PanaXSeries

The One to Watch for Constant Innovation-Making the Future Come Alive

MICROCOMPUTER MN101C

MN101CF74G Onboard Serial Programming Manual

Pub.No.3147491-010E

Panasonic

Request for your special attention and precautions in using the technical information and semiconductors described in this book

(1) An export permit needs to be obtained from the competent authorities of the Japanese Government if any of the products or technologies described in this book and controlled under the "Foreign Exchange and Foreign Trade Law" is to be exported or taken out of Japan.

(2) The technical information described in this book is limited to showing representative characteristics and applied circuits examples of the products. It neither warrants non-infringement of intellectual property right or any other rights owned by our company or a third party, nor grants any license.

(3) We are not liable for the infringement of rights owned by a third party arising out of the use of the product or technologies as described in this book.

(4) The products described in this book are intended to be used for standard applications or general electronic equipment (such as office equipment, communications equipment, measuring instruments and household appliances).
Consult our sales staff in advance for information on the following applications:

- Special applications (such as for airplanes, aerospace, automobiles, traffic control equipment, combustion equipment, life support systems and safety devices) in which exceptional quality and reliability are required, or if the failure or malfunction of the products may directly jeopardize life or harm the human body.
- Any applications other than the standard applications intended.

(5) The products and product specifications described in this book are subject to change without notice for modification and/or improvement. At the final stage of your design, purchasing, or use of the products, therefore, ask for the most up-to-date Product Standards in advance to make sure that the latest specifications satisfy your requirements.

(6) When designing your equipment, comply with the guaranteed values, in particular those of maximum rating, the range of operating power supply voltage, and heat radiation characteristics. Otherwise, we will not be liable for any defect which may arise later in your equipment.
Even when the products are used within the guaranteed values, take into the consideration of incidence of break down and failure mode, possible to occur to semiconductor products. Measures on the systems such as redundant design, arresting the spread of fire or preventing glitch are recommended in order to prevent physical injury, fire, social damages, for example, by using the products.

(7) When using products for which damp-proof packing is required, observe the conditions (including shelf life and amount of time let standing of unsealed items) agreed upon when specification sheets are individually exchanged.

(8)

If you have any inquiries or questions about this book or our semiconductors, please contact one of our sales offices listed at the back of this book.

Section 1 Connecting the PX-FW2

1

Table of Contents

Section 1 Connecting the PX-FW2 1

1.1 Connecting the PX-FW2 2
1.1.1 PX-FW2 Connecting Signals 2
1.1.2 The example of a connection circuit with PX-FW2 3

1.2 Component Value Calculations 4
1.2.1 Component Values 4
1.2.2 Reset Signal Capacitor (C1) Maximum Value Calculation 4
1.2.3 Pull-up Resistor (R1) Minimum Value Calculation 5
1.2.4 Relationship Between RupRst and RsRt 5
1.2.5 Pull-up Resistor (R2, R3 and R4) Minimum Value Calculations 5
1.2.6 Communication Pin Series Resistor (R6, R7 and R8) Maximum Value Calculations .
6
1.2.7 Relationship Between RupMin and RsMax 6

1.3 Flash Memory Programming Procedure 7
1.3.1 Overview of the Flash Memory Programming Procedure 7
1.3.2 Key Code 7
1.3.3 Flash Programming Control Program 7

1.4 Loader Area Programming Procedure 8
1.4.1 Overview of the Flash Memory Programming Procedure 8
1.4.2 Key Code 8
1.4.3 Flash Programming Control Program 8

Section 1 Connecting the PX-FW2

1

1.1 Connecting the PX-FW2

The MN101CF74G includes an on-chip 128 KB flash EEPROM that can be erased and written electrically.The Panasonic PX-FW2 is used to program this on-chip flash EEPROM with the MN101CF74G in the onboard state. This chapter describes the procedure for connection the MN101CF74G to the PX-FW2.

1.1.1 PX-FW2 Connecting Signals

To connect the MN101CF74G to the PX-FW2, a total of 6 lines must be connected: three communication signal lines, reset, VDD, and VSS. The MN101CF74G is connected to the PX-FW2 using a 10-conductor flat cable. The PX-FW2 can be connected to the target board easily if a connector for a 10-conductor flat cable is mounted on the target board. If a connector cannot be mounted on the target board, the 10-conductor flat cable can be directly soldered to the board.

Note: The length of the cable must not exceed 30 cm. The serial communication system may not work correctly with cables longer than 30 cm.

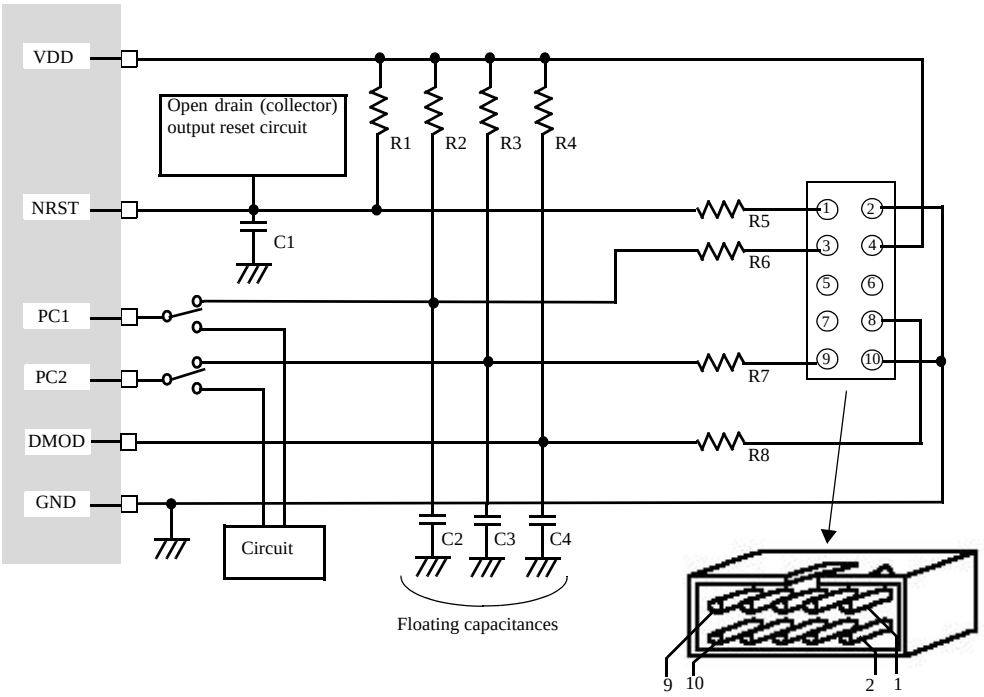
Table 1.1.1 MN101CF74G and PX-FW2 Pin Correspondence

MN101CF74G signals (pin number)	PX-FW2 connector signals (pin number)	I/O	Notes
NRST (23)	NRST (1)	MN101CF74G <-- PX-FW2	RESET
PC1 (10)	TDO (3)	MN101CF74G <-> PX-FW2	DATA
PC2 (11)	TCLK (9)	MN101CF74G <-- PX-FW2	CLOCK
DMOD (24)	DMOD (8)	MN101CF74G <-- PX-FW2	WRITER MODE
VDD	VDD (4)	MN101CF74G --> PX-FW2	POWER SUPPLY
VSS	GND (2,10)	-	GND

Note: If a flash programmer other than the Panasonic PX-FW2 is used, the connection pins may differ from those shown in tables 1.1.1.

1.1.2 The example of a connection circuit with PX-FW2

If at all possible, all other circuits should be disconnected when the MN101CF74G is connected to the PX-FW2 with this connection circuit. If disconnecting other circuits is difficult, design the connection circuit so that communication is performed reliably by selecting optimal component values based on the instructions in this manual.



Recommended connector: Hirose Electric Co., Ltd., straight type pin header
Product No.: HIF3FC-10PA-2.54DSA

Fig 1.1.1 Sample Connection Circuit Using a 10-Conductor Flat Cable

---

Note: Be careful not to mistake the pin numbers on the 10-conductor flat cable connector. The pin numbers on this connector are set up so that, when the connector is viewed from the connection target side with the cutout pointing, the upper right pin is pin 1, and the lower right pin is pin 2. Similarly, the upper left pin is pin 9 and the lower left pin is pin 10.

The communication data pin and the communication clock pin must be pulled up. There arecases other than those where a PX-FW2 is used where these pins must be pulled up as well. See the IC documentation for details.

Use an open collector (or similar) reset circuit, and design the circuit so that signals do not collide.

1.2 Component Value Calculations

This section presents the calculations for each of the components used for connection with the PX-FW2.

1.2.1 Component Values

The table shows the values of the components used in figure 1.1.1.

-The value of the resistor R1 must be greater than RupRst.
-The values of the resistors R2, R3, and R4 must be greater than RupMin and greater than 1 k ohm.
-The value of the resistor R5 must be less than 1/10 that of R1 and less than RsMax.
-The value of the resistor R6 must be less than 1/10 that of R2 and less than RsMax.
-The value of the resistor R7 must be less than 1/10 that of R3 and less than RsMax
-The value of the resistor R8 must be less than 1/10 that of R4 and less than RsMax
-C1 must be less than Crst and less than 100 uF.
-C2, and C3 must be under 50 pF.
-Except for the Vdd and VSS lines, the line length of the signal from the connector to the microcontroller must be less than 30 cm.

[Refer to 1.1.2 The example of a connection circuit with PX-FW2]

Note: This document is written assuming that the clock and data outputs used from the PX-FW2 are the push-pull outputs.
The required component values will differ from those shown here if the PX-FW2 open-drain outputs are used.

1.2.2 Reset Signal Capacitor (C1) Maximum Value Calculation

Writing to MN101CF74G, it uses the oscillator stabilization time after the microcontroller resets. The rise time of the reset must beless than 1/3 of the oscillator stabilization time (Twait). The maximum value, Crst, of the reset signal capacitor is determined from the equation (1).

$$C_{rst} = \frac{\text{The oscillator stabilization time}}{3 * \text{ Pull-up resistor R1}} \quad \text{... Equation (1)}$$

1.2.3 Pull-up Resistor (R1) Minimum Value Calculation

The maximum output current from the PX-FW2 is 12 mA. Since this value is the maximum load current available for outputting a low level, R_{upRst} can be determined from equation (2).

$$R_{upRst} = \frac{\text{Operating supply voltage (VDD)}}{12mA} - R_{sRst} \quad \text{... Equation (2)}$$

1.2.4 Relationship Between R_{upRst} and R_{sRt}

If you want to insert a resistor with a large value in series with the reset pin, the pull-up resistor (R_{upRst}) and the series resistor (R_{sRst}) must meet the condition in equation (3) so that the signal level falls all the way to the low level.

$$R_{upRst} * \frac{1}{10} >= R_{sRst} \quad \text{... Equation (3)}$$

1.2.5 Pull-up Resistor (R2, R3 and R4) Minimum Value Calculations

Find the maximum output current, I_{OL}, for the pins used for communication from the microcomputer IC documentation. Since that value is the maximum load current available for outputting a low level, R_{upMin} can be determined from equation (4).

$$R_{upMin} = \frac{\text{Operating supply voltage (VDD)}}{\text{Pin maximum output current } (I_{OL})} \quad \text{... Equation (4)}$$

1.2.6 Communication Pin Series Resistor (R6, R7 and R8) Maximum Value Calculations

If series resistors are inserted in the communication pin lines, the signal transmission speed will be slowed due to the influence of the load capacitors (C2, C3, and C4). To assure reliable communication, the time for the signal voltage to change by 63% of the supply voltage (i.e. the time constant) must be held to under 1/8 of the communication period.
If we assume that the load capacitance is 50 pF and the communication frequency is 1 MHz, then the maximum resistor value (RsMax) allowable for reliable communication will be, from equation (5), 2.5 k ohm.

$$R_{sMax} = \frac{1}{8 * \text{Communication frequency (f)} * \text{Load capacitance (C)}} \quad \text{... Equation (5)}$$

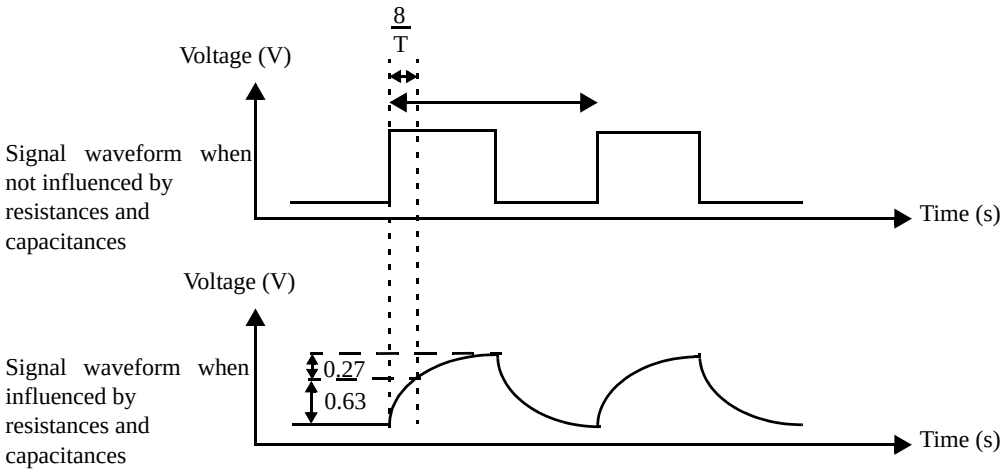


Fig 1.2.1 Relationship Between Communication Frequency, R, and C

1.2.7 Relationship Between R_{upMin} and R_{sMax}

It will be possible to insert resistors with large values in series in the communication lines if the communication speed is lowered. However, even in that case, the pull-up resistor (R_{upMin}) and the series resistor (R_{sMax}) must meet the condition in equation (6) so that the signals fall to the low level.

$$R_{upMin} * \frac{1}{10} >= R_{sMax} \quad \text{... Equation (6)}$$

1.3 Flash Memory Programming Procedure

This section describes the procedures for onboard serial programming using the PX-FW2.

1.3.1 Overview of the Flash Memory Programming Procedure

This program runs on the microcontroller and is used to control programming the MN101CF74G on-chip flash EEPROM using the Panasonic PX-FW2.
Using PX-FW2 to opearate on-board serial writing of MN101CF74G, micon program that is called loader program is not needed.

Note: Using on-board serial writer other than PX-FW2, loader program may be needed.

1.3.2 Key Code

The MN101CF74G area that allows key code settings is the area from 0x4001 to 0x4FFF.
And arbitrary area of 7 to 255 bytes within this area cam be set as the key code area.
See the PX-FW2 manual for details on the security functions and key codes.

1.3.3 Flash Programming Control Program

The programming control program is loaded in RAM in the target microcontroller and implements the flash memory write control algorithm. This program includes functions for erasing flash memory, for writing the user program to flash memory, and for reading out data from flash memory.This program is loaded into RAM from the programmer using serial communication between the PX-FW2 and the loader program.

Note that the file MN101CF74G.exe for MN101CF74G is included in the additional product information pack. Executing this file registers both MN101CF74G product information and the programming control program with Flash Commander.

1.4 Loader Area Programming Procedure

This section describes the procedures of onboard serial programming for the loader area using the PX-FW2.

1.4.1 Overview of the Flash Memory Programming Procedure

This program runs on the microcontroller and is used to control programming the MN101CF74G on-chip flash EEPROM using the Panasonic PX-FW2.
Using PX-FW2 to opearate on-board serial writing of MN101CF74G, micon program that is called loader program is not needed.

Note: Using on-board serial writer other than PX-FW2, loader program may be needed.

1.4.2 Key Code

The MN101CF74G area that allows key code settings is the area from 0x4001 to 0x47FF.
And arbitrary area of 7 to 255 bytes within this area cam be set as the key code area.
See the PX-FW2 manual for details on the security functions and key codes.

1.4.3 Flash Programming Control Program

The programming control program is loaded in RAM in the target microcontroller and implements the flash memory write control algorithm. This program includes functions for erasing flash memory, for writing the user program to flash memory, and for reading out data from flash memory.This program is loaded into RAM from the programmer using serial communication between the PX-FW2 and the loader program.

Note that the file MN101CF74G.exe for MN101CF74G(Loader) is included in the additional product information pack. Executing this file registers both MN101CF74G(Loader) product information and the programming control program with Flash Commander.

Index

C

Communication Pin Series Resistor (R4, R5, and R6) Maximum Value Calculations 6
Component Value Calculations 4
Component Values 4
Connecting the PX-FW2 2

G

Flash Memory Programming Procedure 7, 8
Flash Programming Control Program 7, 8

K

Key Code 7, 8

O

Overview of the Flash Memory Programming Procedure 7, 8

Q

PX-FW2 Connecting Signals 2
Pull-up Resistor (R1) Minimum Value Calculation ... 5

S

Relationship Between RupMin and RsMax 6
Relationship Between RupRst and RsRt 5
Reset Signal Capacitor (C1) Maximum Value Calculation 4

U

The example of a connection circuit with PX-FW2 ... 3

Record of Changes

2004/06/07 3147491-010E	First Version

MN101CF74G
Onboard Serial Programming Manual

June, 2004 1st Edition

Issued by Matsushita Electric Industrial Co., Ltd.

SALES OFFICES

□NORTH AMERICA

● **U.S.A. Sales Office:**
Panasonic Industrial Company□ [PIC]
• **New Jersey Office:**
2 Panasonic Way Secaucus, New Jersey 07094, U.S.A.
Tel:1-201-348-5257 Fax:1-201-392-4652
• **Chicago Office:**
1707 N. Randall Road Elgin, Illinois 60123-7847, U.S.A.
Tel:1-847-468-5720 Fax:1-847-468-5725
• **San Jose Office:**
2033 Gateway Place, Suite 200, San Jose, California 95110, U.S.A
Tel:1-408-487-9510 Fax:1-408-436-8037
• **Atlanta Office:**
1225 Northbrook Parkway Suite 1-151 Suwanee, Georgia 30024, U.S.A.
Tel:1-770-338-6953 Fax:1-770-338-6849
• **San Diego Office:**
9444 Balboa Avenue, Suite 185, San Diego, California 92123, U.S.A.
□Tel:1-858-503-2910 Fax:1-858-715-5545
● **Canada Sales Office:**
Panasonic Canada Inc.□ [PCI]
5770 Ambler Drive 27 Mississauga, Ontario L4W 2T3, Canada
Tel:1-905-238-2243 Fax:1-905-238-2414

□LATIN AMERICA

● **Mexico Sales Office:**
Panasonic de Mexico, S.A. de C.V.□ [PANAMEX]
Amores 1120 Col. Del Valle Delegacion Benito Juarez C.P. 03100 Mexico, D.F. Mexico
Tel:52-5-488-1000 Fax:52-5-488-1073
• **Guadalajara Office:**
Sucursal Guadarajara Av. Lazaro Cardenas 2305 Local G-102 Plaza Comercial Abastos; Col. Las Torres Guadalajara, Jal. 44920, Mexico
Tel:52-3-671-1205 Fax:52-3-671-1256
● **Brazil Sales Office:**
Panasonic do Brasil Ltda.□ [PANABRAS]
Caixa Postal 1641, Sao Jose dos Campos, Estado de Sao Paulo, Brasil
Tel:55-12-3935-9000 Fax:55-12-3931-3789

□EUROPE

● **Europe Sales Office:**
Panasonic Industrial Europe GmbH□ [PIE]
• **Germany Sales Office:**
Hans-Pinsel-Strasse 2 85540 Haar, Germany
Tel:49-89-46159-119 Fax:49-89-46159-195

□ASIA

● **Singapore Sales Office:**
Panasonic Semiconductor Sales Asia□ [PSCSA]
300 Beach Road, #16-01, the Concourse, Singapore 199555, the Republic of Singapore
Tel:65-6390-3688 Fax:65-6390-3689
● **Malaysia Sales Office:**
Panasonic Industrial Company (M) Sdn. Bhd.□ [PICM]
• **Head Office:**
15th Floor, Menara IGB, Mid Valley City, Lingkaran Syed Putra, 59200 Kuala Lumpur, Malaysia
Tel:60-3-2297-6888 Fax:60-6-2284-6898
• **Penang Office:**
Suite 20-07,20th Floor, MWE Plaza, No.8, Lebuh Farquhar,10200 Penang, Malaysia
Tel: 60-4-201-5113 Fax:60-4-261-9989
• **Johore Sales Office:**
Menara Pelangi, Suite8.3A, Level8, No.2, Jalan Kuning, Taman Pelangi, 80400 Johor Bahru, Johor, Malaysia
Tel:60-7-331-3822 Fax:60-7-355-3996
● **Thailand Sales Office:**
Panasonic Industrial (Thailand) Ltd.□ [PICT]
252-133 Muang Thai-Phatra Complex Building, 31st Floor Rachadaphisek Road, Huaykwang, Bangkok 10320, Thailand
Tel:66-2-693-3400 to 3421 Fax:66-2-693-3422 to 3427
● **Philippines Sales Office:**
Panasonic Industrial Sales Philippines□ [PISP]
102 Laguna Boulevard,Bo.Don Jose Laguna Technopark, Santa. Rosa, Laguna 4026, the Philippines
Tel:63-2-520-8615 Fax:63-2-520-8629
● **China Sales Office:**
Panasonic Industrial (Shanghai) Co., Ltd.□ [PI(SH)]
Floor 12, China Insurance Building, 166 East Road Lujiazui, Pudong New District, Shanghai 200120, China
Tel:86-21-6841-9642 Fax:86-21-6841-9631
Panasonic Industrial (Tianjin) Co., Ltd. [PI(TJ)]
Room No.1001, Tianjin International Building 75, Nanjin Road, Tianjin 300050, China
Tel:86-22-2313-9771 Fax:86-22-2313-9770
Panasonic SH Industrial Sales (Shenzhen) Co., Ltd.□[PSI(SZ)]
• **Shum Yip Centre Office:**
25F, Shum Yip Centre, #5045, East Shennan Road, Shenzhen, China
Tel:86-755-8211-0888 Fax:86-755-8211-0970
Panasonic Shun Hing Industrial Sales (Hong Kong) Co., Ltd.□ [PSI(HK)]
11th Floor, Great Eagle Center 23 Harbour Road, Wanchai, Hong Kong
Tel:852-2529-7322 Fax:852-2865-3697
● **Taiwan Sales Office:**
Panasonic Industrial Sales (Taiwan) Co.,Ltd.□ [PIST]
• **Head Office:**
6F, 550, Sec. 4, Chung Hsiao E. RD. Taipei 110, Taiwan
Tel:886-2-2757-1900 Fax:886-2-2757-1906
• **Kaohsiung Office:**
6th Floor, Hsin Kong Bldg. No.251, Chi Hsien 1st Road, Kaohsiung 800, Taiwan
Tel:886-7-346-3815 Fax:886-7-236-8362
● **Korea Sales Office:**
Panasonic Industrial Korea Co., Ltd.□ [PIKL]
Kukje Center Bldg. 11th Floor, 191 Hangangro 2ga, Youngsan-ku, Seoul 140-702, Korea
Tel:82-2-795-9600 Fax:82-2-795-1542

Semiconductor Company, Matsushita Electric Industrial Co., Ltd.
Nagaokakyo, Kyoto 617-8520, Japan
Tel:075-951-8151
http://panasonic.co.jp/semicon/e-index.html
080304□ Printed in Japan