[[NB14-001]]

14
16/3/53 to 5/7/53

[[NB14-002]]

11000 [[24]]
01100 [[12]]
00110 [[6]]
00011 [[3]]
10100 [[20]]
01010 [[10]]
00101 [[5]]
10010 [[18]]
01001 [[9]]
10001 [[17]]

16-3-53

An enforced rest in bed with severe chill gives me an opportunity to review the situation on the calculator.
Last week I got quite a wide support for a plan for a determined assault on marginal test facilities. Although not quite to the exclusion of outside work as I at first proposed we have at last got round completely all of the amplifier positions.
This week Shaw and Mann should be paying particular attention to those points which have been shown up as the most critical.
It is significant that two of the most critical are where circuits are associated with half adders

[[NB14-003]]

namely in the accumulator and the sequence control tank.
This might mean that there is something incompatible between the half adder circuits and the panel 1 circuits. Such a problem might well be worked out best on the test rack but perhaps it is best to study the problem on the machine first.

For some time the urgency of immediate problems has prevented me from giving the necessary attention to routine maintenance.
Now that the first stage of the marginal test programme is coming to an end the time has come [[begin strikeout]] to lay down a few hard and fast rules for routine [[end strikeout]] to review the present rather sketchy routines that are being done at present and to bring them up to date with the added work needed for fulfilment of the marginal test programmes.

[[NB14-004]]

For the work to be done smoothly two new programmes are required.
(a) Store and Decoder Test Programme
(b) A4 to include V, N and T tests.

There seems to be no difficulty about (b) but the programme that I had devised for the store has some fundamental snags to it.
(a) A decoder fault which caused the input to tank x to be put into tank x+2 also would not be checked as the routine for stacking is such that although an incorrect pattern would be stacked in x+2 it would subsequently be overwritten by the correct pattern before it

was checked.
(b) by some queer arrangement in the checking sequence errors in alternate tanks tend to cancel.

As it was hoped that the new programme would be a suitable detector for all types of store or decoder faults this beginning is not very promising. However it is still felt that a composite store test is desirable and more thought must be given to this

[[NB14-005]]

Marginal testing
Bringing Circuits up to standard
Setting of Standard Min Margins
Extension to flip flops
[[ditto]] other circuits
R
A
G
Normal Minimum Working

Maintenance drifts
LC30 & 22
LC16
New Spare 36 from WK [[Wayne Kerr]]
Modify - trigger circuits
[[jottings in pencil]]

27 Friday Afternoon
NPL

Improve [[Sm---]]
Set min Margins
--- EHL end of week to JMMP Mann [[in pencil]]

[[illegible]]
Other Circuits
Special invest [[investigation?]] eg 1/2 adder Transfer [[line?]]
- EHL [[in pencil]]
Special test program for invest & faults
Reallocation of test lines Max of 3 circuits

Standards
Separate trigger bias control to any circuits by means of a switch.

[[diagram]]

[[NB14-006]]

24-3-53

Quite a lot of good work was done in my absence and a couple of all night sessions were done. Apart from odd teleprinter faults the calculator has produced very few errors.
P2 has been tried this afternoon using the Ferranti reader and that seems to work very well.
The advent of teleprinter corruptions raised the question of marginal checks on the solenoids and I have been looking for my original notes on this subject. These have not come to hand but [[ends abruptly]]

[[diagram]]

[[NB14-007]]

25-3-53

We have fallen down on the De Haviland job again today.
After a false start when the normal test failed with only 4v of margin applied, we tried again with 3 1/2 volts this seemed to work O.K. and then they tried a mod to the programme. This failed and the job was abandoned. After testing the machine without throwing up any faults we tried the Arithmetic test using random numbers. This went happily until by increasing margins to 4v it failed. Thereafter it failed fairly frequently even when the margins were removed altogether.

It was some time before I tried raising the HT voltage and found that by raising it 2 volts the faults were cured. A 4 was used to show-up H&C as the first to fail with a drop of 5 volts on HT and that showed up the marginal conditions to exist in the second half adder of the accumulator. I have suggested that this effect should be noted but not pursued as tests are going on on the test bench on the sensitivity of the half adder. As the HT voltages had been varying considerably during the day it is likely that this marginal

[[NB14-008]]

condition was the cause of a lot of the earlier trouble. Last night work on OJ6 was wasted because [[begin strikeout]] the [[end strikeout]] of teleprinter corruptions. Investigating this point I found that the -15 volt line on the output units was very sensitive and a change of + or - 2 volts is sufficient to cause corruptions. This line has now been derived from the [[stabilised?]] negative [[illegible]]

Set minimum margins
Special Test Programmes for fault investigations
Separate Trigger Bias control for any circuits
Apply marginal tests to output flipflops
1. [[illegible]]

[[NB14-009]]

Servicing and Maintenance

Newman
(a) Must Work
(b) May Work

Phister
No of faults per unit operation during use

MV Wilkes
Marginal testing Periods twice a day

[[diagram]]

27-3-53
An afternoon spent at NPL at the Faults and Maintenance section of the Symposium. Most of the contributions echoed our experiences with notable references to periods of poor serviceability, banging racks with spanners and test programmes that the machine "learns to do". A tendency to romance about the best way to express serviceability of a machine was brought down

[[NB14-010]]

to earth by JMMP who said the important questions were why the machine had failed and the best way of correcting the fault. Caminer took another guy to task for saying that useful work could be done on a machine that was showing a fault every 10 minutes. Out of this one gets the impression that we are much more exacting in our demands of our machine and that statements of reliability from Ferranti etc are to be viewed against this background. Our contributions were given much more serious attention than most and I came away with the impression that the name Lyons has had considerable uplift in the calculator world.

	Serviceable	Investigation Required	Unserviceable
Storage Units	3	2 1/2	2
Amplifiers	3	2	1
Decoders			

[[NB14-011]]

Set minimum margins
i.e.
(a) Voltage at which machine declared u/s [[unserviceable]]
(b) ditto serviceable but requiring investigation
(c) ditto at which machine declared unconditionally serviceable.

These voltages will be related to particular test programmes. Voltages will be [[begin strikeout]] applied [[end strikeout]] only applicable to particular test programme.

Simple Test Programmes

Addition	A. S. E.	Subtraction
0	A 4 L	S 4 L
1	S 4 L	A 4 L
2	B 6	B 6
3	E 0	E 0
4)	Pattern	Pattern
5)	Pattern	Pattern

Collate
0 H 6 L
1 C 8 L
2 S 10 L
3 B 5
4 E
5 Z
6) Pattern
7) Pattern
8) Pattern
9) Pattern

[[NB14-012]]

Machine to be tested at 3 levels

(a) Serviceable

(b) Conditionally Serviceable requiring investigation
(c) Unserviceable

Tests
) General Functional Tests
) Store Tests
) Auxiliary Equipment Tests
Particular circuit tests

Data and Result conversion
Queries
Alarm Pulse in result conversion LC99 ?
Delay in [[931? G31?]] for Store Coince [[Coincidence]] avoid too early coince Think again 98
Mod to MSU to take Shifty Waveforms 96
Mod to Transfer Unit for special entry Still to be done
Store to Coince for minus sign ex [[G11? 911?]] 95
D35 to IG [[input gate?]] of Marker register [[93? G3?]] ?
[[914? G14?]] for address of minus sign ?
Phasing of Accumulator Sign flip flop LC99

Give G numbers to all gates not yet marked. Give W numbers to all new waveforms.
Conversion Limiting [[G? 9?]] 4,5,6 & 7 where are they ? LC91
Endpulse for Result Conversion ? LC99

[[NB14-013]]

OUTPUT Code
Letters / Figures to give shift from code to clear

Timing Printer
) Print
) Perf

) Parl Print
) Perf

P P interchange

	Code	Clear
15	Lett	Letter
31	.	V
7	7	7
11	Figs	Figs
13	Space	Z
14	11	K
23	I	M
27	*	G
3	E	3
29	/	B
5	T	5
9	U	9
30	Q	C

6	Y	6
10	J	10
12	R	S

[[NB14-014]]

	Code	Clear
8	8	8
4	4	4
28	-	A
2	2	2
26	10	X
22	6	N
1	1	1
25	9	L
21	5	H
19	3	D
0	P	0
24	LF	LF
20	+	Space
18	CR	CR
17	F	:
16	0	W

1-4-53

Some good work done on both productive and development sides. One fault has been dogging us for some days now - namely the failure of the B order to produce an end pulse when the accumulator is negative. By banging the unit (LC49) two other faults have been induced and cured but the original fault has persisted. One fact that excuses some of the violence was that when present it could be cured by a light tap on any of the components around [[f?]]1. The latest

[[NB14-015]]

measure has been to change one of the 22pf condensers as being a possible cause of the trouble. After 6 or 7 hours we still don't know whether this constitutes a cure or not. Mann has been experimenting with the half adder removed from the counter tank with the idea of making it less sensitive. By using positive feedback over a clocking gate he has produced some improvement but the order of tolerance to injected marginal voltages must be doubled before we can be satisfied.

[[diagram]]

It occurs to me that this change to a gate in a half adder might lead to some improved rise times which in turn may call for increased delays. It is proposed to use a more error proof [[begin strikeout]] method of [[end strikeout]] coding for output so that the dropping or picking up of a digit does not convert one numeral into another. One snag about this is that many programmes are already [[ends abruptly]]

[[NB14-016]]

Problems on Reconversion

Set [[to f 5?]] is either once gated D21 0v
twice gated [[illegible]] D35
Result digit to Coince [[Coincidence]] III twice gated

The ideal Store
    Access time - zero
    Series for serial machine
    Selection of Words with min of equipment
Present Store
    Access time too long
Multiplication of storage units
    Too costly
Magnetic Drum
    Slow and Costly Access time low
Magnetic Wire and Tape
    Access time very low
[[Query?]] speed of expansion as a result of heat

[[NB14-017]]

[[diagram]]
[[diagram]]
Suppose, instead of a coince [[coincidence]] unit there was a device which switched the [[begin strikeout]] receiving [[end strikeout]] output section of the storage unit to one of 32 outputs
[[diagram]]

Mercury Delay Lines

Use 1 word length lines instead of 16 words
Use multiplex system gating the inputs to the tanks

[[diagram]]
[[diagram]]

Â£320 Crystal for each word + 1
 Â£20 each
  Â£1.25 each word for barrels
Crystals N.

[[NB14-018]]

Jobs
Five Wire Printer
Digits in Mix Register
New Ferranti reader desk
Cut off ends of switch spindles on MTR unit
New labels for MT Panel
Compact diagrams of Conversion
Accommodation of Program tapes TRT
Servicing of Dimaphon
[[COMMENT (JD): a google search found Dimaphon: a brand name for a dictation recording machine made by Assmann Dictating Systems Ltd. Dimaphons recorded on reusable plastic discs or records and were equipped with foot pedals and earphones. from 1948]]
Labels for Short tanks ATC
Gibbs and Frequency Monitor
Flip Flop marginal tests

Half Adder margins
Storage unit modifications
Storage unit injection of interference Mann
Photographing Store
Frequency Control Unit
Projector.

After the easter break a good day on the whole with the teleprinter fault found (? I hope) and a little tiddyvating [[titivating]] on the frequency control unit now giving us a range of 18 degrees. I left the programmers at work on OJ14 confirming results of a fortnight ago but this is nearly complete and they will go on to productive work.
The B order failure is still with us in spite of the replacement of various components.
A new effect has been noticed namely extra digits appearing in the lower half of the [[illegible]]

[[NB14-019]]

register. This is rather ominous but so far has not been repeatable. As a security measure, the monitor lead going from the [[illegible]] A link to the control desk has been disconnected.
It is proposed to make the changes in the computer set up this coming week end and I am proposing to work on Friday evening as well as Saturday in order to get a good run on checking the new units.
This means that the normal work for Friday evening will be shifted over to Thursday evening and Teleprinter maintenance will be put off for a week or so.
The difficulty is to provide alternative work in the event of a set back.
It is very important in the light of the consolidation program that the computer inlet change should be made as soon as possible

[[NB14-020]]

Accommodation of program tapes.
Section of shallow drawers sectionalised with timber about 1/2" wide for ease of labelling.
Each drawer could be for different types of program
e.g. Test programmes M
ditto A
ditto S
Demonstration Prog.
Clamps for easily inserted labels
Dimensions of divisions 3" x 3" x 1"

[[diagram]]
one drawer
Calculate accommodation available in new whole size draws fitted to present table.

[[NB14-021]]

8-4-53
A very unsuccessful day.
The Border fault is still with us
Teleprinter faults appear to have been cleared up now.
New fault - additional digits in the multiplier register has persisted during the day and I hope has been located.
It was partly due to sparking of the thermostat contacts, partly due to inefficient bonding of the motor to earth (in the vault. An AC voltage of 170v could be measured between the motor casing and the calculator earth.
Moving the flexible tubing produced showers of 1's in both multiplier and accumulator. I have arranged for the heaters to be switched off tonight which should remove all doubts about interference from this source now that proper bonding has been supplied.
I had arranged with JMMP to do the computer changeover this weekend but this has been overruled in his absence by

Kaye, Caminer and Barnes who think that TRT ought to have been informed.

[[NB14-022]]

Store Access
If an intermediate register were used to take a number being transferred to the store so that the waiting time could be in parallel with the operational time. Thus T24 would cause number to be transferred from Accumulator to register A and then the machine would proceed with the next order while an auxiliary coince [[coincidence]] unit provided the necessary waveforms for transferring from the register A into position 24.
This might work the other way too i.e. transfers from the store to the computer or coordinator provided that prior warning of the address required was given.
What this really amounts to is letting stage 1 and stage [[11? 61?]] operate at the same time.

1	2
Extract order from store and set up	Extract number from store Carry out arithmetic
[[action?]]	Stack result in store

[[NB14-023]]

Orders are of 3 kinds
(a) No access to store required E RL
(b) Access to store before operation can commence eg A SC V
(c) Access to store required after operation is complete T U

Saving in time if in (b)
access to store before operation commences is before Coders are set up
Savings in time if in (c)

Photograms required.

1.	S 26	I5	
2	S 26 A		I8
3	S 27	O1	
4	S 27 A		O3
5	A 4	O10	
6.	A 10 A		M5. H.S.I.
7	A 10 S		
8	A 10 G		
9	A 10 E		
10	A 10 B		
11	A 10 H & C		
12	A 10 R		
13	A 10 L		
14	A 10 V1		
15	A 10 V2		
16	A 10 V3		
17	A 10 V4		
18	A 10 V5		
19	S 24		

[[NB14-024]]

Make record of all electrical [[begin strikeout]] operation [[end strikeout]] equipment.

Control HT from Rectified Supply

Sat Interferences
Clock Pulse width monitor cct
Test program for interference between readers, teleprinter etc
Monitor Scope jitter
Converter to all tanks of store

10-4-53

Sequence OJ6
Effect Wrong Result
Invest
The nature of the fault was at first rather obscure but after some deliberation on the part of the programmers it was found that extra digits appeared in tank 48 compartment 0 where "Time" [[Time?]] was being stored. The program was modified so that the machine worked in a loop continually adding and transferring to this compartment. This gave no sign of faults but on further investigation

[[NB14-025]]

it was found that the program assumed a clear accumulator before starting the calculation. A further mod to the program extended the loop to include the previous sequence. This produced evidence of the fault and slow running showed that an order was being corrupted in its formation in the accumulator, the long discriminant digit being lost. Eventually an order A.T.E. adding an order in tank 40 into a clear accumulator and transferring out showed that the first digit D19 was occasionally lost. Tracing this back it was found to be due to the output gating waveform for tank 40 being applied to the OP Decoder on rack 5 was failing to get up quickly enough to catch the first digits. The trouble was found to be exaggerated considerably by tapping V10 in the OP decoder and on trying to remove the valve the top cap came off.
The valve was replaced and the fault did not recur.
During this investigation it was noticed that the unclocked

[[NB14-026]]

pulses in the Multiplicand tank were running in together rather badly.

10-4-53
DH [[De Havillands]] seem to be having very poor luck indeed on the calculator. For the third time in succession they have been turned away without any results having been proven.
Today started fairly well with P2 being done using the Ferranti reader and the High Speed Output and all seemed set for a good run on OJ6.
This proved a fond thought however as after performing quite well on the test with 4v margins applied it failed almost immediately on doing the real job.
For some time the store was suspected and tank 42 had its storage unit changed twice. Later the PE reader was found to be failing on 1 digit and had to be adjusted.
Eventually the main problem was found to be in an output decoder where a SP61 with a loose top cap was causing

[[NB14-027]]

gating waveform to be delayed.
Earlier this morning we had trouble with the Ferranti reader 1 being converted to 3. I could not get any very satisfactory traces to definitely prove my point but I'm fairly confident that the cause is the delay in getting ones from the annex to the store. A single 1 produces a much wider unclocked pulse than a string of pulses and if late, may gate [[illegible]] two pulses at the clocking gate.
This has always been a doubtful point about the annex system and is very likely to vary according to the setting of the frequency.

[[NB14-028]]

[[diagram]] <- Small margin ->
4v
3v Folders. Needle.
Miss Hyams Photogram sheets a & b
Program to test annex to all tubes

a HSI x
A a
A b
U a
A c

Mod to annex required to overcome the discrimination between 2 tube and single tube annex
Switching
4 Margin[[May?]] for first test
2 Intermediate tests to be done with

Routine Test Margin	5v
Operation Margin	4
Assurance Margin	2v

Gibbs Frequency Monitor end of week

[[NB14-029]]

Maint Programming

Programmes for Vibrating
Setting up of store (high?)
Caminer re Engineers sheets
A [[illegible]] Dial on Relay C GRG

15-4-53

At last we have given de Havilland some useful time. An all night run gave 6 hours of trouble free time after some rather peculiar trouble in the Order tank.
A meeting today reviewed the general position as well as clearing the air over the question of whether marginal voltages should be imposed when inter job tests were being run. The decision is that there should be marginal voltages applied at three levels

Routine Test Margins	5v
Operational Margin	4v
Assurance Margin	2v

[[NB14-030]]

Routine Test Margins will be applied for routine testing.
Operational margins in conjunction with the particular test programs for jobs. Assurance margins with the same programmes as intermediate tests during production runs.

Priority jobs are
Confirm Panel 1 mod.
Half Adder improvements

Flip Flop Marginal Testing
Frequency Monitor

The question of dry joint testing was raised again and EJK [[Ernest Kaye]] was all for routine general battery of units once a week.
TRT I think sees my point of view but wants to steer a middle course and attack one unit at a time.
I have suggested that vibration can only be useful if applied under control and is continuous while the test is running.

[[NB14-031]]

Test programs permanently stored on drum

Total	7792 hrs	
Mt & Eng	1322	[[Maintenance & Engineering]]
Comp	6470	
Fault	860	

Serviceability 87% of scheduled computing time 72% of total on [[switched on?]] time.

Failures

R	12,000	24	1 in 4 x 10 to power 6 [[million]]
C	10	1 in 2 [[million]]	
CRT	30		
Pentode		200	
Diodes		108	
Other		49	

No shift Right [[illegible]]
Left only 1 place

[[diagram]] a graph with
vertical axis "Prob [[ability?]] of T without fault"
horizontal axis "Time"

[[NB14-032]]

Slow / Show decimal

15-4-53

A bad day today.
Trouble was envisaged last night when an attempt at OJ14 failed but I went to an IEE lecture and did not hear anything further until WHD [[Wally Dutton?]] phoned to say Initial orders would not go in.
This morning I found that the valves in the CPG [[Clock Pulse Generator]] had been changed and the dividers required setting up. This done I confirmed that Starter EP [[End Pulse?]] was failing. It did not take long to pin this down to a diode with HR in PSU1 [[Power Supply Unit?]]. With a new valve here M5 was tried but failed on B Test apparently due to a right shift order failing. It transpired that this was due to LC49 delivering both EP [[endpulse]] and [[Dq?]] causing the Coordinator to skip over the Right shift order. Examination of the circuit showed that f1 in this unit is being asked to set on ED0 and reset on ED1 with the [[tailing?]] of the set and reset pulses extended rather more than usual. This effect was very intermittent and after some time disappeared whereupon right shift was found to be failing on AD3.

[[NB14-033]]

by increasing the amplitude of this (it had been attenuated some time earlier) this worked correctly.
Other troubles that occurred during this period were failure of left shift and round off order.

I have forgotten to mention another effect which occurred after the starter end pulse had been put right.
This was that the starter orders failed to go in correctly and when they did most erratic operation of readers and changeover unit ensued on reading tape. By putting in digits from the push buttons it was established that these faults only occurred when stacking in the more significant half of the minorcycle. This was eventually traced to the transfer tank 1 and the storage unit was replaced to cure the effect.

To return - eventually I decided to replace the valves in the CPG and when this had been done M5 went through quite happily with normal margins.
Our experience today has shown that there are still places in the machine where

[[NB14-034]]

circuits are operating marginally. The evidence we have gathered points to weaknesses in shifting Rounding off and testing for zero and there may be others. It is obviously necessary to give some time to a study of these troubles even if only to show how such marginal conditions can be tested for.
This evening a successful trial of P1 program was made and I left the machine churning out OJ14 results which I hope it will do for some hours yet.

15-4-53
[[COMMENT (JD): second time we've seen this date and it is now tomorrow!]]

To all appearances OJ14 did a good job last night but closer inspection this morning showed two errors in the test sequence and a repeat showed up further troubles.
Although the M5 test went through OK with margins, A13 the random number test failed very early with no margin applied. This was soon located to faulty flip flop in the complementer. This put right it still failed this time due to inefficient suppression of digits in the complementer. This was due to the fact that I had earlier reduced the gain in the

[[NB14-035]]

Multiplicand because digits were running in together. The next trouble to arise was in the store Tank 37 getting extra digits. This was shown to be a dry joint in the Storage Unit but the unit replacing this had even worse trouble - intermittent dropping of whole batches of digits.
This in turn was due to a fault in the transmitter section which could be cured by earthing the screening can of the oscillator valve.
Altogether a fairly wasteful day with bags of work still outstanding.
De Havilland people were standing by all day today but fortunately no one was optimistic enough to give them the word to come.
Tomorrow they are hoping to get some hours of work in before I do my worst on the computer. P1 is still to be done however so that there will not be much time to cure odd faults.

[[NB14-036]]

Caminer re tape Accommodation

Progress

Maintenance

Computer Changeover

Storage unit [[illegible]] for modification
Changeover Control
Shaw [[Ray Shaw]] Half Adder and Flip Flop

Changeover contactor Spark [[quenching?]]
Shorten Converter Test Tape
Number End

Serial Nos of [[Mullicathodes?]] (New)

Reduce amplifier load to 2K2 AD1
Set up phase of Complementer
Check back edge of waveform in complementer against first pulse.

[[NB14-037]]

20-4-53

Just leaving Cadby Hall at 1145 after a hellish evening.
This weekend i.e. on Saturday I with the aid(?) of EJK [[Ernest Kaye]] installed the three Acc input channel Units LC17, 24 & 33.
After a struggle with the complementer all seemed well and a definite improvement over previous working was obtained.
Today after finding a small error in the collator, P1 and P2 were done and this evening Pinkerton should have proceeded with some work. Instead, the way was made clear for improvement on the general set up of the Acc I.O.
Against my better judgement I let him have his head with the investigation. True some things were found that needed correction but it was soon obvious that we had lost the happy state of correct working. I stayed on much later than I had intended in an effort to get things back to normal but It seems that unless Shaw has some luck tomorrow the old units will have to go back.
I have asked for tomorrow off as I feel a bit the worse for wear after so much late work

[[NB14-038]]

I am determined NOT to go in tomorrow and Pinkerton will have to make his peace with TRT.
I will have to answer for my sins on Wednesday but tonight I am only too glad to turn my back on it for a few hours.
On Friday night OJ6 had its best run yet scoring about 15 hours of useful work.
During tests that morning the reader failed again (16 digit) and there was a recurrence of the HS Outlet fault coder waveform failing in amplitude after a few seconds.
Typewriter
Telephone extension
Sensitivity to Clock Pulse amp
Program to check all tanks with Ferranti

[[NB14-039]]

22-4-53

It seems that things go so much better when I am away than when I am at work. After a very lovely days rest I returned to find that the calculator had been working happily all night.
During that time however a reader fault (PE) and the store had caused trouble. During tests that morning the reader failed again (16 digit) and there was a recurrence of the HS Outlet fault coder waveform failing in amplitude after a few seconds. I think the latter fault has now been located to a diode in one of the Action decoders
this was only slightly over the specified 500 ohm forward resistance. Pinkerton is examining this valve as it may give some support to an interface theory which has been put forward by an STC expert.
Shaw has been working on the flip flop problem and finds that by wobbling the cathode of the trigger valves with AC, flip flops can be tested for [[unserviceability?]]. About 8 volts RMS is required.
Unfortunately this does not cover the oversensitive flip flop so if this is used it [[calls?]] for a [[complementary?]] test to [[save?]] [[ends abruptly]]

[[NB14-040]]

[[diagram]]

When I made my test on the flip flop I found that inserting a small amount of AC onto the grid only made it more sensitive and did not do the reverse. That I found was due to the rectifying effect of the grid that was conducting. It may be possible to combine this with the other system to give a complete coverage

[[diagram]]

[[NB14-041]]

Data Conversion

Why an amplifier in path to AccIO and none in path to complementer?

Progress Meeting

Payroll trial with Converter when new tape machines are available.
Attempt to have these reading by 1st May.
Tabulator starts May 4
Demonstration 1st May. STC equipment.

[[NB14-042]]

24-4-53

A new type of fault. This shows itself during the printing sequence of P1 and results in numbers such as 1056 being printed as 1000. So far it only happens during this particular job and is cured by small alteration to programme. It is caused by failure of L shift end pulse resulting in a shift of 36 places instead of 8. This in turn is caused by the clearing of the order tank during left shift. A coincidence waveform has been seen but the reason for its stimulation is not clear so far.
An attempt is to be made to get the Payroll job done as a demonstration on Friday next. The converter has been responding well to daily tests but the attempt will not be made until the new medium speed tape machines are available.

[[NB14-043]]

Progress

Freq Control this Friday or not ay all.
Marginal tests on New Units
[[Investigation?]] of Spike
P1 fault x
Mount Transformer Sat WHD [[Saturday Wally Dutton?]]
Power Supplies
Tests with Converter
[[Attr tests?]] on Ferranti No 1 Hour early
Clock Pulse phase and Amp
Pulses on Outlet Annex Circuit
Modified storage unit
Test Converter annex for extra digit

Multiplier full of 1 Add order

look at complementer

1 Annex fault marking time.
Change Decoder

Dutton
Change decoder producing HO1
Wire up Multiplicand and Multiplier

Shaw
Confirm change in Decoder
HO19 check first tank output
Check converter to store D1 s
Effect of changing CP Amp and Phase

[[NB14-044]]

24-4-53

This morning an explanation was found of the fault in the P1 programme. Apparently 2 Dgs [[Dg Digit?]] were being produced from the [[19? 29?]] order and under certain circumstances this would produce a second stimulation of the coincidence unit in stage 2 of the following order. The cause of the 2 Dgs was a logical fault in LC49 where if the [[accumulator?]] had a particular pattern extending down into the lower half the coder being delayed might gate another digit [[off?]] the accumulator before [[begin strikeout]] the first Dg had produced
the R2 End Pulse [[end strikeout]] it was reset by the R2 End Pulse.
A simple solution is to remove the delay in the coder waveform which is not necessary now that 2 suppression positions are being used.
A simpler circuit can now be devised which uses only 1 flip flop.
Some useful time was spent on amplifier marginal testing this afternoon, and this evening 3 1/2 hours of OJ16.
The new Variac for the marginal testing rack has arrived and is being mounted

[[NB14-045]]

this weekend

Brushes broken on Variac
-HT Smoothing installed
Termination of Odd and Even Pulse

[[diagram]]

28-4-53

Work is proceeding on the development of the second outlet annex for use with the tabulator. So far the annex has been made to work with the reconverter quite well. The progress on the tabulator control circuits is being tested with a simulator in the absence of the real thing which is not expected until next week.
A pair of medium speed tape machines are being wired up for tests with the converter and it is hoped that some of the 'bugs' that have worried us on this machine will go

[[NB14-046]]

with the old tape machines.
The first tests with the converter are booked for tomorrow
[[begin strikeout]] by which time [[end strikeout]] after which a full scale rehearsal of the P4 payroll job can be started.

I am trying to press on with an examination of the (data and results) conversion circuits but there are so many interruptions as to make progress very slow.
The spike on the Complementer has been traced to an inefficient gate in the collator.

Receipt for variac brushes
Power failure
Modified Storage Units
Suppression of interference from MT Switch
P1 fault (cure by shorting out delay line)
TRT re daily tests on Outlet Annex 1 and 2
Drill for handing over machine to programmers.
Marginal checks on other circuits

[[NB14-047]]

[[diagram]]
10 amps on primary
10 / 10 = 1 amp on secondary

100 mA
250v x 100 22K

An attempt to suppress the surge caused by switching off the AC to the primary side of the marginal testing transformer has been unsuccessful. This is probably because the load presented by the Variac when wound right down is is largely inductive so that in spite of the small current the Back EMF is a large one.
There seem to be two alternative actions
(a) Switch the secondary side
(b) Suppress the surge through a series resister large enough to reduce the secondary voltage to an effective zero.

[[NB14-048]]

Progress

Storage Racks
Power Supplies
Positive Power changeover 1/2 hour Tuesday
Permanent Power installation Saturday
Test inlet annex with
New Storage Unit invest
Annex Marginal Test Outlet Inlet

Reconverter startup
Storage Units
Marg FF HA
ditto Annex

Spark suppression [[SRG ? GRG ?]]
Clear and reset annex

May 5 53

A reasonably successful demonstration of the reconverter and converter in use with the calculator was made last Friday to a group of Dutch visitors introduced by STC. Fortunately it was possible to do the demonstration without printing off the results obtained and for the purpose of the event a previously prepared box was read off. We have had some

reasonable success with the standard gear and there certainly seems to be a big improvement in work with the converter since the tape machines were changed.

[[NB14-049]]

A great deal of evidence was obtained in the way in which the outlet system corrupts results. These have yet to be analysed fully.
Barnes has discovered two logical flaws in the arrangements for result conversion.
(a) when using the output tube of the store, the clearing can not be done as was hoped by the [[illegible]] of the coincidence waveform as while marking time in the event of the tabulator being unready, the information waiting to be sent out will be cleared.
(b) In reconversion the address of the tens of shillings digit cannot be obtained from the multiplicand in the usual way as only one digit is required and unless other precautions are taken the address will result [[begin strikeout]] in an uncertain number [[end strikeout]] in the result digit being stacked in an odd or even compartment instead of in 1 or 0.

It would seem that (a) is easily solved if only one output tube is to be used by [[causing?]] an appropriate waveform from the annex for clearing

[[NB14-050]]

if two or more output tubes are being used then it may be necessary to gate the coincidence waveform at its source by an annex waveform which is down during the waiting period and goes up on annex ready.

[[diagram]]

The problem of (b) may be solved by supressing the three unwanted digits of the address or by arranging for the tab [[tabulator?]] to print a 1 an even position.
This is not convenient as it would be necessary to inhibit the alarm circuits also [[begin strikeout]] otherwise [[end strikeout]] e.g. Â£7.10.0 would cause coince [[coincidence]] in 15

[[diagram]]

[[NB14-051]]

Progress WE 6-5-53

Mechan [[Mechanical?]]
5 wire printer space instead of 2

Electronic
Annex fault
cure of P1 fault?

Storage Tubes
x tubes now have attenuator. Modified Model

Margins
New transformer and switch installed
Half Adders [[not?]] very satisfactory
Annex now tested under margins

Reconverter
Reason for start failures still not clear - becoming less frequent

Fault on outlet annex

Converter
considerable improvement with new tape m/c still some occasional faults which have been too intermittent to investigate

[[diagram]]

[[NB14-052]]

Progress Discussion

I am organising a shift of the first part of the store this weekend. Store racks 0 1 2 and 3 are all being shifted up one place to make for consolidation equipment at the control desk end.
Fortunately much of the wiring can be left as it is but a complete interchange between the new 0 rack and the old 3 rack is necessary.
Mann and the two lads and [[Miss?]] Hills are doing the main job and I am coming in on Sunday to test it.
Power wiring changes are taking place at the same time which accounts for the need for a Sunday test.

	M.	W.	A.	H.		
Parallel up all common leads			y		y	
Wire in Monitor lead for Rack 0					y	
Shift all other monitor leads down			y			
Labels on Coax leads (Racks)					y	
Shift Routed? coince [[coincidence]]					y	y
Pull through Coax leads from 3 to 0			y	y	y	
Labels on Coax leads Vault			y	y	y	
Modification to Cards					y	

[[NB14-053]]

While vaults are open check should be made on all present positions.

[[diagram]]

also a note should be made of all tanks at present using attenuation. Leads to be removed one at a time and replaced after new label attached.

Store

Storage Unit
Coince [[Coincidence]] Waveform Gate and Order tank
Flipflop margins
Outlet Annex
Inlet Annex
Half Adders
Mann Test Schedules [for 93 94 96

Frequency Monitor
Labels for short tubes

[[NB14-054]]

Grouping of Margins on New Computer Units

To ensure that the M D0 is always an even D0 it is necessary to link the odd and even pulse generator with the Counter tank.
Unfortunately the digit in the counter tank that corresponds with the alternate minorcycle is a D2 and to use this to control the W1 flipflop would involve a separate flipflop.
It would be possible to use the flipflop output of the majorcycle pulse generator to control the setting and resetting of W1.

[[diagram]]

as no odd or even pulses are manufactured around the D24 there would be no objection to feeding the flipflop waveform straight into diodes provided the DC level was maintained. At worst this mod would call for 1 ECC33 and 1 EB91.

[[NB14-055]]

Cables to Racks

(a) Flip Flop Margins
(b) Amplifier
(c) Storage Units
(d) Decoders
(e) Relay Circuits
(f) Other Circuits
(g) Flip Flop Indicators

8 racks Storage Units	x 2	16
13 racks	x 5	65
		--
		81

Flip Flop indicators 100

Lamp and switch for clear waveform on Tank 56

[[diagram]]

String of [[illegible]] required

1 Counter
2 Margins
3 Output Switch

[[NB14-056]]

12 May 53

Tests on flip flops in the machine have been reasonably satisfactory so that work is now going ahead to provide facilities for testing all the flip flops in this way. This means that

(a) more leads are required to go from all racks to the Control Desk
(b) in order that a suitable marginal voltage should be applied to the flip flops all other marginal test points will have to have series resisters inserted.
(c) Consideration must be given to a [[means?]] of testing flipflops for oversensitivity.
(d) While cables are being made for marginal testing consideration must be given to the need for flip flop indicators. There may be as many as 12 or more flipflops on a rack. This calls for
12 wires for indicators
24 ditto margins
[[begin strikeout]] This is [[end strikeout]] if all are to be tested separately.
This would be rather an unwieldy arrangement so some compromise must be sought.
On the computer all flipflops on one rack could be marginally tested at once provided that indicators are available to pinpoint the failure

[[NB14-057]]

on the Coordinator however closer discrimination must be given [[begin strikeout]] otherwise [[end strikeout]] as otherwise fault finding may become tedious.

FF [[illegible]]
Frequency Monitor and control

Plan of Action

1. Margins on all amplifiers other than half adders
2. Work mon Half Adders to improve margins.
3. Cables made up for Marginal testing and flipflop indicators
4. 500 ohm in all flipflop set and reset cathodes.
5. Indicator lamps at top of control desk Margins on Output Switch
6. Reset to Stage 2
7. [[Gated?]] coince [[coincidence]] for clearing OT [[Order Tank]]
8. Make Md0 Even.

[[NB14-058]]

Computer Control 1

[[diagram]]

13-5-53

A curious fault occurred this evening after a 2 1/2 hour run on the Crystallography Job. The machine went into a loop for which there seemed to be no easy explanation. M5 was put on and although no faults were recorded a peculiar hesitation was noted during the B order test. This effect was more noticeable when margins were NOT being applied. Closer analysis using the A10 B test showed that a right shift order was failing. It was found that an E order was

[[NB14-059]]

being carried out instead of the R. The E order was in tank 0/22 the R order in 2/22. Therefore tank No [[illegible]] was suspected. This was OK but the F8 flipflop was being reset very early in the Stage 1 of the R order. Further investigation showed that this was due to an end pulse coming from a previous B order after a Dg had already been sent. I did not investigate further as it was already 2300 hrs so I have left it for Shaw.
Looking now at the diagram it is clear that the trouble may well lie in the insensitivity to reset of the F1 flipflop in LC49.
Investigations into marginal testing of flipflops suggest that it may be necessary to apply sensitivity tests as well as

insensitivity tests.
I took a standard static register and inserted a 500 ohm in one cathode. This unbalanced the sensitivity to the extent of 5v on one side and 8 on the other

[[NB14-060]]

[[diagram]] [[includes two valves A and B - see refs below]]

If A is conducting then an increase in cathode load will raise grid of B. When a reset is applied to cathode of A a smaller increase will be necessary to kick it over than before.
When B is conducting, no current is flowing through the cathode of A so that the increased cathode load has no effect on the size of pulses required at B cathode.

Rewire Computer A
Step up Multipliers in Amplifier Margins
Further work on Flip Flop
Frequency Control Unit
Lamp and Switch on Tank 56 Clear
Work on Reconverter
Marginal Tests on Annexes
ditto on other circuits

[[NB14-061]]

Progress Discussion
examination of [[researching?]] of
Payroll Loop Mon[[day]] 16

Continuing last nights trouble on the B order it was found to be due to severe condition imposed on f1 in LC49 which is asked to set on an ED0 and reset on ED1 under the particular condition in the B test.
Putting it right took best part of the day and resulted in a delay line being put in the reset to D1. Unfortunately in making the change Shaw coupled in the coder waveform without [[illegible]] which resulted in trouble on multiplications when the multiplicand was negative. After this had been put to rights trouble occurred due to faulty valve in the PE Reader.
TRT has put me wise to a "change in emphasis". JMMP [[Pinkerton]] is to be more concerned with the serviceability of the machine and I am to keep him informed.

[[NB14-062]]

Progress Meeting
Plan for Shaw Saturday
Rewiring of Computer A
Lamp and Switch on Tank 56
Review of control leads needed for each rack
Half Adder
Storage Unit
Wires for Control
Routine of Test [[begin strikeout]] Schedule [[end strikeout]] Programmes
ditto Maintenance Routines

It is now proposed that instead of providing just enough control lines to each rack to serve margin and indicators, provision is made for say 30 lines to each rack. This will give enough leads for most racks even if two are needed for each flip flop.

With such an arrangement it will be possible to have a separate line from each control [[begin strikeout]] with [[end strikeout]] so that a greater flexibility can be exercised at the control desk.

[[NB14-063]]

[[jottings]]

Waveforms for C and R

Commence W41

[[NB14-064]]

Now proposed to separate out the Flip Flop indicator lines from the marginal testing leads. although I must admit that I see no good reason for doing this. At present there seems good reason for having about 60 wires from each rack to the control desk.
There seems no point in providing such an abundance from the store racks so for a while at least these will be left as they are.
This leaves

3 Coord
3 Comp
1 Reader
1 Clock Pulse
5 Annex

13 Racks

13 racks to be provided for
The accommodation of 60 wires at the foot of the rack is no particular problem but at the control desk 780 wires will be available.
Many of these will be common together but the system will permit a much closer control to be made and all of the weighting resistances can now be put at the control desk end.

[[NB14-065]]

[[diagrams]]

Termination of cables and mounting of series resistors can be done on Hinged plates mounted at the back of the MT panel. Each plate can be provided with tag strips which will act as terminals

[[diagram]]

and also for mounting the series resistors., The 60 resistors will be arranged in 4 rows of 15 making the plate approximately 1'[[foot]] square thus termination for [[illegible]] is provided by the live side of the plate.

[[NB14-066]]

Data and Results

1. 90 [[to power 5?]] Data Conversion Proceeding but no output shown from LC96
2. LC95 Why an amplifier for Acc IO but not for Complementer

3. Check wiring of LC98 to ensure that terminal 12 is input as well as output (i.e. mixer) otherwise coince [[coincidence]] unit will not get complete result digit.

Swinging gate on Control Desk

Each gate accommodates terminations of 2 racks ie 120 wires with possible series resistors

Periodical testing Valves Decoding & valves

[[NB14-067]]

19-5-53

There was a bit of a panic last night that was due to trouble in tanks 0 & 3. Unfortunately tank 3 had shown extra digits during tests in the morning and had not been followed up. An inquest this morning resulted in a promise that log would be kept in much more detail.
It is true that there has been some negligence in log keeping one reason being that Miss Hills is away from her desk too much - usually typing out log sheets. I must agitate for a typewriter for her.

Pinkerton re typewriter
TRT re rack covers
Where is suppression of 3 digits during sterling result reconversion

[[NB14-068]]

Modifications required for Conversion

(a) LC40 ([[begin strikeout]] try and [[end strikeout]]
(b) Mixer in LC34
(c)

A blitz on the Reconverter has resulted in a disclosure of yet another trouble on the Standard equipment. Probe effect in new gas tubes. This leaked out in a casual sort of way when Kaye enquired into a mod that [[Cottril?]] was putting on the Collator. It was confirmed today when after a day and a half of runs on the payroll job a new tube was found with probe effect and had been causing the trouble which has been with us for some weeks.
The new multicathode tubes which we have been given to replace the old type are also giving

[[NB14-069]]

trouble - only 7 out of 24 found to be useable. The troubles we have had on the payroll demonstration have apparently been due to a bad tape recording - a recording made on the new equipment which has been awaited for some time as being the answer to all our troubles. Taking all this together there seems to be some hope that the new Consolidation equipment will soon be more than just a possible rival.
The tabulator has been working but there is much interference which is being investigated.
A Payroll job has been carried out already on this equipment using Ferranti input but it was spoiled by extra digits being put into the output annex.

[[NB14-070]]

20-5-53

Shaw drawing up description of Marginal Testing Arrangements.

The new store test program takes too long and doesn't test the store in the clear state. Ask [[Weston?]] to consider new

line - S24 with different pattern in each tank
ie
[[diagram]]

Progress Meeting for Fortnight

Order Cable for MT runs
Testing of Diode in Machine
Grouping of Flip Flops for MT
Try D18 in LC40
Mod to LC19 re set & reset of ff [[flipflop]]
Examination of B tank rejected from Order Tank
Try circuit locking [[W1???]] MD0
New Storage Units test in MC
Half Adder & 17pi tank
Wedge attenuators in long tanks
Investigate 5 wire 2 corruption
Test Programmes S30 & S30A

[[NB14-071]]

Statement on Marginal Testing & plans for future

FF need increase all series resistors therefore test separately.
(a) Connect up all those capable of withstanding 9v
(b) Investigate all others and improve - as they come into line connect up

TRT
Code Panel Miss L
Direct Parker
Fault Diagnosis

[[NB14-072]]

10-6-53

A curious fault on initial orders caused some head scratching today. It happened first on a new programme that was being tried and was confirmed when the M5 failed using the stacking test about 12 corruptions were recorded only two varieties.

Correct	11011 011011 01101 1
Incorrect (a)	11010 100101 00001 1
Incorrect (b)	11010 101001 01101 1

This defied solution all the afternoon but I was sure the solution was available in the information available unfortunately the address had been increased and the action reduced by one in each case. In decimal form the orders were
27/877/19
26/1185/19
26/1325/19

This evening over tea I think I have worried out the solution as being a negative multiplication instead of a positive one. This was arrived at as follows:-

Correct	11011 011011 01101 1
Subtract Incorrect	11010 100101 00001 1

00000 110110 01100 0

This is the equivalent of an address of

12
64
128
512
1024

1740

This at first sight did not appear to

[[NB14-073]]

help until I noticed that 1740 is twice 870. Turning to the other corruption the difference is found to be 1600 = 2 x 800. Now for this to be the explanation of the corruption it is required that the first part of the address 800 in one case and 870 in the other is subtracted instead of added to give a negative address which when added to the action digit gives the required pattern. This would happen if the multiply order was being corrupted into a negative multiply order thus

10(-10(8)+7)+7 = -723

512

211
128

83
64
--
19

Action + Suff 11011 000000 00000 1
Negative Address -723 010110 10011 1

11010 101001 01101 1

Similarly

-10 ((10)8 +7)+7 = -863

512

351
256

95
64
--
31

11011 000000 00000 1
Negative Address -863 11010 11111

11010 100101 00001 1

At this stage it is not clear whether the fault is due to action static registers not being set up or to digits dropping out of the order tank or to a fault in the computer

[[NB14-074]]

[[numbers]]

Brixham

95069
95134 Stockbridge 10:15 3 galls
95267 Brixham 4 galls
95374 Ivybridge 3 galls, oil
95495 Brixham 3 galls
95515 left Brixham 9am
95585 Crewkerne 3 galls 2 pints oil
95711 Harlington 3 galls

Termination of control lines on Racks

[[diagram]]

[[NB14-075]]

Typewriter for Miss Hill TRT
Converter
Tapes
S.C.T.
Term on Annex
Spike on Outlet

[[jottings]]

Delivery Note
100 & 29

6 KK 1/6
1 [[illegible]] 2/6

4/-
Less K% 7

3/5
---

1 Pt Van Ice 1/3 1/2
1 Pt Chock Ice 1/6

Nett 2/9 1/2

[[NB14-076]]

16-6-53

Calculator has been going extremely well since I came back from holiday nearly a fortnight ago.
I have been able to look around & take stock. TRT has given me one or two prompts but has left things generally to me.
As soon as Mann is through with his tests on the storage units he will take over the normal running of the machine with some direction from me or Shaw as necessary.
Shaw is taking over the initiative on Marginal Testing with direction from myself and is going to take a bigger interest

in the STC equipment than he has done as yet.
This will leave me more time to concentrate on the consolidation equipment and this will be very necessary as the time comes for the testing of the Conversion equipment.
Miss Hills is to be used more for assistance in fault finding so that a closer check can be kept on records.
Parker continues to operate STC equipment but [[begin strikeout]] with [[end strikeout]] under much more close control.

[[NB14-077]]

Investigation into some shortcomings in the Marginal Testing of amplifiers shows that the original scheme for grouping of amplifiers was wrong.
I assumed that it would be desirable to separate out into different groups any amplifiers that tended to react upon each other. This has resulted in groupings that respond well as groups but which fail when given a general test.
On reviewing the situation I think the correct procedure should be to put all mutually affecting amplifiers in the same group so that the weighting resistors used take this into account. This means that when using margins for investigation of a fault, a marginal condition which exists when general margins are applied will still be recognised when group margins are used.
This means that the usual method of calculating weighting resistances will not always work out very well and if [[begin strikeout]] they do [[end strikeout]] it does not a closer

[[NB14-078]]

check on the effects must be made before deciding upon the weighting resistances to be used.
Example
P1 P2 P3 amplifiers which are in effect in series so that margins applied to P1 or P2 will [[begin strikeout]] determine [[end strikeout]] condition the failure voltage of P3.
These would be grouped together and the usual method used for working out weighting resistors. The group would then be tested and by further detailed tests higher values of weighting resistances used where necessary.

17.6.53

TRT is considering rationalisation of the form of actions with a view to making room for a B register. He has asked me to look into the question of the use of coder waveforms in the coordinator and computer with a view to rationalising these too.
The principle of the B register is to enable orders to be modified each time it is used. Thus if an order starts at

[[NB14-079]]

28 300 17 each time it is used it would be increased by 1 the process would depend on this order being added to the constant in a B register before going into the order tank.
This would call for at least a full adder in addition to the B register and the controlling circuits necessary i.e. about 5 new units.
Looking at coder waveforms the first impression is that there is need for all the coders produced now but the method of producing them could well be reviewed.
The original principle was to produce the simple waveforms in the Action Decoders and then to make up the more complex combinations in the Coders.
Later additions have resulted in the mixing normally done in the Coders being done in the units where the combination is needed. This is a result of crowding in the Coder rather than any plan but in view of the fact that in many cases the ingredients of a composite coder have to be taken to adjacent units it might be convenient to do the mixing here a scheme which would save space

[[NB14-080]]

in the coder as well as reducing the number of lines leaving the coordinator.

18-6-53

A very satisfactory demonstration of consolidation equipment working on Payroll was given to the Directors of BTM yesterday
apart from one or two minor troubles the equipment has given remarkably little trouble and big decisions will have to be taken shortly
A new fault on the B order has been shown up under marginal conditions. It has apparently been shown up after a modification to correct a possible logical fault in design had been made.
Investigation showed that a curious ticking in the speaker during the A10B test was due to an Add order being executed instead of the B order. The curious thing about this was that the add order itself was being curtailed by an end pulse coming from the B order unit. Another curious thing is that this effect is produced by the application of margin

[[NB14-081]]

to the amplifier in LC30 dealing with End Pulses.
How amplification of end pulses can have the effect of [[begin strikeout]] producing [[end strikeout]] converting a B order into an Add order is difficult to imagine particularly if a B order end pulse is being produced at the same time.
There is one possibility.
If there is break through of a pulse on the end pulse line, and if the F13 ASR is oversensitive to reset then the amplification of this breakthrough may reset the "one" ASR leaving 28 set up instead of 29. This may occur after the 29 order has existed long enough to set F1 so that although conditions are set for the B order after only a short period this gives way to the A order. The F1 in LC49 having been set will provide a B end pulse which will knock down the A coder before there is a chance of a coincidence so that nothing ever gets added into the accumulator.
This theory stands or falls on the ability to demonstrate the coder for A following immediately on the tail of a short B coder.

[[NB14-082]]

19-6-53

Quite a day.

I arrived at 1.30 this afternoon to find chaos reigning.
P2 had failed twice for varying reasons and no progress was being made. Eventually a lead was obtained 839 had been converted as 8399 later another fault was consistent with the PE reader reading the same row of holes twice.
Reader test gave no joy so an attempt was made using the mechanical reader. One more [[bakery? - bakery valuations]] was done and then we failed again for an apparently different kind of fault.
For a while this deflected attention from the reader but after reading in again on the PE reader another fault consistent with a reader error occurred.
This time there was a definite fault on the reader as the 1648 digit stayed put whatever tape was put on. Thiswas soon found to be a valve and after replacing this we steamed on again. A new reader fault occurred once again same row read twice. This time I took the assembly out for

[[NB14-083]]

examination and found that the detent spring was too far forward t [[begin strikeout]] let the ratchet [[end strikeout]] slip into the ratchet. After adjusting this we pressed on again and after a while a new fault came up Decoder trouble apparently with the contents of 0/0 being stacked in 32/0. A store check failed to show up any fault so I started measuring valve currents. I found a SP61 passing a permanent 10 milliamps but unfortunately it was the wrong valve to explain the trouble. Manual programmes were used to test 0 and 32 without success. We then refed programme and all seemed well until with [[bakery 6 ?]] every item came out as a fault - fortunately this was explained by a data error and we steamed on to the bitter end finishing at 10.45.
The problem now is to decide if the fault has been cured and if so what was it - or they?

[[NB14-084]]

20-6-53

Investigation into the sensitivity of Half Adders to marginal voltages.
(a) Observe effect through the 1/2 adders.
(b) Apply to one only in [[illegible]] loop.
(c) Effect of increasing Clock
(d) Possible mods to Clocking Gate.

Yesterdays faults
(a) Reader trouble indicated and not pursued because another fault existed
(b) Observation that because other programmes did not fail this fault lay in some peculiarity in the P2 programme.

[[NB14-085]]

20-6-53

Investigation of failure of half adders under marginal voltages.
Tests were made today in order to find out why half adders appear to be so abnormally sensitive to application of marginal voltages. It was known that this was particularly true of the carry amplifier.
After one or two tests had been made it became fairly obvious that the trouble on the carry line was due to the fact that a very small breakthro of say a volt on the carry line was fed back into the carry input line - amplified and then fed out again as bigger breakthro (after a delay of 2 microseconds) and so on. This only occurred if more than one adjacent pulse was fed into the input as each [[bit?]] of breakthro had to be let thro by a pulse at the input in the second position.
This was first put forward as a theory and then proved in the following way.
With a half adder having terminals 3 and 5 connected together clock pulses applied but no other connections made, a single digit pulse was fed in at terminal 1. Marginal voltage of 3v applied

[[NB14-086]]

The amount of breakthro on the 3 and 5 connection was observed. Then a pattern of two adjacent digits were fed in (from PSU 111). Under these conditions two levels of breakthro could be seen. A pattern of 3 adjacent digits gave three different levels, the largest being limited by the amplifier. Similarly for each additional digit to the pattern the effect on the breakthro could be seen. (A slow trace was used giving one complete cycle of marginal test voltages).
In order to test the theory that the second pulse assisted the breakthro of the first a pattern 101010101 .... was put in which gave no increase in breakthro over the first pulse.
This experiment shows the need for a limiting circuit in this line which will not permit any breakthro.
A limiting circuit of sorts was tried on the anode of the carry amplifier but this was not a success as although the breakthro could be completely removed normal addition tests failed with the circuits connected

[[NB14-087]]

Coax Leads to Storage Unit
Half Adder

Alarm circuits for Result[[Con?]]
K order

Shaw Organise installation of units and control test and modification

Mann Day to Day operation of machine

Dutton Pulse [[illegible]]
Modification
Testing

Parker Bench tests and inspection

Gibbs Group Tests

Work that can now be done

Coax Leads
Valve Current checks
Valve tests
Unit testing of spares
Modification of Storage Units
Modification of obsolete spares

[[NB14-088]]

It is planned to give lectures on the Consolidation scheme with particular reference to Conversion.
(a) Mathematics of Data & Result Conversion
(b) Input & Output machinery
(c) Inlet System and Data Conversion
(d) Outlet System & Result Conversion

Progress for next week

Installation of LC34
Tests on Bench of Half Adder
Working of K order
Bench Tests of Freq Control Unit (Parker)

[[NB14-089]]

Publish report on Flip Flops
TRT draft on Lights and Responsibility
Notes on marginal test cards
Check ordering of cards
Chase plan file cabinet
Group Tests of Conversion Units
Chase ordering of Cables for MT
MT of clock pulse generator
ditto Frequency Control Unit
Half Adder MT on bench
Draw up Maintenance Routine schedules
Talk on Conversion
Pulse sources

Call meeting to discuss methods of recording details of marginal tests
Subjects.
(a) Circuits to which margins can be applied
1. Amplifiers
2. Storage Units

3. Flip Flops
4.

(b) Failure voltages and recording of same.
(c) Grouping
(d) Testing levels
(e) New developments e.g. triggering of flip flops on anode.

[[NB14-090]]

180
Programme Board
Dinner Hour
Board insufficient room for

1-7-53

A start has been made on the development programme dealing with data and result conversion.
Already modification to LC40 & LC [[??]] 0 have been made, and the new LC34 has been installed.
Test schedules have been written for each unit individually and I am now concentrating on group tests. Unfortunately Only two of these can be done on the bench and the main work must be done in the machine as the whole process is much bound up with already existing units.
For this reason I am going to introduce units into the machine in ones and twos testing at each stage. The last units to become available are those of the constant generator so that when these have had their "part C" test all of the other units will have been installed in the machine

[[NB14-091]]

Then when the constant generator has been tested the first attempts can be made to carry out conversion inside the machine.
This plan of work it is hoped will be complete by the end of August but as I hope to have a weeks holiday then I must press to get an improvement on that date.
An attempt to get Programmes stacked by means of cards was made last night. This has disclosed a snag in the original plan. both the first & second cards have their contents stacked in Tank 1. The second stack order comes before the card feed has recovered from sending the first card into the machine so in waiting it clears out the input order itself.

[[NB14-092]]

Had discussion today with TRT on requirements for marginal testing ie control leads. At present it seems that it will be impossible to get him to agree to the requirements I have put forward ie 60 wires for each rack but acknowledges the fact that if we ask for 20 wires now he will probably be faced with a demand for another 20 in 3 months time.
At the same time he is apparently against me remaining content with things as they are.
He has asked me to prepare a minimum requirements demand having regards to the effort that is likely to be available during the next 3 months.
At present we have available 3 wires for each rack but this makes no provision for flipflop testing and flipflop indication.
Essential requirements are
1. FF [[FlipFlop]] indicators
(W12 F 1 2 3 4 5 6 7 8 9 10 11
Coord (W13 12 13 14 15 16 17
(PAD
= 20 wires

Computer W2 W[[illegible]] LC28 W6 W8

[[NB14-093]]

Special Circuits for which extra provision should be made

Coord A Transfer Unit Amplifier
Coord C
Pulse Generator Clock Pulse Dividers
Clock Pulse width and Amplitude
Clock Pulse phase
Reader Relay operating circuits
Annexes Counter Circuit bias

Required - a hard valve with 10 stable states

[[illegible]]

[[NB14-094]]

Modifications Required

Coder for K order
Coder [[is this 11 or ditto?]] for data conversion
LC40 for Acc Sign Indication
LC34 K order

Wiring changes
When installation of Data and Result conversion units are being carried out, if the amount of wiring change is small it may be better to put in temporary wiring in a distinctive colour which can be made permanent at a later date. Where changes are extensive a planned change is better.

Changes needed for Conversion
Mod to Coder II
Pulse Wiring i CharGen [[Character Generator]] & C/O unit
ii Shift Order Tank
iii Installation of 93 [[T? +?]]
iv Installation of 94 95 96
v Installation of 90.91.92.
vi Installation of 97.98.99.
Machine Work
11th Tests with 93
18th Tests with 94 95 96 using [[begin strikeout]] spurious [[end strikeout]] artificial patterns
25 Test pattern generator
Test Data Conversion

[[NB14-095]]

Query possibility of naming pulses
P1, 2, 3 etc in same way as W waveforms

90
91A
91B
9

Gate Coince [[Coincidence]] waveform so that Order is not cleared

[[NB14-096]]

Valve currents of valves > 10 mA [[milliamps]]
Tighten nuts on Power Supplies
Relay Adjustments Telegraph
Relay Adjustments HS
Starter Units
Readers Mech
Readers P.E.
Teleprinter
Teleprinter Reperforators
Vaults
Diode Testing
Valve Currents on Decoders

[[NB14-097]]

[[Back cover]]