

# ELLIOTT

# 900

Volume 3: OPERATING INSTRUCTIONS

Part 1: BASIC EQUIPMENT

Section 2: PAPER TAPE EQUIPMENT

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## Chapter 1: INTRODUCTION AND OPERATING INSTRUCTIONS

### 1.1 Introduction

Up to two paper tape stations may be connected to the 900 computer. A paper tape station consists of a tape reader, a tape punch and associated logic power supplies. A common tape storage bin is provided for each punch and reader. Each station is also provided with a dispenser for the reader tape, a unipunch and a tape rewinder.

If only a single paper tape station is included in a system, both reader and punch, which are free-standing, would normally be placed on top of the computer console (see Figure 1). If a double paper tape station is included in a system, the second reader and punch will normally be placed on top of a standard 900 desk which houses an Interface Unit and the controller for the second station. In the latter case, both paper tape stations will be connected to the Central Processor via the Interface Unit.

### 1.2 Controls

The controls for a single paper tape station are mounted on the individual units, and on a control panel mounted on the top front edge of the computer console. An identical control panel for a second paper tape station will be mounted on the desk housing the Interface Unit and the controller for the second paper tape station.

The push-button switches and indicator lamps on both control panels appear white when their associated lamps are switched off.

#### 1.2.1 Tape Reader Controls

The following controls are located on the computer control panel and on the desk housing the second paper tape station controller and Interface Unit:

##### READ button

This is a non-locking push-button incorporating a lamp. The button is illuminated blue when the lamp is switched on. The lamp is switched on when

- (1) The reader tape guide plate is raised for loading or unloading tape, (250 ch. per sec readers only).
- (2) The end of the tape passes the read head.
- (3) The unit is first switched on.

- (4) The RUN OUT button is operated.
- (5) An error condition occurs, e.g. creep.

The button will remain illuminated and a tape read instruction cannot be obeyed until the READ button is pressed. Operation of the READ button causes the tape to be advanced until the next sprocket hole is detected and the buffer register for the reader is then loaded.

#### STOP button

This is a non-locking push-button incorporating a lamp. The button is illuminated yellow when the lamp is switched on. The STOP button may be pressed at any time in order to stop a tape being read. After this action the READ button must be pressed in order to continue. The lamp incorporated in the STOP button is illuminated when the button is pressed and will remain so until the READ button is pressed.

#### HOLD UP lamp

This button is illuminated red when the central processor is held up on a tape read instruction which cannot be completed.

#### SELECT INPUT switch

This is a single pole three-position switch selecting READER, AUTO or TELEPRINTER input to the central processor.

When the paper tape station is used on its own, i.e. no teleprinter, the position of the SELECT INPUT switch is immaterial as all input instructions are automatically diverted to the tape reader.

When the paper tape station is used in conjunction with a teleprinter, the SELECT INPUT switch performs the following functions:

##### (1) READER

In this position all input instructions are diverted to the tape reader and it is not possible to input characters from the teleprinter.

##### (2) TELEPRINTER

In this position all input instructions are diverted to the teleprinter and it is not possible to input characters from the tape reader.

### (3) AUTO

In this position a reader or teleprinter input is selected by an instruction from the central processor.

The following controls are located on the tape reader (see Figure 2):

RUN OUT button (250 and 500 ch. per sec. readers)

This is a non-locking push-button which, when pressed, causes tape to be fed continuously through the tape reader. The button is operative at all times.

ON/OFF switch (250 and 500 ch. per sec. readers)

This is a toggle switch which should be permanently left in the ON position.

Tape Guide Plate

This is a hinged spring loaded plate on the 250 ch. per sec. reader. When raised, it allows the loading and unloading of tape.

On the 500 ch. per sec. reader this plate is fixed in position.

Tape Guide Posts (250 ch. per sec. reader only)

There is a tape guide post situated on either side of the tape guide plate. They are individually adjustable by moving in or out to any one of three positions to allow for 5, 7 or 8 hole tape. The positions are centre for 7 hole tape, innermost for 5 hole tape, and outermost for 8 hole tape.

Pressel Bar (500 ch. per sec. reader only)

This bar is adjustable to any one of three positions by moving in or out to allow for 5, 7 or 8 hole tape. The positions are centre for 7 hole tape, innermost for 5 hole tape, and outermost for 8 hole tape.

In addition the bar when held depressed allows the loading of tape laterally into the reader.

#### 1.2.2 Tape Punch Controls

There is one control located on the tape punch. This is an ON/OFF toggle switch which should be permanently left in the ON position.

The following controls are located on the computer control panel:

RELOAD button

This is a non-locking push-button incorporating a lamp. The button is illuminated blue when the lamp is switched on. The lamp is switched on by operation of the Tape Low microswitch on the tape punch dispenser; this occurs when the length of tape remaining on the spool core is approximately 90 ft. Tape punch instructions are held up when the RELOAD lamp is switched on and a single operation of the switch has no effect while the tape low condition persists. However, the condition can be overridden by holding the RELOAD button depressed. When a new reel of tape has been fitted, the RELOAD button must be pressed to switch off the lamp and clear the Tape Low condition.

RUN OUT button

This is a non-locking push-button which, when pressed, causes the tape punch to continuously feed blank tape. The RUN OUT button will remain operative when the RELOAD lamp is switched on.

SELECT OUTPUT switch

This is a single pole three-position switch selecting TELEPRINTER, AUTO or PUNCH output from the central processor.

If a paper tape station is used on its own, i.e. no teleprinter, the position of the SELECT OUTPUT switch is immaterial as all outputs are automatically diverted to the tape punch.

If the paper tape station is used in conjunction with a teleprinter, the SELECT OUTPUT switch performs the following functions:

(1) TELEPRINTER

In this position, all output instructions are diverted to the teleprinter and it is not possible to output characters to the tape punch.

(2) PUNCH

In this position all output instructions are diverted to the tape punch and it is not possible to output characters to the teleprinter.

(3) AUTO

In this position the output is channelled to either the teleprinter or tape punch by an instruction from the central processor.

### 1.3 Operating Procedure

#### 1.3.1 Adjustment of Punch Tape Width

A tape width adjustment turret is mounted on the front of the punch immediately to the right of the punch block. Three guide studs protrude from the turret at 120° spacings. By rotating the turret to one of three positions, a guide stud will be set vertically. The selected mode is shown by 5, 7 or 8, appearing in the window on the front of the turret.

#### 1.3.2 Loading the Tape Reader (250 ch. per sec)

Adjust the tape guide posts to the required tape width. Lower the reel of tape into the tape dispenser and locate the spool spindle in the grooves on the tape edge of the dispenser. Position the dispenser so that the tape will travel in a straight line through the tape reader. Raise the spring-loaded tape guide plate and load the tape laterally into the reading station under the drive roller and with the lead end pointing left and data hole number one furthestmost from the operator. Position the tape so that the last blank character is beneath the reader lamp. Depress the READ button on the relevant computer control panel to extinguish its lamp and load the reader buffer register.

#### 1.3.3 Loading the Tape Reader (500 ch. per sec)

Adjust the pressel bar to the required tape width. Lower the reel of tape into the tape dispenser and locate the spool spindle in the grooves on the tape edge of the dispenser. Position the dispenser so that the tape will travel in a straight line through the reader. Depress the pressel bar and load the tape laterally into the reader under the drive roller and tape guide plate with the lead end pointing left and data hole number one furthestmost from the operator. Release the pressel bar and position the tape so that the last blank character is beneath the reader lamp. Depress the READ button on the relevant control panel. The READ lamp will be switched off by this action and the reader buffer register will be loaded.

#### 1.3.4 Loading the Tape Punch

Adjust the tape width turret to the required hole working position. Load a reel of tape as shown in Figure 3. The tape must be threaded through the punch so that the studs on the tape width turret are on the operator's side of tape, and the tape is below the head of the stud. Tape of 1 inch,  $\frac{7}{8}$  inch and  $1\frac{1}{16}$  inch width may be used for 8, 7 and 5 hole working respectively, but if punching in 8, 7 and 5 hole modes is required at different times on the same tape, then 1 inch wide tape must be used. Depress the RUNOUT button on the control panel to output a length of blank tape. Operate the RELOAD button.



### 1.3.5 Reading in Tape under Initial Instructions

Verify that the mains power supply is available as indicated by the OFF push-button on the control unit being lit. Set the Mode switch to OPERATE.

Depress the ON push-button, which will be illuminated when all power supplies are at their correct levels. The RESET and INTERRUPT LEVEL 1 lamps on the control unit and the READ lamp on the control panel will also be lit signifying that the computer is ready for use.

Set the Address Keys on the control unit to 8181 (1 111 111 110 101) and load the tape into the tape reader.

If a teleprinter is also connected to the central processor, the SELECT INPUT switch should be set to READER.

Depress the READ button on the control panel. The lamp should be extinguished.

Depress the JUMP button on the control unit. The program will now be read into the store.

### 1.3.6 Reading in Subsequent Tapes

Load the tape into the tape reader and set the Address Keys to the required store address.

Depress the READ button on the control panel and the JUMP button on the control unit.

## 1.4 Materials Required

Two types of paper tape are available:

Type	WATERLOW A1	ASCOM
Length (nominal)	1000 ft (304.8 m)	
Widths	$1\frac{1}{16}$ in (1.8 cm) for 5 channel working $\frac{7}{8}$ in (2.2 cm) for 7 channel working 1 in (2.5 cm) for 8 channel working	
Colours	White, Light Blue, Dark Blue, Green, Pink, Red,	White, Light Blue, Dark Blue, Green, Pink and Yellow
Overprinting	Two types, giving 24 possible codings	Available at extra cost



Waterlow A1 paper tape is available from:

Waterlow Automation Services Ltd.,  
P.O. Box 10,  
DUNSTABLE,  
Bedfordshire,  
England.

Ascom paper tape is available from two suppliers:

Rollco Papers Ltd.,  
11-16, Leigh Hunt Street,  
London, S. E. 1.  
England.

Thames Paper Supplies Ltd.,  
13-21, Curtain Road,  
London, E. C. 2.  
England.

In addition to WATERLOW A1 and ASCOM tapes, PREMIER C has been found to give satisfactory operation in the reading and punching equipment. It does however, produce more fluff, necessitating more frequent cleaning of the equipment. PREMIER C is available from:

Percy Boyden & Co. Ltd.,  
5, Commerce Way,  
Wadden,  
CROYDON,  
Surrey,  
England.

## Chapter 2: OPERATOR'S MAINTENANCE

### 2.1 Introduction

The operator is responsible for the following duties:

- (1) Carrying out regular maintenance as detailed in this Chapter.
- (2) Ensuring that adequate supplies of paper tape are available.
- (3) Running test programs as detailed in Chapter 3.
- (4) Some changing of faulty units as detailed in this Chapter.
- (5) Storage of all tapes.
- (6) Running user's programs.

The operator must not remove or adjust any part of the equipment unless so instructed in this Chapter.

### 2.2 Materials Required

The following items are required for the maintenance detailed in this Chapter.

- |     |                      |                            |
|-----|----------------------|----------------------------|
| (1) | Lint-free cloth      | Catalogue No. 6241         |
| (2) | Camel hair brush     | Catalogue No. 5416         |
| (3) | Suction cleaner      |                            |
| (4) | Paper Tape gauge     | Catalogue No. 1(2/4)A14806 |
| (5) | Test program X PTS 1 |                            |

### 2.3 Daily Maintenance

#### 2.3.1 Cleaning

Every morning, prior to switching on, the operator must carry out the following cleaning procedure on each paper tape station:

- (1) Clean the lower edge of the prism in the tape reader with a lint-free cloth.

- (2) Dust the light masks and platform of the tape reader with a camel hair brush.
- (3) Dust the punching block and platform of the tape punch with a camel hair brush.
- (4) Clean the tape storage bin with a suction cleaner.
- (5) Empty the chad box.

NOTE: On no account must chad be emptied into the storage bin, nor must the bin be used for other rubbish.

### 2.3.2 Character Spacing

Every morning, after switching on, approximately 2 feet of blank tape should be run out from the tape punch(es).

Place the tape against the ledge of the paper tape gauge. Hold the tape firmly against the gauge and turn the gauge over. View through the bevelled slot in the gauge and see if every sprocket hole is wholly inside the slot. If one sprocket hole is partially obscured the punching is out of alignment.

Place the tape against the ledge of the paper tape gauge and adjust its position so that exactly half of the first sprocket hole is showing the left-hand end of the gauge. Turn the gauge over, gripping the tape against it firmly. The 51st sprocket hole may vary from being just totally obscured to just totally visible for the punching to be within the permitted tolerance.

If either of these tests fail, an engineer must be informed, and the tape punch changed for a good one (see Paragraph 2.4.2). These tolerances are necessary to ensure that mechanical reading devices can read the punched tape without error.

### 2.3.3 Test Program

The test program X PTS 1 checks the operation of either a single or double paper tape station and must be run daily after the cleaning and character spacing operations have been completed. The procedure is detailed in Chapter 3.

## 2.4 Changing of Punch or Reader

If it is necessary to install a new punch or reader, the following procedure should be used. After the new unit has been fitted, the

appropriate parts of the daily maintenance should be carried out to ensure that the new unit is functioning correctly.

#### 2.4.1 To Change a Reader

Operate the STOP button on the control panel and remove any tape that is in the reader. Set the ON/OFF switch on the front of the reader to OFF. Unscrew the two plugs at the rear of the reader. Change the reader and screw the plugs into the sockets on the rear of the new reader. Set the ON/OFF switch to ON.

Run the daily test program X PTS1 to check that the new reader is reading correctly.

#### 2.4.2 To Change a Punch

Operate the STOP button on the control unit. Raise the lid of the soundproof box. Set the ON/OFF switch on the right-hand side of the punch to OFF. Disconnect the two plugs at the rear of the punch and lift the punch mechanism out of the box. Replace with a new punch, locating the feet in the grooves in the floor of the box. Secure the plugs at the rear of the punch and set the ON/OFF switch to ON. Ensure that the punch is loaded with a reel of paper tape, run out a length of blank tape and check that the character spacing and alignment is satisfactory. Place the leading end of the tape in the groove provided in the side of the soundproof box and close the lid. Run the daily test program X PTS1 to check that the new punch is operating correctly.

## Chapter 3: DAILY TEST PROGRAM

### 3.1 Introduction

The daily test program (X PTS 1), tests that the logical and mechanical aspects of up to two paper tape readers and two paper tape punches at randomly varying speeds of operation.

The program is issued as a sumchecked binary tape. Adequate copies of this tape should be made for emergencies.

### 3.2 General Description

In the normal mode of operation, the program reads, checks and punches continuously a particular pattern with a variable delay in each alternate cycle of reading and punching. Any combination of the two readers or two punches can be used or both readers and punches can be used simultaneously the output alternating between each punch (i.e. one cycle each) and input alternating between each reader (i.e. one cycle each). The program can also read and check tape without punching and punch tape without reading. Five, seven or eight channel paper tape may be used in this test. The pattern output consists of a 'JU' pattern - 256 characters comprising 85 (01010101) and 170 (10101010) alternately - and a binary count of 0-255.

### 3.3 Control

The operator reads in the program tape under Initial Instructions 8181 (111111110101 on address keys). After reading, continuous output from the punch, indicates that an error has arisen during reading.

The operator then enters the program at different addresses depending on the width of tape to be used in the test.

For 8 channel tape jump to 21 (0000000010101)

For 7 channel tape jump to 24 (0000000011000)

For 5 channel tape jump to 27 (0000000011011)

The program comes to a dynamic stop.

If the operator re-enters the program at 30 (0000000011110), punch 1 (i.e. the one whose controller is housed in the 900 computer cabinet) punches at full speed 6 in of blanks followed by 1024 characters (about 8 ft of tape) and comes to a dynamic stop.

If the operator re-enters the program at 31 (0000000011111), punch 2 (i. e. the one whose controller is housed externally) punches at full speed 6 in of blanks followed by 1024 characters (about 8 ft of tape) and comes to a dynamic stop.

Without tearing off the tape from the punch, the operator loads the leading blanks of the tape just punched into the tape reader, depending on which combination of paper tape punch and paper tape reader is to be tested.

### 3.4 Operating Modes

There are 5 modes of operating this test:

- (a) Load the leading blanks of the tape punched by PUNCH 1 into READER 1 and jump to 32 (0000000100000)
- (b) Load the leading blanks of the tape punched by PUNCH 1 into READER 2 and jump to 33 (0000000100001)
- (c) Load the leading blanks of the tape punched by PUNCH 2 into READER 1 and jump to 34 (0000000100010)
- (d) Load the leading blanks of the tape punched by PUNCH 2 into READER 2 and jump to 35 (0000000100011)
- (e) Load the leading blanks of the tape punched by PUNCH 1 and PUNCH 2 into READER 1 and READER 2 or into READER 2 and READER 1 and jump to address 36 (0000000100100). READER 2 will read one cycle of characters and PUNCH 1 will punch one cycle of characters. READER 1 will then read one cycle of characters and PUNCH 2 will punch another cycle and repeat the sequence again. The program successively reads in and checks one block of 256 characters and punches a further block. The first 8192 characters are read and punched at full speed, the next 8192 characters are read and punched with a varying delay between each character, i. e. on alternate 8192 character cycles, reading and punching take place at varying speeds. The program continues to run until either it detects an error, or the punch runs out of tape, or the operator stops it manually prior to re-entry at another point.

The entry points for the "read 1 only", "read 2 only", "punch 1 only" and "punch 2 only" modes of operation are 37 (0000000100101), 38 (0000000100110), 39 (0000000100111) and 40 (0000000101000) respectively,

the program reads or punches tape at varying speeds in alternate cycles as before.

The delay is varied within the program using pseudo-random numbers within the range 120-1023; these values give delays between read or punch instructions within the range 9-70 ms.

### 3.5 Errors

The program detects an error only while tape is being read in and checked against the store. The error output occurs on the punch and the program then reaches a dynamic stop. The punch selected for the output of an error message is the same as the one which would have punched out the next character.

The error output consists of 6 in of blanks followed by the correct character, 4 blanks followed by the character actually read and then a further 6 in of blanks.

An error may be due to either an incorrect character having been punched, or to the paper tape reader having misread a character. The operator should examine the portion of tape at which reading stopped, comparing it visually with a specimen tape to determine where error occurred. For 5 and 7 channel tape the character punched for the "character which should have been read" will always be the 8 channel character (the relevant bits should be ignored).