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# User's Manual

**Phase-out/Discontinued**

# IE-77016-98, IE-77016-PC

## In-Circuit Emulator

## Hardware

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### Target Device

**$\mu$ PD77015**

**$\mu$ PD77016**

**$\mu$ PD77017**

**$\mu$ PD77018**

**$\mu$ PD77018A**

**$\mu$ PD77019**

**$\mu$ PD77110**

**$\mu$ PD77111**

**$\mu$ PD77112**

**$\mu$ PD77113**

**$\mu$ PD77114**

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**Major Revisions in This Edition**

Page	Description
Throughout	Addition of $\mu$ PD77015, 77018A, 77019, 77110, 77111, 77112, 77113, and 77114 to target devices. Deletion of description about IE-77016-CM-EM6 and EB-77017. Addition of description about IE-77016-CM-LC.
p. 10	Change of target operating system in <b>Table 1-1 Host Machine Environments</b> .
p. 18	Change of JP2 settings in <b>2.2.2 Jumper settings</b> .

The mark ★ shows major revised points.

## PREFACE

<b>Target Readers</b>	<p>This manual is intended for users who wish to design and develop application systems using digital signal processors (<math>\mu</math>PD77016 Family).</p> <p><b>The <math>\mu</math>PD77016 Family comprises the <math>\mu</math>PD77015, 77016, 77017, 77018, 77018A, 77019, 77110, 77111, 77112, 77113, and 77114.</b></p> <p><b>In this manual, the <math>\mu</math>PD77015, 77016, 77017, 77018, 77018A, and 77019 are described as the <math>\mu</math>PD7701X Family, and the <math>\mu</math>PD77110, 77111, 77112, 77113, and 77114 as the <math>\mu</math>PD77111 Family unless there are functional difference.</b></p>
<b>Purpose</b>	<p>This user's manual is intended to give users an understanding of the installation and settings of the IE-77016-98 and IE-77016-PC required when debugging software in system development.</p>
<b>Organization</b>	<p>This manual consists of the following sections:</p> <ul style="list-style-type: none"><li>• GENERAL DESCRIPTION</li><li>• INSTALLATION</li><li>• PRECAUTIONS</li></ul>
<b>Conventions</b>	<p>Data significance: Higher digits on the left and lower digits on the right</p> <p>Active low representation: <math>\overline{xxx}</math> (overscore over pin or signal name)</p> <p><b>Note:</b> Footnote for item marked with <b>Note</b> in the text</p> <p><b>Caution:</b> Information requiring particular attention</p> <p><b>Remark:</b> Supplementary information</p> <p>Numerical representation: Binary ... XXXX or 0bXXXX</p> <p>Decimal ... XXXX</p> <p>Hexadecimal ... 0XXXXX</p>

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**Documents Related to Devices**

Document Name Part Number	Pamphlet	Data Sheet	User's Manual		Application Note
			Architecture	Instructions	Basic Software
μPD77016	U12395E	U10891E	U10503E	U13116E	U11958E
μPD77015		U10902E			
μPD77017					
μPD77018					
μPD77018A		U11849E			
μPD77019					
μPD77019-013		U13053E			
μPD77110		U12801E	Under preparation		
μPD77111					
μPD77112					
μPD77113		U14373E			
μPD77114					

**Documents Related to Development Tools**

Document Name		Document No.
IE-77016-98, IE-77016-PC User's Manual	Hardware	This document
IE-77016-CM-LC User's Manual		U14139E
RX77016 User's Manual	Function	U14397E
	Configuration Tool	U14404E
RX77016 Application Note	HOST API	U14371E

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## CHAPTER 1 GENERAL DESCRIPTION

### 1.1 System Outline

The IE-77016-98 and IE-77016-PC are support tools for developing systems that use digital signal processors ( $\mu$ PD77016 Family, referred to as DSP here after). Unlike the conventional in-circuit emulator (referred to as IE here after), the IE-77016-98 and IE-77016-PC do not require a target probe because the IE function is implemented inside the DSP. These boards are connected to the target system through dedicated pins (five for the  $\mu$ PD7701X Family and six for the  $\mu$ PD77111 Family)<sup>Note</sup>. IE functions that use dedicated pins are controlled via serial communication.

As a consequence, the IE-77016-98 and IE-77016-PC communicate with the DSP in the target system. The IE-77016-98 is inserted into the expansion bus of the PC-9800 Series, and the IE-77016-PC is inserted into the expansion bus of IBM PC/AT™ compatibles.

**Note** When using the IE-77016-98 and IE-77016-PC, provide dedicated pins for connection to the target system (refer to **CHAPTER 3 PRECAUTIONS**).

★ When the target is a DSP other than the  $\mu$ PD77016, the IE-77016-CM-LC is a separate requirement.

**Remark**  $\mu$ PD7701X Family:  $\mu$ PD77015, 77016, 77017, 77018, 77018A, 77019  
 $\mu$ PD77111 Family:  $\mu$ PD77110, 77111, 77112, 77113, 77114

## 1.2 Host Machine Environments

The environments of each host machine are as follows.

★

**Table 1-1. Host Machine Environments**

Host Model	PC-9800 Series	IBM PC/AT Compatibles
Operating system <sup>Note</sup>	Windows™95 or Windows NT™	Windows 95 or Windows NT
Display	Recommended: 640 × 480 or more	Recommended: 640 × 480 or more
Internal memory	Recommended: 16 MB or more	Recommended: 16MB or more

**Note** The target OS depends on the debugger control software (ID77016).  
The IE-77016-98 and IE-77016-PC themselves do not depend on the OS.

## 1.3 Hardware Configuration

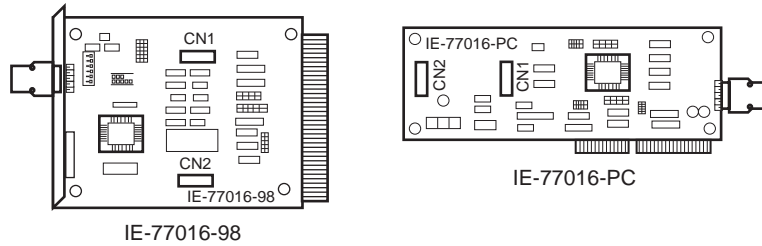
This section describes the hardware configuration of the IE-77016-98 and IE-77016-PC.

### 1.3.1 IE-77016-98 and IE-77016-PC

The IE-77016-98 board is inserted in the PC-9800 Series expansion bus (C bus), while the IE-77016-PC board is inserted in the IBM PC/AT compatible (ISA bus), supplying in-circuit emulation functions to the target systems.

A dedicated interface cable should be used to connect these boards to their target systems.

**Figure 1-1. IE-77016-98 and IE-77016-PC**

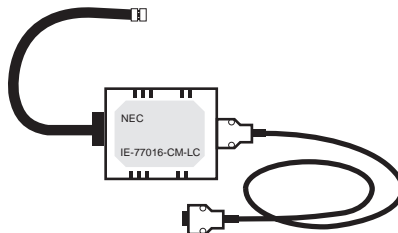


### ★ 1.3.2 IE-77016-CM-LC (Optional)

The IE-77016-CM-LC is an optional cable with a level converter to convert 5 V to 3 V and 3 V to 5 V. This cable is used to connect the IE-77016-98 or IE-77016-PC, which inputs/outputs 5 V signals, to a DSP ( $\mu$ PD77015, 77017, 77018, 77018A, 77019, 77110, 77111, 77112, 77113, and 77014), which inputs/outputs 3 V signals.

When the target is the  $\mu$ PD77016, the IE-77016-CM-LC is not required since the cable attached to the IE-77016-98 and IE-77016-PC can be used.

**Figure 1-2. IE-77016-CM-LC**

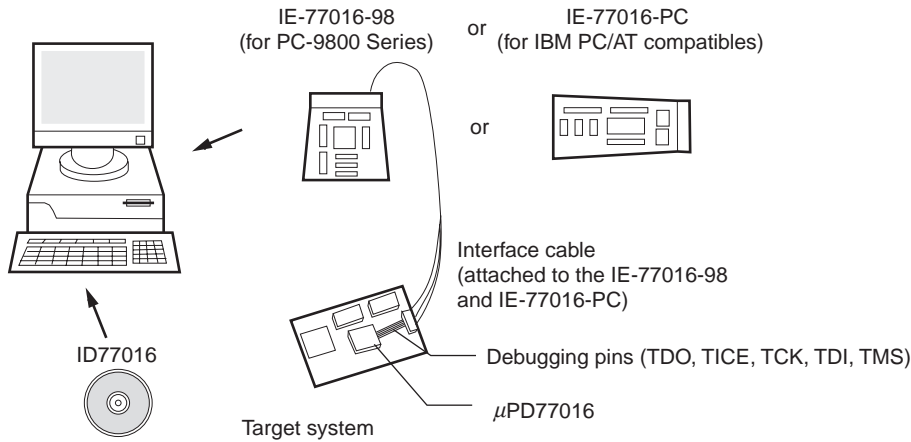


## 1.4 System Development Overview

The DSP development support system is as indicated below.

### 1.4.1 Development environment of $\mu$ PD77016

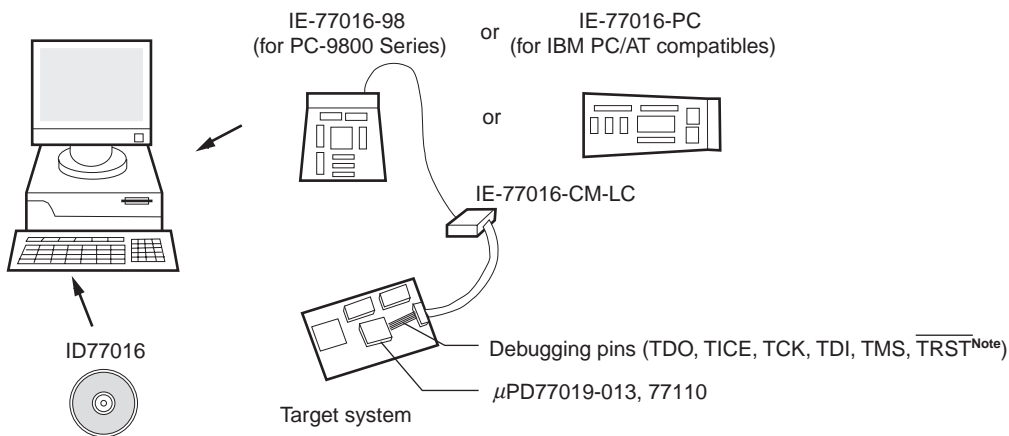
Figure 1-3. Example of  $\mu$ PD77016 Development Environment



[Products required] • IE-77016-98 or IE-77016-PC  
• ID77016 (optional)

### ★ 1.4.2 Development environment of $\mu$ PD77019-013 and $\mu$ PD77110

Figure 1-4. Example of  $\mu$ PD77019-013 and  $\mu$ PD77110 Development Environment



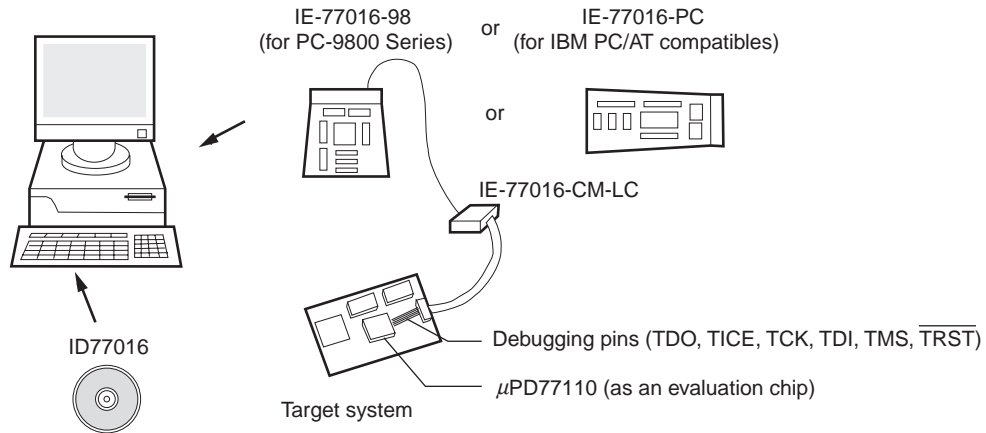
**Note**  $\overline{\text{TRST}}$  is not required for the  $\mu$ PD77019-013.

[Products required] • IE-77016-98 or IE-77016-PC  
• ID77016 (optional)  
• IE-77016-CM-LC (optional)

★ 1.4.3 Development environment of mask ROM versions ( $\mu$ PD77015, 77017, 77018, 77018A, 77019, 77111, 77112, 77113, 77114)

(1) Emulation operation

Figure 1-5. Example of Mask ROM Version Development Environment (Emulation Operation)

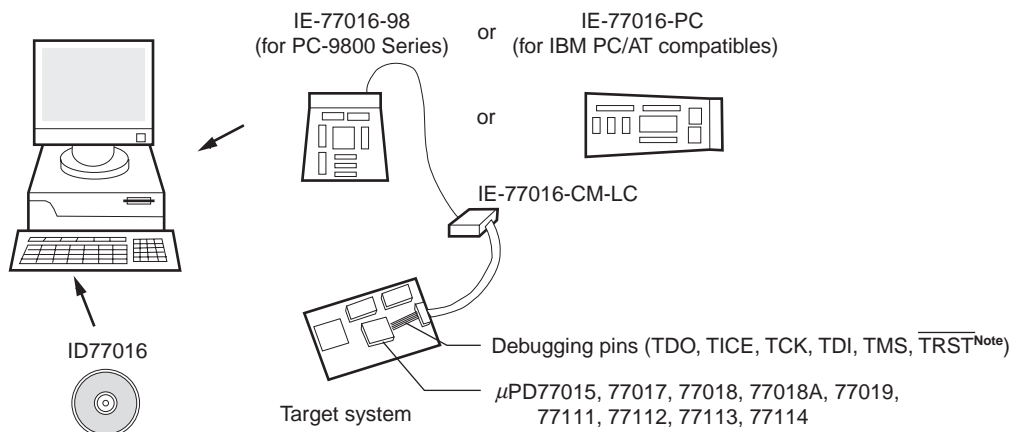


- [Products required]
- IE-77016-98 or IE-77016-PC
  - ID77016 (optional)
  - IE-77016-CM-LC (optional)

**Caution** The operating voltage, pin configuration, and a part of the architecture are different for each device, which makes precise emulation impossible.

## (2) Real chip operation (when debugging after device is mounted)

Figure 1-6. Example of Mask ROM Version Development Environment (Real Chip Operation)



- [Products required]
- IE-77016-98 or IE-77016-PC
  - ID77016 (optional)
  - IE-77016-CM-LC (optional)

**Note**  $\overline{\text{TRST}}$  is not required for the  $\mu\text{PD}$ 77015, 77017, 77018, 77018A, and 77019.



## 1.5 In-Circuit Emulator Functions

### (1) Real-time execution and step execution

### (2) Break function

This function will generate a break when one of the preset break conditions is met during real-time execution. However, it cannot be used together with the non-break monitor function.

### (3) Non-break monitor function

Confirmation of and changes to the contents of the register/data memory can be specified without generating a break. However, it cannot be used together with the break function.

### (4) Trace function

The program execution process can be traced through step execution, which recreates the execution process.

**Caution** There is no real-time trace function.

[MEMO]

**CHAPTER 2 INSTALLATION**

**2.1 Package Contents**

The following items are packaged as a set:

**(1) Emulation board**

IE-77016-98 or IE-77016-PC

**(2) Accessories**

- (a) Interface cable: 1
- (b) User's Manual Hardware (this manual): 1
- (c) Guarantee card: 1
- (d) Itemized packing list: 1

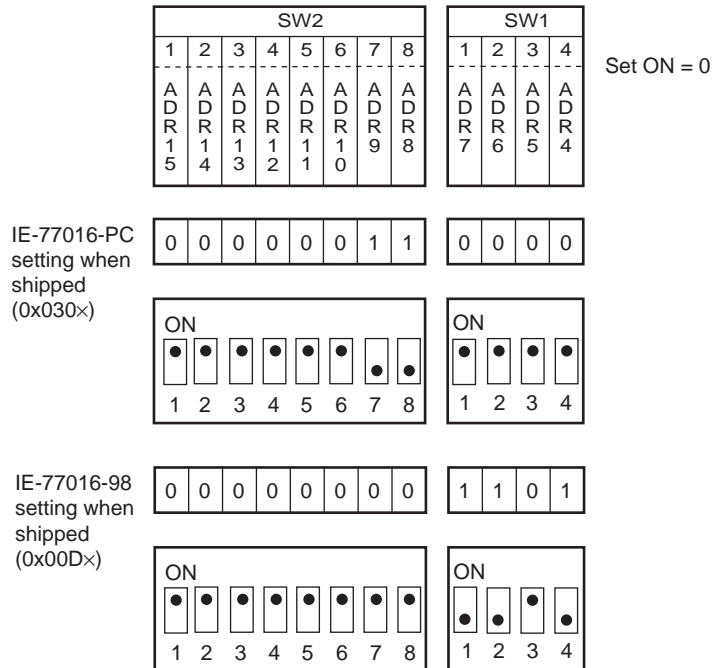
**2.2 Board Settings When Shipped**

**2.2.1 Board I/O address settings**

The control board occupies 16 addresses (0xXXX0 to 0xFFFF) of I/O space. The DIP switches on the control board, SW1 and SW2, are used to set the I/O addresses (higher 12 bits: addresses 4 to 15) as viewed from the host computer.

Figure 2-1 shows switches SW1 and SW2 on the board. When shipped, the IE-77016-98 is set to 0x00D0 and the IE-77016-PC is set to 0x0300.

**Figure 2-1. SW1 and SW2 Settings**



## ★ 2.2.2 Jumper settings

JP2 on the control board should be used as set when shipped.

**Figure 2-2. JP2 Setting**

Setting when shipped	HWE	HFE
IRQ12 (IRQ6)	<input type="radio"/>	<input type="radio"/>
IRQ6 (IRQ5)	<input type="radio"/>	<input type="radio"/>
IRQ5 (IRQ4)	<input type="radio"/>	<input type="radio"/>
IRQ3	<input type="radio"/>	<input type="radio"/>
NC	<input type="radio"/>	<input type="radio"/>
NC	<input type="radio"/>	<input type="radio"/>

**Remark** The signal names in parentheses are for the IE-77016-PC.

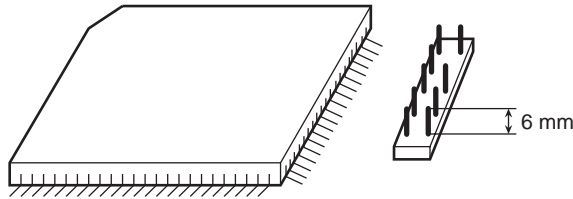
**CHAPTER 3 PRECAUTIONS**

When using the in-circuit emulator functions of this product, be careful of the following items.

**3.1 Connection to the Target System**

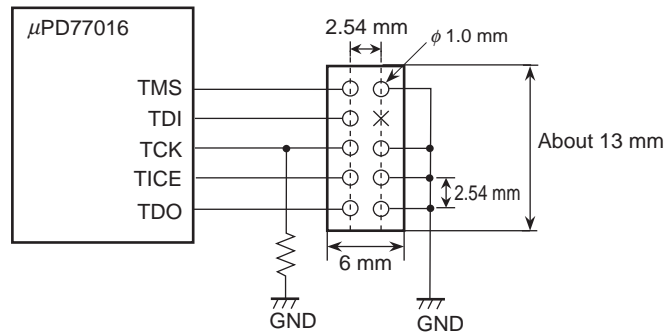
Provide dedicated pins on the target system to connect the IE-77016-98 or IE-77016-PC to a DSP on the target system.

**Figure 3-1. IE Connection Pins on the Target System**



**Figure 3-2. Circuit Diagram and Dimensions of IE Connection Pins on Target System (1/2)**

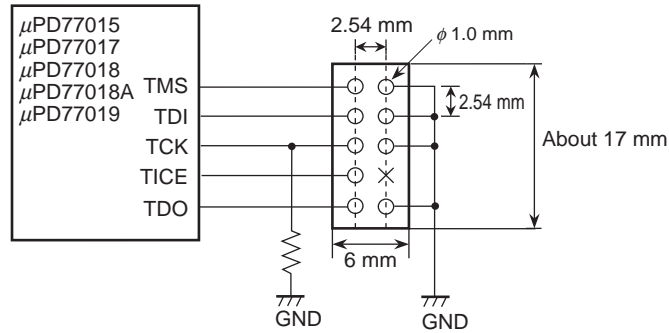
(a)  $\mu$ PD77016 (when using 10-pin flat cable attached to the IE-77016-98 and IE-77016-PC)



**Remark** ○ = Pin (0.635 × 0.635, l = 6 mm)  
 × = Key Removed (To prevent false insertion, do not provide a pin.)

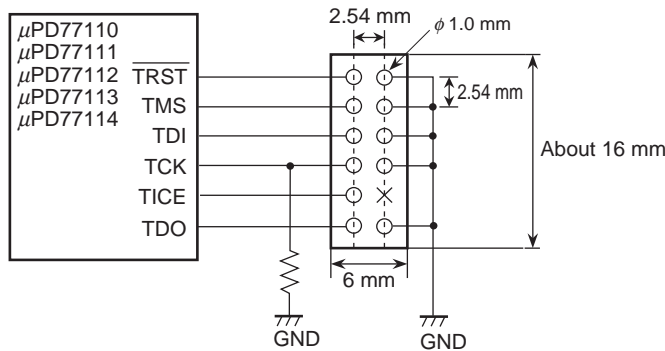
★ **Figure 3-2. Circuit Diagram and Dimensions of IE Connection Pins on Target System (2/2)**

**(b)  $\mu$ PD7701X Family (except  $\mu$ PD77016) (when using 10-pin flat cable attached to IE-77016-CM-LC)**



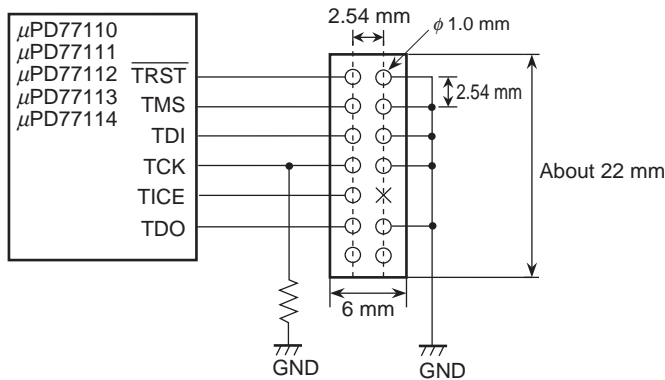
**Remark** ○ = Pin (0.635 × 0.635, l = 6 mm)  
 × = Key Removed (To prevent false insertion, do not provide a pin.)

**(c)  $\mu$ PD77111 Family (when using 12-pin flat cable attached to IE-77016-CM-LC)**



**Remark** ○ = Pin (0.635 × 0.635, l = 6 mm)  
 × = Key Removed (To prevent false insertion, do not provide a pin.)

**(d)  $\mu$ PD77111 Family (when using 14-pin flat cable attached to IE-77016-CM-LC)**



**Remark** ○ = Pin (0.635 × 0.635, l = 6 mm)  
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[MEMO]

[MEMO]





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