

# ELLIOTT

# 9000

Volume 4: ENGINEERING MAINTENANCE  
Part 1: BASIC EQUIPMENT  
Section 6: ON LINE PROGRAM FACILITY (DPA213)

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## Chapter 1: DESCRIPTION

### 1.1 Introduction

The On Line Program Facility is an optional feature of the 900 paper tape station and consists of one logic board. Additional back wiring is also required when this facility is incorporated. The board is a type DP 321 and is inserted in position 17 of the paper tape controller logic rack.

The board enables a status word to be input to the central processor to indicate the readiness of each of the four modes of operation, namely, reader, punch, teleprinter input and teleprinter output. Examination of the status word before an input or output instruction, avoids the program being held up by devices that are busy.

The board also contains logic which enables the paper tape station to be set either 'On Line' or 'Off Line' by means of a control word output from the central processor. When in the 'On Line' mode an input or output instruction is carried out regardless of the state of the addressed device. If the device is busy, the input data is all zeros and the output data is lost. In the 'Off Line' mode the central processor is held up until the device required becomes not busy. If, when outputting two characters to the teleprinter in the 'On Line' mode, the second character is output while the teleprinter is still busy with the first, both characters will be corrupted, and may be lost. At least two 100 ms should be allowed between successive characters to ensure that none are lost or corrupted.

The logic diagram of the board is shown in Figure 1 together with the component details. The references adjacent to the signal names indicate the place where the source of the signal can be found, e.g. 900 4.1.3, FIG. 5 means that the signal originates on Figure 5 of Section 4.1.3 of the 900 Manual.

### 1.2 Significance of Status Word

The Status Word consists of four bits which are input to the central processor on the [IR1] to [IR4] lines and have the following significance when true:

|       |                                 |
|-------|---------------------------------|
| [IR1] | Read buffer loaded              |
| [IR2] | Punch ready                     |
| [IR3] | Teleprinter input buffer loaded |
| [IR4] | Teleprinter output ready        |

The selection switches on the control panel, SELECT INPUT and SELECT OUTPUT, provide a manual facility for overriding the device selection of the program (for details see Section 4.1.3 or 4.1.4). The significance of the status word bits as stated only applies when both selection switches are set to 'AUTO'.

### 1.3 Action of Select Switches

The logic of the status word is arranged such that in the event of the program selection being overridden, the bits are made to change in accordance with the position of the selection switches. This means that when a specific device is selected the status bit for that device will appear in both bits [IR1] and [IR3] for input or [IR2] and [IR4] for output. To achieve these conditions the following signals are obtained from the device selection logic (see Fig.5 Sections 4.1.3 and 4.1.4) and fed to the On Line Program Facility Board:

|                  |                    |
|------------------|--------------------|
| <u>AUTO IN*</u>  | from 14/DP1 pin 16 |
| READER           | from 14/DP1 pin 18 |
| <u>AUTO OUT*</u> | from 14/DP1 pin 48 |
| PUNCH            | from 14/DP1 pin 50 |



Reference to the SELECT INPUT switch shows that  $\overline{\text{AUTO IN}^*}$  is false when 'AUTO' is selected,  $\text{READER}$  is true when the switch is set to 'READER' and  $\overline{\text{AUTO IN}^*}$  is true and  $\text{READER}$  false when the 'TELEPRINTER' position is selected.

$\overline{\text{AUTO IN}^*}$  is inverted at 17/2B11 and then gated with  $\text{READER}$  at 17/1A12 to produce  $\text{TPIN}$ . One of the three signals  $\text{AUTO IN}$ ,  $\text{TPIN}$  or  $\text{READER}$  is true when the corresponding position is set on the SELECT INPUT switch.

A similar procedure is adopted for the SELECT OUTPUT switch, the signals generated being  $\text{AUTO OUT}$ ,  $\text{TPOUT}$  and  $\text{PUNCH}$ .

#### 1.4 Ready Signals

The signals  $\text{RWAIT}$ ,  $\text{PWAIT}$ ,  $\overline{\text{L}}$  and  $\text{CLOCK BUSY}$  are used as ready signals for the reader, punch, teleprinter input and teleprinter output respectively. With the exception of  $\overline{\text{L}}$  these signals are false when the device is not busy,  $\overline{\text{L}}$  goes false when the teleprinter input buffer is loaded.

The logic to produce the status bits  $\overline{\text{IN1}}$  and  $\overline{\text{IN3}}$  is identical to that for  $\overline{\text{IN2}}$  and  $\overline{\text{IN4}}$  and hence only one will be described in detail.

When operating in the 'AUTO' mode position of the SELECT INPUT switch,  $\text{READER}$  and  $\text{TPIN}$  are false and cause the output of 17/4B12 to be held true.  $\text{AUTO IN}$  is true so that when the devices are not available and  $\text{RWAIT}$  and  $\overline{\text{L}}$  are true, the signals  $\overline{\text{IN1}}$  and  $\overline{\text{IN3}}$  are held true. These signals are transmitted to the interface lines [IR1] and [IR3] via the logic on board 15/DP2. When  $\text{RWAIT}$  or  $\overline{\text{L}}$  goes false the corresponding status bit is made true.

If the 'READER' position is selected,  $\text{AUTO IN}$  is false and the outputs of 17/4B13 and 17/3A11 are held true irrespective of the state of

the RWAIT and  $\overline{L}$  signals. As READER is true, when RWAIT is true, the output of 17/4B12 is held false and the input status bits are therefore false. When RWAIT goes false, since TPIN is also false, the output of 17/4B12 goes true and allows the status bits to be made true by the gating signal.

Similarly when 'TELEPRINTER' is selected, AUTO IN and READER are false and TPIN is true. The status bits can only be made true when  $\overline{L}$  goes false indicating that the buffer is loaded for an output transfer.

A similar action occurs for the output status bits [IR1] and [IR4].

#### 1.5 Status Word Input

The status word is input by the instruction 15 2049, [ADDRESS BIT 1] being true. This signal is inverted by 17/2A11 to produce  $\overline{A1}$  which is fed to board 16/DP3 pin 51 to inhibit the control logic when the interface timing chain signals occur. The timing chain is started by SELECT and A1 gated at 17/6B12 causing  $\overline{\text{SET ACT}}$  to go false to set the bistable on the 16/DP3 board so that  $\overline{\text{ACT}}$  goes false. This occurs even if the devices are busy.

$\overline{A1}$ ,  $\overline{\text{ACT1}}$  and  $\overline{\text{INSEL}}$  gated at 17/3B13 produce a true signal to gate the status of the devices onto the interface lines at 17/4A11 for [IR1], 17/4A13 for [IR3], 17/5A11 for [IR2] and 17/5A13 for [IR4].

#### 1.6 Control Word

The instruction to output a control word is 15 6145. If bit 1 of the control word is true the paper tape station is set 'On Line', if bit 1 is false the paper tape station is set 'Off Line'.

When the control word is output, [ADDRESS BIT 1] is true and hence A1 is true. SELECT and A1 therefore ensure that  $\overline{\text{SET ACT}}$  goes

false and the interface timing chain is started even if the devices are busy.

OUTSEL, A1 and ACT\* gated at 17/6A12 give a false signal which is inverted before being applied to both elements of the bistable 17/7B12 and 17/7A13. If bit 1 of the control word is true,  $\overline{\text{OUT1}}$  is false and is gated at 17/7B12 causing ON LINE to go true. If bit 1 is false,  $\overline{\text{OUT1}}$  is true and gated at 17/7A13 causes ON LINE to go false.

Any request to the paper tape station causes SELECT to go true, so that when ON LINE is true,  $\overline{\text{SET ACT}}$  goes false to start the interface timing chain. This allows the transfer to proceed regardless of whether the selected device is busy or not.





## Chapter 2: TEST PROGRAM

### 2.1 Introduction

The test program XDPA 213 provides a means of testing the operation of the On Line Program Facility.

The program tape is supplied as a sum-checked binary tape for input under Initial Instructions.

### 2.2 Operation

The XDPA 213 tape should be read in under initial instructions, entry point 8181. The teleprinter should be 'On Line', and the punch loaded. Enter the program at entry point 21. When sufficient paper has been output on the punch, load it into the paper tape reader. Reading and punching will now occur simultaneously with teleprinter output.

To check teleprinter input the operator should occasionally type in a character which will subsequently be displayed by teleprinter output.

Output to the teleprinter will be of the form:

\* \* \* \* \* 10 characters per line

\* \* \* \* \*

\* \* \* \* \*

etc.

\* \* \* \* \* operator types (.)

\* \* \* . . . . .

. . . . .

. . . . .

### 2.3 Description

The program will select the special 'On Line' mode. The input status instruction will be given, to determine which devices are available for use.

- (1) If the punch is ready for output a zero character will be output followed immediately by a fullhouse character. The fullhouse character should be lost if the hardware functions correctly.
- (2) The reader will then be checked, if it is ready for input one character will be read. If this is a non-zero character a message will be displayed (see paragraph 2.4.2) and the program will enter a dynamic stop.
- (3) If neither punch nor reader are ready for a data transfer the teleprinter will be examined to check if the input buffer is loaded. If the input buffer is loaded a character will be read in, and stored in a 'character-in' location. Program returns to 2.3 (1).
- (4) At intervals the 'teleprinter ready for output' bit will be examined. If the bit is set the contents of the 'character-in' location will be typed. Program returns to 2.3 (1).

The output characters are punched 10 to a line, the newline characters will be output in 'off-line' mode.

The interval described in 2.3 (4) is to enable an operator to interrupt the teleprinter logic by filling the teleprinter input buffer, as no

characters could be typed in if the teleprinter were to output at full speed.

## 2.4 Error Indications

### 2.4.1 Punch

If the 'On Line' facility fails to operate correctly, the fullhouse character described in 2.3. (1) will be output.

### 2.4.2 Reader

If the reader detects a non-zero character, e.g. fullhouse from 2.4.1, the message

#### READER/PUNCH ERROR

will be displayed on the control teleprinter. If, when the reader is unloaded, the teleprinter and/or punch cease to output, this will indicate that the 'On Line' mode is not functioning correctly.

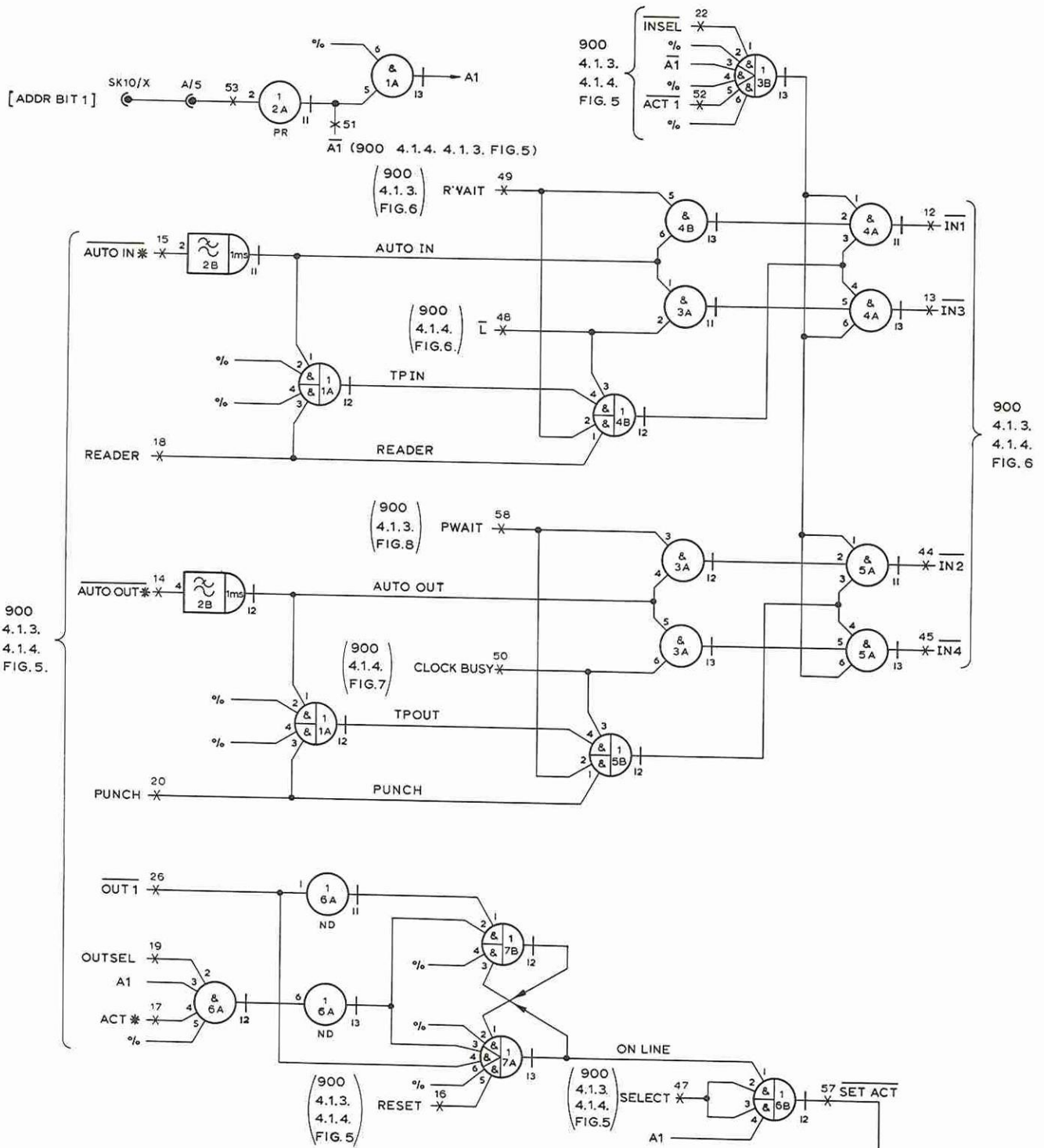
### 2.4.3 Teleprinter

If the teleprinter is switched 'Off Line' the punch or reader should not be affected in any way, i.e. output to the teleprinter will not be held up as the status bits will not be set.

N. B. If a device, in the auto state, fails to operate, the status bit for that device would probably be suspect, especially if that device operates correctly with the usual test programs, e.g. XPTS1 for READER/PUNCH.







900  
4.1.3.  
4.1.4.  
FIG. 5.

900  
4.1.3.  
4.1.4.  
FIG. 6

LOGIC BOARD COMPONENTS

| AREA REF. | 1  | 2  | 3  | 4  | 5  | 6  | 7  |
|-----------|----|----|----|----|----|----|----|
| A         | 06 | 12 | 01 | 02 | 02 | 03 | 05 |
| B         | 06 | 18 | 05 | 06 | 06 | 06 | 06 |

NOTE:- C1,C2, AND C3 DECOUPLING CAPACITORS  
10μF ±20% CATALOGUE No. 9137

