DXY-800, DXY-101

Operation Manual



Roland X-Y PLOTTER DXY-800 DXY-101

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- * IBM is a registered trademark of International Business Machines Corporation of USA and IBM-PC is the trade name of its products.
- * Tandy is a registered trademark of Tandy Corporation of USA and TRS-80 is the trade name of its products.

1. Brief Descripfion	The DXY-800 and DXY-101 are compact, lightweight, high speed X-Y plotters with exchangeable pens (DXY-800 only) and realize excellent cost performance. By connecting a computer, letters, figures and graphs can be drawn easily. These plotters permit much clearer and more accurate drawing of pictorial output than is possible with an ordinary printer.
	 Some of the many outstanding features of the DXY-800 and DXY-101 are as follows. 1. Compact and lightweight. Can be installed vertically (60°). A more compact, lightweight design has been realized over conventional models, with a width of 496mm, a depth of 435mm, a height of 77mm and a weight of 4.1kg (DXY-800 unit only). In addition, vertical installation is possible by using the accessory stand. This allows the unit to be freely installed in any location.
	 An abundance of functions are provided and control commands are simple. A wide variety of command functions such as vectors, characters and graphics are available, along with replaceable pens, as standard features. In addition, such items as circles, arcs and hatching can be drawn just as you desire. What is more, control commands are simple using BASIC.
	3. Pen movement permits drawing in 0.1 mm steps and paper up to 420 mm by 297 mm can be used. Since pen movement is in 0.1mm steps, coordinate designa- tion or calculation in the program are simple. In addition, recording papers smaller than 420mm x 297mm can be used
	4. Felt tip pens can be used. In addition to eight special color pens, by using the accessory pen holder, felt tip pens can be used. Depending on the condition of the pen used, drawing speed can be switched between two settings (180mm/sec and 90mm/sec).
	 Easy to connect to a computer. Simple connection is possible for a computer which is connectable to a printer having standard Centronics specifi- cations. In addition, RS-232C specifications interface is available.
	 AC adapter system power supply Equipment stability and safety have been improved by separating the DC pack power supply system from the unit. A hook hole is provided to allow the pack to be hung on a wall.

2. Packing Checklist

The following accessories are packed in the box of the DXY-800 or DXY-101, along with the plotter unit. Be sure to check that all of the required accessories are in the packing box prior to use.

	Item	DXY-800	DXY-101
(1)	Special pens	(Black, red, brown, blue, green, purple, orange, pink) 8	(Black only) 1
(2)	Magnetic sheet for holding recording paper	1	2
(3)	Pen holder	4	1
(4)	AC adapter	1	1
(5)	Stand	1	1
(6)	Operation Manual	1	1
(7)	Position setting seals	0	1

3. Precautions.	 Installation Place the unit on a flat, stable stand or install vertically (60°) using the accessory stand. Avoid locations where the unit will be exposed to direct sunlight, high temperature environments, and dusty or humid locations. Do not use in a location which has heavy vibration or in noisy environments. Since the power supply (AC adapter) generates heat when used, place in a location suitable to heat dissipation (a location having good ventilation).
	 Use Insure that the power supply cord and computer input/ output cables are installed in such a manner as to prevent accidents or disconnection while in use. When connecting with a computer, be sure to perform an operation check (Refer to page 8) to confirm that there are no abnormalities. Prior to turning power on, set the pen carriage to the lower left. If not set in this position, not only will the most effective drawing range not be obtained, but with the DXY- 800, it will not be possible to exchange pens. Do not block the ventilation openings on this unit or place items over the AC adapter .
	 After using or when not using In order to prevent ink evaporation, when not using the pens, cover them with the caps or put them in the penstock (DXY-800). When not using the unit, be sure to remove the power supply plug from the outlet. When not using the unit, remove the pen from the pen clip and pen carriage.

Other

- Never lubricate any of the mechanical parts.
- Never place heavy objects on the drawing board or allow it to become scratched.
- Do not apply strong force to the arm or carriage and avoid impact.
- If the drawing board or the X rail cover are stained, clean them lightly with cloth using neutral detergent.
- Do not move the arm or carriage manually after turning power on.

II.Basic Procedures.

1. Names of sections.





*Do not use (connect) at the same time as a Centronics specifications connector.

- 2. Power Supply (AC Adapter) Connections.
- 1. Check to see that the plotter unit power switch is off, then connect the AC adapter to the power supply connector of the plotter unit.
- Plug the power supply plug of the AC adapter into an AC 2. outlet.
- 3. Loading Recording Paper.



Load the recording paper in the following sequence.

DXY-800

1. Open the paper holder and insert the left edge of the recording paper in the holder.

- 2. Align the upper edge (front edge) of the recording paper with the X rail cover.
- Close the paper holder and secure the left edge of the З. recording paper, insuring that the paper has no creases or looseness, and secure the right edge using the magnet sheet.
- DXY-101
- 1. If a pen is already installed in the pen carriage, remove the pen.
- 2. When using the paper in 420mm x 297mm size, affix the accessory position setting seals. Since there are extra seals, these are convenient for position setting of other sizes.
- Note: The seals are made using a material which has no effect on the drawing, however, avoid affixing in the drawing area as much as possible.
- 3. Align using the recording paper position setting seals and secure using the magnet sheet. At this time, insure that there are no creases or looseness in the recording paper.

The recording paper should have the proper ink absorption properties, should not stretch or shrink with variations in the humidity and should be smaller than 420mm x 297mm. High quality graph paper, coated paper or tracing paper are best, but, depending on the application, copy paper or OHP (overhead projector) transparent film may also be used.

<u>7</u>

4. Recording Pen Installation.





Align the disc portion of the accessory pen holder containing the special pen with the guide portion of the pen carriage or pen clip and insert gently.

- Installing a felt tip pen in the pen holder
 Use a high quality pen which has an outside diameter of
 9.5mm or less and a weight of 7g or less.
 The standard distance between the tip of the pen and the recording paper is 2mm, however, this varies depending on the type and shape of the pen. Therefore, it is alright if the distance is a little greater or smaller. Install using the following procedure.
- 1. Turn the top portion of the pen holder counterclockwise to loosen it.
- 2. Load a pen and gently turn the top portion of the pen holder clockwise to secure the pen.
- 3. Install in the pen carriage, adjust the wick length and tighten by turning the top portion of the pen holder clockwise and secure the pen.

5. Setting the Drawing Point of Origin.



For the DXY-800 and DXY-101, the position of the pen when the power is turned on becomes the drawing point of origin (home position, coordinates 0,0). Drawing is only performed to the right and above that point of origin. Because of this, prior to turning power on the sure to set the

Because of this, prior to turning power on, be sure to set the position of the pen to the lower left. If not set correctly, the maximum effective drawing area cannot be obtained and, with the DXY-800, pen exchange will not be possible.

Prior to turning power on, be sure to manually set the position of the pen carriage to the lower left.

- When setting manually, be sure to avoid applying too much pressure on the pen carriage or moving too quickly.
- Do not move the arm or carriage manually while the power is on.
- DXY-800 and DXY-101 are different in drawing area.
- 6. How to Use the Stand.



Be sure to use the stand when using the DXY-800 or DXY-101 in a vertical position (60°) .

Attach the stand to the long slots on the back of the plotter.

Take the following precautions when using the plotter in a vertical position.

- Be sure to place on a flat, stable surface.
- Do not apply excessive pressure on the surface of the plotter or on the stand.

7. Operation Check (Self-Test Mode)



• DXY-800

- 1. Load pens in pen clip numbers 1 through 8.
- 2. Turn power on while pressing the PEN UP switch and the HOME switch.

The carriage will change pens in sequence from number 1 through number 8 and will go through the movements for drawing " []" of the N command with each one. Finally, the system will return to the drawing point of origin (home position) and the test will be complete. Since this operation is performed in the pen up condition, by pressing the PEN UP switch once more, the system will go to a pen down condition and actual drawings can be made on the recording paper.

• DXY-101

- 1. Load a pen in the pen carriage.
- 2. Turn power on while pressing the PEN UP switch and the HOME switch.

The carriage will transit the outside of the effective drawing area and coordinates (0, 2600), (2600, 3700) and (3700, 0) and return to the point of origin (home position). Then it will go through the movements for drawing "*" of the N command and the test will be complete. Since the pen up condition is designated, even in the pen down condition, only a "*" symbol can be drawn.

1. Parallel Interface

•	.a.	•	•	

APPLE II DXY-800, 101

Signal	Signal	Pin
STROBE	 STROBE	1
DB0	 D0	2
DB1	 D1	3
DB2	 D2	4
DB3	 D3	5
DB4	 D4	6
DB5	 D5	7
DB6	 D6	8
DB7	 D7	9
ACK	 ACK	10
GND	 GND	19~30

(1) Main Computer Connection

In this example, we will explain how to connect an APPLE II, IBM-PC, TRS-80. Basically, if a computer is available which has standard Centronics specifications input/output terminals for printer connection, the DXY-800 and DXY-101 can be connected to the printer connector without modification. In the case of other types of computers, refer to the printer connection section of the operation manual for the respective computer and make the connection accordingly.

After connection, place the DXY-800 or DXY-101 in the PRINTER mode (Refer to page 21) and when a computer-toprinter print command is sent, if correct printout is made by the plotter, then the DXY-800 or DXY-101 is connected correctly.

• APPLE II, IIe (Apple)

Use a parallel printer interface card (Roland D G APPLE II parallel interface board or APPLE A2B0002). By using this card, data transfer similar to a printer is possible using PR#n command.

Perform connection as shown Fig 14.

• TRS-80 (Tandy)

A Tandy Radio Shack expansion interface (Catalog No. 26-26-1140-1) and a cable are required when connecting the DXY-800 or DXY-101 to a TRS-80.

Use a Tandy Radio Shack cable (Centronics specifications) or make your own by closely following the specifications outlined in the expansion interface manual and on P. 10 (2)-(1) of this manual.

• IBM-PC (IBM)

An IBM monochrome monitor/printer interface card and a cable are required when connecting the DXY-800 or DXY-101 to an IBM-PC.

Use an IBM printer cable.

When operating the DXY-800 or DXY-101 using IBM-BASIC (BASIC A), a "Device Time Out Error" may occur. In this case, the printer BUSY signal will become HIGH level and an error message is output. Refer to the note on P. 22 concerning the IBM-PC, and the sample program on P. 26.

2 Input/Output Data.

(1) Connection

Use DDK 57-30360 or equivalent as a connector. Pin arrangement is as follows.

F	ig. 15									
	NC	36	18	NC						
Γ	NC	35	17	GND						
	NC	34	16	GND						
Γ	GND	33	15	NC						
	ERROR	32	14	NC						
	NC	31	13	HIGH	*					
Γ	GND	30	12	GND						
	"	29	11	BUSY						
	"	28	10	ACK						
	"	27	9	* D7						
	"	26	8	D6						
	"	25	7	D5						
		24	6	D4						
	"	23	5	D3						
	"	22	4	D2						
	,,	21	3	D1						
	,,	20	2	Dφ	7					
[,,	19	1	STROBE						
	± 4	.7k ⁄//	+ 5∨							
	* If the hit select switch is set to 7, the system becomes NC \sim									

(2) Input/output connector hookup

Input data signals consist of 8-bit data (D0 through D7). An input data signal (D0 through D7) is sent via pins 2 through 9. Next, a STROBE signal is input. At this time, the plotter BUSY signal comes ON and an ACK signal is output and data is read and the drawing operation starts. When the designated operation is completed, the system goes to a condition awaiting the next data input.

When making input/output cables, cable length should be 1.5m or less.



2. Serial Interface

(1) Connector Pin Assignment.

The DXY-800 and DXY-101 are provided the RS-232C specifications connector to permit connection to a computer having an RS-232C specifications connector.

Image: signal product of the systemSignal product of the systemSignal product of the system1AAPG (Protective Ground)Frame groundPG2BATD (Transmitted Data)Serial data from computer sideRxDReceive3BBRD (Received Data)OpenNCNC4CARTS (Request to Send)RTS from computer sideREQReceive5CBCTS (Clear to Send)CTS from plotter sideREADYSend6CCDSR (Data Set Ready)Connected to CD (Data Terminal Ready)DTR · ACKSend7ABSG (Signal Ground)Signal line GNDSG8CFDCD (Data Carrier Detector)OpenNCNC9-18NCOpenDTR ReceiveNC20CDDTR (Data Terminal Ready)Connected to CC (Data Set Ready)DTR Receive Receive21-25NCOpenMCNC	Pin [•] Number	Symbol	Computer Side RS-232C	DXY-800 and DXY-101 Side RS-232C				
1AAPG (Protective Ground)Frame groundPG-2BATD (Transmitted Data)Serial data from computer sideRxDReceive3BBRD (Received Data)OpenNCNC4CARTS (Request to Send)RTS from computer sideREQReceive5CBCTS (Clear to Send)CTS from plotter sideREADYSend6CCDSR (Data Set Ready)Connected to CD (Data Termi- nal Ready)DTR · ACKSend7ABSG (Signal Ground)Signal line GNDSG-8CFDCD (Data Carrier Detector)OpenNCNC9-18NCOpenConnected to CC (Data Set Ready)NC20CDDTR (Data Terminal Ready)Connected to CC (Data Set 					Signal Name	Signal Direc- tion		
2BATD (Transmitted Data)Serial data from computer sideRxDReceive3BBRD (Received Data)OpenNCNC4CARTS (Request to Send)RTS from computer sideREQReceive5CBCTS (Clear to Send)CTS from plotter sideREADYSend6CCDSR (Data Set Ready)Connected to CD (Data Termi- nal Ready)DTR · ACKSend7ABSG (Signal Ground)Signal line GNDSG-8CFDCD (Data Carrier Detector)OpenNCNC9-18NCOpenConnected to CC (Data Set Ready)NCNC20CDDTR (Data Terminal Ready)Connected to CC (Data Set Ready)DTRReceive Receive21-25NCOpenMCSEND	1	AA	PG (Protective Ground)	Frame ground	PG	—		
3BBRD (Received Data)OpenNC4CARTS (Request to Send)RTS from computer sideREQReceive5CBCTS (Clear to Send)CTS from plotter sideREADYSend6CCDSR (Data Set Ready)Connected to CD (Data Terminal Ready)DTR · ACKSend7ABSG (Signal Ground)Signal line GNDSG-8CFDCD (Data Carrier Detector)OpenNCNC9-18NCOpenConnected to CC (Data Set Ready)NC20CDDTR (Data Terminal Ready)Connected to CC (Data Set Ready)DTRReceive21-25NCOpenImage: NCNC11-25NCOpenImage: NCNC12-25NCBUSY from plotter sideBUSYSEND	2	BA	TD (Transmitted Data)	Serial data from computer side	RxD	Receive		
4CARTS (Request to Send)RTS from computer sideREQReceive5CBCTS (Clear to Send)CTS from plotter sideREADYSend6CCDSR (Data Set Ready)Connected to CD (Data Terminal Ready)DTR · ACKSend7ABSG (Signal Ground)Signal line GNDSG-8CFDCD (Data Carrier Detector)OpenImage: Connected to CC (Data Set Ready)NC9-18NCOpenImage: Connected to CC (Data Set Ready)NC20CDDTR (Data Terminal Ready)Connected to CC (Data Set Ready)DTR21-25NCOpenImage: Connected to CC (Data Set Ready)NC12-25NCOpenImage: Connected to CC (Data Set Ready)NC	3	BB	RD (Received Data)	Open		NC		
5CBCTS (Clear to Send)CTS from plotter sideREADYSend6CCDSR (Data Set Ready)Connected to CD (Data Terminal Ready)DTR - ACKSend7ABSG (Signal Ground)Signal line GNDSG8CFDCD (Data Carrier Detector)OpenImage: SendNC9-18NCOpenImage: SendNC20CDDTR (Data Terminal Ready)Connected to CC (Data Set Ready)DTRReceive Receive21-25NCOpenImage: SendNCImage: SendNCOpenImage: SendNC21-25NCOpenImage: SendSEND	4	СА	RTS (Request to Send)	RTS from computer side	REQ	Receive		
6CCDSR (Data Set Ready)Connected to CD (Data Terminal Ready)DTR - ACKSend ACK7ABSG (Signal Ground)Signal line GNDSG8CFDCD (Data Carrier Detector)OpenNCNC9 - 18NCOpenNCNC20CDDTR (Data Terminal Ready)Connected to CC (Data Set Ready)DTRReceive Receive21 - 25NCOpenNCNC14 - 25NCOpenSEND	5	СВ	CTS (Clear to Send)	CTS from plotter side	READY	Send		
7ABSG (Signal Ground)Signal line GNDSG-8CFDCD (Data Carrier Detector)OpenOpenNC9 - 18NCOpenOpenNC20CDDTR (Data Terminal Ready)Connected to CC (Data Set Ready)DTRReceive Receive21 - 25NCOpenNCNC20VANCOpenNC	6	СС	DSR (Data Set Ready)	Connected to CD (Data Termi- nal Ready)	DTR · ACK	Send		
8CFDCD (Data Carrier Detector)OpenNC9 - 18NCOpenNC20CDDTR (Data Terminal Ready)Connected to CC (Data Set Ready)DTR21 - 25NCOpenNC20VNCOpen21 - 25NCSEND	7	AB	SG (Signal Ground)	Signal line GND	SG	-		
9 - 18 NC Open NC 20 CD DTR (Data Terminal Ready) Connected to CC (Data Set Ready) DTR Receive 21 - 25 NC Open NC 21 - 25 NC BUSY from plotter side BUSY SEND	8	CF	DCD (Data Carrier Detector)	Open		NC		
20CDDTR (Data Terminal Ready)Connected to CC (Data Set Ready)DTRReceive21 - 25NCOpenNCBUSY from plotter sideBUSY	9 – 18		NC	Open		NC		
21 - 25 NC Open NC BUSY from plotter side BUSY	20	CD	DTR (Data Terminal Ready)	Connected to CC (Data Set Ready)	DTR	Receive		
BUSY from plotter side BUSY SEND	21 - 25		NC	Open		NC		
	19		NC	BUSY from plotter side	BUSY	SEND		



Fig. 17

		_										
((2) Connecting to a Computer											
	Computer Si	de		DXY-800, DXY-101								
19	Signal Name	Signal Name Pin No. Pin No. Sig										
	PG	1		1	PG							
	TD	2	·	2	R x D							
	RD	3		3	NC							
	RTS	4		4	REQ							
	CTS	5		5	READY							
	DSR	6		6	DTR · ACK							
	SG	7		7	SG							
	DCD	8		8	NC							
	S·RTS	19		19	BUSY							
	DTR	20		20	DTR							

Data transfer between the computer and the plotter is performed by handshake using RTS, CTS, REQ and READY signals.

Consequently, operations where READY or BUSY is disregarded and data is sent cannot be guaranteed.



Computer side

Fig.

Plotter side

REQ: ON

다. READY: ON

 \square

- RTS: ON
 CTS: ON
 CTS: ON
- 3 TD: ON
- (READY) is reset (goes OFF) when a start bit is received, and is set (comes ON) when data is read by the DXY-800 or DXY-101.
- (BUSY) is reset (goes OFF) for a period of one stop bit, and is set (comes ON) when data is read by the DXY-800 or DXY-101.

Timing chart

• IBM-PC

When using the DXY-800 or DXY-101 with an RS-232C interface, be sure to check the RS-232C control software procedures prior to connecting.

Since the DXY-800 and DXY-101 receive data by handshake. they have control signals for erroneous timing (READY or BUSY).

_	(IBM-PC)		(DXY-800, DXY-101)			
Fig. 21	Signal Name	Pin No.	Pin No.	Signal Name		
	FG	1	 1	PG		
	ΕΙΑ ΤΧ DATA	2	 2	R x D		
		3	3	NC		
	EIA RTS	4	4	REQ		
	EIA CTS	5	 5	READY		
	EIA DSR	6	 6	DTR ACK		
	SIGNAL GND	7	 7	SIG GND		
		8	8			
		19	19	BUSY		
	EIA DTR	20	20	DTR		

The above connection diagram shows a connection made using an RS-232C interface card, and is based on CP/M-86.

* CP/M is the trademark of Digital Reserch.

• APPLE II, IIe

Connect using Super Serial Card (Reorder Apple Product #2L0044) and exclusive connector cable.

	(APPLE	11)	(DXY-800, DXY-101)			
Fig. 22	Signal Name	Pin No.	Pin No.	Signal Name		
	FRM GND	1	 1	PG		
	Τ×D	2	 2	R x D		
		3	3	NC		
	RTS	4	 4	REQ		
	CTS	5	 5	READY		
	DSR	 6	DTR·ACK			
	SGL GND	7	 7	SIG GND		
	DCD	8	8	NC		
	S.CTS	19	19	BUSY		
	DTR	20	 20	DTR		

(Note)

When connecting to an APPLE II, be sure to set the bit select switch to "7". ("8" will result in an error and operation will not be possible.)

For Super Serial Card setting, set the Jumper Block to "MODEM", turn switch 7 of DIP switch 1 OFF, and turn switch 7 of DIP switch 2 OFF.

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3. Input Data Code

The DXY-800/101 is designed to accept standard **ASCII** (American Standard Code for Information Interchange) code.

Г: , 00				1									
riy. 23					D 7	0	0	0	0	0	0	0	0
	<u>م د</u>	<u></u>	<u> </u>		D6	0	0	0	0	1	1	1	1
	Table				D 5	0	0	1	1	0	0	1	1
					D 4	0	1	0	1	0	1	0	1
	D3 D2 D1 D0				0	1	2	3	4	5	6	7	
	0	0	0	0	0			SP	0	@	Ρ		р
	0	0	0	1	1		•	!	1	А	Q	а	q
	0	0	1	0	2		\diamond	"	2	в	R	b	r
	0	0	1	1	3			#	3	С	S	с	s
	0	1	0	0	4		\triangle	\$	4	Ð	т	d	t
	0	1	0	1	5		\mathbb{X}	%	5	, E	U	е	u
	0	1	1	0	6		\bigcirc	&	6	F	V	f	v
	0	1	1	1	7		\times	,	7	G	W	g	w
	1	0	0	0	8		Ă	(8	н	х	h	×
	1	0	0	1	9		Ж)	9	Т	Y	i	У
	1	0	1	0	А	LF	X [‡] X	*	:	J	Z	j	Z
	1	0	1	1	В		ESC	+	:	к	[k	{
	1	1	0	0	с			,	<	L	\	ł	1
	1	1	0	1	D	C _R		—	=	М]	m	}
	1	1	1	0	E			•	>	Ν	1	n	~
	1	1	1	1	F			/	?	0	+	0	SP

Note. If an undefined code is received by the DXY-800/101, the ERROR light will turn on, and the ERROR line, (pin 32), will go Low.

Notice that the ASCII code is a 7 bit code, and that there are 8 bits on the data bus.

The DXY-800/101 does not function unless bit 7 is set to Low (except after 'P' Command).

The table shows ASCII code and its corresponding binary digit, and hex digit. (msd; most significant digit, lsd; least significant digit)

ASCII code	A	7
binary digit	0100	0001
	msd	lsd
hex digit	4	1
(decimal digit)	6	5

N.Drawing Commands.

1. List of Drawing Commands.		Command	Input Format
Fig. 24	Н	HOME	Н
-	D	DRAW	Dx1, y1, x2, y2, xn, yn
	М	MOVE	Мх, у
	I	RELATIVE DRAW	l x1, y1, x2, y2, xn, yn
	R	RELATIVE MOVE	R x1, y2
	L	LINE TYPE	Lp
	В	LINE SCALE	Bl
	Х	AXIS	X p,q,r
	S	ALPHA SCALE	Sn
	Q	ALPHA ROTATE	Q n
	Р	PRINT	P c1c2cn
	Ν	MARK	Nn
	ESC	EXCHANGE	(ESC) or CHR\$ (27) + ''n''
	J	PEN CHANGE	J n (DXY-800 only) *
	С	CIRCLE	C x, y, r, θ1, θ2
	Е	RELATIVE CIRCLE	Er, θ1, θ2
	А	CIRCLE CENTER	Ах, у
	G	A + CIRCLE	G r, θ1, θ2
	К	A + %	K n, l1, l2
	Т	HATCHING	Tn, x, y, d, t

* For the DXY-101, a "J" command results in an error.

2. Drawing Commands.



1. "H" command (H)

Moves the system to the home position (0, 0) in a pen up condition.

*When there is an error, the error indication is cleared using this command.

10 REM *** Listing #1. *** 20 REM *** The 'H' command. *** 30 LPRINT "H"

2. "D" command (Dx₁, y₁, x₂, y₂, xn, yn)

Draws a line from the current pen position to $(x_1, y_1), (x_2, y_2) \cdots$ to (x_n, y_n) , in sequence.

"x" and "y" values are integers of up to 4 digits which are multiples of 0.1mm and are all absolute coordinates.

10 REM *** Listing #1. *** 20 REM *** The 'D' command. *** 30 REM --- No 1 ---40 X1=1000:Y1=1000 50 LPRINT "D";X1;",";Y1 60 REM --- No 2 ---70 LPRINT "D0,1000" 80 LPRINT "H"

The above program draws lines as shown in Fig. 25. (The space between ③ and ① in the drawing is a pen up movement.) Lines 40 and 50 in the program are convenient for when lines are drawn using many READ DATA statements and FORNEXT statements, etc.



- **3.** "M" command (Mx, y) Performs the same movement as the "D" command in a pen up condition.
 - 10 REM *** Listing #2. ***
 - 20 REM *** The 'M' command. ***
 - 30 REM --- No 1 ----
 - 40 X1=1000:Y1=1000
 - 50 LPRINT "M"; X1; ", "; Y1
 - 60 REM --- No 2 ---70 LPRINT "MO,1000"
 - 80 LPRINT "H"

Moves from (1) to (2) to (3) to (1) in a pen up condition.

(Fig. 26)

4. "I" command $(I \triangle x_1, \triangle y_1, \triangle x_2, \triangle y_2, \dots, \triangle x_n, y_n)$

Draw lines while moving from the current position for a distance expressed by the relative difference $(\triangle x, \triangle y)$. "x" and "y" values are integers of up to 4 digits which are multiples of 0.1mm and are all absolute coordinates.

10 REM *** Listing #3. *** 20 REM *** The 'T' command. *** 30 LPRINT "M1000,1000" 40 LPRINT "IO,-1000,-500,500"

SO LPRINT "H"

Moves from ① to ② in a pen up condition, then moves from ③ to ③ to ④ while drawing lines, then moves to the home position in a pen up condition. (Fig. 27)



5. "R" command $(R \triangle x_1, \triangle y_2)$

Performs the same movement as the "I" command in a pen up condition.

10 REM *** Listing #5. *** 20 REM *** The 'R' command. *** 30 LPRINT "M1000,1000" 40 LPRINT "R0,-1000,-500,500" 50 LPRINT "H"

Moves from (1) to (2) to (3) to (4) to (1) in a pen up condition. (Fig. 28)

"L" command (Lp) Draws a solid line when p=0 and a dotted line when p=1.

10 REM *** Listing #6. *** 20 REM *** The 'L' command. ***

30 LPRINT "L1" 40 LPRINT "D0,1000,500,500" 50 LPRINT "L0" 60 LPRINT "H"

In the program, this command may be written either before or after the "B" command (designates the pitch of the dotted line). The initial value is p=0 and makes a solid line. Draws dotted lines in ① to ② to ③ sequence and returns to the home position in a pen up condition. (Fig. 29) Similar to the "L" command and the "B" command, once designated, the designated condition remains in effect until redesignated, therefore, in the program, the dotted line designation is cancelled on line 40 and the system returns to a solid line drawing condition.



7. "B" command (B²)

Designates the pitch of the dotted lines when drawing dotted lines using the "L" command. " ℓ " is an integer in the range of $0 \langle \ell \leq 255 \rangle (25.5 \text{mm})$. The line portions and space portions are equal and the repeat cycle is twice the value of ℓ . The initial value is $\ell = 30 \rangle (3 \text{mm})$.

```
10 REM *** Listing #7. ***
20 REM *** The 'B' command. ***
30 LPRINT "B50"
40 LPRINT "L1"
50 LPRINT "D1000,0"
60 LPRINT "L0"
70 LPRINT "B30"
80 LPRINT "H"
```

Draws a dotted line with 5mm pitch from ① to ②, then moves from ③ to ① in a pen up condition. (Fig. 30)







8. "X" command (Xp, q, r)

Draws coordinate axis parallel to the x axis or y axis. p=0 designates the y axis and p=1 designates the x axis. Scale lines are input with spacing designated by "q".

The operation is repeated the number of times designated by "r".

```
10 REM *** Listing #8. ***
20 REM *** The 'X' command. ***
30 LPRINT "M1000,1000"
40 LPRINT "X1,100,15":LPRINT "M1000,1000"
50 LPRINT "X0,50,20"
60 LPRINT "H"
```

Moves from (1) to (2) in a pen up condition, then draws scale lines 15 times on the x axis with 10mm spacing, the moves from (3) to (2) in a pen up condition, then draws scale lines 20 times on the y axis with 5mm spacing, then returns to the home position from (4) in a pen up condition. (Fig. 31)

9. "P" command $(Pc_1 c_2 ... c_n)$

Prints character designated by "c".

- 10 REM *** Listing #9. ***
- 20 REM *** The 'P' command. ***
- 30 LPRINT "M1200,1800"
- 40 LPRINT "PRoland DG DXY-800, DXY-101"
- 50 LPRINT "H"

Prints "Roland DG DXY-800, DXY-101" from (2) to (3), then returns to the home position. (Fig. 32)

To print characters or character patterns not contained on the keyboard, use "CHR\$"

10. "S" command (Sn)

Designates the size of characters and symbols. "n" is in a range of 0 to 15. At n=0, the character size is 0.7×0.4 mm (0.4 x 0.4mm for symbols). In this case, character spacing is 0.3mm. Character and symbol size and character spacing can be printed up to multiples of (n+1). The initial value is n=3, with character size of 2.8 x 1.6mm, symbol size of 1.6 x 1.6mm, and character spacing of 1.2mm.

```
10 REM *** Listing #10. ***
20 REM *** The 'S' command. ***
30 LPRINT "S9"
40 LPRINT "M1100,1900"
50 LPRINT "PRoland DG DXY-800,DXY-101"
60 LPRINT "S3"
70 LPRINT "H"
```

Draws characters 7 x 4mm in size with 3mm spacing starting from coordinates (1100, 1900). (Fig. 33)





11. "Q" command (Qn)

Designates the rotation angle of the characters. "n" is a value from 0 to 3. "n=0" is 0° , "n=1" is 90° , "n=2" is 180° and "n=3" is 270° . The initial value is "n=0"

10 REM *** Listing #11. *** 20 REM *** The 'Q' command. *** 30 LPRINT "S7" 40 LPRINT "G1" 50 LPRINT "M3000,200" 60 LPRINT "PRoland DG X-Y PLOTTER" 70 LPRINT "S3" 80 LPRINT "G0" 90 LPRINT "H"

Draws characters parallel to the y axis starting from coordinates (3000, 200). Movement between (1) and (2), and between (3) and (1) is made in a pen up condition. (Fig. 34) The condition designated by the "Q" command remains in effect until redesignation is made. Therefore, line 70 in the program cancels the n=1 designation and the system returns to the initial value. This was also done with the "S" command.

12. "N" command (Nn)

Draws special characters (marks) centering on the pen position. n is a value from 1 through 10. The respective marks are $\bullet, \diamondsuit, \square, \triangle, \boxtimes, \circlearrowright, \circlearrowright, \divideontimes, \And, \And$.

10 REM *** Listing #12. *** 20 REM *** The 'N' command. *** 30 LPRINT "S14":LPRINT "M1200,500" 40 FOR I=1 TO 10 50 LPRINT "N";I:LPRINT "R100,0" 60 NEXT I 70 LPRINT "S3" 80 LPRINT "H"

Draws marks in sequence, beginning with n=1 to 10 and starting from coordinates (1200, 500). Movement between (1) and (2), and between (3) and (1) is made in a pen up condition. (Fig. 35)







Designates mode change. "n" is a value from 0 to 2. n=0 is the PLOT mode, n=1 is the PRINTER mode and n=2 is the SELF-TEST mode.

10 REM *** Listing #13. *** 20 REM *** The 'ESC' command. *** 30 REM --- No 1 Printer Mood ---40 LPRINT CHR\$(27);"1" 50 REM --- No 2 Test Mood ---60 LPRINT CHR\$(27);"2" 70 REM --- No 3 Plotter Mood ---

80 LPRINT CHR\$(27);"0"

14. "J" command (Jn) (DXY-800 only)

Designates pen exchange for the DXY-800. "n" is a value from 1 to 8 and designates pen numbers 1 to 8, respectively. After pen change, the pen returns to the position prior to the "J" command designation. The initial value is n=1.

```
10 REM *** Listing #14. ***
20 REM *** The 'J' command. ***
30 LPRINT "M1500,1500"
40 LPRINT "J3"
50 LPRINT "D2100,1800"
60 LPRINT "J6"
70 LPRINT "D2700,1500"
80 LPRINT "H"
```

Initially moves to pen number 1, then returns to the home position, then moves between (1) and (3) in a pen up condition, then, in order to change pens, moves to the penstock from position (3), and after changing pens, returns to position (3), then draws a straight line between (3) and (4), then, from position (4), changes pens again, then draws a line between (4) and (5), and finally, returns to the home position. (Fig. 36)

Be sure that pens are loaded at penstock number 3 and number 6.

Immediately after turning power on, or after pressing the HOME switch, if a command other than a "J" command is initially input, pen number 1 will be selected.

15. "C" command (Cx, y, r, θ_1 , θ_2)

Draws circles and arcs. "x" and "y" designate the coordinates of the center of the circle or arc. "r" designates the radius. " θ_1 " and " θ_2 " designate the initial and final angles and are within a range of 0° to 360°. Drawing is made in the counterclockwise direction.

10 REM *** Listing #15. *** 20 REM *** The 'C' command. *** 30 LPRINT "C500,1500,300,0,360" 40 LPRINT "H"

Draws a figure 37 with the center at coordinates (500, 1500), a radius of 300 (30mm) and from 0° to 360°, in other words, a circle. (Fig. 37).







16. "E" command ($\text{Er}, \theta_1, \theta_2$)

Draws circles and arcs similar to the "G" command, however, the current position of the pen is the starting point for drawing the circle or arc. This command is convenient for continuous drawing of circles or arcs.

10 REM *** Listing #16. *** 20 REM *** The 'E' command. *** 30 LPRINT "J3" 40 LPRINT "M1500,1500" 50 FOR I=3 TO 5 60 LPRINT "J";I 70 LPRINT "E200,180,360" 80 NEXT I

90 LPRINT "H"

Draws arcs while changing pens. (Fig. 38) Load pens in penstock number 3 through number 5.

17. "A" command (Ax, y)

Designates the center coordinates for the "G" command and the "K" command. Once designated, it remains in effect until power is turned off or until redesignated.

10 REM *** Listing #17. *** 20 REM *** The 'A' command. *** 30 LPRINT "A500,1500"

18. "G" command (Gr, θ_1 , θ_2)

Draws a circle or arc around the position designated by the "A" command. Designation of the radius and the initial and final angles is performed similar to the "C" command.

- 10 REM *** Listing #17,#18 ***"
- 20 REM *** The 'A', 'G' command. ***
- 30 LPRINT "A500,1500"
- 40 LPRINT "6500,0,360"
- 50 LPRINT "H"

Draws a circle with the center at coordinates (500, 1500) and a radius of 500 (50mm). (Fig. 39)

19. "K" command (Kn ℓ_1 , ℓ_2)

Draws division lines and extraction lines for the circles drawn using "A" commands and "G" commands. The uppermost part (90°) is 0% and "n" designates the percentage in increments from 1% to 100% in a clockwise direction.

10 REM *** Listing #19. *** 20 REM *** The 'K' command. *** 30 FOR I=0 TO 100 STEP 10 40 LPRINT "K";I;",";"500,300" 50 NEXT I 60 LPRINT "H"

Draws division lines and extraction lines for the circles drawn in **17** and **18**. (Fig. 40)



20. "T" command (Tn, x, y, d, t)

Draws hatching or quadrangles. n=1 is for hatching only, n=2 is for boxes only, and n=3 is for drawing both hatching and boxes. "x" and "y" are the respective "x" axis and "y" axis lengths. "d" is the spacing between hatching. "t" designates the hatching angle. t=1 is 0°, t=2 is 45°, t=3 is 90°, and t=4 is 135°.

10 REM *** Listing #20. *** 20 REM *** The 'T' command. *** 30 LPRINT "M300,1400" 40 LPRINT "T3,400,200,20,2" 50 LPRINT "H"

Draws a 20 x 40mm box with hatching. Furthermore, to draw a box only, as a dummy, designate d=0 and the appropriate value of 1 to 4 for "t". (Fig. 41)

- If the values used in the respective drawing command examples are used just as they are, there will be no need to change the recording paper. (Provided 420mm x 297mm size recording paper is used.)
- If the line numbers are rearranged, programs 1 through 20 can be executed at the same time. (Fig. 42)
- If executed using the following equipment, add the lines as shown to the beginning and end of the sample program.

APPLE II (Apple)

10	PR#2	(When interface is plugged into
20	PRINT " "	the number 2 slot)
1000	PR#0	(Cancels interface card slot designation)
1010	END	

IBM-PC (IBM)

With an IBM-PC, for drawing hatching and circles, it may take approximately 4 or 5 seconds or more (since a Device Time Out error is generated).

10	ON ERROR GOTO 1000
:	
:	
1000	IF ERROR=24 THEN RESUME 0
1010	ON ERROR GOTO 0





3. Printer Mode.	 The DXY-800 and DXY-101 have a function for printing character codes just as they were input. This function is known as the PRINTER mode. By using this function, data received for making drawings can be checked. Check to see that the power switch is OFF, set the drawing point of origin, load the recording paper, and install a recording pen. Turn the power switch ON while pressing the HOME switch. Or, to get into the PRINTER mode after turning power on, use an "ESC" command. Pen number 1 will be installed in the pen carriage (DXY-800), the system will move to coordinates (200, 2500) and go to an awaiting input condition. To cancel the PRINTER mode, push the home switch and the pen up switch at the same time, or switch to the PLOT mode using an "ESC" command. In the PRINTER mode, character strings can be printed with character size of S=3 (2.8 x 1.6mm), 123 characters per line, and 53 lines per page. In the PRINTER mode, when 53 lines have been printed, the system returns to the initial page position (200, 2500). Thereafter, if the recording paper is changed and the HOME switch is pressed, the data signal will be read again and printing performed.
4. Error Indication and Recovery.	 Error indication When a condition occurs in which the DXY-800 or DXY-101 cannot operate correctly, the POWER LED blinks to indicate an error has occurred. An error indication is made when any of the following data is input. When an illegal command character is input. (For example "O", "W", etc.) When input is not made in the proper sequence. (For example, when HD200, 500 is input) When a parameter of 5 digits or greater is input. (For example, when M10000 is input) When the pen exceeds the operating range. "M" and "D" commands An error indication is made when a positive value parameter of 4 digits or less is input and a proper command is received and the pen begins to move toward the location, but a numerical value exceeding x=3500* or y=2600 has been input. "R" and "I" commands When a negative value parameter of 4 digits or less is input and a proper command is received and the pen begins to move toward the location, but a numerical value exceeding x=3500* or y=2600 has been input. "R" and "I" commands When a negative value parameter of 4 digits or less is input and a proper command is received and the pen begins straight line operation using the designated movement value, but the range of absolute coordinates exceeds x=0 to 3500* or y=0 to 2600, the movement in that direction will stop and an error indication will be made. "X" command When a command is received in which the "q" and "r" limit parameters are positive numbers of 4 digits or less, but, due to the drawing start position and the values of "q" and "r", the movement range is exceeded, an error indication will be

made.

- 5. When an illegal parameter is input
- When, for an "'M" command, "n" is 0 or greater than 10, or, for a "U" command, when "n" is 0 or greater than 4, an error indication will be made.
- ^O For "B", "S" and "Q" commands, even if an undefined value is input for the "l" or "n" parameter, if that value is a positive number of 4 digits or less, it will be accepted as a correct command and an error indication will not be made. However, in this case, it cannot be guaranteed as to what kind of operation will be performed.
- 6. For the DXY-101, a "J" command results in an error.
- * X = 3500 is valied for DXY-800 and X = 3700 for DXY-101.
- Error recovery

If an error indication is made, further operation cannot be guaranteed. Therefore, the error must be cleared.

Normally, this is done by inputting an "H" command or by pressing the HOME switch.

When an incorrect format has been input and an error indication has been made, thereafter, any input other than "LF" will not be accepted, so input "LF".

The error indication will not be cleared, but all subsequent command inputs will be executed. Also, when an error occurs as a result of exceeding the operating range, even after the error indication is made, drawing operating can be continued, but the accuracy of the pen position cannot be guaranteed.

W.**Appendices**.

1. Sample Programs.

The following programs are written in BASIC for IBM-PC, TRS-80 and APPLE II. But these may be translated easily into other BASIC dialects, and into other languages.

Fig. 43



For IBM-PC

10 REM *** SAMPLE PROGRAM *** 20 REM 30 ON ERROR GOTO 1000 40 REM 50 FI=3.14159 60 FOR A=-60 TO 430 STEP 3 X1≐2000+INT(300*COS(PI*A/180)) 70 Y1=1800+INT(100*SIN(FI*A/180)+A/2) 80 100 X2=1700+INT(500*CDS(PI*A/180-2.5)) 110 Y2=600+INT(200*SIN(PI*A/180-2.5)-A/2) 120 LPRINT"M":X1;",";Y1:LPRINT"D";X2;",";Y2 130 NEXT A 140 LPRINT"H" 150 ENÐ 1000 IF ERR=24 THEN RESUME O 1010 ON ERROR GOTO 0

For TRS-80

100 REM *** SAMPLE PROGRAM *** 110 REM 120 PI=3.14159 130 FOR A=-60 TO 430 STEP 5 140 X1=2000+INT (300*COS (PI*A/180)) 150 Y1=1800+INT (100*SIN (PI*A/180) +A/2) 160 X2=1700+INT (500*COS (PI*A/180-2.5)) 170 Y2=600+INT (200*SIN (PI*A/180-2.5) -A/2) 180 LPRINT "M";X1;",";Y1:LPRINT "D";X2;",";Y2 190 NEXT A 200 LPRINT "H" 210 END

```
For APPLE II
           100 REM *** SAMPLE PROGRAM ***
                    N= SLOT NUMBER
           110 REM
           120 N=2
           130 PR# N
            140 PI=3.14159
            150 FOR A=-60 TO 430 STEP 5
            160 X1=2000+INT (300*CDS(PI*A/180))
                Y1=1800+INT(100*SIN(PI*A/180)+A/2)
            180 X2=1700+INT (500*COS (PI*A/180-2.5))
            190 Y2=600+INT(200*SIN(PI*A/180-2.5)-A/2)
            200 PRINT "M";X1;",";Y1:PRINT "D";X2;",";Y2
            210 NEXT A
            220 PRINT "H"
            230 PR# 0
            240 END
```

2. Specifications.

	DXY-800	DXY-101	
•Effective Plotting Range	X-axis 350mm, Y-axis 260mm	X-axis 370mm, Y-axis 260mm	
 Plotting Speed 	180mm/sec (maximum in axial direction)		
●Step Size	0.1mm/step		
 Distance Accuracy 	1% or less of tra	aveling distance	
 Repetition Accuracy 	0.3mm	or less	
●Switches	Power, Pen up/down, Hom	ne, Speed Select, Bit Select	
●LED	Power/Error, Pen Up		
Parallel Interface	Centronics compatible		
Input	STROBE (1 Bit), 7/8 Bit Parallel Data		
Output	BUSY (1 Bit), ACK (1 Bit), ERROR (1 Bit)		
I/O Signal Level	TTL level		
Input Transmission	Asynchronous		
System			
Input Data	7 bit/8 bit		
 Serial Interface 	RS-232C compatible		
Transfer method	Non-synchronous, simplex data transfer		
Transfer speed	300, 600, 1200, 2400, 4800, 9600 baud (Switched using DIP switch)		
Stop bit	Bit 1 or bit 2 (Switched using DIP switch)		
Parity check	Even, odd, none (Switched using DIP switch)		
Data bit	Bit 7 or bit 8 (Switched using DIP switch)		
●Recording Pen	8 (Black, red, brown, blue, green, purple, orange, pink)	1 (Black)	
Power Supply	AC adaptor (DC +9V, +28V)		
Power Consumption	20W		
•Dimensions (W x D x H)	19-1/2'' (W) x 17-1/8'' (D) x 3'' (H) in (496 x 435 x 77 mm)		
●Weight	4.1kg (9 lb) 4.0 kg (8 lb 13 oz)		

* Specifications are subject to change without notice.

3. DIP Switch Settings. (For RS-232C Interface)





 Par Par Bau Sto Dat 	ity check ity check ud rate p bit a bit	· · · · · · · · · · · · · · · · · · ·	Even Yes 9600 Bit 2 Bit 8
Switch Number	Function		
1	Baud rate	300 baud -	
2	"	600 baud -	
3	"	1200 baud -	
4	<i>''</i>	2400 baud -	
5	"	4800 baud -	
6		9600 baud -	
7	Parity check	ON: ODD	DFF: EVEN
8	Data bit	ON: 7 bit (DFF: 8 bit
9	Stop bit	ON:1 bit (DFF: 2 bit
10	Parity check	ON: YES	DFF: NO
			 (Notes) Switch the DIP switch to match the specifications of the computer side. (Parity check, stop bit and baud rate) For baud rate switch switching, be sure only one is on. Also, when switching, first turn all switches OFF then turn the switch for the desired baud rate ON.
4. Opti	ons.		The following separately sold options are available for the DXY-800 and DXY-101. Please consult a Roland D G office or your dealer for details.
			Pen holder set

Pen holder set	XY-4PH	4/set
Exclusive pen set	XY-4SPA	(Black) 4/set
	XY-4SPB	(Black, blue, red,
		green - 1 each) 4/set
	XY-4SPC	(Orange, purple,
		brown, pink-1
		each) 4/set
Connection cable · · · · · · · ·	XY-PC6	For NEC PC8801
Parallel interface card	Parallel Car	d For APPLE II

5. When Using Machine Language with the DXY-800 or DXY-101

1. Control method

DXY-800 and DXY-101 control format is as follows. COMMAND, PARAMETER, PARAMETER · · ; PARA-METER, TERMINATOR.

Commands are single English capital letters listed in the "COMMAND" section of the Drawing Command Table. twenty commands are available such as "D", "M", "I", etc. Parameters provide information for the above commands and are normally input using numbers, however, in some cases, such as for the "P" command, letter codes may be used, and the "H" command has no parameters. A command is used to separate the parameters and is known as a "delimiter" and by using this for the "D" command or "I" command, consecutive parameters can be input. The terminator indicates the end of the drawing command and is input as "LF(0A)", "CR(0D)" or "CRLF (0D0A)".





2. Drawing command classifications and abbreviations

- 1) "'L", "B", "S", "Q" AND "U" commands, once input, remain in effect until changed.
- 2) "X", "H", "N" and "Z" commands take effect after a terminator is received.
- 3) The "P" command does not require a delimiter between parameters, but prints each character as it is received.
- 4) The "C" and "E" commands draw circles and arcs individually.
- 5) The "A", "G" and "K" commands are used in combination to draw division lines and extraction lines for circles, arcs and circular graphs pie charts.
- 6) The "T" command is used to draw hatching and quadrangles.
- 7) "M", "Ď", "R" and "I" commands perform vector movements.

Drawing commands in 1) through 6) above have no abbreviations. They begin with a command and end with a terminator. For the four commands in 7) above, the following abbreviation methods are available.



The initiation using a command and termination using a terminator as shown above may be abbreviated as shown below.



In other words, if input as shown above, if a comma follows Y_1 , the plotter starts to draw a straight line from the current position in the direction of X_1 , Y_1 and upon reaching X_1 , Y_1 goes to a condition in which it is able to receive X_2 , Y_2 . If a delimiter follows Y_2 , it moves in the same manner, executing the "D" command until receiving a terminator.

ROLAND CORP US 7200 DOMINION CIRCLE Los Angeles, CA 90040

213-722-6933





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