FTP-628DSL308

PRODUCT SPECIFICATION

TITLE		FTP-628DSL308 Product Specification		
DRAW No.		A1NA21207-3081/6		**CUST**
EDIT	**DATE**	**DESIGN**	**CHECK**	**DESCRIPTION**
DESIGN	'02.04.11	Yada	**CHECK**	**APPLY** Sakurai

FUJITSU COMPONENT LIMITED SHEET 1／83

Application

This specifications provide for control board FTP-628DSL308 for thermal printer mechanism FTP-6X8MCL series.

The printer mechanism which suits this control board is as shown in the table below.

Printer type			With platen detection switch	Without platen detection switch*1
2-inch mechanism	Normal type	Auto-cutter none	FTP-628MCL053 FTP-628MCL054	FTP-628MCL051 FTP-628MCL052
		With auto-cutter	FTP-628MCL353 FTP-628MCL354	FTP-628MCL351 FTP-628MCL352
	"ELM" type	Auto-cutter none	FTP-628MCL103	FTP-628MCL101
		With auto-cutter	――――	――――
3-inch mechanism	Normal type	Auto-cutter none	FTP-638MCL053 FTP-638MCL054	FTP-638MCL051 FTP-638MCL052
		With auto-cutter	――――	――――
	"ELM" type	Auto-cutter none	FTP-638MCL103	FTP-638MCL101
		With auto-cutter	――――	――――

Note *1): It is possible to apply by adding the mounting parts (jumper resistor).

The feature and the specification of the control board by the combination with the above-mentioned printer mechanism are described.

Please note this product enough in handling referring to notes of the appendix description before use.

SECTION   A
Features

The features of the printer unit using this Control board and printer mechanism FTP628 MCL are as follows.

1. Maximum 60mm / second   high- speed printing.(standard paper, high-speed print mode).

2. Compact and light weight.

3. RS-232C interfaces.

4. Automatic starting point detection function by mark detection method is included.

5. Paper run out, platen release, head temperature abnormality, head voltage abnormality fuse blow out detection functions are included.

6. Various papers can be selected by commands setting.

7. The print of 384 dots/line (FTP628MCL series) and 576 dots/line (FTP-638MCL series) is supported by 8lines/mm high resolutions.

8. Stable printing quality by temperature detection function.

9. Stable printing quality by thermal head driving voltage detection function.

10. Two types of fonts: 12 dot characters (12 x 24 dots and 24 x 24 dots) and 16 dot characters (8x16 dots and 16 x 16 dots) can be selected by commands.

11. MCU operation abnormality detection function by watchdog timer.

12. Fuse blow out detection functions for electric circuit to protect from over current of motor.

13. Various bar code commands are supported.

14. Paper auto-cut.(Only the control board with the auto-cutter drive circuit .)
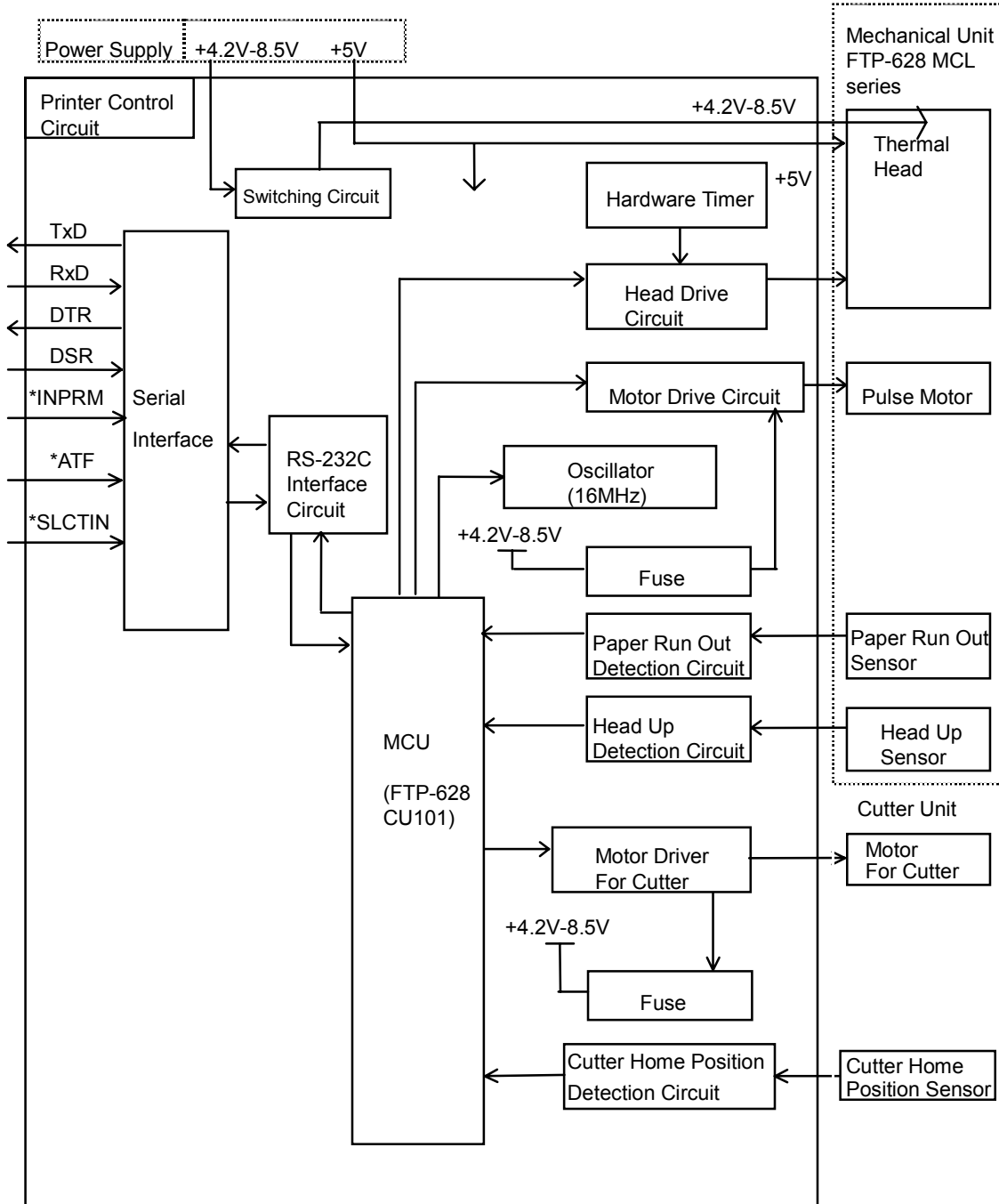
15. Power down function

DOCUMENT CONTROL SECTION

DATE

TITLE	FTP-628DSL308 Product Specification			
DRAW No.	A1NA21207-3081/6		CUST	
EDIT	D A T E	D E S I G N	CHECK	D E S C R I P T I O N
DESIGN			CHECK	APPLY

FUJITSU COMPONENT LIMITED

3／83

01.10 FDNCA-4902-2

SECTION B
Circuit Configuration

The circuit configuration of the control board is as follows.

Power Supply +4.2V-8.5V +5V

Printer Control Circuit

+4.2V-8.5V

Mechanical Unit
FTP-628 MCL series

Thermal Head

Switching Circuit

Hardware Timer

+5V

TxD

RxD

DTR

DSR

*INPRM

*ATF

*SLCTIN

Serial Interface

RS-232C Interface Circuit

Head Drive Circuit

Motor Drive Circuit

Pulse Motor

Oscillator (16MHz)

+4.2V-8.5V

Fuse

MCU

(FTP-628 CU101)

Paper Run Out Detection Circuit

Paper Run Out Sensor

Head Up Detection Circuit

Head Up Sensor

Cutter Unit

Motor Driver For Cutter

Motor For Cutter

+4.2V-8.5V

Fuse

Cutter Home Position Detection Circuit

Cutter Home Position Sensor

DOCUMENT CONTROL SECTION

DATE

SECTION C
General Specifications

1. Outward appearance

35.05	3.25	
5.5		
CN4		
CN5		
4-φ3.2	45.5	
(52.0)	33.0	
φ6.5(FG)	CN3	13.0
CN1	CN2	
3.25	18.5	3.25
45.0	3.25	
62.8		
(69.3)		

10max 1.6 2max

DOCUMENT CONTROL SECTION

DATE

EDIT D A T E D E S I G N C H E C K D E S C R I P T I O N
DESIGN CHECK APPLY

2. Connector composition

Parts number and the pin assignment of each connector are shown below. The direction is assumed to be the one seen from the control board side.

(1) CN1 (Power supply)

a. Parts number

S6B-XH-SM3-TB: J.S.T. Mfg Co,Ltd.

b. Pin assignment

№	Name of signal	Note
1	Vcc	Logic power supply terminal.
2	GND (Vcc)	Logic power supply grand terminal.
3	GND (Vdd)	Thermal head and motor power supply grand terminal.
4	GND (Vdd)	
5	Vdd	Thermal head and motor power supply terminal.
6	Vdd	

*A logic power supply grand terminal and, a thermal head and motor power grand terminal are connected together in the control board .

(2) CN2 (Centronics interface)

This connector is not mounted.

(3) CN3 (RS-232C interface)

Refer to the paragraph of "D. the interface specification".

EDIT	D A T E	D E S I G N	C H E C K	D E S C R I P T I O N		
DESIGN			CHECK		APPLY	

TITLE FTP-628DSL308 Product Specification

DRAW No. A1NA21207-3081/6 CUST

FUJITSU COMPONENT LIMITED SHEET 6／83

(4) CN4 (Thermal printer)

a. Parts number
52610-3090:　　　Molex

b. Pin assignment

№	Name of signal		Direction	Note
1	PSGND		--	Paper sensor power supply
2	PSVD		--	Paper sensor power supply grand
3	*PES		Input	Signal of paper sensor
4	HUP		Input	Signal of head-up sensor
5	HSVD		--	Head-up sensorpower5 supply
6	VH		--	Thermal　head power supply
7	VH		--	
8	HD		Input	Input signal of print data
9	HCLK		Output	Synchronous clock for communication
10	GND		--	Thermal　head power supply grand
11	GND		--	
12	*STB6	(*STB5)	Output	Thermal head energizing control signal
13	*STB5	(*STB4)	Output	
14	*STB4	(*STB3)	Output	
15	5VH		--	Power supply for thermal head control
16	TM1		Input	Thermally sensitive resistor input terminal 1
17	TM2		Input	Thermally sensitive resistor input terminal 2
		(*STB2)	(Output)	(Thermal head energizing control signal)
18	*STB3	(*STB1)	Output	Thermal head energizing control signal
19	*STB2	(*AE02)	Output	
20	*STB1	(*AE01)	Output	
21	GND		--	Thermal　head power supply grand
22	GND		--	
23	*LAT		Output	Thermal head data latch signal
24	HD		Output	Print data signal
25	VH		--	Thermal　head power supply
26	VH		--	
27	MT/*B		--	Stepping motor drive signal
28	MT/B		--	
29	MT/*A		--	
30	MT/A		--	

Three-inch mechanism in ( ) at two-inch mechanism besides ( ).

(5) CN5 (Auto-cutter)

a. Parts number
S4B-PH-SM3-TB:　　　　　J.S.T. Mfg Co,Ltd.

b. Pin assignment

№	Name of signal	Direction	Note
1	CHP	Input	Auto-cutter home position detection signal
2	GND (+5V)	--	Logic grand
3	MT+	--	Auto-cutter motor drive signal
4	MT-	--	

		TITLE	FTP-628DSL308 Product Specification	
		DRAW No.	A1NA21207-3081/6	CUST

EDIT	DATE	DESIGN	CHECK	DESCRIPTION	FUJITSU COMPONENT LIMITED	SHEET	7／83
DESIGN			CHECK	APPLY			

3. Print Specification

(1) Printing System
Thermal printing system

(2) Printing Speed
(Head voltage 8.5V, Standard paper(PD150R), Room temperature, Under 64 concurrently energized dots/line, automatic division print mode)

		Maximum Printing Speed (mm / sec)		
		High-speed Mode	Medium-speed Mode	Low-speed Mode
Alphanumeric Katakana	Internal half size character 12x24	60	50	30
	Internal full size character 24x24			
	Internal half size character 8x16			
	Internal full size character 16x16			

*:Depends on the data transfer speed

(3) Thermal Head Configuration

Item	Specification	
	FTP-628	FTP-638
Resolution	8 dots / mm	
Heating Unit Size	0.125 mm (vertical) x 0.125 mm (horizontal)	
No. of Heating Units	384 dots/line	576 dots/line
Effective Printing Area	About 48 mm	About 72 mm

(4) Number of Digits of Print Characters

Print Mode	Type	Number of Digits	
		FTP-628	FTP-638
Alphanumeric Katakana	Internal half size character 12x24	32	48
	Internal full size character 24x24	16	24
	Internal half size character 8x16	48	72
	Internal full size character 16x16	24	36

(5) Type of Print Characters and Character Configuration

Print Mode	Type	Number of Characters
Alphanumeric Katakana	Internal half size character 12x24	159
	Internal full size character 24x24	159
	Internal half size character 8x16	159
	Internal full size character 16x16	159
International, Special	Internal half size character 12x24	195
	Internal full size character 24x24	195
	Internal half size character 8x16	195
	Internal full size character 16x16	195

(6) Print Mode

a. Character Space

Print Mode	Type	Character Space (No. of dots)
Alphanumeric Katakana	Internal half size character 12x24	12
	Internal full size character 24x24	24
	Internal half size character 8x16	8
	Internal full size character 16x16	16

b. Line Feed

Print Mode	Type	Line Feed (No. of dots)
Alphanumeric Katakana	Internal half size character 12x24	24 ~ 255
	Internal full size character 24x24	24 ~ 255
	Internal half size character 8x16	16 ~ 255
	Internal full size character 16x16	16 ~ 255

c. Print Character Type

Print Mode	Type of Print Characters
Alphanumeric Katakana	Internal half size character (12x24) Internal full size character (24x24) Internal half size character (8x16) Internal full size character (16x16)

d. Extended Mode

Print Mode	Extended Print Mode
Alphanumeric Katakana	Horizontal double size, reverse order, Black and white reversal, vertical double size, x4 size
Image	Reverse order, black and white reversal

e. Image Mode

	FTP-628	FTP-638
Max. No. of Dots/Line	384	576

(7) Printing Density
OD Value: 0.8 or more (density of solid black print area under standard print conditions)

Paper	Specified paper
Measuring Instrument	Sakura Density meter PDA 65

Discoloration of printing caused by paper is not included in this specification.

TITLE	FTP-628DSL308 Product Specification

DRAW No.	A1NA21207-3081/6	CUST

EDIT	DATE	DESIGN	CHECK	DESCRIPTION	FUJITSU COMPONENT LIMITED	SHEET	9/83
DESIGN			CHECK	APPLY			

4. Paper Feed Specification

Paper Feed System	Friction feed
Line Feed Space	About 1/8 inch (when power is turned ON), n/203 inch (programmable)
Line Feed Speed	About 7.5 mm / sec (By * ATF signals)

5. Paper Specification

Specified Paper	Sensitive paper	TF50KS-E4	(Nippon Paper)
	Standard paper	TF60KS-E	(Japan Paper)
		PD150R	(Oji Paper)
	Medium-term storage paper	TF60KS-F1	(Nippon Paper)
		TP60KJ-R	(Nippon Paper)
		PD170R	(Oji Paper)
		P220VBB-1	(Mitsubishi Paper)
		FH65BC-3H	(Oji Paper)
	Long-term storage paper	PD160R	(Oji Paper)
		AFP-235	(Mitsubishi Paper)
		HA220AA	(Mitsubishi Paper)
Paper Type	Thermo-sensitive roll paper (thermo-sensitive side is on outside)		

6. Functional Specification

(1) Self test print function

(2) Paper feed function — By * ATF signal

(3) Paper run out detection function — By internal sensor of printer mechanism

(4) Head up (platen open) detection function — By internal mechanical switch of printer mechanism

(5) Thermal head temperature detection function — By internal thermistor of printer mechanism

(6) Fuse blow out detection function

(7) Voltage detection function

(8) Internal RAM abnormality detection function

(9) Cutter operation abnormality detection function

(10) Motor power saving function

(11) Mark detection function — By GS < command

(12) MCU operation abnormality detection function — By watch dog timer

(13) Bar code print function

7. Control Command Specification

See "Section G Control Command Specification".

8. Power Consumption

(1). Driving head

Voltage: 4.2 – 8.5 V
Current: See the following table (model indicates a typical product).

Printing Rate	Speed	High-speed Print Mode		Medium Speed Print Mode		Low-speed Print Mode	
	Model						
12.5%	628MCL	0.87	(0.93)	0.75	(0.93)	0.44	(0.62)
	638MCL	1.37	(1.53)	1.33	(1.53)	1.09	(1.53)
25.0%	628MCL	1.73	(1.84)	1.54	(1.84)	0.87	(1.23)
	638MCL	2.66	(3.02)	2.64	(3.02)	1.34	(1.83)
50.0%	628MCL	3.40	(3.64)	3.43	(3.64)	1.78	(2.45)
	638MCL	5.22	(5.85)	5.22	(5.85)	2.69	(3.60)
100.0%	628MCL	——		——		3.56	(4.82)
	638MCL	——		——		5.35	(6.93)

Units [A]

• Values inside ( ) indicate peak values, and values outside ( ) indicate mean values.
• Conditions
  Voltage: 7.2 V
  Head resistance: 169 Ω (176 Ω - 4%)
  Ambient temperature: 25 °C
  Paper: Standard paper (equivalent to PD150R)
  Printing density: Applied dots are assumed to be evenly distributed.
• When mode by which head is automatically divided is set, the peak current changes the head division drive number in proportion to the print rate and is suppressed automatically. This case, the maximum number of dots where current flows is 64 dots, the peak current is 2.5 A. (Conditions are same to above mentioned.)

(2). Driving motor (feeding paper)

Voltage: 4.2 V ~ 8.5 V
Current: 0.8 A (max)

(3). Driving motor (paper cutter)

Voltage: 5 V ± 5%
Current: 1.5 A (max)

(4). Driving logic
  (Consumption current in standard control circuit which use this MCU)

Voltage: 5.0 V ± 5%
Current:: 0.2 A (When the printer is driving usually, this current is maximum value.)
Current: 60 mA (When the printer is switching to power down function, this current is maximum value.)

EDIT	D A T E	D E S I G N	C H E C K		D E S C R I P T I O N	
D E S I G N			CHECK		APPLY	

TITLE FTP-628DSL308
Product Specification

DRAW No. A1NA21207-3081/6   CUST

FUJITSU COMPONENT LIMITED SHEET 12 / 83

01.10 FDNCA-4902-2

9. Operating Environment

During Operation	Operating Temperature	0 ~ 50 °C [1]
	Operating Humidity	20 ~ 50% RH (no condensation)
During Stopping	Storage Temperature	-20 ~ 60 °C
	Storage Humidity	5 ~ 90%RH (no condensation) excluding thermosensitive paper

[1]: The temperature range that guarantees print quality is 5 ~ 40°C.

Note
1. When printing is continued under high temperature conditions, the printer may enter off-line status automatically because of the temperature rise of the head, and stop printing (head temperature abnormality). When the head temperature drops to normal, the printer automatically returns to on-line status and continues printing.
2. Relation between temperature and humidity in printing is as follows.
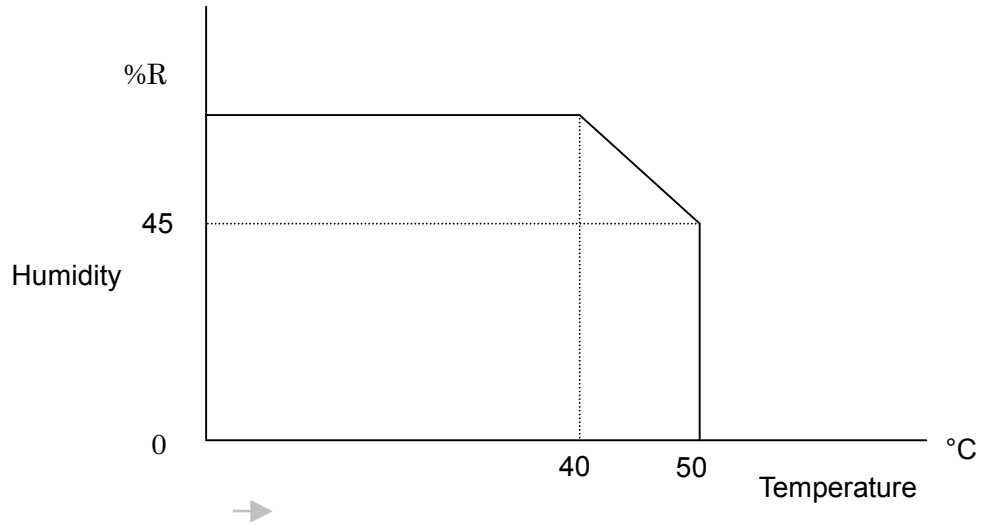
10. Noise

60 dB or less

Note
The measurement is a point 1m away from the device. 5℃ and state of test print. However, the form cutting sound is excluded.

11. Life

(1). Thermal head life
Abrasion-proof: 50 km
Pulse-proof: 100 million pulses

[Condition]
Use form: PD150R   corresponding
Ambient temperature: 25 °C
Average print rate: 25 %

12. Reliability, performance, and others

Vibration-proof (Non-operate)
At 1.0G or less:(splinter amplitude 0.15mm, 10~55~10Hz, and 1 octave/minute)
Do not operate by 20 cycles X, Y, and Z axially for each abnormal.

DOCUMENT CONTROL SECTION

DATE

EDIT	D A T E	D E S I G N	C H E C K	D E S C R I P T I O N
DESIGN			CHECK		APPLY	

TITLE FTP-628DSL308
Product Specification

DRAW No. A1NA21207-3081/6

CUST

FUJITSU COMPONENT LIMITED

SHEET 14／83

SECTION D
Interface Specification

1. Serial Interface Specification

(1) General Specification

    a. System: serial interface
    b. Data receiving speed: 19,200 bps
    c. Synchronous system: start-stop synchronous system, full duplex communication
    d. Handshake: by DTR / DSR signal
    e. Input / output level: RS-232C level

(2) Electrical Characteristics of Input / Output Signals

    a. Signal level (for output)
        (a) Space (logic = 0): + 3 V ~ + 12 V
        (b) Mark   (logic = 1): - 3 V ~ - 12 V

    b. Input condition
        (a) RD,DSR

SP232ECN*[1]
Equivalent

        (b) *INPRM

        (c) *SLCTIN,*ATF

c. Output condition

SP232ECN*[1]
Equivalent

Note 1: For the input / output characteristics, see the data books of the SP232ECN
from Sipex Corp.

(3) Pin array of I/O signal

№	Signal name	I/O	備 考
1	RD	Input	Receive data
2	TD	Output	Transmission data
3	DTR	Output	Data terminal ready
4	GND	――	Signal grand
5	DSR	Input	Data set ready
6	*SLCTIN	Input	Detection function setting
7	*INPRM	Input	Initialization demand
8	*ATF	Input	Form sending

Note
1. It is shown that the signal to which "*" is attached is a negative-true logic signal.
2. The direction of I/O is the one having seen from the printer side.
3. Parts number of the use connector is B8B-ZR-SM3B-TF (J.S.T. Mfg,Ltd.)
equivalent goods.
he other party side connector must use the following parts number equivalent
goods.
ZHR-8 (J.S.T. Mfg,Ltd.)

DOCUMENT CONTROL SECTION

DATE

EDIT	D A T E	D E S I G N	C H E C K	D E S C R I P T I O N		
DESIGN			CHECK		APPLY	

TITLE FTP-628DSL308
Product Specification

DRAW No. A1NA21207-3081/6   CUST

FUJITSU COMPONENT LIMITED SHEET 16／83

(4) Description of Signals

Signal Name	Function

RXD	1) Serial data input signal. Data signal to be transferred from host to printer.
	2) "Space" indicates no data (= 0), "Mark" indicates that data exists (= 1).
	3) The data format is as follows.
	
	| Start
		b0	b1	b2	b3	b4	b5	b6	b7	Stop |
										
										   Note *1) Length of stop bit is 1 bit fixed.
										   Note *2) Data length is 8 bits fixed.
										4) Start bit is "Space" and stop bit is "Mark".

TXD	1) Serial data output signal. Data signal to be transferred from printer to host. 2) Other functions are the same as RXD.
DTR	1) Output signal to indicate that printer is in data receive enable status. 2) "Space" indicates data receive enable status, "Mark" indicates data receive disable status. 3) If data is sent from host when this signal is "Mark", an error occurs and data is ignored. 4) "Mark" is output during initialization, receive buffer full status and when an abnormality is detected
DSR	1) Input signal to indicate that printer is in data transmission enable status. 2) When this signal is "Space", printer judges the status as data transmission enable, and sends data to host. When this signal is "Mark", printer does not send data.

DOCUMENT CONTROL SECTION

Signal Name	Function
*INPRM	1) Signal to initialize printer 2) Normally "High". A hardware reset is executed when "Low" changes to "High". 3) This signal sets the printer status as follows.

1	Print buffer	Clear
2	Line feed pitch	About 3.25 mm
3	ANK character pitch	12 dots / character
4	Print character type	12x24 dots half size character
5	Page length setting	44 lines, about 143 mm
6	Double width specification	Clear
7	Black and white reversal printing	Clear
8	Reverse order printing	Clear
9	Receive code buffer	Clear
10	Character code	Set to Japanese characters
11	International character setting	Japan
12	Printing speed setting	High-speed mode
13	Horizontal tab setting	Every 8 characters
14	ark detection to start point setting	About 2 mm
15	Paper run out detection setting	Valid $*^1$
16	Head up (platen open) detection setting	Valid $*^1$
17	Temperature abnormality detection setting	Valid $*^1$
18	Voltage abnormality detection setting	Valid $*^1$
19	Paper type	Continuous paper
20	Vertical double size print mode specification	Clear
21	X4 size print mode specification	Clear
22	Print quality setting	Type 3
23	Automatic status transmission mode specification	Clear
24	90° character rotation	Clear
25	Paper auto-feed amount setting	20mm
26	Motor off-time setting	One excitation time = 0.5 sec Excitation holding time = 1.0 sec
27	automatic division print setting	Clear

*1:This can be set to invalid by the *SLCTIN signal.

4) If the *ATF signal in "Low" status is initialized by this signal, the test function mode is set.

5) If initialization is executed when the data is in the buffer, this data is deleted.

6) During initialization, DTR outputs "Mark". After initialization end if an error does not occur becomes "Space". After initialization end if an error occurs DTR keeps "Mark".

Signal Name	Function
*ATF	1) Paper feed request signal 2) Normally "High". Paper is fed in "Low" status. 3) When paper is fed by this signal, the internal processing time is not constant. Use the line feed command for a more accurate paper feed. 4) When paper feed is executed the printer enters off-line status. And DTR becomes "Mark". 5) When paper is fed by receiving this signal, the position on the page does not change. If paper is fed by the new page command after paper is fed by this signal, the page start position deviates. 6) If this signal in "Low" status is initialized by the *INPRM signal or the power supply is turned on, the test function mode is set.
*SLCTIN	1) Signal that makes the detection functions of initial setting invalid 2) If power is turned ON or if initialization by the *INPRM signal is executed when this signal is "Low", paper run out detection, head up (platen open) detection, head temperature abnormality detection and head driving voltage abnormality detection become invalid.

TITLE FTP-628DSL308
Product Specification

DRAW No. A1NA21207-3081/6

CUST

EDIT | DATE | DESIGN | CHECK | DESCRIPTION

DESIGN | | | CHECK | | | APPLY

FUJITSU COMPONENT LIMITED

01.10 FDNCA-4902-2

SECTION E
Timing Chart

1. RS-232C Interface

(1). When power is turned on (no error):
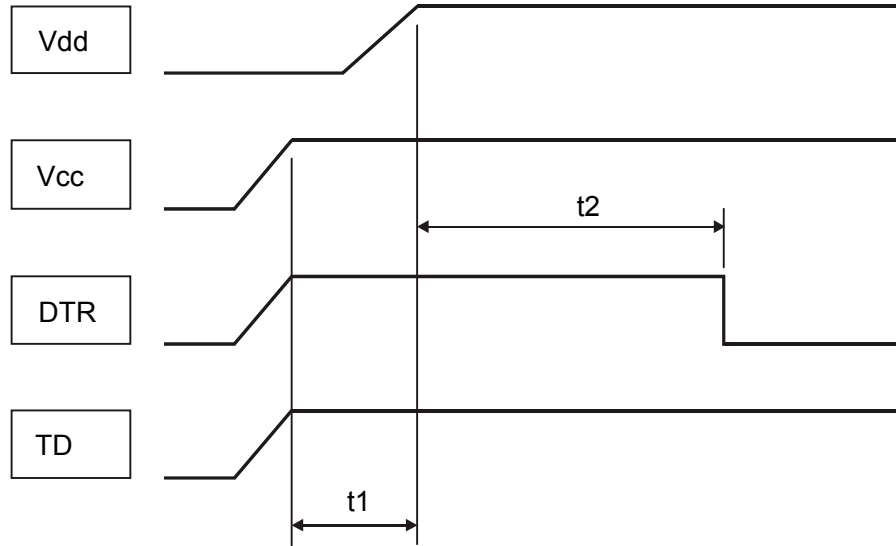
a. Power supply sequence time	$t1 \geq 0$ msec
b. Initialization time	$t2 \leq 1.2$ sec

Note

   To set paper run out, head up (platen open), head voltage abnormality and head temperature abnormality detections to invalid at the initial setting, set the *SLCTIN signal to "Low" level before turning power ON.

(2). *INPRM reset timing (no error)
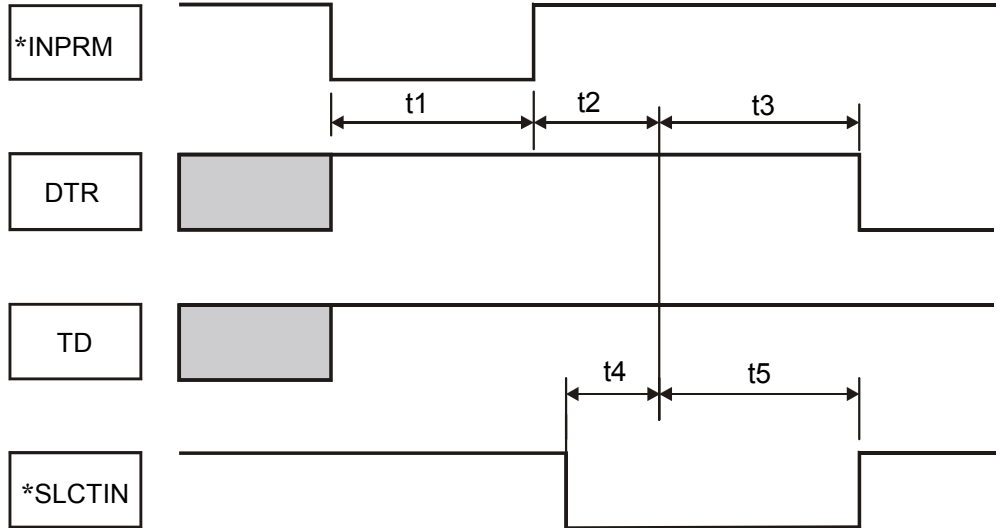
a. *INPRM = "L" time	t1 ≥ 10 μsec
b. Initialization transition time	t2 ≤ 90 msec
c. Initialization time	t3 ≤ 1.2 sec
d. *SLCTIN setup time	t4 ≤ 0 msec
e. *SLCTIN hold time	t5 ≥ t3

Note

    To set paper run out, head up (platen open), head voltage abnormality and head temperature abnormality detection to invalid at the initial setting, set the *SLCTIN signal to "Low" level before initialization.

SECTION F
Functional Specification

1. RS-232C Interface
(1) Test Print Function

Test Print Function	1) The self-test print function is selected when power is turned ON or if initialization by the *INPRM signal is executed while the *ATF signal is "Low". 2) The mode automatically changes as follows.

$$\rightarrow ⓐ \rightarrow ⓑ \rightarrow ⓒ \rightarrow ⓓ \rightarrow ⓔ \rightarrow ⓕ \rightarrow ⓖ \rightarrow ⓗ \rightarrow ⓘ \rightarrow ⓙ^{*1} \rightarrow$$

a. 50% checkered printing (2 lines)
b. 25% checkered printing (3 lines)
c. Printer setting status printing
d. Japanese character set (12x24) (1 set)
e. Overseas character set (12x24) (1 set)
f. International characters (12x24) (8 lines)
g. Japanese character set (8x16) (1 set)
h. Overseas character set (8x16) (1 set)
i .International characters (8x16) (8 lines)
j. Paper cut*1

3) 8x16 font characters are printed 4 times size mode. And the other characters are printed normal size mode/
4) In the internal set state, the printer is in states of RS232C interface set and the other extend function sets.
5) The self-test print mode is for standard paper (equivalent to PD150R)
6) If an error occurs during test printing, printing stops. When error is cleared, about one second later printing restarts.
7) To clear test printing, shut power OFF or execute initialization by the *INPRM signal when *ATF is set to "High".

*1: Cut only when cutter driving circuit is mounted

TITLE	FTP-628DSL308 Product Specification	
DRAW No.	A1NA21207-3081/6	CUST

EDIT	DATE	DESIGN	CHECK	DESCRIPTION	FUJITSU COMPONENT LIMITED	SHEET 22／83
DESIGN			CHECK	APPLY		

DOCUMENT CONTROL SECTION

DATE

(2) Detection Functions

Detection Function	Function
Paper Run Out Detection	1) During printing or feeding paper, a paper run out is detected when the sensor continuously detects a black level for about 6mm. 2) When the printer detects a paper run out during printing, the printer automatically stops. 3) Set the paper. If an error has not occurred, about one second later printing restarts from the next line. 4) When paper run out detection invalid mode is set by the detection function setting command or the *SLCTIN pin, paper run out is not detected. 5) When paper run out status is detected in paper run out detection valid mode, paper cannot be fed by command, but can be fed by the *ATF signal. 6) When paper run out is detected, driving of the motor is turned OFF. 7) When the connector for detection is in open status, it is judged as a paper run out.
Platen release Detection	1) When the head up (platen open) sensor becomes open state, it is judged the head up (platen open). 2) When the printer detects the head up (platen open), if the print is operating the head and motor driving is stopped in one line, the printer automatically stops. 3) When the head up (platen open) state is released, If an error has not occurred, about one second later printing restarts from the next dot line. At this time printing continuity is not guaranteed. 4) When head up (platen open) status is detected in head up (platen open) detection valid mode, paper cannot be fed by command, but can be fed by the *ATF signal. 5) When head up (platen open) is detected, driving the motor is turned OFF. 6) When the connector for detection is in open status, it is judged as a head up (platen open).
Thermal Head Temperature Abnormality Detection	1) Temperature is detected by the Thermally sensitive resistor inside the thermal head to protect the head from heating. 2) When abnormal temperature (high temperature) is detected, the printer stands by in busy status until the temperature drops to the specified temperature. 3) When temperature abnormality is detected in temperature abnormality detection valid mode, paper cannot be fed by command, but can be fed by the *ATF signal. 4) When the temperature of the thermal head returns to printing enable status and an error has not occurred, the printer immediately returns to normal status.

Detection Function	Function
Fuse Blow Out Detection	1) When a fuse blow out for motor protection is detected. 2) Shut the power OFF and exchange the fuse. 3) In fuse blow out status, data cannot be received and paper cannot be fed by the *ATF signal.
Voltage Abnormality Detection	1) Printing head drive voltage is detected, when this voltage is in 3.6V- 9.8V range voltage abnormality is detected. The printer is automatically stopped. 2) When power-supply voltage returns within the above-mentioned range, the printer immediately returns to normal status and restarts.
Mark Detection Function	1) Mark is detected by the paper run out detection sensor. 2) The shape of the mark is as follows. Mark 5mm±0.5mm 3) When paper run out or head down status is detected at initialization, the sensor may be on the mark. Feed paper for a maximum of 8 mm and stop the printer avoiding the mark position. If paper run out status is not cleared, it is judged as paper run out status and the printer stops. 4) If a mark is not detected on the page when mark detection is executed, mark undetected status is reported. 5) Mark undetected status is held until the next data (command) is received or until a high priority error occurs.
Cutter Abnormality Detection	1) In the cutting operation, if one cutting cycle is not end within 4 seconds, cutter abnormality is detected and the printer automatically stops 2) If power-supply shut off and errors are improved, the printer returns to normal status after turning on the power. Attention the blade of the cutter while operations of improvement.
MCU Operation Abnormality Detection Function	1) MPU operation abnormality is detected by the watchdog timer to prevent printer damage caused by a malfunction. 2) If the watchdog timer is activated by MCU runaway, a hardware reset is executed automatically and printing stops. 3) At reactivation the power supply is cut and turns on again, or the reset is executed by *INPRM signal.

(3) Protective Functions

Power Supply Disconnection Sequence Protection	1) This function prevents burning of the head caused by the reverse order disconnection of the logic power supply and power supply for the head. 2) By the thing to put up FET outside, even the logic power supply turning on cuts the head power supply, and the head is protected. 3) MCU detects the head power supply voltage and fuse voltage at initialization, and stops initialization until these values reach the specified values.
Motor Protection	1) Insert a rush resistant fuse (capacity 1.0A) to prevent motor smoking caused by an operation abnormality. 2) Motor current is shut OFF about ten seconds after the motor stops.
Hardware Timer	1) Limit the applied pulse width of the head by a hardware timer to prevent head burning by fixing the logic of the thermal head enable pin.
Motor Power Save Function	1) After the motor operation stops, current flows for one phase to maintain the phase of the pulse motor. This takes about 10 seconds. Current automatically shuts OFF. Motor excitation maintenance time can set by command. 2) If current is OFF when motor operation starts, current flows in the same phase for a maximum of 50 ~ 60 msec to fix the pulse motor phase before motor operation starts.
Power Down Function	1) By receiving DC2 command, the printer switches to power down mode. 2) In the state of the down of power, oscillation of departure pendulum is stopped. 3) Please refer to the paragraph of control command specification for details of the power down function.
Head Automatic Division Function	1) By setting the printing speed automatic setting command, according to the ratio printed blacking driving division of the head is automatically done, and the battery drive is enabled.
Head Width Automatic Detection Function	1) In turning on the power or initialization by *INPRM signal the head width is automatically detected. 2) If a printer detected the head width is 2 inch, MECO signal is set to "High". And if a printer detected the head width is 3 inch, MECO signal is set to "Low".

DOCUMENT CONTROL SECTION

SECTION G
Command Specification

Conventions for command explanations

Each command is explained using the following conventions:

[Name]   Command name

[Function]   Function of command

[Code]   Control code represented in hexadecimal or decimal notation.
              $[X]_{16}$ Hexadecimal notation
              $[X]_{10}$ Decimal notation

[Explanation]

        Explanation of command function

(1) HT

[Name]   Horizontal tab

[Function]
        The HT command moves the printing position to the next horizontal tab position.

[Code] $[09]_{16}$
            $[09]_{10}$

[Explanation]

(1) If the next horizontal tab position is not set, the HT command is ignored.

(2) If the next horizontal tab position is outside the printing area, the printing position is shifted to the proper position by adding 1 to the printing area width.

(3) If an HT command is received when the print head is located at the position to which the printing has been newly shifted by adding 1 to the printing area width, buffer-full printing is executed. Then, the horizontal tab operation is executed from the head of the next line.

(4) The horizontal tab position is set with *ESC D*.

(5) If characters are received when the print head is located at the position to which the printing has been shifted by adding 1 to the printing area width, buffer-full printing is executed.   Then, the print head moves to the leftmost column on the next line, and the received characters are processed.   When a line feed command such as *LF* is received, data is printed and a line is fed.   The print head then moves to the leftmost column on the next line.

(6) In backward printing, the tab indicates a position from the rightmost column.

(2)   LF

[Name]   Line feed

[Function]
The LF command prints the data already contained in the print buffer, then sets the next-data receive position at the leftmost column on the next line.

[Code] $[0A]_{16}$
$[10]_{10}$

[Explanation]

(1) The *LF* command prints the data already contained in the print buffer, then sets the next-data receive position at the leftmost column on the next line.

(2) In the initial state, the line spacing is set to approx. 1/8 inch.

(3) When there is no data in the print buffer, only a line feed operation is executed.

(4) When different-height character typefaces are to be printed on the same line, these character typefaces are arranged so that their bottom ends are aligned at the same level.

(5) If line spacing during printing/line-feeding is shorter than the character height, a length equal to the character height feeds the paper.

TITLE	FTP-628DSL308 Product Specification		
DRAW No. A1NA21207-3081/6			CUST
EDIT	DATE	DESIGN	CHECK
DESIGN		CHECK	

DESCRIPTION

APPLY

FUJITSU COMPONENT LIMITED

SHEET 28／83

01.10 FDNCA-4902-2

(3)   FF

_____

[Name]   Forms feed (new page)

[Function]

The FF command prints the data already contained in the print buffer, then sets the next-data receive position at the leftmost column on the next page.

[Code] $[0C]_{16}$
             $[12]_{10}$

[Explanation]

(1) The *FF* command feeds paper by the specified page length.

(2) In the initial state, the page length is set to approx. 143 mm. (44 lines).

(3) When cut-sheet printing is selected, the *FF* command executes the following operations:

• When the page length is set to 0 (page length cancellation) by using *ESC C*, the paper is ejected.

• Paper ejection is checked using the paper-out sensor. When the detection is invalid, the paper ejection is checked.

• The maximum paper ejection length is approx. 1 m. If the paper-out state is not detected within the span of the 1-meter ejection, the paper ejection terminates.

(4) When label printing is selected, the *FF* command executes the following operations:

• The data contained in the print buffer is printed, and a search is made for the head of the next label.

• The beginning of a line is set as the next printing position.

• A label is selected with *ESC c1*.

(4) DC2

[Name]   Power down

[Function]

When it receives this command, the printer switches to power down mode.

[Code] $[12]_{16}$
          $[18]_{10}$

[Explanation]

(1) When receiving this code, the printer switches to power down mode.

(2) If the printer buffer contains data, the printer prints the data before switching to power down mode. If the print buffer contains no data, the printer immediately switches to power down mode.

(3) When level of *SLCTIN signal become low, power down mode is canceled.

(4) If this code is received during printing, the printer switches to power down mode upon completion of the operation.

(5) This code is invalid in bit image print mode.

(5) ESC RS

[Name]   Black-white reversed printing specification

[Function]

The ESC RS command specifies black-white reversed printing.

[Code] $[1B]_{16}$ $[1E]_{16}$
$[27]_{10}$ $[30]_{10}$

[Explanation]

(1) The *ESC RS* command specifies black-white reversed printing.

(2) The *ESC RS* command can be specified in units expressed in characters. One line can contain both normal printed characters and reverse printed characters.

(3) The *ESC RS* command can be used in all character modes.

(4) The *ESC RS* command can also be used in bit image printing.

(5) The line-spacing area is not appeared in reverse format.

(6) When a printing start command (*LF* or *FF*) is received in reverse mode, some of the print image is not appear in reverse format. This reverse suppression continues from the reverse mode specified character to the rightmost column (in forward printing mode) or to the leftmost column (in backward printing mode).

(7) The print image of the characters skipped with a *HT* command is not appear in reverse format.

(6)   ESC US

[Name]   Black-white reversed printing cancellation

[Function]

The ESC US command cancels black-white revered printing.

[Code] $[1B]_{16}$ $[1F]_{16}$
              $[27]_{10}$ $[31]_{10}$

[Explanation]

(1) The *ESC US* command cancels the reverse printing mode.

(2) The *ESC US* command does not start character printing.

						TITLE	FTP-628DSL308 Product Specification	
						DRAW No.	A1NA21207-3081/6	CUST
EDIT	D A T E	D E S I G N	C H E C K	D E S C R I P T I O N		FUJITSU COMPONENT LIMITED	SHEET	32／83
D E S I G N			CHECK		APPLY			

01.10 FDNCA-4902-2

(7) ESC !+n

[Name]　　　Printing mode specification

[Function]

　　　The ESC !+n command specifies printing mode.

[Code]　　　$[1B]_{16}$ $[21]_{16}$ [n]
　　　　　　$[27]_{10}$ $[33]_{10}$ [n]

[Explanation]

(1) The *ESC !+n* command specifies printing mode.

(2) The following figure shows the relationship between the bits of parameter n and printing mode:

b7	b6	b5	b4	b3	b2	b1	b0
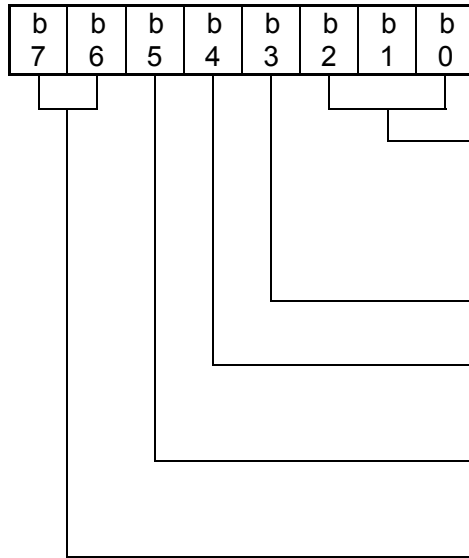
000:　08x16-dot ANK character typeface
001:　12x24-dot ANK character typeface
010:　16x16-dot ANK character typeface
011:　24x24-dot ANK character typeface

Undefined

0:　Double-width cancellation
1:　Double-width specification

0:　Double-height cancellation,
1:　Double-height specification

Undefined

(3) When both the double width and double height are specified, characters with the double height and width character typeface are printed.

(4) When one line contains different-height character typefaces, the character typefaces are arranged so that their bottom ends are aligned at the same level.

(8)   ESC %+n

[Name]   External registration character specification/cancellation

[Function]

The ESC %+n command specifies or cancels registered external characters.

[Code] $[1B]_{16}$ $[25]_{16}$ $[n]$
         $[27]_{10}$ $[37]_{10}$ $[n]$

[Explanation]

(1) The *ESC %+n* command selects an internal character set (system-defined font) or a registered external character set (user-defined font).

(2) The following figure shows the relationship between the bits of parameter n and the character set to be selected:

b7	b6	b5	b4	b3	b2	b1	b0
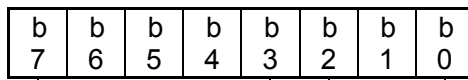
000: Internal character specification
001: Registered external character specification
010: Undefined
011: Undefined
100: Undefined
101: Undefined
110: Undefined
111: Undefined

Undefined

(3) One of the following character sets is selected with the character type selected with the *ESC !* command:

No.	*ESC !* Specification	Registered External Character Specification
1	08 x 16 ANK	08 x 16 registered
2	12 x 24 ANK	12 x 24 registered
3	16 x 16 ANK	16 x 16 registered
4	24 x 24 ANK	24 x 24 registered

(4) If an undefined external character code is received when the registered character-printing mode is set, the corresponding internal character is printed.

DOCUMENT CONTROL SECTION

DATE

EDIT	D A T E	D E S I G N	C H E C K	D E S C R I P T I O N		
DESIGN			CHECK		APPLY	

TITLE   FTP-628DSL308
Product Specification

DRAW No.   A1NA21207-3081/6   CUST

FUJITSU COMPONENT LIMITED   SHEET 34/83

01.10 FDNCA-4902-2

(9) ESC &+y+c1+c2+x+d1 to dN

[Name]   External registration character definition

[Function]

The ESC &+y+c1+c2+x+d1 to dN command defines external characters to be registered.

[Code] $[1B]_{16}$ $[26]_{16}$ [y] [c1] [c2] [x] [d1] to [dN]
              $[27]_{10}$ $[38]_{10}$ [y] [c1] [c2] [x] [d1] to [dN]

[Explanation]

(1) This *ESC* command defines external characters to be registered.

(2) Parameter y must specify 0.

(3) Parameter x specifies a dummy code. A NUL code must be specified.

(4) Parameter d specifies the data to be defined.

(5) Parameter c1 and c2 specify the areas to be defined. The values of parameter c1 and c2 values must satisfy the following conditions:

$[20]_{16} \le c1 \le c2 \le [FF]_{16}$

(6) To define one character, parameter c1 and c2 must be specified so that the c1 value is equal to the c2 value.   To define two or more characters, the data block of d1 to dN must be specified the same number of times as the number of characters to be defined.

(7) If "c2 < c1" is detected, a parameter error is assumed and the external characters are not registered.

(8) The length of the data required to define one external character to be registered depends on the character type specified with the *ESC !* command (see the following table):

Character type specified with *ESC !*	Data length
08 x 16 ANK	16 bytes
12 x 24 ANK	48 bytes

(9) The maximum number of registration characters is 8. If character registrations is executed over 8 characters, it's the parameter error.

(9) The character-typeface definition data must use the following formats:

MSB   LSB   MSB   LSB MSB   LSB MSB   LSB

d1, d2, d3, d4, d5, d6, d7, d8, d9, d10, d11, d12, d13, d14, d15, d16

[8×16]

d1, d4, d7, d10, d13, d16, d19, d22, d25, d28, d31, d34, d37, d40, d43, d46, d49, d52, d55, d58, d61, d64, d67, d70

[24×24]

MSB　　　LSB　MSB　　　LSB　　　　　MSB　　　LSB　MSB　　　LSB

d1
d3
d5
d7
d9
d11
d13
d15
d17
d19
d21
d23
d25
d27
d29
d31

[16×16]

d1
d3
d5
d7
d9
d11
d13
d15
d17
d19
d21
d23
d25
d27
d29
d31
d33
d35
d37
d39
d41
d43
d45
d47

[12×24]

TITLE　FTP-628DSL308
Product Specification
DRAW No.　A1NA21207-3081/6
CUST
EDIT　DATE　DESIGN　CHECK　DESCRIPTION
DESIGN　　CHECK　　APPLY
FUJITSU COMPONENT LIMITED　SHEET　37／83
01.10 FDNCA-4902-2

DOCUMENT　CONTROL　SECTION

DATE

(10)   ESC *+m+n1+n2+d1 to dN

[Name]   Bit image printing

[Function]

The ESC *+m+n1+n2+d1 to dN command specifies and prints a bit image.

[Code] $[1B]_{16}$ $[2A]_{16}$ [m] [n1] [n2] [d1] to [dN]
$[27]_{10}$ $[42]_{10}$ [m] [n1] [n2] [d1] to [dN]

[Explanation]

(1) This *ESC* command specifies and prints a bit image.

(2) The relationship between parameter m and image print modes is as follows:

m	Mode	Number of print dots		Number of dots
		Vertical direction (number of dots)	Horizontal Direction	
97	Single density	1	16	(n2*256+n1)*print-width/2
98	Double density	1	8	(n2*256+n1)*print-width

(3) Parameter n1 and n2 specify the number of lines to be printed. Without regard to the specified mode, conditions 0 ≤ n1 ≤ 255 and 0 ≤ n2 ≤ 3 must be satisfied.   If condition n1= n2 = 0 is satisfied, a parameter error is assumed and this *ESC* command becomes invalid. Data overflowing from the specified printing area is ignored.

(4) The following figure shows the relationship between bit image data and print data:

- When m = 97-
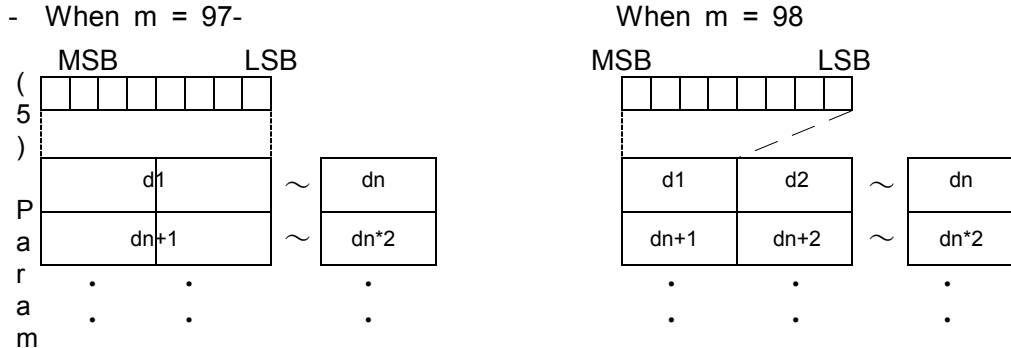
(5) Parameter n1 and n2 specify the number of dots in the vertical direction of the bit image to be printed. That is, the number of dots is "256 x n2 + n1."   Therefore, the number of dots to be transferred is "(256 x n2 + n1) x print-head-width."

(6) The print width depends on the printer model as follows:

Printer	Print width (bytes)
FTP-628MCL	48
FTP-638MCL	72

(11) ESC ?+n

[Name]   External registration character deletion

[Function]

The ESC ?+n command deletes an external registration character specified with parameter n

[Code] $[1B]_{16}$ $[3F]_{16}$ [n]
           $[27]_{10}$ $[63]_{10}$ [n]

[Explanation]

The character code registered is deleted. The value of parameter n must satisfy the following condition:
$$[20]_{16} \leq n \leq [FF]_{16}$$

(2) After deletion, the corresponding internal character is printed.

(3) The code definition pattern of the character type specified with the *ESC !* command is deleted.

(4) If an unregistered character code is specified with the *ESC ?+n* command, the *ESC ?+n* command is ignored.

TITLE	FTP-628DSL308 Product Specification

DRAW No.	A1NA21207-3081/6	CUST

EDIT	D A T E	D E S I G N	C H E C K	D E S C R I P T I O N	FUJITSU COMPONENT LIMITED	SHEET	39/83
DESIGN			CHECK		APPLY		

01.10 FDNCA-4902-2

(12) ESC 2

[Name]   1/6-inch line pitch setting

[Function]

　　The ESC 2 command sets the single line pitch to 1/6 inch.

[Code] $[1B]_{16}$ $[32]_{16}$
            $[27]_{10}$ $[50]_{10}$

[Explanation]

(1) The *ESC 2* command sets single line pitch to 1/6 inch.

(2) When line pitch is set using the *ESC 2* command, the line spacing set with the *ESC A* command is invalidated.

(13)　ESC 3+n

[Name]　　　Line pitch setting

[Function]

　　　The ESC 3+n command sets single line pitch.

[Code]　　　$[1B]_{16}$ $[33]_{16}$ [n]
　　　　　　$[27]_{10}$ $[51]_{10}$ [n]

[Explanation]

(1) The *ESC 3+n* command sets single line pitch to n dot lines.

(2) When line pitch is set using the *ESC 3+n* command, the line pitch previously set with the *ESC A* command is invalidated.

(3) In line feed with printing, paper is fed by at least the height of the character currently specified. In line feed without printing, paper is fed only by the specified line spacing. For example, when line spacing of 10 dot lines is specified for a character of which height is 24 dot lines, paper is fed by 24 dot lines (in line feed with printing) or 10 dot lines (in line feed without printing).

TITLE	FTP-628DSL308 Product Specification

| DRAW No. | A1NA21207-3081/6 | CUST |

EDIT	D A T E	D E S I G N	C H E C K	D E S C R I P T I O N	FUJITSU COMPONENT LIMITED	SHEET	41／83
DESIGN			CHECK		APPLY		

01.10 FDNCA-4902-2

(14) ESC @

[Name]   Printer resetting

[Function]

The ESC @ command initializes the printer.

[Code] $[1B]_{16}$ $[40]_{16}$
              $[27]_{10}$ $[64]_{10}$

[Explanation]

(1) The *ESC @* command initializes the printer.

(2) The *ESC @* command prints the data contained in the print buffer, and initializes various setup items.

(3) When the *ESC @* command is executed, various setup items are set as follows:

    (a)   Print buffer = Cleared
    (b)   Line pitch = 26 dot lines
    (c)   Type of print characters = 12x24-dot ANK
    (d)   Double-width character printing specification = Cancellation
    (e)   Double-height character printing specification = Cancellation
    (f)   Character code set = Domestic character set
    (g)   International character set = Japan
    (h)   Mark head detection distance setting = Approx. 2 mm (forward direction)
    (i)   Paper-out detection function = Valid[*1]
    (j)   Head up (platen open) detection function = Valid[*1]
    (k)   Thermal error detection function = Valid[*1]
    (l)   Voltage error detection function = Valid[*1]
    (m)   Print quality = Standard paper
    (n)   X4 size print mode specification = Clear
    (o)   Printing speed setting = High-speed mode
    (p)   Receive code buffer = Retained
    (q)   Horizontal tab setting = Every 8 characters
    (r)   Reverse video specification = Cancellation
    (s)   Backward printing specification = Cancellation
    (t)   Feed function = Valid
    (u)   Paper type = Continuous forms
    (v)   Registered characters = Retained
    (w)   Page length setting = 44 lines (approx. 143 mm)
    (x)   90° character rotation = Clear
    (y)   Paper auto-feed amount setting = 20mm
    (z)   Motor off-time setting = One excitation time :   0.5 sec
                           Excitation holding time : 1 sec
    (aa)   Automatic operation division print setting = Cancellation

    *1:   This can be set to invalid by the *SLCTIN signal.

(15) ESC A+n

[Name] Line spacing setting

[Function]
The ESC A+n command sets the line spacing to "n" dot lines.

[Code] $[1B]_{16}$ $[41]_{16}$ $[n]$
$[27]_{10}$ $[65]_{10}$ $[n]$

[Explanation]

(1) The *ESC A+n* command sets the line spacing to "n" dot lines.

(2) Condition $0 \leq n \leq 255$ must be satisfied. However, when "n + character-height" is 256 dot lines or more, the line spacing is n + character-height - 256.

(3) If the *ESC A+n* command is set two or more times for the same line, the last set line spacing is valid.

(4) When line pitch is set with the *ESC 3* or *ESC 2* command, the line spacing set with the *ESC A+n* is invalidated.

(16) ESC C+n

[Name]   Page length setting

[Function]

　　The ESC C+n command sets the page length to "n" lines.

[Code] $[1B]_{16}$ $[43]_{16}$ [n]
              $[27]_{10}$ $[67]_{10}$ [n]

[Explanation]

(1) The *ESC C+n* command sets the page length to "n" lines.

(2) Condition $0 \le n \le 63$ must be satisfied.

(3) When parameter n specifies 0, the page length is reset.　If a *FF* command is received when the cut sheet mode is specified and the page length is reset, the paper is ejected.

(4) If the value of parameter n is incorrect, the page length setting is invalidated and the previous page length is validated.

(5) Even if the line spacing is changed after the page length is set, the page length is not changed.

(6) When an *ESC C+n* command is executed, the printing start position moves to the top of the next page.

(7) The line pitch is set as follows:
　(a) When the line spacing is set with *ESC A* command, the line pitch is set with "character-height + line spacing".
　(b) When the line pitch is set with *ESC 2* or *ESC 3* command, the line pitch is set with the line pitch to be set.

---

(17) ESC D+d1 to dN+NUL

[Name]   Horizontal tab position setting

[Function]

   The ESC D+d1 to dN+NUL command sets the horizontal tab position.

[Code] $[1B]_{16}$ $[44]_{16}$ [d1] to [dN] $[00]_{16}$
              $[27]_{16}$ $[68]_{16}$ [d1] to [dN] $[00]_{10}$

[Explanation]

(1) Condition $1 ≤ d ≤ 255$ must be satisfied.

(2) Condition $1 ≤ N ≤ 32$ must be satisfied.

(3) The horizontal tab position is set to the position that is "d x ank-character-width" distant from the head of the line in the printing area.
When character-width are satisfied to double-width, the horizontal tab position is applied double- character width.

(4) Even if the character width is changed after the horizontal tab position is set, the set horizontal tab position is not changed.

(5) When the horizontal tab is set with the *ESC D+d1 to dN+NUL* command, the horizontal tab position already set is canceled.

(6) When horizontal position d=8 is set, executing a *HT* command moves the next print position to column 9.

(7) Up to 32 horizontal tab positions can be set. If more than 32 horizontal tab positions are set, the data at the excessive tab positions is handled as ordinary data.

(8) The "d" values must be entered in ascending order, and must end with NUL. If the "dN" value is equal to or smaller than the "dN-1 value, processing this *ESC* command is terminated when the dN value is received. The subsequent data is handled as ordinary data.

(9) All horizontal tab positions can be canceled with the *ESC D NUL* command.

(10) When the power to the printer is turned on or the printer is reset, the horizontal tab positions are set for intervals of 8 characters selected in the initial state.

DOCUMENT CONTROL SECTION

DATE

TITLE   FTP-628DSL308
Product Specification

DRAW No.   A1NA21207-3081/6   CUST

EDIT   D A T E   D E S I G N   C H E C K   D E S C R I P T I O N   FUJITSU COMPONENT LIMITED   45／83
DESIGN   CHECK   APPLY

01.10 FDNCA-4902-2

(18)　ESC J+n

[Name]　　　Forward paper feed

[Function]

　　The ESC J+n command feeds paper in the forward direction.

[Code]　　　$[1B]_{16}$ $[4A]_{16}$ [n]
　　　　　　$[27]_{10}$ $[74]_{10}$ [n]

[Explanation]

(1) The *ESC J+n* command feeds paper in the forward direction by "n" dot lines.

(2) Condition $0 \leq n \leq 255$ must be satisfied.

(3) When there is data in the print buffer, the data in the print buffer is printed after which paper is fed in the forward direction.

(4) When parameter n specifies 0, the data contained in the buffer is printed but paper is not fed.

TITLE	FTP-628DSL308 Product Specification	
DRAW No.	A1NA21207-3081/6	CUST

EDIT	DATE	DESIGN	CHECK	DESCRIPTION	FUJITSU COMPONENT LIMITED	SHEET	46／83
DESIGN			CHECK		APPLY		

01.10 FDNCA-4902-2

(19) ESC K+n

[Name]   Backward paper feed

[Function]

The ESC K+n command feeds paper in the backward direction.

[Code] $[1B]_{16}$ $[4B]_{16}$ [n]
          $[27]_{10}$ $[75]_{10}$ [n]

[Explanation]

(1) The *ESC K+n* command feeds paper in the backward direction by "n" dot lines.

Condition $0 \leq n \leq 255$ must be satisfied.

(3) When there is data in the print buffer, the data in the print buffer is printed after which paper is fed in the backward direction.

(4) When parameter n specifies 0, the data contained in the buffer is printed but paper is not fed.

(5) If paper back-feed is executed, paper jam may be occurred. If use this command, it is necessary to confirm application with printer.

(6) if paper back-feed executed, the upper part of character is smashed by gear's back-rush. When the print is execute after back-feeding, feed the paper forward with amount more than back-rush, prevent smash of character.

(7) When this command is executed, the paper must not come off from the rubber roller.

(20) ESC R+n

[Name]   International character specification

[Function]

   The ESC R+n command specifies printing using a specified set of international characters.

[Code] $[1B]_{16}$ $[52]_{16}$ [n]
          $[27]_{10}$ $[82]_{10}$ [n]

[Explanation]

   (1) The *ESC R+n* command enables a set of international characters (specified with parameter n) to be printed.

   (2) The relationship between international characters and parameter n is as shown below.

   (3) In the initial state, the domestic character set and character set "Japan" are set.

   (4) If the value of parameter n is invalid, this *ESC* command is invalidated. The previous setting is validated.

n	Code Country	23	24	40	5B	5C	5 D	5D	5E	60	7B	7C	7E
0	USA	#	$	@	[	＼	]	^	`	{	¦	}	~
1	FRENCH	#	$	à	°	ç	§	^	`	é	ù	è	¨
2	GERMAN	#	$	§	Ä	Ö	Ü	^	`	ä	ö	ü	ß
3	UK	£	$	@	[	＼	]	^	`	{	¦	}	~
4	DENMARK	#	$	@	Æ	Ø	Å	^	`	æ	ø	å	~
5	SWEDEN	#	¤	É	Ä	Ö	Å	Ü	é	ä	ö	å	ü
6	ITALY	#	$	@	°	＼	é	^	ù	à	ò	è	ì
7	SPAIN	Pt	$	@	¡	Ñ	¿	^	`	¨	ñ	}	~
8	JAPAN	#	$	@	[	¥	]	^	`	{	¦	}	‾
9	NORWAY	#	¤	É	Æ	Ø	Å	Ü	é	æ	ø	å	ü
10	DENMARK2	#	$	É	Æ	Ø	Å	Ü	é	æ	ø	å	ü
11	SPAIN2	#	$	á	¡	ñ	¿	é	`	í	ñ	ó	ú
12	RATIN AMERICA	#	$	á	¡	ñ	¿	é	Ü	í	ñ	ó	ú
13	JAPAN2	#	$	@	[	¥	]	^	`	{	¦	}	~

   (Each code value is represented in hexadecimal notation.)

   n = $[41]_{16}$ Domestic character set ANK
   n = $[42]_{16}$ Foreign character set ANK

(21)   ESC c+1+n

[Name]   Internal processing setting

[Function]

The ESC c+1+n command sets internal processing.

[Code] $[1B]_{16}$ $[63]_{16}$ $[31]_{16}$ $[n]$
          $[27]_{10}$ $[99]_{10}$ $[49]_{10}$ $[n]$

[Explanation]

(1) The bits of parameter n specify internal processing as follows:

b7	b6	b5	B4	b3	b2	b1	b0
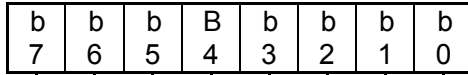
0:   Continuous forms
1:   Labels
2:   Cut sheets
3:   Continuous forms with auto paper load
     Function

Undefined

In moved the head down
0:   auto paper load effective
1:   auto paper load Invalidity

0:   Forward detection of marks (fixing)

Undefined

0:   Mark detection selection (fixing)

(2) A mark is a black bar with a height of 5 mm.

Mark

5 mm
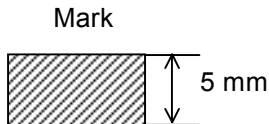
(3) When the printer is initialized, parameter n is cleared to 0.

(4) If this *ESC* command is issued when there is data in the print buffer, the data in the buffer is printed after which the internal processing is set.

(5) When the specified paper type is a label, marks are automatically detected when forms are inserted.   When the specified paper type is cut sheets, cut sheets are automatically fed when they are set.

(6) If the paper type is changed from "cut sheets" to "other than cut sheets," the existing forms are automatically ejected.

(7) When the specified paper type is continuous forms with auto paper load, continuous forms with auto paper load are automatically fed when they are set

(22) ESC d+n

[Name]   n-line feed

[Function]

The ESC d+n command prints the data and feeds a line, then feeds the paper by "n" lines.

[Code] $[1B]_{16}$ $[64]_{16}$ [n]
              $[27]_{10}$ $[100]_{10}$ [n]

[Explanation]

(1) The *ESC d+n* command feeds paper by a line count specified with parameter n.

(2) Condition $0 \le n \le 255$ must be satisfied.

(3) After "n" lines are fed, the data receive position is set at the left edge on the line.

(4) When the value of parameter n is 0, the data contained in the buffer is printed but the paper is not fed.

(5) When there is data in the print buffer, the data contained in the buffer is printed after which paper is fed by "n" lines.

DOCUMENT CONTROL SECTION

DATE

					TITLE	FTP-628DSL308 Product Specification		
					DRAW No.	A1NA21207-3081/6		CUST
EDIT	DATE	DESIGN	CHECK	DESCRIPTION	FUJITSU COMPONENT LIMITED	SHEET	50/83	
DESIGN			CHECK		APPLY			

(23)　ESC e+n

[Name]　　　Backward n-line feed

[Function]

　　　The ESC e+n command prints the data and feeds a line, then feeds the paper in the backward direction by "n" lines.

[Code]　　　$[1B]_{16}$ $[65]_{16}$ [n]
　　　　　　$[27]_{10}$ $[101]_{10}$ [n]

[Explanation]

(1) The *ESC e+n* command feeds paper in the backward direction by the line count specified with parameter n.

(2) Condition $0 \leq n \leq 255$ must be satisfied.

(3) After "n" lines are fed, the data receive position is set at the left edge on the line.

(4) When the value of parameter n is 0, the data contained in the buffer is printed but the paper is not fed.

(5) If paper back-feed is executed, paper jam may be occurred. If use this command, it is necessary to confirm application with printer.

(6) if paper back-feed executed, the upper part of character is smashed by gear's back-rush. When the print is execute after back-feeding, feed the paper forward with amount more than back-rush, prevent smash of character.

(7) When this command is executed, the paper must not come off from the rubber roller.

(24) ESC s+n

[Name]   Printing speed setting

[Function]

The ESC s+n command sets printing speed.

[Code] $[1B]_{16}$ $[73]_{16}$ [n]
              $[27]_{10}$ $[115]_{10}$ [n]

[Explanation]

(1) The *ESC s+n* command sets printing speed (function mode).

(2) When there is data in the print buffer, the data contained in the print buffer is printed after which the printing speed is set.

(3) When the same printing speed as the current printing speed is specified with this *ESC* command, no change occurs.

(4) The relationship between parameter n and the specified printing speed is as follows:

n	Function mode
$[60]_{16}$	High-speed printing
$[61]_{16}$	Medium-speed printing
$[62]_{16}$	Medium-speed printing
$[63]_{16}$	Low-speed printing
$[64]_{16}$	Fixed division into six printing (628 series)
	Fixed division into nine printing (638 series)

(5) If a parameter value not listed in the above table is set, the newly set printing speed is invalidated. The previous printing speed is validated.

(25)　ESC t+n

[Name]　　　Character code table selection

[Function]

　　　The ESC t+n command selects page n from the character code table.

[Code]　　　$[1B]_{16}$ $[74]_{16}$ [n]
　　　　　　$[27]_{10}$ $[116]_{10}$ [n]

[Explanation]

(1) The *ESC t+n* command selects page n from the character code table.

(2) The bits of parameter n specify the following information:

b7	b6	b5	b4	b3	b2	b1	b0
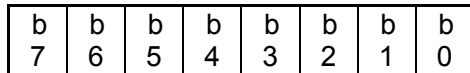
0:　National character setting
1:　Overseas character setting

Undefined

(3) The *ESC t+n* command has the same effect as that acquired by specifying $[41]_{16}$ or $[42]_{16}$ in the parameter of the *ESC R* command. Therefore, when both the *ESC t+n* command and the *ESC R* command are specified, the last of these *ESC* commands specified is validated.

(4) The initial value of parameter n is 0.

(5) See Section H, "List of Character Codes."

(26)　ESC {+n

[Name]　　　Upside-down printing setting/cancellation

[Function]

　　　The ESC{+n command sets or cancels upside-down printing.

[Code]　　　$[1B]_{16}$ $[7B]_{16}$ [n]
　　　　　　$[27]_{10}$ $[123]_{10}$ [n]

[Explanation]

(1) Parameter n sets or cancels upside-down printing.

(2) The bits of parameter n specify the following information:

b7	b6	b5	b4	b3	b2	b1	b0
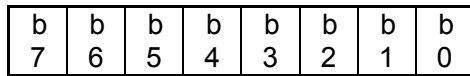
0:　Upside-down printing cancellation
1:　Upside-down printing setting

Undefined

(3) The *ESC {+n* command can be used in all character modes.

(4) The *ESC {+n* command can also be used in bit image printing.

(5) The character base line is at the bottom of the character typeface. Print character typefaces are arranged so that their bottom ends are aligned at the same level.

TITLE FTP-628DSL308
Product Specification

DRAW No. A1NA21207-3081/6　　CUST

FUJITSU COMPONENT LIMITED

54／83

EDIT　DATE　DESIGN　CHECK　　DESCRIPTION
DESIGN　　　　　CHECK　　　　APPLY

01.10 FDNCA-4902-2

DOCUMENT CONTROL SECTION

DATE

(27) FS 9+n

[Name]　　　Detection function enable/disable setting

[Function]

　　　The FS 9+n command enables or disables various detection functions.

[Code]　　　$[1C]_{16}$ $[39]_{16}$ [n]
　　　　　　$[28]_{10}$ $[57]_{10}$ [n]

[Explanation]

(1) Condition $0 \leq n \leq 255$ must be satisfied.

(2) The bits of parameter n specify the following information:

b7	B6	b5	b4	b3	b2	b1	b0

- 0: Feed key invalid
  1: Feed key valid

- 0: Thermal error detection invalid
  1: Thermal error detection valid

- 0: Voltage error detection invalid
  1: Voltage error detection valid

- 0: Head up (platen open) detection invalid
  1: Head up (platen open) detection valid

- Undefined

- Undefined

- 0: Paper-out detection invalid
  1: Paper-out detection valid

- Undefined

(3) In the initial state, all of the detection functions are valid.

(4) The voltage error detection valid or invalid setting enables or disables the fuse blow out detection function.

DOCUMENT CONTROL SECTION

DATE

TITLE　FTP-628DSL308
Product Specification

DRAW No.　A1NA21207-3081/6　　CUST

EDIT　DATE　DESIGN　CHECK　　DESCRIPTION　　FUJITSU COMPONENT LIMITED　SHEET　55／83

DESIGN　　　　　CHECK　　　　APPLY

01.10 FDNCA-4902-2

(28) GS <

[Name]   Mark detection execution

[Function]

   The GS < command feeds paper up to the next mark position.

[Code]   [1D]$_{16}$ [3C]$_{16}$
              [29]$_{10}$ [60]$_{10}$

[Explanation]

   (1) The *GS* < command feeds paper up to the next mark position.

   (2) After a mark is detected, paper is fed (the head is detected) in accordance with the head detection base; the paper feed then stops.

   (3) In the initial state, the mark mode is set.

   (4) If no mark is found within the specified page length from the mark-detection-execution starting point, an error is assumed and the page feed stops.

   (5) For an explanation of the relationship between mark position and print line position, see the printer mechanism specifications.

(29) GS A+m+n

[Name]   After-mark-detection head distance setting

[Function]

The GS A+m+n command sets the head detection distance to be used after mark detection.

[Code] $[1D]_{16}$ $[41]_{16}$ [m] [n]
              $[29]_{10}$ $[65]_{10}$ [m] [n]

[Explanation]

(1) The *GS A+m+n* command sets the head detection distance to be used after mark detection.

(2) The value of parameter m is always 0.

(3) Parameter n specifies the head detection distance in dot lines.

(4) Condition $0 \leq n \leq 63$ must be satisfied. If an "n" value outside this range is specified, a parameter error occurs. The previous head detection distance is not changed.

(5) When the power is turned on or the printer is reset, parameter m is cleared to 0 and parameter n is set to 16.

(30)　GS E+n

[Name]　　　Print quality setting

[Function]　　The GS E+n command sets print quality in paper units.

[Code]　　　[1D]$_{16}$ [45]$_{16}$ [n]
　　　　　　　[29]$_{10}$ [69]$_{10}$ [n]

[Explanation]

(1) The GS E+n command sets print quality for each paper and automatic division print mode is set or canceled.

(2) In most high-order bit n_7 of n, automatic division print mode is set or canceled. When parameter n_7 specifies 1, automatic division print mode is canceled. In this case the print speed conforms to setting by the print speed set command. When parameter n_7 specifies 0, automatic division print mode is set.

If automatic division print mode is set, regardless of the print speed command (ESC s), driving division of the head is automatically executed according to the print rate of the printed data. Therefore, the printing speed changes by printing data.

(4) The automatic division print mode is controlled by the energizing dot number 64 dots at the maximum.

(5) The four low-order bits of parameter n are used to select paper quality. The relationship between parameter n and paper quality is as follows:

n	Mode	Paper quality	Applicable paper type	Manufacturer
0	TYPE[1]			
1	TYPE[2]			
2	TYPE[3]		TF50KS-E4	Nippon Paper Mfg. Co., Ltd.
3	TYPE[4]	Standard paper	PD15R, PD160R, PD170R	Oji Paper Mfg. Co., Ltd.
4	TYPE[5]		TF60KS-F1, TF60KJ-R	Nippon Paper Mfg. Co., Ltd.
5	TYPE[6]		TF60KS-E	Nippon Paper Mfg. Co. Ltd.
			P220VBB-1	Mitsubishi Paper Mills, Ltd.
6	TYPE[7]		HA220AA	Mitsubishi Paper Mills, Ltd.
7	TYPE[8]			
8	TYPE[9]	Long preservation paper	AFP-235	Mitsubishi Paper Mills, Ltd.
9	TYPE[10]			
10	TYPE[11]			
11	TYPE[12]			

(5) The initial value of parameter n is 3.

(6) Setting 12-15 of parameters n is assumed to be a prohibition.

(31) GS e+n+m

[Name] Bar code width setting

[Function]

The GS e+n+m command sets the width of a bar code.

[Code] $[1D]_{16}$ $[65]_{16}$ [n] [m]
$[29]_{10}$ $[101]_{10}$ [n] [m]

[Explanation]

(1) Parameter n specifies the width of a narrow bar in dots.

(2) Parameter m specifies the width of a wide bar in dots.

(3) When the code does not consist of wide bars and/or narrow bars, the value of parameter n is set as the minimum width.

(4) The initial value of parameter n is 2. The initial value of parameter m is 6.

(5) The following conditions must be satisfied:

$1 \leq n \leq 255$
$1 \leq m \leq 255$

(32) GS h+n

[Name]   Bar code height setting

[Function]

  The GS h+n command sets the height of a bar code.

[Code] $[1D]_{16}$ $[68]_{16}$ [n]
             $[29]_{10}$ $[104]_{10}$ [n]

[Explanation]

  (1) Condition $1 \leq n \leq 255$ must be satisfied.

  (2) Parameter n specifies the height of a bar code in dots.

  (3) The initial value of parameter n is 60.

DOCUMENT CONTROL SECTION

DATE

(33) GS k+m+n+d₁ to dₙ

[Name]   Bar code printing

[Function]

    The GS k+m+n+d_1 to d_n command selects a bar code type and prints a bar code.

[Code] $[1D]_{16}$ $[6B]_{16}$ [m] [n] $[d_1]$ to $[d_n]$
                 $[29]_{10}$ $[107]_{10}$ [m] [n] $[d_1]$ to $[d_n]$

[Explanation]

(1) Parameter m specifies the type of bar codes to be printed (see the following table):

m	Type of bar code	Number of records
65	UPC-A	Fixed ($11 \le n \le 12$)
66	Undefined	———
67	JAN(EAN)13	Fixed ($12 \le n \le 13$)
68	JAN(EAN)8	Fixed ($7 \le n \le 8$)
69	CODE39	Variable
70	ITF	Variable
71	CODABAR	Variable

(2) The command configuration, code, definition area, and part of the conditions depend on parameter m.

(3) Parameter d specifies the character to be printed. If parameter d specifies a character code that cannot be printed when the data length is fixed, the corresponding bar code is not printed. If parameter d specifies a character code that cannot be printed when the data length is variable, the bar code prior to this command is printed but the subsequent data is handled as ordinary data.

(4) After a bar code is extended, the printing start position is set to the next dot of the bar code end data.

(5) If the print data exceeds the printing area of which width is one line, the overflowing part of the data is ignored.

(6) If the bar code is higher than the line spacing set with the *ESC 2* or *ESC 3* command, paper is fed by the bar code height without regard to the specified line spacing.

(7) When NUL is specified at the check digit position or when an odd number of data records is specified in ITF with m=70, the check digit is calculated automatically. The calculation results are added to the bar code. When data other than NUL is specified at the check digit position, the received data is expanded in the bar code without modifications.

(8) When one line contains both a bar code and characters to be printed, the bottom of these characters and the bottom of the bar code are aligned at the same level.

(9) Two or more bar codes cannot be contained on the same line.   If this GS command is received when there is a bar code in the print buffer, the data contained in the print buffer is automatically printed, after which the command is accepted.

(10) A code area which is available to be set by each bar codes is shown as below :

A kind of bar codes	Code area
UPC-A, ITF, EAN-13/8	'0' ～ '9'
CODE 39	'0' ～ '9', 'A'～ 'Z',' ','$','/','+','%'
CODABAR	'0' ～ '9','-','$',';','/','.','+','A'～'D'

(34)　GS w+n

[Name]　　　Bar code width magnification setting

[Function]

　　　The GS w+n command sets the width magnification of a bar code.

[Code]　　　$[1D]_{16}$ $[77]_{16}$ [n]
　　　　　　$[29]_{10}$ $[109]_{10}$ [n]

[Explanation]

(1) Parameter n specifies the horizontal magnification of a bar code.

(2) Condition $1 \leq n \leq 255$ must be satisfied.

(3) The initial value of parameter n is 1.

(4) Both the widths of a narrow bar and a wide bar is multiplied by n times.

					TITLE	FTP-628DSL308 Product Specification
					DRAW No.	A1NA21207-3081/6	CUST
EDIT	D A T E	D E S I G N	C H E C K	D E S C R I P T I O N	FUJITSU COMPONENT LIMITED	63／83
D E S I G N			CHECK		APPLY	

01.10 FDNCA-4902-2

(35)   *FS E + n*

[Name]   Correction of impressed energy.

[Function]

    Impressed energy is corrected.

[Code] $[1C]_{16}$ $[45]_{16}$ [n]
                $[28]_{10}$ $[69]_{10}$ [n]

[Explanation]

    (1) The correction value is set by n. The range of n is shown below.

             $0 \leq n \leq 255$

    (2) Impressed energy grows by the value of n large.

    (3) Please note that the life of the head shortens when the impressed energy is too large. There is danger to which the head is disconnected for $n \geq 128$.

    (4) An initial value is n=52.

(36)   ESC V + n

[Name]   Right rotation 90°.

[Function]

    The character is rotated right by 90°.

[Code] $[1B]_{16}$ $[56]_{16}$ [n]
             $[27]_{10}$ $[86]_{10}$ [n]

[Explanation]

(1) 90 ° rotation is specified by n and release is set.

n	set content
0	Rotation release of 90°
1	Rotation specification of 90°

(2) It is effective to all character kind.

(3) It is invalid concerning the barcode, the image, and the registration image.

(4) A standard print and the rotation print of 90° can exist together in the same line because an automatic changing is not done by this command.

(5) Character font becomes equal to 270° rotation (90° in left rotation) when 90° rotation is specified at upside-down printing.

(6) The direction of the expansion must not rotate with the character when you rotate the length double size and the double width character right by 90°.

TITLE   FTP-628DSL308
Product Specification

DRAW No.   CUST
A1NA21207-3081/6

EDIT	DATE	DESIGN	CHECK	DESCRIPTION
DESIGN			CHECK		APPLY

FUJITSU COMPONENT LIMITED   SHEET   65／83

01.10 FDNCA-4902-2

(37) GS a + n

[Name]   Setting and cancellation of auto status transmission.

[Function]

    When the serial communications mode is selected, the target status for the automatic status transmission is selected.

[Code] $[1D]_{16}$ $[61]_{16}$ [n]
              $[29]_{10}$ $[97]_{10}$ [n]

[Explanation]

(1) The relation of the target status for n and the transmission is as follows.

Bit	Status	setting
0	Undefined————————	
1	State of online/off-line	0:Invalidity 1:Effective
2	State of error	0:Invalidity 1:Effective
3	Undefined————————	
4	State of automatic paper feed	0:Invalidity 1:Effective
5-7	Undefined————————	

(2) An initial value becomes n=0.

(3) Status is transmitted when this command is received or status is changed. At this time, because each status shows a present state, the status transmission of invalidity is not done.

(4) When all status is invalid, the automatic status transmission is not done.

(5) This command is effective only serial interface board.

(6) There is a possibility to cause the delay between reception of command and sending of status.

(7) The following status in four bytes is transmitted without confirming host's state.

01.10 FDNCA-4902-2

The first byte (printer information).

Bit	status	Caption
0	Unused	0: Fixation
1	Unused	0: Fixation
2	Unused	0: Fixation
3	online/off-line	0: online 1: Off-line
4	auto-loading	0: not auto-loading 1: auto-loading
5	Unused	0: Fixation
6	Form sending with FEED key	0: not feed 1:feed
7	Unused	0: Fixation

The second byte. (error information)

Bit	Status	caption
0	U	0: Fixation
1	Unused	0: Fixation
2	Head up (platen open)	0:undetection 1:detection
3	The cutter is abnormal	0:undetection 1:detection
4	Mark check failed	0:undetection 1:detection
5	Hard ware error	0:undetection 1:detection
6	Head temperature is abnormal	0:undetection 1:detection
7	Power supply voltage is abnormal	0:undetection 1:detection

Note
  Hard ware error is internal RAM is abnormal, head heat reckless driving, fuse blow out.

The third byte (paper detection status)

Bit	Status	caption
0	Unused	: Fixation
1	Unused	: Fixation
2	out of paper	:undetection :detection
3-7	Unused	: Fixation

The fourth byte (parameter) ‥‥ specification parameter (Refer to the *FS r* command)

		TITLE	FTP-628DSL308 Product Specification	
		DRAW No. A1NA21207-3081/6		CUST

| EDIT | D A T E | D E S I G N | C H E C K | D E S C R I P T I O N | FUJITSU COMPONENT LIMITED | 68／83 |
| DESIGN | | | CHECK | | APPLY | |

01.10 FDNCA-4902-2

(38) FS r + n

[Name]   Parameter transmission

[Function]

    A specified parameter replies when the serial communications mode is selected.

[Code] $[1C]_{16}$ $[72]_{16}$ $[n]$
              $[28]_{10}$ $[114]_{10}$ $[n]$

[Explanation]

(1) This command is effective only serial communications.

(2) The reply parameter is specified by n.

(3) An initial value is n=0.

(4) The range of n is $0 \leq n \leq 255$.

(5) The parameter is transmitted when this command is received. The reply data follows the format of the automatic status transmission and replies parameter n as status in the fourth byte.

The first byte	The second byte	The third byte	The fourth byte
Printer information	Error information	Paper information	Parameter

(6) When the parameter reply is done by this command, the automatic status transmission always reaches the value of a specified parameter.

(7) It can be confirmed that the ending of print by this command.

The reception data		Operation	The transmission data
n line print data	first page data	first page data print	
FS r+"1"			→ status+"1" transmission
n line print data	second page data	second page data print	--► (status: head up (platen open))
r+"2"		head up (platen open)/head-down	
· · · · ·		second page data print	--► (status:head-down(platenclose))
		third page data print	→ status+"2" transmission
n line print data	eighth page data	· · ·	
FS r+"8"		eighth page data print	→ status+"8" transmission

(39) ESC EM + n

[Name]   Setting the amount of the feeding at automatic paper feed.

[Function]

The amount of the feeding at automatic paper feeding is set.

[Code] $[1B]_{16}$ $[19]_{16}$ [n]
                $[27]_{10}$ $[25]_{10}$ [n]

[Explanation]

(1) The amount of feeding is set by this command.

(2) The set amount of feeding is n dot line.

(3) The range of n is $0 \leq n \leq 255$. The automatic paper feed function becomes invalid for n = 0.

(4) An initial value is about 20mm.

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(40) *GS V + n + m*

_____

[Name]   Paper cut

[Function]

    The paper cut is executed

[Code] $[1D]_{16}$ $[56]_{16}$ [n] [m]
              $[29]_{10}$ $[86]_{10}$ [n] [m]

[Explanation]

(1) The relationship between parameter n and the operation is as follows:

n	Operation	Note
0, 48	Cut	Without m
65	Feed + Cut	With m

(2) When n is 65, paper cut executes after feeding related m. The parameter m indicates the amount of feeding.

(3) The parameter m indicates dot line and can be set range is $0 \le m \le 255$.

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TITLE   FTP-628DSL308
             Product Specification

DRAW No.   CUST
        A1NA21207-3081/6

FUJITSU COMPONENT LIMITED   SHEET   72／83

01.10 FDNCA-4902-2

(41) ESC X + n + m

[Name]   Setting the turning time of the motor excitation.

[Function]

The turning off time of the motor excitation current is set.

[Code] $[1B]_{16}$ $[58]_{16}$ [n] [m]
$[27]_{10}$ $[88]_{10}$ [n] [m]

[Explanation]

(1) The off time of motor exciting after feeding or print stopping is set.

(2) n sets one excitation time after the motor stops in 0.5 seconds.

(3) m sets time from the motor stop to turning off in 0.5 seconds.

(4) The time that can be set range is as follows.

$$0 \leq m \leq n \leq 255 \qquad 0 \leq m \leq 20$$

(5) An initial value is m=10 and n=20.

(6) The difference of the time of n and m has been excited by one aspect in a slight current.

(7) When parameter n specifies 255, Motor OFF does not do.

1.   The domestic (JAPAN) Character Codes

UPPER / LOWER	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0			SP	0	@	P	`	p	＿	⊥	SP	―	タ	ミ	＝	×
1			!	1	A	Q	a	q	▬	⊤	。	ア	チ	ム	⊨	円
2		DC2	"	2	B	R	b	r	▬	⊣	「	イ	ツ	メ	╪	年
3			#	3	C	S	c	s	■	⊢	」	ウ	テ	モ	⊣	月
4			$	4	D	T	d	t	■	―	、	エ	ト	ヤ	◢	日
5			%	5	E	U	e	u	■	—	・	オ	ナ	ユ	◣	時
6			&	6	F	V	f	v	■	｜	ヲ	カ	ニ	ヨ	◤	分
7			'	7	G	W	g	w	■	｜	ァ	キ	ヌ	ラ	▼	秒
8			(	8	H	X	h	x	｜	⌐	ィ	ク	ネ	リ	♠	〒
9	HT	EM	)	9	I	Y	i	y	▮	¬	ゥ	ケ	ノ	ル	♥	市
A	LF		*	:	J	Z	j	z	▮	└	ェ	コ	ハ	レ	♦	区
B		ESC	+	;	K	[	k	{	▮	┘	ォ	サ	ヒ	ロ	♣	町
C	FF	FS	,	<	L	¥	l	¦	▮	〔	ャ	シ	フ	ワ	●	村
D		GS	－	=	M	]	m	}	▮	╲	ュ	ス	ヘ	ン	○	人
E			.	>	N	^	n	~	▮	╲	ョ	セ	ホ	゛	／	▓
F			`	／	?	O	＿	o	SP	＋	╱	ッ	ソ	マ	゜	╲	SP

(In this table, "SP" indicates a space.)

Note

1. Each code is represented in hexadecimal notation.

2. If an undefined code ($[00]_{16}$ to $[1F]_{16}$) or an undefined *ESC*, FS, or GS sequence listed in this table is received, an abnormal operation may occur. (However, when image print data, character registration data, or command parameters are received, they are handled as ordinary data.)

2. Overseas (Foreign) Character Codes

UPPER / LOWER	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0			SP	0	@	P	`	p	Ç	É	á	::	└	⊥	α	≡
1			!	1	A	Q	a	q	ü	æ	í	✖	┴	⊤	β	±
2		DC2	"	2	B	R	b	r	é	Æ	ó	✖	┬	┬	Γ	≥
3			#	3	C	S	c	s	â	ô	ú	│	├	┘	π	≤
4			$	4	D	T	d	t	ä	ö	ñ	┤	─	┘	Σ	ſ
5			%	5	E	U	e	u	à	ò	Ñ	╡	+	╒	σ	J
6			&	6	F	V	f	v	å	û	ª	╢	╞	╓	μ	÷
7			'	7	G	W	g	w	ç	ù	º	┐	╟	╫	τ	≈
8			(	8	H	X	h	x	ê	ÿ	¿	┐	╚	╪	Φ	°
9	HT	EM	)	9	I	Y	i	y	ë	Ö	⌐	╣	╔	┘	Θ	•
A	LF	EM	*	:	J	Z	j	z	è	Ü	¬	║	╩	┌	Ω	·
B		ESC	+	;	K	[	k	{	ï	¢	½	┐	╥	■	δ	√
C	FF	FS	,	<	L	¥	l	¦	î	£	¼	┘	╞	▬	∞	n
D		GS	-	=	M	]	m	}	ì	¥	¡	┘	═	▮	φ	²
E			.	>	N	^	n	~	Ä	₧	«	╛	╬	▐	ε	▪
F			/	?	O	_	o	SP	Å	ƒ	»	┐	╧	▬	∩	SP

Note:
1. Each code is represented in hexadecimal notation.

2. If an undefined code ($[00]_{16}$ to $[1F]_{16}$) or an undefined *ESC*, *FS*, or *GS* sequence listed in this table is received, an abnormal operation may occur. (However, when image print data, character registration data, or command parameters are received, they are handled as ordinary data.)

SECTION I
Packaging, Stamping, Soldering, and Other Conditions

1. Stamping

The name, the serial number, and the number of versions of products are displayed in the our company standard label in this control board.

2. Packaging

This control board is packed based on the packing specification of the our company standard.

3. Other Conditions

(1) Detected errors must be resolved by mutual agreement in accordance with this specification.

(2) To change the contents of this specification, the changes must be reported on and mutually agreed upon in advance.

(3) The model described in this specification is the standard model. Therefore, when functional compatibility is maintained, the items not described in this specification may be changed without prior notice.

(4) If more detailed information is required or ambiguous information is detected, these problems must be resolved by mutual agreement.

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TITLE FTP-628DSL308 Product Specification

DRAW No. A1NA21207-3081/6   CUST

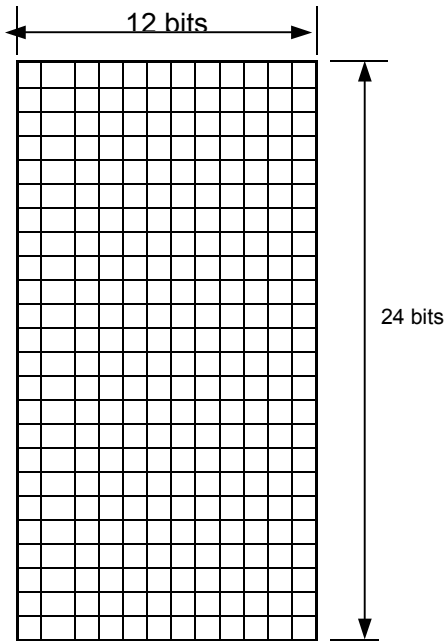FUJITSU COMPONENT LIMITED   SHEET 76／83

01.10 FDNCA-4902-2

Appendix 1
Configuration of Character Typeface

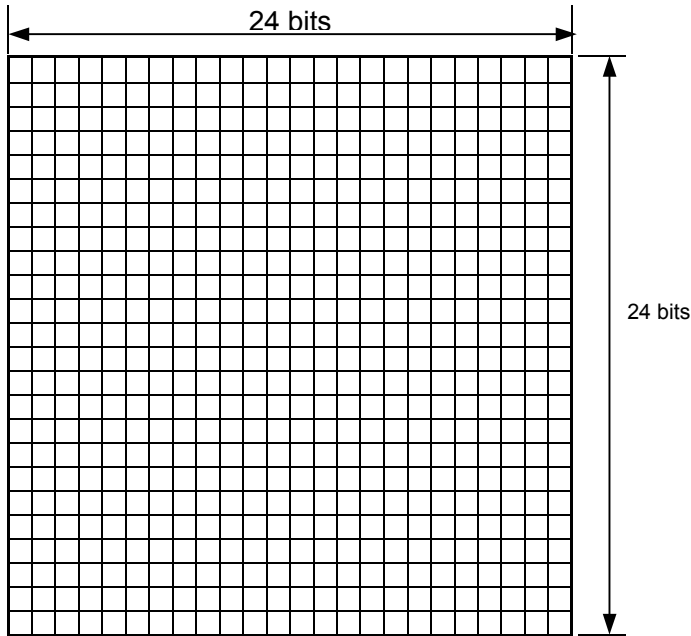### 1. Relationship between character typeface and print character area

(1) Internal half-size [12 x 24 dots] character typeface (internal data = print pattern)

12 bits

24 bits

(2) Internal full-size [24 x 24 dots] character typeface (double-width typeface of internal half-size characters)
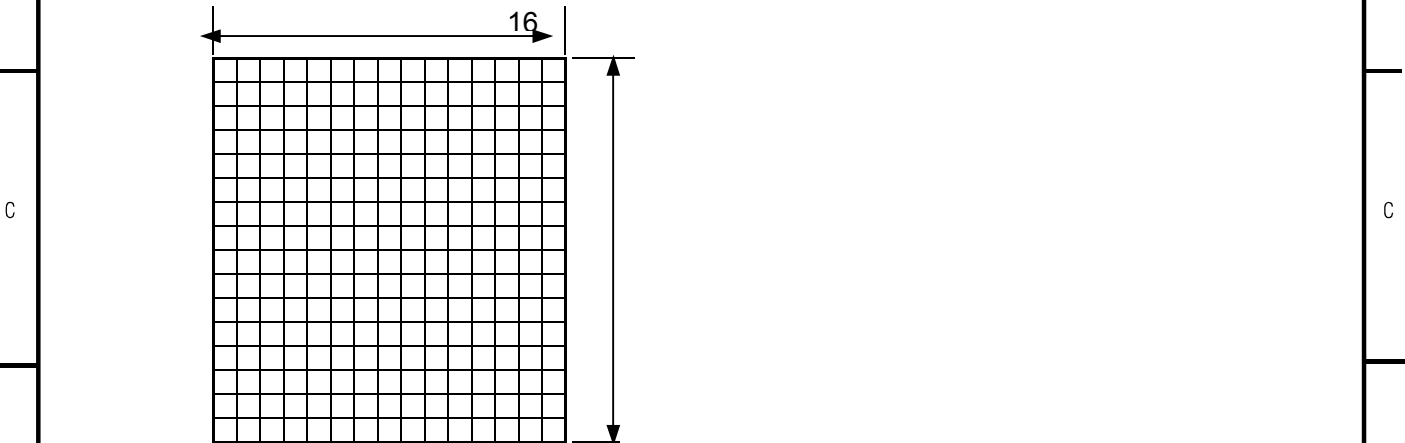
24 bits

24 bits

DOCUMENT CONTROL SECTION

DATE

(3) Internal half-size [8 x 16 dots] character typeface (internal data = print pattern)

(4) Internal full-size [16 x 16 dots] character typeface (double-width typeface of internal half-size characters)
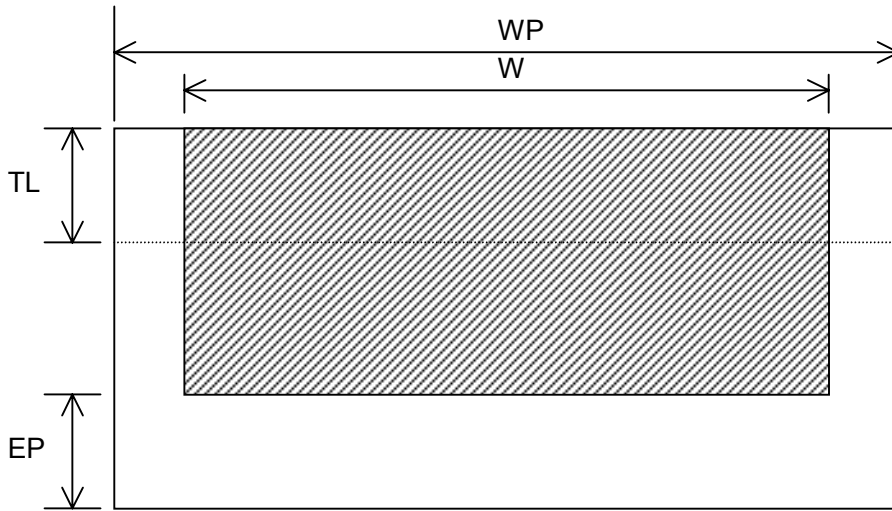
16

Appendix 2
Paper Printing Area and Mark Detection Position

1. Paper printing area

Symbol	Explanation		Length (mm)
WP	Maximum paper width	FTP-628MCL or equivalent product	About 58
		FTP-638MCL or equivalent product	About 80
W	Maximum printable area	FTP-628MCL or equivalent product	About 48
		FTP-638MCL or equivalent product	About 72
EP	Paper-out state detection position	FTP-628MCL or equivalent product	About 8.4*[1]
		FTP-638MCL or equivalent product	About 8.4*[1]
TL	Distance from paper cut position to print position (Auto cutter use)		About TBD

Note *1)
This value varies with the printing mode used.

2. Mark detection position (when head detection distance is 2 mm)

Printing position

ML
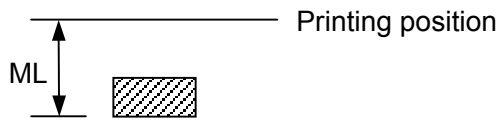
Symbol	Explanation	Length (mm)
ML	Distance from mark position to printing position	About 6.4

Appendix
List of Commands

(1)	HT	:	Horizontal tab
(2)	LF	:	Line feed with printing
(3)	FF	:	Forms feed
(4)	DC2	:	Power down
(5)	ESC RS	:	Black-white reversed printing specification
(6)	ESC US	:	Black-white reversed printing cancellation
(7)	ESC !+n	:	Printing mode specification
(8)	ESC %+n	:	External registration character specification/cancellation
(9)	ESC &+y+c1+c2+x+[d]k	:	External registration character definition
(10)	ESC *+m+n1+n2+[d]k	:	Bit image mode specification
(11)	ESC ?+n	:	External registration character deletion
(12)	ESC 2	:	1/6-inch line pitch setting
(13)	ESC 3+n	:	Minimum-pitch-unit line pitch setting
(14)	ESC @	:	Printer initialization
(15)	ESC A+n	:	Line spacing setting
(16)	ESC C+n	:	Page length (number of lines) setting
(17)	ESC D+[n]k+NUL	:	Horizontal tab position setting
(18)	ESC J+n	:	Printing and minimum-pitch-unit paper feed
(19)	ESC K+n	:	Backward paper feed
(20)	ESC R+n	:	International character specification
(21)	ESC c+1+n	:	Internal processing setting
(22)	ESC d+n	:	Printing and n-line feed
(23)	ESC e+n	:	Printing and backward n-line feed
(24)	ESC s+n	:	Printing speed setting
(25)	ESC t+n	:	Character code table selection
(26)	ESC {+n	:	Upside-down printing setting/cancellation
(27)	FS 9+n	:	Detection function enable/disable setting
(28)	GS <	:	Mark detection execution
(29)	GS A+m+n	:	After-mark-detection head detection distance setting
(30)	GS E+n	:	Print quality setting
(31)	GS e+n+m	:	Bar code width setting
(32)	GS h+n	:	Bar code height setting
(33)	GS k+m+n+[d]k	:	Bar code printing
(34)	GS w+n	:	Bar code width magnification setting
(35)	FS E+n	:	Correction of impressed energy
(36)	ESC V+n	:	Right rotation 90°
(37)	GS a+n	:	Setting and cancellation of status transmission
(38)	FS r+n	:	Parameter transmission
(39)	ESC EM+n	:	Setting the amount of the feeding at automatic paper feed
(40)	GS V+n+m	:	Paper cut
(41)	ESC X+n+m	:	Setting the turning time of the motor excitation

Appendix 5
Conditions for Use

To use the printer with this control board built in, the following conditions must be satisfied.

(1) Power supply

    a. The power supply unit that satisfies the specified specifications must be used. If a power supply unit that does not satisfy the specified specifications is used, normal operation is not assured and errors may occur.

    b. When the power is turned on, the MCU must stop until voltage of VH system becomes approx. 3.8 V or higher and enters in the state of the standby.

    c. The MCU automatically controls the print density in accordance with the detected power voltage. The power voltage is detected every four dot-lines. If the print head power voltage changes during this period, the density cannot be controlled. If the power voltage changes extremely, an overload may apply to the print head. To prevent this, the print head voltage variation must be kept within $\pm5\%$.

(2) The printing head heat

    The print head becomes a high temperature very much along with the print. Please do not touch the print head and the support board directly by the hand.

    When the print head is pulled down with paper run out state, praten might be transformed by heat.

(3) The motor heat

    The motor and motor drive element become a high temperature. Please do not touch by the hand.

(4) Cutter

    Please don't insert fingers or foreign matters to the cutter part. Injuries may be receive or troubles may occur.

(5) Paper

    a. The recommended paper is wound on a roll. The external side of the rolled paper is the heat-sensitive side. Set the paper so that the heat-sensitive side can touch the print head.

    b. If paper is set so that its edge is oblique to the paper guide, a skew feed or jam may occur. Set paper so that its edge is parallel to the paper guide.

    c. If the paper that does not satisfy the specified specifications is used, the print quality is not assured and errors may occur.

    d. Heat-sensitive paper is liable to deteriorate in a high-temperature, high-humidity environment. Especially when the temperature increases up to 60℃ or higher, coloring may occur. Carefully store heat-sensitive paper.

(6) Paper jam

When the paper jam is generated, the power supply of the printer is cut and please raise the head and remove the paper. When working without turning off the power supply of the printer, if the connector comes off, the head is occasionally damaged. Moreover, causes the printer to break down when the printing in the state of the form jam.

(7) Water and foreign matter

a. Adhering liquid such as water or metal chips such as needles and pins to the control board may cause a printer failure.

b. If printing is performed in a condensation state, the print head may be damaged. If condensation is occurred, let the printer dry sufficiently before starting printing.

(8) Impact

Because this product is made of precision electronic and mechanical components, do not drop it or hit it with a solid object. Applying the force of an impact to the product may cause errors to occur.

(9) When not using for a long time

When the printer is not used for a long time, please put into the state to raise the head. When the head is left lowered, praten might be transformed.

(10) Installation

a. This product must be kept horizontally as much as possible. Use this product in a place free of vibration.

b. Please ground the printer mechanism to FG (frame playground) surely.

c. The printer with this board mounted must not be used in an environment subject to direct sunlight or dust (oil or iron dust).

d. The power supply line must be separated from other devices (e.g., large-sized motors) that cause noise.

e. The printer with this board built in must be installed so that it is positioned as far away as possible from large-noise-emitting devices such as high-voltage devices and large-sized motors.

f. To connect or remove the connector, always turn off the power in advance. If the connector is connected or removed while the power to the printer is on, errors may occur.

g. Please lock surely, and connect the connector of connected each cable correctly. There is no lock mechanism in the connector on the head side and confirm insertion up to the deepest part, please.

h. Impossible power must not join each cable when you mount the printer on the device. Especially, it is necessary to note because the head connection cable influences the pressurizing power of the head. Moreover, please note that causes abnormal heating and the head damage, etc. of the head when the connection of the head connector is imperfect enough about the connector connection.

i. If continuous printing is performed at a high print rate (high print density), the head heat may build up and the head temperature may exceed the maximum usable temperature. In this case, printing may be stopped by the thermal error detection function. Printing resumes automatically after the head cools down to the print enabling temperature.

j. To connect or remove the cutter, always turn off the power of the printer in advance. If the cutter is connected or removed while the power to the printer is on, it is very dangerous because the cutter may move.

k. If power is supplied to the print head for a long period of time, the heater may undergo electrolytic corrosion. If the no-printing state continues for a long period of time, turn off the power to the print head and set the printer to the standby state. (See the "*FS 9*" (detection function setting command).)

TITLE	FTP-628DSL308 Product Specification
DRAW No.	A1NA21207-3081/6	CUST

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01.10 FDNCA-4902-2