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Memorandum M-630

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Project Whirlwind  
Servomechanisms Laboratory  
Massachusetts Institute of Technology  
Cambridge, Massachusetts

SUBJECT: BI-WEEKLY REPORT, PART I, OCTOBER 1, 1948

To: 6345 Engineers

From: Jay W. Forrester

1.0 WHIRLWIND I COMPUTER ELEMENTS

1.1 Listed by Block Diagram Number

102 Program Counter

(J. A. O'Brien)

The prototype model of the program counter has been received from Sylvania. Tests on this unit will begin next week.

300 Arithmetic Element

(G. G. Hoberg)

A block diagram has been completed which shows in detail the proposed functional arrangement of test equipment for testing the WWI arithmetic element. (Drawing D-33028)

301/103 A-Register/Program Register

(R. H. Gould)

An A-register digit panel, serial number 14, has been received from Sylvania for test. It has been compared with the prototype panel and will serve as a standard when returned to Sylvania. Tests have shown that it satisfies specifications on all points although it is not quite as good as the prototype in some cases. Tests are continuing to determine the reason for this.

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700 Operator's Console

(C. W. Watt)

Considerable progress has been made toward completion of a temporary operator's console to be used for the initial system testing of WWI. A block diagram has been completed, racks and wireways installed, a physical layout of needed equipment made, a method of video cabling formulated, and procurement of needed equipment begun. A date of Dec. 1 has been tentatively set as a completion date for this work, although parts of it will be available sooner to test registers as they arrive from Sylvania.

1.2 System Engineering1.21 Power Control & Distribution

(R. E. Hunt)

A complete system of installation drawings has been worked out.

The first draft of a Master Installation drawing is almost finished.

Installation Sub Assemblies will be completed as rapidly as possible in order to correlate all installation under one master system.

Existing drawings will be utilized as far as possible. Existing drawings that do not dovetail with the proposed system will be obsoleted and redrawn.

(H. S. Lee)

Laboratory Power Supply & 115 Volt Distribution, Computer Racks. This installation has been started and is progressing satisfactorily.

Rack Filament Power Panel. Fabrication of seventy-five (75) of these units has been completed and will be installed as soon as the racks are painted.

Filament Transformers. Five-hundred (500) have been delivered and are being inspected and tested in accordance with Test Specification S7.420-1. Thirty days will be required to complete the testing.

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1.21 Power Control & Distribution (continued)

(R. E. Hunt)

Installation of Power Control & Distribution is about a week behind schedule, due mainly to late delivery of purchased components.

The status of component parts is as follows:

1. Power Distribution Busses - are 95% complete and should be installed within one week.
2. Shunt Panel - completed and installed.
3. Laboratory Power Dist. Panel - drafting complete and ready for manufacture.
4. Common Tie Panel - 80% complete, should be complete and installed within one week.
5. Power Control Panel - drafting is about 60% complete. All components are on hand. Manufacture and installation should require about three weeks more.
6. Remote Power Control - drafting is complete, and panel is ready for manufacturing.
7. Marginal Checking Control - drafting is complete, and panel is ready for manufacturing.
8. Blown Fuse Indication Panel - panel is being manufactured at present and should be ready within one week.

(C. W. Watt)

Power Control - The power control system schematic has been completed except for finishing touches in the drafting room, and a panel to house the necessary relays, switches, and timers has been designed. This will be known as the Power Supplies Control Panel.

WWI Installation. All of the racks have been installed and painted. Certain needed accessories being procured by Sylvania have not yet arrived and are being held up by material shortages. Wiring and cabling cannot proceed very far until the overhead wireways arrive in about a week.

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1.22 Power Cabling

(H. S. Lee)

Gavitt Mfg. Co. has advised that delivery of the first lot of preformed cables will be made before 6 October.

The preformed cables for the arithmetic register driver racks are being fabricated in our shop.

A temporary power distribution system has been designed to expedite testing of the A-register and other registers that may be delivered prior to completion of the power cabling installation. Drawing SD-40157 delineates this temporary distribution system. This system will utilize some of the permanent cabling in addition to the temporary expedients.

1.23 Video Cabling

(C. W. Watt)

The specification on records and markings of WWI video cabling has been issued under number S7.504-3 instead of S7.509 as mentioned in the bi-weekly report of Sept. 17. This has been approved and distributed to the standards books.

1.25 Time Schedules

(R. A. Osborne)

All time schedules are being posted through September. Prints will be distributed to interested parties early next week.

1.3 Auxiliary Equipment

1.31 Power Supplies

(J. J. Gano)

Synchronous Motor Regulator. After overcoming difficulties due to gassiness in 6L6 tubes and high ripple in the error voltage, the regulator was set in operation in its breadboard assembly form. Over a twenty-four hour period, a recording meter showed a variation of less than one volt on the 115 volt supply. Without the regulator the variation is six to ten volts.

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1.31 Power Supplies (continued)

(H. R. Boyd)

I visited the Power Equipment Company on Tuesday, September 28. They have completed the construction of all five of the high-current thyatron supplies. The 150-volt supply is being installed now, the 250 volt supply is under test at PEC and will be received this week. The +120, +90, and -150 volt supplies will be tested and shipped this week. All five units should be installed and operating by October 15. The 48 volt relay supply will be finished this month while the two bias supplies are rescheduled for November 15. Additional information on these conferences is being written up in M-629.

(C. R. Wieser)

WWI Filament Power. Installation of the WWI filament alternator is being delayed because the drive motor has not yet been delivered. (Delivery has been promised for several dates now past.)

(L. J. Nardone)

Variable Voltage. Time and voltage measurements of transients in the variable-voltage supply, due to applying a step load of 2 amps, are being made. A decrease in the transient voltage and a faster response of the system must be obtained.

1.32 Air Conditioning

(J. C. Proctor)

The working drawings for the duct work has been completed and part of the equipment set up. The shop work on the ducts is nearly complete. The next two weeks should see the job well along, although completion will depend on installation of the air ducts on the cabinets by Sylvania.

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<u>WWI Drawing List</u>	<u>Block Diagram</u>	<u>Block Schematic</u>	<u>Circuit Schematic</u>
System	B-37071-5		
Control	B-37098-4		
Master Clock	B-37159-1		
101 Pulse Generator	A-37155-1	B-32385	E-32333-3
102 Program Counter	B-37062-4	B-32213-1	D-31516-4
103 Program Register	B-37067-2	B-39289-1	D-31276-8
104 Control Switch	B-37066-3	T60CS00-4-C	Z60CS00-A W60CS00-1-A Z60CS00-2-A
105 Operation Matrix		S600M00	Z600M00-1-C
Control-Pulse Output		R60CP00	S60CP00-1-B
106 Time-Pulse Distributor	B-37068-3	T60P000-8-B	
106 Time-Pulse Distributor Counter		T60P000-3-A	Y60P000-B
106 Time-Pulse Distributor Output		T60P000-4-A	Z60P000-1-A
109 Clock-Pulse Control	B-39817-1	C-32642	R-31916
110 Frequency Divider	A-37154-1	B-32264-1	R-31729-1
111 Synchronizer	---	---	---
112 Restorer-Pulse Generator	A-37160	B-32209-3	D-31909-6
200 Storage	C-37156-1		
201 Storage Switch	B-37121-1	B-32855 T60CS00-4-C	Z60CS00-A Z60CS00-2-A E-32830 R-32722
202 Toggle-Switch Storage	B-37123-2		E-32711 E-32721-1
203 Flip-Flop Storage Output	B-37060-4	B-32269	E-31635-3
203 Flip-Flop Storage Register	B-37057-4	B-32268	E-31621-3
203 Flip-Flop Storage Control	A-37061-5		

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<u>WVI Drawing List (Continued)</u>		<u>Block Diagram</u>	<u>Block Schematic</u>	<u>Circuit Schematic</u>
301	A-Register, Digits 1-15	B-37056-2	B-31211-3	D-31276-8
301	A-Register, Digit 0	B-37056-2 B-37072-7	B-31574	D-31573-2
302	Accumulator, Digits 1-14	B-37063-5	D-31213-3	R-31275-4
302	Accumulator, Digit 0	B-37096-5	D-32851	R-32850
302	Accumulator, Digit 0, Aux. Panel	B-37096-5	B-32492-2	D-32602
303	B-Register	B-37097-3 B-37069-3	B-31212-3	D-31277-4
304	Sign Control &			
308	Divide-Error Control		C-31576-2	E-31619-1
305	Step Counter	B-37074-5	D-31828-1	D-39764-1
305	Step Counter Output		A-32723-1	D-32735
306	Multiply &			
307	Shift Control		C-31532-3	E-31588-3
308	Divide Control		C-31552-2	R-31718-3
309	Special Add Memory & ACO Carry		C-31575-2	E-31632-1
310	Point-Off Control		C-31600-5	E-31717-3
403	In-Out Register	B-37119-2	B-32434-1	D-31277-4
404	Comparison Register	B-37120-2	B-32578	E-32576-1
601	Check Register	B-39816-2	B-32577	E-32576-1
	Bus Driver, Arithmetic Element		A-32297-1	D-31727-5
	Bus Driver, Flip-Flop Storage		A-32296-1	D-31726-5
	Register Driver, Type I		B-32207	E-32261-3
	Register Driver, Type II		A-32691	D-32690
	Fuse Indication Panel			W60P00-7-C
	Voltage Variation Panel			W60P00-6-B
	WVI Power-Connector Pin Connections			C-31955-4

## 2.0 WHIRLWIND I RESEARCH

### 2.1 Circuits

#### 2.11 Flip-Flop Design and Stability

(J. J. O'Brien)

The marginal checking scheme in which the screen voltage of one tube is raised is being investigated using aged 7AD7 tubes from the Five-Digit Multiplier. If one tube of FF-1 circuit has aged more than the other, the scheme works very well. However, with both tubes badly aged, it does not indicate so clearly.

With the supply of aged 7AD7 tubes the general effects of low plate current on FF-1 circuit are being studied.

#### 2.16 Basic Circuits

(A. K. Susakind)

A comparison of the revised trigger-tube circuit with the trigger-tube circuit used in WWI is being made. The gain of the two trigger-tube circuits is about the same for plate voltages of 150 and 250 volts. Whereas the loading effect of the revised trigger-tube circuit for a short pulse is mostly capacitive, that of the previous version is more complex and is currently being analyzed.

### 2.2 Components

#### 2.23 Vacuum Tube Studies

(H. B. Frost)

A study is being made of the effects of bad 7AD7's on operation of buffer amplifiers.

### 2.3 Systems

#### 2.31 Five-Digit Multiplier

(H. L. Ziegler)

Work is continuing on the marginal-checking alterations. In addition to these alterations, various changes in circuitry and physical layout are being made in order to improve the operation and appearance of the multiplier. Also,

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2.31 Five-Digit Multiplier (continued)

four read-out gates with suppressor control switches and a buffer amplifier have been added to each digit panel. These new circuits are part of an error detection system being developed by J. J. O'Brien.

Due to the addition of these circuit changes and installations to the original job of marginal-checking alterations, several more weeks will be required to complete the entire job.

(E. S. Rich)

The control panel and the filter panel for the marginal checking equipment are being constructed. It will probably require at least two weeks to complete the installation.

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### 3.0 SPECIAL CIRCUITS

#### 3.2 Test Equipment

(R.E. Hunt)

A coaxial switching panel has been designed that will switch any one of 16 input lines to one output to some line.

The switch utilizes 2 8-Button-Low capacity push button switches - so arranged that when any button is depressed, any other depressed button in the register is automatically released.

All lines are terminated through 91 ohms when not selected.

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5.0 CHECKING METHODS

(G. C. Sumner)

A report of progress made in the recent study of trouble location is virtually complete. It will be issued in the near future as a thesis report.