

~~RESTRICTED~~

6345  
Memorandum M-826

UNCLASSIFIED

Page 1 of 16

Project Whirlwind  
Servomechanisms Laboratory  
Massachusetts Institute of Technology  
Cambridge, Massachusetts

SUBJECT: BI-WEEKLY REPORT, PART II, April 1, 1949

To: 6345 Engineers

From: Jay W. Forrester

6.00 MATHEMATICS

(P. Rabinowitz and E. Reich)

In connection with the problem of integrating internal and external storage, a specific problem is being investigated, namely, the multiplication of two 50 by 50 matrices. It is hoped that general rules and techniques will be derived from this and other specific problems.

Preliminary examination of our problem reveals that the speed of solution will be limited by the speed of reading and recording from internal to external storage. In this problem, the ratio of computing time to read and record time is small.

However, other problems may show other results and general rules will be able to be stated only after detailed investigation of a greater variety of problems.

(M. Daniloff)

The theory of the deflection of the signal grid of E.S. Storage Tubes under an eccentric ring load was developed. This applies to the case of a relatively high initial tension. The solution was obtained by a conformal transformation of the symmetric case, using a bi-linear mapping function. (The final formula was communicated to Mr. R. Shaw).

The study of the eigen-values problem has been resumed. As a preliminary step frequency of the electrical natural oscillations in a spherical cavity are being calculated by means of Willer's scheme of successive approximations.

RESTRICTED

~~RESTRICTED~~

6345

Memorandum M-826

UNCLASSIFIED

Page 2

7.0 INPUT AND OUTPUT

(E.S.Rich)

A study is being made of the Input-Output equipment which is planned to be used with WWI. The immediate aim of this study is to work out a simple method for testing the reader-recorder units and for putting information into the computer and taking it out via the film.

Testing of line by line operation of the reader-recorder units will involve use of the IC and Comparison Registers and IO Control but will be done in such a way that it will not interfere with operation of other parts of the computer. A method has been worked out for reading binary numbers from punched teletype tape onto the film and also for preparing a punched tape from binary numbers read from film. This method requires an additional 4-digit shifting register and uses the teletype transmitter-distributor to initiate the necessary control pulses.

The possibility of using Morse code sending and receiving equipment such as is manufactured by McElroy instead of teletype to accomplish the above has been investigated. It does not seem desirable to use such equipment for at least two reasons: (1) the motion of the tape cannot be controlled precisely (2) the equipment would require modification for our purposes.

Methods for using teletype without requiring a separate shifting register are being examined.

UNCLASSIFIED

~~RESTRICTED~~

~~RESTRICTED~~

6345  
Memorandum M-826

UNCLASSIFIED

Page 3

## 8.0 STORAGE TUBES

### 8.1 Tube Construction and Testing

#### 8.11 Tube Construction and Processing

(F. H. Caswell, T. F. Clough and P. Youtz)

Tests on the two recent storage tubes, ST75 and ST77, showed 15 to 25 small positive spots scattered over the negative surface. Vibrating the collector with a strong a-c signal reduced the number of spots. The increased number of spots occurring in these tubes with smaller screen to mosaic spacing substantiated conclusions from previous test results that indicated foreign material between screen and surface. ST75 was opened carefully and examined with a microscope. A piece of lint was associated with each positive spot. Therefore the tube construction procedures were re-evaluated and changed to produce a lint-free tube. Toward that end ST81 in the Be mosaic-on-mica series with a .015" glass spacer was constructed and processed.

Two evaporation tubes with thermocouples on the evaporation boiler were processed. Several more evaporation tubes using thermocouples are under construction. We will evaluate the results from these tubes to decide whether to use thermocouple or pyrometer readings.

(R. Shaw)

A modified target assembly for the measurement of the resistance of the film deposited on an auxiliary target to record progress of the evaporation process has been drawn and is now being made in which three auxiliary targets are placed as close as possible to the main target. It is hoped that these, being placed where they "see" the full aperture in the boiler, will collect a representative sample.

A graph and an alignment chart have been made to aid in temperature measurements of evaporation tube components.

The storage-tube drafting group has been engaged chiefly in the layout and detailing of mounts for the installation of storage tubes in WWI.

(W. E. Pickett)

Glass Components - During this last period, the inventory

~~UNCLASSIFIED~~  
RESTRICTED

~~RESTRICTED~~

6345  
Memorandum M-826

UNCLASSIFIED

Page 4

8.11 Tube Construction and Processing (Cont'd)

of glass components received most of the activity. The supply of evaporating tube envelopes, stems and thermocouples are ample for our normal needs in the next period.

The ten-pin stems, as planned, were constructed and the supply of tested ten-pin stems on hand now is sufficient for our needs for the coming month.

In order to help eliminate lint in tube construction and inspection, several glass jigs were constructed for the inspection room. The jigs seemed to work well and should contribute towards a lint-free assembly.

During this coming period emphasis will be placed on building up the supply of storage-tube envelopes and parts, aside from the normal planned work.

(J. S. Palermo)

A new type support ring - SA-33639 will be used in the next evaporation tube. The purpose of this ring is to mask the edge of the target from evaporating Be.

We are presently processing twelve mica surfaces .015 - .020 thick, to be used in subsequent evaporation tubes. These surfaces will be used in preference to our present surfaces, which are not so thick, and are more apt to become distorted due to the contraction resulting after the silver has been applied to the back side.

Within the last period seven glass pyrex surfaces have been received and processed and are ready for use in evaporation tubes.

Stainless-steel support rings (SA-40251) will be used in all future assemblies, in order to eliminate magnetization effects experienced with former assemblies.

Requisition of numerous mechanical components necessary for storage-tube construction is being expedited to the maximum to cope with continued changes in design and specifications. Some jigs and fixtures are being designed.

8.12 Tube Testing

(H. Klemperer)

During this period wiring and components of our test

UNCLASSIFIED

RESTRICTED

RESTRICTED

6345  
Memorandum M-826

UNCLASSIFIED

Page 5

8.12 Tube Testing (Cont'd)

equipment were improved and overhauled, and circuit sketches and diagrams were brought up to date or newly drawn up.

Four storage tubes were run on life test continuously with half of the storage surface positive, half negative. These charges hold steadily during the night, but switching transients and power line variations often destroy the pattern during the day time.

(A. H. Ballard and C. L. Corderman)

Since the demand for testing new storage tubes has eased temporarily, the television-demonstrator equipment was shut down one week for a badly needed overhauling. It was necessary to repair or replace several of the component units, and in addition, an effort was made to make the installation, especially power distribution, more permanent.

On the basis of past experience, the standard test procedure for storage tubes has been revised. These tests have been extended to give basic information on performance when writing negative, and will definitely establish the relation between television pictures and the inspection diagram of the surface. Maximum  $V_{HG}$  and minimum  $V_{HG}$  have been redefined to mean the range in which positive spots are stable on a negative background. The term optimum  $V_{HG}$  has been eliminated until more is known about the factors affecting its choice. Meanwhile, the standard tests will be conducted using  $V_{HG} = 100V$  for mica tubes and  $V_{HG} = 200V$  for glass tubes wherever possible.

(J. S. Rochefort and N. S. Zimbel)

High Speed Read-Write Unit - Testing has commenced on ST51. These tests have been performed at repetition frequencies which varied from push-button operation to frequencies as high as 8.4 kc. The cycle R, W-; R, W+ has been generally used. The storage characteristics of three representative spots on the surface have been examined. Although comprehensive data has not as yet been compiled, a number of trends have been noted. The following observations are the results of the tests which have been performed.

1. Each spot studied possesses a stable range of  $V_{HG}$  of approximately 100V, in which writing of either polarity may be accomplished. The upper limit of this

UNCLASSIFIED

RESTRICTED

RESTRICTED

6345  
Memorandum M-826

UNCLASSIFIED

Page 6

8.12 Tube Testing (Cont'd)

range is dependent on the amplitude of the signal-plate switching pulse on write minus. This indicates that if the test equipment had larger switching voltages available the range would be even greater than 100V.

2. The stable range for each spot studied strongly overlaps the ranges for the others to the extent that it seems reasonable to expect that one set of voltages and pulses will insure proper storage operation over most of the surface.

3. The range of  $V_{HG}$ , over which storage may be expected for prolonged periods of time, is determined by push-button operation. The apparent upper limit of this range increases with frequency. However, this apparent increase in upper limit seems to be due to the fact that a spot is read before it can fade into the negative background.

4. Results indicate that holding-gun action (maximum duty factor) should be studied at high frequencies.

(J. H. McCusker)

Further tests were run on the 5UP high-velocity gun in RT50, a beam analyzer tube. The spot size decreased and the maximum current density at first increased and then decreased as the control grid was made negative with respect to the cathode and the first anode voltage was adjusted to give maximum current density and smallest spot size.

Increasing the potential of both the second grid and second anode causes the maximum current density to increase, but does not affect the size of the spot appreciably. If the potential of the second grid alone is increased, the maximum current density remains approximately constant, but the spot size increases.

RT47-1, a beam analyzer tube with a Dumont high-velocity gun, was tested. The holes in the target and faraday cage are apparently not lined up so no results can be obtained on current density or size of the beam.

A memo is being prepared on the results obtained so far on the beam-analyzer tubes.

UNCLASSIFIED

RESTRICTED

RESTRICTED

6345  
Memorandum M-826

UNCLASSIFIED

Page 7

8.13 Storage Tube Reliability Tester

(J. O. Ely and R. Sisson)

In order to operate this equipment using storage tubes with non-centered high velocity beams, d-c positioning was installed. This provided satisfactory control of the position of the array, but introduced a new problem, namely a difficulty in proper frequency-response compensation for the positioning networks.

Two experiments were performed. One involved an investigation of the effect of minimum and maximum write times as a function of  $V_{HG}$ , with single spot operation. The other consisted of writing alternately positive and negative on a spot and checking the signal read out for proper polarity. Both of these experiments were conducted before the proper compensation was put into the positioning circuits and are thus not of great value.

When the compensation was improved operation was improved. A pattern was cycled through the array in such a manner that each spot alternated in polarity at varying intervals. The output signals were observed so that errors could be detected. One and one-half hours of errorless operation were obtained - that is, about 130 million errorless storage operations were performed. (This was with ST67;  $V_{HG} = 125V$ ; 7.5V on filaments)

Since it has been fairly well proved that one source of error is power line transients, this equipment is being completely isolated. A new -150V supply was installed to free the equipment from any connection with laboratory power. A-c for the equipment will be obtained from the alternator supplying WWI filaments in order to isolate this setup from the laboratory a-c which carries large and frequent transients.

The problem of compensation in the positioning circuits needs further study. With the solution of this problem and with the new power setup, it is hoped that we will be able to go ahead with the testing of storage tubes.

Trouble was experienced around March 17th because of low cathode emission from the HV gun of ST67. No reason for the rather sudden drop in emission can be found. Satisfactory operation has been obtained with the tube, since then, by running with 7.5 volts on the filaments.

UNCLASSIFIED

RESTRICTED

~~RESTRICTED~~

6345  
Memorandum M- 826

UNCLASSIFIED

Page 8

8.13 Storage Tube Reliability Tester (Cont'd)

(J. A. DiGiorgio Jr.)

The teletype printing register has been partially tested with some d-c filtering added.

A local -150V regulated supply was installed to replace the laboratory supply.

The two A/R 256 scopes were checked and overhauled.

8.2 Storage Tube Research

8.23 Output System Circuits

(W. J. Nolan)

Preliminary to the design of a signal plate-to-amplifier coupling-network an extensive series of measurements was made to determine the equivalent circuit of the signal plate at frequencies above 2 mc. Among storage tubes produced recently a variation of over 50% was noted in the signal plate capacitance. A storage assembly having supports and leads arranged to provide better r-f characteristics was also tested and showed a marked improvement over the usual structure.

(G. G. Hoberg)

A mixer-amplifier circuit has been designed for applying read and write (-) gates to two storage-tube signal plates connected in parallel. The total load to be driven is of the order of .001 microfarad. Output amplitudes will be up to 100 volts for the read gate and up to 200 volts for the write (-) gate. The design is intended for use in WWI.

Construction of a breadboard of this 6-tube amplifier and a 2-tube write (-) gate generator designed by O'Brien and Hayes will begin immediately.

(C. H. R. Campling)

Tests on the r-f pulser have shown that, while reasonably satisfactory output pulses can be obtained, the operation of the phase-shifting portion of the circuit is far from satisfactory. This is caused in part at least by the excessive production of harmonics in the output of the oscillator. It is believed that the defect can be

UNCLASSIFIED

~~RESTRICTED~~



RESTRICTED

UNCLASSIFIED

6345  
Memorandum M-826

Page 9

8.23 Output System Circuits (Cont'd)

corrected by the redesign of the oscillator itself and by an investigation of the design of the double-tuned circuits. The design of these circuits should be facilitated by the use of the sweep oscillator to determine their frequency characteristics.

8.3 Unclassified

(H. Rowe)

A T-50-1 power supply which had been built was adjusted for proper operation. This is a regulated supply, 0 - 500V at 10 ma, for general use in the Storage Tube Lab.

Block diagrams and schematics for the TV Demonstrator test setup are being brought up to date for the entire equipment. A memo will be issued in the near future with the results of this work.

(S. H. Dodd)

The storage-tube-mount layout for WWI prototype should be completed in about one week and the detailing completed by 4/17. A few of the details are complete and the shop is making fabricated substitutes for the castings. The mu-metal tube shield prototype was ordered from an outside vendor a week ago. The mount is now about a week and a half behind schedule.

(M. I. Florencourt)

The numerical and subjective lists of photographs have been brought up to date.

Storage-tube construction and inspection sheets have been revised to incorporate the latest improvements in form.

8.4 Deflection Circuits

(J. M. Hunt)

A breadboard of a proposed deflection-circuit output amplifier has been subjected to preliminary tests to determine its stability and transient response. Although final judgement must be deferred until tests with the

UNCLASSIFIED

RESTRICTED

~~RESTRICTED~~

6345  
Memorandum M-826

UNCLASSIFIED

Page 10

8.4 Deflection Circuits (Cont'd)

actual transmission-line load, initial tests indicate that the transient performance of the amplifier is satisfactory.

Static performance tests will be conducted next, following which the amplifier will be tested under conditions more closely approaching the actual operating conditions of the WWI deflection system.

(L. J. Nardone)

The design of a two-wire shielded transmission line for feeding the deflection-voltage to the storage tubes has been completed. Drawing numbers SA-33804, SA-33805, and SB-33806 contain the complete mechanical design of the line.

The schematic drawings of the coder section of the deflection-voltage generator have been brought up to date. All components have been numbered.

The design of the input-gate panel to the deflection-voltage generator has been completed. A "paste-up" schematic drawing and layout have been completed and submitted to the drafting room.

A complete layout of the coder section of the deflection-voltage generator is now being worked on and should be completed in a few days. Following this a d-c wiring layout will be drawn up.

UNCLASSIFIED

~~RESTRICTED~~

RESTRICTED

6345  
Memorandum M-826

Page 11

UNCLASSIFIED

11.0 FACILITIES AND CENTRAL SERVICE

11.1 Publications

(J. N. Ulman, Jr.)

The following material has been received in the Library,  
Room 217, and is available to 6345 Personnel.

6345 Reports

<u>No.</u>	<u>Title</u>	<u>No. of Pages</u>	<u>No. of Drwgs.</u>	<u>Date</u>	<u>Author</u>
R-157	A High-Speed Multi-Position Electronic Switch (SM Thesis, Abstract in E-211)	39	43	3-7-49	D.R. Brown
E-207-1	Nomogram for Determining Thickness of Beryllium Film	2	1	3-22-49	R. Shaw
E-212	Storage Tube ST57: Construction, Processing and Initial Testing	2	-	3-8-49	M. Florencourt
E-214	Storage Tube ST77: Construction, Processing and Initial Testing	2	-	3-17-49	M. Florencourt
E-216	Holding-Beam Trajectories and Potential Fields Near the Storage Surface	2	5	3-18-49	H.E. Rowe
E-219	Electrostatic Storage Control	7	1	3-25-49	S.H. Dodd N.H. Taylor R.R. Everett J.A. O'Brien R.P. Mayer
E-220	Demonstration Problems for Whirlwind I with Test Storage	16	-	3-30-49	G. Cooper
M-766	Anodizing Procedure	5	3	12-30-48	J.S. Palermo
M-799	Preparing Circuit Schematics for Drafting	1	1	3-14-49	A.M. Falcione
M-800	Progress Report: The Solution of Power Network Performance on Large-Scale Digital Computers	3	-	3-9-49	P.A. Fox
M-801	Conference at RCA on Vacuum-Tube Life	2	-	3-16-49	E.S. Rich
M-802	Report on a Visit to Bell Telephone Laboratories Concerning the Transistor - March 11, 1949	2	-	3-14-49	R.L. Sisson
M-803	Program Counter Quantities	1	-	3-17-49	H. Fahnestock
M-804	Summary of Accumulator Test Results	1	26	3-17-49	G.C. Sumner
M-805	Bi-Weekly Report, Part I, 3-18-49	17	-	3-18-49	
M-806	Bi-Weekly Report, Part II, 3-18-49	17	-	3-18-49	

RESTRICTED

**RESTRICTED**6345  
Memorandum M-826

Page 12

UNCLASSIFIED

6345 Reports (Continued)

<u>No.</u>	<u>Title</u>	<u>No. of Pages</u>	<u>No. of Drwgs.</u>	<u>Date</u>	<u>Author</u>
M-807	Decimal to Binary Conversion Program	7	-	3-18-49	C.W. Adams
M-808	Specifications for Video Amplifier and Probe	4	-	3-18-49	R. Rathbone
M-809	Control Desk Push Buttons	1	-	3-21-49	J.A. O'Brien
M-810	Proposed Modifications of Existing Deflection-Voltage Generator for Use in Special Display	3	-	3-23-49	A.K. Susskind
M-811	Check Register Video Cabling	2	-	3-23-49	R.H. Murch
M-812	Standardizer Amplifier, Design and Construction	1	-	3-24-49	H. Fahnestock
M-813	Program Register, Use as a Storage Register	2	1	3-24-49	R.R. Everett
M-814	Progress Report: M.S. Thesis in Servomechanisms	2	-	3-8-49	J.E. Pierson
M-815	Test Operation Precautions	1	-	3-24-49	H.B. Frost
M-816	Typing of Ditto Masters and Reproduction Thereof	2	-	3-28-49	A.M. Falcione
M-817	Selection of Voltage Variation Circuits	4	-	3-25-49	C.W. Watt
M-818	In-Out Control	11	1	3-29-49	J.A. O'Brien E.S. Rich J.M. Salzer B.R. Everett
M-819	Checking Methods - Use of Check Register	1	-	3-30-49	N.H. Taylor
M-820	Systems Operation, Trouble Location	2	-	3-30-49	N.H. Taylor
M-822	WWI Panel Assignment	1	-	3-31-49	H. Fahnestock
M-823	6345 Personnel	3	-	4-1-49	
C-101	Binary to Decimal Conversion, Meeting of March 22, 1949	1	1	3-21-49	C.W. Adams
C-102	Decimal to Binary Conversion	2	2	3-29-49	C.W. Adams

Library Files

.004	European Scientific Notes, 1-15-49				ONR, London
47	Technical Information Pilots, Numbers U2221-2340				Lib. of Congress
51	Tracerlog, March 1949				Tracerlab
52	Progress Report for WWI Electronic Digital Computer for Period March 12 - March 25, 1949				Sylvania
73	Pre- and Post-Analyses by Reeves Analysis and Computer Group; March 21, 1949; Job No. 9-7.2				(Reeves Instrument Corporation)
198	Interim Engineering Report on Radio Control Transmitter Model AN/ARW-55 and Radio Control Receiver Model AN/ARW-56; Period February 1 to March 1, 1949				Collins Radio Co.

**RESTRICTED**

RESTRICTED

6345  
Memorandum M-826

Page 13

UNCLASSIFIED

Library Files (Continued)

<u>No.</u>	<u>Title</u>	<u>Author</u>
207	Project Hurricane Quarterly Report No. 2; January 1, 1949	Raytheon & ONR
231	Report No. 5 on Operation and Evaluation of the Beacon Triangulation System and Ionosphere Beacon System; by Dr. H. E. Harrington; May 1 - July 31, 1948	{ Oklahoma A & M College
261	Some Servo System Sinusoidal Studies; C. F. White	{ Naval Research Laboratory, Washington, D.C.
262	Military Teletypewriter Systems of World War II, F. J. Singer, Bell Telephone Labs	AIEE
263	Ballistic Instrumentation Problems, White Sands Proving Ground	
264	Bibliography on Electronic Computing; February, 1949	R. Serrell
265	The Digital Converter; August 26, 1948; for Naval Research Laboratory, Washington, D. C.	D.H. Gridley
266	Interim Engineering Report on Airport Taxi Control System	Gilfillan Bros.
267	Report on the Development of FM/CW Radar; November and December 1948	Raytheon

11.2 Standards Committee

(H. B. Morley)

New and revised standards issued this period:

- S7.411-2 Operation Matrix Driver Panel
- S7.411-4 Synchronizer
- S7.411-5 Control Switch/Test Storage Switch Switch-Panel (Assigned but not issued)

11.3 Purchasing and Stock

(H. B. Morley)

Recent investigation of new or supplementary sources of supply for pulse transformers has so far failed to find a vendor who can supply a satisfactory product. An order has been placed with NBT to cover foreseeable requirements.

Considerable difficulty has been experienced recently in procuring carbon brushes for motors and generators. Supplying manufacturers' model and serial numbers for the equipment has not given satisfactory results, and we have resorted to supplying dimensional sketches and ordering from a vendor who makes up brushes to order. It is suggested that this practice be

RESTRICTED

~~RESTRICTED~~

6345  
Memorandum M-826

Page 14

UNCLASSIFIED

11.3 Purchasing and Stock (Continued)

applied to all motor and generator equipment in the building and that the drawings be accumulated by this department for inclusion in the Standards Book.

The total value of requisitions placed in the past month has increased considerably over recent months, accompanied by a slightly higher number of requisitions issued. Constant effort is being made to secure equal or better quality materials at lower prices.

(S. H. Dodd)

Estimates of pulse transformer requirements for the EST row have been made to assure an adequate supply when needed.

(R. Fairbrother)

Our order of pulse transformers as received from Amertran was not coated as expected, and in inspection the 1:1's and 5:1's did not produce the output wave shape desired. After considerable testing, it was decided that they were acceptable for WWI panels, however they will be used only as an emergency stock. An order has been placed with New England Transformer for an additional 1000 units.

A parts list for the Control-Switch/Storage-Switch Output panel is being prepared by adding mechanical parts to Sylvania's schematic parts list. Parts lists drafts have been prepared for the electrical components of Control-Switch/Storage-Switch Matrix panel and Comparison Register Check.

11.4 Electronic Construction

(A. Taylor)

WWI construction continues on schedule with a few exceptions where it is ahead of schedule. These exceptions are for the greater part due to the interest and activity of the technicians involved.

(A. R. Curtiss)

A deflection voltage amplifier was breadboard assembled.

A low voltage power supply was chassis assembled, using the T-50-1 circuit.

Transformers received from the Berkshire Transformer Corp. were tested for leakage and breakdown.

RESTRICTED

~~RESTRICTED~~

6345  
Memorandum M-826

Page 15

UNCLASSIFIED

11.4 Electronic Construction (Continued)

4 RF amplifiers (10 mc) are being constructed.

One technician is assigned to full time work on the storage tube life test racks assembled in Room 219.

11.5 Drafting

(A. M. Falcione)

Work Load Status - The work load has been steady. Schedule requirements have been met to date, although somewhat hampered by lost time due to sickness of employees.

Mr. Sid Zussman of Bldg 32 was transferred back to his former group. He had been working here on a temporary basis as a mech. checker.

Class 1.0 drafting standards together with Administrative Memoranda A-83 will be issued within the next few days. This will replace Memoranda A-34 and revisions thereto.

Memorandum M-816 dated March 28, 1949 was issued recently to all secretaries and typists regarding our recent difficulties with reproduction of ditto masters. This memorandum explains the approved method of making a ditto master.

11.6 Unclassified

(J. C. Proctor)

Air Compressor - A standby air compressor has been installed, and is now in operation. This will automatically pick up the load in case the regular compressor fails, assuring the laboratory of a constant supply of air.

(L. Prentice)

Machine Shop - We have completed one-half of the order for a new type of support ring for storage tube. This new type ring was rolled from .031 nickel, and new rolls and die were made.

Work is in progress on storage tube frame and support clamps prototype. The top bracket has been delivered to inspection and the drawings for the bottom bracket were delivered to the shop today. All material has been ordered and received.

UNCLASSIFIED

~~RESTRICTED~~

~~RESTRICTED~~

6345  
Memorandum M-826

Page 16

UNCLASSIFIED

11.6 Unclassified (Continued)

Some work has been done on dies and templates for Check Comparison Register.

New packing has been installed in the air staking tool and more dies will be made to stake clinch nuts and standoffs.

Sheet Metal Shop - The load on this shop will be heavy during the next few weeks. The punch press will be set, and not stopped for small jobs, this is a necessity if we are to meet present schedules. We are trying to obtain another brake, this will save time now lost due to changing brake to suit different thicknesses.

Please do not ask for work without an order as almost always these small jobs take one man's time for at least one-half day.

12.0 GENERAL

Non-Staff Terminations

Ray L. Ellis

UNCLASSIFIED  
~~RESTRICTED~~