[[NB10-001]]

10
9/5/52 to 9/9/52

[[NB10-002]]

[[jottings]]

[[diagram]]

Edsac Mark II

Maint & Serviceability
Parallel - repetition of units

Arith   Register
     ACC [[Accumulator]]
     ADDER   (subtracter)

Interpretive Subroutines (built in)

Acc   Double length
Multiplicand
Multiplier
Shifting by transferring from one register to another & reverse

[[NB10-003]]

[[diagram]]

Control
[[E?]] SCT   --> coince [[coincidence]] unit
s   Order
9   Adder   subtracter
N   ?
       ?
control identical with arithmetic unit

Sequences

decoding tree   Matrix A   Matrix B

        [[diagram]]

             To gate   Next address
             of Computer

                  two way switch operated
                  by Accumulator Sign

[[NB10-004]]

Programming

[[diagram]]

Number out of store

```
0 | 0 -> D     | |          | |1 |   |
1 | D - C -> B | |          | |2 |   |
2 | Store -> D | |          | |  |   |
3 | D - B -> C | |          | |  |   |

0 |            | |+ 1 - G   | |1 |   |
1 | C -> B     | |E -> H    |E|2 |   |
0 | B -> C (R) | |H - G -> E |  |1 | 12 |
1 |            | |          | |  |   |
2 |            | |          | |  |   |
3 |            | |          | |  |   |
```

E ---- coince unit
F ---- SCR

C ---- Acc
A ---- Mic [[Multiplicand]]

	Arith	Store	Control	Coord?		
0			F -> E & H		1	
1		0	-1 -> G		2	
2			H - G -> E		3	
3			St -> F		4	
4		(C)	E -> H		5	
			F -> E		6	
			H - G -> F		7	
			St -> H		8	
			H -> Dec		-	
H T 9	C -> Store			(I)		
S U 10	C -> Store			(O)		
11						
12						
13						
14						
15						
16						

Timing of Micro orders
4 microsecond per micro order

      244
      243
      193
      198

[[NB10-005]]

9-5-52
Colloquium at Cambridge
Stringer on control arrangement of EDSAC II
I found Stringers talk almost unintelligible but some of the questioning afterwards clarified my ideas somewhat.
The principle of microprogramming seems to be that the wiring up of a diode matrix which itself is quite a small part of the machine determines the nature of the machine.
The machine proper consists of a number of registers connected by means of gates to common input and output buses. Some of these registers are permanently connected to certain other units of the machine such as adding or subtracting circuits and coincidence seeking circuits but for the most part any register can be used for any purpose.
The control of the gates in the circuit is determined by the wiring of the matrix mentioned before under the control of the digits in one register which through a decoding tree selects one line of the matrix.
The main theme of the colloquium (although I did not appreciate this at the time) was to show how particular

[[NB10-006]]

wiring of the matrix [[begin strikeout]] worked in a [[end strikeout]] caused the control to operate in sequence.

[[diagram]]

[[COMMENT (JD): see JMMP's notes from this meeting at http://www.computinghistory.org.uk/det/63079/63079-Logical-Design-of-EDSAC-II-with-special-reference-to-Micro-programming/]]

[[NB10-007]]

[[diagram]]

        Jobs
Battery 1
Valve Grading
Valve Tester
Storage Units & Tubes
Fault Analysis
Test for Counter tank out of step
Slowspeed timebase for the Cossor Scope [[COMMENT (JD): A.C. Cossor Ltd. was a British electronics company founded in 1859.]]

[[NB10-008]]

6-6-52

Ever since the machine [[begin strikeout]] was [[end strikeout]] started working regularly it has been known that the plugging in and unplugging of units from power supplies has been [[begin strikeout]] likely and [[end strikeout]] almost certain to cause the counter to go out of step and thus [[begin strikeout]] ruin the [[end strikeout]] spoil the contents of the store.
Now it is almost certain that this is due to a disturbance on one of the DC lines and as [[begin strikeout]] almost [[end strikeout]] every unit causes this [[begin strikeout]] same [[end strikeout]] effect it is most likely to be due to [[begin strikeout]] the [[end strikeout]] a disturbance of the Unstabilised HT supply.
[[begin strikeout]] Now this effect could cause [[end strikeout]]
The most likely circuits to be disturbed by such a disturbance are
        (a) Clock Pulse Generator
        (b) Frequency Control Unit
        (c) Counter Tank Half Adder
        (d) Counter Tank Storage Unit
If it were possible to isolate the offending unit from such disturbance a great advantage would be achieved in that during

test programmes units could be plugged in and out for modification without fear of losing the test programme in the store.
It appears that there might be a simple course open to us. i.e. if it were found to be due simply to extra 1's in the counter tank due to disturbance of

[[NB10-009]]

the unstabilised HT supply to the panel1 then if this unit had its plug connected so that it draws its HT from the stabilised supply the trouble may be avoided.
Alternatively an independent supply might be provided for the sensitive unit.

6-6-52

        Slow speed timebase

This is required as a piece of auxiliary equipment to use with a Cossor Oscilloscope to enable work to be done with Gas tube circuits and tape machines and other slow speed equipment. The lowest speed of the Cossor is probably about 100 cycles where as it is desirable to see the whole of a teleprinter character which takes 1/7 second. i.e. a timebase is required which will give a continuous range of speeds from 100 c/s down to 2 c/s [[c/s cycles per second]]

[[NB10-010]]

It will also be desirable to be able to trigger this timebase from a positive pulse.

        Testing of tubes

Wide Band amplifier to have incorporated in it the arial switch and a standard oscillator & Modulator

[[diagram]]

[[diagram]]

10-6-52

For some weeks now a cloud has been hanging over Leo.
The store has been breaking up. Faults due to extra 1's and the dropping of digits have been increasing in number and at last we have been forced to give the problem greater priority and I am at present investigating Battery No 1 which has been the latest cause of serious trouble although

[[NB10-011]]

Batteries 2 & 4 are having tubes rejected regularly now so that there is a great danger that there will be a serious situation unless a quick solution to the trouble is found.
A temporary solution is known at present. This is to remove the mercury and repeat the fitting process i.e. alcohol first and then Hg [[mercury]] unfortunately all tubes do not respond satisfactorily to this treatment for more than a day or two so that failing a solution to the problem we may be forced to the ludicrous position of refitting batteries daily in order to keep sufficient tubes available.
Today the experiment of refitting without going through the alcohol stage. This proved a failure. The pulses produced from the refilled tank were worse than before whereas by emptying and refitting with alcohol a distinct improvement in shape and phase was obtained.
In view of the fact that the failure of these tubes in a process which takes several days, and as [[begin strikeout]] some [[end strikeout]] not all of the tubes are affected in the same way it seems most likely that the effect is due to movement

[[NB10-012]]

of the alcohol.
There are two ways in which the alcohol can move.
    (a) it may be displaced by the mercury and emerge from the filler hole where it will evaporate.
    (b) it may escape into crevices between the crystal and rubber washers and be lost to the atmosphere.

(a) might be expected to be a quick process but (b) [[begin strikeout]] might [[end strikeout]] if it happened might take some days depending on the tightness of the rubber washer seals.
If one assumes that b is happening and is the cause of the trouble then there seems to be two ways of dealing with it.
    (a) the limits on the crystal assemblies can be changed to give more compression of [[begin strikeout]] crystals [[end strikeout]] washers. This entails remaking parts and certainly dismantling the battery.
    (b) use a different wetting agent which would be less likely to creep and which would not evaporate.

[[NB10-013]]

[[diagram]]

    35 / 5
    £10

Further work has been done on delay lines including the resurrection of tube No 13 in No 1 battery (previously almost completely dead). This has now been turned into the best tube in the battery by emptying and refilling using Glycerine as the wetting agent. The question now is whether glycerine is likely to affect the rubber washers.
It took a full day for No 13 to settle down after filling using glycerine and if this gives any measure of the time it will

[[NB10-014]]

take for it to fail, then this should guarantee a life of some months, as with alcohol the tubes were useable immediately on filling.
We have obtained a dictophone for an experiment in getting fault sheets typed directly. I had an opportunity to try it out this evening. P2 and P3 were worked through almost without a hitch. Almost - but I did have a new type of fault. The machine stopped on a zero order but on relating the SCT [[Sequence Control Tank]] to the OT [[Order Tank]] there was no logical [[reasoning?]] to explain the contents of the latter.
According to the SCT there was a perfectly good ref to Tank 16 compartment 8 and at this address was a perfectly good subtract order.
I assumed a simple lapse - reset W13 and pressed on. Luck was with me and the job was completed.

[[NB10-015]]

    Maintenance

Fault Finding
Marginal Tests
Maintenance

Additional Engineer Electronic
Additional Engineer Mechanical
Additional Assistant Valve Check

Control Reconverter
(Valve Control Gas Tube)

Gibbs re PE reader

Reperforator
Tests on reader to see what tolerance is permissible on sprocket holes.

[[NB10-016]]

Destination Switching

Relays
A   B
Box loaded
Machine [[Alternating?]]
Machine in use
Tail required (common)
Tail Finished
Job End Used Box (Green flick)
Unused Box   (Amber Flick)

Lamps

Green   Load new box
Red   Box on
Green Flicker Change Box
Amber Flicker Empty Box not used
Amber steady No box required

Control of record solenoids

[[diagram]]

Another talk on destination switch by TRT at the end of next week.
Notes in preparation for same

[[NB10-017]]

14-6-52

Next week we start doing regular tests on the reconverter. It is believed that fundamentally the circuitry is sound, and the remaining shortcomings are probably due to gas tubes.
I am going to work with Smith on this part of the gear with a view to getting some first hand experience on the starting up and maintaining the equipment. Some alarm is felt at the amount of swapping around of tubes which has been done up to this point and I propose to instal a control on tube movements as soon as possible.
JMMP is getting in touch with STL [[STC Labs]] on the subject of testing these valves and I feel that this point will be forced to an issue so that some sort of tester will be available before long.
Work with Smith on the reconverter will clash with the work I wish to do on the battery 2 but the reconverter must come first unless the storage problem becomes acute again.
Shaw's work next week will have to be divided between machine faults, Reconverter tests and extension of the store.

[[NB10-018]]

16-6-52

A start made on cooperation between STC and LEO in that I now know how to switch on and (possibly) the things to

look for when things don't go quite right.

There is still an alarming amount of switching around of gas tubes and one of the first things I will have done is a record made of the [[begin strikeout]] number of [[end strikeout]] positions of valves and their numbers.

From then on all movement and failure of valves will have to be recorded.

Tomorrow I must get Miss Hills to record the position of valves on the forms she has already produced.

I have not been able to get a reproduction of the breakthrough spikes which were the cause of tank 1 in battery 2 being rejected last week. The effect was marked [[begin strikeout]] when the [[end strikeout]] with a panel 1 which had been modified for RF Gain Control, so that possibly it was a combination of two effects. Fortunately it will soon be possible to make the test with a modified panel 1 as one of these was rejected today from service on the machine.

This morning there were a whole series of faults on the machine which piled up one on the other.

[[NB10-019]]

(a) CCU1 Fuse
(b) Tape torn
(c) Panel 1 US
(d) [[begin strikeout]] Counter [[end strikeout]] Digit pulse generator

Time on the machine is required for
(a) Mod to Control Desk EHT unit
(b) Programme Trials P4
(d) Photoelectro reader

18-6-52

Diode Tester tried out. Have had considerable difficulty in providing the desired low voltage DC to operate the vibrator and relay.

I had fondly assumed that half wave rectification of the 6.3 [[COMMENT (JD): 6.3 is the voltage for valve "heaters"]] would have supplied the necessary voltage but the drain of several hundred milliamps is too much for this. For the time being I have used the 50 volt supply and with this good results are obtained for diode characteristics.

The special arrangement for testing rectifiers & back voltage

[[NB10-020]]

characteristics of rectifiers has failed due to 50 cycle phase displacement at one end of the test voltage winding. This produced a loop on the screen instead of a line and could be removed by using a test voltage from the old transformer.

It seems that a solution would be to have a screen between the test voltage winding and all other windings but if we have to provide a rewind then it would be as well to provide a 20 volt winding for a more adequate relay supply voltage.

[[diagram]]

Before doing this two things could be tried
(a) series resistances in test voltage
(b) capacity to earth from both sides of test winding
[[COMMENT (JD): see diagram above - these points in red]]

[[NB10-021]]

The photoelectric reader has been tried out again today and found wanting. The reversed digit is not reversing completely which may be due to lack of light in that position.

[[diagram]]

[[diagram]]

[[NB10-022]]

Reconversion
Complete

[[diagram with text]]

Pulse 2 & 3 for Destination

[[diagram]]

[[NB10-023]]

[[diagram]]

Use [[begin strikeout]] flip [[end strikeout]] Multivibrator for switch relay instead of vibrator.

[[diagram]]

[[diagram]]

[[NB10-024]]

20-6-52

Progress

Diode tester

P E Reader   Plug
           Vibration

Two bad days - faults due to
(a) Faulty Clock Pulse Generator
(b) Dry Joints in two static registers
(c) Intermittent short on digit pulse due to crock lead [[COMMENT (JD): looks like clock overwritten by crock - crocodile clip leads were use by engineers to make temporary connections using the spring clips that represent a crocodile's jaws]]
(d) Dry Joint in Coincidence Unit
These seemed to cause all manner of peculiarities.
The point now arises - how much of the trouble would have been avoided by the proposed maintenance schemes.
Regular unit changes & overhauls would have accounted for a, b & d - and a regular morning inspection of

[[NB10-025]]

leads clipped onto racks would have disposed of c

Work for Monday -

Before any tests are put on make comparison tests of pulses in glycerin [[filled? fitted?]] tank. To do this really thoroughly the whole of battery 2 ought to be checked as at present the tests can only be comparative.
I have advocated that until we have sufficient evidence to show that glycerin is the answer to our problem, a regular

check should be made on pulses in all tanks of the store. The problem is how to do these quickly.
The Wide band amplifier should be fitted with a standard modulator and oscillator so that if a digit pulse is applied to the input terminal a normal output into 70 ohm co-ax is available. This should be fed to the delay line in question and the output from the delay line fed into the present wideband amplifier. The problem remains on how to check the phasing of the amplified pulse. This could be done by putting a fixed delay in the

[[NB10-026]]

[[diagram]]

wideband amplifier which would simulate the normal delay in a panel 1 between the RF input and the unclocked pulse position. In this way a comparison could be made using a double beam oscilloscope between the Digit pulse input and the delayed amplifier output.
This calls for a particularly good fixed delay which will not introduce any appreciable distortion.
Also the gain of the amplifier is required to be calibrated.

[[NB10-027]]

[[diagram]]

[[diagram]]

number occupies 1/4 of normal time
access time is still the same
[[COMMENT (JD): are these early thoughts on interleaving the bits in store as used to improve speed in Leo II?]]

[[diagram]]

Mr Fredericks
        Fault sheet
        Search onStore
                Arithmetic
Mod to Wide band amplifier

[[NB10-028]]

    Maintenance Report

Delay Lines   no further trouble

Calculator Circuits
    Work with Photoelectric Reader has shown up deficiencies in Coordinator which have now been corrected.

Mechanical Units
    Modified reader 2 suspected of faults

Converter
    Now running with two tape machines. Faults occurring on both annex and converter must be cleared before daily tests can be started.

Reconverter and Compositor
    Out of service for modification to output registers

Tape Machines

General

Annexes
      Valve saving circuits

Test Equipment
      Three oscilloscopes have developed minor faults which have been corrected.

Diode Tester
      now in use but requires some further development

Valves
      Diodes in Coordinator being tested. 4 units out of [[gap]] completed
Furthe valve testing awaiting more effort

[[NB10-029]]

      Fault Sheet Analysis

x Fault sheets have been edited and a preliminary analysis prepared.

      Collator

Fault developed in Pulse generator circuit. Maintenance done by Mr Cotteral of STC - screen resistance gone low causing valve to overheat. Otherwise in daily use.

30-6-52

Fault on Converter
Fault on MS ST1   x 1
Spare valves for Collator & Converter
Spare Gas tubes -
Valve grading - put into operation
Reconverter circuits
Mark II Computer   [[COMMENT (JD): early thoughts on Leo II?]]
Valve tester Diodes   Design
Valve Tester Other Valves   Design
Wide Band Amplifier Design
Slowspeed timebase for Cossor
Marginal Tests
Maintenance schedule
Double Store
? Assistance on STC equipment

[[NB10-030]]

      Mark II Computer

An adder in a computer working in mixed binary decimal needs to deal with 4 inputs.
      1. Input a
      2. Input b
      3. Binary Carry
      4. excess 6   [[COMMENT (JD): a foretaste of C, the excess constants register on Leo III that permitted decimal

/ sterling arithmetic?]]
It must therefore have three outputs
     (a) total
     (b) carry to next digit
     (c) carry to next but one digit
I think it is probably true that the input for the carry need only provide for 1 digit to be added but this must be proved.

     Teleprinters (Switching)
Transmitters   single case
Receiving   (No Keyboard double case sprocket feed)
(No time cut out)
All space is non space non print.

  , . Z Po Ins' Remve)(Alarm/

  : 0 3 6 9   -   S

  L == 1 4 7   10   *

  LF CR 2 5 8   11   +   X
                             |
                             v

[[COMMENT (JD): == (above) represents 3 horizontal lines stacked vertically]]

  Converter counter to zero
  Annex clear

Position of cancellation character
Can ordinary paper be used on sprocket carriage
What [[begin strikeout]] does [[end strikeout]] is start S to do on Teleprinter
Alarm at end of box

[[NB10-031]]

Receiver does not print == but give space [[== see page 30]]
    Half Adder - Subtracter

[[diagram]]

1011
0111

0100

[[diagram]]

3-7-52

Maintenance of machine
    Directly responsible to TRT
STC equipment Gibbs
Assistance ? Harker
Shaw on holiday Friday

[[diagram]]

[[NB10-032]]

Immediate Problems

      Maintenance of Machine
      Reconverter
      Converter
      Collater
      Doubling store

Faults exaggerated by development
      PE reader Failing or Not Failing
(case where both readers were failing on different faults
      Reader 2 maintenance

Outstanding shortcomings in Annexe   Shaw

      Valves   200 -

[[NB10-033]]

Order hard valves for Converter and Collater
List of circuits for consideration in annex
Eliminate extra sign digit

Programme for next week
1. Reconverter tests
2. Store extension
3. Converter Test if possible.
4. Valve Grading
5. Design of Wide Band Amplifier [[Gates?]]
6. Photo electric reader out for mod
7. Change Decoders
8. JMMP to phone WJE [[COMMENT (JD): WJ Edwards was responsible for the electrical department at Cadby Hall see Peter Bird pp 33,42]]
9. Order Hard Valves for STC equipment

      Long term
Shaw & X on machine
Fault finding technique
Diode Tester Design
Time base for Oscilloscope
Maintenance Schedule
Marginal testing
Valve Tester Design

[[NB10-034]]

Investigate the possibility of a code which would permit a simpler form of arithmetic unit in Binary Decimal Arithmetic

[[diagram]]

[[jottings]]

5-7-52

More trouble on machine. This time apparently due to failure of multiplication although this has not been conclusively proven.

The trouble with this fault is that it seems difficult to reproduce the effect definitely without all the complication of P2 and its miles of tapes and programmes.

Investigations have been made into the waveforms and pulses resulting from the failing programme but there is very little to see.

One effect noticed was that

[[NB10-035]]

the W2 - waveform was hitting the 30v & 10v line on the Multiplicand Shifting Unit very badly and would be better if it were 25 volts instead of 33 with a negative zero restorer.

The fact that clipping a scope onto some of these waveforms occasionally stops the machine with W2 set is a little disturbing as the circuits show that the worst should be incorrect results.

Tomorrow (Monday) I propose that if M5 does not show cause of trouble other tapes D7 D5 and the like are put on in the hope that the same fault may manifest itself in a different form.

The fact that this type of fault causes a loss of time while the programmers try to determine the nature of the fault is one to be considered very seriously.

It is true that the programmer mind may be able to diagnose from results the nature of the fault and may then require to confirm his findings by checking the store or running the programme again, but this nearly always leads to a search lasting for [[begin strikeout]] some [[end strikeout]] an hour or so and the number of faults found in

[[NB10-036]]

this way which could not have been found more quickly in other ways is very small.

The present fault is reputed to be that a multiplier has been set up, and the next multiplication order (next order in sequence) fails to produce a result in the store position to which it is transferred

21
31   but a second multiplication
 6
 5   with the same multiplier
31   is performed correctly.
 6
 5   This could be the result

of quite a number of effects and the amount of work which was done on the multiplication order was mainly due to the fact that the control circuits of multiplication had been giving trouble. I suppose it is just possible that during the search for this particular trouble on Friday night JMMP may have made some alteration which while it did not cure the multiplication control fault, may have introduces this second fault.

One possibility that I had not thought of before is that the clearing waveform of the multiplicand which would happen during the setting up order may not be resetting

[[NB10-037]]

in time to let the multiplicand go into the multiplicand tank.

[[diagram]]

[[diagram]]

[[diagram]]

[[diagram]]

[[NB10-038]]

7-7-52

It seems that we may have at last got onto the tail of our present trouble.
A modified P2 programme is at present going in and producing reasonable results after nearly the whole day spent chasing hares.
A modified programme is being used because Caminer thought that his mod would get round the fault. It didn't but a short [['11' ?]] programme after a lot of trouble was made to produce the same kind of fault by reducing the gain on the TCT.

[[COMMENT (JD): Clearly Lenaerts had a term - "11" - for little programs like this. I remember them as "frig" programs on Leo II and III. Mary Coombs, Leo I programmer, remembers "that when we were having problems debugging programmes or helping the engineers find faults on the computer we would often spend hours sitting at the control panel inputting little sequences of instructions by hand, especially when we were pretty sure it was a computer fault because it was intermittent."]]

A new tank had been connected to this on Saturday morning.
The trouble now is to show why and how a high gain in the TCT could have produced this failure of multiplication.
I suppose that under certain circumstances it was possible that an extra pulse got into the TCT which would have played havoc with the length of the W2+- waveform.
I have left JMMP and Kaye to carry on this evening but

[[NB10-039]]

if all goes well I will have P2 done again tomorrow so that the effect can be demonstrated more definitely
1. How can future faults of this kind be prevented?
2. Why did none of the test programmes show up the fault
3. Would marginal tests show up the effect.

Answers (?)
1. by marginal checking
2. Because the precise conditions of operating were not set up and a test programme has not been constructed as yet which will knowingly reproduce the most exacting conditions for any test.
3. Marginal checks would not have shown it up if they consisted merely of reducing the amplitude of the pulses applied to units. On the other hand if marginal tests included the increasing and lowering of amplitudes then the fault might well have been found.

[[NB10-040]]

    Photoelectric readers
There are several shortcomings of the PE reader as it exists

1. failure of PE cells
2. Dust on glass
3. Vibration of structure affecting light falling on PE Cells
4. Possibility of particles between light source and tape.

For the machine as it is I think development of a HS [[High Speed?]] mechanical device using contact, capacity, to indicate the 1's might be a better avenue to explore.

If however the idea is to develop possibilities with a view to future PE reading of documents then two other points might be considered. [[COMMENT (JD): what would become the Lector document reader]]

(a) Reading marks on paper in metal base ink or graphite by measurement of resistance.

(b) PE reading by reflected rather than transmitted light. This would reduce the size of the reader and reduce effect of particles.

[[NB10-041]]

Maintenance

Diodes -->
Valve Tests
Inspection of units
        <--

Flip Flop sensitivity deferred

Monday Tuesday   Dutton Crowhurst

Short tanks change
        with
Readers stiff wires
& clamped flex wire

Relays reader 6 months
        Clements [[Arthur Clements]]

Pulse wires on units

        Discussion on Maint

Diodes [[Processed? Procedure?]]
Other Valves - same procedure
Inspection of units - sound Dutton & Crowhurst on late work.
Change short tanks and test old ones.
Readers. Install stiff wires to overcome breakages
Relays - Inspect during general maintenance of units and during normal reader maintenance. Query what about starter
Pulse wire on units
        Remove sleeves

[[NB10-042]]

8-7-52

We are by no means out of the wood on this multiplication fault.
Earlier it was found that a large spike was present on the input and output gating waveforms applied to tank 7 and this was welcomed as the cause of all the trouble.
(a) it explained the differences by 1 of some of the results as it could have added a D1 pulse into tanks 7 15 23 & 31
(b) after a long debate it was shown that it would have explained the multiplier fault as a 1 could have been gated out of the store while the C5 waveform was up thus producing a new 0Do which would have played havoc with the W2+-waveform
[[begin strikeout]] on second tho [[end strikeout]]

This spike is caused by the lengthening of the tank SR waveforms as a result of the extra capacity of the new store connections.
On second thoughts the spike could not be the cause of the multiplication fault as the Tank SR's are reset

[[NB10-043]]

9-7-52

Why should W2 stick up?
(a) Failure of reset pulse.
(b) set and reset at same time
(c) closing down of C5 when W2 is set
(d) Oversensitive ff [[flipflop]] (set)
(e) Undersensitive ff (reset)

Failure of reset pulse could be caused by
1 bad tank or panel 1
2 Fault on input gate of TCTSU
3 Dry Joint

Both (b) and (c) could be caused by an unauthorised pulse being put into the TCT. This could be due in turn to a new 0Do being produced or to spikes arising in TCT.

Check up on short tanks
Change Diodes in one unit
Replace valve in storage unit
?Control Desk buttons

[[NB10-044]]

Procedure During Fault Finding

In view of the obvious differences of opinion as to [[begin strikeout]] how [[end strikeout]] the exact procedure to be adopted during periods when the machine is faulty, it is desirable to have a [[begin strikeout]] more [[end strikeout]] wider acceptance of the generally agreed policy that the engineer in charge of machine should decide what is to be done next.
It is natural for programmers to consider it their duty to show the precise way in which the machine fails.
It is natural for all concerned to express an interest in what progress has been made.
It is natural for JMMP, Kaye and TRT to have their own ideas as to how the job should be tackled but when all these things merge to [[begin strikeout]] prevent me from doing what [[end strikeout]] cause interruption to progress of fault finding inevitably tempers become short and the work suffers.

I want
(a) no interruptions even well meant ones while faults are being traced.
(b) Report to be made (once only please) at dinner time and at night (available following morning) when machine is US.

[[NB10-045]]

Distractions during fault finding

Too many people want full report.
Suggest Quarantine. with Bulletins issued twice daily
Direction in hands of one person
Cooperation of Programmers

one person who knows the effect to be available at request of engineer in charge
Programming effort on breaking down programme to give shorter loops for test purposes

Miss Mills to Use Board for notices:-
(a) Unit out for inspection and valve check
(b) Modification (temporary)

Valves, diodes are dying fast what policy do we adopt

Tank 17 clear gate.

[[NB10-046]]

I have carried out a mod on LC27 making end of coincidence start the multiply sequence and so far as has been tested this gets round the fault on P2 which has been dogging our steps for nearly two weeks.
Unfortunately this doesn't explain the whole trouble and it may be that the cause will become troublesome in another respect if it gets worse. For this reason it would be desirable to find the cause of the trouble and eliminate it at the source.
This might be possible if more time were available for this sort of work. As it is, the demands for tests with the reconverter, and the converter and the extended store, not to mention the PE Reader which itself causes more trouble than any other reader we have had - all these call for machine time which makes life difficult.

[[NB10-047]]

I put my case for isolation to TRT today and he is apparently with me.
As an experiment we are to have a signalling system consisting of the three lights Green Amber & Red :-

Green   Serviceable

Green and Amber   Conditionally serviceable - this may cover times when machine is being used on a job although a fault is known to exist.

Amber   Machine faulty but not considered dangerously so

Amber Red   Fault Finding please do not disturb

Red   Completely out of service. Do not disturb except under extremely urgent circumstances.

The responsibility for deciding what course to adopt when there is a choice of actions has been left for me. I have decided to interpret this as widely as possible so that any decision to spend considerable time on a particular fault is mine to take even if it means interfering with normal converter reconverter tests.
TRT is anxious to

[[NB10-048]]

become more familiar with the logic used in fault tracing and has asked for a few notes on the subject.
I have explained that there are normally three immediate indications of machine failure.
(a) Stops
(b) Loop
(c) Wrong Results
The first two are by far the simplest to consider but the last is generally more common and much more difficult to follow up.

16-7-52

Loads more trouble on computer

Multiplication (Multiplicand start)
PE Reader
AC flip flop W3
AC flip flop W5
Coordinator open circuit anode load
Readers (mechanical)
Work with Reconverter
Work with Converter (Faults)
Control desk button
Store faults
Decoder breakthrough

[[NB10-049]]

Preparation for my holiday
Work on circuit diagrammes

[[diagram]]

[[NB10-050]]

Progress Meeting

Serviceability of the machine remains very poor
Indications are :- general decline in valves and possibly some changes in component value is only tripping our attempt at preventative maintenance.
Valves very short awaiting delivery
No diodes
No [[aged ?]] pentodes
Prospects depend on attitude to faults   1. Immediate
(a) We concentrate on just keeping serviceable in which case we must be prepared for faulty results on some jobs
(b) We trace each fault to its conclusion and consequently allocate more time to fault finding and less to productive work, development and demonstrations.

[[NB10-051]]

M5 St1   Storage Unit   Tank 5
     48 hrs   Decoupling
PE Reader
Multiplication Starting up
Reader
[[begin strikeout]] Clock Pulse gen [[end strikeout]] Frequency Control
Store
Counter Tank
Valve Changing AC77
AC 77
[[GC ? CC ?]] Resistance

Written program & report for inspection and maintenance

Dutton
Clements

[[NB10-052]]

Progress

Porter
Girl Valve Tester (Part time?)
Mechanic(2 & 5)
Mann

Take down Battery 4 & experiment with length

W3 during Left and Right Shift

Monday Afternoon Evening
    Multiplication fault
    Reconverter Programme Trials
Tuesday Morning
    Converter test
Tuesday Afternoon
    PE Reader
    Double Store
Wednesday Morning
    Double Store
Wednesday Afternoon
    P1
Thursday Morning
    Converter
    Programme Trials
Thursday Afternoon
    P2 P3
Friday
    Double Store.

[[NB10-053]]

Programme of work for Machine W\E

              AM   PM
Monday   Reconverter   Converter Unit
        Right Shift   OJ1 &
        OJ1   Programme trials

Tuesday   Reconverter   [[begin strikeout]] Tabs ? Trials ? OJ1 [[end strikeout]]
        Double Store   P2 Mult

Wednesday   PE Reader   P1

Thursday Programme   P2 / 3
        Trials
        [[illegible]]
        Conversion &

Reconversion

Friday   Double Store

    Jobs for other people
(a) Circuit diagrammes
(b) Cards   Valve grading
(c) Valve records
(d) [[Cabling ?]] for remote control
(e) Chassis for valve aging
(f) Panel 1 modification
(g)

[[NB10-054]]

19-7-52

One of the problems I have not faced up to as yet is that of valve testing (other than diodes).
What are the symptoms we get in valves which we want to check for.
(a) Disconnections
(b) Short circuits
(c) deviations from characteristics used
(d) Gas current

21-7-52

For a change we have had a reasonable day today.
Reconverter tests showed no faults on computer but plenty on Reconverter - similarly Shaw (returned from holiday) has apparently cleared an old fault on [[begin strikeout]] Converter [[end strikeout]] inlet annex but Converter itself is giving trouble in the running total register.
OJ1 has been tried both on the machine and with reconverter and has not caused any trouble.
We have recommenced work

[[NB10-055]]

on the extension of the store and this has progressed well. By putting 4 microseconds of delay in the reset of F8 a spike has been removed from the gating lines (input and output) of tank 7 in spite of being connected to the extended store.
Shaw is continuing with further tests on the first rack of the extended store.

Barnes is available for work on the maintenance of the machine. There may be some difficulty here as in bringing Shaw back into the picture since his holiday I have not been able to give Barnes as much opportunity to do things as I might have done. I must see him tomorrow and put this to right.
Dutton and Crowhurst are tackling two more units this evening and I have drawn up a programme for them which lasts into September.
Grover has been offered as an assistant to ease the situation with regards to maintenance work. [[COMMENT (JD): John Grover, one of the original group of 5 programmers from 1950, had done an engineering apprenticeship at Woolwich Arsenal. see Peter Bird pp 48, 204]] While extra hands on wiring wuld be useful TU [[Trade Union ?]] considerations make this unwise and I am asking him to help with the organisation of

[[NB10-056]]

circuit diagrammes.
These are in a fairly chaotic condition and need to be tackled urgently.
It is required to

(a) Separate out diagrammes of units not yet built
(b) Separate out diagrammes which are out of date
(c) Mark up diagrammes with grade 1 positions.

(b) Programme for Shaw
(c) Programme for Dutton
(a) Maintenance report
(d) Written programme of work (list) for D
(e) Written programme of work for [[illegible]]
(f) Routine for circuit diagramme Job
(g) Valve grading (valve replacement chit)
(h)

[[NB10-057]]

My insistence that we should persevere in tracing a difficult fault instead of skating round it has been vindicated. With Barnes & Shaw, I put back all the mods and repeated P2 for the week that had gone wrong. After a struggle we made it go wrong again. With the assistance of Barnes as a producer of short test tapes we were soon in possession of a tape which was an exact copy of the fault producing data, but sad to relate it failed to reproduce the fault, although the correct data failed almost every time. Almost in desperation an extra row of holes was added to the test tape to simulate the next row of holes to be read on the correct data. This did the trick. It turns out that the reader produces a certain amount of breakthrough which is magnified into a new pulse in the transfer unit. Only when there was a row of holes following, to be read at the critical moment of doing the multiplication order did the breakthrough become sufficient to cause trouble.
The solution and moral is twofold. (a) Increase threshold

[[NB10-058]]

in the transfer unit so that pulses below 5 volts are ignored. (b) not to use feed line for triggering flip flops.

I am now faced with several jobs to be completed before I go on holiday
(a) Report on Maintenance of Machine
(b) Maintenance schedule for Dutton and Clements.
(c) Instructions for Shaw on Work for next fortnight
(d) Decide how responsibility for Standards equipment is to be spread during next fortnight.
(e) Clear fault in Converter
(f) Circuit diagrams of Computer

23-7-52

A little confusion this morning when I wanted priority on Reconverter trials on Payroll job. This meant hold up on PE Reader and Doubling store.
Unfortunately however I had forgotten the fault on the Annex & reconverter which occasionally prevents transfers from being made to reconverter.
The effect was known and was reproduceable so I had said put on one side, and deal with it later.
However the fault curtailed programme trials and the

[[NB10-059]]

store extension was proceeded with.
This did not proceed without incidents and it was abandoned when the demand for tests before P1.
I have not progressed very far with my work on maintenance schedules.
I must make up at least the framework of such a schedule so that Shaw can proceed next week.

Caminer has caused a stir by showing that if the first digit of a number is a sign digit, then the presence of a long Wo [[perhaps Wo is an abbreviation of Word]] discriminant digit in an order makes it a negative number. [[COMMENT (JD): the discriminant in an instruction indicated whether the address related to is a short d=0 or long d=1 word in store. This would make it more likely that the script means Word]]

If my schemes on computer are used it means that a long discrim address will result in an order being held in the computer as a complement, so that the result of adding 1 to the address will in fact result in 1 being taken off.

If an address is to be changed from a long to a short or vice versa then it would be necessary to complement it.

e.g. Convert 28/n/19 to 28/n/17

requirement would be satisfied by

[[NB10-060]]

12/a/17
 5/a/17

to increase a long no. address by 4 it would be necessary to 12/(4) - or alternatively if the 4 is always to be used with long no. addresses then it can be held as -4 and added

i.e.   12/a/19 is really -12/a

       12/a/17 is really +12/a

An alternative arrangement would be to provide a distinct adding circuit for orders where sign digits are ignored.

        Time Analysis   ? Miss Taylor

Jobs on Reconverter and Converter

Programme for next two weeks

Programme using HS input
Step up Converter tests
Query work for programmers
Double Store
Fault on Outlet Annex
HS Payroll   Hemy
Tests on Battery 4 (put battery 4 in vault)
[[begin strikeout]] Check tanks 6 & 7 [[end strikeout]]

[[NB10-061]]

Weekly time analysis
Maintenance Report
Maintenance schedules
Morning Tests - Dutton
Faults   (Shaw
       (Barnes
Circuit Diagrams.   Grover
Converter & Collator Faults   Gibbs
Mod Sheets :-
Position of Amplifier in input unit to be changed.
Triggering of Multiplication
? scheme for limiting threshold of input to Transfer unit

[[diagram]]

[[diagram]]

[[diagram]]

[[NB10-062]]

Converter Test set

Required
Any character
One digit + CR LF
One digit + CR LF LF
CR LF

Crowhurst Storage Unit

11-8-52

Tape Machine

Capstan Rubbers (Eccentricity)

Messrs Ridler & Phillips

Block schematics for all STC

[[NB10-063]]

Maintenance Report

Delay Tubes   No trouble

Electronics   Multiplication fault not yet traced but this is not causing serious interference

Mechanical Units
Output teleprinter occasional faulty printing.
PE reader occasional

Collator   Investigation of recent failure awaiting work on tape machine

ConverterLimited Regular tests now proceeding [[begin strikeout]] very [[end strikeout]] occasional faulty conversion [[begin strikeout]] has not been investigated, but from [[end strikeout]] thought to be due to gas tube troubles.

Reconverter   Being modified for Main Power supplies

Tape Machines   Whole question of faults on tape machines being considered in conjunction with Mr Ridler and Mr Phillips

General

 Reliability   satisfactory
 Maintenance Programme   Proceeding to plan
 Fault Sheet Analysis   Continuing

Minor Mods

WW Resistors   Complete
Diode Tester no progress
Storage Units

[[NB10-064]]

14 August

    Jobs Outstanding

Reconverter Circuits
Tape Machines
Fault Sheet Analysis
Multiplication Fault
Valve Grading Routine
Computer Circuits
Double Store
Maintenance Schedules
Fault Finding Routine   Query FS
Removal of Additional Sign Digit
Patent Specification

Mrs Ball
* 4 types STC valves
Parker for STC interview Monday

Battery
Transformer for Diode tests

Units for Inspection

[[NB10-065]]

64   Store
10   Computer & Coord
 1   Test Rack
11   Annex
--
86

92 - including 1 now at Wayne Kerr as a model

 2   Under Maintenance
 2   Faulty
 2   Spare

? Immediate state of affairs using 64 tube store. How many spares available.

(a) Personal Report
(b) Maintenance   (i) valve

(ii) Points for TRT
(c) Mark II (i) Block schematic
(d) Consider a second all night session 1. Power supply   2.

Out   2 x 2 = 4
Inlet double   3 = 3
single   2 x 2 = 4
               --
               11
               ==
5 - 6
   12

Miss Hills now D grade
[[D Weeks ? D Weeler ?]] now C grade

[[NB10-066]]

Maintenance
(a) Computer   Storage Units
        adequacy of spares
        Routine inspection
        Valve testing
(b) Collator   ) occasional trigger tube
(c) Converter   ) trouble
(d) Tape Machines
 a Power Supply - any long runs introduce hazard of alternator heating

Test pattern for HSI
  required to include changeover of boxes

[[illegible Feed ?]]
Addition) Positive
Subtraction   )   and
Multiplication) negative
Shifting   )
either half of Accumulator

Sign digit in front or behind
Negative numbers

[[NB10-067]]

22-9-52

Maintenance & Development

        Programme

(a)   Bench Test on ACFF replacement
(b)   Remove additional sign Digit
(c)   Negative Multiplication

to be completed week commencing 13 September i.e. 3 weeks
[[COMMENT (JD): I think 13 October, 3 weeks from today - 22nd September]]

Dutton on Holiday
 Supervision of Crowhurst work by Shaw & Myself.
 Next week Miss Hills goes on holiday
 Daily analysis of time
 Use Dictaphone

        Work convenient for Home
Check log against typed sheet
Check Query fault sheets
Analyse fault sheets
Test schedules for LC31 37 &
Study Tape Machines & switching circuits

[[NB10-068]]

        Progress Meeting

Raise point re Raw AC for LT in event of failure of regulator.

(3 core cable & plugs & socket for Halt Step & Restart)
3 x 3 pin sockets 2 amp
1 x 3 pin plug   2 amp
50 yards 3 core cabtyre
[[COMMENT (JD): Googling cabtyre showed that it is a word viz:- Urban lore states that after the war, rugged electrical cable was needed, so a class of highly robust but flexible cable was developed with a tough rubber outer covering that was made from recycled rubber car or taxi-cab tires. This group was given the name â€œCabtire or Cabtyre Cableâ€ . Cabtyre cable is still available in 2021.]]

Mon) -----   10 pm
Tue) OJ4   Stay

Wed   OJ5   10 hours ---> late
     (from noon)

[[NB10-069]]

Margin - [[inset?]] sub [[tube6?]]
Are details necessary for Wasted Work

Tests on C21 in unit B
signal (after 2 stage amplification)
signal with tape stationery
            Negligible
signal with no signal on tape
             5 degrees
average signal 1.9

        Rack 2
Fed from Square wave generator 10 millivolts to one side of secondary of transformer =29v and 30v

zero gain setting 5 volts
max 60 volts

Rack 1
10 millivolt in = 16 volts out

Injection of signal into read head

[[diagram]]

[[NB10-070]]

27-8-52

We have had a long period of good serviceability.
Last week an actuarial job of 30 hours was completed only to find that a programming error had rendered it all useless.
This week we have redone most of it as well as making good progress on Inlet and Outlet.
Much trouble has been experienced on the tape machines and I have been investigating the possibility of injecting a standard signal to take the place of a tape which is difficult to prepare and not permanent.
During last evenings work a fault occurred on the actuarial programme due to the addition digit failing. This fault disappeared on investigation. Fortunately I have planned to eliminate the additional digit this weekend so I am not worried.
Faults have occurred fairly regularly on the Converter [[begin strikeout]] and [[end strikeout]] on starting up, but how much is due to the tape machines is not known.
I feel there is a tendency, while the machine serviceability is good, to put onto it as much as possible at the expense of some maintenance.

[[NB10-071]]

this must be resisted otherwise we will find ourselves back in trouble.

A fault has now developed on Converter which causes failure of conversion of any long numbers.

Tape Machines

Collater   Tape machine

(a) Set up amplifier by comparing with other amplifier
(b) [[begin strikeout]] Make Recording [[end strikeout]]
    Clean a short loop of tape
(c) Make recording of repeated pattern e.g. S 9 +
(d) Examine pattern as reproduced by Collate machine inspecting for interference
(e) Try on Converter tape machine

[[NB10-072]]

Additional Sign Digit

        8   6   6
1. Odd D38 from 25 to 31 and 17

        3   3

2.Even D0 from 34 to 22

      8   5

3. Odd D35 from 25 to 26

      8   4

4. Number from 22 to 34

[[COMMENT (JD): These are written looking like "exponentials" or superscripts but seem to refer to a "source" and "destination"]]

     Phillips

Circuit Diagrams
Block Schematics
Pulse Amplitude & width settings

Before the Reconverter is handed over as a going concern we must have
(a) Full circuit diagrams
(b) Block Schematics
(c) Setting up instructions

[[NB10-073]]

     Maint   28-8-52

Thursday Collater 3 tubes replaced
     Converter 5 tubes replaced
Converter fault on long numbers   probe effect
 ditto   faults on starting up always a 4 difference i.e.
      3 instead of 7
      235 instead of 635
      2467895 instead of 6467895
Collater fails to set up correct conditions occasionally (possibly insufficient delay - delay in timing of reset relay)

     Marginal Checks
Cambridge are departing from their original scheme of attenuation of pulses and are going over to raising and lowering amplifier points

[[diagram]]

If this were done at cadby [[Cadby Hall]] a square wave generator would be desirable of sufficiently low impedance to permit quite a low resistance to be used.

[[NB10-074]]

     Tape Machines
1. Describe plan for controlling parameters of tape machines
2. Obtain confirmation of results
3.

Sept 20 Parker starts

Fortnight here first before going to

Tape Machine Test Head

PE Reader Maintenance

Consider Fredericks for measurement of standards on Tape Machine

Consider Reader Plug
Saturday Morning
Setting up Character Generator
Control Desk cover screw dropped through

[[NB10-075]]

More Gas trigger tube Tested

                                Sched
Fig 1.   Block of Reconverter and Compositor   7/1
   2. Step Pulse Counter   7/3
   3. Inlet switch   7/2
   4. Number End Counter   7/2
   5. Decoder   7/3
   6. Sequence Control   7/2
   7. Reconversion Limiter   7/2
   8. A/D Leo Coders and Registers   7/4
   9. A/H Composition Control   7/3
   10.   A/C Composition Distributer   7/5
   11.   Time scale   7/5
   12.   A Character Former   7/6
     B Transmitter   7/6
   13.   Output Reader   7/6
   14.   Doubler   7/7
   15.   Progresser & Aggregator J   7/7
   16.   Progresser & Aggregator [[J? I?]]7/7
   17.   Progresser & Aggregator H   7/7
   18.   Progresser & Aggregator G   7/7
   19.   Progresser & Aggregator B to F   7/7
   20.   Progresser & Aggregator A   7/7
   21.   Tape Machine Control   7/8
   22.   Tape Timer   7/8

[[NB10-076]]

29-8-52

Discussion with TRT on general plan re maintenance of STC equipment.
(a) Tests necessary to establish standards of voltages pulses and waveforms affecting Tape Machines (Gibbs)
(b) Continue tests on Converter and eliminate starting up effects also loss of 4's (Shaw)
(c) Investigate initial resetting of Collater

(d) Get details of Reconverter.

Programme for work re marginal checking of computer

Training of Miss Hills

Casualty list of trigger tubes

[[NB10-077]]

30-8-52

The changes in the Computer necessary for removing the additional sign took about half an hour after which M5 tests went without a hitch. I then did other programmes as a test but here I ran into trouble as OJ1 produced the wrong results. The fact that the results it did produce were consistent showed that the fault - if fault there were was probably one of connecting the wrong digit pulse. I spent best part of the day (Saturday) trying to spot the trouble. One case of failure I did notice in shifting a negative number repeatedly to the right had not shown up in the tests and I am sure was not the cause of the trouble. It was an occasional dropped digit in the lower half of the accumulator and was corrected by a small movement of a potentiometer.

On reconsidering the matter one of the most likely causes of the trouble would be if the sign inspection

[[NB10-078]]

pulse was looking at the pulse one less significant than the sign pulse. This would not have been noticed by any of the tests but might have been quite important in OJ1 or OJ5.

This could be a lead from 23^8 instead of 22^8 for the number into the warning unit.
A simple test will resolve this :-

0	A	3	The sequence will
1	G	5	stop if the
3	S	3	G order recognises
4	E	0	the 12 order
5	Z		as negative

     Maintenance
Mrs Ball to check valves ex machine. 1 Unit per diem.

PE Reader   Weekly
Mechanical Reader Fortnightly

In order to put a measure on the serviceability of the machine it is proposed to make some standard scale e.g.
Time spent on Faults
0 - 10%   Excellent
10 - 20% V Good
20 - 25% Good
25 - 30% Fair

[[NB10-079]]

     Marginal Checking

Points to be checked
(a) Sensitivity of Flip Flops (under & over)
(b) Amplifiers

Sensitivity of Flip Flops would vary if one of the stabilised voltages were variable.
e.g. if the 250+ stat was made 260+ then grid potentials would rise generally and flipflops would be more difficult to latch over. Similarly if the same supply was brought to 240, then the sensitivity would be increased and any tendency to trigger on breakthrough could be checked.
The same effect could be achieved by varying the negative stabilised supply.
It is desirable that an experiment be made on the test rack to see what variations are required to cause the triggering margin of flip flops to change by 20%.

[[NB10-080]]

Marginal Testing
(a) Square wave injected into gain control on Storage Unit in store
(b) Square wave injected into gain control of all amplifiers - variation of amplification is desirable to be done in two parts
    (a) Computer & In Out
    (b) Coordinator
    so that results are not too confusing

(c) Key to give change of x volts to negative stabilised supply

1-9-52

Analysis of Fault Sheets

1. Part of Machine
 (a) Coordinator
 (b) Computer
 (c) IO
 (d) Store

  (a) Coord
     i.   Coince
     ii   Stage I II
     iii Decoding
     iv Coding
     v   Transfer

  (b) Computer
      Acc [[modulator?]] loop
      Computer Control

[[NB10-081]]

2. Way shows up
 (a) Machine Stops
 (b) Machine goes into loop
 (c) Wrong Results

    Cause
Valve Failure

Mechanical

2-9-52

Gibbs has been carrying out tests on tape machines but so far has not been able to do more than examine conditions in the record circuit.
This has brought up several points worthy of discussion with STL.
1. Wiring of flip flop is ill conceived and prone to interference.
2. Method of triggering & to apply a voltage to one grid while leaving the other open. This with (1.) leaves the door wide open to triggers by interference.
3. Bleed chains of very high resistors are being

[[NB10-082]]

used e.g. 2M2 + 2M2 across +220 & -110 to provide a reference potential. This can hardly be a stable arrangement and very prone to interference.
4. The reference potential appears to be at the lower end of the working range of the flipflop.

I was able today to remove two rather pernicious faults from the converter. The failure of the 4 digit in occasional decimal digits appears to have been due to a faulty trigger tube in the 1D2 0D2 pair.
Having removed this offender I was left with the failing case on starting up after a rest. At this point another fault due to a "soft" trigger tube in the RT register drew my attention to rather erratic "return to base" of two multicathode tubes.
These were replaced and the fault cured. On testing again for the starting up fault I find that this too has disappeared presumably with one of the multicathodes.
Fault finding by luck rather than judgement!

[[NB10-083]]

The general serviceability of the machine remains good, much of OJ5 has been completed. The multiplication stimulating unit gave a little trouble after being modified last night but on inserting an amplifier in the EOC lead the trouble ceased.

3-9-52

The trouble I ran into last Saturday on the removal of the additional sign digit was due to a contortion in the programme. A positive number is shifted left until it becomes negative and is then shifted two places right. The changes I have introduced make only one right shift necessary to achieve the same effect as the point examined to determine the sign of the number is one less significant.

[[NB10-084]]

3-9-52

Most of today has been spent on programme trials.
Two points arise.
1. Programmes must have a closer check before being put onto machine.
2. Programmes designed for HSI & HSO must be tried out without the converter and reconverter first to avoid waste of manpower and (at present stage) to avoid distraction caused by failure of these auxiliary parts of machine.

Referring to 1. it would seem that some scheme which would permit programme errors to be eliminated before put on machine would save considerable amount of machine time.
Surely it would be worth the effort needed to transcribe the programme into the store form when it is ready to be put on and have someone work through it just to see that no major blunders have been overlooked.

The collator has had a good day today. After one fault when I tested it this morning it has worked all day without trouble.

[[NB10-085]]

If progress continues to be good it seems that the programme for putting in the units replacing those with AC flipflops and providing for negative multiplication may be brought forward.
None of these units should call for alterations to existing pulse wiring, but negative multiplication will call for extra leads separating out [[begin strikeout]] C41 and C22 [[end strikeout]] V & N.
If this plan is brought forward I will be able to devote a little more time to the Reconverter and the Maintenance programme.
The test head for the tape machine has been made and works quite well. Unfortunately being unscreened it is responsible for a little hum pick up which may be due to the heater transformer mounted on panel ( )
It will be possible to use it also as a receiving head to measure the strength of the recording field as delivered by the record head.
In order that a tape machine can be tested without teleprinter or tape box a flipping relay circuit can be used to simulate the teleprinter.

[[NB10-086]]

[[diagram]]
[[diagram]]

4-9-52

Rack wiring for Negative Multiplication
Cathode followers for Control Desk
New Block schematics for removal of sign digit
New Numbers for Coder

[[NB10-087]]

5-9-52

Today started rather badly with the knowledge that P2/3 had failed last night.
After correcting a fault on the PE Reader and the Accumulator Shifting Unit I tried M5 and had trouble on reader 2 (mechanics changing readers however did not cure the trouble and it was found that contacts on the changeover relays were [[bunching?]] so that a read order carried out directly after a changeover could occasionally read from both [[begin strikeout]] digits [[end strikeout]] readers at once.
This was cured by bending relay contacts but showed up another unexpected fault i.e that a read order following changeover might equally well fail due to contacts either making too slowly or bouncing during the time of the read order.
The curing of the bunching was sufficient to permit P2/3 to go ahead, but the other trouble must be investigated further as it may cause [[begin strikeout]] trouble in [[end strikeout]] some future programmes to fail. After several false starts a trial was run on P4 (Payroll) this afternoon and some success was achieved. Mr Simmons came

[[NB10-088]]

down and saw the results coming out. Unfortunately it was not quite all he had expected as the programme had halts interspersed in order that results for each man could be checked. When he arrived an inquest was being held into the results for one man.
However he did see the data read, the results recorded and printed off. He commented on the difficulty of demonstrating such a job in view of the dispersed equipment.
He showed some interest in the test head I was using on the tape machine.

I have made some progress on the tape machines. There seems to be very little margin between reliable triggering of the read flipflop and the danger of noise triggering it. The behaviour of the flipflop generally is not very good, and I find that there are no "puff aiding" condensers being used. I have modified Converter A machine with 10 pf on either grid and have achieved a reasonable improvement in this way.

[[COMMENT (JD): puff is the spoken name for pico-farad condensers - a pico-farad is one millionth of a micro-farad. The original script could have been acting or aided so I asked Chris Burton, who led the Manchester Baby rebuild and he said "my late uncle worked on radar at Swanage in the early 1940s, and he introduced me to the concept of "speed-up puffs" in about 1950 and it has stuck with me ever since. It is pretty clear to me that the phrase is "puff aided", implying that the pulse edge time is thus treated."
I also mentioned cabtyre (see page 68 above) and he noted "Ah the nostalgia! Cabtyre cable is familiar to me from helping my father when he was installing electrical equipment all those years back! I still have some in my workshop and we also used some on the "Baby" rebuild".]]

[[NB10-089]]

        Jobs
Tape Machines   Gibbs
Maintenance schedule
Negative Multiplication   Shaw
Collater
Reconverter Circuits
Marginal Checking (Flip Flops)   Kaye
Changeover & Read Orders
Programme for the week
Mark II Computer
Valve Routine
Cards for Tape machines
Small Block Schematic for Reconverter
Remove wiring associated with additional sign digit

        Negative Multiplication
(a) Small modification to Coder
(b) Route C22 & C37
(c) [[begin strikeout]] Install LC32 [[end strikeout]]
(d) Test programmes required.

[[NB10-090]]

I intend to get the negative multiplication available a bit earlier than scheduled. Provided that our theories are not faulty there should be no difficulties.
Apart from replacing the unit with a new one (this has just been done) the only required modifications to the machine are
(a) Provide C1 for ASC V & N
(b) Provide C37 for V & N
(c) Provide C11 for N
A modification has been made to the Coder to provide for the mixing of N with others to produce C1 and C37 but a small alteration is required as two separate inputs for N were provided instead of one.

Apart from this the changes needed are as follows
[[begin strikeout]] (a) V to go to Coder instea [[end strikeout]]
(a) [[begin strikeout]] present [[end strikeout]] N output from decoder to go to Coder, and to Panel 32
(b) Present lead from V to computer to go to 32 only.

(c) A new lead from Coder C37 to go to LC26.

A further modification is necessary to the Coder. N must be mixed in to produce C5 so that [[begin strikeout]] W2 [[end strikeout]] escalator wave forms are produced.

[[NB10-091]]

9-9-52

1. Breaker In
2. Auto control on
3. Press "Transformer on" button & hold pressed until controlled AC volts registers 150 volts.
4. Wait for control to raise volts to 230
5. Confirm Heaters now alight
6. [[begin strikeout]] Wind up re [[end strikeout]] Observe 50 volts on meter
7. Wind up Rheostat to mark
8. As AC controlled volts pass 150 push HT on button

[[COMMENT (JD): looks like the instructions for switching something on - perhaps the STC equipment?]]

[[NB10-092]]

[[jottings]]

[[NB10-093]]

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