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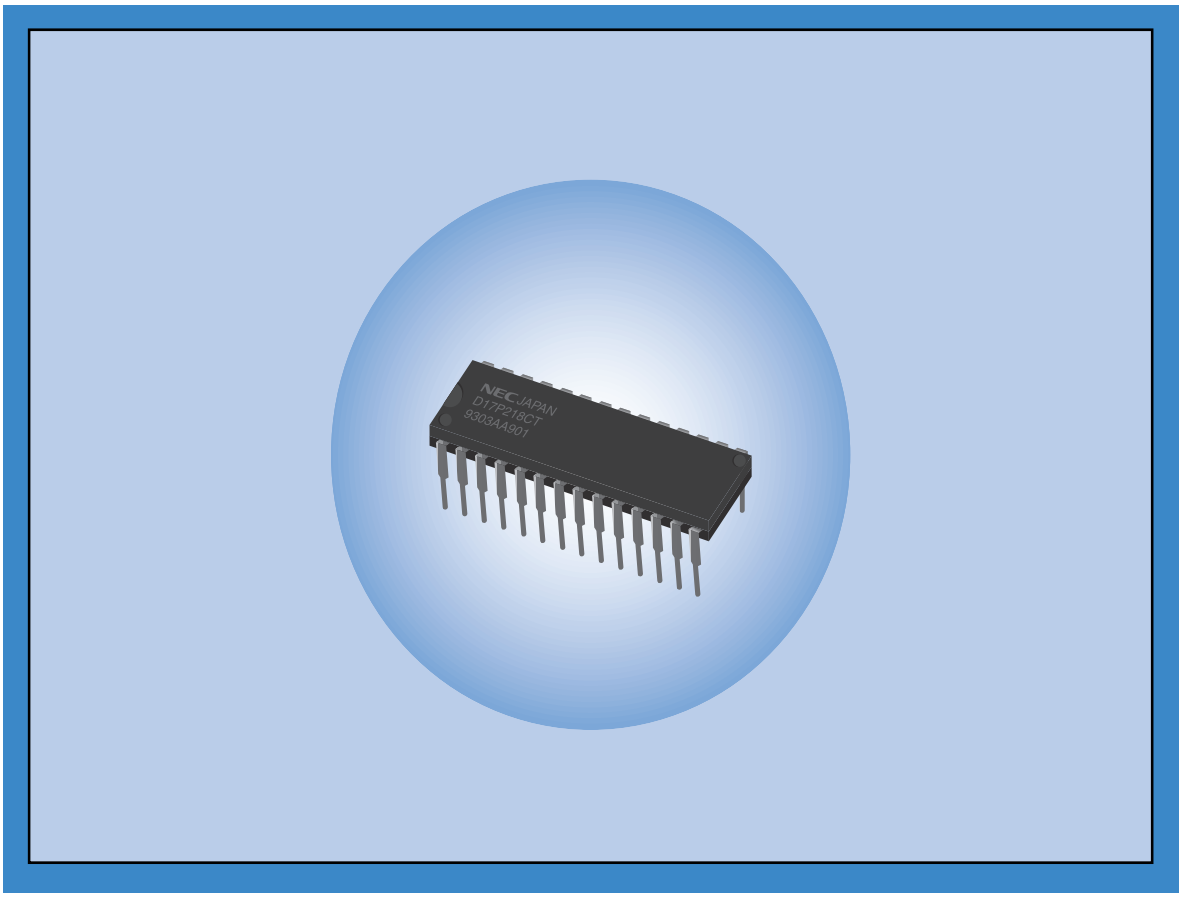
NEC

Microcontrollers for Remote Controllers



November 2002

For General-Purpose Remote Controllers

69A Series

fx = 3.5 to 4.5 MHz ceramic oscillation

- **µPD69A**
  4 KW/128
  20 SSOP, 56 keys
  High-speed instruction execution and low POC detection voltage selectable by mask option.
- **µPD68A**
  2 KW/32
  20 SSOP, 56 keys
- **µPD67A**
  1 KW/32
  20 SSOP, 56 keys

For Preset Remote Controllers

1724x Series

- µPD17246 — 32 KB/447 — 30 SSOP
- µPD17245 — 24 KB/447 — 30 SSOP
- µPD17244 — 20 KB/447 — 30 SSOP
- µPD17243 — 16 KB/447 — 30 SSOP
- µPD17242 — 12 KB/447 — 30 SSOP
- µPD17241 — 8 KB/447 — 30 SSOP
- µPD17240 — 4 KB/447 — 30 SSOP

789088 Subseries

- µPD789088 — 32 KB/576 — 30 SSOP
- µPD789086 — 16 KB/384 — 30 SSOP

For LCD Remote Controllers

789467 Subseries

- μPD789467 24 KB/512 — 52 LQFP
- μPD789466 16 KB/512 — 52 LQFP
- μPD789464 8 KB/256 — 52 LQFP
- μPD789462 4 KB/256 — 52 LQFP

789327 Subseries

- μPD789327 24 KB/512 — 52 LQFP
- μPD789326 16 KB/512 — 52 LQFP
- μPD789324 8 KB/256 — 52 LQFP
- μPD789322 4 KB/256 — 52 LQFP

μPD69A Series

For infrared remote control transmitters/
general-purpose applications

Part Number	**μPD67A**	**μPD68A**	**μPD69A**	**μPD6P9**
Major applications	AV, household electric appliances			
ROM size	1002 × 10 bits	2026 × 10 bits	4074 × 10 bits	
	Mask ROM			One-time PROM
RAM size	32 × 4 bits		128 × 4 bits	
Number of supported keys	32 (standard)/56 (when using key expansion pin)			
Operation clock frequency (fx)	3.5 to 4.5 MHz (ceramic oscillation)			
Instruction execution time	16 μs (@ fx = 4 MHz)		16 μs or 8 μs Note 1 (@ fx = 4 MHz)	
Modulation carrier frequency	Each high-/low-level width can be set from 250 ns to 64 μs (@ fx = 4 MHz) via modulo registers			
Timers	9-bit programmable timer: 1 channel, timer clock: fx/64			
POC circuit	On chip			
RAM retention detector	On chip			
Power supply voltage (V_{DD})	2.0 to 3.6 V		2.0 to 3.6 V or 1.8 to 3.6 V Note 2	2.2 to 3.6 V
Package	20-pin plastic SSOP (7.62 mm (300))			
Development tools	Assembler			

Notes 1. Selectable by mask option in the μPD69A. Fixed in each product of the μPD6P9.

2. Selectable by mask option

μPD1724x Series

For preset remote controllers/
small-scale general-purpose applications

Part Number	**μPD17240**	**μPD17241**	**μPD17242**	**μPD17243**	**μPD17244**	**μPD17245**	**μPD17246**
Major applications	Preset remote controllers, toys, portable systems						
ROM size	2048 × 16 bits	4096 × 16 bits	6144 × 16 bits	8192 × 16 bits	10240 × 16 bits	12288 × 16 bits	16384 × 16 bits
RAM size	447 × 4 bits						
Carrier generator for infrared remote controller	On chip						
I/O ports	Input: 5, I/O: 19						
External interrupt	1						
Timers	2 channels						
Watchdog timer	On chip						
Low voltage detector	On chip						
RAM retention detector	On chip						
Instruction execution time (@ 4 MHz)	High-speed mode: 4 μs/Normal mode: 8 μs						
Power supply voltage (V_{DD})	2.0 to 3.6 V						
Package	30-pin plastic SSOP (7.62 mm (300))						
One-time PROM product	μPD17P246						
Development tools	Assembler, device file, integrated debugger, in-circuit emulator						

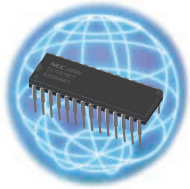
μPD789088 Subseries

For preset remote controllers/
small-scale general-purpose applications

Part Number		μPD789086	μPD789088	μPD78F9088
Major applications		Preset remote controllers, toys, portable systems		
ROM size		16 KB	32 KB	
		Mask ROM		Flash memory
RAM size		384 bytes	576 bytes	
Operation clock frequency (fx)		1.0 to 5.0 MHz (ceramic/crystal oscillator)		
Instruction execution time		0.4 μs/0.8 μs/1.6 μs (@ fx = 5.0 MHz)		
General-purpose registers		8 bits × 8 registers		
Instruction set		• 16-bit operations • Bit manipulation (set, reset, test) etc.		
I/O ports		24		
Timers		• 8-bit timer: 3 channels • 16-bit timer: 1 channel • Watchdog timer: 1 channel		
Timer outputs		1		
Serial interface		UART/3-wire serial I/O mode: 1 channel		
Key return circuit		On chip		
Vectored interrupt sources	Maskable	Internal: 8, External: 2		
	Non-maskable	Internal: 1		
Reset		• Reset by $\overline{\text{RESET}}$ signal input • Internal reset by watchdog timer • Reset via power-on-clear circuit		
Power supply voltage (V_{DD})		1.8 to 5.5 V		
Package		30-pin plastic SSOP (7.62 mm (300))		
Development tools		Assembler, C compiler, device file, integrated debugger, system simulator, in-circuit emulator		

μPD789327 Subseries

For infrared remote control transmitters/
LCD drive



Part Number		μPD789322	μPD789324	μPD789326	μPD789327	μPD78F9328
Major applications		AV, air conditioners				
ROM size		4 KB	8 KB	16 KB	24 KB	32 KB
		Mask ROM				Flash memory
RAM size		256 bytes		512 bytes		
LCD display RAM size		24 × 4 bits				
Operation clock frequency (fx)		• 1.0 to 5.0 MHz (Main system clock: Ceramic/crystal oscillation) • 32.768 kHz (Subsystem clock: Crystal oscillation)				
Instruction execution time		• 0.4 μs/1.6 μs (@ 5.0 MHz operation with main system clock f_X) • 122 μs (@ 32.768 kHz operation with subsystem clock f_{XT})				
General-purpose registers		8 bits × 8 registers				
Instruction set		• 16-bit operations • Bit manipulation (set, reset, test) etc.				
I/O ports		21				
Timers		• 8-bit timer: 2 channels • Watch timer: 1 channel • Watchdog timer: 1 channel				
Timer output		1				
POC circuit		Mask option				On chip
Serial interface		3-wire serial I/O mode: 1 channel				
LCD controller/driver		• Segment signal outputs: 24 • Common signal outputs: 4				
Vectored interrupt sources	Maskable	Internal: 6, External: 2				
	Non-maskable	Internal: 1				
Reset		• Reset by $\overline{\text{RESET}}$ signal input • Internal reset by watchdog timer • Reset via power-on-clear circuit				
Power supply voltage (V_{DD})		1.8 to 5.5 V				
Package		52-pin plastic LQFP (10 × 10)				
Development tools		Assembler, C compiler, device file, integrated debugger, system simulator, in-circuit emulator				

μPD789467 Subseries

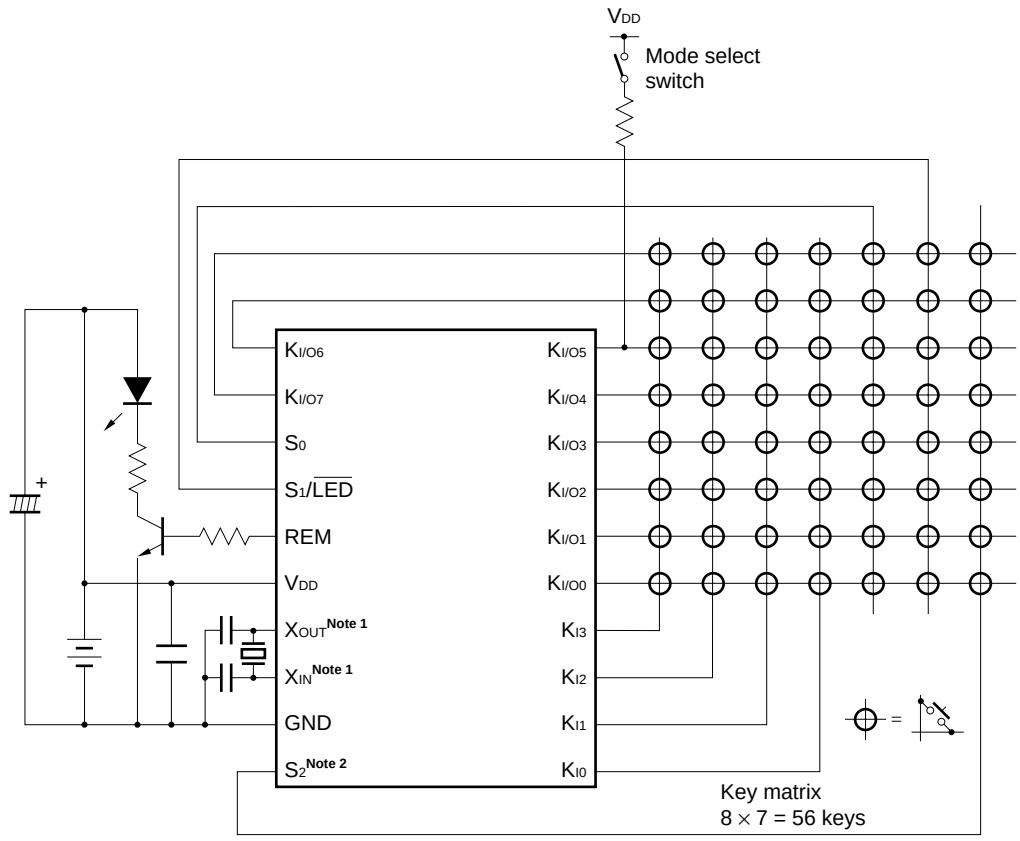
For infrared remote control transmitters/ LCD drive

Part Number		μPD789462	μPD789464	μPD789466	μPD789467	μPD78F9468
Major applications		AV, air conditioners				
ROM size		4 KB	8 KB	16 KB	24 KB	32 KB
		Mask ROM				Flash memory
RAM size		256 bytes		512 bytes		
LCD display RAM size		23 × 4 bits				
Operation clock frequency (fx)		• 1.0 to 5.0 MHz (Main system clock: Ceramic/crystal oscillation) • 32.768 kHz (Subsystem clock: Crystal oscillation)				
Instruction execution time		• 0.4 μs/1.6 μs (@ 5.0 MHz operation with main system clock f_X) • 122 μs (@ 32.768 kHz operation with subsystem clock f_{XT})				
General-purpose registers		8 bits × 8 registers				
Instruction set		• 16-bit operations • Bit manipulation (set, reset, test) etc.				
I/O ports		18				
Timers		• 8-bit timer: 2 channels • Watch timer: 1 channel • Watchdog timer: 1 channel				
Timer output		1				
POC circuit		Mask option				On chip
A/D converter		8-bit resolution × 1 channel				
LCD controller/driver		• Segment signal outputs: 23 • Common signal outputs: 4 • On-chip booster				
Vectored interrupt sources	Maskable	Internal: 6, External: 2				
	Non-maskable	Internal: 1				
Reset		• Reset by $\overline{\text{RESET}}$ signal input • Internal reset by watchdog timer • Reset via power-on-clear circuit				
Power supply voltage (V_{DD})		1.8 to 5.5 V				
Package		52-pin plastic LQFP (10 × 10)				
Development tools		Assembler, C compiler, device file, integrated debugger, system simulator, in-circuit emulator				

Application

Remote control transmitter (56 keys; mode selection switch accommodated)

μPD69A Series



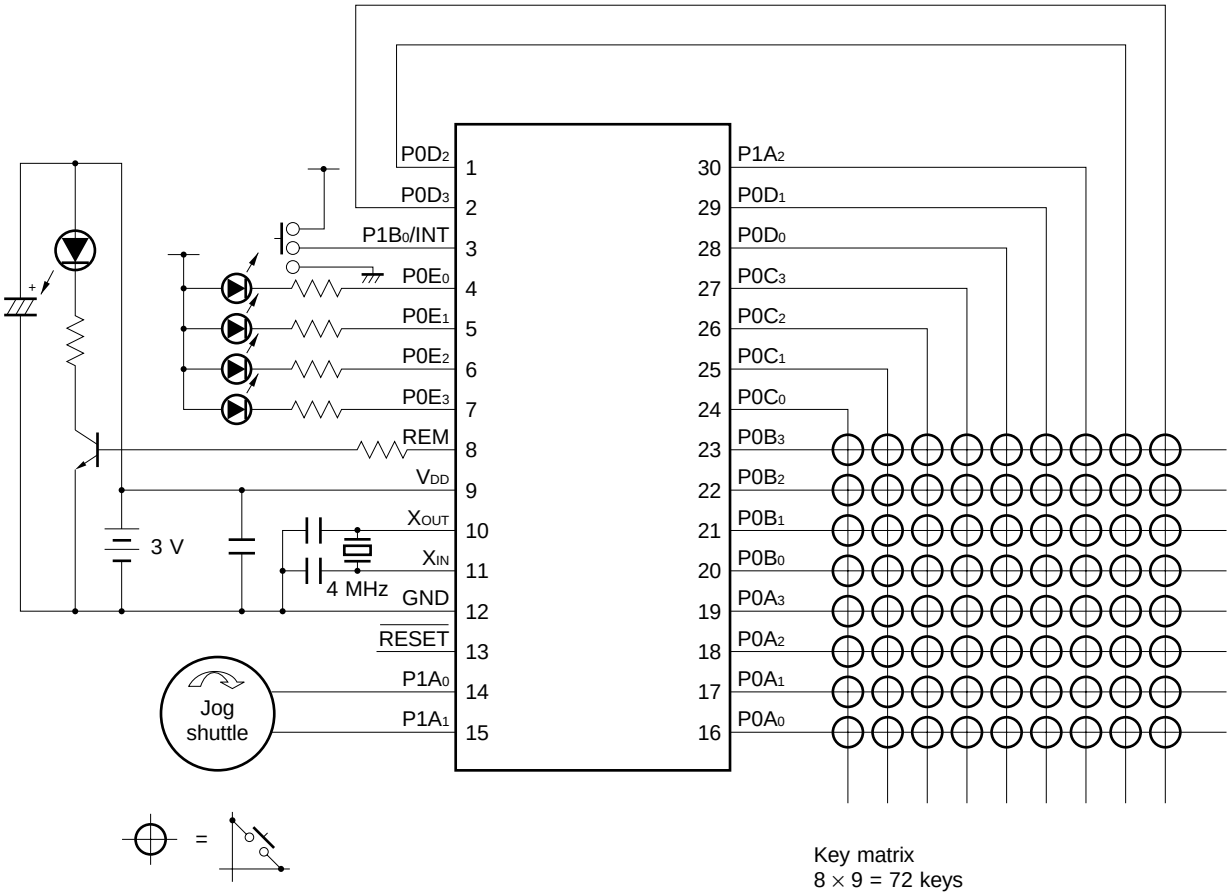
Notes 1. When incorporation of a capacitor for oscillation has not been specified by a mask option.

2. S_2: Set to high level for STOP mode release

Application

Remote control transmitter
(72 keys accommodated)

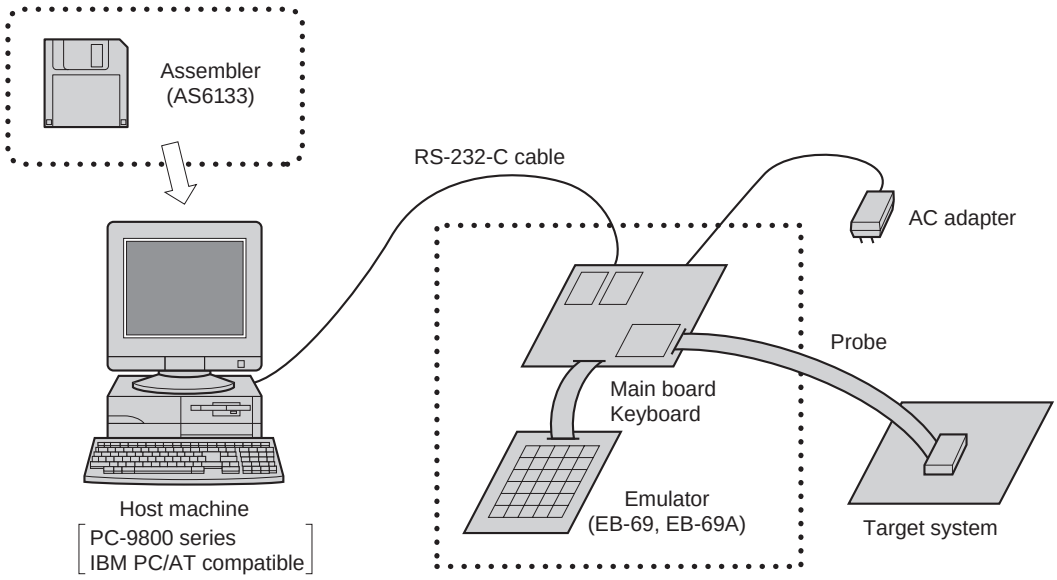
μPD1724x Series



Development Tools

The μPD69A Series is developed in the following environment.

Development environment : PC-9800 series, IBM PC/AT™ compatibles



Remarks **1.** RS-232-C cable, probe, and AC adapter are sold separately.
2. EB-69 and EB-69A (under development) are manufactured by Naito Densei Machida Mfg. Co., Ltd.

Software

◆ Assembler (AS6133)

Features
- Absolute assembler for μPD69A series.
- Output load module file to serve as EB-69 and EB-69A input and diagnostic lists.

Hardware

◆ Emulator (EB-69, EB-69A)

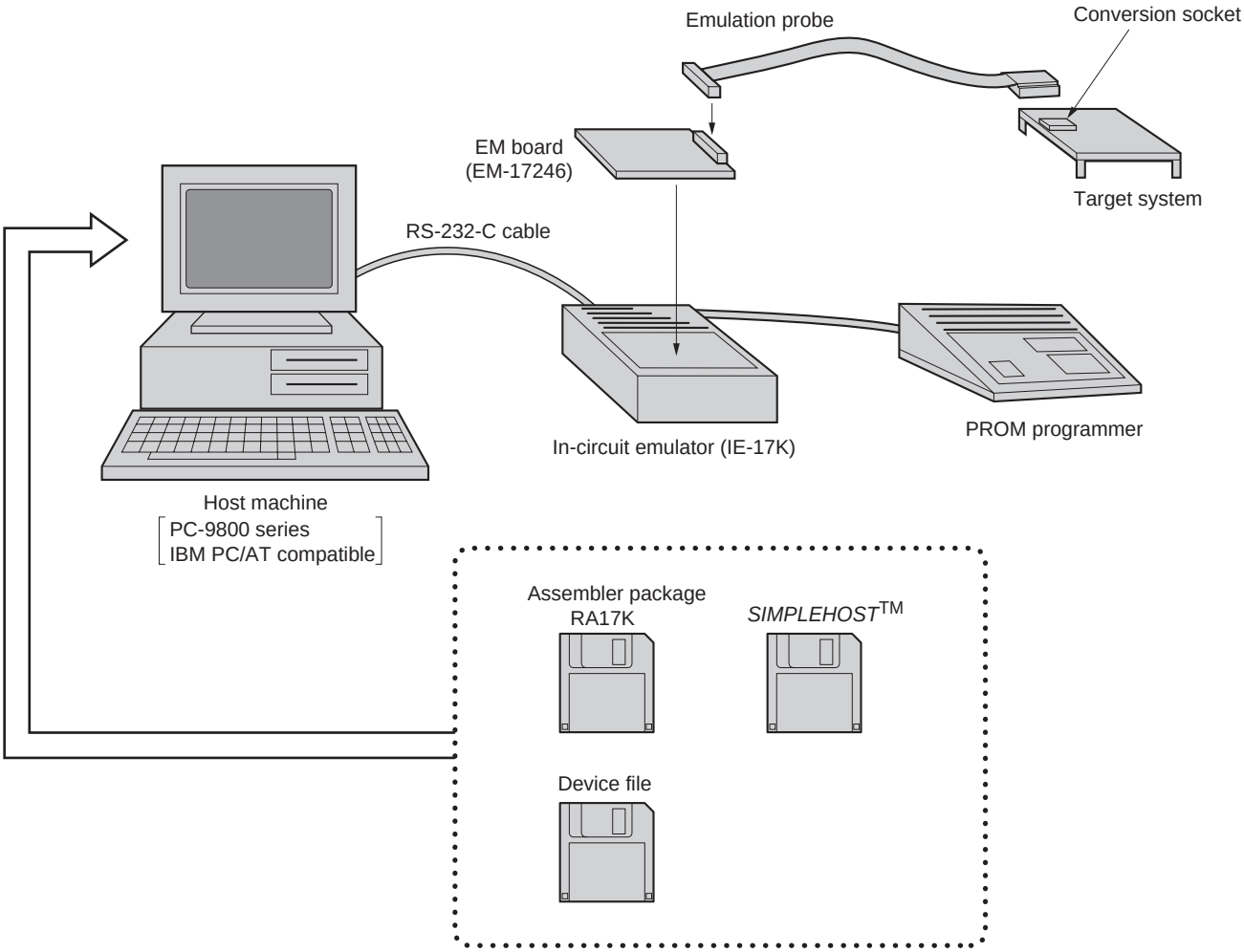
Features
- Operations such as key input and infrared LED light emission confirmation can be performed using the keyboard unit provided.
- Connection to target is possible using the probe (sold separately).
- Event functions including step execution and program execution break are included.
- Guard functions including stack overflow and coverage break are included.

Remark EB-69 and EB-69A (under development) are manufactured by Naito Densei Machida Mfg. Co., Ltd.

Development Tools

The μPD1724x Series is developed in the following environment.

Development environment : PC-9800 series, IBM PC/AT compatibles



Software

- RA17K (relocatable assembler package)
- Device file: Available for each product
- *SIMPLEHOST*: Compatible with RA17K

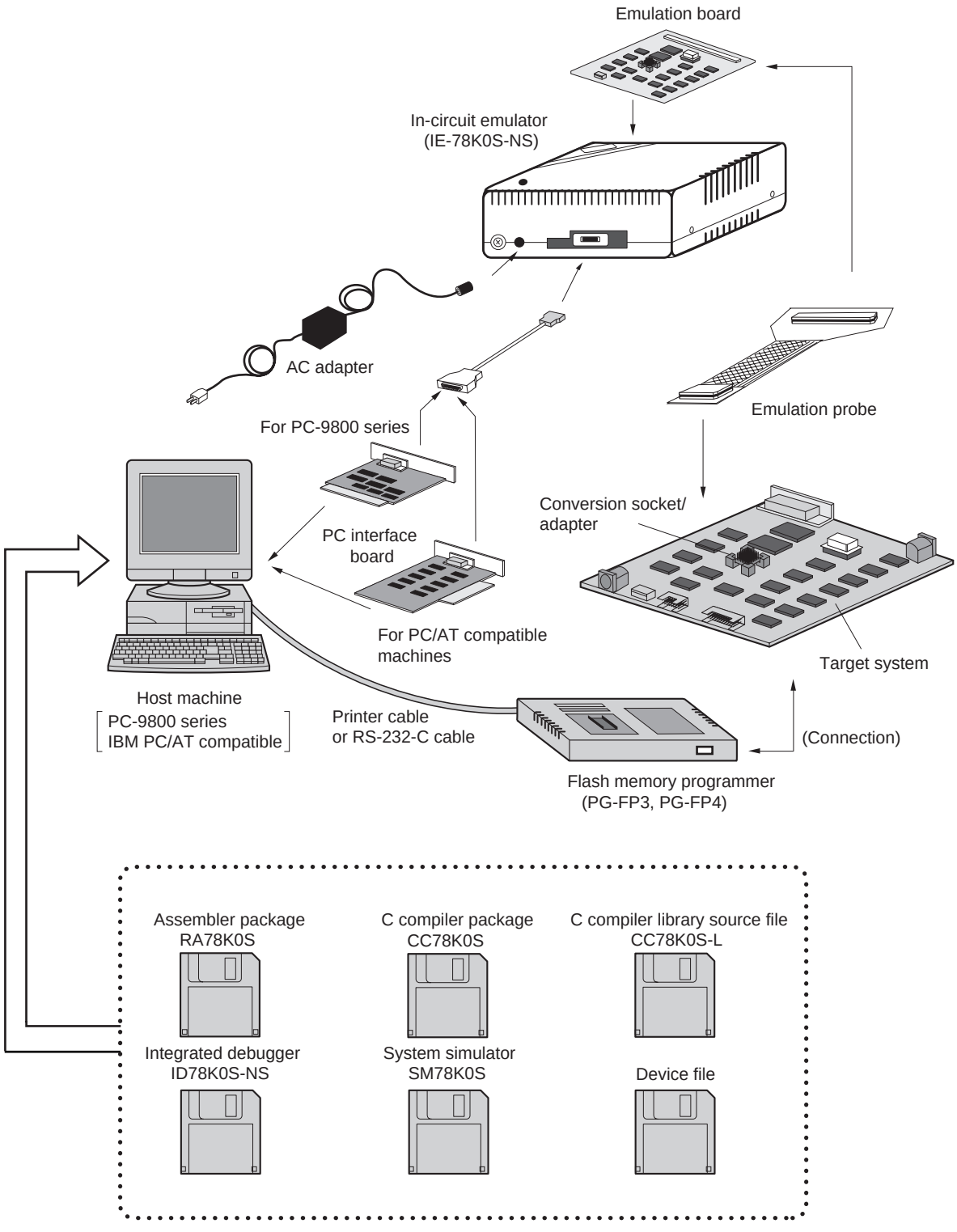
Hardware

- IE-17K or IE-17K-ET (in-circuit emulator)
- EM-17246 (EM board manufactured by Naito Densei Machida Mfg. Co., Ltd.)
- Emulation probe
- Conversion socket
- PC-9800 series or IBM PC/AT compatible
- PROM programmer (for writing to one-time PROM such as AF-9706, AF-9708, AF-9709 manufactured by Ando Electric Co., Ltd.)
- Programmer adapter (PA-17P236 manufactured by NEC)

Development Tools

The μPD789088 subseries, 789327 subseries, and 789467 subseries are developed in the following environment.

Development environment : PC-9800 series, IBM PC/AT compatibles



Development Tools

μPD789088 subseries, 789327 subseries, and 789467 subseries

Software

- RA78K0S (relocatable assembler package)
- CC78K0S (C compiler package)
- CC78K0S-L (C compiler library source file)
- ID78K0S-NS (integrated debugger)
- SM78K0S (system simulator)
- Device file: Available for each product

Hardware

- IE-78K0S-NS (in-circuit emulator)
- IE-70000-MC-PS-B (AC adapter)
- IE-70000-98-IF-C/IE-70000-PC-IF-C/IE-70000-PCI-IF-A/IE-70000-CD-IF-A (PC interface board)
- Emulation board: Available for each product
- Emulation probe
- Conversion socket/adapter
- PC-9800 series or IBM PC/AT compatible
- Flash memory adapter (PG-FP3/PG-FP4, FL-PR3/FL-PR4 manufactured by Naito Densei Machida Mfg. Co., Ltd.)
- Adapter for writing to flash memory (manufactured by Naito Densei Machida Mfg. Co., Ltd.)

Homepage

Please feel free to visit our Microprocessor home page for more information.

http://www.necel.com/micro/index_e.html

Memo

Memo

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