

Digital Computer Laboratory
Massachusetts Institute of Technology
Cambridge, Massachusetts

SUBJECT: VISIT TO BURROUGHS, PHILADELPHIA, ON DECEMBER 18, 1952

To: Test Equipment Committee, C. W. Watt

From: B. B. Paine and L. L. Sutro

Date: December 24, 1952

Abstract: We visited Burroughs to observe the first pulse units manufactured there on our third order for equipment; to clarify some matters concerning delivery schedules, components, and circuit changes; to make sure that all the information previously discussed with Control Instrument Company had reached Burroughs; and to get acquainted with the men who will be handling our order. Initial deliveries may be delayed, but the delivery of the entire order is expected before the date indicated in our original delivery schedule.

1.0 Production Arrangements for Third Order

Burroughs has set up manufacturing facilities for pulse control equipment on the third floor of a modern garage building on Vine Street in Philadelphia. Here we met Tom Briggs, the department manager, Joe Chedaker, the engineer in charge of our order, Jake Mayer, shop foreman, and others. Their shop employs about fifteen girls and several men. They said that their entire shop facilities are at our disposal.

They are now assembling

Gate Tube Panels
Flip Flops
Delay Line Panels

even though all the parts for any of these units have not yet arrived. The most critical items are the front panels which are being punched, engraved, and painted at Control Instrument Company. The panels are promised for December 29. If they don't arrive, Burroughs will start punching, engraving, and painting themselves. Burroughs has so far shipped ten Delay Line Panels made by Control Inst. Company.

We had understood that Control Instrument Company had ordered all the parts needed for the third order on the date the order was placed, namely October 16. We find that no parts have been ordered for the Rack Power Control, apparently because Control Instrument Company never completed the drawing showing our requested revisions. Burroughs is now ordering the parts. The assembled Rack Power Control units can reach us the first week in February at the earliest.

Burroughs had apparently received the erroneous information that we insist on silver plated hollow slotted turret lugs and they had purchased a number of these to use in the first units to be built. They have now arranged to have the same lugs hot-tin dipped for use in the remainder of this order.

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B. Paine examined the one complete sample unit and found, on the whole, that the workmanship and soldering were excellent. Due to government regulations, they have been able to buy only 50-50 solder, and this was evident in the sample unit. A letter has been written stating that we require 60-40 solder to be used on the order, and this letter should enable them to apply our contract number on the purchase of this solder.

We inquired about the possibility of installing dial locks on each of the panel dials in all the units using dials. They said they would certainly punch the panels to enable us to install the locks, and if delivery of the locks came within our time schedule they could install them too. They will quote on the cost of this.

Burroughs is awaiting instructions from us on how to ship. We directed them to send the first ten units by air freight. They left Friday, December 12, and arrived here Tuesday, December 16 at 12:00 noon. The advisability of shipping the entire order by air freight was questioned.

The following table presents a shipping schedule for the third order which Burroughs plans definitely to meet. This differs from the schedule which we included in our purchase order in that the shipment promised then for December 30 is missed. However, complete delivery is here promised for March 9 instead of March 14 in the earlier schedule.

	<u>Units</u>	<u>Shipping Dates</u>				
		Jan. 12	Jan. 26	Feb. 9	Feb. 23	Mar. 9
1001-BW	MV Pulse Generators	10	19	---	---	---
1002-AW	HF Pulse Generators	10	7	---	---	---
1003-AW	Gas Tube Pulse Generators	---	---	18	18	---
1103-AW	Flip-Flops	40	---	40	11	11
1201-AW	Gate Tube Panel	40	---	40	16	16
1202-AW	Crystal Gate Panel	---	---	28	---	---
1301-BW	Gate and Delayed-Pulse Gen.	---	---	---	25	25
1302-AW	Delay Line Panel	20	15	---	---	---
1402-AW	Gate Channel Selector	---	---	---	20	10
1501-AW	Pulse Gaters	---	---	---	---	17
1601-AW	Mixers	---	---	22	22	---
7202-AW	Rack Power Control Units	---	---	---	---	39
TOTALS		120	41	148	112	118

Ten 1302-AW Delay Line Panels have already been shipped to us and received here.

2.0 Component History in Pulse Units already Received

A question was raised with Harry Kenosian, Tom Briggs, and Joe Chedaker about G. E. Switchette used in the 1003-AW Gate Tube Pulse Generator which has been found to short the grid of a tube to the +250 volt supply occasionally when operated. It was agreed that this switch was unsatisfactory for units to be built in the future and that Burroughs would attempt to find a substitute.

The Burroughs engineers wondered why we insisted on Sylvania glass-sealed crystals. We told them of our experience with tap shorts, open circuits, and other difficulties with the Raytheon crystals used on our first order. The Sylvania crystals will continue to be used exclusively on our order except in the 1601A crystal mixer box where there are space limitations. We previously agreed to the use of Raytheon crystals in this unit. The possibility of using Hughes diodes in this unit was also tentatively proposed by Burroughs.

The 3:1 pulse transformer to be used in the third order will be the Hipersil transformer made by Radio Music Corporation, Burroughs' type PT-10. The 1:1 transformer will be a ferrite model manufactured by Technitrol, identical electrically with the old Burroughs' type PT-7 ferrite transformer. Both of the old Burroughs' ferrite transformers have proved to be mechanically unreliable, since several of them have developed open windings either in shipment or in the course of normal handling. Both of the new transformers mentioned have better mechanical construction and should be reliable.

3.0 Proposals for Later Orders

Harry Kenosian, Tom Briggs, and Joe Chedaker talked with us for more than an hour about improvements that could be made to Burroughs units and about new types they are ready to sell us.

In all the Burroughs units that they are making for their own laboratory they are replacing the types 7AD7 and 6AG7 tubes with the computer version of the 6CL6. We have reported this to Bonnell Frost who says that the 6CL6 is definitely better than the 6AG7 in a normally-off Pulse Amplifier, but there is some question about its service in a RLC peaker. Frost will ask Burroughs for life data on the 6CL6 before giving an opinion on its use in all the circuits in which Burroughs is now using it. Kenosian says that use of the 6CL6 requires no circuit changes.

Kenosian showed us two new units. The type 1004A is a Multivibrator Pulse Generator similar to type 1001-BW that we are buying now, to which has been added a SPDT switch, a gas tube, and a push button so that pulses may be obtained either at the frequency determined by the Multivibrator or by push button. The type 2001A Binary Register combines features of both a Flip-Flop and a Gate Tube Panel. They have promised to send us a circuit schematic and quotation within a week.

Burroughs is interested in making core drivers such as our Model 5 and Model 6. They have asked for drawings on which to quote. J. Chedaker says that production of these could be concurrent with present production for the third order. Since our decision whether to order core drivers from them is likely to be based on comparative costs we have asked Floyd Manning to estimate the cost of making Model 5 or Model 6 Core Drivers in our shop on the basis of \$3.50 per man-hour. He estimates \$60.00 for fabrication. If parts cost \$40.00, total cost is \$100.00

Kenosian was interested in our efforts to reduce the number of voltages in our Power Supply. He agrees with us in our effort to dispense with +120 volts. He recommends that we then replace +90 volts by +105 volts and use voltage dividers wherever +90 volts is needed.

We have needed to order another Type 9101A Power Supply to meet Steve Dodd's request for two. While two have come in, one will be permanently needed for testing plug-ins. Chedaker reports that Power Equipment Company has procured parts for eight more and will soon assemble them. If we order one of these now it can be built to produce all of our standard voltages except +120 volts, following the circuit modifications worked out by Bob Paddock. To add a +120 supply would require a major redesign. To the two Type 9101A's we have received we have added P-1's to supply +120 volts.

Since several engineers in our laboratory have admired the chassis used in Burroughs equipment for use in bread-board assemblies we inquired if such a chassis could be obtained from them. They said yes and in a later tour of their laboratory they showed us many bread-boards using this chassis. They said that the extruded aluminum channel could be easily punched for tube sockets. In a recent comparison of costs they found that this chassis is only a little more expensive than one bent up from sheet steel. If engineers are interested in obtaining some of these chassis we will ask for a quotation.

4.0 Component and Assembly Inspection Procedures to be Followed on the Third Order

Frank Virgadamo and B. Paine discussed Burroughs' plans for testing the components to go into our units and for inspecting the final assemblies. The necessity of 100% testing of resistors and capacitors seemed doubtful to Virgadamo, but we will insist that they continue to do it. Crystal diodes will always be 100% tested, to our specifications where applicable. Final plans for inspecting the assemblies have not been made since Virgadamo has as yet engaged no inspectors. He plans to do much the same sort of inspection as was done by Control Instrument Company. Bob Hayworth, who was loaned by Burroughs to Control Instrument Company to supervise video testing of the second order, will be working on the video testing in Philadelphia.

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It may be wise for us to visit Burroughs again when production quantities are coming off the assembly line in order to discuss further the inspection procedures and to eliminate the necessity for excessive inspection here.

Signed BBPaine
(B. B. Paine)

L. L. Sutro (BSP)
(L. L. Sutro)

Approved C. W. Watt
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