



**HEWLETT  
PACKARD**

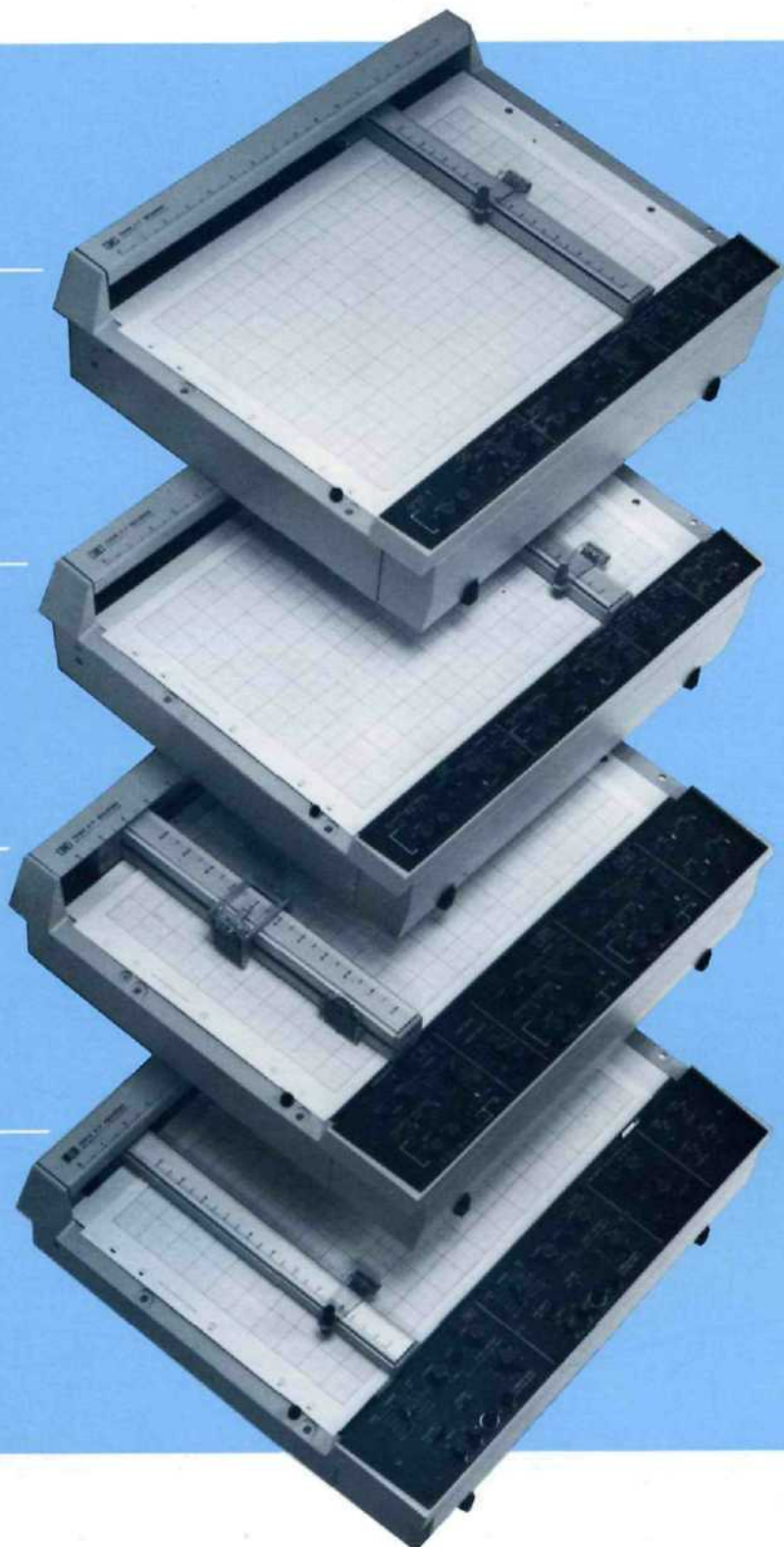
**LABORATORY  
X-Y RECORDERS**

11 in. X 17 in. and A3

**7044B/7045B**

**7046B/7047A**

TECHNICAL DATA, NOVEMBER 1980



**7044B**

**general purpose**

**7045B**

**high speed**

**7046B**

**two pens, high speed**

**7047A**

**high sensitivity**

## DYNAMIC PERFORMANCE

Hewlett-Packard offers a family of laboratory instruments designed to help you make X-Y recordings easily, accurately, and reliably. This line — 7044B, 7045B, 7046B, and 7047A — provides a range of dynamic performance and sensitivity that gives you the versatility, performance, and dependability required in laboratory applications. You have the choice of medium or high speed, one or two pens, medium or high sensitivity, allowing you to pick the configuration required for your application.

## FEATURES

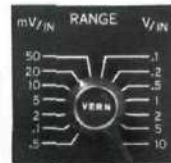
The electrostatic holddown system, silent and trouble-free with no moving parts, solidly grips any size paper up to  $28 \times 41.9$  cm ( $11 \times 17$  in.) including the standard ISO A3. And the disposable fiber-tip ink pen produces a clean, crisp, continuous trace. Four easy-to-change colors (black, blue, red, green) on the 7044B, 7045B, 7047A and three colors (blue, red, black) on the 7046B are available to permit easy trace identification. The continuous duty servo motors, used on both the X and Y axes, allow the pen to be driven off-scale for long periods of time without being damaged. Built-in hardware simplifies table or rack mounting.

The front panel polarity switch reverses pen direction, eliminating the need to reverse input leads. Standard on all models are TTL remote control and rear connector. The TTL control allows remote control of such items as pen lift, servo mute, electrostatic holddown, and event marker. On Models 7045B and 7046B, a response switch is provided that significantly reduces the recorder slewing speed to facilitate initial setup.

Very high resolution 10-turn verniers are provided for precise and repeatable adjustments on the 7044B, 7045B, and 7046B. These verniers provide continuous overlapping sensitivity adjustment for each adjacent pair of calibrated voltage ranges.



Fourteen ranges with easy-to-use 1, 2, 5, 10 scaling speeds set-up of calibrated graphs.



Convenient, rear-mounted, banana jack receptacle is provided for remote controlled pen lift on the 7044B, 7045B, and 7046B.

## Quality in Common

This series of general-use X-Y recorders has been designed to satisfy both current and future laboratory applications. The high-level performance and reliability of these recorders are the results of a design philosophy that has evolved through 30 years of Hewlett-Packard experience as the leading manufacturer of X-Y recorders.

Each unit is designed to meet exacting Hewlett-Packard environmental specifications. For example, units are designed to meet performance specifications over a temperature range of  $0^{\circ}$  to  $55^{\circ}$  C; 95% relative humidity at  $40^{\circ}$  C; plus rugged shock, vibration, RFI, and altitude specifications.

All mechanical components are designed for rugged use and long life. For example, the servo mechanism is constructed to exceed 50 kilometres (5 years of average use) of pen travel without needing adjustment. In addition, all precision mechanical components critical to maintaining long-term alignment are mounted on a single-piece casting.

# PERFORMANCE SPECIFICATIONS

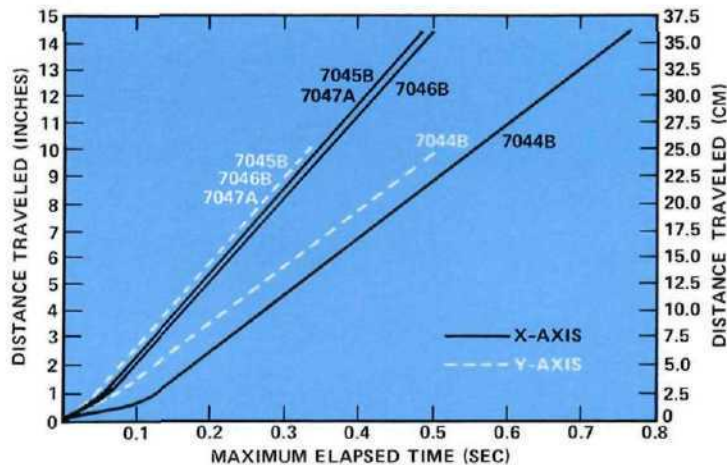
## INPUT SPECIFICATIONS

	7044B General Purpose	7045B High Speed	7046B Two Pens	7047A High Sensitivity
Type of Input	Front and rear input. Floating, Guarded. Polarity reversal switch on front panel.			Front input only. Floating, Guarded. Employs a unique common mode driver circuit; eliminates need for connecting CMV to recorder if CMV $\leq$ 10V peak.
Input Ranges	0.5, 1, 2, 5, 10, 20, 50 mV/in.; 0.1, 0.2, 0.5, 1, 2, 5, 10 V/in. (metric calibration available in 0.25, 0.5, 1.0, 2.5, 5, 10, 25 mV/cm; 0.05, 0.1, 0.25, 0.5, 1.0, 2.5, 5 V/cm). Continuous vernier between ranges.			0.05, 0.1, 0.5, 1, 5, 10 mV/in.; 0.05, 0.1, 0.5, 1, 5, 10 V/in. (metric calibration available in 0.02, 0.05, 0.1, 0.5, 1, 5 mV/cm; 0.01, 0.05, 0.1, 0.5, 1, 5 V/cm). Continuous vernier between ranges.
Input Resistance	————— < 1 megohm constant on all ranges. > —————			
Source Resistance	10 k $\Omega$ maximum on all ranges.			10 k $\Omega$ maximum on all ranges except .02 mV/cm, .05 mV/cm, and .1 mV/cm (.05 mV/in. and .1 mV/in.) where it is 2 k $\Omega$ maximum.
Accuracy	$\pm$ 0.2% of full scale (includes linearity and deadband) at 25° C. Temp Coefficient $\pm$ 0.01% per ° C.			
Range Accuracy	$\pm$ 0.2% of full scale $\pm$ 0.2% of deflection (includes linearity and deadband) at 25° C. Temp Coefficient $\pm$ 0.01% per ° C.			
Deadband	————— < 0.1% of full scale. > —————			
Common Mode Rejection	110 dB dc and 90 dB ac (exceeds 130 dB dc and 110 dB ac under normal lab environmental conditions) with 1 k $\Omega$ between HI and LO terminals CMV applied between ground and LO, and attenuator on most sensitive range. CMR decreases 20 dB per decade step in attenuation.			130 dB dc and 130 dB ac with 1 k $\Omega$ imbalance in either the high or low terminal (exceeds 150 dB under normal lab conditions). CMR decreases 20 dB per decade step in attenuation from the most sensitive range.
Normal Mode Rejection	Internal filter not available.			30 dB minimum at line frequency with FILTER IN. (50 dB typical at 60 Hz and 40 dB typical at 50 Hz.)

## DYNAMIC SPECIFICATIONS

Slewing Speed	50 cm/sec (20 in./sec) min.	76 cm/sec (30 in./sec) minimum. (97 cm/sec [38 in./sec] typical under normal lab conditions.)		
Acceleration Peak — Y-Axis	2540 cm/sec <sup>2</sup> (1000 in./sec <sup>2</sup> )	7620 cm/sec <sup>2</sup> (3000 in./sec <sup>2</sup> )	6350 cm/sec <sup>2</sup> (2500 in./sec <sup>2</sup> )	7620 cm/sec <sup>2</sup> (3000 in./sec <sup>2</sup> )
— X-Axis	1270 cm/sec <sup>2</sup> (500 in./sec <sup>2</sup> )	5080 cm/sec <sup>2</sup> (2000 in./sec <sup>2</sup> )	3800 cm/sec <sup>2</sup> (1500 in./sec <sup>2</sup> )	5080 cm/sec <sup>2</sup> (2000 in./sec <sup>2</sup> )
Overshoot	2% of full scale maximum.	————— < 1% of full scale maximum. > —————		

## STEP INPUT RESPONSE



# PERFORMANCE SPECIFICATIONS (Continued)

## OFFSET SPECIFICATIONS

	7044B General Purpose	7045B High Speed	7046B Two Pens	7047A High Sensitivity
<b>Zero Offset</b>	Zero may be placed anywhere on the writing area or electrically off scale up to one full scale from zero index.			Eleven calibrated scales of zero offset in both axes. Switchable in steps of one full scale from +1 to -10.
<b>Offset accuracy at 25°C</b> (applies to calibrated only)	————— < Not Applicable. > —————			±0.1% of full scale times N where N = number of scales of offset.
<b>Offset Temperature Coefficient</b>	————— < Not applicable. > —————			±0.004% of full scale times N per °C.
TIME BASE SPECIFICATIONS				
<b>Time Base</b>	Optional: 8 speeds; 0.5, 1, 2, 5, 10, 20, 50, 100 sec/in. (metric calibration is 0.25, 0.5, 1, 2.5, 5, 10, 25, 50 sec/cm) switchable into X or Y axis.			Standard: 6 speeds; 0.5, 1, 5, 10, 50, 100 sec/in. (metric calibration .1, .5, 1, 5, 10, 50 sec/cm) switchable into X or Y axis.
<b>Time Base Accuracy</b>	————— < 1.0% at 25°C. Temp Coefficient ±0.1%/C° > —————			

## GENERAL SPECIFICATIONS

	7044B General Purpose	7045B High Speed	7046B Two Pens	7047A High Sensitivity
<b>Power</b>	100, 120, 220, 240 Vac +5 -10% 48 to 440 Hz 135 VA	100, 120, 220, 240 Vac +5 -10% 48 to 440 Hz 175 VA	100, 120, 220, 240 Vac +5 -10% 48 to 440 Hz 175 VA	100, 120, 220, 240 Vac +5 -10% 48 to 66 Hz 180 VA
<b>Pen Lift</b>	————— < Electric (remote via TTL level) > —————			
<b>Writing Area</b>	————— < 25 cm × 38 cm (10 × 15 in.) > —————			
<b>Weight</b>	Net 13.7 kg (30 lb); shipping 19.1 kg (42 lb)		Net 16 kg (35 lb); shipping 21.3 kg (47 lb)	Net 18.6 kg (41 lb); shipping 24 kg (53 lb)

## OPTIONS

	Option	Option	Option	Option
<b>Metric</b>	006	006	007	001
<b>Event Marker</b>	002	002	002	002
<b>Time Base</b>	001	001	001	Standard

## ACCESSORIES SUPPLIED

7044B, 7045B	Description	Part Number	7047A	Description	Part Number
1. Accessory Kit		07044-60541	1. Accessory Kit		07047-60010
1 Package	Disposable Pens, Red	5081-1190	1 Package	Disposable Pens, Red	5081-1190
1 Package	Disposable Pens, Blue	5081-1191	1 Package	Disposable Pens, Blue	5081-1191
1	Slidewire Cleaner	5080-3605	1	Slidewire Cleaner	5080-3605
1	Lock R & P	1251-1029	1	Extender Cable	07047-60037
1	Hood Connector	1251-2264	1	Lock R & P	1251-1029
1	Conn. R & P 37-Pin	1251-3062	1	Hood Connector	1251-2264
			1	Conn. R & P 37-Pin	1251-3062
2. Operating and Service Manual (7044B/7045B)		07044-90006	2. Operating and Service Manual (7047A)		07047-90000
3. Dust Cover (7044B/7045B)		4040-0879	3. Dust Cover (7047A)		4040-0073
7046A			7044B, 7045B, 7046B, 7047A		
1. Accessory Kit		07046-60480	1. Graph Paper, 10 sheets (English, Heavy)		9270-1004
1 Package	Disposable Pens, Red	5060-6662	Graph Paper, 10 sheets (English, Light)		9270-1005
1 Package	Disposable Pens, Blue	5060-6664	2. Graph Paper, 10 sheets (Metric, Heavy)		9270-1024
1	Slidewire Cleaner	5080-3605	Graph Paper, 10 sheets (Metric, Light)		9270-1042
1	Lock R & P	1251-1029	3. Power Cord (2.3 m [7.5 ft.])		8120-1348
1	Hood Connector	1251-2264	4. Side Trim Panel — Left (7044B/7045B)		07040-00416
1	Conn. R & P 37-Pin	1251-3062	Side Trim Panel — Right (7044B/7045B)		07040-00417
2. Operating and Service Manual (7046B)		07046-90009	Side Trim Panel — Left (7046B/7047A)		07046-60800
3. Dust Cover (7046B)		4040-0073	Side Trim Panel — Right (7046B/7047A)		07046-60810

# RECORDER SELECTION

## 7044B general purpose



The 7044B and 7045B one-pen recorders offer a choice of dynamic response to fit most applications. The 7044B is a medium speed recorder designed for general-purpose applications. It is a dependable lab recorder — the “workhorse” of the line.

## 7045B high speed



For higher speed applications, the performance of the 7045B offers higher slewing speed and acceleration in both X and Y axes. This high dynamic performance allows the 7045B to faithfully reproduce an extremely wide range of fast-changing input signals.

## 7046B two pen, high speed



The 7046B offers dynamic performance similar to the 7045B in a two-pen model. Both Y axes have virtually no overshoot, allowing accurate plotting of two variables against a third.

## 7047A high sensitivity

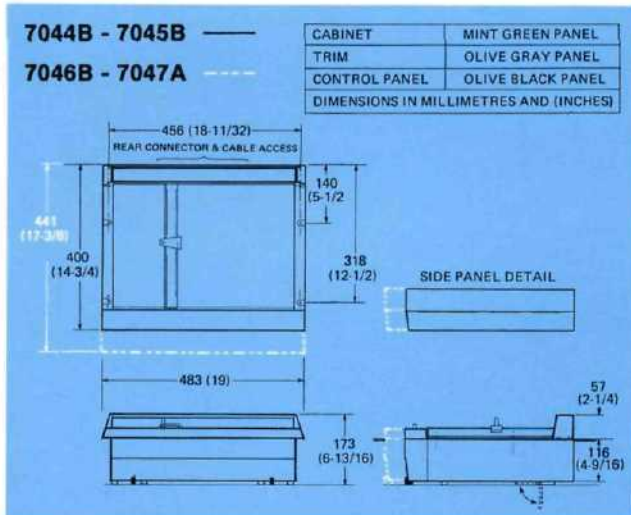


The 7047A is the most sensitive recorder ever built by Hewlett-Packard. This one-pen model features the dynamic response of the 7045B plus microvolt sensitivity — 20  $\mu\text{V/cm}$  to 5 V/cm (50  $\mu\text{V/in.}$  to 10 V/in.) — coupled with ruggedness and reliability. A Common Mode Driver circuit eliminates the need for connecting CMV source to CMV terminal below 10 volts of CMV. Switchable input filter provides 40 dB of normal mode rejection. Time Base with six sweep speeds is standard! For applications that are many and varied, the 7047A provides the maximum in user versatility.

## OPTIONS

For additional capability, three options are available — Time Base (standard on 7047A), Event Marker, and Metric Calibration. The optional Time Base has eight sweep speeds. The easily-accessible plug-in Event Marker identifies significant events in a recording sequence. Additionally, Metric Calibration is yours for the asking.

**Optional time base:** With this optional time base, these X-Y recorders can record data versus time. The user can apply eight calibrated sweep speeds to either the X or Y axis (X axis only on 7046B). This furnishes a full range of speed rates from 0.25 s/cm to 50 s/cm. The time base provides automatic pen control and accepts remote triggering for start, sweep, and reset.



# RECORDER SUPPLIES

Hewlett-Packard's accessories and supplies are selected with the same attention to quality and performance as the instruments for which they are designed. Paper, pen, and ink quality all contribute to the process of achieving vivid colors, clean crisp lines, and a permanent, accurate output record.

These supplies are those most frequently used in recording applications. The complete listing may be found in HP's Recorder Supplies Catalog.

Since it is essential that recorder supplies are available to you where and when you need them, the Hewlett-Packard distribution organization is dedicated to rapid, reliable delivery. HP has 175 sales and services offices located in 65 countries ensuring rapid processing and prompt delivery of your order.

Record with confidence. Record with Hewlett-Packard recorder supplies.

## RECORDING PAPER

ENGLISH GRID			METRIC GRID				
Model Number	Description	Part Number	Model Number	Description	Part Number	Price	
	11 × 17 in. (100 sheets per box)			280 × 420 mm (100 sheets per box)			
All Models	Blank	9280-0180	All Models	Blank	9280-0180		
	Standard grid			Standard grid			
	heavy paper	9270-1004		heavy paper	9270-1024		
	lightweight paper	9270-1005		lightweight paper	9270-1042		
	Gemkote® paper	9280-0269					
	Semilogarithmic						
	linear × 2 cycle	9280-0159					
	linear × 3 cycle	9280-0160					
	3 cycle × linear	9280-0168					
	2 cycle × linear	9280-0169					
	Logarithmic						
	2 cycle × 3 cycle	9280-0167					
	3 cycle × 2 cycle	9280-0165					
	3 cycle × 4 cycle	9280-0171					

## WRITING SYSTEMS

SIGNAL PEN SYSTEM			EVENT MARKER SYSTEM					
Model Number	Description	Part Number	Model Number	Description	Part Number			
7044B 7045B 7047A	Disposable pens (package of 5) red blue green black	5081-1190	7044B 7045B 7047A	Event marker installation kit	07044-60001			
		5081-1191						
		5081-1192	7046B only	Event marker installation kit	07046-60012			
		5081-1193						
7046B only	Disposable pens (package of 3) red blue black	5060-6662	All Models	Disposable capillary tips (box of 5)	5080-3655			
		5060-6664				.77 cc replaceable cartridges		
		5060-6668					red	1530-1026
							blue	1530-1028
		green	1530-1027					
		black	1530-0981					
			purple	1530-0982				

