PRINTER INTERFACE KIT
TYPE 80C

SERVICE MANUAL

EUR

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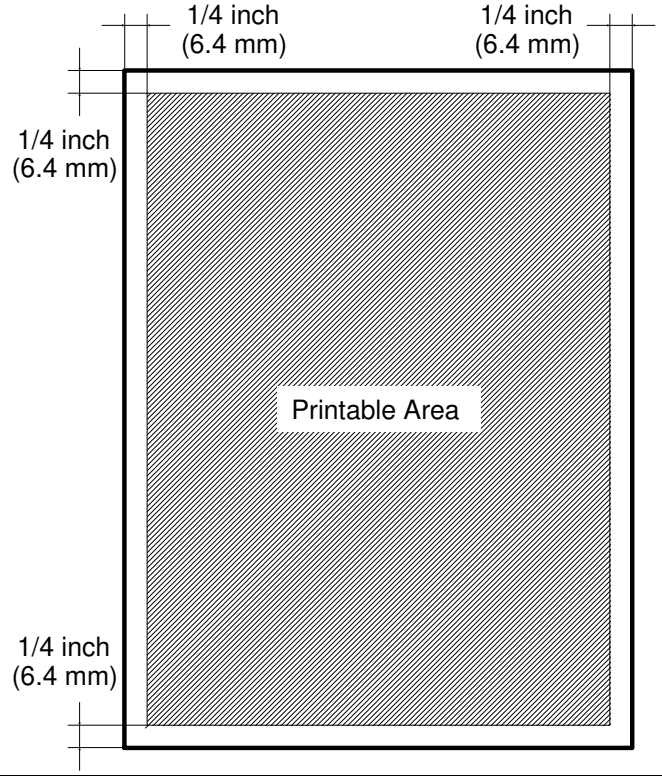
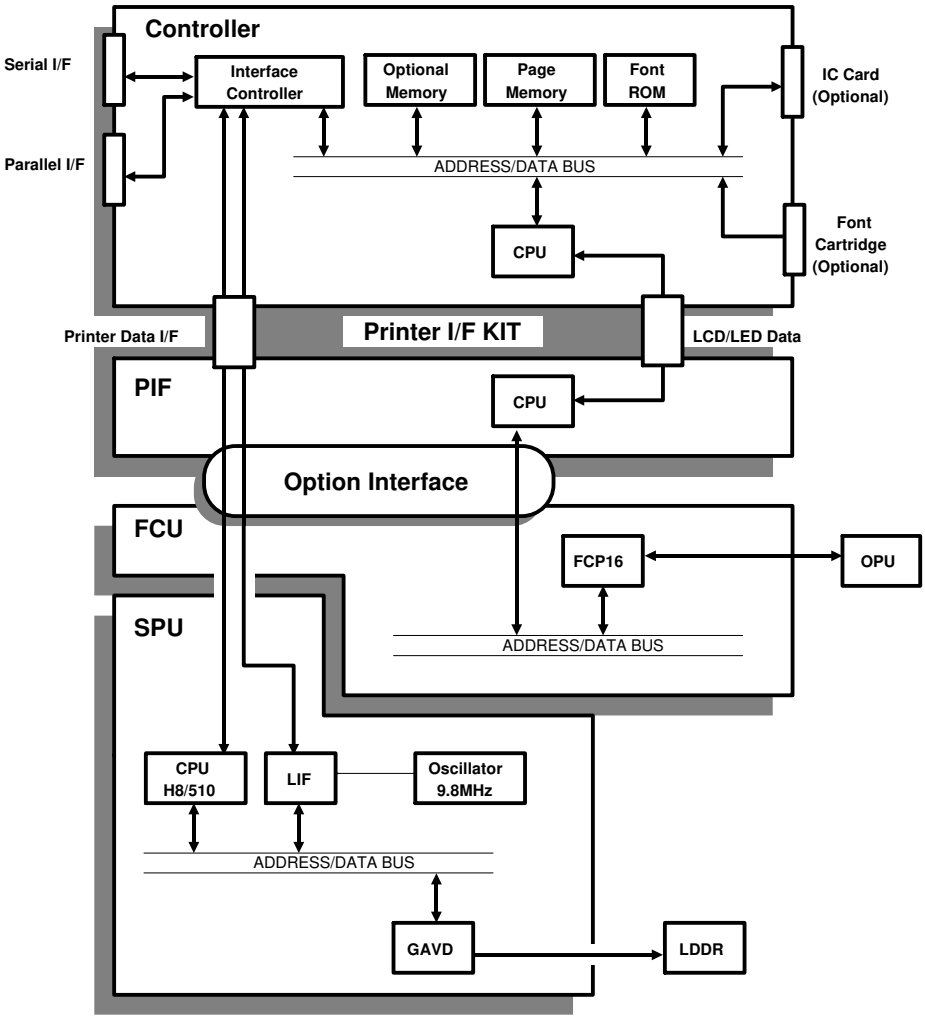
1. OVERALL INFORMATION

1.1. SPECIFICATIONS

Items	Specifications
Printing Resolution	300 dpi
Printing Speed	10 ppm (LT / A4)
First Page Printout TIme	Less than 15 s
Paper Size	Letter, Legal, A4
RAM Capacity	Standard - 2.0 MB
Host PC Interface	1 Serial Port - RS232C 1 Parallel Port - Centronics
Emulation Modes	HP LaserJet III (HP Printer Control Language Level 5, HP Graphics Language/2) EPSON FX-850 IBM Proprinter XL24E LayOut Document Description Language Turbo Mode (fast bit-image transfer) HEX printout
Printable Area	
Others	IC Card Slot - 1

1.2. OVERALL SYSTEM CONTROL



The printer interface kit consists of two PCBs: the printer controller board (Controller) and the printer interface board (PIF).

1.2.1. Printer Data Path

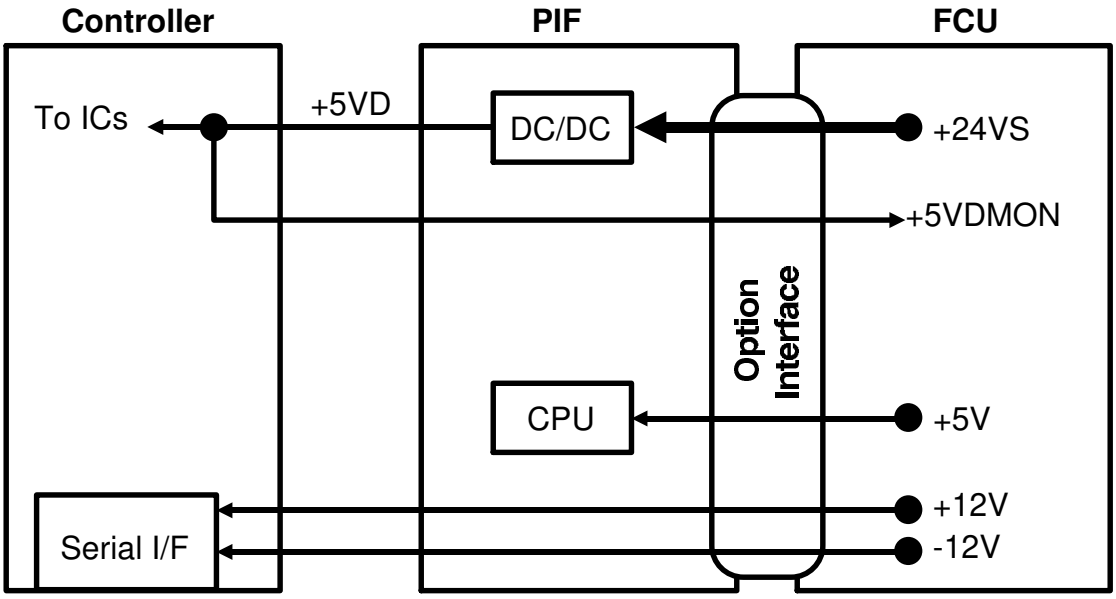
Through the serial and/or parallel interface(s), the Controller handshakes with the host(s) and receives print data, using one of the available emulation modes. Then the CPU creates an imaginary page in the memory using the fonts stored in the ROM. After one page of print data has been created, the Controller sends the video data through the printer data interface to the LIF on the SPU for printing. The PIF emulates the print data and control signals for the LIF to work correctly, and supplies the 9.8 MHz clock signal to the LIF for 300 dpi printing.

1.2.2. LCD/LED Data Path

The three LEDs on the operation panel are always dedicated to the Controller. They indicate the status during printing, and are directly controlled by the Controller.

In Printer Mode (Function 37), the LCD display and four Quick Dial keys are dedicated to the Controller to access printer functions. Within the printer functions, some settings are not available because of limitations to the machine's hardware. The CPU on the PIF monitors the function status and the settings and indicates these on the LCD. It also modifies the data if necessary (for example, Half Letter size paper will not be displayed as a possible paper size).

1.3. POWER DISTRIBUTION



The PIFE generates +5VD for the Controller from the +24VS supplied by the FCU. +5V for the PIF CPU is directly supplied by the FCU. The +5V line is returned to the FCU as +5VMON, so that the FCU can detect whether the printer interface is installed or not.

2. DETAILED SECTION DESCRIPTIONS

2.1. INTERFACE SPECIFICATIONS

2.1.1. Parallel Interface

The parallel interface can use either Centronics or Dataproducts signalling protocols. The selection is made by a user adjustment.

1. Pin Assignment

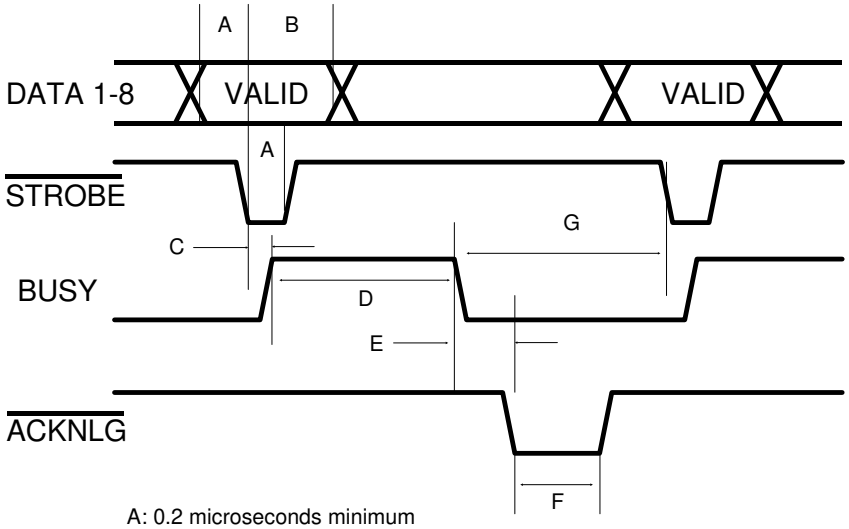
There is an 8-bit parallel interface. The pin assignments are as follows.

Signal Pin	Return Pin	Signal	Direct-ion	Description
1	19	STROBE	IN	The strobe pulse from the host to read data in. Centronics: Active LOW, Dataproducts: Active HIGH.
2 - 9	20 - 27	DATA1-8	IN	Parallel data bits 1 to 8. For 7-wire connections, the most significant bit can be fixed at 0 using a user adjustment.
10	28	ACKNLG	OUT	Indicates that data has been received and the printer is ready to receive more data.
11	29	BUSY/ DEMAND	OUT	A HIGH (Centronics) or LOW (Dataproducts) indicates that the printer cannot receive data. The printer is busy when the interface already contains a byte from the computer but not yet taken by the controller, when the printer is off line, and when there is a printer error. The Centronics signal is called BUSY, and the Dataproducts signal is called DEMAND.
12	30	PE	OUT	Indicates that the printer is out of paper.
13	-	SELECT	OUT	This corresponds to the Centronics SELECT and the Dataproducts READY and ONLINE signals.
15	-	DRTN		Reserved for data direction control. If HIGH, data goes from host to printer. If LOW, it goes the other way. The pin is pulled up on the controller board.
16	-	GND	-	Logic ground
17	-	CH-GND	-	Printer's chassis ground
18		5V470R		Pulled up to 5 V through a 470 Ω resistor.
19 - 30	-	GND	-	Twisted pair return signal ground level
32	-	ERROR	OUT	Indicates when the printer is out of paper, off line, or in an error condition.

Other pins: Not used.

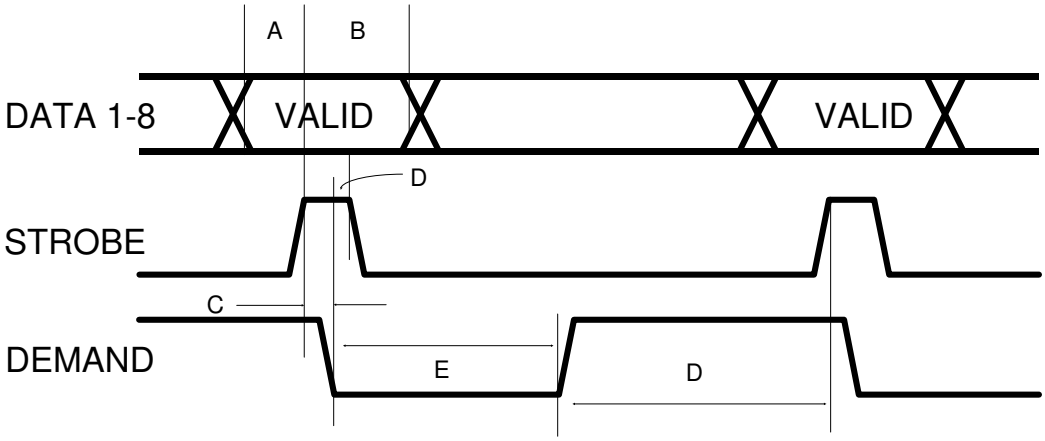
2. Interface Timing

Centronics



A: 0.2 microseconds minimum
B: 0.1 microseconds minimum
C: 0.15 microseconds maximum (normally 0.12)
D: 0.3 microseconds minimum (normally 0.5)
E: 0.07 microseconds maximum (normally 0.03)
F: 1 to 2 microseconds (normally 1.7)
G: Always at least zero

Dataproducts



A: 0.2 microseconds minimum
B: 0.1 microseconds minimum
C: 0.15 microseconds maximum
D: Always at least zero
E: 0.3 microseconds minimum

2.1.2. Serial Interface

1. Data Format

Word Length:	7 or 8 bits
Parity:	None, odd, or even
Stop Bits:	1 or 2
Baud Rate:	300, 600, 1200, 2400, 4800, 9600 bps
Signalling:	RS-232C or RS-422C, selected by user adjustment
Flow Control:	XON/XOFF

2. Pin Assignments

The serial interface pin assignments are compatible with that of the HP Laser-Jet printer, both for the RS-232C and RS-422C configurations.

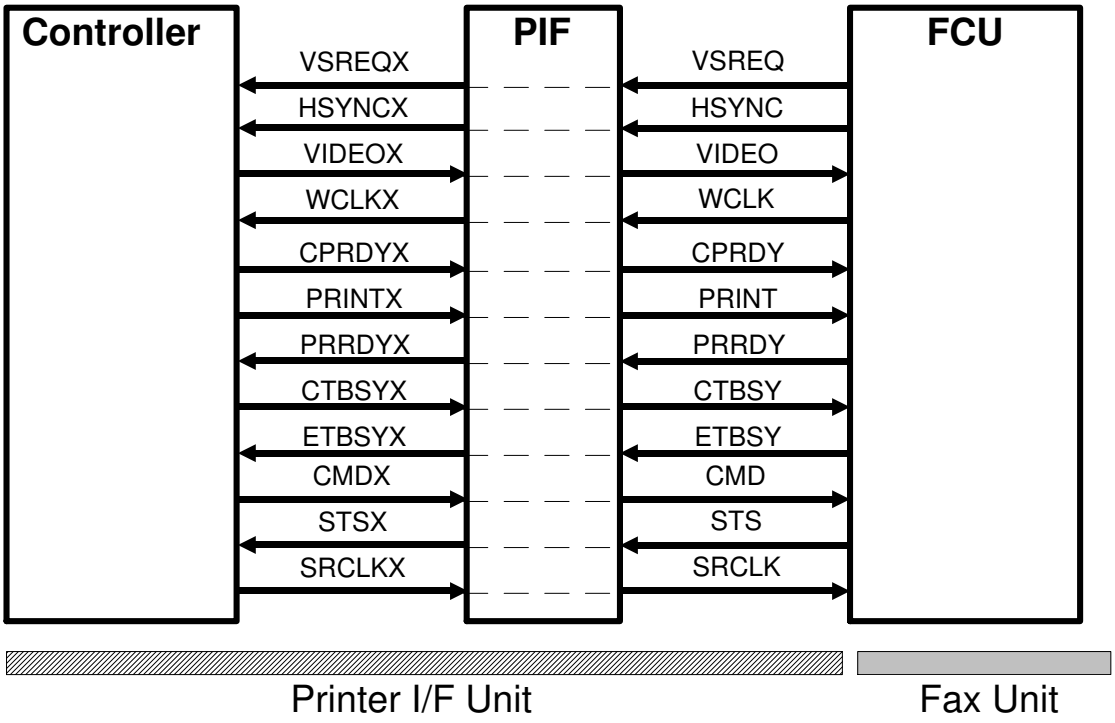
Signal Pin	Signal	Direct-ion	Description
1	FG	-	RS232/RS422: Connected to the printer chassis.
2	TXD	OUT	RS232: Serial data from printer to computer.
3	RXD/RDA	IN	RS232: Serial data from computer to printer. RS422: Serial data from computer to printer, line A.
4	RTS	OUT	RS232: Request To Send. Held HIGH by the printer.
7	SG	-	RS232/RS422: Signal ground. Provides a ground for all signal lines.
9	TDA	OUT	RS422: Serial data from printer to computer, line A.
10	TDB	OUT	RS422: Serial data from printer to computer, line B.
18	RDB	IN	RS422: Serial data from computer to printer, line B.
20	DTR	OUT	Data Terminal Ready. Indicates whether the printer is ready to receive data. If the printer ready protocol is not selected, DTR is always HIGH (always ready to receive). If printer ready protocol is selected, the printer can only accept data when DTR is HIGH. When DTR goes LOW, the computer must stop sending data within 128 characters. The active signal level can be changed with a user adjustment.

2.1.3. Printer Data Interface

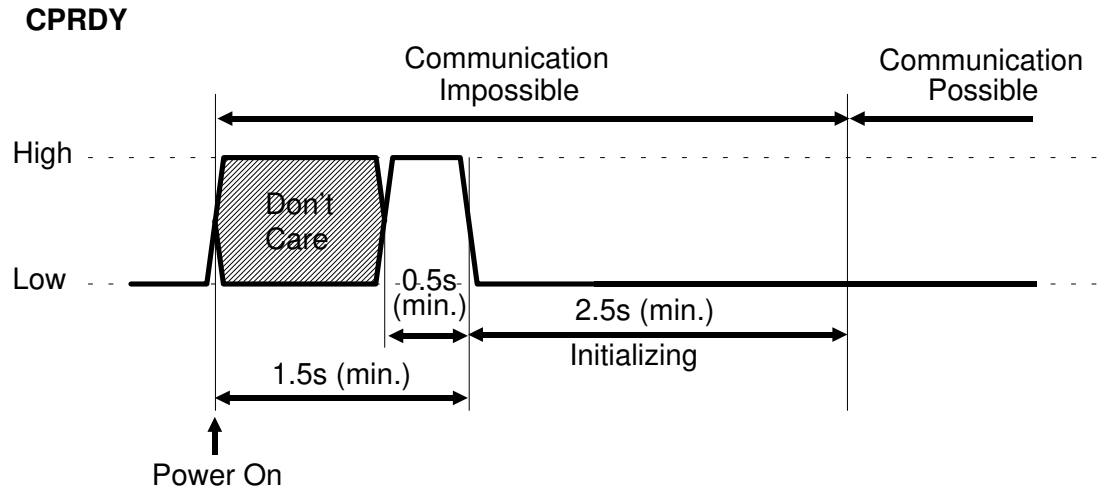
1. Signals

Name	Description
VSREQX	Active (low) while the controller transfers one page of image data to the FCU.
HSYNCX	Clock signal for synchronizing each line of image data.
VIDEO	Raster data for printing.
PRCLK	Clock signal for synchronizing raster data.
CPRDY	Inactive (high) when initializing or resetting the printer mechanism.
PRINT	Active (low) before transferring one page of image data to the FCU.
PRRDYX	Active (low) while the printer mechanism is in standby status. Inactive (high) while the printer is busy or has a problem.
CTBSY	Active (low) while the controller is sending a command to the FCU.
ETBSY	Active (low) while the FCU is sending status data to the controller.
CMD	Command data (8 bit serial).
STS	Status data (8 bit serial).
SRCLK	Clock signal for synchronizing commands and status data.

Signal Directions

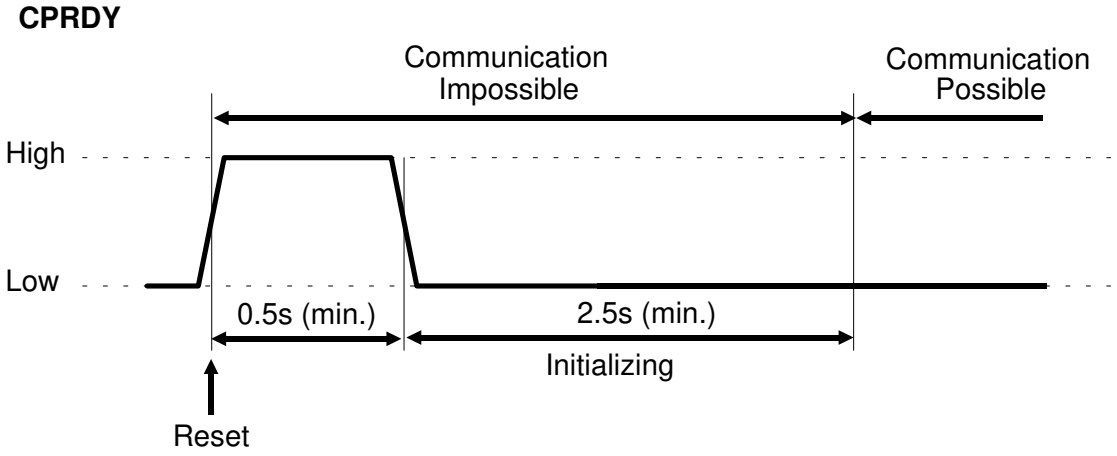


2. Power-On Timing



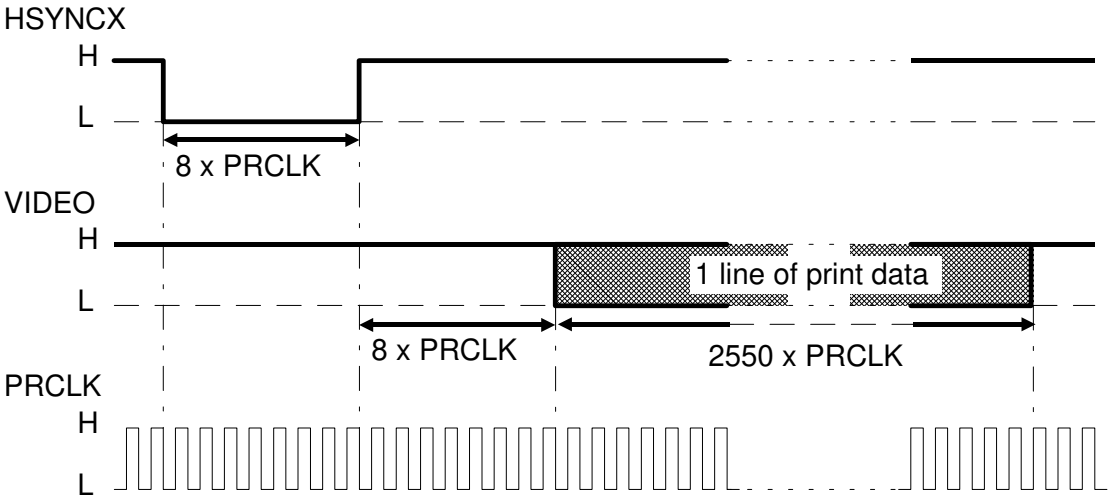
When the power is switched on, the controller raises CPRDY to high for at least 0.5 s, then initializes itself within 2.5 s. After initializing is completed, the controller will be ready to communicate with the host PC(s) and the FCU.

3. Reset Timing

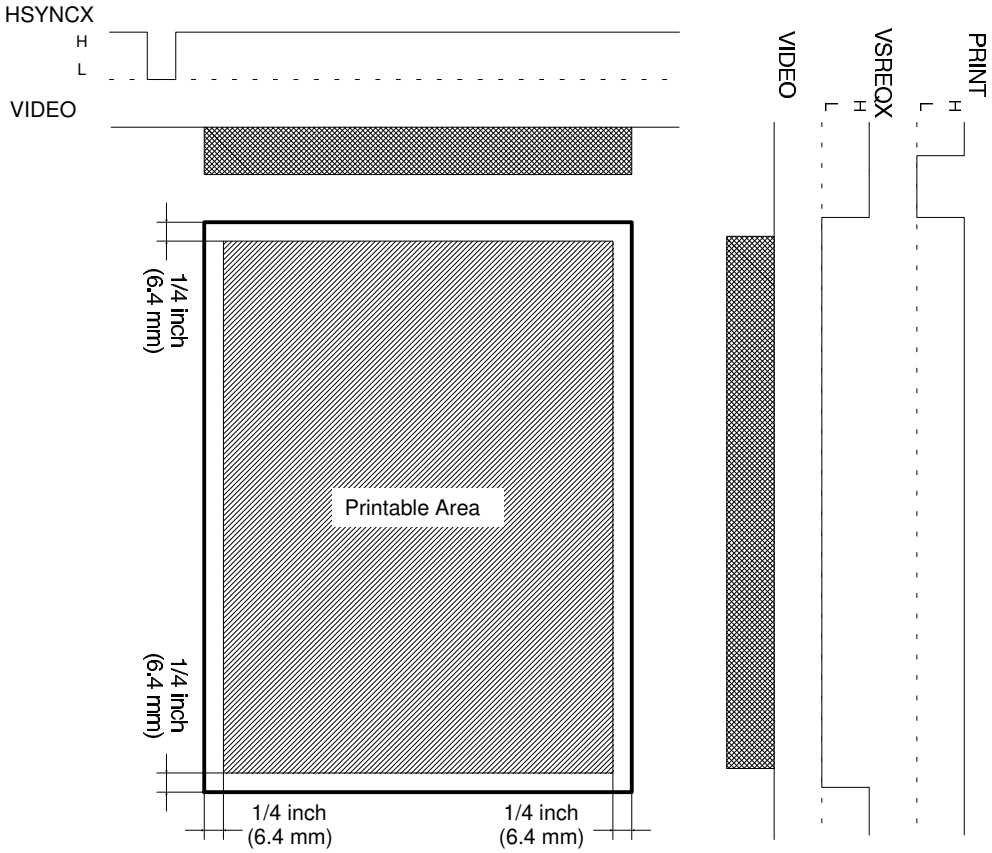


When the user resets the printer using function 35, the controller activates CPRDY for at least 0.5 s, then the controller initializes itself and the printing process is canceled. After initializing is completed, the controller will be ready to communicate with the host PC(s) and the FCU.

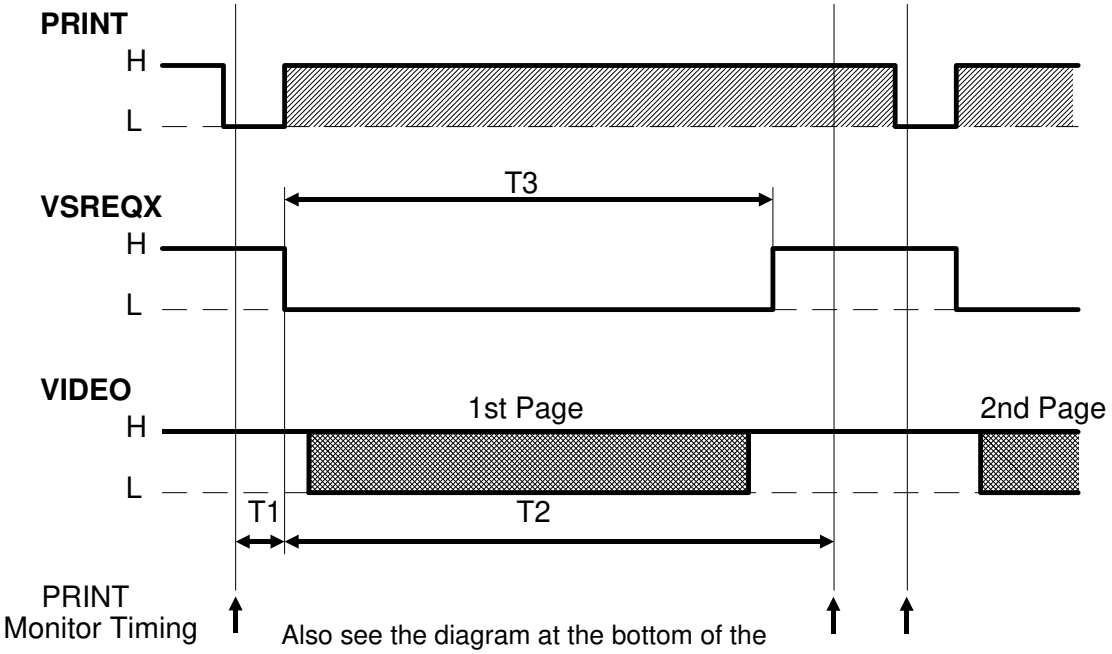
4. Image Data Synchronization (Horizontal)



The FCU drops HSYNCX to low for eight PRCLK clock cycles before receiving each line of image data. Then, after the next eight cycles of PRCLK has passed, the controller starts to transfer one line of image data.
The frequency of the PRCLK clock is between 1.3 MHz and 1.96 MHz.



5. Image Data Synchronization (Vertical)



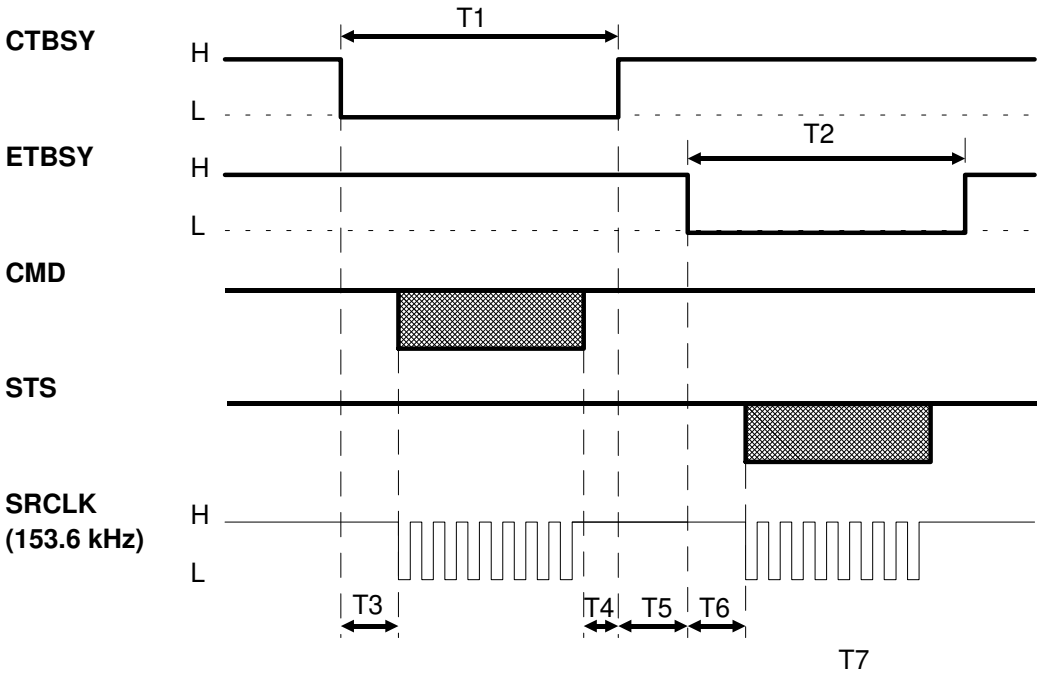
The FCU monitors the PRINT signal from the controller every 2 ms to detect if a print request is coming from the controller or not. After T1 has passed since the FCU detected the PRINT signal to be active (low), the FCU drops VSREQX to low so that the controller can acknowledge that the printer is ready to receive one page of image data. After one page of data has been received from the controller, the FCU inactivates the VSREQX signal until PRINT is activated again for printing the next page.

The times T1, T2 and T3 vary depending on the following conditions.

Parameter	Time	Condition
T1	1.0 s	When the hexagonal mirror motor is active.
	6.0 s	When the hexagonal mirror motor is inactive.

Parameter	Paper Size	Time
T2	Letter	8.5 s
	Legal	10.6 s
	A4	9.0 s
T3	Letter	7.58 s
	Legal	9.64 s
	A4	8.06 s

6. Command / Status Signal Timing



STS informs the controller of status information, such as the current paper size and any mechanical problems that are encountered.

The FCU informs the controller of the printer status (STS) in an 8 bit serial format, in response to a command (CMD) from the controller. If a status signal (STS) is not received within T5 (100 ms) after the controller sends a command, the controller will resend the command to the FCU.

Refer to the above diagram and to the following table below for the timing.

Parameter	Time
T1	62.7 µs
T2	Less than 30 ms
T3	9.77 µs
T4	4.07 µs
T5	Less than 100 ms
T6	9.77 - 10.58 µs

3. SERVICE TABLES AND PROCEDURES

3.1. SERVICE LEVEL FUNCTIONS

There are no special service operations. Refer to the operation manual for all printer operation procedures.

3.2. SERVICE RAM ADDRESSES

0802BE
Data wait time after the last page has been printed, when printing from the printer interface. (Hex; unit 1 s)

3.3. DIP SWITCHES

Controller
TB1 ~ TB4: Do not change the default settings.