Feb. 05, 2024

This document consists of the following contents.

- Technical Information On-board Flash Programmer FP-10 (12th Edition)

  Refer this document before using FP-10.

- FP-10 User's Manual (73th Edition) - (Excerpted version(*))

  This manual describes target interface specifications of FP-10.

  ※ This is an excerpt of "Chapter 7 Target Interface Specifications" and "Chapter 13 External I/O functions of FP-10" from the FP-10 User's Manual.

On-board Flash Programmer FP-10 Technical Information

12th Edition (Feb. 05, 2024)

Table of Contents

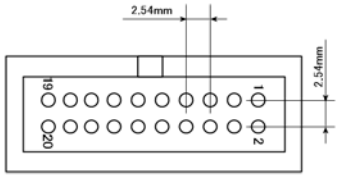
Document change history

First Edition	Sep. 22, 2010	Initial edition
Second Edition	Mar. 04, 2011	・“Supported connectors” Added graphic images of the connectors. ・“FP-10 usage environment check chart” Added graphic images of the optional products. ・Changed the reference diagram of JTAG interface. Changed the contents on RTCK signal in the reference diagram of ②. ・Deleted the description of the case where ETM is not used and half-pitch (1.27mm) connector is used. When you use them, please contact us. ・Added the note on Key in respective signal tables in ③ - ⑥. “Key” is intended for protection against wrong insertion. ・Added the note on $\overline{\text{SRST}}$ signal in respective signal tables. ・Changed the note on $\overline{\text{TRST}}$ signal in respective signal tables.
Third Edition	Apr. 19, 2011	・SWD interface signal table Added the note on $\overline{\text{SRST}}$ signal. “Exception applies when the option that uses software reset in stead of $\overline{\text{SRST}}$ signal has been specified in the setting of FP-10 control software (C-Flash), it can be left unconnected.”
Fourth Edition	Nov. 20, 2015	・“Supported connectors” Added the note. ・Changed the note on SRST signal in ①③④⑥. ・Added the note on EXOK signal and EXSTART signal in the reference diagram of ①②. ・Added the note on EXOK signal and EXSTART signal in ①②.
Fifth Edition	Nov. 30, 2016	・Added the Table of Contents. ・Changed the note on TVDD signal in ①②.
Sixth Edition	Sep. 5, 2017	・Corrected the Pin No. of EXOK signal and EXSTART signal in the reference diagram ①.
Seventh edition	May. 25, 2018	・Changed “① SWD interface and ② JTAG interface” for FP-10 (model PS)specification. ・Added “⑤ (10 pin 1.27 mm pitch connector + JTAG interface)”. ・Changed “Using FP-10 special signals” for FP-10 (model PS)specification.
Eighth edition	Mar. 19, 2020	・Added the note on SW0 signal in ①.
Ninth edition	Nov. 16, 2020	・EX_OK and EX_STARTn signals removed from JTAG interface.
Tenth edition	Jun. 1, 2021	・Added the note on Connectors in ③④⑤.
11th edition	Nov. 25, 2022	・EX_BSY signal removed from JTAG interface. ・Added Note.
12th edition	Feb. 05 2024	・Regarding the reference circuit diagram in (3), pins 11 and 13 have been changed to N.C.

Supported connectors

(For detailed dimensions of the connectors, refer to the documentations by respective manufacturers of the connectors.)

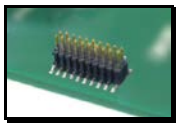
20-pin 2.54mm-pitch connector

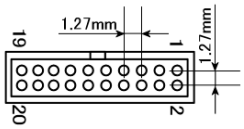


(Top view on the target board)

Recommended connector
Manufacturer: OMRON Corporation
Model : XG4C-2031

20-pin 1.27mm-pitch connector*1

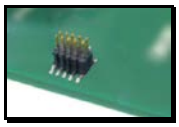


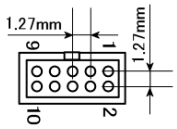


(Top view on the target board)

Recommended connector
Manufacturer: Samtec, Inc.
Model : FTSH-110-01-L-DV-K

10-pin 1.27mm-pitch connector*2





(Top view on the target board)

Recommended connector
Manufacturer: Samtec, Inc.
Model : FTSH-105-01-L-DV-K

*1: **Requires a target probe "SWJ-PRB-MIL20-20HP" (Optional product).**
*2: **Requires a target probe "SWJ-PRB-MIL20-10HP" (Optional product).**

* Before connecting, please refer the pin configuration diagram and make sure that the connector is in the right direction and the signals and pin numbers match. In addition to our own specifications, each company may have extended their own specifications, so be sure to check the signal names as well. The signal may be shorted and cause a malfunction.

Applicable products

This manual is applicable for the following products:

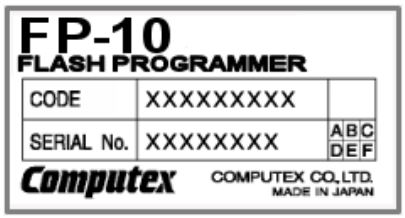
- On-board Flash Programmer FP-10
- On-board Flash Programmer FP-10 (model PS)

* The FP-10 uses the CPU's debug function (SWD/JTAG) to control the CPU. Depending on the CPU, signals other than those in this technical document may be used for debugging functions, so be sure to check the manual of the CPU when using it.

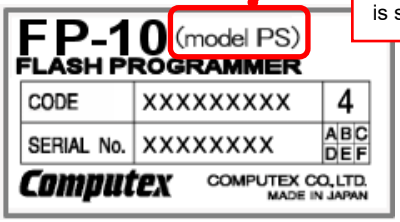
Info.

If you are using the conventional FP-10, please contact our sales department.

Discrimination between the FP-10 (model PS) and the conventional FP-10 can be confirmed with the seal on the back of the FP-10 main unit.



In case of FP-10

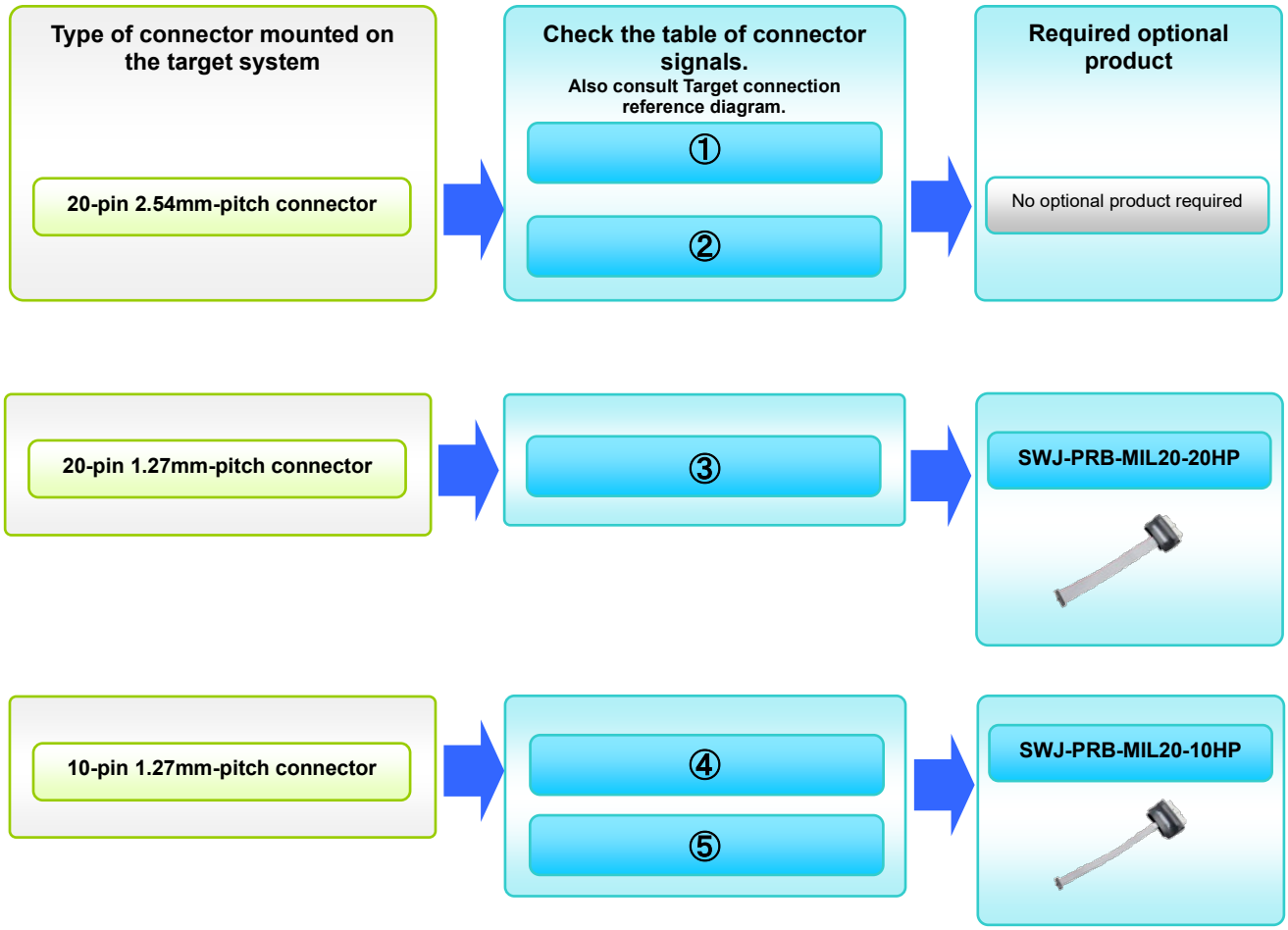


In case of FP-10(model PS)

Model name "(model PS)" is stated.

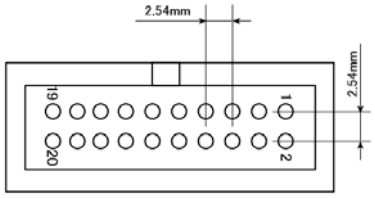
FP-10 usage environment check chart

Drawn in the following chart are the requirements for using FP-10.
With reference to the chart below, check to see if the current environment is suitable for FP-10 use.



20-pin 2.54mm-pitch connector

Target connector specifications



(Top view on the target board)

Recommended connector
Manufacturer: OMRON Corporation
Model: XG4C-2031
(For detailed dimensions of the connector, refer to the documentation by manufacturer of the connector.)

*Please refer the pin configuration diagram above and make sure that the connector is in the right direction before connecting.
Please check the pin number in the signal table above and make sure the signal and the pin numbers match.

① SWD interface

FP-10 can be connected using the standard SWD interface. Please note that to use the Power supply function or External input/output function, FP-10 has to be connected using FP-10 special signals.

Signal description

Pin No.	SWD I/F			FP-10 (model PS)		Changed	Remarks
	Signal	Input/ Output*1		Signal	Input/ Output*1		
1	VTref	Output	=	VTref	Output	-	Connect the I/O power supply of the CPU to FP-10. This is used as the reference voltage signal. Please note that this is not the target power supply.
2	TVDD	Output	⇒	**X3.3V (N.C.)**	**Input**	**Yes**	TVDD signal is not used in FP-10. X3.3V signal supplies 3.3V at 200 mA. max and can be used as the power supply to the target. NC when the Power supply function is not used. Please note that this signal should not be used if X5V(Pin 20) is used as the power supply. Refer to "Using FP-10 special signals" on page 11 for usage instructions. Caution: Please note that the Power supply function is not supported if this signal is depicted as TVDD. Do not use the Power supply function in that case.
3	N.C.	-	⇒	**EX_BSY (N.C.)**	**Input**	**Yes**	EX_BSY is an External input/output function signal. NC when External input/output function is not used. Refer to "Using FP-10 special signals" on page 11 for usage instructions.
4	GND	-	=	GND	-	-	
5	N.C.	-	⇒	**EX_NG (N.C.)**	**Input**	**Yes**	EX_NG is an External input/output function signal. NC when External input/output function is not used. Refer to "Using FP-10 special signals" on page 11 for usage instructions.
6	GND	-	=	GND	-	-	
7	SWDIO	Input/Output	=	SWDIO	Input/Output	-	
8	GND	-	=	GND	-	-	
9	SWCLK	Input	=	SWCLK	Input	-	
10	GND	-	=	GND	-	-	
11	N.C.	-	⇒	**EX_STARTn (N.C.)**	**Output**	**Yes**	EX_STARTn is an External input/output function signal. NC when External input/output function is not used. Refer to "Using FP-10 special signals" on page 11 for usage instructions.
12	GND	-	=	GND	-	-	
13	SWO	Output	⇒	**N.C.**	**-**	**Yes**	NC as this signal is not used.
14	GND	-	=	GND	-	-	
15	SRSTn	Input	=	SRSTn	Input	-	SRSTn signal is the open-collector output. If the target's power-on reset or system reset can't be connected to the wired-OR circuit or if it's not possible to use wired-OR circuit, connect with OR circuit.
16	GND	-	⇒	**EX33_BSY (N.C.)**	**Input**	**Yes**	EX33_BSY is an External input/output function signal. NC when External input/output function is not used. Refer to "Using FP-10 special signals" on page 11 for usage instructions. Caution: Please note that External input/output function is not supported if this signal is depicted as GND or connected to GND. Do not use the External input/output function in that case.
17	N.C.	-	⇒	**EX_OK (N.C.)**	**Input**	**Yes**	EX_OK is an External input/output function signal. NC when External input/output function is not used. Refer to "Using FP-10 special signals" on page 11 for usage instructions.

(Continued from previous page)

Pin No.	SWD I/F			FP-10 (model PS)		Changed	Remarks
	Signal	Input/ Output*1		Signal	Input/ Output*1		
18	GND	-	⇒	EX33_OK (N.C.)	Input	Yes	EX33_OK is an External input/output function signal. NC when External input/output function is not used. Refer to "Using FP-10 special signals" on page 11 for usage instructions. Caution: Please note that External input/output function is not supported if this signal is depicted as GND or connected to GND. Do not use the External input/output function in that case.
19	N.C.	-	⇒	EX33_STARTn (N.C.)	Output	Yes	EX33_STARTn is an External input / output function signal. NC when External input/output function is not used. Refer to "Using FP-10 special signals" on page 11 for usage instructions.
20	GND	-	⇒	X5V (N.C.)	Input	Yes	X5V signal supplies 5V at 200mA. max and can be used as the power supply to the target. NC when the Power supply function is not used. Please note that this signal should not be used if X3.3V(Pin 2) is used as the power supply. Refer to "Using FP-10 special signals" on page 11 for usage instructions. Caution: Please note that the Power supply function is not supported if this signal is depicted as GND or connected to GND. Do not use the Power supply function in that case.

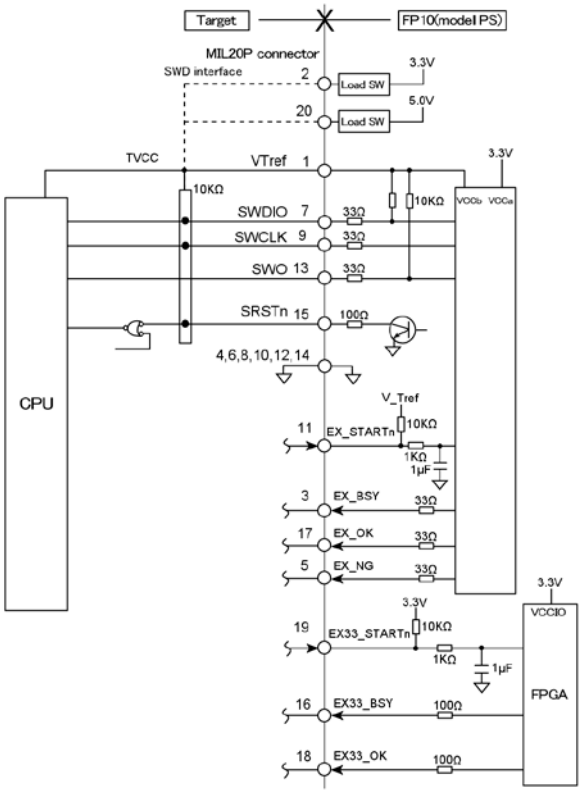
*1: Input/output is based on the target system.

Signal table

Pin No.	Signal	Remarks*1	Pin No.	Signal	Remarks*1
1	VTref	Output	2	[X3.3V] *5	Input
3	(EX_BSY)*2	Input	4	GND	
5	(EX_NG)*2	Input	6	GND	
7	SWDIO	Input/ Output	8	GND	
9	SWCLK	Input	10	GND	
11	(EX_STARTn)*2	Output	12	GND	
13	SWO*3	Output	14	GND	
15	SRSTn	Input	16	<EX33_BSY>*4	Input
17	(EX_OK) *2	Input	18	<EX33_OK>*4	Input
19	<EX33_STARTn>*4	Output	20	[X5V] *5	Input

*1: Input/output is denoted for the target system.
*2: External input/output function signal that will be at VTref level when high.
*3: Unused. NC.
*4: 3.3V External input/output function signal.
*5: Power supply function signal.

Target connection reference diagram



■ To prevent malfunction, the length of wirings from the CPU to the target connector should be kept as short as possible.

② JTAG interface

FP-10 can be connected using the standard JTAG. Please note that to use the Power supply function or External input/output function, FP-10 has to be connected using FP-10 special signals.

Signal description

Pin No.	JTAG I/F			FP-10 (model PS)		Changed	Remarks
	Signal	Input/ Output*1		Signal	Input/ Output*1		
1	VTref	Output	=	VTref	Output	-	Connect the I/O power supply of the CPU to FP-10. This is used as the reference voltage signal. Please note that this is not the target power supply.
2	TVDD	Output	⇒	**X3.3V (N.C.)**	**Input**	**Yes**	TVDD signal is not used in FP-10 X3.3V signal supplies 3.3V at 200 mA. max and can be used as the power supply to the target. NC when the Power supply function is not used. Please note that this signal should not be used if X5V(Pin 20) is used as the power supply Refer to "Using FP-10 special signals" on page 11 for usage instructions. Caution: Please note that the Power supply function is not supported if this signal is depicted as TVDD. Do not use the Power supply function in that case.
3	N.C.	-	⇒	**N.C.**	**Input**	**Yes**	When using the SWD interface, it can be used as EX_BSY, but when using the JTAG interface, it cannot be used as EX_BSY, so it will be N.C.
4	GND	-	=	GND	-	-	
5	TDI	Input	=	TDI	Input	-	
6	GND	-	=	GND	-	-	
7	TMS	Input	=	TMS	Input	-	
8	GND	-	=	GND	-	-	
9	TCK	Input	=	TCK	Input	-	
10	GND	-	=	GND	-	-	
11	N.C.	-	=	N.C.	-	-	
12	GND	-	=	GND	-	-	
13	TDO	Output	=	TDO	Output	-	
14	GND	-	=	GND	-	-	
15	SRSTn	Input	=	SRSTn	Input	-	SRSTn signal is the open-collector output. If the target's power-on reset or system reset can't be connected to the wired-OR circuit or if it's not possible to use wired-OR circuit, connect with OR circuit.
16	GND	-	⇒	**EX33_BSY (N.C.)**	Input	**Yes**	EX33_BSY is an External input/output function signal. NC when External input/output function is not used. Refer to "Using FP-10 special signals" on page 11 for usage instructions. Caution: Please note that External input/output function is not supported if this signal is depicted as GND or connected to GND. Do not use the External input/output function in that case.
17	N.C.	-	=	N.C.	-	-	
18	GND	-	⇒	**EX33_OK (N.C.)**	Input	**Yes**	EX33_OK is an External input/output function signal. NC when External input/output function is not used. Refer to "Using FP-10 special signals" on page 11 for usage instructions. Caution: Please note that External input/output function is not supported if this signal is depicted as GND or connected to GND. Do not use the External input/output function in that case.
19	N.C.	-	⇒	**EX33_STARTn (N.C.)**	Output	**Yes**	EX33_STARTn is an External input / output function signal. NC when External input/output function is not used. Refer to "Using FP-10 special signals" on page 11 for usage instructions.
20	GND	-	⇒	**X5V (N.C.)**	Input	**Yes**	X5V signal supplies 5V at 200mA. max and can be used as the power supply to the target. NC when the Power supply function is not used. Please note that this signal should not be used if X3.3V(Pin 2) is used as the power supply. Refer to "Using FP-10 special signals" on page 11 for usage instructions. Caution: Please note that the Power supply function is not supported if this signal is depicted as GND or connected to GND. Do not use the Power supply function in that case

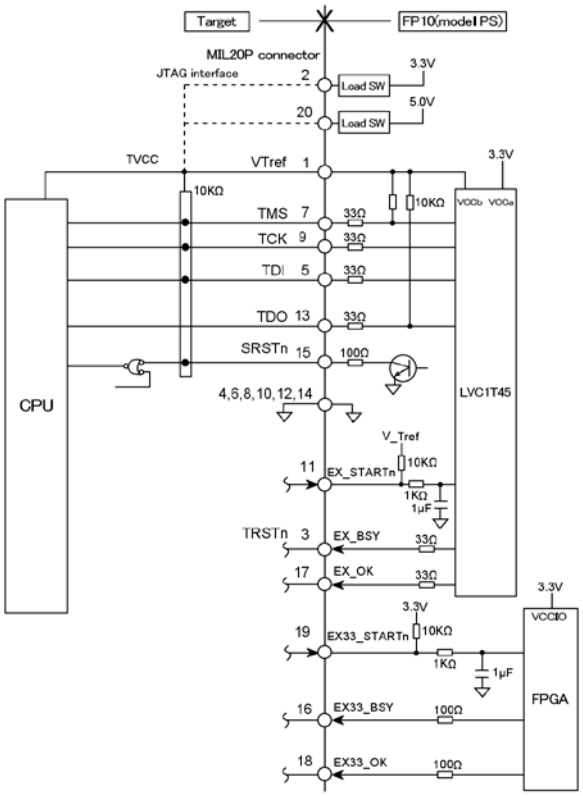
*1: Input/output is based on the target system.

Signal table

Pin No.	Signal	Remarks*1	Pin No.	Signal	Remarks*1
1	VTref	Output	2	[X3.3V] *4	Input
3	(EX_BSY) *2	Input	4	GND	
5	TDI	Input	6	GND	
7	TMS	Input	8	GND	
9	TCK	Input	10	GND	
11	(EX_STARTn)*2	Output	12	GND	
13	TDO	Output	14	GND	
15	SRSTn	Input	16	<EX33_BSY>*3	Input
17	(EX_OK) *2	Input	18	<EX33_OK>*3	Input
19	<EX33_STARTn>*3	Output	20	[X5V] *4	Input

*1: Input/output denoted is for the target system.
*2: JTAG interface is not supported.
*3: 3.3V External input/output function signal.
*4: Power supply function signal.

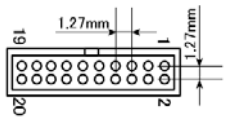
Target connection reference diagram



■ To prevent malfunction, the length of wirings from the CPU to the target connector should be kept as short as possible.

20-pin 1.27mm-pitch connector

Target connector specifications



(Top view on the target board)

Recommended connector
Manufacturer: Samtec, Inc.
Model: FTSH-110-01-L-DV-K
(For detailed dimensions of the connector, refer to the documentation by manufacturer of the connector.)

*Please refer the pin configuration diagram above and make sure that the connector is in the right direction before connecting.
Please check the pin number in the signal table above and make sure the signal and the pin numbers match.

This connector does not support the power supply function to the target.

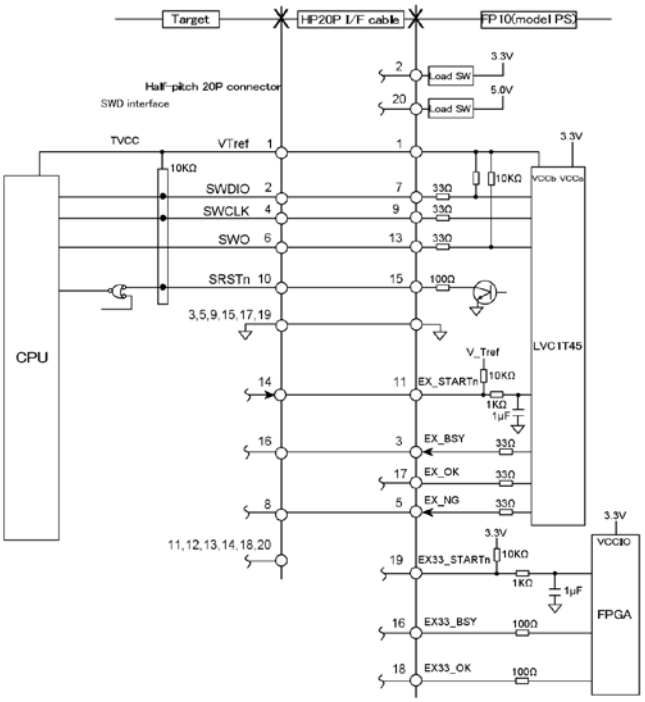
③ SWD interface

Signal table

Pin No.	Signal	Remarks*1	Pin No.	Signal	Remarks*1
1	VTref*2	Output	2	SWDIO	Input/ Output
3	GND		4	SWCLK	Input
5	GND		6	SWO*3	Output
7	Key		8	NC	NC
9	GND		10	SRSTn*4	Input
11	GND*5		12	TraceClk*3	Output
13	GND*5		14	TraceD0*3	Output
15	GND		16	TraceD1*3	Output
17	GND		18	TraceD2*3	Output
19	GND		20	TraceD3*3	Output

*1: Input/output is denoted for the target system.
*2: Connect the I/O power supply of the CPU to VTref.
*3: Unused. NC.
*4: Open-collector output. If the target's power-on reset or system reset can't be connected to the wired-OR circuit or if it's not possible to use wired-OR circuit, connect with OR circuit.
*5: In some target systems, this pin may be assigned as a power supply pin.This product is GND, so do not connect it to the power line (or leave it unconnected).

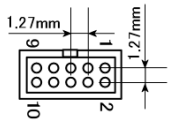
Target connection reference diagram



■ To prevent malfunction, the length of wirings from the CPU to the target connector should be kept as short as possible.

10-pin 1.27mm-pitch connector

Target connector specifications



(Top view on the target board)

Recommended connector
Manufacturer: Samtec, Inc.
Model: FTSH-105-01-L-DV-K

(For detailed dimensions of the connector, refer to the documentation by manufacturer of the connector.)

*Please refer the pin configuration diagram above and make sure that the connector is in the right direction before connecting.
Please check the pin number in the signal table above and make sure the signal and the pin numbers match.

This connector does not support the power supply function to the target.

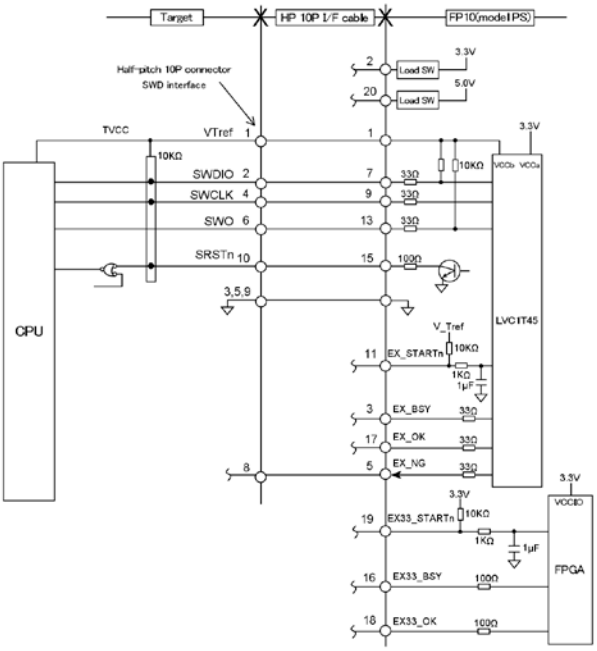
④ SWD interface

Signal table

Pin No.	Signal	Remarks*1	Pin No.	Signal	Remarks*1
1	VTref*2	Output	2	SWDIO	Input/ Output
3	GND		4	SWCLK	Input
5	GND		6	SWO*3	Output
7	Key		8	NC	Input
9	GND		10	SRSTn*4	Input

*1: Input/output is denoted for the target system.
*2: Connect the I/O power supply of the CPU to VTref.
*3: Unused. NC.
*4: Open-collector output. If the target's power-on reset or system reset can't be connected to the wired-OR circuit or if it's not possible to use wired-OR circuit, connect with OR circuit.

Target connection reference diagram



■ To prevent malfunction, the length of wirings from the CPU to the target connector should be kept as short as possible.

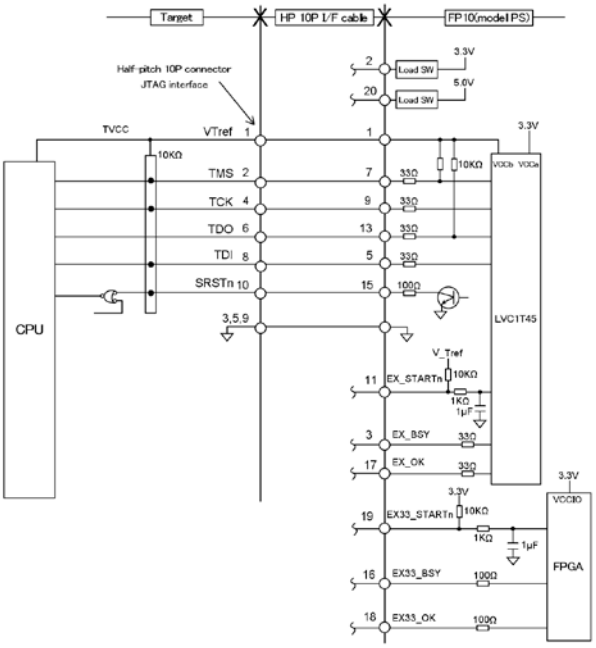
⑤ JTAG interface + Trace

Signal table

Pin No.	Signal	Remarks*1	Pin No.	Signal	Remarks*1
1	Vtref	Output	2	TMS	Input/ Output
3	GND		4	TCK	Input
5	GND		6	TDO	Output
7	Key*3		8	TDI	Input
9	GND		10	SRSTn*2	Input

*1: Input/output is denoted for the target system.
*2: Open-collector output. If the target's power-on reset or system reset can't be connected to the wired-OR circuit or if it's not possible to use wired-OR circuit, connect with OR circuit.
*3: Intended for protection against erroneous insertion.

Target connection reference diagram



■ To prevent malfunction, the length of wirings from the CPU to the target connector should be kept as short as possible.

Using FP-10 special signals

The three categories of FP-10 special signals are explained below:

(1) EX_STARTn, EX_BSY, EX_OK, EX_NG

These signals are used for operating FP-10 from external equipments such as inspection units, jigs etc. When using the power supply function mentioned in category(3), the 3.3V I/F mentioned in category(2) can be used.

When SWD is used, JTAG signal line that is free is used.So this signal will not work when using JTAG interface.Please use the 3.3V I/F version.

Signal	Description	JTAG*1
EX_BSY*2	During writing, H is output from FP	×
EX_NG*2	When the write result is NG, H is output from FP	×
EX_STARTn*3	Start writing when there is a pulse input to FP	×
EX_OK*2	When the write result is OK, H is output from FP	×

*1: JTAG interface is not supported.
*2: The H level will be the same as the VTref (Pin 1 of the target connector) level. Level will be L if VTref is cut off.
*3: Reference voltage needs to be input to VTref in order to detect the pulse.

(2) EX33_STARTn, EX33_BSY, EX33_OK

These signals use 3.3V I/F for operating FP-10 from external equipments. There are only 3 signals and the signal corresponding to EX_NG signal in Category-1 is not present. The power supply function of categories(1), (2), and (3) can be used independently.

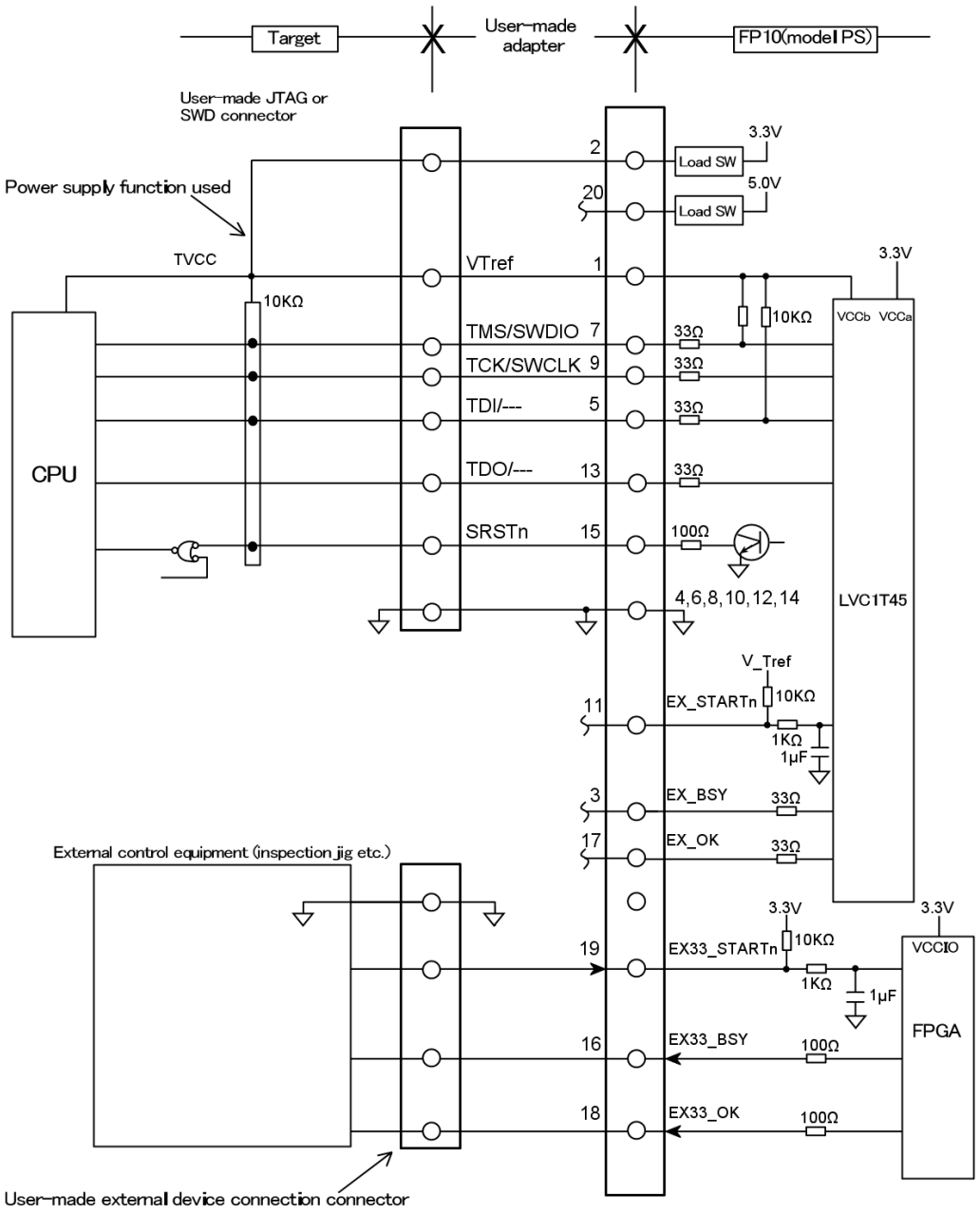
Signal	Description	JTAG
EX33_BSY*1	During writing, H is output from FP	○
EX33_STARTn	Start writing when there is a pulse input to FP	○
EX33_OK*1	When the write result is OK, H is output from the FP	○

*1:H level is 3.3V.

(3) X3.3V, X5V

These signals supply 3.3V and 5.0V respectively to the target at ±5% accuracy and 200 mA max. Only one must be connected to the target, i.e. these two signals lines must not be used simultaneously.

Please refer these examples below for better understanding:



Note

- FP-10 is only guarenteed to run with the dedicated cable that comes with it. Using a different cable type may lead to unexpected results.
- Keep the wire length between the JTAG connector and the CPU on the target system as short as possible.

Technical Information on On-board Flash Programmer FP-10 (12th Edition)

Go through the required procedures as stated under Foreign Exchange and Foreign Trade Control Law in exporting (including the case where travellers directly carry) this product or providing this product for residents outside Japan.

Chapter 7 Target Interface Specifications

7.1 Introduction

This chapter describes the target interface specifications for connecting FP-10 to the target.

Info

For reference circuit and contents of technical nature not described in this manual, refer to "Technical Information on On-board Flash Programmer FP-10" on Computex website
(https://www.computex.co.jp)

7.2 Specifications of the target connector

FP-10 supports JTAG and SWD as debugging interfaces.

JTAG is employed as the standard interface and the standard 2.54mm-pitch 20-pin MIL connector has to be used. For connecting the target system, the dedicated interface cable (TARGET cable) included with the product should be used.

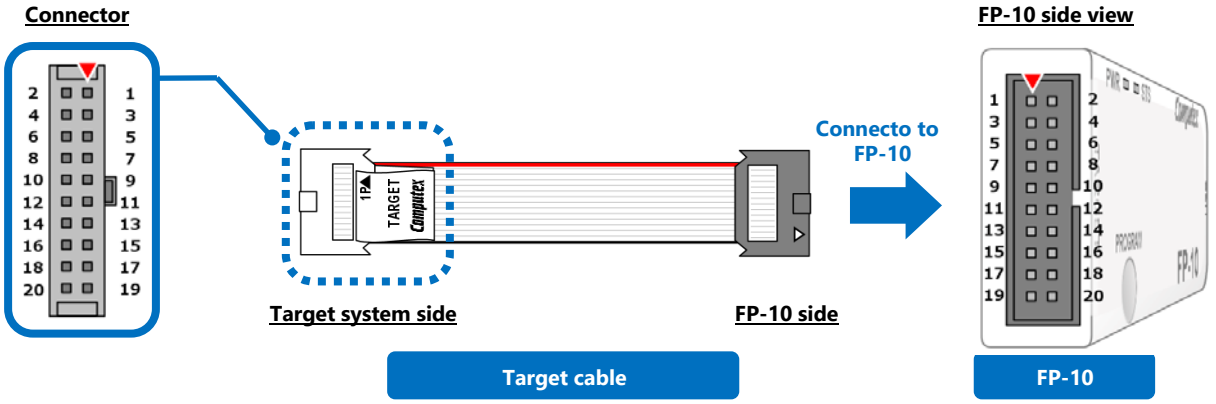
For specification details, refer to "Technical Information on On-board Flash Programmer FP-10" the Computex website.

Please note that the Target interface specifications and specifications of the External Input/Output function of FP-10 have changed for the XMC1300 series. For details on XMC 1300 series compatibility, please refer to "XMC1000 series compatible FP-10 owner's manual.pdf".

The standard JTAG interface specifications are described below.

7.2.1 Pin allocation

The pin allocations are specific to FP-10 and the target cable is dedicated to FP-10. Make sure that you only use the TARGET cable that is included with the product.



No.	Signal	Input/ Output*1	FP-10 internal circuit	Remarks
1	VTref	Output		Reference voltage for FP-10. Connect the CPU's I/O power supply to this signal. Please note that this is not the target power supply.
2	X3.3V (N.C.)	Input		3.3V power supply from FP-10 to the target. This signal is used when using the Power supply function. NC otherwise.
3	EX_BSY (N.C.)	Input	33Ωseries	This signal is used when using the External input/output function. Set to N.C. when using the JTAG I/F or when not using the external input/output function.
4	GND			
5	TDI / EX_NG (N.C.)	Input	33Ωseries	TDI signal is used with JTAG I/F. EX_NG is used when using the External input/output function. NC if External input/output function is not used.
6	GND			
7	TMS/SWDIO	Input/ Input/Output	33Ωseries 10KΩPull-Up (VTref)	TMS is an input signal used with JTAG I/F and SWDIO is an input/output signal used with SWD I/F. This signal is pulled up to VTref potential.
8	GND			
9	TCK/SWCLK	Input	33Ωseries	TCK is a JTAG I/F signal and SWCLK is a SWD I/F signal.
10	GND			
11	EX_STARTn (N.C.)	Output	1KΩseries 10KΩPull-Up (VTref)	This signal is used when using the External input/output function. This signal is pulled up to VTref potential. Set to N.C. when using the JTAG I/F or when not using the external input/output function.
12	GND			
13	TDO/SWO (N.C.)	Output	33Ωseries 10KΩPull-Up (VTref)	TDO is a JTAG I/F signal. NC in case of SDW I/F since this signal is not used when using SDW I/F. This signal is pulled up to VTref potential.
14	GND			
15	SRSTn	Input	100Ωseries Open-collector output	Open-collector output. If the target's power-on reset or system reset can't be connected to the wired-OR circuit or if it's not possible to use wired-OR circuit, connect with OR circuit.
16	EX33_BSY (N.C.)	Input	100Ωseries	This signal is used when using the External input/output function. NC otherwise. Please note that the External input/output function is not supported if this signal is depicted as GND or connected to GND. Do not use the External input/output function in that case.

(Continued from previous page)

No.	Signal	Input/ Output*1	FP-10 internal circuit	Remarks
17	EX_OK (N.C.)	Input	33Ωseries	This signal is used when using the External input/output function. Set to N.C. when using the JTAG I/F or when not using the external input/output function.
18	EX33_OK (N.C.)	Input	100Ωseries	This signal is used when using the External input/output function. NC otherwise. Please note that the External input/output function is not supported if this signal is depicted as GND or connected to GND. Do not use the External input/output function in that case.
19	EX33_STARTn (N.C.)	Output	1KΩseries 10KΩPull-Up (3.3V)	This signal is used when using the External input/output function. NC if External input/output function is not used. This signal is pulled up to 3.3V potential.
20	X5V (N.C.)	Input		5V power supply from FP-10. NC when the Power supply function is not used. Please note that the Power supply function is not supported if this signal is depicted as GND or connected to GND. Do not use the Power supply function in that case.

*1 : Input/Output is based on the target system.

Comparison of target interface specifications of FP-10 and FP-10 (model PS)

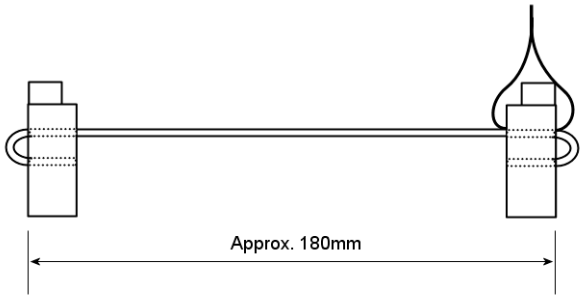
The target interface specifications of FP-10 and FP-10 (model PS) have partially changed. Refer to the table below.

Pin No.	FP-10			FP-10 (model PS)		Changed	Remarks
	Signal	Input/ Output*1		Signal	Input/ Output*1		
1	VTref	Output	=	VTref	Output	-	
2	TVDD	Output	⇒	**X3.3V**	Input	**Yes**	Do not use the Power supply function if this signal is depicted as TVDD.
3	EX_BSY	Input	=	EX_BSY	Input	-	
4	GND	-	=	GND	-	-	
5	TDI/EX_NG	Input	=	TDI/EX_NG	Input	-	
6	GND	-	=	GND	-	-	
7	TMS/SWDIO	Input/ Input/Output	=	TMS/SWDIO	Input/Output	-	
8	GND	-	=	GND	-	-	
9	TCK/SWCLK	Input	=	TCK/SWCLK	Input	-	
10	GND	-	=	GND	-	-	
11	EX_STARTn	Output	=	EX_STARTn	Output	-	
12	GND	-	=	GND	-	-	
13	TDO	Output	=	TDO	Output	-	
14	GND	-	=	GND	-	-	
15	SRSTn	Input	=	SRSTn	Input	-	
16	GND	-	⇒	**EX33_BSY**	Input	**Yes**	Do not use the External input/output function if this signal is depicted as GND or connected to GND.
17	EX_OK	Input	=	EX_OK	Input	-	
18	GND	-	⇒	**EX33_OK**	Input	**Yes**	Do not use the External input/output function if this signal is depicted as GND or connected to GND.
19	N.C.	-	⇒	**EX33_STARTn**	Output	**Yes**	
20	GND	-	⇒	**X5V**	Input	**Yes**	Do not use the External input/output function if this signal is depicted as GND or connected to GND.

*1 : Input/Output is based on the target system.

7.2.2 Dimensions of TARGET cable

Dimensions of the dedicated TARGET cable are as follows.



7.3 Target interface voltage level

- Input voltage level

Target voltage (V)	5.0V	3.3V	1.8V
VIH(min)	3.5V	2.0V	1.17V
VIL(max)	1.5V	0.8V	0.63V

- Output voltage level

Target voltage (V)	4.5V	3.0V	1.65V
VOH(min)	3.8V	2.4V	1.2V
VOL(max)	0.55V	0.55V	0.45V

Note

SRSTn is the output signal of the open-collector.

Please note that the waveform may be affected depending on the wire length and load from FP-10 to the CPU of the target system. If there is distortion in the waveform and if the disturbance exceeds the specifications of the device, it is recommened to insert a damping resistor in the signal line to suppress the disturbance.

7.4 Signal specifications

7.4.1 JTAG/SWD signals (TCK, TMS, TDI, TDO, SWDIO and SWCLK)

JTAG or SWD connection can be used to communicate with the on-chip debug unit in the ARM core.
JTAG uses four signal lines - TCK, TMS, TDI and TDO, while SWD required two - SWDIO and SWCLK. The signal designation may differ slightly depending on the CPU, but generally for CPUs that use both JTAG and SWD, TMS and SWDIO, TCK and SWCLK use the same terminals.
Make sure to check the specifications of the target CPU before connecting the necessary signals.
Please note that TRSTn (reset signal for JTAG) is not used.

7.4.2 SRSTn signal

SRSTn signal is used as the reset signal for initializing the CPU from FP-10.
The output from FP-10 is open-collector to allow wired-OR connections on the power-on-reset and system reset signals on the target.

7.4.3 VTref signal

VTref is the reference voltage used by FP-10 to communicate with the target. Connect the CPU's I/O power to this signal. The valid range should be 1.65V~5.5V.

7.4.4 X3.3V/X5V power supply (model PS)

X3.3V/X5V are voltage signals that are output by FP-10 which can be used as the power source to the target. As the names indicate, X3.3V (Pin 2 on the target connector) and X5V (Pin 20 on the target connector) supply 3.3V and 5V respectively at ± 5% accuracy and can supply up to 200 mA. Please note that only one signal can be connected to the target at a time. In other words, these two signals can not be used simultaneously. For details on C-Flash settings, see "3.3 Target System Settings".
Rise time at power on is 2 ms.
As a protection machanism, if an overcurrent flows due to short circuit of the target etc., the protection circuit shuts off power to FP-10 stopping the output from these signals. Also, if VTref voltage (voltage of Pin 1) is lower than the threshold when power is normally supplied to the target, FP-10 powers down stopping the output of these signals.
Leave the X3.3V/X5V signals as NC if the Power supply fuction is not used (FP-10 can not be or is not used as the power source to the target).

7.4.5 External I/O function signals

The following signals are assigned on the target connector for enabling the External Input/Output function of FP-10:

Pin 3 as EX_BSY

Pin 5 as EX_NG

Pin 11 as EX_STARTn

Pin 17 as EX_OK

Pin 16 as EX33_BSY

Pin 18 as EX33_OK

Pin 20 as EX33_STARTn

The above mentioned signals should be connected to an external equipment controlling the FP-10 and not to the target on which the CPU to be written is mounted.

Please refer to "Chapter 13 External I/O functions of FP-10" for detailed specifications.

If the External I/O functions of FP-10 is not used, leave these signals as NC.

Chapter 13 External I/O functions of FP-10

13.1 Introduction

A new feature to detect the write status of FP-10 by an external device has been added. The following signals in the table below have been modified on the target connector. For information about the Target connector, refer to section "7.2 Specifications of the target connector".

External input / output function powered by VTref (1 pin)

Pin No.	Signal	Description	Command	Supported C-Flash version*1	JTAG*2
3	EX_BSY*3	During writing, H is output from FP	FP_EXBSY	V1.44.00 or newer	×
5	EX_NG*3	When the write result is NG, H is output from the FP	FP_EXNG	V1.44.00 or newer	×
11	EX_STARTn*4*5	Start writing when there is a pulse input to FP	FP_EXSTART	V1.38.00 or newer	×
17	EX_OK*3	When the write result is OK, H is output from FP	FP_EXOK	V1.38.00 or newer	×

*1 : Corresponding version varies depending on the function.
*2 : All signals can not be used when using JTAG.
*3 : H level will be the same as the VTref (Pin 1 of the target connector) level. Level will be L if VTref is cut off.
*4 : Reference voltage needs to be input to VTref in order to detect the pulse.
*5 : Note that this function is available only in standalone mode..

FP-10(model PS) also supports the External input/output function using 3.3V I/F. When power is supplied to the target using the FP-10 (model PS), since the taget power is turned on and off synchronously during the write process, VTref signal (target voltage) can not be used as the power supply. As an alternative, the 3.3V I/F can be used. Please notet hat the 3.3V I/F can be used as a normal 3.3V external input/output signal even if the power supply function of the FP-10 (model PS) is not used,

External input / output function using 3.3V I/F

Pin No.	Signal	Description	Equivalent signal	Supported C-Flash version	JTAG
16	EX33_BSY	During writing, H is output from FP	EX_BSY (3 pin)	V1.60.00 or newer	○
18	EX33_OK	When the write result is OK, H is output from the FP	EX_OK (17 pin)	V1.60.00 or newer	○
19	EX33_STARTn*1	Start writing when there is a pulse input to FP	EX_STARTn (11 pin)	V1.60.00 or newer	○

*1 :**Note that this function is available only in standalone mode.**

Please note that both External input / output function powered by VTref and 3.3V I/F can not be use simultaneously.

13.1.1 EX_OK/EX33_OK(model PS)

There are 3 modes available for EX_OK output which can be chosen using C-Flash as explained below:

① Result output (High at OK, Low at NG), V.1.44.00 or later

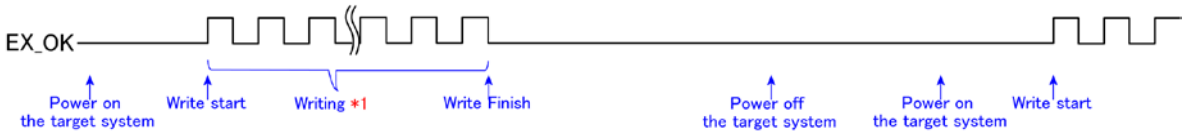
H is output when write completes successfully. If writing fails, nothing(L) is output.

② LED interlocking (Pulse output during writing, High at OK, Low at NG)

EX_OK pulse will resemble the turning on and off of the STS LED on the FP.

- The following waveform is output during Write operation and when the operation completes successfully:

- The following waveform is output during Write operation and when the Write operation fails:



*1 : L/H signal period may vary during Write operation

③ Write interlocking (High during writing, Low after writing)

H is output on EX_OK when Write operation is in progess. After write operation comepletes, irrespective of whether the Write operation succeeds or fails the signal level drops to L.

13.1.2 EX_STARTn/EX33_STARTn(model PS)

FP-10 will start the Write operation when it detects a falling edge on EXSTART instead of waiting for the **PROGRAM button**.

To use EX_STARTn, it needs to be configured using C-Flash as explained in Section 13.2.

Please note that edge detection of EX_STARTn signal will be ignored when Write operation is in progress.

13.1.3 EX_BSY/EX33_BSY(model PS)

To use EX_BSY, it needs to be configured using C-Flash as explained in Section 13.2.

When EX_BSY is configured, H is output during Write operation and L is output when Write operation completes.

Please note that this signal is shared with the JTAG's /TRST signal. Make sure not use this signal when the /TRST signal of the CPU on the target system is connected to FP.

13.1.4 EX_NG

To use EX_NG, it needs to be configured using C-Flash as explained in Section 13.2.

When EX_NG is configured, H is output when Write operation fails.

Please note that this signal is shared with the JTAG's TDI signal. Make sure not use this signal when the TDI signal of the CPU on the target system is connected to FP.

In External input/output function using 3.3V I/F, no signal is output.

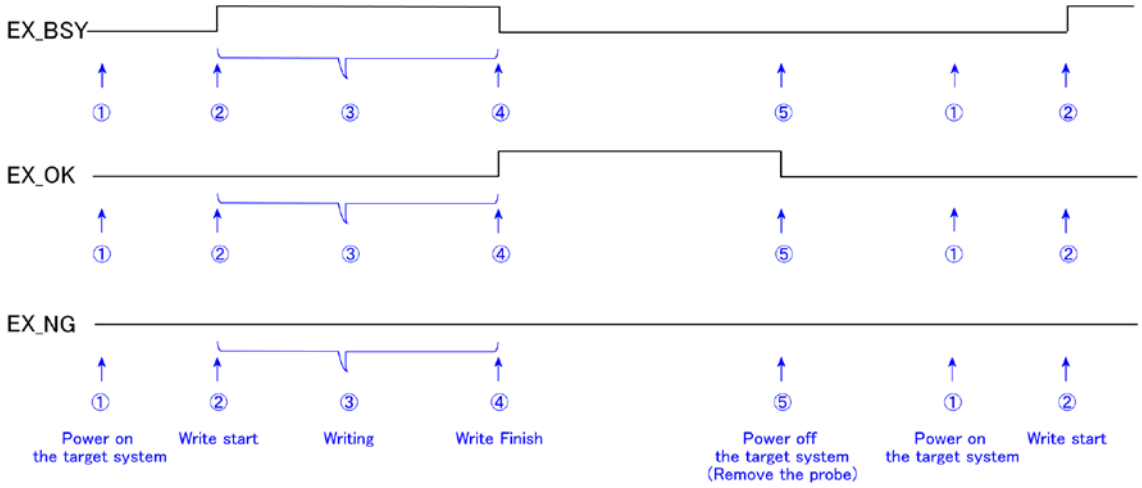
13.1.5 Using each signal in combination

By setting EX_OK signal to "result output" and enabling the output of the EX_BSY and EX_NG signals, the three signals can be combined to determine the progress and result of Write operation with the external device.

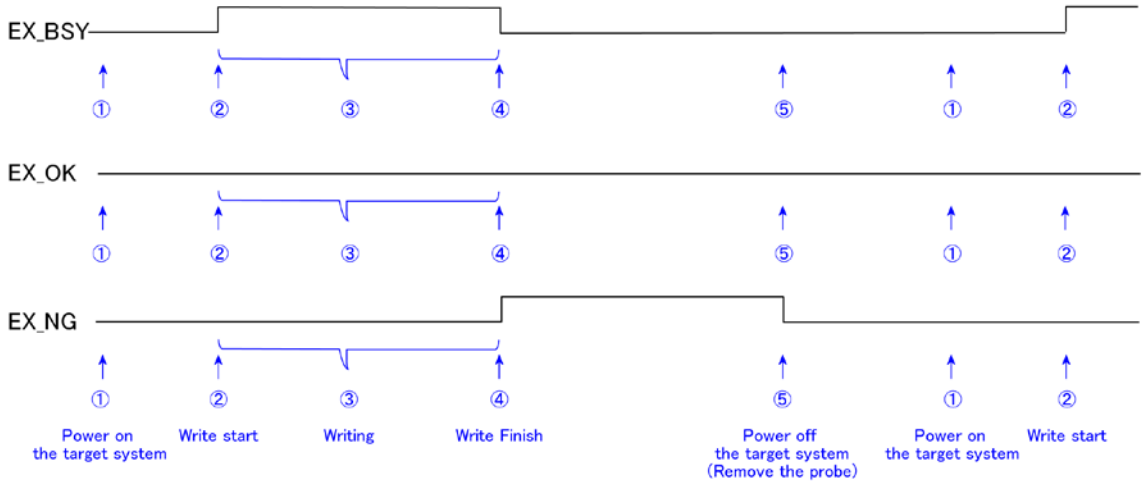
This also applies to EX33_OK and EX33_BSY signals of the External input/output function when 3.3V I / F is used.

In External input/output function, EX_NG signal is output using 3.3V I/ F.

- The following waveform is output during Write operation and when the operation completes successfully:



- The following waveform is output during Write operation and when the Write operation fails:



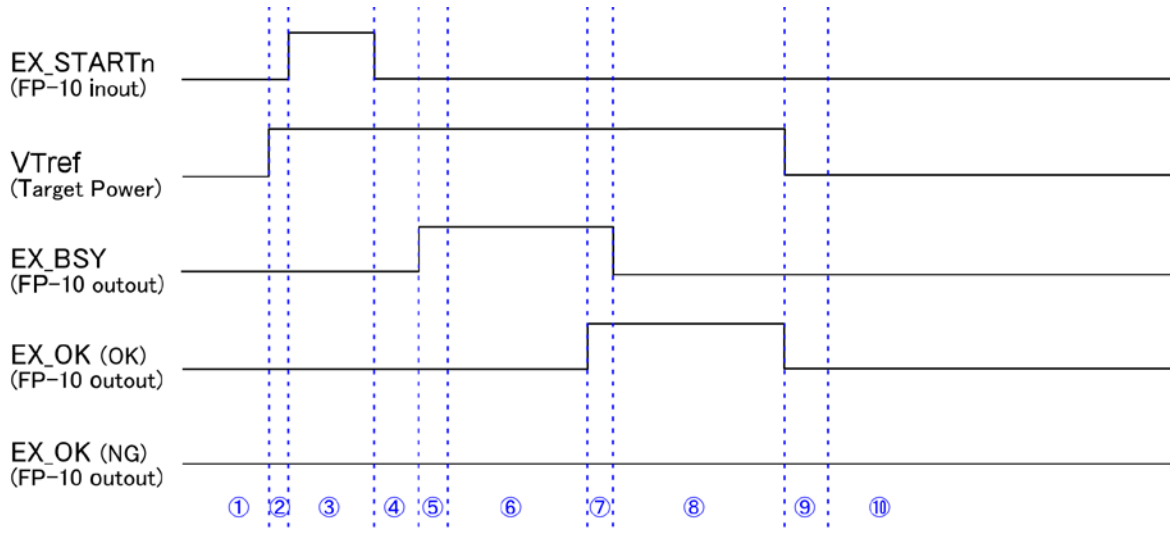
H level will be the same as the VTref (Pin 1 of the target connector) level. The level will be L if Vtref is cut off.

If VTref signal is interrupted, EX_OK/EX_NG signal will automatically output L. H will not be output even if VTref signal is restored after this during the current operation.

In External input/output function using 3.3V I/F, H level will be at 3.3V.

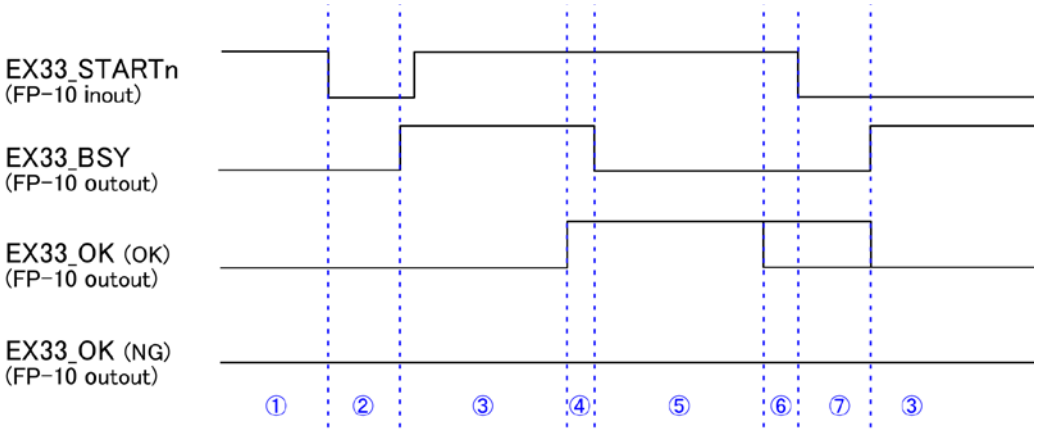
FP-10 monitors if External input/output function is powered by VTref(Pin 1) and if VTref signal is interrupted.

13.2 External I / O function timing with VTref (1 pin)



①	FP-10 setup time(1300ms,Only immediately after the FP-10 power supply,Usually 10)
②	Time from the input of Vtref until EX_STARTn can be recognized (16 us)
③	HI retention of EX_STARTn (no specified time)
④	Time from the falling edge of EX_STARTn to the start of write processing (300 ms)
⑤	Processing before writing
⑥	Writing
⑦	EX_BSY, EXOK change time 5us
⑧	Result output(OK:EX_OK/HI,NG:EX_OK/LOW)
⑨	Wait time for next write(1ms)
⑩	Waiting for the next start.

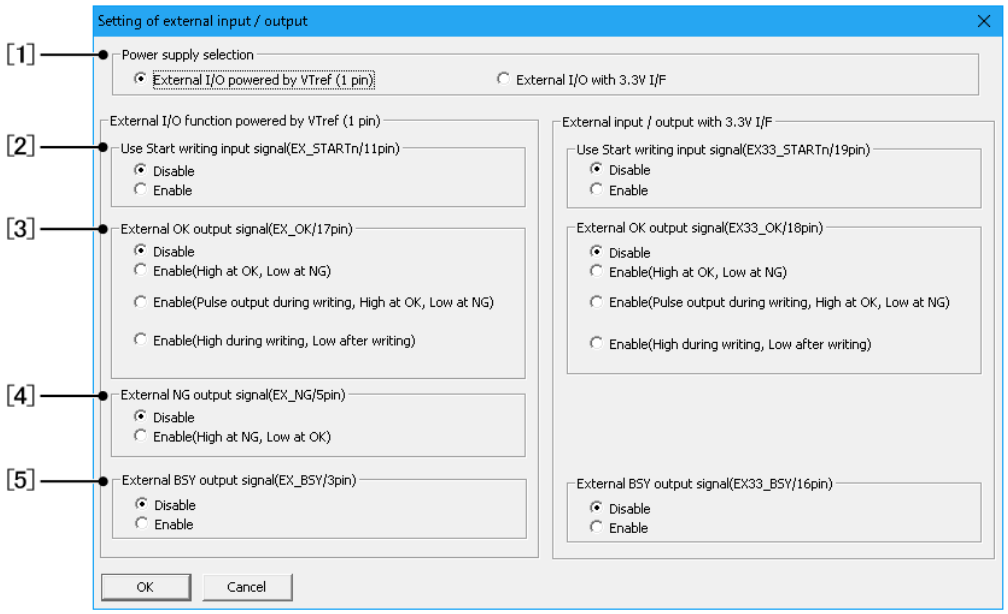
13.3 External I / O function timing with 3.3V I/F



①	FP-10 setup time(1300ms,Only immediately after the FP-10 power supply)
②	Time from the falling edge of EX_STARTn to the start of write processing (300 ms)
③	Writing
④	EX_BSY, EXOK change time 5us
⑤	Result output(OK:EX_OK/HI,NG:EX_OK/LOW)
⑥	When the power supply function of FP-10 is not used,EX33_OK is LOW when there is no VTref input. When the power supply function of FP-10 is used,EX33_OK keeps HI. Wait time for next write(1ms)
⑦	When the power supply function of FP-10 is used,EX_STARTn After recognizing the falling edge, set EX33_OK to LOW.

13.4 C-Flash Settings

Navigate to **[Target system setting] [Set Initial value]** tab. On clicking the **[External I/O Setting]** button, the following setting screen will be displayed:



[1] Power supply selection

Use VTref or 3.3V I/F.

[2] Use Start writing input signal

Input signal to FP-10 to start the Write procedure.

[3] External OK output signal

Select the output format of the OK signal.

[4] External NG output signal

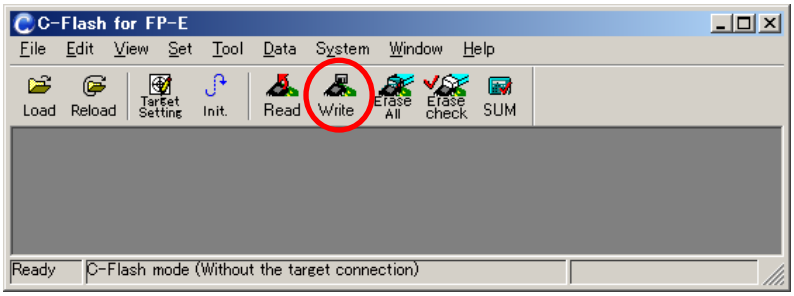
Select the output of NG signal. Select the output format of NG signal.

[5] External BSY output signal

Select the output format of the BSY signal.

Perform the settings as follows.

If **[Write]** is grayed out and can not be pressed, refer to "3.3 Target System Settings" and "4.2.2 Specifying the data (file) for writing into on-chip flash memory" to make various settings of C-Flash until the **[Write]** button becomes enabled.
Press the **[Write]** button.



Press the **[Write]** button to reflect these setting in FP-10 (Otherwise, these settings will not be reflected in Standalone-mode).

If **[Write]** is grayed out and can not be pressed, refer to "3.3 Target System Settings" and "4.2.2 Specifying the data (file) for writing into on-chip flash memory" to make various settings of C-Flash until the **[Write]** button becomes enabled.
Press the **[Write]** button.

Done.

Note

External Input/Output settings are written to the C-Flash project file If External Input/Output function is enabled on FP-10 to begin with, and if FP-10 is initialized with a project file that has External Input/Output function set to disabled, upon executing [Write] the External Input/Output function will be disabled on FP-10.