interested to hear what handles you would like on the modules to make them easy to test and what specifications you would put on ways of getting cables in and out of the box. It would also be handy to include a list of the cables that go in and out of the box.

/d

digital

INTEROFFICE MEMORANDUM

TO: Gordon Bell

DATE: 12/6/72

DEC 11 1972

cc: Ken Olsen

FROM: Bob Savell

DEPT: Memory and Power
Supply Engineering

SUBJ: CONTROL OF MANUFACTURING GROUPS

You, Roger Cady and I met the other day to discuss the high rate of rejects still observed when memories are tested at the input to the 11/05 computer final assembly area. We explained that engineering design problems over the last few weeks account for no rejects, component failures account for a percentage that is still larger than we'd like, but that the largest category are apparently due to the units not being tested properly in the Manufacturing Memory Test Area.

You asked if I felt I should run the Memory Test Area. I do not feel I should for three reasons:

1. The problem in Memory Test is typical of the problems in all manufacturing test areas--poor discipline brought on because Manufacturing's philosophy is to "ship the numbers". That's all they're ever told by their management, and they continually tell us that they "don't have time" or "can't afford the time" to do the job right.

Manufacturing must learn to take the responsibility for quality as well as quantity, and for setting up the administrative procedures necessary to insure that if the checkout procedures specified by engineering are not carried out properly by their people, that they can identify the people involved and correct the situation.

2. I feel that my job right now in building up the Power Supply Group and solidifying both memory and power supply groups is large enough that I don't want my efforts to be diluted.
3. Our group should be spending our follow-on engineering effort on any engineering design problems that do occur, and in working with component engineering so that together we can try to get the component failure rate lower. We cannot do this if we continually have to monitor and point out manufacturing problems.

CONTROL OF MANUFACTURING GROUPS

Bob Savell

Page 2

I'd like to point out that the man running the test area, John Groark, is completely capable of running it properly. He knows what to do and how to do it, but has been unable to run it right because of pressure to ship.

Roger Cady stated that he felt it was, and always had been, the engineer's responsibility to define and monitor the administrative manufacturing procedures mentioned above. I may be a bit slow, but I've been here 11½ years now and have never understood that to be the engineer's responsibility, nor have I observed that Roger Cady's engineers seem to understand that they have that responsibility. If that responsibility does exist, it's a well kept secret.

When I learned that Roger was going to work on problems of this sort in Manufacturing I was pleased because Manufacturing clearly needs help. If Roger's statement to me is an example of the way in which he's going to solve the Manufacturing problems, however, then we're in big trouble since his approach is to transfer responsibility from Manufacturing back to Engineering! I've already stated my feelings about that.

Gordon, how about getting some company wide clarification on these two questions?

- (1) What is the engineer's responsibility?
- (2) What is Manufacturing's responsibility?

Unless the answers to these questions are quite clear, neither groups will be able to staff and budget to properly handle the total job, nor will their performance be able to be measured.

jmp



INTEROFFICE MEMORANDUM

TO: Joe St. Amour

DATE: December 27, 1972

FROM: Ken Olsen

DEPT: Administration

SUBJ: POWER SWITCH FOR 11/05

Steve Teicher was telling me some of the problems with the power switch on the 11/05. He concluded that we should make the switch a separate assembly and therefore get rid of the adjustment problems.

I am not happy with that idea alone. We used to have the switches as a separate assembly and they caused no end of trouble, so it is not just a matter of whether it is integral with the front panel or separate. We have to have a straightforward way of actuating and adjusting the switches. Maybe the problem is we don't over-drive them enough.

/d

TO: Steve Teicher

DATE: November 13, 1972

Cc: Andy Knowles

FROM: Ken Olsen

DEPT: Administration

SUBJ: CHEAPER 11/05

I would like to meet with you someday soon to talk about what we can do to make the 11/05 cheaper. What are the costs for each of the major pieces? It would be interesting to know what the costs are in the major module. If they are relatively small, we can gain a lot working over the power supplies, sheet metal and front panel.

Now that we have this experience, what are the alternative configurations? Would it be an advantage to go to the 3 1/2 inch panel, or would we be better off going to 7 inches, or 8 3/4 inches, or 10 1/2 inches high? If we went to 10 1/2 inches high, what would we use the other space for and what power supplies would we need? If we built a version of the 11/05 in Ireland or Taiwan which we would sell to the OEM's at a very low price but without the normal services, what should we put in this? Should it be a large, easy-to-assemble, cool and reliable box with a simpler front panel or no front panel?

If we imported the OEM product in order to separate it from our normal product line, what could we do to make the memories and peripherals somewhat different? It would be nice to have the OEM memory the same for manufacturing and testing, but different as far as final configuration. Could we also put some of the peripherals that are now in the systems units on one hex board?

Could we get rid of all the systems units so that we could just line up sockets the way the PDP-8 does? We could then put the peripheral on a hex board with daughter boards. The daughter boards would end up perhaps taking less space than a systems unit, and might end up being a lot simpler than putting in a systems unit with a number of quad boards.

I am on a kick of trying to get mother/daughter boards considered because I believe they will be the way around our complex board layout problem and board re-layout problems.

The 11/05 is one of the products we are going to concentrate on making very inexpensively because large quantities are made.

/d

digital INTEROFFICE MEMORANDUM

TO: See Distribution List

DATE: January 31, 1972 FEB 2 1972

FROM: Dennis Macklin

DEPT: LDP Engineering

SUBJ: 11/05 Chassis - Use by others

A resent examination of the 11/05 chassis shows that it is not readily usable for other products. This is because of the small opening in the front.

I see it as very desirable for this chassis to be more universal so that we can quit reinventing the same, but slightly different. I will be pursuing this over the next few days.

Potential usage of 11/05 chassis:

Lab Peripheral System
" " " Expansion A-D's

Cassettes?



DM/kcs

- Distribution List:
- Engineering Committee
 - Bob Puffer
 - Roger Cady
 - Joe St. Amour
 - Bruce Delagi
 - Loren Prentice
 - Lorrin Gale

Ken Olsen

~~Andrew~~

This tells where we
are on the PDP-11/25.
We are in reasonable
shape. It is budgeted,
planned and a powerful
product. We plan to start

pdp11
memo

DATE: January 21, 1972

Selling it in July - maybe slightly
sooner if
we need to.

SUBJECT: PDP-11/25 SCHEDULE, STATUS AND NEAR FUTURE

TO: Distribution

FROM: Jim O'Loughlin

Andy Knowles
1/28/72

SCHEDULE:

The attached PDP-11/25 schedule indicates the development and initial shipment of the machine and its component elements. Initial builds are ten (10) in June with a monthly progression of 40 in July and 60 in August; shipments are schedule for the month after build to allow system configuration and debug.

Certain assumptions are basic to this schedule.

1. Automatic test and acceptance has to happen for the PDP-11/45 and this occurs before the PDP-11/25 needs it. Stations must be built for the PDP-11/25 with dedicated XOR testors adjacent to the production line.
2. Memories for the PDP-11/25 are the MM11-S or equivalent (3 MM11-S type in a 9 slot, double system unit). The development and test of the memory module is critical to the development of the PDP-11/45 (and the PDP-11/05) and must happen. The PDP-11/25 numbers must be requested, however, and the equivalent memory defined.
3. The power supply for the PDP-11/25 machine is integral with the BALL-DA basic box or BALL-DB expansion box. The electrical portion of this power supply is a subset of the H742A power supply with the regulator modules H744A and H745A being used. The numbers for the PDP-11/25 must be requested and the testing of the power supply by the PDP-11/45 group monitored. A very basic assumption, which must itself be monitored, is that the power supply is a repackaging job only.
4. ROM's represent an advantage in that initial ECO's that normally require etch changes may now be implemented with a new ROM. The facility to inspect and alter ROM's is assumed as it is necessary for the PDP-11/05 and PDP-11/45.

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Purchase and test inputs are necessary on the PDP-11/25 volume and types.

The schedule is reasonably tight, especially for the Ball-DA box and power supply and the FIS option. No direct conflict is now apparent with the production schedule of the PDP-11/05 or the PDP-11/45; these machines are ahead of the PDP-11/25 and should do significant basic work for us. Help them! The schedule does accommodate the corporate constraint on overtime (salaried personnel excepted).

STATUS:

The schedule has been presented to the product line, new products and production; marketing has a business plan although further refinement is necessary on option quantities and the phase over from the PDP-11/20. Money is budgeted for Q3 and Q4 for the project; it is expedient that the project, as scheduled, is completed on time!

The status of the individual elements of the PDP-11/25 are noted:

1. KD11-A basic processor has all boards (4 hex and 1 quad) layed out, three boards are being digitized, two boards are completed. The backpanel is being wire listed for the basic machine. The console, KY11-D is being layed out.
2. Memories are being developed for the PDP-11/05 and PDP-11/25. Two testers up, another next week. Verbal commitment for prototype needs from Dave Gendreau.
3. Box and Power Supply begins drafting layout of the box today. Units available to PDP-11/45 not yet tested completely. Verbal commitment for regulator units for prototype needs from Al Hirsch.
4. EIS breadboard is being debugged on the KD11-A breadboard. Prints need redrawing to go to layout.
5. FIS design is developing with algorithms and data paths; no logic design exists.
6. Memory segmentation breadboard is being constructed. The hooks are difficult in the breadboard, but the prototype will not be available. After EIS, the segmentation will be debugged in the breadboard.
7. No work yet done on manuals or training. Three week courses will be provided; initial course in May.

January 21, 1972

8. No complete PDP-11/25 exists.

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NEAR FUTURE:

No meetings are planned for the next month or two, yesterday's production meeting can suffice for a while. Engineering has some design to do, and others groups are busy or don't need to start yet. Copies of a bi-weekly status report will be distributed. If questions arise please call X2654. Regular meetings will occur when we're closer to production. Send notes for distribution with the status reports and communicate directly with people involved with a problem. (The distribution list notes names and specialties.) Do work not meetings.

SERMON (Optional)

Certain problems happened to use (engineering and production) on the PDP-11/20; there is no intention of repeating them. The following items are resolved:

1. Adequate modules will be available to allow module swapping.
2. An integral XOR testor will exist with the production line to allow repair of modules on site.
3. Machine builds of basic machines will be in one month; shipment of the systems are in the following month.
4. An engineering acceptance procedure that requires much of PDP-11 devices is being developed. The PDP-11/25 will meet this procedure.
5. Training will be orientated toward systems with new emphasis on manufacturing needs and diagnostic programming techniques. Power supply training will be mandatory.
6. Since the PDP-11/25 replaces the PDP-11/20, care is necessary in discussing the PDP-11/25 and its characteristics. Don't want to turn off PDP-11/20 sales

JOL/emp

PROJECT(S) PDP 11/25

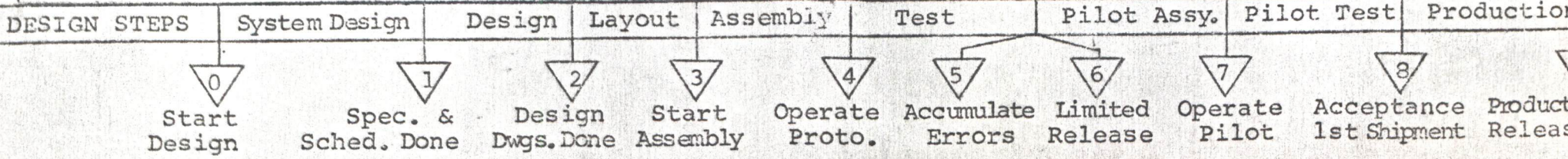
BY J.F. O'LOUGHLIN

SHORT DESCRIPTION SMALL COMPUTER CONSISTING OF:

DATE 1/18/72

KD11-A PROCESSOR; MM11-S MEMORY (OR EQUIVALENT); BAI1-DA BOX WITH INTEGRAL POWER SUPPLY; AND PROCESSOR OPTIONS (E1S, F1S AND MEMORY SEGMENTATION).

MONTH (1/2 Month per Block)	JAN	JAN	FEB	FEB	MARCH	MARCH	APRIL	APRIL	MAY	MAY	JUNE	JUNE
LETTER CODE FOR MONTH	G	G	H	H	I	I	J	J	K	K	L	L
PROCESSOR (KD11-A)	LAYOUT	DIGITIZE	BUILD	DEBUG(2)	DEBUG(1)	DEBUG(2)	PILOT ASSY(10)					
MEMORY (MM11-S)	BACKPANEL		NEED(3)	NEED(3)	NEED(3)	NEED(15)	NEED(30)					
BOX & POWER (BA11-DA)			DESIGN	PRINTS	BUILD(3) & DEBUG	BUILD(2)	PILOT ASSY(15)					
E1S (KE11-E)	DEBUG		LAYOUT		BUILD	DEBUG(4)	PILOT ASSY(5)					
F1S (KE11-F)	DESIGN		PRINTS	LAYOUT		BUILD	DEBUG(4)	PILOT ASSY(5)				
MEMORY SEG. (KT11-D)	BUILD		DEBUG	LAYOUT		BUILD	DEBUG(4)	PILOT ASSY(5)				
MANUALS & TRAINING			SPECS	MANUAL INPUTS	MANUAL WRITE	TRAINING (PROD & F. 5)						
PDP 11/25 (BUILD)			PROTO 1 & 2		PROTO 3	PROTO 4 & 5	PILOT ASSY(10)					



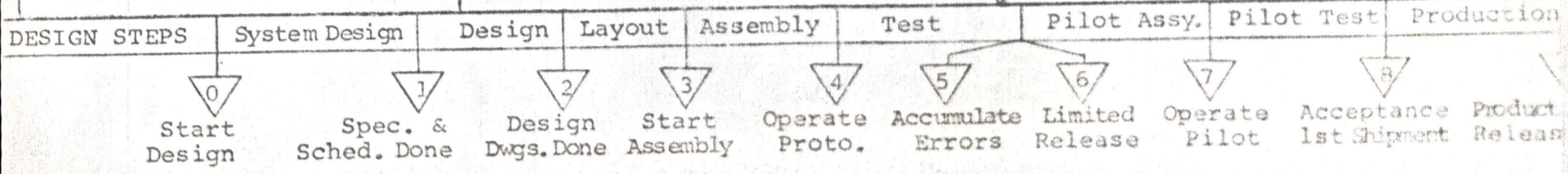
*If "Test" ends with Accumulated Errors that require rework, appropriate design steps such as re-design,

PROJECT SCHEDULE

PROJECT(S) PDP11/25 (CONT.)
 SHORT DESCRIPTION _____

BY J.F. O'LOUGHLIN
 DATE 1/18/72

MONTH (½ Month per Block)	JULY	JULY	AUG	AUG	SEPT	SEPT	OCT	OCT	NOV	NOV	DEC	DEC
LETTER CODE FOR MONTH												
PROCESSOR (KD11-A)					PILOT ASSY (40)	PILOT ASSY (60)	PILOT ASSY (100)	•••				
MEMORY (MM11-S OR EQUIV.)					NEED (150)	NEED (250)	NEED (300)	•••				
BOX & POWER (BA11-DA) (BA11-DB)					PILOT ASSY (60)	PILOT ASSY (100)	PILOT ASSY (120)	•••				
EIS					PILOT ASSY (15)	PILOT ASSY (25)	PILOT ASSY (30)	•••				
FIS					PILOT ASSY (15)	PILOT ASSY (25)	PILOT ASSY (30)	•••				
MEMORY SEG (KT11-D)					PILOT ASSY (10)	PILOT ASSY (15)	PILOT ASSY (20)	•••				
PDP11/25 (BUILD)					PILOT ASSY (40)	PILOT ASSY (60)	PILOT ASSY (100)	•••				
PDP11/25 SYSTEMS (SHIP)					SHIP (10)	SHIP (40)	SHIP (60)	SHIP (100)	•••			



PDP-11/25 DISTRIBUTION LIST AND ORGANIZATION CHART

PRODUCT LINE:

5-2	Andy Knowles	Group Manager
5-2	Julius Marcus	Product Line Manager
5-2	Roger Cady	Engineering Manager
5-2	Bob Anundson	Marketing

ENGINEERING:

5-2	Jim O'Loughlin	PDP-11/25 Machine, KD11-A Processor
5-2	John Buzynski	KD11-A Processor, FIS and EIS Options
5-2	Chuck Kaman	ROM Program, Algorithms
1-2	Tom Freiss	Breadboard, KY11-D Console
5-2	Paul Janson	{KT11-D Memory Segmentation
1-2	Ed Anton	{KJ11-A Stack Limit
5-2	Bill Minor	{BALL-DA and BALL-DB,
5-2	Chuck Blasi	{Box with Power Supply

SUPPORT:

1-5	Gene Stringer	New Products (Engineer)
1-4	John Harrington	New Products (Black Hat)
1-4	Dennis O'Connor	Test Line
W/M	Bud Dill	Production (in lieu of specific appointee)
21-4	Wayne Grundy	Field Service
5-3	John Wannamaker	Model Shop (Layout)
4-5	Joe Madden	Drafting
A&M	Bill McLain	Manuals
5-2	Ed Crowley	Training
1-4	Don Tahmoush	Quality Control
3-5	Earl Haight	Diagnostic Programming
12-2	Ron Brender	System Programming



pdp11

digital

PDP-11/35 BUSINESS PLAN

Jb

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DO NOT COPY

Jack MacKeen
PDP-11/OEM Marketing
March, 1973

PDP-11/35 BUSINESS PLAN - SYNOPSIS

1. Product

PDP-11/40 CPU in 10½ Inch Box

2. Basic price includes:

1. CPU
2. Box with slides
3. Console
4. Power Supply
5. 8K memory (MF/ME/MM11S)

3. Cost (on basis of 1,000 units)

\$2,482

4. Price Recommended

\$9,995

5. Discount/Terms

Type I OEM - Return to Factory Warranty

6. Gross Margin at Average OEM Discount (29%)

\$4,614-65%

7. Related/Affected Product

PDP-11/05, PDP-11/15, PDP-11/40

8. Announcement/Delivery Plans

Announced to selected customers starting in April. General announcements in June. Initial deliveries end of May/June to selected customers (current 11/15 or 11/40 customers) based on availability of memory.

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Cost/Margin Work Sheets	
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Product Photographs/Sketches	

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I. PRODUCT DESCRIPTION

The PDP-11/35 packages the 11/40 processor in a 10½ inch high chassis. It consists of a rack-mountable box 10½ inches high, 17 inches wide, and 23¼ inches deep. This box has the capability of mounting five PDP-11 System units. Two of these are used for the central processor and its options. The three remaining spaces are for memory and/or peripherals. Power is provided by the H750 supply. System units mount front-to-back on the left side of the BA11-DA Box (as viewed from the front). Power Supply mounts on the right side. Air is drawn in from the sides at the front and exhausted at the rear (see sketch App. B).

The PDP-11/35 will be available only as a rack-mountable box with three possible memory variations. (No plans have been made for a table-top version with super cover as practically no table-top machines are sold to OEM's.) All memories will be 8K minimum bundled into the basic system which will consist of the following:

Central Processor - KD11A (same as PDP-11/40).

Mounting Box - BA11-DA/DB (includes slides).

Power Supply - H750.

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I. PRODUCT DESCRIPTION (Cont.)

Console

Memory - Minimum 8K in one of three versions,
(see table next page)

All other components or options are to be purchased as line items. No bundled systems will be offered.

Although the PDP-11/35 is intended to eventually replace the PDP-11/15, the recommended packaging/pricing policy is not to unbundle to the level which the PDP-11/15 did. Analysis of the PDP-11/15 orders shows a 100 percent order rate for Programmer's Consoles, and nearly 100 percent for Power Fail/Restart and Multi-Level Priority Interrupt Options. With the sophisticated systems possible with the PDP-11/35, these features should be standard. Therefore, the PDP-11/35 basic price will include the individual items listed in the product description above plus the standard features of Power Fail/Restart, Multi-Level Priority Interrupt, Prewired/Pretested CPU Option Slots, and capability for serial or parallel console terminals.

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I. PRODUCT DESCRIPTION (Cont.)

The table below presents the PDP-11/35 nomenclature including variations in memory and available spaces for mounting peripherals.

TABLE 1

<u>Type #</u>	<u>Memory Variation</u>	<u>Voltage</u>	<u>System Unit Space Available</u>
PDP-11/35 JA	MF11	115V	1
PDP-11/35 JB	MF11	230V	
PDP-11/35 JC	MM11S	115V	2
PDP-11/35 JD	MM11S	230V	
PDP-11/35 JE	ME11LA	115V	3
PDP-11/35 JF	ME11LB	230V	

The PDP-11/35 will be sold initially as an OEM machine only under a Type 1 discount. Terms and conditions will be those of the OEM discount agreement i.e., documentation with the first system only, circuit schematics with each system, 30 day Return-to-Factory Warranty, and reproducible diagnostics with the first system only. All other services such as system software, training, additional documentation, installation, and extended warranty will be available at established prices.

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II. COST DATA

Presented below is the product cost for the basic packaging as described in Section I. These costs were obtained from the Cost Accounting Group (Larry Rasile). These costs include system integration, but not manuals or inventory obsolescence charges.

J. J. [unclear] 4/3/73 RR

KD11-A Processor	\$ 655
KY11 Console	147
MM11S Memory	700
BAll-DA Box and Cables	136
H750 Power Supply	244
System Integration	
Misc. Parts	100
F.A. & T.	<u>500</u>
	\$2,482

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III. MARGIN ANALYSIS/RECOMMENDED PRICING

The detail chart below presents the margins to be realized at the various discount levels on the Type I schedule based on the cost listed in Section II.

The recommended price for the product was arrived at by first examining the distribution of discount levels under our existing OEM discount agreements. The average discount level was then used to arrive at a net price for the processors as this is the only price the OEM cares about. This net price was then factored back up to arrive at a list price. Recommended list price is \$9,995 U.S. for the basic system as defined in Section I. (MM11S and MF11L only - ME11L version is \$10,495 to reflect \$500 price difference between ME11L and MF11L).

<u>List Price</u>	<u>Discount Level</u>	<u>Net Price</u>	<u>Gross Margin</u>	
			<u>\$</u>	<u>%</u>
\$9,995	1 - 15%	\$8,496	\$6,014	70.8%
	2 - 20%	\$7,996	\$5,514	69.0%
	3 - 29%	\$7,096	\$4,614	65.0%
	4 - 34%	\$6,597	\$4,115	62.4%
	5 - 36%	\$6,397	\$3,915	61.2%
	6 - 38%	\$6,197	\$3,715	60.0%

Recommended Pricing Summary (Refer to Table I, Section I.)

<u>Type #</u>	<u>Price</u>
PDP-11/35 JA/JB	\$9,995
PDP-11/35 JC/JD	\$9,995
PDP-11/35 JE/JF	\$10,495

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IV. PRODUCT UNIT/\$ FORECAST

The PDP-11/35 is estimated to have a product life in the OEM Marketplace of three to four years. Based on the projected announcement date and start of deliveries, this active product life will include Fiscal Years 1973 through 1977. The table below projects the expected unit shipments over these fiscal years from the OEM Group alone.

<u>Fiscal Year</u>	<u>Q1</u>	<u>Q2</u>	<u>Q3</u>	<u>Q4</u>	<u>Total</u>
FY, '73	-		5	30	35
FY, '74	140	170	195	210	715
FY, '75	240	250	260	270	1,020
FY, '76	250	290	280	280	1,100
FY, '77	250	220	150	50	670
					<u>3,540</u>

The table below represents the estimated gross revenues to the corporation (for both basic processor/memories (column 3) and as systems.

<u>Fiscal Year</u>	<u>CPU's #</u>	<u>Basic CPU/Memory\$*</u>	<u>Systems \$*</u>
FY, '73	35	.35	.91
FY, '74	715	7.15	21.45
FY, '75	1,020	10.2	32.64
FY, '76	1,100	11.0	37.40
FY, '77	670	6.7	23.45

*\$ in millions

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V. RELATED/AFFECTED PRODUCTS

Primary intent of the PDP-11/35 will be to replace the PDP-11/15 thus completing a "second generation" PDP-11 Family for both limited (OEM) and full service (end-user) models.

Availability of PDP-11/35 will impact all of the OEM PDP-11/40's to some degree. This will be due to three factors:

1. Type 1 Discounts
2. Unbundling.
3. Convenience of the smaller package - 10½" box versus full 72" cabinet.

However, since more and more large PDP-11 systems will be sold and the PDP-11/35 announcement will occur during the manufacturing build up of PDP-11/40's to a full product rate, the actual effect of the PDP-11/35 will be to cause a leveling in the OEM PDP-11/40 order rate rather than an actual decrease in PDP-11/40 orders. It is expected that for large systems the PDP-11/40 will still be selected versus the PDP-11/35 due to the flexibility in power and packaging inherent in a single large chassis.

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V. RELATED/AFFECTED PRODUCTS (Cont.)

There is potential impact as well on the PDP-11/05, primarily due to packaging (e.g., the availability of PDP-11/35 power in a 10½" box will be attractive to those PDP-11/05 users who want more performance, but have balked at the fully bundled PDP-11/40 price.) However, the packaging consideration will be minimized because the 10½" chassis PDP-11/05 will actually offer greater packaging advantages for peripherals than the PDP-11/35.

The PDP-11/35 price has been recommended so as to maintain a substantial margin over the projected 10½" chassis PDP-11/05. This should therefore leave the highly flexible PDP-11/05 as the low price entry from the PDP-11 Family. Since the PDP-11/05 business has accelerated rapidly with no decrease in the PDP-11/15 business there is little actual impact expected on the PDP-11/05.

The charts in Appendix A show comparisons of the PDP-11/35 versus the PDP-11/40, PDP-11/15, and PDP-11/05 at gross and net dollars for approximately equivalent system configurations.

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VI. PRODUCT SCHEDULES

1. Manufacturing Forecast

Forecasts have been entered through Q4 of FY '74. The intent is to establish some inventory of basic products to have on the shelf at time of general announcement. Initial delivery availability will be specified at time of announcement in a manner which will allow relief of PDP-11/15 backlog if required, and to forestall losses of orders to competition because of delivery. The OEM Product Group has received allocations for Q4 of FY '73.

2. Customer Commitments

Commitments have been made to only two customers - Kodak and Time Data. Kodak is a major customer and the early delivery (March) of PDP-11/35's will provide a valuable test bed prior to volume deliveries. Two systems have already been delivered to Kodak and two more will be shipped by the end of the month. We are currently on schedule with PDP-11/35 deliveries to Kodak.

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VI. PRODUCT SCHEDULES (Cont.)

2. Customer Commitments (Cont.)

All delivery commitments for this product are being made only by the OEM Group at this time.

3. Due to the current backlog situation and long lead times quoted for both PDP-11/40 and PDP-11/15 (300 PDP-11/40 - ten months ARO and 200 PDP-11/15 six months ARO), it is proposed that the PDP-11/35 be preannounced to selected PDP-11/15 - PDP-11/40 customers. By converting these customers to PDP-11/35's, the backlog/lead time situation which is currently causing DEC to lose business can be improved to levels which present and potential customers can accept.

This conversion will begin in Q4 of FY '73 and continue through Q1 of FY '74. Since the average OEM requires 60-90 days to turn a system around after computer delivery, the PDP-11/35 will not show up in public until after that time. This will allow us to delay announcement for this period of time while receiving revenues and working on the backlog problem.

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VI. PRODUCT SCHEDULES (Cont.)

3. (Cont.)

This conversion can be implemented immediately upon approval of this plan, subject only to manufacturing's ability to build product in Q4, FY '73. Assuming implementation, the PDP-11/35 should be announced in June at the National Computer Show in New York.

4. Phase Over Program

Major users of the PDP-11/35 will come from the present major users of the PDP-11/15's. Currently, 80% of the PDP-11/15 business comes from ten customers. In order to facilitate the rapid transition of PDP-11/15 users to PDP-11/35's and therefore minimize duplicating our manufacturing efforts, presentations on the PDP-11/35 will be made to the following key PDP-11/15 OEM's prior to announcement. These OEM's are:

Time Data
Eastman Kodak
Applied Color
Frederick Electronics
Computer Machinery Corporation
Hendrix Electronics
Foxboro Company
Periphonics
Tektronix

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VI. PRODUCT SCHEDULES (Cont.)

5. Advertisement/Support Materials

An ad to support product announcement has been drafted. Cost versus need is being reviewed and the ad may be dropped.

A brochure is underway with a target date for availability in the field offices by May 1, or at announcement date if that is later. Particular emphasis is being placed on making this brochure a working document from which the customer can understand packaging variations and thereby reduce ordering confusion.

The processor is included in the new PDP-11 Family Processor Handbook scheduled for completion at the end of March.

Release of all promotional material will be coordinated with the actual product announcement.

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VII. COMPETITION

The PDP-11/35 will compete primarily with the following equipment:

Data General - Nova 800

Hewlett-Packard - 2100

Interdata - Model 70/74

General Automation - SPC 16 Series

NOTE:

The competitive chart in Appendix B shows a feature/price comparison for a number of machines in addition to the above. Note that a price of \$9,995 for the PDP-11/35 compares favorably with:

General Automation SPC 16/40	\$ 9,150
Hewlett-Packard 2100A	\$11,000
Interdata 74	\$ 9,900

The new DG 840 is also an interesting price comparison. Base price includes 16K core and memory management.

DG 840	DEC PDP-11/35
\$16,530	CPU/8K 9,995
	MM11L 4,400
	KT11-D 2,480
	<u>6,875</u>

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A P P E N D I X A

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APPENDIX A

PDP-11/35 Business Plan
(Continued)

-A1-

March, 1973

MANUFACTURING COST ESTIMATES

L. Rasile *L. Rasile*
4/3/73

	<u>Present Estimate</u> <u>PDP-11/35</u>	<u>PDP-11/40</u> <u>Estimate</u>
<u>KD11A Processor</u>		
M7231	\$110 std.	\$110 std.
M7232	\$103 std.	\$103 std.
M7233	\$ 96 std.	\$ 96 std.
M7234	\$ 85 std.	\$ 85 std.
M7235	\$ 78 std.	\$ 78 std.
M981	\$ 18 std.	\$ 18 std.
Logic (70-9009)	\$165 std.	\$165 std.
Assy & C/O (from KA11 processor)	(Included in F.A.&T.)	(Included in F.A.&T.)
 KY11-D Console	 \$147	 \$145
MM11S	\$700	\$700
BA11-DA Box, Bezel, and Cable	\$136	\$249
H750 Power Supply	\$244	\$390
DL11-A	\$ 84	\$ 84
LT33-DC	\$931	\$931
Basic System Integration Material (Misc. & parts not accounted for.)	\$100	\$100
F.A.&T	<u>\$500</u>	<u>\$500</u>
	\$3,497	\$3,754
Inventory Obsolescence	<u>\$353</u>	<u>\$376</u>
	\$3,850	\$4,130
 11/35 is Less DL11A/LT33DC/ Inv. Obsolescence	 <u>-\$1,368</u>	
11/35 Cost	\$2,482	

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APPENDIX A

PDP-11/35 Business Plan
(Continued)

March 1973

-A2-

11/15 MARGIN ANALYSIS

	<u>List</u>	<u>Total Net</u>		<u>Cost</u>	=	<u>G.M.</u>	<u>% G.M.</u>
2-9	\$9,200	8,020	-	2,778	=	5,242	65%
10-19	\$9,200	7,560	-	2,778	=	4,782	63%
20-49	\$9,200	6,972	-	2,778	=	4,194	60%
50-99	\$9,200	6,632	-	2,778	=	3,854	58%
100-199	\$9,200	6,448	-	2,778	=	3,670	57%
200	\$9,200	6,264	-	2,778	=	3,486	56%

PDP-11/15 List Price \$4,000 + \$5,200 (ME11L) = \$9,200. CPU is Type II Discountable and Memory is Type I Discountable.

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APPENDIX A

PDP-11/35 Business Plan
(Cont.)

-A3-

March, 1973

PDP-11/35 VERSUS PDP-11/15 MARGIN ANALYSIS

<u>PDP-11/35 List</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>
\$9,995	2-9	8,496	+476	6,014	+772
	10-19	7,996	+436	5,514	+732
	20-49	7,096	+124	4,614	+420
	50-99	6,597	-35	4,115	+261
	100-199	6,397	-51	3,915	+245
	200	6,197	-67	3,715	+229

EXPLANATION OF COLUMNS

1. Discount Quantity Level
2. PDP-11/35 Net
3. Unit increase in net due to PDP-11/35 (PDP-11/35 Net - PDP-11/15 Net)
4. PDP-11/35 Gross Margin
5. Unit increase in Gross Margin due to PDP-11/35 (PDP-11/35 G.M. - PDP-11/15 G.M.)

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APPENDIX A

PDP-11/35 Business Plan
(Continued)

March 1973

-A4-

PDP-11/35 - PDP-11/05 - PDP-11/40 PRICE COMPARISON

ON AN EQUIVALENT SYSTEM BASIS

	Present PDP-11/40	PDP-11/35 List	PDP-11/35 Net	10 1/2" Chassis PDP-11/05 List	PDP-11/05 Net
Teletype	std.	1,620	1,620	1,620	1,620
TTY Control	std.	400	328	std.	std.
Cabinet	std.	650	533	650	533
Inst. & 30-Day Warranty	260	250	250	250	250
CPU W/8K	12,995	9,995	7,096	*7,295	5,180
* Exp. Box	<u>N/A</u>	<u>1,500</u>	<u>1,065</u>	<u>1,500</u>	<u>1,065</u>
List	13,255	14,415		11,315	
Total Net	(PDP-11/40) \$10,915		10,892		8,648

Discounts Assumed

Type I - 29%

Type II - 18%

* Price is estimated

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COMPARISON TABLE: 8K WORD SYSTEMS

JANUARY 1973

	DEC (5¼) PDP-11/05	CA Alpha 16	DG (10¼) Nova 1220	DG (5¼) Nova 1210	GA (15¼) SPC-16-40	GRI 909-30	GRI 99-10	HP 2100A	Interdata 70	Interdata 74	Modcomp I	Microdata 1600/21	Texas TI 960A	Texas TI 980A	Varian 620/L	
CPU (16b)	6,495	4,750	6,300	5,400	5,550	5,650		3,750	6,800	3,600	3,600	3,545	4,350	4,975	7,700	
CONSOLE	/	/	/	/	/	760	2,040	/	/	300	/	750	/	/	/	
TTY CTRL.	/	150	4010	350	4010	350	N/A	348	/	350	/	/	450	450	550	
POWER F/R	/	350	8106	400	8106	400	/	310	300	200	250	300	/	/	/	
CLOCK	/	350	4008	400	4008	400	/	260	350	OSC 1,250	OSC 400	OSC 400	/	/	/	
4 LVL. INT	/	500	/	/	/	500	/	1,000	/	/	/	550	200	200	/	
DMA	/	400	/	/	/	500	/	300	1,000	1,000	1,000	1,000	850	200	200	
8K	/	/	/	/	+4K 2,600	+4K 2,950	2,400	5,000	+4K 2,700	4,000	4,200	3,600	/	/	/	
XPN SLOTS	4	1	8	1	8		2	14	1½	3	?	6	NGP	NGP		
XPN AMPS	5	2	20	4	?		4		?	9	4	?	NGP	NGP		
	6,495	6,500	7,450	6,550	9,150	9,930	7,710	MPR	FP	M/D	9,100	10,045	MPR	EAE		
								EAE	11,100	9,900			PTY	MPR	EAE	
								PTY					5,350	PTY	AE	
									11,000					BOOTS	8,250	
XPN SLOTS	24	400	5	900	10	19	16	350	16	350		20	NGP	NGP	25	
BOX AMPS	22	600	12	600	24	?	12	600	12	600	24	600	27.5	750	20	75
	1,000	1,500			1,850	1,200	950	950			1,100	750	1,200	1,400	1,000	
OEM QTY.	1-0%	1-5%		1-10%	1-10%		1-10%	1-15%		1-15%						
DISCOUNT	20-29%	20-18%		20-31%	20-30%		20-25%	20-29%		20-30%						
	119-36%	49-40%		200-40%	199-40%		99-33%	34-32%		61-40%						
										100-45%						
SOURCE	DEC	CA	DG	DG	GA	GRI	GRI	H.P.	AUERBACH	ID	AUERBACH	MD	TI	TI	AUERBACH	
DATE	NOV 72	NOV 72	APR 72	APR 72	NOV 72	APR 71	NOV 72	NOV 72	MAY 72	NOV 72	SEPT 72	SEPT 72	JULY 72	JULY 72	JULY 72	

N/A - Not Available OSC - Oscillator EAE - Extended Arithmetic Element M/D - Multiply/Divide Boots - Bootstrap
 MPR - Memory Protect PTY - Parity FP - Floating Point NGP - Not General Purpose

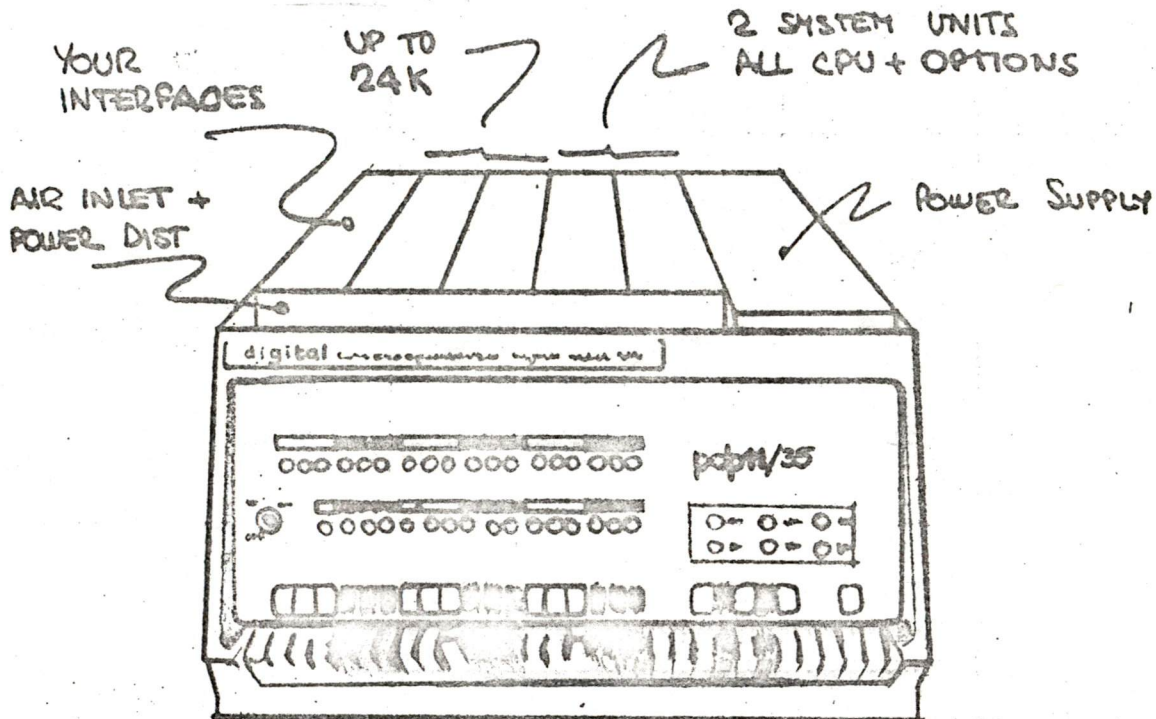
-A5-
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A P P E N D I X B

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The PDP-11/35 offers in its unique package five system units; of these only two are required to house the CP and all the mentioned options plus Line Clock (KW11L) and terminal interface.



The next two system units can be filled with up to 24K and there is still one system unit for whatever use you can imagine. The room available will prove sufficient for most applications, but if more space is needed, any expansion box can be used.

Concerning power, a typical system with 8K will have 11 Amps at +5V, 2 Amps at -15V and 1 Amp at +15V available for expansion.

digital

**DIGITAL EQUIPMENT CORPORATION
MAYNARD, MASSACHUSETTS 01754**

SEP 5 1971

Andy Knowles

To: Ken Olsen

I reviewed the PDR 11/35
with marketing and engineering
on Friday.

There were two major
problems with the box which
have been corrected.

① The power distribution
method was too limited for
the amount of current
moved around in the box.
This has been completely
redesigned and is now
adequate.

② Cooling was a problem.
The fan assembly has been

DIGITAL EQUIPMENT CORPORATION

Andy Knowles

redesigned and the component case temperature halved (brought well within specification).

Our maximum liability is 60 machines in a very controlled situation. We will now announce the machine in 8K versions only (big box 11/35, 11/05) We are awaiting a schedule for the new box and supply which will take the 16K memory

Andy 9-4-73

DIGITAL EQUIPMENT CORPORATION



INTEROFFICE MEMORANDUM

TO: Operations Committee
Cc: Bill Long
Joe Meany
Clayton Rix

DATE: September 18, 1973
FROM: Jack MacKeen *Jack*
DEPT: PDP-11/OEM Marketing
EXT: 3115 LOC: 5-2

SUBJ: BUSINESS PLAN - EXPANDED (21" CHASSIS) PDP-11/35

Approval is requested for the attached "Expanded PDP-11/35" Business Plan.

In conjunction with the plan, it is proposed that the previously approved (4/9/73) price of \$9995 for the 8K, 10 1/2" 11/35 be reduced to \$9495. Approval is requested for this change.

JCM/emp

Enclosure

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pdp11

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EXPANDED PDP-11/35 BUSINESS PLAN

(21" CHASSIS)

Jack MacKeen
PDP-11/OEM Marketing
September, 1973

SYNOPSIS

1. PRODUCT

11/40 converted to 16K memories less TTY and services.

2. BASIC PRICE INCLUDES

CPU console, 21" chassis, cab, power control, power supplies, and appropriate memory.

3. COST

	<u>16K</u>	<u>32K</u>	<u>48K</u>	<u>64K</u>
	\$ 4021	5022	6181	7182

4. RECOMMENDED PRICE

	\$16995	20495	24495	27995
--	---------	-------	-------	-------

5. TERMS

Type 1 OEM Discount/Return to Factory Warranty.

6. GROSS MARGIN AT 29% AVERAGE OEM DISCOUNT

	66.7	65.4	64.4	63.9
--	------	------	------	------

7. RELATED/AFFECTED PRODUCT

OEM PDP-11/40

8. ANNOUNCEMENT/DELIVERY

16K announced October 1 for Q3 delivery.
32K, 48K, 64K announced January 1 for Q4 delivery.

TABLE OF CONTENTS

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II. Cost Data	3
III. Margin Analysis/Recommended Price	4
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V. Related/Affected Products	6
VI. Product Schedules	7
VII. Competition	8
APPENDIX A	
COST REFERENCE JUNE (PINK BOOK)	

I. PRODUCT DESCRIPTION

The primary intent of the expanded 11/35 is to provide an aggressively priced processor/memory package to gain additional revenues from present and additional OEM customers requiring the processing capability of the 11/40 class machine. In the OEM marketplace, these customers are presently purchasing 11/40 systems with a gross value of \$45,000 - 50,000 and having slightly over 32K of core.

Additionally, the expanded 11/35 completes the establishment of a true OEM product family by offering the power and packaging flexibility of the 11/40 chassis on unbundled OEM terms. The OEM product family now would consist of 5 1/4" and 10 1/2" 11/05; 10 1/2" and 21" 11/35. The expanded 11/35 also provides a vehicle for the sale of the new 16K memories.

The expanded 11/35 is mechanically the 11/40 as presently sold with the following changes.

1. TTY and control (standard on 11/40) are not included and must be purchased as line items.
2. Existing 8K (MF11-L) backplane and power regulator are removed. 16K (MF11-U) backplane, power regulator and harness are added.
3. Memory Management Unit (KT11-D) is included.
4. Front panel rescreened 11/35.

I. PRODUCT DESCRIPTION (Con't)

As with the 10 1/2" 11/35, the expander version will be sold as an OEM product with a type 1 discount. Terms and conditions are those of the OEM discount agreement, i.e., 30 day return to factory warranty, documentation at list prices, and circuit schematics and OEM diagnostics with each system. All other products/services such as system software, training, installation and extended warranty are available at established prices.

The expanded 11/35 will be available in four versions varying only in core memory size. Memory Management will be standard. I/O Console device and control (TTY or LA30) is not included and must be purchased as a separate line item. All other standard hardware features of the 11/40 are included.

<u>TYPE #</u>	<u>MEMORY</u>	<u>VOLTAGE</u>	<u>SYSTEM UNIT SPACES AVAILABLE</u>
11/35 /	16K	115/230	5
11/35 /	32K	115/230	5
11/35 /	48K	115/230	3
11/35 /	64K	115/230	3

II. COST DATA

Presented below is the cost data used as the basis for this plan. Except where noted, costs shown are "Prior 3 Month's Weighted Average Actual Cost," from the June 1973 Option and System Actual Cost Report (Pink Book).

1. 16K Model

11/40-CA		\$4390
Less LT33DC	\$ 941	
DL11-A	84	
MF11-L	711	
	<u>\$1736</u>	
		1736
		<u>2654</u>
Plus		
16K MF11-U*		1159
KT11-D		<u>208</u>

BASIC COST \$4021

2. 32K Model

Plus 16K MM11-U*		1001
	COST	<u>\$5022</u>

3. 48K Model

Plus 16K MF11-U*		1159
	COST	<u>\$6181</u>

4. 64K Model

Plus 16K MM11-U*		1001
	COST	<u>\$7182</u>

*Cost from MF11-U/MM11-U business plan.

NOTE:

1. Cost of Option Level only.
2. Cost does not include FY74 accounting changes.

J. J. J. J.
9/19/73

III. MARGIN ANALYSIS/RECOMMENDED PRICE

MEMORY SIZE WITH MGMT.		DEC PRICE	COST	% G.M. AVE. DISC. 29%	% G.M. MAX. DISC. 38%
1.	16K	16995	4021	66.7	61.8
2.		+5%	4871	59.6	53.8
3.		+5%	5721	52.6	45.7
1.	32K	20495	5022	65.4	60.4
2.		+5%	6047	58.4	52.4
3.		+5%	7072	51.4	44.3
1.	48K	24495	6181	64.4	59.3
2.		+5%	7406	57.4	51.2
3.		+5%	8631	50.4	53.2
1.	64K	27995	7182	63.9	58.6
2.		+5%	8582	56.8	50.6
3.		+5%	9982	49.8	42.5

NOTE: Lines 2 and 3 of each category above provide margins realized if miscellaneous costs are added to the manufacturing costs at 5% of list price. This was first done in the June 1973 Cost Report (Pink Book).

Line 2 represents allocated miscellaneous manufacturing costs.

Line 3 represents system integration.

IV. PRODUCT UNIT FORECAST

	<u>Q1</u>	<u>Q2</u>	<u>Q3</u>	<u>Q4</u>	<u>TOTAL</u>
FY74	--	--	*130	*150	280
FY75	150	160	170	175	655
FY76	175	180	175	150	680
FY77	100	50	30	--	180
					<hr/> 1795

*Based in part on conversion of existing 11/40 orders and customers.

With the exception of the 16K memories, this product is now over one (1) year old. Approximately two (2) years additional life can be expected and then a sharp drop will occur due to announcement of new mid-range 11 replacement at significantly less \$.

The table below presents estimated gross revenues for the above CPUs shipped as systems. Average value per system will rise as lower core prices trigger increased core buying and additional peripherals are added to the system. The rise will be very slight due to price erosion.

<u>FISCAL YEAR</u>	<u># SYSTEMS</u>	<u>SYSTEM REVENUES*</u>	<u>AVERAGE</u>
FY74	280	\$12,040	\$43K
FY75	655	31,440	48K
FY76	680	35,360	52K
FY77	180	9,540	53K

*In 000's

V. RELATED/AFFECTED PRODUCTS

Presently OEMs can purchase the 11/40 only as a bundled full-service system. With the 11/40 now an accepted product in the marketplace, many OEMs wish to make repeat buys without paying for unnecessary services. The expanded 11/35, offered as an unbundled product on OEM terms fulfills this need.

Since 70% of the present OEM 11/40 business comes from less than 20 customers, a minimum 70% of OEM 11/40 business will be converted to the expanded 11/35. Unbundling, combined with the aggressive pricing contained herein, is expected to bring the impact to over 90%. New OEMs may still buy bundled systems (11/40) for development under the new OEM QDA, but this should be less than 10% of total OEM requirements for the processor and will approach zero in a short time. This is supported by the fact that with software now treated as a product at standard prices, even new OEMs will probably buy the expanded 11/35 in order to maintain product continuity.

In summary, the OEM 11/40 business will convert to the expanded 11/35.

VI. PRODUCT SCHEDULES

As the 16K memories are already being implemented on the 11/40 (new regulator - H754, new power harness), the expander 11/35 can be produced as soon as these ECOs are completed and the 16K memories available.

The OEM Group will ship the first production 16K sense systems in Q2, FY74 if all ECOs and tests are completed on schedule. Large scale deliveries can then be made in Q3.

VII. COMPETITION

The expanded version of the 11/35 will compete in the OEM area primarily with the Data General Nova 840. Varian has announced a "memory mapping" feature with the V-73 to handle 256K words of core, but price and policies are not available.

16K NOVA 840	\$16,530	EXPANDED 11/35	\$16,995
Less Memory	-2,400		
Price Cut	14,130		
CAB	1,000		
POWER FAIL	400		
	<u>\$15,530</u>		
32K			
ADD	6,400		
	<u>\$21,930</u>		\$20,495

APPENDIX A

COST REFERENCE JUNE (PINK BOOK)

PRODUCTION BUSINESS MANAGER

RESPONSIBLE ENGINEER

B. Hesseltine

WESTMINSTER

B. Armstrong

CURRENT:	Average Actual Cost			FY74 Standard	Prior 3 Month's Weighted Average Actual Cost
	June				
Raw Material			908		907
Memory Stack			234		225
Labor & O/H Added:	Labor	O/H	Total		
Board Fabrication	40	136	176		184
Metal Fabrication	22	64	86		88
Module Production	72	252	324		303
Sub-Assy. Prod.	48	118	166		162
Final Assy.&Test	245	565	810		868
Labor & O/H Total	427	1135	1562		1605
Direct Product Build Cost			2704		2737*
Allocated Misc.Mfg. Cost			500		
Cost Before System Integration			3204		
Allocated System Integration			500		
Total Manufacturing Cost			3704		

Comments: Dir. Prod. Build Cost

* Restated to include correct P/S costs in Bill of Material

Cum
Volume
(Units)

HISTORY: Date of 1st Shipment

Dir. Prod. Build Cost	1st.Qtr.	2nd.Qtr.	JAN.	FEB.	MAR.	APR.	MAY	JUNE
						2836*	2687*	2704
Quantity Produced						6	12	26
Acceptance Yield								91%
Dir.Prod. build Cost Committed by Mfg.								
Initial Cost Estimates								

FORECAST:

Dir. Prod. Build Cost
Qty. Per Month

Estimated Product Life:
Estimated Units During Product Life:

What If?

Maynard List Price: \$9,995

PRODUCTION BUSINESS MANAGER

RESPONSIBLE ENGINEER

B. Hesseltine

WESTMINSTER

B. Armstrong

CURRENT:	Average Actual Cost			FY'74 Standard	Prior 3 Month's Weighted Average Actual Cost
	June				
Raw Material			2000		2002
Memory Stack			234		220
Labor & O/H Added:	Labor	O/H	Total		
Board Fabrication	47	156	203		192
Metal Fabrication	51	157	208		215
Module Production	64	251	315		320
Sub-Assy. Prod.	60	165	225		249
Final Assy.&Test	237	538	775		872
Labor & O/H Total	459	1267	1726		2169
Direct Product Build Cost			3960		4390
Allocated Misc.Mfg. Cost			650		
Cost Before System Integration			4610		
Allocated System Integration			650		
Total Manufacturing Cost			5260		

Comments: Dir. Prod. Build Cost

Cum
Volume
(Units)

HISTORY: Date of 1st Shipment

Dir. Prod. Build Cost	1st.Qtr.	2nd.Qtr.	JAN.	FEB.	MAR.	APR.	MAY	JUNE
		4497	4297	4467	4463	4457	4318	3960
Quantity Produced		41	73	78	71	73	143	171
Acceptance Yield								
Dir.Prod. build Cost Committed by Mfg.								
Initial Cost Estimates								

FORECAST:

Dir. Prod. Build Cost
Qty. Per Month

Estimated Product Life:
Estimated Units During Product Life:

What If?

Maynard List Price: \$12,995

digital

**DIGITAL EQUIPMENT CORPORATION
MAYNARD, MASSACHUSETTS 01754**

digital

INTEROFFICE MEMORANDUM

DEC 28 1972

TO: Operations Committee

DATE: December 28, 1972

FROM: Andy Knowles

DEPT: Small Computer Products

EXT : 3043

SUBJ: PDP-11/35 & 16K MEMORY STRATEGY

PDP-11/35

Our strategy is not to announce this machine publicly until around WESCON (Aug 73).

We will introduce it to customers in January-March '73 and deliver it to whomever will switchover from PDP-11/15's at PDP-11/15 prices during Q4 since Pete will be building PDP-11/35's.

It is an OEM machine only (for now)

Reasoning:

- (1) Cost is lower than 11/15 because of CPU, memory . . . profits at 11/15 prices will be higher
- (2) It is the 11/40 CPU and memory . . . we get a competitive advantage technically i.e., 1.85x the speed, the 11/40 bells and whistles, etc.
- (3) We have customers somewhat waiting (Time Data, Kodak, etc.)
- (4) They are (machines) forecasted and allocated Q4 so we should start (privately) selling Q3.

New 16K Memory

Our strategy here is not to introduce this memory to customers during Q3, Q4 and maybe Q1, but to use it in shipments when available at existing 8K memory prices.

Reasoning

- (1) We need to move memory prices now. Let's maximize profits.
- (2) We haven't forecasted it although the design will be ready for LR late March. Estimated Cost is \$1,000 per copy.
- (3) It takes a new backplane (packing density is higher) and power supply module. These aren't ready for 11/40, 11/45's yet, so we must be careful.

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