[[NB08-001]]

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18-10-51

There were still a few things wrong with Leo yesterday morning.
(a) The E end pulse failed occasionally
(b) Right Shift failed
(c) Eventually there was evidence of complementer failure in a new P3 programme.
I think that the trouble with E end pulse has been removed by a spot of widening in LC40 The Trouble on R apparently is only serious on R(2) and is due to a breakthro spike which so far has not been eliminated in any case it can be avoided by adjustment of pots.

[[NB08-002]]
The complementer fault is still with me.
The complementer fault was one which had occurred before and which was due apparently to a small spike on the [[subtrahend]] line which was being amplified and resulting in a sign digit being left in the accumulator after subtracting -x from -x
Caminer produced a short tape programme which showed that one setting of P1 in the complementer was near the limit. Adjusting this to give a wider limit produces trouble on other programmes

and so a mean position was found which satisfied all tests. It has not left a very wide margin of error however and I am not certain that it may not produce other errors
Surely the complementer mod is the most needed at present.
More time was spent today trying to get sense out of the character generator and it seems that something may have been achieved here. It seems that the negative pulses (140 volts) were losing about 10 volts when triggering gas tubes. This was possibly due to the KT61 not being

[[NB08-003]]
of sufficient stature to supply the 30 [[volts]] of pulses required. However on examination it was found that the valve being used was [[hollowing]] so that as an anode follower was not very efficient. Increasing negative bias improved this situation and it seems that this must may at last be working satisfactorily.
The final blow today came when it became apparent that P1 was not going to work due apparently to failue of the machine to ~~add~~ carry out orders of the type

A_x stored in x.
After investigation it seems that the trouble is due to executing the add order twice
Actually 2 orders are called for~~e~~

e.g.
499 T_x
500 A_{500}
501 A_{503}
502 T_{600}
503 (2)

instead of order in 600 being stepped on to A_{502}
it becomes a "24" order :-

28-20-20

28 20 20
2
24-41-10

One thing that could cause this is if in some way the

[[NB08-004]]
"1" to the sequence control tank could be suppressed in some way. Why this effect should be in any way connected with an order that adds itself into the accumulator I just cannot see.

19-10-51

If the annex suppression of "1" to SCT is connected up This may be the cause of the trouble. In the Annex CHS is delayed and gated with a negative waveform and then reversed so as to inhibit additions to SCT Now while there whould be no

CHS waveform it is known that there are spikes on all coder lines which are due to the changeover of + & - SR outputs Now these will probably be amplified by the reversing valve in the HS control circuits and may well be sufficient to cause suppression of "1" to SCT
The spikes occur at the end ~~of~~ pulses as the ASRs are reset
~~The add order would ge~~
A program set up today showed that there were spikes of amplitude of about 15 volts being applied to the suppression list from the Annex. Some of the spikes

[[NB08-005]]
appeared to coincide with the Add ~~end pulse~~ R2 pulse although this ~~is~~ occurs ~~before~~ the end pulse terminating the Coder Waveform. In fact it would appear that the spikes on the Coder line do not interfere with the SCT "1" but that the offending spike is generated in the Annex from a R_1+R_2 pulse
~~Later fro~~
Having removed the Annex line P_2 was tried again but this time there was another fault "1"s were being added into the store during a clearing process After a lot of high powered detective work these were found to be due to

breakthro of 33/4 volts from the Accumulator which was ~~pro~~ improved to about 6 volts in the first transfer tank, and then manufactured into a full pulse by the second. This was renewed by a slight touch of the P_3 in AccIO.
I have left Caminer & Hemy pursuing a slender chance of completing P_1 tonight and hoping to continue with P_2 & P_3 tomorrow
A fault still with us is the occassional corruption on the Character Generator

[[NB08-006]]

[[DIAGRAM]]

A programme [[of]] work has been started which allocates work to various people in the team It has been worked out up to Xmas. I have been given a ~~whee~~ weak in which to decide what is to be done with the complementer and during the first two days of the ~~rest~~ following week Dutton will carry out the mods after which I will test so as to be operational by the following Thursday.

Storage Junction Unit
Monitors
Clements to modify hoods.

23-10-51

After having a general tidy up yesterday morning, I went full tilt into the new "programme" I am considering the complementer modification. At the same time Dutton is carrying on with wiring of Coder rack after which we hope the machine will be normal again. The character generator is being "toothcombed" by JMP and I hope will be available for a run on Thursday.
Hemy has produced

[[NB08-007]]
two programmes to test the susceptibility to "28 itis" but it will probably need to work in conjunction with the [[attenuator]].
The fault "28itis" seems to have only one possible cause the failure of a 1 to go into the SCT. It is interesting to consider how this would affect other orders.
One order in particular gives us an possible explanation of another fault :- the disappearance of a number. If a T order is repeated The compartment to which the number sbe transferred

is cleared.

24-10-51

Completed arrangements for mods to Complementer yesterday Apart from the DC flip flop this consists of a rearrangement of a couple of gates and a general rationalising of circuit elements consistent with the DC flip flops.
Dutton continued with the rewiring of the Coder Rack and this was completed last night. The short tests I was able to give however suggested that Leo was unhappy

[[NB08-008]]

24-10-51

Introductory Lecture on Leo

~~Bine~~	Binary No in a	Constants in x onwards
0	28 a	Work in y
1	12 x	Result in z
2	2f	1 in w
3	5 y	
4	28 z	
5	25 (1)	
6	28 w	
7	5 z	
6	28 y	
8	12 x+1	
9	27	
10	3	
11	28 x+1	
12	27	
13		

I have modified my ideas on how much gear would be needed for my reconversion scheme. If I produce only 8 patterns by mixing digits and then produce the other 28 by shifting these patterns it seems reasonable to do all the gating and synthesizing with at the most 5 units. This assumes that I can produce a unit containing 1x4 way & 1x8 way ring counters.

[[NB08-009]]

[[DIAGRAM - CIRCUITS]]

[[DIAGRAM - CIRCUIT]]

10^0 D1
10^1 D2, 4,
10^2 D3, 6, 7.
10^3 D4, 6, 7, 8, 9, 10.
10^4 D5, 9, 10, 11, 14.
10^5 D6, 8, 10, 11, 16, 17.
10^6 D7, 10, 15, 17, 18, 19, 20.
10^7 D8, 10, 11, 13, 16, 20, 21, 24.

[[NB08-010]]
Constants taken to Collater & Complementer direct. Micand tank used as result register with multiplication sequence providing circulation & shifting.
For conversion multiplicand tank can be used for the mixed BD number and once again the multiplication sequence used for shifting. The digits will be inspected as they are shifted by a stationery digit probably D32 each gated digits producing a W6 and the sequence brought to an end by an end pulse

[[DIAGRAM - CIRCUIT]]

In order to avoid having to generate digits between 8 and 15 it would be quite logical ~~to~~ (as the proposed sequence will always be a long number sequence) to always set up conditions for a short number even minorcycle sequence and send the constants thro the Transfer tank thus producing a half minorcycle

[[NB08-011]]
delay. In this way the digits required D_0 to D_{23} (inclusive) allowing for slipping and gating become D18/35 & D_0 to D_5 which are already provided.
a new line from the transfer unit to the new control circuits would switch the constants from Acc IO to Complementer as required

~~Best~~ 30-10-51
Best part of yesterday spent checking up on conditions inside the shifting units of the accumulator. One trouble was that one of the amplifiers in ACCSU II was acting as an attenuator rather than an amplifier so that any loss in amplitude of the input was exaggerated causing complete failure.
I corrected this by changing the anode load of this amplifier to ~~10~~ 1K so that the limiting action could be used without breakthro being amplified.
Another fundamental fault in these circuits is that the

[[NB08-012]]
delay amplifier - mixer circuit is fundamentally unbalanced and gives preferential treatment of the delayed pattern to the extent of some 7 or 8 volts.
I am calling for a change here and if necesary an attenuator in the undelayed line to ~~compensat~~ give more similar pulses to the amplifier.
On the subject of the reconversion scheme I have oversimplified the ring counter problem I had assumed that in a series of common cathode triodes with grids at a + potential one would

always conduct and cut the others off completely and that if another [[3]] valve was triggered it would conduct cutting off the previous valve and all the others. This is not true unless some means is made whereby the conducting valve communicates a DC drop in potential to the grids of all the other valves.
This appears to mean that in an 8 way counter each anode must be connected separately and thro a separate resistance to all of the other

[[NB08-013]]
grids. More, if the voltage drop to be communicated from the anode is 100 volts and supposing that the potential divider communicated half of this then the potential divider provided by the grid leaks of all the other valves will cut the voltage change available from 50 volts to 14 volts I see no reason why this should not permit a stable set up but it seems doubtful whether triodes would be suitable

due to their long grid base. On the other hand with the cathodes available the ~~pentode~~ tiresome business of reversing the anode waveform is eliminated and we are left with 8 Pentodes and 4 Double triodes for an 8 way ring counter.

[[DIAGRAM - CIRCUIT]]

[[NB08-014]]

[[DIAGRAM - CIRCUIT]]

If W13 fails to reset and inspite of this, stimulation is given to the next stage 3 both W12 + W13 will be on togehter

Interlocked Coord

Mech EP cannot do single slip if it is inhibited.
End Pulse does not produce R_2 pulse in absence of Coince stim
~~Second incorrect EP~~
R_1 does not reset TNSR
? gating of D1+D19

[[NB08-015]]

1-11-51

Ring Counter
It should be possible to make a stable ring counter without the complication of multiple grid anode connections by using 4 (in a 4 counter) flip flop which could be

ECC 33's each reset by a common reset pulse and each set by the result of its neighbour. Thus assuming that the common reset is applied to each A cathode thro a 100pf capacitor and each B cathode is connected thro a [[1 ??] [[jf]] to the next A grid the differentiated version of the first ff going off would give

a +ve kick to the A grid of the next part thus setting those. It is true that there will at the same time be a reset pulse applied to the A cathode but it could be arranged fairly simply that the grid pulse should have overriding control and so only pulses applied to cathodes of valves not being gated on the grid would be reset

[[NB08-016]]

[[DIAGRAMS - CIRCUIT]]

To 8 way ring counter

Differentiated version of negative waveform must be substantial enough to override the reset pulse which must be equally effective on all other
To make things doubly certain the positive ~~wave~~ output from each flip flop can be used to gate its own reset pulse but this becomes a bit expensive in materials.
If the original idea can be made to work with ECC33s as the flip flop pair it should be possible to make up a 4 ring counter

[[NB08-017]]
with 61/2 valves and an 8 ring counter with 121/2 not including any amplification of reset pulse. It will be desirable that triggers should be applied to grids rather than cathodes to avoid backfiring.

[[DIAGRAMS - CIRCUIT]]

5-11-51

Machine in a state of flux today. Complementer is still not completely right and I have been working on this all day. Shifting Units have been out for modification and these too have thrown up queries mainly concerned with phasing of unclocked pulses.
One drawback on the complementer was the fact that ~~one gate~~ amplifier was feeding both a biased off reversing valve and also a gate. The bias on the reversing valve was -6 volts and the cathode load was 200Ω When the amplifier produced a pulse greater than 6v the grid cathode

[[NB08-018]]
of the reverser contributed a conducting diode across the amplifier anode load. This was dealt with in two ways, the grid stopper of the reverser was increased to 10K to limit grid current, the reverser was fed from the cathode of the gating valve.
Another snag was that the pulses being received by the complementer had been delayed by an amplifier in the MSU so that the subtrahand sent to the collater for gating with D35 to produce D_{AS} was late and the pulse out was very small. This was overcome by bypassing

the D35 gate and taking the number itself to LC28 where it delayed and is gated by ED_0 and W6 to give AD_2. An alteration is needed to LC20 to provide DC restoration

of the number.
The subtrahend still needs to go thro the Collater as there it is mixed with the addend which also required AD2.

[[NB08-019]]

6-11-51

A fault on the machine which has been giving trouble for some time has been named "28 itself-itis" In this fault one order has been apparently carried out twice. In the particular cases recorded the order has been 28/x/ stored in x and was followed by 5/x so that the ~~number~~ order in x was carried out and then restacked in its original position. The only machinery by which such a fault could occur seems to be the failure to add 1 into the sequence control tank.
~~Investigating this fault~~

~~a similar effect (but not the same)~~
It was thought that this effect was due to the suppression of "1"s to SCT line which is part of the Annexe control system. This was shown not to be the case.
Another fault which had no resemblence to the first was one which completely skipped an order rather as if the SCT had had 2 added instead of 1.
In this case it was found that the effect happened after a G order and when the number in the SCT was about to change from 15/31 to 16/0 (the effect

[[NB08-020]]
being to change it to 16/1
A similar sequence was tried which although it failed to produce the same effect stopped the machine due to too small an end pulse from the G order. This was partly overcome by using the amplified even D_0 for G end pulse but it raises other questions.
The state of the coordinator when the failure took place suggested that it might be possible for W13 to remain set when stage 1 was triggered resulting in a R_1 pulse being treated as an R_2 pulse and consequently adding an extra

1 into the SCT. This would explain the skipping of an order.
This problem has not yet been fully resolved but it raises the point that the coordinator is not completely interlocked and that failure of one part of it does not necessarily result in the stopping of the machine.
In order to produce a more fully interlocked system the Coordinator is being investigated more fully and up to date ideas are centered around a 1 ft coord which is either in stage I or stage II

[[NB08-021]]

[[DIAGRAM - HORIZONTAL CIRCUIT]]

Progress

(a) Shift Units Complete
(b) Complementer
(c)

6-11-51

Complementer
Additional digit is small because number ex micand is on a step of about 4 volts when this is mixed with the AD2 then the latter is robbed of 4 volts of its amplitude

[[DIAGRAMS - WAVEFORMS]]

[[NB08-022]]

[[DIAGRAMS - WAVEFORMS]]
cure is to remove step.
Shifting Units
Left shift OK
Right shift - additional digit occasionally [[misses]] at the D_R [[in]] OK may be amplitude of AD2 again.
Not Amplitude of AD2
~~break thro~~ of C7 on W5 in LC22 gate gives spike infront of AD3 which is large enough to be added into the accumulator under some circumstances

---

The gain control P_1 on [[pce]] IO is very critical due to small size of additional

[[DIAGRAM - WAVEFORMS SCRATCHED]]

digit in Addend if gain is increased above a certain point the breakthro spike on AD1 is added into the acc thus clearing the AD2 if it is reduced to remove this spike then the AD2 pulse becomes insufficient

---

Multiplication M5 V2 & M5 V3 fails. Apparently due to small amount of breakthro on input to Complementer via terminal 3 & 4 causing suppression of digits.
AD1 was being sent from a terribly poor SP61 producing a waveform :-

[[NB08-023]]

[[DIAGRAM - WAVEFORM]]

replacing this valve cures the effect
Valve shows no defect other than low emission

Failure on $V_1V_2V_3$ was due to breakthro on input to complementer causing partial suppression of subtrahend. Adjustment of P_1 gives necessary clipping action but is still rather too critical for my liking.

6-11-51

Had a bad day today but at finish was considerably better off than ever before.
Main cause of all my troubles was need of adjustment of controls after considerable alterations in circuitry.
Critical controls now are
(a) P_1 in Complementer. Due to oversensitivity of suppression circuits. I think the bias on the reversing valve might well be increased to 9 volts ~~at~~ on present

showings.
A breakthro of 3/4 volts at input causes suppression or partial suppression

[[NB08-024]]
one of the causes of breakthro at input of Complementer is the W4 wave[[form]] which lets thro some of the micand ~3 volts during multiplication
(b) AD2 whose size is effectively reduced when mixed with number ex micand because the latter is on a step produced by breakthro of W6.
(c) Amplification in ~~Acc~~ ADIO The number sent to the left adder has an abnormal amount of breakthro on it and P_3 on this unit is abnormally critical in adjustment. All the inputs to this unit should be

examined to see how this arises. ~~In the case~~
(d) AD3 the additional digit for right shift tends to have an breakthro pulse of some 3 volts at the beginning. This is due to breakthro of C6 on the W5(R) waveform used to produce P_R which may let 1 or 2 spikes thro at the begining of a right shift. These are added to the number in the accumulator before shifting starts and tend to clear the additional digit
Work for tomorrow depends on a clean sheet

[[NB08-025]]
to start with. If Leo is forthcoming then tests on P_1 programme to show possibility of 28 itis and jumping orders. Also the 1's corrupting the store should be chased.
If everything is OK then return to Acc IO

8-11-51
Had a power failure yesterday which lasted up to 1400 hrs so that comparatively little was done. However all tests were satisfactory and I went on to the P1 tests. Apart from a few Character Generator corruptions there were no faults in the two test programmes but when a genuine P1 was tried for last week there were faults when dealing with negative numbers. ie [[gross loses]] of which there were a few.
After struggling thro the programme order by order

[[NB08-026]]
a yell went up from Caminer Hemy & Barnes as they realised that the programme could never have worked for negative inputs. So it would appear that Leo was vindicated on that count too.
I mentioned my Binary Decimal Conversion scheme to TRT yesterday and he had not heard of it before. JMMP is not very quick as [[passing]] on ideas which are not his own. However he demanded a copy of my note and I await results.

<u>A blue print for Leo Maint</u>
The first effort towards getting the maintenance services on a footing for normal running have been made with the ordering of a trolley for running the [[Cossor]] Scope around the racks.
There are other ideas I want to link up to the general maintenance scheme
1. Power points at the foot of each rack to eliminate all the temporary power points which are needed for scopes, lamps, irons etc.
2. A hook on table

[[NB08-027]]
bracket which can be hooked on to the centre crosspiece of any rack as a temporary work bench

[[DIAGRAMS - BRACKETS]]

some small inspection lamps using a small 6 volt transformer in bakelite case with lense & reflector for projecting a beam into the entrails of a unit (similar to night light.)
3. Synch lines carrying D35 all round the machine and two spare line not connecting to anything but which can be hooked on by a local connection (One yellow one orange one white
4

[[NB08-028]]

Analysis of Faults

The purpose behind any analysis of faults made at this time should be to make general fault finding more simple.
In my present proposals Faults have been tabulated under headings
(a) Valve Failure.
(b) Component Failuts.
(c) Mechanical
(d) Pulse Amplitude
(e) Break thro
(f) Design

Interviewing candidates for my assistant
Questions to ask
1 Why interested in Leo.
~~2~~ After Describing Job.
2. Re schooling Maths?
Physics? What sort
Practical?
3 Hobbies
4 Binary Arithmetic Decimal Arithmetic

Selected Miss Hills

[[NB08-029]]

14-11-51

The time has come for me to consider in detail how an assistant will enable me to get maintenance on the machine more thoroughly organised.
The changeover will inevitably be gradual as Miss Hills will need considerable training before she can hope to do any technical work at all in the first instance will be simply taking notes which I will have to confirm afterwards.
~~One~~ There are several jobs which must be started

immediately.
One of these is daily meter readings. I must get a suitable book in which these (including hour meter readings) can be recorded. Provision must be made in this book for a note on what units are plugged in when the reading is taken

[[NB08-030]]

DC Supplies

Un C AC V A	C AC V A	Instabilised Pos DC V A	Neg DC V A	[[Hg]] V	Stabilised Pos V A	Neg V A

[[HORIZONTAL TABLE]]

Alternating Direct V A	Controlled V A	[[How]] [[How]]	Unstabilised Positive V A Hous	Neg V A V 50	Stabilised Pos V A	Neg V A

Date Time Note re Load.

19-11-51

Another week with no completion of P_3.
Faults on the Character Generator caused most hold ups but it seems that we may have solved most of these as on Friday afternoon it seemed to have given in after a couple of mods
Other persistent faults on the machine however failed attempts at P_2 until late on Friday and the job was completed at about 10pm.
Mr JRMS turned up about 730 and stayed to see the

[[NB08-031]]
job through.
We think now that the faults on the P_2 programme that prevented an earlier successful run may well have been due to the Character Generator The practise of sending a ~~second of~~ output perforate order every few seconds keeps the character generator in good operation but the first or second of these given when the data starts going in may well have caused an extra end pulse which ruined the beginning of the data. Actually the fault seemed to be due to reading

the same rows of holes twice so that 88~~8~~ was stacked in a position that should have had 8
Today I spent some time on the Complementer and I have improved its performance considerably. I have had the unit tidied up, and also some rack wiring has been done. Tomorrow I hope to get something done about the step on the number from the Micand shifting unit so that much of my troubles on AD2 are removed.
I have still quite a bit

[[NB08-032]]
to do in preparing the way for Miss Hills to take over some of my worries
If all goes well tomorrow I hope to be able to do tests on the P2 programme to prove whether or not we have found the trouble.
Clements has got the first tape reader out for modification so that the tape will engage more teeth of the sprocket wheel. Gibbs is working to get the monitors back into operation so that with good luck tomorrow evening will see a great improvement

in the general appearance and atmosphere surrounding Leo. Shaw is anxiously awaiting a chance to get tests done on Annex systems which have been undergoing radical changes including rack rewiring.

[[NB08-033]]

[[DIAGRAM]]

Query why not use capacity of cams or magnetic effect of suitably place poles on rotor instead of switch contacts

(a) Start
(b) Automatic stop
(c) Mark Space relay
(d) End Pulse with automatic stop

[[DIAGRAM]]

27-11-51

Bakery Sales still not completed to date but a big purge is all set for this weeks job. Last week the character generator was the bête noire although there were also some troubles on the machine. One, which while permitting P_1 would not permit ~~the~~ a demonstration of the payroll programme was due to a D35 missing completely off computer A Rack. This proved to be a broken connection. The incredible part was that none of the tests showed up the fact that multiplication by

[[NB08-034]]
a negative multiplier was not correct due to W4 not operating. It appears that the present tests use the same multiplier to check with both + & - micands so that the faults cancelled.
Work has proceeded this week with Operating control and some of the circuits are working sufficiently well to give reasonable faciltities at the control desk. The buttons available are rather dangerous however and its es surprisingly easy to spoil a programme

TRT has initiated a do or die effort to get P jobs done this week. This is coupled with an all out effort to get the rest of the bugs out of the character generator.
I have been working with Kaye this afternoon and we have unearthed at least two possible causes of trouble. One was the fact that the start relay was badly set up, the other that the trigger electrode of the start stop flip flop pair did not have the [[series]] 100K. The effect of this could have been the effect of producing several extra

[[NB08-035]]
characters on starting up.
There have been three distinct types of faults which may have been corrected with each other.
1. After a rest of some minutes the CG [[will]] do 2 or 3 characters instead of one on being stimulated
2. After a rest the second and sometime the third character perforated would be corrupted.

3. On quite infrequent occasion the CG would become jammed with the Markspace flipping in space conditions so that

the perforator churned out yards of blank tape.
The first fault is the only one we can hope to have cleared. It may be that the second and third are similar faults altho No 2 was not reproducible this evening.
The second and third faults have not been reproduced since we attempted to examine~~d~~ the waveform on the cathode of the work trigger tube. Can it be that the circuit has been disturbed in some way eg. Dry Joint?

[[NB08-036]]
The theory we are working on at present is that ~~the~~ as there is no buffer stage between the cathode of the flip flop pair which we use to ~~trigger~~ operate the start gates the gate itself may be producing some back coupling effect on the flip flop. We know that a flip flop may be triggered either on the cathode or the grid so that a negative pulse or differentiated waveform breaking thro one of the gates onto the input connected to the Mark trigger tube could ~~try~~ cause this to conduct

thus causing the CG to jam.
:-

[[DIAGRAM]]

[[NB08-037]]

[[DIAGRAM]]

? Double Pulse
Double Pulse or Breakthro from start gate back to mark.
? Relays & Start ----------

? Double Pulse <----------
Space fails to [[trigger]] from Start <----------

Bias
Pulse Amp & Tolerance
Use of rectifiers
"slow rise gate"
?

? Mods

<u>Faults</u>
(a) Double operation after rest
(b) Running away (Space jammed)
(c) Second character extra mark in the position
(d) 27" corruption for 18" then correct
(e) 2n + 17 (prior to mods)

(f) Mixing first space element (J to 7)

[[NB08-038]]

28-11-51

P_1 completed today without any hitches! Much effort was put into an investigation of the shortcomings of the character generator this morning and after doing a few extended tests on last week P_1 we started this week's at 4 oclock finishing at 5.35. There were about 3 corruptions and as all the results had been calculated before hand (just in case) it was possible to say that ll the results were correct
After this we put in a programme to continually print

10 and made one or two spot checks around the circuit One point was very pointed and may be a cause of some of our trouble.
On inspecting the negative P pulse I noticed that it was difficult to sync when the CG was working A close examination revealed that either the frequency was jumping occasionally or an extra pulse was being produced. Examining the sine wave (at present being supplied by our audio oscillator) proved that this was quite steady but there were infact extra pulses

[[NB08-039]]
being produced somewhere. The pulses are produced in the squaring circuits following the oscillator. A small kink which corresponds with the back edge of the first start ~~pulse~~ waveform in being amplified and squared to produce an extra pulse

Bias 165 No 12 yes 26 Trigger

Pulses normally 50v +
Sneak not more than 10v
Gate

[[DIAGRAM]]
+B +Vp < 320
Vs + Vp < 177
V+ + Vp > 191
trigger pulse
output from anode
(B + Vp - Vm)
Maintaining

[[Radifer]] Q -
1½mA 3 type disc 2K per disc
40 c p disc
3 no of disks
3 capacity 40 pf

[[NB08-040]]
[[TylR4]] 4mA
Night lights
potential between two cathodes
P_{min} < -140 v

current .3 to .5 mA

36 108

[[DIAGRAM]]

3-12-51

The P programme was completed without any hiches or holdups at 220 on Friday afternoon. Everyone was duly impressed and pleased and even Shaw was happy as for the rest of the afternoon he was able to play with his annexe
I have still got a fault to trace on the storage Junction Unit which gave trouble earlier in the week but I must spend a good deal of time with Miss Hills today introducing her to the job in easy stages

[[NB08-041]]
First I must get her accustomed to the more menial tasks so having introduced her to the control desk she will be asked to dust it!
Meter readings is the next job & this will involve [[rustling]] up a sheet of paper and setting some exercises in interpreting meter readings.
Then test tapes need to be sorted out and a gentle introduction to this would be to get her to assist in perforating a tape or two to see "how they come".
The laymans guide will be a good study book to fill in time with accent at first on binary

numbers and arithmetic.
The Serviceability log must be a first consideration and is to be given over entirely with the instruction to worry out of us information as to what is going on.

[[NB08-042]]

5-12-51

Progress Meeting

SJU Fault
Junction Box for Teleprinter
Clearing Up Wires

[[DIAGRAMS]]

EL 33

Bias	10	7	5
1	.2.5	20.8	40.0
.2	.4	22.5	42.0
.3	.3.5	22.7	40.8
4	1.0	16.2	34.0
.5	3.0	28.8	47.0
.6	.3.1	20.2	40.0

[[NB08-043]]

7 12 51

This has been quite a succesful week. I started off with a rather unusual sort of fault on the Storage Junction Units but apart from that there has been very ltitle trouble. Even this character generator has not produced a corruption and the $P_1/_3$

programmes were completed early this afternoon.
There were however two hitches one when an order was read in incorrectly on P_2 and a second when P_2 produced nonsense but the latter has almost certainly been proved

to be a programming fault and an old unmodified P_2 program was used to do the job.
This afternoon several demonstrations were given of the machines capabilities and a new Payroll programme has been tried. This is a much more elaborate affair than the old ~~P~~ V_3 and uses both tape readers for current and brought forward data and perforates the carried forward data for the following week.
A rearrangement of responsibility is being made.
I am being made responsible for the maintenance of the machine

[[NB08-044]]
as a whole including the Standard Telephones equipment Shaw is to gradually take over the testing and maintenance of the Computer.
Miss Hills who started last Monday has shown herself to be very keen should prove very usefull. She has been keeping the Reliability log up to date Taking meter readings and has even had a go at some analysis of Fault Sheets.
I have asked her to start a reliability chart which shows relative times of Productive work etc.

10-12-51

Maintenance Schedule

One of my first jobs under the new arrangement is to ~~see~~ prepare a maintenance schedule & see that it is carried out efficiently
Separate Headings of Maintenance
Input Output Machinery.
Control Desk
Units
Wiring
Mercury Delay lines & Vaults
Power Supplies
The Air Supply of course does not cover the Standards Equipment of which ther is as yet only one rack

[[NB08-045]]
In/Out - Tele Readers Wiring Consult Clements
Control Desk - Gibbs re valve checks. Maint of Siements switch Wiring
Units. Periodical Visual Inspection - leaking [[illegible]] & hot [[illegible]]
" Attenuator Tests
Valve Current checks
Wiring. Visual inspection.
Loosen & Tighten all tags
Tighten cable connections.
Power & signal plugs & cables
Delay lines. Periodical Bandwidth checks
Tighten cable connections
Oil & greas fan as required.
~~Power sup~~

Progress Storage Battery Gibbs & Clements
Character Generator Rebuild
Supervisory Panel.

? Z order & reset

Z order Test

3 - 0 ---------- 6d
1 - 0 2d
9 1½
9 ½
5/6

[[NB08-046]]

	1	2	3	4	5	6	\
Keybord	a	b	c	d	P0		
~~Reader~~ Head+	a	b	c	d			
Print			a	b	c	d	

	CTSE	Checkers TS engageable
	TMCE	Tape Machine Output clutch engageable
	RTSE	Recorders TS engageable
Input	CRID	Checkers Register input disconnected
	CRTS	Operators controlled by recorders TS
	RSPCR	Recorders Stopping pulse connected to checkers Rig [[units]]
	RCXC	Registered characters crossed over and compared
	MSRR	Mark Start in Recorders Reg
	MLFCR	Mark Line Feed & Checkers Reg
Mark	MALCR	Mark Alarm " " "
	MPOCR	Mark PO " " "
	MPORR	Mark PO " recorders Reg
	OCRC	From Checkers Reg to Checker
Output	ORRC	" recorders " " "
	OCRTM	" checkers Reg to tape Machine
	ORRTM	" recorders " " " "

Normal	1 2 1 2 1 2 1 - - - -
Start followed by normal	0 2 1 2 1 2 1 - - - -
Print Out	0 2 1 . . . . 2 1 5 6 2 1
Dissimilar Character	0 2 1 . . . . 2 1 2 3 4 5 6 2 1
Remove	0 2 1 . . . . 2 1 5 6 7 8 9 5 6 2 1
Insert	0 2 1 . . . . 2 1 5 6 10 11 5 6 2 1

[[NB08-047]]

12-12-51 \

A rather unusual fault cropped up this evening during the P_1 programme this evening The machine stopped with both W12 & W13 reset but with PAD set. On examining

the point at which it stopped it appeared to have been a G order. The accumulator was negative at the time so that control should have been transferred. A "1" had already been added into the SCT so that all evidence pointed to a "failed" G order with no end pulse.
The Action static registers were examined and found to be all set showing that in some

way F15 had been set incorrectly or possibly failed to respond to the reset of a previous order. This is not sufficient explanation in itself however as had this been the case a multiplication order would have been carried out instead of the G and the programme would probably have been corrupted.
Two possible lines of approach suggest themselves
(a) Investigate the sequence of order preceeding the failing G order
(b) Test ASRs for sensitivity to set and reset.

[[NB08-048]]
There are faults on both Teleprinter and Reader 1 to be investigated Tomorrow
Teleprinter is faulting producing corruptions when started up from rest - also an extra 16 fault has been noticed.
The reader fault is less easily seen and was only noticed when doing a repetition of I orders. Under these conditions 2 peckers failed to make contact.

[[DIAGRAMS - CIRCUITS]]

[[NB08-049]]
Inspection LC 29

[[DIAGRAM - CIRCUIT]]

17-12-51

Complete wiring of [[extra]] rack connections.
? Power point strings
Castors for Scope Trolley.
Micand & Mier connections
Attenuator tests on Computer
Clearing up of odd wires
Covers on
Consider Mods outstanding
Miss Ledger & programmers office

[[NB08-050]]

[[DIAGRAM - CIRCUIT]]

[[DIAGRAM - CIRCUIT]]

[[NB08-051]]

18-12-51

Analysis of Faults
" " Time.

Reconsider all modification work outstanding & give priority.
Work on Collater
Termination of signal lines

Mods outstanding
(1) A D1
(2) Order P
(3) Storage Junction Units output
(4) Stimulate V
(5)

[[NB08-052]]

Record

Control Box
T ---------- Character line
M ---------- Teleprinter motor.
Box on
Reset fault [[&]] up.

Tape Box	Read / Check
T/P	RR

Box on

Transmit
Control Box
Transmit
Read Check
RR

Collate
Control Box
Box On
RC
Check
Rack
Reset
Tape Box
Collater
Box On

Run Back
Tape Box
Box On
TP
RC
RR
Control
Query & Box on

[[NB08-053]]

Interlocks ?
With all control box switches in normal position & rest of equipment set up for collate

---

CTS 076 = C_0 B7 A6

[[DIAGRAM]]

[[DIAGRAM - CIRCUIT]]

[[NB08-054]]

Collater Block [[Schematics]]

Fig 6
SC2 no mixer crystals shown
SC5 missing mixer crystals
? meaning of [[SYMBOL]] (Germanium ?)

Teleprinter Codes

	a b c d e
0	S M M S M
1	M M M S M
2	M M S S M
3	M S S S S
4	S M S M S
5	S S S S M
6	M S M S M
7	M M M S S
8	S M M S S
9	S S S M M
10	M S M M M
11	M S M M S
Tape starts	M S S M S
End Cross +	M S S S M
End of Recording alams	M M S M S
Long Number L	S M S S M
Space	S S M S S
Car Return	S S S M S
Line feed	M M M M M
Starting Colon :	S M M M S
Minus Sign -	M M S S S
Designation *	M S M S S
Test Z	S S M S M

[[NB08-055]]

[[DIAGRAM]]

x x x

Digit	Running Total	2	4	8
3	0	0	0	0
0	3	0	0	0
2	0 ---------- 11	0	0	0
1	00 ---------- 01	1	0	0
2	0 ---------- 01	1	0	0
1	000 00	1	1	0
2	0 00	1	1	0
1	0000 00	0	1	1
2	0 00	0	1	1
1	00000 00	0	0	1
2	0 00	0	0	1
1	0 00	0	0	0

[[NB08-056]]
Rack Tidying
Maintenance Schedule.
Power Points for Racks
hooking leads for computer
Analysis of Faults
Signal Line Termination
Time Analysis
Attenuator Tests

Leo Serviceability

Since the Serviceability log has been used ~~there have been~~ occasions have arisen when there has been some doubt as to what heading certain times should be designated.
In order to regularise the position and in order to come in to line with the ideas laid down in "Control ... Leo" The following subdivision of work are suggested
First there should be The [[logged]] division between serviceable and unserviceable

[[NB08-057]]
By the term serviceable is to be understood that the machine is available for work Either productive as in the case of a routine job or other work such as programme tests, demonstrations
Under the term Unserviceable must be included all other time including testing time ie the machine will be assumed to be unserviceable untill the tests have proved otherwise

(a) Ensure maximum time of serviceability
(b) Maintain Supply of spares -
(c) Ensure adequate maintenance
(d) Prepare reports on machine serviceability
(e) Maintain records
(f) Supplies of Paper etc.

~~Spares that may~~
Consumables
Complete dissection of valves used.

neon lamps
Fuses.
Paper
Wire
Solder
Cable
Cable plugs & sockets
Soldering Irons & spares.
Inspection Lamps
Oscilloscopes
Cleaning materials

[[NB08-058]]
Power Plugs

"Eliminate additional sign digit."
If additional sign digit is to be discarded then in the accumulator only one digit will indicate the sign of the number and therefore, if the sign is still examined in the same place (exit from Acc I) it will be on D34
Assuming that no changes will be made until the revised panel 40 has been put into use it appears that the following changes will be necessary
LC34. No from Acc Delayed Amplified and
gated with Odd D35 as at present. Output
taken from the gate for sign pulse
Remainder of warning circuit becomes

[[NB08-059]]
superfluous.
LC17. ~~Unless there is likely to be some new mode of the extra sign position in the accumulator~~
It is desireable ~~that~~ but not absolutely
necessary that f_1 should be reset by Odd D35
LC23 D4 must now be on Odd D35
LC26 Odd D35 to be gated with W5 R
instead of even D_0 to produce D_R AD3 not AD 35
LC28 DAS and AD2 circuits redundant
LC29 Part of this unit becomes redundant
as a result of the modified LC40
LC30 " " " " "
LC31 f_2 to be reset by Odd D35
LC33 AD2 circuits redundant
LC37 AD3 input remains but as a
result of change to LC26 input
is now Odd D35
LC40 Completely modified

Modification needed fo negative multiplication

[[DIAGRAM - CIRCUIT SCRATCHED]]

LC 32

[[DIAGRAM - CIRCUIT]]

[[NB08-060]]

Collater
Mods required to improve present working arrangements

1. Remove time switch from Teleprinter.
2. Bring all Record / Collate switches together so that one switch can operate the lot.
3. Convenient reset switch
4.

To improve knowledge of Collater
Draw up schematics and layout diagrams with indications of positions [[of]] various parts. (Miss Hills)
Produce diagrams showing patterns of "struck" tubes at different stages of collation.

[[NB08-061]]

STC Colour Code

Black	- 110
Slate	- 220
Red	+ 220
Blue	Channel +150
White	Earth
R/White	+P
Orage	+[[Rias]]
Black/White	-P
Green	General wiring

"Swinging Gate"

[[DIAGRAM]]

Swing Gates [[Millicall]]

[[DIAGRAM]]

[[NB08-062]]

[[DIAGRAM]]

For the past 2 weeks I have been studying the collater and converter circuits with a view to taking over from the STC people as soon as possible. I am having a tremendous struggle to adjust my mind to deal with circuits and circuit naming systems which differ greatly from the EDSAC scheme of things.
The main difference seems to be that where as in the EDSAC scheme discrete names are given to pulses and waveforms, STC give specific names to their tubes and only general names to the outputs of these tubes. This is not wholly true

[[NB08-063]]
as in the outputs from their time scale a specific name is given from the output of a cathode at a particular time eg $A_2B_3C_9$ but here also the name given is derived from the lettering of the tubes.
There is a reason for this system of nomeclature in that the striking of a particular tube is visible and if the machine is stopped at any time in a sequence, an indication of the state of affairs is usually to be obtained from an inspection of the struck tubes. ~~To my mind however this~~
Unfortunately the lettering or numbering of the tubes has not

been very cleverly done so that it is not easy to learn the significance of each tube. To my mind however this method of numbering components instead of waveforms conflicts so violently with the methods used on the computer generally that it would be much more easily ~~simulated~~ understood if a parallel nomenclature was started up as soon as possible designed to bring the Gas tube circuits more into line with those of the computer.
This will cause inconvenience now, at a time when the

[[NB08-064]]
initial translation is being done and temporarily while coworking with STC staff. ~~But it is~~ felt that the gain due to having a more easy understanding of the circuit for those who have knowledge of the computer will far and away outweigh any temporary inconvenience at this stage.
There are of course several parts of circuits in the STC gear which have no counterpart in the computer (eg timescales) Also the fact that there is no [[regulating]] timing control similar to

our clock pulses & counter tank means that each sequence of ~~the ge~~ operations needs its own time reference. This has something in common whith the Computer however when we remember the timing pulse of the multiplication sequence

1 - 2 - 3 - 4 - 5 - 6
< >
10 - 9 - 8 - 7
1 - 2 - 3 - 4 - 5 - 6
< >
10 - 9 - 8 - 7
1 - 2 - 3 - 4 - 5
< >
10 - 9 - 8 - 7- 6

[[NB08-065]]

<u>General Pulse Suppliers</u> ±P

These are so similar to out clock pulses that they might well be given the same home. STC

<u>Time scales</u>

These give rise to a sequence of output waveforms which occur at regular intervals. Considering one using 3 multicathode tubes these are called A B & C and if they each have 10 states

A will be triggered every ~~20~~ .1 mS say
then B will ... 1.0 mS
C " ..... 10.0 mS.
A particular cathode of A will produce an output once every m/s.
Particular timing may be

achieved to the nearest .1 m/s from the first trigger by gating outputs of various A B C cathodes together thus A_5 B_2 C_7 if gated together would produce one pulse for each sequence at time 83.6 m/s after the first trigger. The point that it is not 72.5 m/s is due to the numbering of the cathodes which go from 1 to 10 instead of 0 to 0
I think a scheme for numbering these cathodes more logically is required so that the actual timing will not call for mental gymnastics on the part of the designer or maintenance engineer.

[[NB08-066]]
If timescale cathodes are numbered from 0 to 10 then a gated time such as ~~aA~~ C_5 B_3 A_2 will mean 532 periods after the start.
An ungated C_5 would mean a long waveform lasting for 100 p

S - Start - Space - Stop

Slow rise gate

[[DIAGRAM - CIRCUIT]]

[[NB08-067]]
Relays

CS A B & C	not in use until power supply.
CSD	Reset control
SWR	[[Tapemade]] Sw
RA RB	~~Tape Taut~~ Clutch Control
TTA TTB	Tape Taut
A_5 B_6 ~~C_2~~	
	65
	165
256	265
145	365
NDc	(c after any valve number indicates cathode output without c indicates operation on "slow rise".)

CR
Time
A B C

[[NB08-068]]

T pulse Generator

PG 1/2	----------	t_1
2/3		t_2
3		t_3 & t_{3A}
4		

5 ---------- t_4 & $PG5_c$

Timing Schedule for Various Character [[Mean]] Diagram relating PG PC & T pulse generator

14-1-52

At 10 00 am on Thursday morning last we started a reliability trial on the computer. The job was tax tables for the current year and starting at week 8 it was hoped to run non stop to week 52.
The weak link was of course the teleprinter and it was not unexpected when ~~other~~ teleprinter faults occurred and we had to switch over to the character generator while adjustments were made.
For the first 24 or so hours the computer itself behaved very well. Then a fault on

[[NB08-069]]
the decoders showed up & this was corrected after changing a decoder. Some hours later a second decoder was changed. The first unexplained fault occurred about 22 20 on Friday when an E order failed to produce an end pulse. We pressed on however for a very long time after this without a single hitch. On Saturday evening apparently the contents of the store shifted around due to counter going out of step

Faults

Teleprinter	Mechanical
	Query endpulse suppression by C27
E order	Panel 40 will cure this.
Counter	?

I have been working on the converter with [[Dawson]] during the past week and have learnt a thing or two about ~~the~~ it. The collater has been performing well but I suspect I have trouble on it right now
[[Dawson]] will probably want

[[NB08-070]]
to depart from us this week so I must concentrate on the converter with him so as to be ~~for~~ reasonably competant to service the gear when necessary

Programme for WC 14 Jan 52

* Panel 40 testing
* Annexe Link with C
* Tape Reader 2 mod & wiring.

Analysis of faults

b 1
2 Warning Note - Tank 16 & decoders
3
4 . ? Decoding
5
6 Char Generator
7 Panel 40 -
8 Decoding

9 Decoding
10 Panel 40
11 Teleprinter EP
12 [[Telp]] Mech
13 Counter out of step
14 Char Gen

[[NB08-071]]

Two Output orders Mixed.

Decoder.
Char Gen.
Inhib EP

Feed Calculator FC
Carriage Return CR.

17-1-51

Collating

There are a number of situations which may arise during collation of information recorded on tape which may make it extremely difficult for the checker to realise where she is and which results in a proof sheet which is very difficult to read.
To some extent, the trouble will become smaller as ~~experience on the part of~~ the checker becomes more experienced but it is felt that unless some change is made there will always be difficulties both for the checker

[[NB08-072]]

and also for anyone who has to examine the proof sheet.
Examples.

1233 45678	Simple faults
1234 3 45678	
1234 1234	Correct
12341	Proof when
00	recorder omits reverses space
1234	and 1
~~12341~~ ‖ ‖	recorder has
12341 ‖ ‖	omitted space.
1 234	

Give examples of simple faults
Corrected.

1 2 3 4 Sp 5 6 7 8
1. Interchange 2&3
2 " 4&Space
3 Omit 2

4 Omit 4
5 Omit Space

6 Interchange 5 & Space
7 Omit 5
8 Interhcange 8 & CR
9 Omit 8
10 Omit CR
11 Interchange LF & CR

Insert extra space

~~Prim~~ Record block of information consisting of lines of
0 1 2 3 4 Sp 5 6 7 8 9
and put a different fault on every second line
Finish up with faults in the 3 line feeds inbetween ~~sev~~ first & second block of 16 numbers.

[[NB08-073]]
I am investigating a new fault on the Collater.
The symptoms are that ~~the~~ ~~on setting~~ having set conditions for collating the first S from the teleprinter fails to engage the clutch.
At present I am not at all clear as to ~~exactly what~~ everything that should result from the first S, but I have at least established that a trigger pair CO CI should be set. In the anode of this pair is a ~~flip flop~~ relay which when energised pulls in the play out clutch. This pair was not being struck. The triggering pulse is S from checkers ~~Register~~ [[T.S]]

On inspecting this pulse ~~from~~ at the CO CI chassis I noticed that sometimes it is there (when everything triggers normally) but sometimes it fails completely.
On inspecting the pulse output from the checkers ~~Register~~ Time Scale I could not make the failure reoccur.

Another fault which occurred yesterday was ~~the~~ a case of corruptions 2 being printed in place of an L This only occurred when collating and investigation suggested that the relays operating from the C & RR were faulty

[[NB08-074]]
The fact that ~~the~~ it was on the proof sheet that the corruption recurred and that the final recording when played off was perfect, showed that it was most likely to be the relay on the output from the recorders register
This was confirmed by interchanging the two relays where upon the proof sheet showed no corruptions [[when]] the final recording had at least one corruption.
Both relays were taken out and adjusted after which no corruptions occurred.

NOMENCLATURE

I am still keen to rationalise nomenclature in the STC circuits.
I think it is inevitable that we should not at this stage interfere with the general lettering of the Tubes otherwise the already unsatisfactory state of the circuits will be reduced to complete chaos.
Instead I think that I will have to ~~providing~~ provide over-riding names for ~~both~~ valves

~~and~~ waveforms and pulses. e.g. The CO CI pair could be termed the clutch pair.
I am seeking for a system of

[[NB08-075]]
waveform and pulse numbering which while distinguishing them from waveforms and pulses in the computer will be ~~simple~~ effective and simple to understand.
I am so used to W waveforms and D pulses that it seems that these are the only possibilities. However Mr Thompsons "Spurt" suggests an alternative for waveforms
One difficulty in applying this terminology to Standards circuits is the fact that they use varying types of pulses and spurts.
However. If I make the rule that the St P pulse are the standard pulse shape

and anything derived from them is a pulse while the output from a trigger tube or mutlicathode is a spurt I have at least gone one step towards rationalisation
The same technique is used in EDSAC for numbering waveform should suffice ie. Number only those that are used outside the chassis on which they are produced. They can be numbered from 1 upwards but probably new numbering will be required for each piece of [[script]]

[[NB08-076]]

Collation

Experience has shown that there are some real difficulties before we can hope to train operators to use our present system of collation or checking.
As an example I have made a recording of a repeated standard pattern and then checked this by the standard approved methods.
Although certain approved rules have been laid down for the checker to follow it has always been assumed that it is immediately obvious from the recorders sheet the nature

of any error which is thrown up on collation.
This is not necessarily true as for example when the g carriage return and line feed characters at the end of a line have been reversed no indication at all is given on the original record. Similarly a space added at the end of a line ~~has~~ is not indicated.
Another error~~s~~ which may occur and which are not easily diagnosed at first glance are when a carriage return and a character have been interchanged Here the character appears to have been omitted but will

[[NB08-077]]
have been overprinted on the first character on the line. If the first and last character on the line are the same, then the only indication that the checker has is a slightly blacker first character.
Another error which might be quite common but would be rather difficult to see at first glance is an extra line feed at the end of the block.

Collater Faults

1. [[False]] Earth Fuse
2. Tape Puckering.
3. Failure of Teleprinter S to engage clutch~~e~~ in Collating.
4 Failure of Tape S to start checkers TS.
5 Corruptions in collated message

6. Adjustment to relays.
7 Failure of tape feed rollers to engage

[[NB08-078]]

18-1-52

Visit from STC personnel re Collater & Converter.
They brought some information I had asked for re the Collater which should help sort things out.
Had a new failure on the Collater today this time it was the gear train for reading.

2
6
8
10

On pushing down the key of the teleprinter the can revolves I and the mark space could make & break a possible 7 times.
This is sent out on the 9 pin plug 6 7 & 8.
For collation

[[NB08-079]]

22-1-52

New Panel 40 works very well but has raised ~~the~~ points that were mixed in the first considerations of the circuit a month ago (17-12-51)
First of all the coder waveform triggering off the sequence in LC29 had to be ammended to include E (~~L~~ C9) then with the present arrangement there would be EP3 for XYE and G as well as the new EP5.
In order to skirt round this difficulty the endpulse for [[Y y]] has been derived from the AD4 digit itself in panel 30 and the [[connection]]

made internally to the EP mixer.
I have at least made a good start to the Collation problem. I have recorded some 16 blocks of data each with a different fault on them
In collating I have run into the usual difficulties but I have made notes on all the troubles and wrote a very brief comment on them. Mr T wanted them for a progress report so I had to hurry them along a bit
It would seem to be an [[advantage]] if the checkers recording version could be back stepped and rerecorded

[[NB08-080]]

[[DIAGRAM]]

but this would presuppose the ability to read backwards as well as forwards and the fact that there is no positive indication of the stop element of a character precludes this

---

Things that might help collation are
(1) a different fault indication
(2) CRLF as one character

~~(3)~~ including a printed indication

4. Block end character including printed indication
~~5.~~
These would work well except for the CRLF character which ~~as it would~~ would need to carry out three separate functions compared with the usual one.

1 2 4 3 3 4 \ 5 6 7 8 E
1 2 3 \ 4 4 \ 5 6 7 8 E

A modification to the TP is of course possible so that when the CRLF key is depressed it carries out all three operations in sequence and locks the keyboard so that

[[NB08-081]]
no other key can be depressed until the end of the sequence is reached. This however is likely to be a difficult modification and is to be avoided if possible.
The mechanical movement of Carriage return already occupies ~~two~~ the whole of the character [[tine]] so that to hope to print a character as well is asking rather a lot. On the otherhand if the printed character were sacrificed there would be ambiguity concerning the error signal --- No --. I have been assuming that the error indication would be a new spacing character but this need

not be so.
If Recapping
(1) / (oblique) used in place of space
(2) Single Char for CRLF
(3) X used for error indication (spacing character)
(4) ~~[[J XCRF]] for Block end~~ B, CRLF used for Block end.

1 2 4 X 3 3 X 4 / 5 6 7 8
1 2 3 / X 4 4 X / 5 6 7 8
1 2 3 4 / 6 X 5 " 6 " 7 8
B

[[NB08-082]]

24-1-52

Tomorrow I will have the whole day to spend on the Converter as Clawson has returned to Enfield to investigate the shortcomings of the new magnetic tape which does not seem to react so well to recording as the old
Saturday I am also spending at Cadby so that by the week end I [[later]] should have had time to clear my mind generally on this job.
It would be as well to decide on a broad line of attack no so that I wont need to spend too much time

deciding where to begin.
At present I feel confident of the general working of the character detection but a few minutes spent testing the reaction of the machine to different characters set up on the test gear will no doubt be very useful.
From this also I can work out the operation of the control characters and then onto the arithmetical conversion circuits.
Some time ago JMP promised that Gibbs would be soon released to assist me with

the ST gear. One of the things that needs to be done immediately is a general

[[NB08-083]]
clean up on the Collater. I have had so many intermittent faults due to dirty relay contacts that a day spent going over these followed by some extented collation tests would be very desireable.
On the subject of dust I must make that complaint to the ST people that no provision for relay covers is made on the ST gear and most of them are wide open to collecting dust as many of the HS relays are mounted in the wrong plane.
Tape machines have been playing up in general as usual

just recently.
There seem to be several shortcomings to the present model.
(a) gears & drives badly designed
(b) bearings not working.
(c) Tape jammings
(d) bad reproduction failing to trigger flip flop.
(e) critical setting of pressure on read & record leads.
(f) static on the perspex screen.
(g)
Coupled with these troubles is the non interchangeability of the two machines one even had its leads wired in reverse [[sl--s]] to the other

[[NB08-084]]
A [[jig]] for repairing broken or torn tapes is required.

[[DIAGRAM]]

Raised Flat ¼ x ½ mounted on plate. about 6" long & Spring clips mounted each end each about 2½" long. 2 ends of tape held rigidly by clips so that the two ends overlap by the [[inch]] separation of the two clips a razer blade used to cut d' diagonal thro both pieces

of tape and while still held in the clip adhesive tape is applied to the butt joint so produced

[[DIAGRAM]]

[[NB08-085]]

25-1-52

Not much was accomplished today. My ideas on ~~coll~~ converter work were upset by a number of computer faults which failed on P_2 & P_3. Much of the trouble was found to be due to wrong results from P_1 but there were other faults which could only have been computer faults.
One in particular was a case where ~~a 28 order was~~

x	28x
y	2~~C~~7 a
z	7/~~2~~
a	28z

& the result in the accumulator was 7/2. This appears to have been due to the 28x order [[illegible]] having failed or that the accumulator had been cleared in someway before the second 28 order had been carried out.
Caminer and I are going to try P_2 again tomorrow morning.
Mr T has made his comments on my collater report. He considers that the checker will have a much easier task if she makes marks on here record

[[NB08-086]]
to indicate what actions have occurred ie if the correct version is
1 2 3 4 . 5 6 7 8
and the recorder has typed
1 3 2 4 . 5 6 7 8
the checkers proof sheet should be marked in pencil :-
1 ~~3~~
2 ~~2~~
3 4 . 5 6 7 8
Where a ~~space is indic~~ non printing character is included in the error being corrected then the checker should type and confirm here characters one by one until

she is past them and then insert or remove
Thus if 1 2 3 4 . 5 6 7 8 has been recorded
1 2 3 4 5 6 7 8 (no space
the checkers proof sheet will appear
1 2 3 4 ~~5~~
. ~~6~~
5 " 6 " 7 8
similarly
1 2 3 4 5 . 6 7 8
will be corrected
1 2 3 4 ~~5~~
` -
5 6 7 8
This means that where a group of digits has been

[[NB08-087]]
omitted at the end of [[grout]]
eg. 1 2 3 4
1 2 3 4

Had a terrible day today. Originally I was to have spent a quiet day with the convertor but as P_2 had not been finished it was decided to redo this
Caminer and Grover came in to doit and I was just there in case.
Everything possible happened A store fault. Reader fault. Relay (Output Units) coupled with various unspecified and unexplained results.
I had returned to the converter after having located the relay fault when Mr T arrived (about 2 30) and said that P_2 must go on if

[[NB08-088]]
possible tomorrow but this meant finding a relay to replace the dud in the Output Unit. Our replacements were all of the type with only 2 tags for the solenoid and this

Output circuit called for a double solenoid. I decided to remove the T relay from Panel 11 to to this.
Unfortunately after ripping it out and putting it into its new positions When I came to test the machine again the Coordinator failed completely.
Just before leaving at 845 this evening I discovered that there was some link between C15 and the misbehaviour of

the Coordinator. I hope I may be able to clear the matter up quite quickly on Monday.

Monday 28.1.52
The fault was anything but quick to give itself up. By 4 oclock this afternoon it was obvious that there were two separate faults, one was due to a spike getting thro the gate producing S_1+[S_2] and ~~there~~ triggering off the coincidence unit to produce a second R_1+R_2 pulse. This responded to an adjustment of the amplifier gain control.

[[NB08-089]]
The second was the low amplitude of Starter end pulse which was big enough to trigger W12 but not big enough to trigger off Panel 9.
The cause was a valve in the ~~output~~ Pulse Selector unit whose [[illegible]] had dropped from 25 to 15 mA with zero GB & gm from 3.5 to 2.2.
These two faults wasted best part of the day.
In between times the reader I which had been taken out for readjustment was returned and found to be faulty. I left Mr JP working on this

The fact that two small faults can cause so long a break in serviceability is due to the fact that they both were affecting the coordinator.
It is true to say that while a fault on the computer is usually easy to trace this is because the coordinator is used ~~to~~ in tracing the fault.
When operating on the Coordinator however things become much more difficult
I must devote some time to thinking up a procedure for testing the coordinator in various stages of breakdown

[[NB08-090]]

Wednesday 30-1-52
Another day of trouble yesterday with Reader I as the chief offender. ~~B~~ We did some useful work however on the M03 job and repeated a 20 minute run 3 times.
Converter has been having Tape Machine trouble again. Spent the last hour of the day on the Character Generator which seems to have relapsed into occassional corruptions.
Today we must press on with the converter but if this is not ready a run on the P_2 programme will give the best indication of the reliability of

character generator.
All these faults that have occurred bring forward the need for a maintenance man and I must get down to the schedules again.
The faults on the character generator, if they persist, may respond to a change in the mark space pair of trigger tubes.
It has been decded that when productive time on the machine is lost due to faults, then the allocation of wanted or lost time should be put down under that heading.
(~~Lost~~ Wasted Productive time

I have a lecture to deliver

[[NB08-091]]
tomorrow evening on Decoding and other aspects of the Coordinator

Maintenance.
1. Mechanical
    Periodical attention to
        Teleprinter
        Perforator & tape printer
        Tape Readers
        All relays
        Tape Machines
2. Electrical
    Valve currents.
        (particular attention to all valves passing 10 mA or more.)
    Breakthro checks (Amplifier Settings)

As soon as duplicate ~~parts~~ units become available then work should become much easier

---

Relay Contacts cleared & ~~adjusted~~ control resources checked once in two weeks. Teleprinter general check once in two weeks. Overhaul after four weeks in service.

[[NB08-092]]

Electric Loco

[[DIAGRAM]]

[[DIAGRAM - HORIZONTAL]]

[[NB08-093]]

31-1-52

I have been drawing up the framework of a maintenance schedule for Leo partly because eventually such a schedule is bound to be required, and partly because the recent spate of troubles with the tape reader and teleprinter shows ~~that~~ how necessary regular maintenance is.
The immediate results of a first analysis of the type and amount of maintenance required, is to show that it does not call for full time for one man.
One of the main causes of this is that the machine must be operational for a large proportion of the time so that maintenance

of parts of the machine in use is taboo. When there are spares of all parts the situation will be slightly different but not very much. The amount of additional work that will be required to keep the STC gear in good order can only be a guess at this stage.
At this stage therefore we could not ask for an additional man just to cover maintenance but there is other work that requires doing which would more than fill his time in.

There are several experimental circuits, ring counters test equipment for gas tubes etc

[[NB08-094]]
that is just not done because of lack of manpower. Also there are a number of jobs which Dutton Crowhurst etc have to attend to which interferes with their normal testing and modification programme. If these things could be given to ~~the~~ a new man whose main responsibility was routine maintenance then our programm ~~wh~~ would go ahead more quickly.
This assumes that there will in the immediate future be a new drive for ~~repeating~~ building spares for non repeated units.
If for any reason this is in doubt then my whose case

fall to the ground as D & G would soon work thro their present programme and be available for maintenance work.
On the whole I feel that there is likely to be full time work for an extra man only on experimental work
Gibbs is working on a tape reader now practically full time whereas he should be spending more time on the CTC stuff.

[[NB08-095]]
Mr Ridler
Enfield 3531 or 0913

[[DIAGRAMS]]

Jobs.

Paignton Plugs for Store Switching
Store A link to be wired
Commone feed line to Control Desk
Power points for all Racks.

00011	[[M]]	8
00101	06	h
00110	61	L
01001	81	2
01010	01	0
01100	9	9
10001	L1	1
10010	b	b
10100	-5	-5
11000	E	E

00110 1 10
01010 000101
10010 001001
00101 01001
01001 10001
010001
01010 011

01100		101
10001		001
10010		11
10100		01
11000	01111	1