International Business Machines Corporation

Monterey & Cottle Roads
San Jose, California 95114
408 / 227-7100

October 22, 1974

Mr. John Wolfgang
Project Director of COMMON
NASA
Code 725
Greenbelt, Md. 20771

Dear John:

I appreciated the opportunity of meeting with you and participating in several of the activities at the COMMON meeting in Hollywood, Florida. I also appreciated some of the confidences and comments which you made regarding our activities in the 1800 area. Please be assured that I will do my best to follow through on the outstanding work that Al Shagory has been involved with.

I also acknowledge receipt of the Appendix A results of the 1800 replacement questionnaire. However, I will not take action on this questionnaire until I am advised by you that I should proceed.

I will also follow with Messrs. Wilkins and Biehl regarding the questions which they are following on as a result of the sound off to insure that these are appropriately handled.

I look forward to hearing from you regarding the results of the meeting, as well as future activities in which we can be of assistance.

I look forward to working with you and your associates.

Sincerely yours,

W. D. Jones
Education Consultant

WDJ/ims

International Business Machines Corporation

Monterey & Cottle Roads
San Jose, California 95193
408/227-7100

April 15, 1975

Mr. John Wolfgang
Division Manager
Systems Division, COMMON
NASA - Code 725
Greenbelt, Maryland 20771

Dear John:

I appreciated very much your assistance and guidance in my activities at the recent COMMON meeting in Minneapolis. I know that your chairmanship of the division will enhance the services that the COMMON organization provides to its users, and that your direction in pursuing these objectives will be of assistance to IBM.

It was a pleasure meeting again with you and with Dale Preston, and I look forward to further association.

Please let me know if I can be of any assistance in the activities.

I will copy you on my acknowledgement to Jim Deck regarding the final report of the Future Machine Committee and will keep you informed of the progress within our organization.

Thanks again for your assistance.

Sincerely,

W. D. Jones

WDJ/ims

International Business Machines Corporation

Monterey & Cottle Roads
San Jose, California 95114
408 / 227-7100

October 10, 1975

Mr. James C. Deck, President
COMMON
Inland Steel Research Labs
3001 Columbus
East Chicago, Indiana 46312

Dear Mr. Deck:

We have reviewed the COMMON 1800 Future Machine Committee Report. It is a very comprehensive and perceptive report.

As discussed at COMMON's last Board Meeting in Florida, IBM has introduced products that partially address the 1800 application areas. Development work continues for these applications. Thank you again for the valuable input to our future product planning.

Very truly yours,

W.D. Jones

WDJ/pdp

974 IBM-01

April 8, 1975

TO: Dave Jones, Consultant, GSD

SUBJECT: Final Report of COMMON's 1800 Project Future Machine Committee

Attached is a report prepared by one of COMMON's projects. This report was developed from more than a year of activities on the part of this project and represents a thorough examination of the subject of a follow-on machine for the IBM 1800.

The 1800, as evolved, represented a real positive step toward these demands. The evolution was the result of a joint effort between IBM and concerned 1800 users who were members of COMMON. The formal efforts of the TSX review committee laid much of the groundwork for development of the MPX operating system. After a suitable time, the MPX operating system was reviewed in the same manner. The MPX review appeared to be somewhat in vain, for shortly after, System/7 appeared on the scene and it became apparent that IBM efforts were going to be in the host-sattelite computer concept. The point is a good number of users donated their time and effort to help ensure the future of a machine that was a good start toward meeting their needs. No definite official word was ever received from IBM concerning the future of a machine like the 1800. Since that time, competition from other vendors both on the economic and the performance fronts, has eroded the number of 1800 users belonging to COMMON. Many of these users were "leading edge" users (a term popular with IBM to denote users active in developing their system to the utmost).

This report represents the kind of information COMMON is willing to provide in order to help IBM to serve us better. COMMON is looking forward to your response.

Sincerely,

James C. Deck
President, COMMON

COMMON
1800 PROJECT
FUTURE MACHINE COMMITTEE
FINAL REPORT

INTRODUCTION

The membership of the 1800 Project in COMMON at the April 1973 meeting elected to have a committee examine the requirements of its membership in the area of a replacement for the IBM 1800 Computer system. In addition, at this time, it became evident that IBM had no viable plans to effectively (performance and cost wise) alleviate their problem of not having a process control computer replacement. Thus this committee was charged with providing a report from the 1800 Project in COMMON to the IBM Corporation, stating the Project's position on a follow-on process computer system.

At the October 1973 COMMON meeting a session "After 1800, What?" was held, during which a preliminary idea was formulated about an IBM 1800 replacement. Following this meeting a questionnaire was created and distributed to all IBM 1800 and System 7 installation representatives in COMMON. Over 50 installations responded to this questionnaire, and the 1800 Future Machine Committee reported the results of this survey to the 1800 Project at the April 1974 COMMON meeting.

The 1800 Project membership suggested at this meeting that a further refined questionnaire be prepared and distributed to the membership. Such a questionnaire was prepared and sent to the 1800 Project membership between the April 1974 and October 1974 COMMON meetings. The results from this survey, formal sessions at the April and October 1974 COMMON meetings, and many informal discussions over an 18 month period are the guiding factors for this report.

HISTORICAL BACKGROUND

Many digital computers, with proper modifications for real-time, on-line data hardware connections could be used in the process control environment. This discussion, however, will be limited to those IBM machines that have been primarily and historically used in this environment. These are the 1710 (1620), and later the 1800 system, along with satellite (attached to a 360/370 host) and stand-alone versions of the System 7.

The IBM 1710 and 1800 systems were supported in both software and hardware to an extent that an extremely complex process control application can be efficiently handled. A System 7 system, on the other hand, is constrained (even in its most powerful configuration) so that it by itself can no longer handle in a complex application in a complex application in a cost-effective manner. Instead it requires another larger machine for program and data analysis support. As of the date of this report, the only large system with viable software support available is a IBM 360 or 370 which results in an overall complex that is no longer cost-effective for most process control applications.

IMPLEMENTATION CYCLE

In all probability a machine of the level needed for process control applications would require at least a five year development cycle to produce a viable and reliable hardware/software system. This means that a replacement for the 1800 should have been "on the drawing boards" seven years ago, and a second generation of that machine should be in development now. In addition, since IBM knew

that they had no intention of providing relief for the 1800 user, an accelerator package should have been made available two years ago.

This committee is not condeming the basic concept of a host-satellite configuration, but rather the specific implementation that resulted. Any future process control machine should include satellite computing and control capability that would function as programmable (software and microcoded firmware) "smart" data collection and control stations. These satellites must be more cost-effective than the current System 7.

THE PROCESS CONTROL APPLICATION

A computer for use in the Process Control Environment should not be limited to the generic class of pure closed-loop, open-loop, or numeric control problems. In addition there are many applications for the machine in the fields of lab automation and data collection. Most of the user installations in all of these fields do not have a large corporate computer available, cannot afford a large machine or have a critical problem where a host machine in the control loop would be technically infeasible.

There is a definite need for a machine of sufficient power to handle both the process problem and the associated "batch" and other "job shop" applications. Furthermore, such a machine must have a reasonable capability for expansion, without being totally obsoleted in a short time frame. Such a machine does not now exist among the computers being actively produced by the IBM Corporation.

Also many users in the process industry cannot afford the luxury of reprogramming their entire software system every four to

five years at the whim of the computer manufacturers arbitrarily and capriciously adding and dropping computers to or from their product line. These new systems must have upward configuration compatibility and must have facilities to minimize system changeovers. The current "state of the art" of computer technology provides the capability for designing such a system today, without undue problems being created. Such a design, however, would require a unified program of continued support to the "Process Industry" on the part of the computer manufacturer. A positive decision to provide such support in the areas of hardware/software systems, field engineering, and trained system engineers for the life of the machine will be a prerequisite for a computer vendor to viable in the field. It appears to the users that IBM is now in danger of losing its position in the process control application area, if indeed it still has such a position. From COMMON's viewpoint IBM should make a positive statement as to their future role in the process control industry.

DESIGN POLICY DECISIONS

While the users themselves cannot make decisions for the computer vendor, the "Process Industry" does require affirmative responses in the following areas from the "Computer Manufacturing Industry".

* A strong commitment to support process control applications.
* A line of computer systems designed for process application as well as data processing applications.
* Ease of system upgrading and graduation from system configuration to system configuration.
* A unified line of computers that are configurable in a cost effective manner for the small user and expandable for the large user.

* Reliability for both the hardware and the multiuser software environments.

* Support for standard process instrumentation and the standard EIA ASCII device interfaces.

* Negation of planned obsolescence syndrome now popular in the computer industry.

* System software/firmware that provides reliable on-line, real-time capabilities with continued maintenance support for the lifetime of the machine.

MACHINE CONFIGURATION

The following discussion describes the type of computer system that is desirable for use in a process control application. This machine is described in terms of the "state of the art" today, as this is the only measurement guide available. Future technology advances, manufacturing techniques, and cost trade-offs may dictate a modification to the system design. The future process control system should be designed with several goals in mind.

* High reliability and maintainability in both hardware and software/firmware.

* Emulation provisions for preceding systems and application software.

* A unified system capable of being easily field expanded.

* A supported lifetime at the users installation of at least ten years.

* Integral design of bus structure, interrupt system, etc. for efficient on-line, real-time data handling.

* Support of devices whose interfaces meet the actual and defacto standards currently used by the computer industry in general and not just those used by IBM.

* Real-time interfaces that are easily connected to various signals and instruments.

* No crippling of the system in the original design.

* Full support of all process and data processing devices, including all feature attachments that are available as part of the system.

* Diagnostic and repair capability on-line including the software and control program support to do the necessary backup switching.

* Compatibility between various computer languages (firmware or software), natural input/output device operations and the mass data structures.

Since by in large the summary in Appendix A of this report is self-explanatory, each point in that summary will not be explained here. Instead, certain critical points will be emphasized. Basically, this future machine should be designed for efficient application in both the process environment and its associated data processing environment. The desirable configuration for this computer would be an IBM 370 type architecture, with optional floating point and decimal arithmetic, better data channel structure with multiport overlapped storage banks for memory, user access to the microcode, and an efficient interrupt structure. This does not mean that an IBM 370 is acceptable, but rather that a subset of the 370 would be a good starting point for the design. (For instance the modularity, bus structure and interrupt structure should be modified.)

The data processing input/output devices available with the machine should include all of the standard devices of this type, line printers, plotters, card readers and punches, disks, magnetic tape, typewriters, paper tape, etc.. All of these devices should be fully supported in hardware and in software. Also it is mandatory that ASCII coded devices controlled via both binary synchronous and asynchronous communication adapters be supported both in software and in hardware. One noteworthy device should be emphasized here: cathode ray tube terminals for both control and operator stations as well as interactive graphic support should be available as standard supported devices.

A standard feature of the machine should be a microcoded basic control structure, with full support for user instruction and control extensions in the microcode. As an extension of this philosophy, optional emulators should be available for running directly IBM 1800, System 7 and other standard machine codes that are currently being used in the process control and data acquisition fields.

The user application should be of prime importance in the operation of the machine, to guarantee this end the machine should:

* Have a monitor and problem state, along with core storage protection, to guarantee operation of the executive system.
* Have built-in support in the software systems to guarantee multiuser data file and program area protection.
* Provide backup and maintenance capability on-line as the process is under control of the system.

Process input/output devices shall be available and fully supported in software and hardware. Typical devices of this type should include digital input and output, pulse counting and transmission, analog-to-digital and digital-to-analog conversion, thermocouple interfaces, etc. All of these devices should be installed by simply plugging in a control card and input/output cards in a standard cage, and adding a software support routine to the system without a major re-system generation of the entire executive.

The basic software system for the machine should permit efficient "batch" usage of the machine, with fully implemented compilers, optional job accounting, efficient tailoring of the executive for the particular machine configuration, and standard application packages.

CONCLUSIONS AND RECOMMENDATIONS

First and foremost, the IBM Corporation must make up its mind if it is going to remain in the process control business and notify its users of this decision. Secondly, assuming that IBM has decided to remain in the process control business, it should "bite the bullet" and admit that they do not now produce as an active machine in their sales line a cost-effective process control or lab automation machine. The "users" are tired of being coerced by IBM to take either one of the present System 370 or the System 7 in any form as an IBM's answer to the users problems in process control applications. By now this should be obvious, if for no other reason, by the lack of sales to this type of user. Thirdly, design a machine that from ground base zero is configured to support real-time data acquisition and control problems.

APPENDIX A.

RESULTS OF THE 1800 REPLACEMENT QUESTIONNAIRE

THIS APPENDIX SUMMARIZES THE RESULTS OF THE 1800 REPLACEMENT QUESTIONNAIRE. SOME 140 QUESTIONNAIRES WERE SENT OUT IN EARLY JULY AND 39 WERE COMPLETED AND RETURNED.

ON THE BASIS OF THE QUESTIONNAIRE CIRCULATED AT THE DENVER MEETING IN APRIL, CERTAIN ASSUMPTIONS AS TO DESIRED MACHINE FEATURES WERE MADE. THESE ARE SUMMARIZED IN THE "ASSUMED" SECTION OF EACH GENERAL AREA OF HARDWARE, FIRMWARE OR SOFTWARE FEATURES. THE RESULTS OF THE ACTUAL QUESTIONNAIRES ARE PRESENTED AS A TABULATION OF THE NUMBER OF TIMES THE SELECTED ANSWER WAS CHOSEN BY THE RESPONDENTS. FOR CERTAIN QUESTIONS, A NEW CATEGORY WAS CREATED--NO ANSWER. THIS WAS COUNTED ONLY IF NONE OF THE CHOICES FOR THE PARTICULAR QUESTION WERE SELECTED.

FOR THE QUESTIONS IN WHICH A "MINIMUM" OR "MAXIMUM" WERE TO BE GIVEN, THE RESULTS ARE TABULATED FOR EACH "VALUE" SELECTED /GIVEN BY THE RESPONDENTS. FOR EXAMPLE, IN QUESTION 15, TEN (10) PERSONS SAID THE MINIMUM MEMORY SIZE SHOULD BE 32 KBYTES. QUESTIONS 15, 27, 30, 37, 38, 39, 40, 41, 47 AND 48 WERE HANDLED IN THIS FASHION. THE RESULTS OF THE TABULATION ARE ALSO PRESENTED AS A HORIZONTAL BAR GRAPH FOR EASE OF VISUAL COMPARISON.

1. YOUR BASIC INSTALLATION IS:
   - A. MANUFACTURING OR CHEMICAL PROCESS CONTROL
     8 XXXXXXXX
   - B. RESEARCH AND DEVELOPMENT
     14 XXXXXXXXXXXXXX
   - C. EDUCATION
     0
   - D. MEDICAL APPLICATIONS
     7 XXXXXXX
   - E. OTHER (PLEASE SPECIFY)
     10 XXXXXXXXXX

   NUCLEAR POWER PLANT DATA ACQUISITION AND MONITOR.
   NATURAL GAS UTILITY
   MIS AT OIL REFINERY
   CIVIL ENGINEERING
   MANUFACTURING AND DISTRIBUTION
   GAS AND ELECTRIC UTILITY
   ELECTRIC UTILITY MONITORING AND CONTROL
   OIL FIELD PROCESS CONTROL
   ELECTRIC UTILITY
   U.S. GOVERNMENT - (NASA)

2. DO YOU USE THE PROCESS CONTROL FEATURES AFFORDED BY THE 1800?

YES	28	XXXXXXXXXXXXXXXXXXXXXXXXXXXX
NO	8	XXXXXXXX
NO ANSWER	3	XXX

CENTRAL PROCESSING UNIT

ASSUMED: MACHINE CYCLE TIME LESS THAN 1 MICROSECOND, 2'S COMPLEMENT ARITHMETIC, HARDWARE TIMERS WITH A RANGE OF 5 MICROSECOND TO 1 SECOND, AUTO-INCREMENTING REGISTERS, HARDWARE INDEX REGISTERS, INTEGER ARITHMETIC INCLUDING MULTIPLY AND DIVIDE, OPTIONAL FLOATING POINT PROCESSOR WITH INSTRUCTIONS, AND OPTIONAL DECIMAL ARITHMETIC WITH INSTRUCTIONS.

3. ARCHITECTURE SHOULD BE

A.	FIXED REGISTER ORIENTED	14	XXXXXXXXXXXXXX
B.	GENERAL REGISTER ORIENTED	23	XXXXXXXXXXXXXXXXXXXXXXX
NO ANSWER		2	XX

4. NUMBER OF REGISTERS?

A.	4-8	13	XXXXXXXXXXXXX
B.	9-12	10	XXXXXXXXXX
C.	13-16	10	XXXXXXXXXX
D.	MORE THAN 16	7	XXXXXXX

5. DO YOU FAVOR A SET OF PRIVILEGED INSTRUCTIONS (I.E. MONITOR OR SYSTEM STATE)?

YES	26	XXXXXXXXXXXXXXXXXXXXXXXXX
NO	12	XXXXXXXXXXXX
NO ANSWER	1	X

6. WORD LENGTH (BITS)?

A.	8	0	
B.	12	0	
C.	16	31	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
D.	24	5	XXXXX
E.	32	5	XXXXX
F.	OTHER...16 OR 32 BIT DOUBLE WORDS	3	XXX

7. NUMBER OF INDEX REGISTERS?

A.	1	0	
B.	2	0	
C.	4	20	XXXXXXXXXXXXXXXXXXX
D.	8	16	XXXXXXXXXXXXXXXX
SEE 3B, 4C OR N/A		4	XXXX

8. DO YOU DESIRE USER CHANGABLE MICROCODE?

YES	18	XXXXXXXXXXXXXXXXXX
NO	19	XXXXXXXXXXXXXXXXXXX
NO ANSWER	2	XX

9. DO YOU REQUIRE

A. 1800 EMULATION

	24	XXXXXXXXXXXXXXXXXXXXXXXX

B. SYSTEM 7 EMULATION

	0	

C. BOTH

	7	XXXXXXX

D. OTHER... PDP-11 OR UNSPECIFIED

	2	XX

EMULATION NOT DESIRED

	6	XXXXXX
NO ANSWER	1	X

MEMORY

ASSUMED: NDRO (CORE, ETC.) AND/OR VOLATILE MEMORY (MOS, ETC.), AND OPTIONAL VIRTUAL MEMORY.

10. MEMORY SIZE (KBYTES)?

MINIMUM	8	7	XXXXXXX
	16	9	XXXXXXXXX
	20	1	X
	32	10	XXXXXXXXXX
	40	1	X
	48	1	X
	64	3	XXX
	100	1	X
	112	1	X
	128	1	X
	256	1	X
NO MINIMUM SPECIFIED		2	XX
MAXIMUM	64	7	XXXXXXX
	128	12	XXXXXXXXXXXX
	164	1	X
	256	10	XXXXXXXXXX
	512	3	XXX
	1MEG	1	X
NO MAXIMUM SPECIFIED		4	XXXX

11. INCREMENTAL EXPANSION SIZE (KBYTES)?

A. 2	2	XX
B. 4	11	XXXXXXXXXX
C. 8	20	XXXXXXXXXXXXXXXXXXX
D. 16	7	XXXXXX
E. 32	2	XX
NO ANSWER	1	X

12. HOW MUCH HIGH SPEED SCRATCH PAD MEMORY DO YOU REQUIRE?

A. 0	12	XXXXXXXXXX
B. 8 WORDS	2	XX
C. 16 WORDS	8	XXXXXXX
D. 32 WORDS	9	XXXXXXXX
E. MORE...64, 4096 OR UNSPECIFIED	3	XXX
NO ANSWER	5	XXXX

13. DO YOU REQUIRE BYTE ADDRESSING?

YES	20	XXXXXXXXXXXXXXXXXX
NO	17	XXXXXXXXXXXXXXXX
NO ANSWER	1	X

14. STORAGE PROTECTION?

A. NONE	2	XX
B. PHYSICAL PAGE	4	XXX
C. PROGRAM PAGE	7	XXXXXX
D. LIMIT REGISTER STACK	6	XXXXX
E. SINGLE WORD WITH PRIVILEGED INSTRUCTION	22	XXXXXXXXXXXXXXXXXXXX
NO ANSWER	1	X
YES, IN SOME FORM	1	X

INTERRUPTS

ASSUMED: THIS MACHINE WILL HAVE PROCESS AND PROGRAM (EXTERNAL AND INTERNAL) INTERRUPTS.

15. NUMBER OF INTERRUPT LEVELS?

MINIMUM	3	1	X
	4	5	XXXX
	5	3	XXX
	6	5	XXXX
	8	5	XXXX
	10	2	XX
	12	6	XXXXX
	13	1	X
	16	5	XXXX
	17	1	X
	24	3	XXX
NO ANSWER		2	XX

MAXIMUM	8	1 X
	10	2 XX
	12	2 XX
	13	1 X
	16	4 XXXX
	18	1 X
	20	3 XXX
	24	9 XXXXXXXXX
	32	5 XXXXX
	48	1 X
	64	4 XXXX
	2**15	1 X
NO ANSWER		4 XXXX

16. DO YOU REQUIRE MULTIPLE DEVICES PER LEVEL OR A DEDICATED LOCATION FOR EACH DEVICE?

MULTIPLE	34	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
DEDICATED	4	XXXX
NO ANSWER	1	X

17. DO YOU REQUIRE FULL SENSE OF INTERRUPT STATUS AND MASKING VIA SOFTWARE?

YES	35	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
NO	1	X
NO ANSWER	3	XXX

18. DO YOU DESIRE SOFTWARE CONTROL OF DEVICE ASSIGNMENTS?

YES	32	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
NO	5	XXXXX
NO ANSWER OR DID NOT UNDERSTAND	3	XXX

INSTRUCTION SET

ASSUMED: STANDARD ADD, SUB, MPY, DIV, AND, OR, FOR, CMP, LOGICAL SHIFTS (SINGLE AND DOUBLE REGISTER, RIGHT, LEFT, AND ROTATE), BYTE SWAPS, FULL ARITHMETIC SHIFTING (SIGN EXTENSION, NORMALIZATION), BIT TEST, BIT SET, REGISTER MODIFY AND SKIP, CONDITIONAL BRANCH ON REGISTER CONTENTS, INDEX REGISTER LOOP CONTROL, I/O TEST, I/O INITIALIZATION, AND FULL STATUS SAVE.

19. DO YOU REQUIRE BYTE MANIPULATION?

YES	21	XXXXXXXXXXXXXXXXXXXXX
NO	17	XXXXXXXXXXXXXXXXX
NO ANSWER	1	X

20. DO YOU DESIRE MULTI-REGISTER LOAD AND STORE?

YES	31	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
NO	8	XXXXXXXX
NO ANSWER	1	X

21. 'EXECUTE' INSTRUCTION?

YES	25	XXXXXXXXXXXXXXXXXXXXXXXXX
NO	5	XXXXX
NO ANSWER	4	XXXX
DID NOT UNDERSTAND	4	XXXX

CONTROL CONSOLE

ASSUMED: DISPLAY OF ALL REGISTERS, TRACE, ADDRESS TRAP, CONSOLE READABLE SWITCHES, MANUAL CONTROL OF I/O DEVICES FROM THE CONSOLE, INSTRUCTION EXECUTION FROM THE CONSOLE SWITCHES, AND WITH AN OPERATOR'S CONSOLE THAT CAN BE A TELETYPE, CRT DISPLAY OR A TYPEWRITER.

22. CONSOLE INTERRUPT?

YES	37	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
NO	0	
NO ANSWER	1	X

23. VARIABLE SPEED INSTRUCTION EXECUTION?

YES	14	XXXXXXXXXXXXXX
NO	22	XXXXXXXXXXXXXXXXXXXXXX
NO ANSWER OR DID NOT UNDERSTAND	3	XXX

24. MANUAL MODIFICATION OF CORE?

YES	36	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
NO	3	XXX

25. DISPLAY MACHINE STATE ON THE CONSOLE?

YES	37	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
NO	1	X
NO ANSWER	1	X

26. IPL FROM CONSOLE?

YES	32	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
NO	5	XXXXX
NO ANSWER	2	XX

INPUT/OUTPUT

ASSUMED: STANDARD CODE FOR ALL DEVICES (ASCII), AUTOMATIC IPL, IPL DEVICE REASSIGNABLE FROM THE CONSOLE SWITCHES, FULL RECOVERY ON POWER FAIL AUTO-RESTART.

27. HOW MANY DMA OR CYCLE STEALING CHANNELS?

MINIMUM	1	1 X
	2	1 X
	3	7 XXXXXXX
	4	6 XXXXXX
	5	3 XXX
	6	5 XXXXX
	8	5 XXXXX
	9	2 XX
	16	3 XXX
	24	1 X
NO MINIMUM SPECIFIED		
		5 XXXXX
MAXIMUM	3	1 X
	6	1 X
	8	4 XXXX
	9	1 X
	10	3 XXX
	12	6 XXXXXX
	15	1 X
	16	9 XXXXXXXXX
	24	3 XXX
	32	2 XX
NO MAXIMUM SPECIFIED		
		8 XXXXXXXX

28. DO YOU DESIRE DISTRIBUTED PERIPHERAL PROCESSORS?

YES	22	XXXXXXXXXXXXXXXXXXXXXX
NO	13	XXXXXXXXXXXXX
NO ANSWER	4	XXXX

29. DO YOU DESIRE I/O TO MULTIPLE CORE BANKS INDEPENDENTLY?

YES	20	XXXXXXXXXXXXXXXXXXXX
NO	14	XXXXXXXXXXXXXX
NO ANSWER	4	XXXX

30. HOW MANY TTY COMPATIBLE DEVICES SHOULD BE SUPPORTABLE?

MINIMUM	0	3 XXX
	1	5 XXXXX
	2	3 XXX
	3	1 X
	4	7 XXXXXXX
	5	1 X
	6	2 XX
	8	6 XXXXXX
	16	2 XX
	20	1 X
	32	1 X
NO MINIMUM SPECIFIED		
		5 XXXXX

	MAXIMUM	2	1 X
		3	1 X
		4	1 X
		6	4 XXXX
		8	3 XXX
		10	3 XXX
		12	3 XXX
		16	5 XXXXX
		20	1 X
		32	3 XXX
		40	1 X
		64	4 XXXX
		256	1 X
	NO MAXIMUM SPECIFIED		
			7 XXXXXXX
31.	DO YOU NEED _____ (CHECK ALL THAT APPLY)?		
	OCR		4 XXXX
	PLOTTER		27 XXXXXXXXXXXXXXXXXXXXXXXXXXX
	7 TRACK TAPE		1 X
	9 TRACK TAPE		16 XXXXXXXXXXXXXXXX
	DUAL DENSITY 9 TRACK TAPE		
			10 XXXXXXXXXX
	PAPER TAPE READER		5 XXXXX
	HIGH-SPEED PAPER TAPE READER		
			9 XXXXXXXXX
	PAPER TAPE PUNCH		6 XXXXXX
	HIGH-SPEED PAPER TAPE PUNCH		
			8 XXXXXXXX
	INTERACTIVE CRT GRAPHICS TERMINALS		
			32 XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
	NO ANSWER		2 XX
32.	LINE PRINTER SPEED?		
	A. 300 LPM		13 XXXXXXXXXXXXX
	B. 600 LPM		19 XXXXXXXXXXXXXXXXXX
	C. 1000 LPM		6 XXXXXX
33.	CARD READER SPEED?		
	A. 200 CPM		12 XXXXXXXXXXXX
	B. 300 CPM		15 XXXXXXXXXXXXXX
	C. 600 CPM		13 XXXXXXXXXXXXX
34.	SEPARATE CARD PUNCH?		
	YES		22 XXXXXXXXXXXXXXXXXXXXX
	NO		17 XXXXXXXXXXXXXXXX
35.	TOTAL DISK STORAGE (MEGABYTES)?		
	A. UP TO 10		9 XXXXXXXXX
	B. 10-50		16 XXXXXXXXXXXXXXX
	C. 50-100		7 XXXXXXX
	D. 100-1000		6 XXXXXX
	E. MORE		1 X

36. DISK ACCESS TIME?

A. 10 MSEC	17	XXXXXXXXXXXXXXXX
B. 50 MSEC	17	XXXXXXXXXXXXXXXX
C. 150 MSEC	1	X
D. 500 MSEC	0	
NO ANSWER	4	XXXX

37. COMMUNICATIONS ADAPTER?

BISYNC-MINIMUM NUMBER OF LINES?

0	3	XXX
1	5	XXXXX
2	1	X
5	1	X
NO ANSWER	22	XXXXXXXXXXXXXXXXXXXXXX

4 SPECIFIED THE FOLLOWING MINIMUM SPEEDS: 600, 600, 2400 OR 9600 BPS.

BISYNC-MAXIMUM

0	1	X
2	2	XX
3	1	X
4	1	X
5	1	X
6	1	X
10	1	X
16	1	X
NO ANSWER	20	XXXXXXXXXXXXXXXXXXXX

3 SPECIFIED THE FOLLOWING MAXIMUM SPEEDS: 4.8, 50 OR 230 KB.

ASYNC-MINIMUM

0	3	XXX
1	2	XX
2	1	X
3	1	X
20	1	X
NO ANSWER	22	XXXXXXXXXXXXXXXXXXXXXX

3 SPECIFIED THE FOLLOWING MINIMUM ASYNC SPEEDS: 110, 110 OR 600 BPS.

ASYNC-MAXIMUM

0	1	X
2	1	X
3	1	X
8	1	X
16	1	X
24	1	X
40	1	X
NO ANSWER	23	XXXXXXXXXXXXXXXXXXXXXX

4 SPECIFIED THE FOLLOWING MAXIMUM ASYNC SPEEDS: 4.8, 4.8, 9.6 OR 50 KB.

38. A/D

BITS-MINIMUM	8	8	XXXXXXXX
	10	2	XX
	11	5	XXXXX
	12	4	XXXX
	14	2	XX
	64	1	?
NO ANSWER		16	XXXXXXXXXXXXXXXX
BITS-MAXIMUM	11	1	X
	12	2	XX
	13	1	X
	14	4	XXXX
	15	4	XXXX
	16	7	XXXXXXX
	23	1	?
	32	1	?
	128	1	?
NO ANSWER		16	XXXXXXXXXXXXXXXX
SPEED-MINIMUM NUMBER OF CONVERSIONS PER SECOND			
	1	1	X
	10	1	X
	50	1	X
	100	5	XXXXX
	200	3	XXX
	1K	3	XXX
	10K	2	XX
	20K	2	XX
	50K	1	X
NO ANSWER		16	XXXXXXXXXXXXXXXX
SPEED-MAXIMUM NUMBER OF CONVERSIONS PER SECOND			
	50	1	X
	500	3	XXX
	1K	3	XXX
	10K	3	XXX
	20K	2	XX
	30K	1	X
	40K	1	X
	50K	2	XX
	100K	3	XXX
	200K	1	X
	10M	1	X
NO ANSWER		17	XXXXXXXXXXXXXXXX

39. D/A

BITS-MINIMUM	8	6	XXXXXX
	10	4	XXXX
	11	3	XXX
	12	1	X
	13	1	X
	16	1	X
	64	1	?
NO ANSWER		19	XXXXXXXXXXXXXXXXXXX
BITS-MAXIMUM	10	1	X
	11	1	X
	12	1	X
	14	1	X
	15	2	XX
	16	5	XXXXX
	32	1	?
	64	1	?
	128	1	?
NO ANSWER		19	XXXXXXXXXXXXXXXXXXX
SPEED-MINIMUM NUMBER OF CONVERSIONS PER SECOND			
	1	1	X
	10	2	XX
	100	1	X
	200	1	X
	1K	2	XX
	2K	1	X
	25K	1	X
	100K	1	X
NO ANSWER		21	XXXXXXXXXXXXXXXXXXXXX
SPEED-MAXIMUM NUMBER OF CONVERSIONS PER SECOND			
	1K	1	X
	100	1	X
	500	1	X
	10K	2	XX
	20K	2	XX
	25K	1	X
	50K	2	XX
	100K	1	X
	500K	1	X
NO ANSWER		21	XXXXXXXXXXXXXXXXXXXXX

40. NUMBER OF A/D POINTS?

MINIMUM	4	1	X
	8	3	XXX
	16	3	XXX
	40	1	X
	64	4	XXXX
	50	1	X
	100	1	X
	128	1	X

	200	1	X
	360	1	X
	448	1	X
	600	1	X
	800	1	X
	1K	1	X
NO ANSWER		15	XXXXXXXXXXXXXXX
MAXIMUM	16	1	X
	64	2	XX
	128	2	XX
	160	1	X
	200	3	XXX
	256	3	XXX
	1000	1	X
	1024	1	X
	1600	2	XX
	2K	2	XX
	NO MAX	1	X
NO ANSWER		17	XXXXXXXXXXXXXXXXX

41. NUMBER OF D/A POINTS?

MINIMUM	1	2	XX
	2	2	XX
	4	2	XX
	8	3	XXX
	10	2	XX
	16	3	XXX
	32	1	X
	50	2	XX
	64	1	X
NO ANSWER		18	XXXXXXXXXXXXXXXXX
MAXIMUM	8	1	X
	10	2	XX
	16	2	XX
	24	1	X
	64	2	XX
	128	2	XX
	160	1	X
	200	2	XX
	250	1	X
	256	1	X
	NO MAX	1	X
NO ANSWER		19	XXXXXXXXXXXXXXXXX

42. DO YOU REQUIRE:

A.	SAMPLE AND HOLD PER INPUT LINE	9	XXXXXXXXX
B.	PROGRAMMABLE GAIN	5	XXXXX
C.	BOTH	9	XXXXXXXXX
D.	NEITHER	5	XXXXX

NO ANSWER 12 XXXXXXXXXXX

43. DO YOU REQUIRE? (CHECK ALL THAT APPLY)

PARALLEL DIGITAL OUTPUT	28	XXXXXXXXXXXXXXXXXXXXXXXXXX
PARALLEL DIGITAL INPUT	31	XXXXXXXXXXXXXXXXXXXXXXXXXXXXX
ECO OUTPUT	32	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
PULSE OUTPUT	19	XXXXXXXXXXXXXXXXXX
COUNTER INPUT	19	XXXXXXXXXXXXXXXXXX
SYNC AND READY FOR EACH GROUP OR POINT	19	XXXXXXXXXXXXXXXXXX
REMOTE, MICROPROGRAMMABLE PROCESS I/O STATIONS	11	XXXXXXXXXX
STANDARD LAB INSTRUMENT INTERFACE	12	XXXXXXXXXX
ISOLATED INTERFACE (E.G. OPTICAL COUPLING)	10	XXXXXXXXX
TTL COMPATIBLE INTERFACES	23	XXXXXXXXXXXXXXXXXXXXX
MECL INTERFACE	2	XX
MOS INTERFACE	3	XXX
CONTACT CLOSURE INTERFACE	22	XXXXXXXXXXXXXXXXXXXX
RELAY DRIVERS	11	XXXXXXXXXX
BI-DIRECTIONAL I/O GROUPS	6	XXXXX
MINICOMPUTER INTERFACE(S)	20	XXXXXXXXXXXXXXXXXX
CABLE DRIVERS AND RECEIVERS	9	XXXXXXXX
DIFFERENTIAL INPUT	14	XXXXXXXXXXXXX
NO ANSWER	4	XXX

SOFTWARE

ASSUMED: PRIORITY DRIVEN SYSTEM, BETTER SYSGEN TAYLORING OF THE SYSTEM, NONPROCESS I/O SPOOLING, STATISTICAL PACKAGE, SCIENTIFIC SUBROUTINE PACKAGE, LAB AUTOMATION PACKAGE, OPTIONAL BATCH JOB ACCOUNTING, I/O DEVICE ASSIGNMENT AT RUN TIME AND REASSIGNMENT DURING EXECUTION, A MORE COMPREHENSIVE I/O DEVICE UTILITY PACKAGE, OPTIMIZING COMPILERS, A MACRO ASSEMBLER, FULL FORTRAN IV (WITH I/O COMPATIBILITY, GLOBAL COMMON AND PROCESS ROUTINES FOR REAL-TIME CONTROL).

44. DO YOU REQUIRE? (CHECK ALL THAT APPLY)

BATCH SYSTEM	29	XXXXXXXXXXXXXXXXXXXXXXXXXX
TIME SLICING	17	XXXXXXXXXXXXXXXX
MULTI-PROGRAMMING	37	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
FILE MANAGEMENT SYSTEM	23	XXXXXXXXXXXXXXXXXXXX
PL/1	11	XXXXXXXXXX

APL	5	XXXXX
BASIC	5	XXXXX
INTERACTIVE BASIC	7	XXXXXXX
SNOBOL	1	X
SIMULATION LANGUAGE	5	XXXXX
COBOL	5	XXXXX
ALGOL	2	XX
NO ANSWER	2	XX

INSTALLATION

ASSUMED: SMALLER PHYSICAL SIZE THAN THE 1800, EASILY FIELD INSTALLED OPTIONS, MODULAR HARDWARE, AND HIGH RELIABILITY.

45. DO YOU REQUIRE? (CHECK ALL THAT APPLY)

SELF-CONTAINED COOLING	15	XXXXXXXXXXXXXXX
BACK-UP POWER SYSTEM	13	XXXXXXXXXXXXX
TURN KEY SYSTEM INSTALLATION	8	XXXXXXXX
NO ANSWER	12	XXXXXXXXXXXX

DIAGNOSTICS

46. DO YOU REQUIRE? (CHECK ALL THAT APPLY)

ONLINE DIAGNOSTICS UNDER THE OPERATING SYSTEM	33	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
USER SYSGEN OF THE DIAGNOSTICS	20	XXXXXXXXXXXXXXXXXXX
MANUFACTURER TRAINING FOR YOUR SERVICE PERSONNEL	12	XXXXXXXXXXX
24 HOUR ON-CALL MAINTENANCE BY IBM	29	XXXXXXXXXXXXXXXXXXXXXXXXXXX
NO ANSWER	1	X

COST

47. WHAT IS THE COST OR MONTHLY RENTAL FOR YOUR PRESENT SYSTEM?

* _____	100K	1 X
	120K	1 X
	140K	1 X
	150K	5 XXXXX
	175K	1 X
	180K	1 X
	186K	2 XX
	200K	1 X

204K	1	X
240K	1	X
300K	2	XX
350K	2	XX
380K	1	X
500K	1	X
650K	1	X

FOR THE ABOVE 22 SYSTEMS, THE AVERAGE PURCHASE COST WAS $241.4K OR $6.04K PER MONTH ASSUMING 40 MONTHS RENTAL EQUALS THE PURCHASE PRICE.

$/MONTH		
4.1K	1	X
5K	1	X
5.2K	1	X
5.4K	1	X
6.5K	1	X
7.4K	1	X
8K	2	XX
8.5K	1	X
10K	2	XX
10-12K	1	X
12K	2	XX
14K	1	X
14.3K	1	X
15K	1	X
17K	1	X

FOR THE ABOVE 18 SYSTEMS, THE AVERAGE MONTHLY RENTAL IS $9.63K OR $385.20K FOR THE SAME ASSUMPTION.

NO ANSWER TO EITHER PART		
	2	XX

FOR THE ABOVE 40 SYSTEMS, THE AVERAGE PURCHASE PRICE WAS $306.12 OR $7.65K PER MONTH.

48. WHAT WOULD YOU BE WILLING TO PAY FOR AN EQUIVALENT (ALTHOUGH FASTER AND MORE UP-TO-DATE) VERSION OF THE MACHINE YOU JUST SPECIFIED?

$ _____		
50K	1	X
60K	1	X
75K	1	X
120K	1	X
125K	1	X
150K	4	XXXX
180K	1	X
200K	2	XX
240K	1	X
250K	1	X
300K	2	XX
380K	1	X
<650K	1	X

NOT AT ANY COST 1 X

FOR THE ABOVE 18 SYSTEMS, THE AVERAGE PURCHASE PRICE DESIRED WAS $207.22K OR $5.18K PER MONTH.

$/MONTH	
4.5	1 X
5K	2 XX
<5.4K	1 X
7K	1 X
9K	2 XX
8.5K	1 X
10K	3 XXX
8-14K	1 X
12K	1 X
12-15K	1 X
15K	2 XX
18K	1 X

FOR THE ABOVE 17 SYSTEMS, THE AVERAGE MONTHLY RENTAL DESIRED WAS $9.76K OR $390.40K PURCHASE.

NO ANSWER TO EITHER PART
5 XXXXX

FOR THE ABOVE 35 SYSTEMS, THE AVERAGE PURCHASE PRICE DESIRED WAS $296.10K OR $7.40K PER MONTH.

H.E. THOMPSON 10-06-74

APPENDIX B.

questionnaires

1800 Replacement Committee
1800 and Sys/7 Projects of COMMON
9 October 1973

ATTENTION: "Sensor-Based" COMMON Members

The "After the 1800, What?" session at the Atlanta COMMON was very well attended by both users and IBMers. The general consensus was quite clear: By the next meeting in Denver a formal report should be prepared telling IBM what COMMON members involved with data acquisition and process control require in the 1800 follow-on system.

In order to accomplish this feat we must obtain some basic information from the membership and form a working committee right away. So, please, if your installation is at all concerned with sensor-based activities, take a couple of minutes to fill in the attached questionnaire and return it to me by the end of this month.

MAILING ADDRESS: Philip A. Thompson
Princeton University
Plasma Physics Lab.
Princeton, NJ 08540

COMMON No. _____ Name of respondent _____
Company _____
Sensor-based application _____
Sensor-based computer configuration _____
_____
Following line if different from above computer:
Computer for program preparation _____ data analysis _____

Future plans:
Major expansion of sensor-based computer & when? _____
Replacement of your sensor-based computer & when? _____

Loyalty to IBM: Any replacement of present system would -- a) have to be IBM __, b) be non-IBM only if significantly better __, c) be considered from any vendor __, d) probably be non-IBM __, or e) not be IBM __.

Committee participation: Would you be willing to --
a) fill out a long questionnaire on 1800 replacement? _____
(You may include ideas for inclusion in questionnaire on the back of this sheet.)
b) work on preparation & interpretaion of questionnaire? ___
c) come a day early to Denver meeting and help write the final draft of the committee report? _____
d) meet some week end in February or March (probably in the Washington DC area) to write the draft of the report? _____

1800-REPLACEMENT QUESTIONNAIRE

Draft Outline

Please answer yes or no on the features and give the values you desire for other questions. Additions and comments should be put on back of sheet.

. 16, 18, 24, 32, 36 (other) bits per word?
. What memory speed?
. Maximum core size?
. How much faster overall speed than 1800?
. Protection by word, page, or fence?
. Multiple sets of registers for rapid context switching (a la Sys/7)?
. How many registers?
. Auto incrementing and decrementing registers?
. How many general-purpose registers?
. Instructions a super-set of present 1800?
. Register-to-register instructions?
. Immediate instructions (operand is data, not address)?
. Floating-point hardware?
. Hardware vectoring of interrupts?
. Relocation hardware?
. Scatter loading?
. Demand paging (virtual memory)?
. Stop-on-address debug feature (a la Sys/7)?
. Cold start from ROM?
. Microprogrammed processor for special functions (e.g., FFT)?
. IOP's for DMA (rather than cycle stealing)?
. Front-end processors?

. Separate card read and punch?
. Faster card reader?
. Maximum amount of disk storage?
. 1000 lpm, caps & lower-case printer?

. Standard logic levels for digital I/O? (TTL?)
. Faster analog-to-digital converters?
. Programmed gain for A/Ds?
. Sample/hold per channel and programmable clocking?
. Faster digital-to-analog converters?

. Emulation of 1800 MPX?
. Easier SysGen?
. More EQU-tunable system routines?
. MVT instead of MFT?
. Routines for converting 1800 software to new system?

. Full FORTRAN IV with Purdue extensions?
. Optimizing compiler?
. FORTRAN arrays backwards in core?
. Global COMMON pool (a la /INSKEL/)?
. What other languages (such as Basic, APL, PL/1)?

. High-speed connection to minicomputers (Sys/2, etc)?
. Telecommunications support?
. TTY support? Maximum number of lines?
. Time sharing in background?

// end
// end

1800 REPLACEMENT QUESTIONNAIRE

THIS QUESTIONNAIRE IS BEING SENT TO YOU BY THE COMMON 1800 REPLACEMENT COMMITTEE SO THAT WE CAN DEVELOP A POSITION STATEMENT FOR IBM. IT HAS BEEN INDICATED TO US THAT IBM IS QUITE INTERESTED IN OUR COMMENTS SO WE URGE YOU TO GIVE THIS QUESTIONNAIRE YOUR IMMEDIATE ATTENTION AND TO RETURN IT BY **19 JULY TO:**

DONALD GOLDEN OR HENRY THOMPSON
DEPARTMENT OF MANAGEMENT
HEALTH AND HOSPITALS GOVERNING COMMISSION OF COOK COUNTY
1900 WEST POLK STREET
CHICAGO, ILLINOIS 60612

1. YOUR BASIC INSTALLATION IS:

A. MANUFACTURING OR CHEMICAL PROCESS CONTROL B. RESEARCH AND DEVELOPMENT C. EDUCATION D. MEDICAL APPLICATIONS E. OTHER (PLEASE SPECIFY) _____

2. DO YOU USE THE PROCESS CONTROL FEATURES AFFORDED BY THE 1800? YES NO

CENTRAL PROCESSING UNIT

ASSUMED: MACHINE CYCLE TIME LESS THAN 1 MICROSECOND, 2'S COMPLEMENT ARITHMETIC, HARDWARE TIMERS WITH A RANGE OF 5 MICROSEC. TO 1 SECOND, AUTO INCREMENTING REGISTERS, HARDWARE INDEX REGISTERS, INTEGER ARITHMETIC INCLUDING MULTIPLY AND DIVIDE, OPTIONAL FLOATING POINT PROCESSOR WITH INSTRUCTIONS, OPTIONAL DECIMAL ARITHMETIC WITH INSTRUCTIONS.

3. ARCHITECTURE SHOULD BE
A. FIXED REGISTER ORIENTED B. GENERAL REGISTER ORIENTED.

4. NUMBER OF REGISTERS?
A. 4-8 B. 9-12 C. 13-16 D. MORE THAN 16

5. DO YOU FAVOR A SET OF PRIVILEGED INSTRUCTIONS (I. E. MONITOR OR SYSTEM STATE)? YES NO

6. WORD LENGTH (BITS)? A. 8 B. 12 C. 16 D. 24
E. 32 F. OTHER _____

7. NUMBER OF INDEX REGISTERS? A. 1 B. 2 C. 4 D. 8

8. DO YOU DESIRE USER CHANGABLE MICROCODE? YES NO

9. DO YOU REQUIRE A. 1130 EMULATION B. SYSTEM 7 EMULATION

C. BOTH D. OTHER _____

MEMORY

ASSUMED: NDRO (CORE ETC.) AND/OR VOLATILE MEMORY (MOS, ETC.), OPTIONAL VIRTUAL MEMORY.

10. MEMORY SYZE (KBYTES)? MIN _____ MAX _____

11. INCREMENTAL EXPANSION SIZE (KBYTES)? A. 2 B. 4 C. 8 D. 16 E. 32

12. HOW MUCH HIGH SPEED SCRATCH PAD MEMORY DO YOU REQUIRE?
A. 0 B. 8 WORDS C. 16 WORDS D. 32 WORDS
E. MORE _____

13. DO YOU REQUIRE BYTE ADDRESSING? YES NO

14. STORAGE PROTECTION? A. NONE B. PHYSICAL PAGE C. PROGRAM PAGE D. LIMIT REGISTER STACK E. SINGLE WORD W/ PRIVILEGED INSTRUCTION

INTERRUPTS

ASSUMED: THIS MACHINE WILL HAVE PROCESS AND PROGRAM (EXTERNAL AND INTERNAL) INTERRUPTS.

15. NUMBER OF INTERRUPT LEVELS? MIN _____ MAX _____

16 DO YOU REQUIRE MULTIPLE DEVICES PER LEVEL OR DEDICATED LOCATION FOR EACH DEVICE? MULTI DEDICATED

17. DO YOU REQUIRE FULL SENSE OF INTERRUPT STATUS AND MASKING VIA SOFTWARE? YES NO

18. DO YOU DESIRE SOFTWARE CONTROL OF DEVICE ASSIGNMENTS? YES NO

INSTRUCTION SET

ASSUMED: STANDARD ADD, SUB, MUL, DIV, AND, OR, XOR, COMP, LOGICAL SHIFTS (SINGLE AND DOUBLE REGISTER, RIGHT, LEFT, AND ROTATE), BYTE SWAPS, FULL ARITHMETIC SHIFTING (SIGN EXTENSION, NORMALIZATION), BIT TEST, BIT SET, REGISTER MODIFY & SKIP, CONDITIONAL BRANCH ON REGISTER CONTENTS, INDEX REGISTER LOOP CONTROL, I/O TEST, I/O INITIALIZATION, FULL STATUS SAVE.

19. DO YOU REQUIRE BYTE MANIPULATION? YES NO

20. DO YOU DESIRE MULTI-REGISTER LOAD & STORE? YES NO

21. 'EXECUTE' INSTRUCTION? YES NO

CONTROL CONSOLE

ASSUMED: DISPLAY OF ALL REGISTERS, TRACE, ADDRESS TRAP, CONSOLE READABLE SWITCHES, MANUAL CONTROL OF I/O DEVICES FROM CONSOLE, INSTRUCTION EXECUTION FROM CONSOLE SWITCHES, OPERATORS CONSOLE CAN BE TTY, CRT DISPLAY , OR TYPEWRITER.

22. CONSOLE INTERRUPT? YES NO

23. VARIABLE SPEED INSTRUCTION EXECUTION? YES NO

24. MANUAL MODIFICATION OF CORE? YES NO

25. DISPLAY MACHINE STATE ON CONSOLE? YES NO

26. IPL FROM CONSOLE? YES NO

INPUT/OUTPUT

ASSUMED: STANDARD CODE FOR ALL DEVICES (ASCII), AUTOMATIC IPL, IPL DEVICE REASSIGNABLE FROM CONSOLE SWITCHES, FULL RECOVERY ON POWER FAIL AUTO-RESTART

27. HOW MANY DMA OR CYCLE STEALING CHANNELS?

MIN _____ MAX _____

28. DO YOU DESIRE DISTRIBUTED PERIPHERAL PROCESSORS? YES NO

29. DO YOU DESIRE I/O TO MULTIPLE CORE BANKS INDEPENDENTLY? YES NO

30. HOW MANY TTY COMPATIBLE DEVICES SHOULD BE SUPPORTABLE?

MIN _____ MAX _____

31. DO YOU NEED (CHECK ALL THAT APPLY)? -OCR- -PLOTTER- -7 TRACK TAPE- -9 TRACK TAPE- -DUAL DENSITY 9 TRACK- -PAPER TAPE READER- -HIGH SPEED PAPER TAPE READER- -PAPER TAPE PUNCH- -HIGH SPEED PT PUNCH- -CRT INTERACTIVE GRAPHICS TERMINALS-

32. LINE PRINTER SPEED? A. 300 LPM B. 600 LPM C. 1000 LPM

33. CARD READER SPEED? A. 200 CPM B. 300 CPM C. 600 CPM

34. SEPARATE CARD PUNCH? YES NO

35. TOTAL DISK STORAGE (MEGABYTES)? A. UP TO 10 B. 10-50

C. 50-100 D. 100-1000 E. MORE _____

36. DISK ACCESS TIME? A. 10 MSEC B. 50 MSEC C. 150 MSEC D. 500 MSEC

37. COMMUNICATIONS ADAPTER? BISYNC-MIN _____ MAX _____ ASYNC-MIN _____ MAX _____

PROCESS I/O

38. A/D BITS-MIN _____ MAX _____

SPEED-MIN _____ MAX _____ CONVERSIONS PER SECOND

39. D/A BITS-MIN _____ MAX _____

SPEED-MIN _____ MAX _____ CONVERSIONS PER SECOND

40. NUMBER A/D POINTS? MIN _____ MAX _____

41. NUMBER D/A POINTS? MIN _____ MAX _____

42. DO YOU REQUIRE: A. SAMPLE & HOLD PER INPUT LINE B. PROGRAMMABLE GAIN C. BOTH D. NEITHER

43. DO YOU REQUIRE? (CHECK ALL THAT APPLY) -PARALLEL DIGITAL OUTPUT- -PARALLEL DIGITAL INPUT- -ECO OUTPUT- -PULSE OUTPUT- -COUNTER INPUT- -SYNC & READY FOR EACH GROUP OR POINT- -REMOTE MICROPROGRAMABLE PROCESS I/O STATIONS- -STANDARD LAB INTRUMENT INTERFACE- -ISOLATED INTERFACE (EG. OPTICAL COUPLING)- -TTL COMPATIBLE INTERFACES- -MECL INTERFACE- -MOS INTERFACE- -CONTACT CLOSURE INTERFACE- -RELAY DRIVERS- -BIDIRECTIONAL I/O GROUPS- -MINICOMPUTER INTERFACE- -CABLE DRIVERS & RECEIVERS- -DIFFERENTIAL INPUT-

SOFTWARE

ASSUMED: PRIORITY DRIVEN SYSTEM, BETTER SYSGEN TAYLORING OF SYSTEM, NONPROCESS I/O SPOOLING, STAT PACKAGE, SCIENTIFIC SUBROUTINE PACKAGE, LAB AUTOMATION PACKAGE, OPTIONAL BATCH JOB ACCOUNTING, I/O DEVICE ASSIGNMENT AT RUN TIME AND REASSIGNMENT DURING EXECUTION, A MORE COMPREHENSIVE I/O DEVICE UTILITY PACKAGE, OPTIMIZING COMPILERS, MACRO ASSEMBLER, FULL FORTRAN IV(WITH I/O COMPATIBILITY,GLOBAL COMMON, AND PROCESS ROUTINES).

44. DO YOU REQUIRE? (CHECK ALL THAT APPLY) -BATCH SYSTEM- -TIME SLICING- -MULTIPROGRAMMING- -FILE MANAGEMENT SYSTEM- -PL1- -APL- -BASIC- -INTERACTIVE BASIC- -SNOBOL- -SIMULATION LANGUAGE- -COBOL- -ALGOL-

INSTALLATION

ASSUMED: SMALLER PHYSICAL SIZE THAN 1800, EASILY FIELD INSTALLED OPTIONS, MODULAR HARDWARE, HIGH RELIABILITY.

45. DO YOU REQUIRE? (CHECK ALL THAT APPLY)-SELF CONTAINED COOLING- -BACK UP POWER SYSTEM- -TURN KEY SYSTEM INSTALLATION-

DIAGNOSTICS

46. DO YOU REQUIRE? (CHECK ALL THAT APPLY) -ONLINE DIAGNOSTICS UNDER THE OPERATING SYSTEM- -USER SYSGEN OF DIAGNOSTICS- -MANUFACTURER TRAINING FOR YOUR SERVICE PERSONNEL- -24 HOUR ONCALL MAINTENANCE BY IBM-

COST

47. WHAT IS THE COST OR MONTHLY RENTAL FOR YOUR PRESENT SYSTEM?

$ _____ OR $/MO _____

48. WHAT WOULD YOU BE WILLING TO PAY FOR AN EQUIVALENT (ALTHOUGH FASTER & MORE UP-TO-DATE) VERSION OF THE MACHINE YOU JUST SPECIFIED?

$ _____ OR $/MO _____

THANK YOU,

THE COMMON 1800 REPLACEMENT COMMITTEE