AN00173: Interfacing FlashRunner with Renesas RL78 Devices

FlashRunner is a Universal In-System Programmer, which uses the principles of In-Circuit Programming to program Renesas RL78 family microcontrollers. This Application Note describes how to properly set up and use FlashRunner to program RL78 Flash devices.

This Application Note assumes that you are familiar with both FlashRunner and the main features of the RL78 family. Full documentation about these topics is available in the FlashRunner user's manual and in device-specific datasheets.

This application note refers to the RNSS_F algorithm versions higher than 01.00.01.00. For the algorithm version 01.00.01.00 please refer to the application note AN00160.

1. Introduction

In-system programming of RL78 microcontrollers is performed via serial communication. As serial communications for programming the flash memory, single-wire UART communication or two-wire UART communication can be used.

In order to use FlashRunner to perform in-system programming, you need to implement the appropriate in-circuit programming hardware interface on your application board.

Thanks to its in-system programming capabilities, FlashRunner allows you to program or update the content of the Flash memory when the chip is already plugged on the application board.

2. Hardware Configuration

The microcontroller's lines needed to program a RL78 device are the following:

2.1 Single-wire UART communication

- **/RESET:** Active low system reset.
- **TOOL0:** Transmit/receive signal.
- **VDD\EVDD:** Device power supply voltage.
- **VSS\EVSS:** Device power supply ground.
- **REGC:** Regulator capacitance pin.

The lines mentioned above must be connected to the FlashRunner's "ISP" connector according to the following diagram:
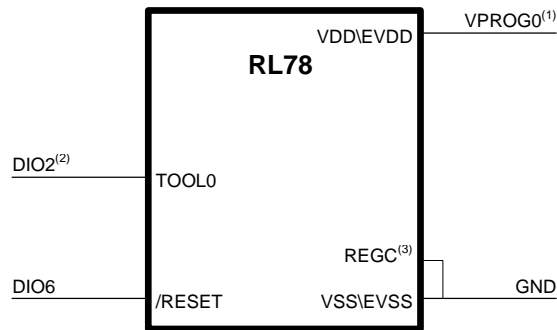
(1) Connect this line if you want FlashRunner to automatically power the target device
(2) An external pullup resitor (1KΩ) is required on this line
(3) Connect the REGC pin to VSS via a capacitor (0.47 to 1 μF).

2.1 Two-wire UART communication

- **/RESET:** Active low system reset.

- **TOOL0:** Mode signal.

- **TOOLTxD\ TOOLRxD:** UART transmission signal \ UART reception signal.

- **VDD\EVDD:** Device power supply voltage.

- **VSS\EVSS:** Device power supply ground.

- **REGC:** Regulator capacitance pin.

The lines mentioned above must be connected to the FlashRunner's "ISP" connector according to the following diagram:
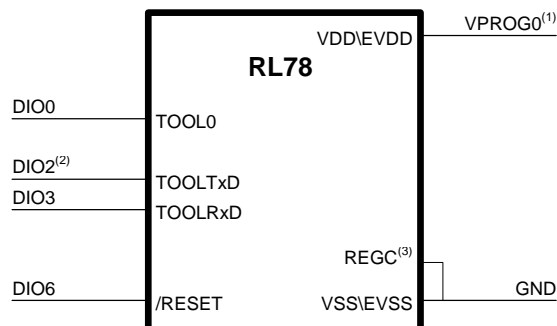

(1) Connect this line if you want FlashRunner to automatically power the target device
(2) An external pullup resitor (1KΩ) is required on this line
(3) Connect the REGC pin to VSS via a capacitor (0.47 to 1 μF).

3. Specific TCSETPAR Programming Commands

Overview

`TCSETPAR` commands set device-specific and programming algorithm-specific parameters. These commands must be sent after the `TCSETDEV` command and before a `TPSTART` / `TPEND` command block.

All of the following parameters must be correctly specified through the relative `TCSETPAR` commands (although the order with which these parameters are set is not important):

- VDD voltage;
- Power Up time;
- Power Down time;
- Reset Up time;
- Reset Down time;
- Reset Drive mode;
- CMODE communication mode settings;
- FOSC external oscillator frequency;
- BAUDRATE bit rate settings;

TCSETPAR VDD

Command syntax:

```
TCSETPAR VDD <voltage mV>
```

Parameters:

`voltage mV`: Target device supply voltage, expressed in millivolts.

Description:

This command is used to properly generate the voltage level of the ISP lines. Additionally, the specified voltage is routed to the VPROG0 line of the FlashRunner's "ISP" connector, which can be used as a supply voltage for the target board.

TCSETPAR PWUP

Command syntax:

```
TCSETPAR PWUP <time ms>
```

Parameters:

`time ms`: Power rising time, expressed in milliseconds.

Description:

This command is necessary because, to enter the programming mode, FlashRunner must properly drive the V_{DD} line during the power-on reset.

The V_{DD} rising time (PWUP) is expressed in milliseconds and depends on the features of your target board. Make sure to choose a value large enough to ensure that the V_{DD} signal reaches the high logic level within the specified time. Note that, if the V_{DD} line has a high load, a longer time is required for the V_{DD} signal to reach the high logic level. If PWUP is not long enough, FlashRunner could not be able to enter the programming mode.

TCSETPAR PWDOWN

Command syntax:

TCSETPAR PWDOWN <time ms>

Parameters:

time ms: Power falling time, expressed in milliseconds.

Description:

The V_{DD} falling time (PWDOWN) is expressed in milliseconds and depends on the features of your target board. Make sure to choose a value large enough to ensure that the V_{DD} signal reaches the low logic level within the specified time. Note that, if the V_{DD} line has a high load, a longer time is required for the V_{DD} signal to reach the low logic level.

TCSETPAR RSTUP

Command syntax:

TCSETPAR RSTUP <time µs>

Parameters:

time µs: Reset rising time, expressed in microseconds.

Description:

The Reset rising time (RSTUP) is expressed in microseconds and depends on the features of your target board. Make sure to choose a value large enough to ensure that the Reset signal reaches the high logic level within the specified time. Note that, if the Reset line has a high load, a longer time is required for the Reset signal to reach the high logic level.

SMH Technologies S.r.l.
Società unipersonale

Capitale Sociale: € 10.000 i.v. - P. IVA: 01607790936 - Rea: PN-90085
via Giovanni Agnelli 1, 33083 Villotta di Chions (PN) Italy
Phone +39 0434 421111 – Fax +39 0434 639021 - info@smh-tech.com - www.smh-tech.com

SofTec Microsystems
SMH Technologies is the licensee of the SofTec Microsystems trademark

TCSETPAR RSTDRV

Command syntax:

`TCSETPAR RSTDRV <mode>`

Parameters:

`mode`: Reset drive mode.

Options:

`OPENDRAIN`

`PUSHPULL`

Description:

Sets the Reset line driving mode

TCSETPAR RSTDOWN

Command syntax:

`TCSETPAR RSTDOWN <time µs>`

Parameters:

`time µs`: Reset falling time, expressed in microseconds.

Description:

The Reset falling time (RSTDOWN) is expressed in microseconds and depends on the features of your target board. Make sure to choose a value large enough to ensure that the Reset signal reaches the low logic level within the specified time. Note that, if the Reset line has a high load, a longer time is required for the Reset signal to reach the low logic level.

TCSETPAR CMODE

Command syntax:

SMH Technologies S.r.l.
Società unipersonale

Capitale Sociale: € 10.000 i.v. - P. IVA: 01607790936 - Rea: PN-90085
via Giovanni Agnelli 1, 33083 Villotta di Chions (PN) Italy
Phone +39 0434 421111 – Fax +39 0434 639021 - info@smh-tech.com - www.smh-tech.com

SofTec Microsystems
SMH Technologies is the licensee of the SofTec Microsystems trademark

```
TCSETPAR CMODE <communication mode>
```

Parameters:

Communication mode: serial communication mode

Options:

UART1: single-wire UART communication mode

UART2: two-wire UART communication mode

Description:

This command is used to select the flash programming serial protocol between FlashRunner and the target microcontroller.

TCSETPAR FOSC

Command syntax:

```
TCSETPAR FOSC <frequency Hz>
```

Parameters:

frequency Hz: External oscillator frequency, expressed in Hertz.

Description:

This command is used to set up the frequency of the external oscillator mounted on the target board.

TCSETPAR BAUDRATE

Command syntax:

```
TCSETPAR BAUDRATE <bps>
```

Parameters:

bps: serial communication bit rate in bit/s

Description:

This command is used to set up the serial communication bit/rate. For this devices the possible bps values are: 1000000,500000, 250000 or 115200 bps.

4. Specific TPCMD Programming Commands

Overview

`TPCMD` commands perform a programming operation (i.e. mass erase, program, verify, etc.) These command must be sent within a `TPSTART` / `TPEND` command block.

Renesas RL78-specific target programming commands are the following:

- **`TPCMD MASSERASE`**;

- **`TPCMD BLOCKERASE;`**

- **`TPCMD BLANKCHECK`**;

- **`TPCMD PROGRAM`**;

- **`TPCMD VERIFY`**;

- **`TPCMD PROTECT`**;

- **`TPCMD GETSECURITY`**;

- **`TPCMD SECURITYRELEASE`**;

- **`TPCMD CHECKSUM`**

- **`TPCMD RUN`**.

SMH Technologies S.r.l.
Società unipersonale

Capitale Sociale: € 10.000 i.v. - P. IVA: 01607790936 - Rea: PN-90085
via Giovanni Agnelli 1, 33083 Villotta di Chions (PN) Italy
Phone +39 0434 421111 – Fax +39 0434 639021 - info@smh-tech.com - www.smh-tech.com

SofTec Microsystems

SMH Technologies is the licensee of the SofTec Microsystems trademark

TPCMD MASSERASE

Command syntax:

```
TPCMD MASSERASE C|D
```

Command options:

C   Specifies that this command refer to Code Flash memory (**C**).

D   Specifies that this command refer to Data Flash memory (**D**).

Description:

It erases Code Flash memory (C) or Data Flash memory (D).

TPCMD BLOCKERASE

Command syntax:

```
TPCMD BLOCKERASE <tgt start addr> <len>
```

Command parameters and options:

C   Specifies that this command refer to Code Flash memory (**C**).

D   Specifies that this command refer to Data Flash memory (**D**).

tgt start addr: Device memory location from where the blockerase operation will start.

| **len**: | Number of locations of a single block or of multiple blocks to be erased. |

Description:

It erases the content of a single block or multiple blocks.

TPCMD BLANKCHECK

Command syntax:

`TPCMD BLANKCHECK C|D <tgt start addr> <len>`

Command parameters and options:

C	Specifies that this command refer to Code Flash memory (**C**).
D	Specifies that this command refer to Data Flash memory (**D**).
tgt start addr:	Device memory location from where the blankcheck operation will start.
len:	Number of locations to be blankchecked.

Description:

It blankchecks Code Flash memory or Data Flash memory. Blankchecks **len** locations starting from the address specified by **tgt start addr**. The start address is the logical address specified in each single device datasheet or User's Guide under "Memory" chapter.

SMH Technologies S.r.l.
Società unipersonale

Capitale Sociale: € 10.000 i.v. - P. IVA: 01607790936 - Rea: PN-90085
via Giovanni Agnelli 1, 33083 Villotta di Chions (PN) Italy
Phone +39 0434 421111 – Fax +39 0434 639021 - info@smh-tech.com - www.smh-tech.com

SofTec Microsystems
SMH Technologies is the licensee of the SofTec Microsystems trademark

TPCMD PROGRAM

Command syntax:

`TPCMD PROGRAM C│D <src offset> <tgt start addr> <len>`

Command parameters and options:

`C`	Specifies that this command refer to Code Flash memory (`C`).
`D`	Specifies that this command refer to Data Flash memory (`D`).
`src offset`:	Offset from the beginning of the source memory.
`tgt start addr`:	Device memory location from where the program operation will start.
`len`:	Number of locations to be programmed.

Description:

It programs `len` locations of Code Flash memory or Data Flash memory starting from the `tgt start addr` address.

`len` specifies the number of locations to be programmed. `tgt start addr` is the logical address specified in each single device datasheet or User's Guide under "Memory" chapter.

TPCMD VERIFY

Command syntax:

`TPCMD VERIFY C|D <src offset> <tgt start addr> <len>`

Command parameters and options:

`C`	Specifies that this command refer to Code Flash memory (`C`).
`D`	Specifies that this command refer to Data Flash memory (`D`).
`src offset`:	Offset from the beginning of the source memory.
`tgt start addr`:	Device memory location from where the verify operation will start.
`len`:	Number of locations to be verified

Description:

It verifies `len` locations of Code Flash memory or Data Flash memory starting from the `tgt start addr` address. `len` specifies the number of locations to be verified.

TPCMD PROTECT

Command syntax:

`TPCMD PROTECT <flg> <bot> <ssl> <ssh> <sel> <seh>`

Command parameters and options:

`flg:` security flag

`bot:` boot block cluster block number

`ssl:` flash shield window start block number (Lower)

ssh: flash shield window start block number (Higher)

sel: flash shield window end block number (Lower)

seh: flash shield window end block number (Higher)

Description:

It is used to perform security settings (enabling/disabling of write, block erase, and boot block cluster rewriting, and setting of flash shield window and others).

If the flash shield window is not to be set, set SSL/SSH to 0000H and SEL/SEH to the target device end block number.

Contents of Security Flag Field

Bit 7   Fixed to "1"

Bit 6   Fixed to "1"

Bit 5   Fixed to "1"

Bit 4   Programming disable flag (1: Enables programming, 0: Disable programming)

Bit 3   Fixed to "1"

Bit 2   Block erase disable flag (1: Enables block erase, 0: Disable block erase)

Bit 1   Boot block cluster rewrite disable flag (1: Enables boot block cluster rewrite, 0: Disable boot block cluster rewrite)

Bit 0 Fixed to "1"

TPCMD GETSECURITY

Command syntax:

```
TPCMD GETSECURITY
```

Command parameters and options:

None.

SMH Technologies S.r.l.
Società unipersonale

Capitale Sociale: € 10.000 i.v. - P. IVA: 01607790936 - Rea: PN-90085
via Giovanni Agnelli 1, 33083 Villotta di Chions (PN) Italy
Phone +39 0434 421111 – Fax +39 0434 639021 - info@smh-tech.com - www.smh-tech.com

SofTec Microsystems

SMH Technologies is the licensee of the SofTec Microsystems trademark

Description:

It is used to acquire security information set to the RL78 (such as writing, block erasure, enabling/disabling rewriting of boot block cluster, and setting of flash shield window).

TPCMD SECURITYRELEASE

Command syntax:

```
TPCMD SECURITYRELEASE
```

Command parameters and options:

None.

Description:

It is used to initialize the security information set to the RL78 (such as writing, block erasure, enabling/disabling rewriting of boot block cluster, and setting of flash shield window).

TPCMD CHECKSUM

Command syntax:

```
TPCMD CHECKSUM C|D <tgt start addr> <len>
```

Command parameters and options:

C	Specifies that this command refer to Code Flash memory (**C**).
D	Specifies that this command refer to Data Flash memory (**D**).

SMH Technologies S.r.l.
Società unipersonale

Capitale Sociale: € 10.000 i.v. - P. IVA: 01607790936 - Rea: PN-90085
via Giovanni Agnelli 1, 33083 Villotta di Chions (PN) Italy
Phone +39 0434 421111 – Fax +39 0434 639021 - info@smh-tech.com - www.smh-tech.com

SofTec Microsystems

SMH Technologies is the licensee of the SofTec Microsystems trademark

tgt start addr: Device memory location from where the checksum operation will start.

len: Size of the memory area where the checksum must be acquired

Description:

It is used to acquire the checksum data in the specified area

TPCMD RUN

Command syntax:

TPCMD RUN

Command parameters:

None.

Description:

It runs the target application.

SMH Technologies S.r.l.
Società unipersonale

Capitale Sociale: € 10.000 i.v. - P. IVA: 01607790936 - Rea: PN-90085
via Giovanni Agnelli 1, 33083 Villotta di Chions (PN) Italy
Phone +39 0434 421111 – Fax +39 0434 639021 - info@smh-tech.com - www.smh-tech.com

SMH Technologies is the licensee of the SofTec Microsystems trademark

5. Typical Programming Flow

The following flow chart illustrates typical steps to help you write your own script file.

```
┌─────────────────────────┐
│        TCSETDEV         │
└─────────────────────────┘
             │
             ▼
┌─────────────────────────┐
│      TCSETPAR VDD       │
│      TCSETPAR PWUP      │
│     TCSETPAR PWDOWN     │
│      TCSETPAR RSTUP     │
│     TCSETPAR RSTDOWN    │
│     TCSETPAR RSTDRV     │
│      TCSETPAR CMODE     │
│      TCSETPAR FOSC      │
│    TCSETPAR BAUDRATE    │
└─────────────────────────┘
             │
             ▼
┌─────────────────────────┐
│        TPSETSRC         │
└─────────────────────────┘
             │
             ▼
┌─────────────────────────┐
│        TPSTART          │
└─────────────────────────┘
             │
             ▼
┌─────────────────────────┐
│     TPCMD MASSERASE     │
└─────────────────────────┘
             │
             ▼
┌─────────────────────────┐
│    TPCMD BLANKCHECK     │
└─────────────────────────┘
             │
             ▼
┌─────────────────────────┐
│      TPCMD PROGRAM      │
└─────────────────────────┘
             │
             ▼
┌─────────────────────────┐
│      TPCMD VERIFY       │
└─────────────────────────┘
             │
             ▼
┌─────────────────────────┐
│         TPEND           │
└─────────────────────────┘
```
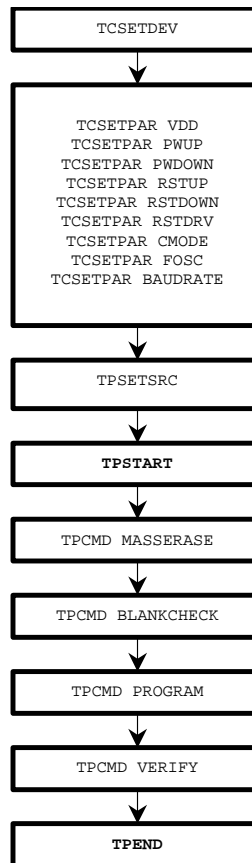
6. Script Example

The example below shows a typical programming flow for a Renesas RL78 device.

```
;
; FLASHRUNNER SCRIPT EXAMPLE FOR RENESAS R5F101LF
;
; Use this example as a starting point for your specific programming needs
;
; ----------
;
; Hardware connections
;
; UART 1 WIRE connection scheme
;
; DIO0 (Not used)
; DIO1 (Not used)
; DIO2 (TOOL0)
; DIO3 (Not used)
; DIO4 (Not used)
; DIO5 (Not used)
; DIO6 (RESET)
; CLKOUT (Not used)
;
; UART 2 WIRES connection scheme
;
; DIO0 (TOOL0)
; DIO1 (Not used)
; DIO2 (TOOLTXD)
; DIO3 (TOOLRXD)
; DIO4 (Not used)
; DIO5 (Not used)
; DIO6 (RESET)
; CLKOUT (Not used)


; Turns off logging
#LOG_OFF
; Halt on errors
#HALT_ON FAIL


; Sets device
TCSETDEV RENESAS R5F101LF RNSS_F


;------------------------
```

SMH Technologies S.r.l.
Società unipersonale

Capitale Sociale: € 10.000 i.v. - P. IVA: 01607790936 - Rea: PN-90085
via Giovanni Agnelli 1, 33083 Villotta di Chions (PN) Italy
Phone +39 0434 421111 – Fax +39 0434 639021 - info@smh-tech.com - www.smh-tech.com

SofTec
Microsystems

SMH Technologies is the licensee of the SofTec Microsystems trademark

```
;FLASHRUNNER I/O Settings

;-----------------------


; Target voltage, mV (change as needed)

TCSETPAR VDD 5000


; Clock oscillator frequency driven by FlashRunner, Hz

; Possible frequencies are: 25000000 divided by a 16-bit prescaler, 0 (DISABLED)

TCSETPAR CLKOUT 0


; VDD rise-time, ms (from 0 ms to 65535 ms)

TCSETPAR PWUP 10


; VDD fall-time, ms (from 0 ms to 65535 ms)

TCSETPAR PWDOWN 10


; RESET rise-time, us (from 0 us to 65535 us)

TCSETPAR RSTUP 100


; RESET fall-time, us (from 0 us to 65535 us)

TCSETPAR RSTDOWN 100


; RESET drive mode: OPENDRAIN or PUSHPULL

TCSETPAR RSTDRV OPENDRAIN


;--------------------

;RNSS_F ALGO Settings

;--------------------


; Communication mode settings (UART1=UART 1 wire, UART2=UART 2 wire)

TCSETPAR CMODE UART1


; External clock source frequency, Hz (change as needed)

; For this device the FOSC value is fixed to 32000000 Hz.

TCSETPAR FOSC 32000000


; Baudrate settings, bps (change as needed)

; For this device the possible values are 1000000, 500000, 250000 or 115200 bps.

TCSETPAR BAUDRATE 1000000


;--------------------------

;Start Programming operation

;--------------------------


; Image file to be programmed (must be placed in the \BINARIES directory)
```

```
TPSETSRC FILE TEST.FRB


; Starts programming block

TPSTART


;--------------

;FLASH commands

;--------------


; Mass erases Flash memory

TPCMD MASSERASE C


; Blank checks Flash memory (change address and length as needed)

TPCMD BLANKCHECK C $0 $18000


; Programs Flash memory (change addresses and length as needed)

TPCMD PROGRAM C $0 $0 $18000


; Verifies Flash memory (change addresses and length as needed)

TPCMD VERIFY C $0 $0 $18000


; Ends programming block

TPEND
```

The FlashRunner's system software setup will install script examples specific for each device of the RL78 family on your PC.

7. Renesas RL78 Specific Errors

Renesas RL78-Specific Errors	
$4A00	`TCSETDEV` command: manufacturer not supported
$4A01	`TCSETDEV` command: algorithm not found on card
$4A02	`TCSETDEV` command: device not supported
$4A03	`TCSETDEV` command: internal hardware configuration error
$4A04	`TCSETPAR` command: parameter not supported
$4A05	`TCSETPAR CMODE` command: missing parameter
$4A06	`TCSETPAR CMODE` command: communication mode not supported by target device
$4A07	`TPSTART` command: command not preceded by `TCSETPAR CMODE` command
$4A08	`TPSTART CMODE` command: invalid parameter

SMH Technologies S.r.l.
Società unipersonale

Capitale Sociale: € 10.000 i.v. - P. IVA: 01607790936 - Rea: PN-90085
via Giovanni Agnelli 1, 33083 Villotta di Chions (PN) Italy
Phone +39 0434 421111 – Fax +39 0434 639021 - info@smh-tech.com - www.smh-tech.com

SofTec Microsystems
SMH Technologies is the licensee of the SofTec Microsystems trademark

$4A09	**TCSETPAR CLKOUT** command: missing parameter
$4A0A	**TCSETPAR CLKOUT** command: invalid frequency
$4A0B	**TPSTART** command: command not preceded by **TCSETPAR CLKOUT** command
$4A0C	**TCSETPAR FOSC** command: missing, invalid or out of range parameter
$4A0D	**TPSTART** command: command not preceded by **TCSETPAR FOSC** command
$4A10	**TCSETPAR VDD** command: missing, invalid or out of range parameter
$4A11	**TPSTART** command: command not preceded by **TCSETPAR VDD** command
$4A12	**TCSETPAR VDD_AUX** command: missing, invalid or out of range parameter
$4A13	**TPSTART** command: command not preceded by **TCSETPAR VDD_AUX** command
$4A14	**TCSETPAR RSTDOWN** command: missing, invalid or out of range parameter
$4A15	**TPSTART** command: command not preceded by **TCSETPAR RSTDOWN** command
$4A16	**TCSETPAR RSTUP** command: missing, invalid or out of range parameter
$4A17	**TPSTART** command: command not preceded by **TCSETPAR RSTUP** command
$4A18	**TCSETPAR PWDOWN** command: missing, invalid or out of range parameter
$4A19	**TPSTART** command: command not preceded by **TCSETPAR PWDOWN** command
$4A1A	**TCSETPAR PWUP** command: missing, invalid or out of range parameter
$4A1B	**TPSTART** command: command not preceded by **TCSETPAR PWUP** command
$4A1C	**TPCMD** command: parameter not supported
$4A1D	Can't establish communication with the target device
$4A1E	**TPCMD VERIFY** command: missing or invalid parameter
$4A1F	**TPCMD VERIFY** command: target start address parameter or length parameter out of range
$4A20	**TPCMD VERIFY** command: source offset parameter out of range
$4A21	**TPCMD VERIFY** command: Flash verify error
$4A22	**TPCMD VERIFY** command: operation not supported by target device
$4A23	**TPCMD PROGRAM** command: missing or invalid parameter
$4A24	**TPCMD PROGRAM** command: target start address parameter or length parameter out of range
$4A25	**TPCMD PROGRAM** command: source offset parameter out of range
$4A26	**TPCMD PROGRAM** command: Flash program error
$4A27	**TPCMD BLANKCHECK** command: missing or invalid parameter
$4A28	**TPCMD BLANKCHECK** command: target start address parameter or length parameter out of range
$4A29	**TPCMD BLANKCHECK** command: Flash blank check error
$4A2A	**TPCMD BLANKCHECK** command: operation not supported by target device
$4A2B	**TPCMD MASSERASE** command: chip erase error
$4A2C	**TPCMD PROTECT** command: missing or invalid parameter
$4A2D	**TPCMD PROTECT** command: chip protection error
$4A2E	**TPCMD PROTECT** command: operation not supported by target device
$4A2F	**TPCMD BLOCKERASE** command: missing or invalid parameter
$4A30	**TPCMD BLOCKERASE** command: target start address parameter or length parameter out of range
$4A31	**TPCMD BLOCKERASE** command: block erase error
$4A32	**TPCMD BLOCKERASE** command: operation not supported by target device
$4A33	**TPCMD RUN** command: execution error
$4A34	**TPSTART** command: execution error
$4A35	**TPEND** command: could not power target off
$4A36	**TPEND** command: execution error
$4A37	**TCSETPAR BAUDRATE** command: missing, invalid or out of range parameter
$4A38	**TPSTART** command: command not preceded by **TCSETPAR BAUDRATE** command
$4A39	**TCSETPAR RSTDRV** command: missing or invalid parameter
$4A40	**TCSETPAR VDD AUX** command: command not allowed
$4A46	**TPCMD GETSECURITY** command: getsecurity error
$4A47	**TPCMD GETSECURITY** command: operation not supported by target device
$4A48	**TPCMD SECURITYRELEASE** command: security error
$4A49	**TPCMD SECURITYRELEASE** command: operation not supported by target device
$4A4B	**TPCMD CHECKSUM** command: missing or invalid parameter
$4A4C	**TPCMD CHECKSUM** command: checksum error
$4A4D	**TPCMD CHECKSUM** command: operation not supported by target device

8. Programming Times

The following table shows programming times for selected Renesas RL78 devices.

Device	Mem. Size	Conditions	Operations	Time
R5F101LF	96 KB Code Flash	FR01LAN Single-wire UART Baudrate: 1 Mhz	Erase+Blank Check+Program+Verify	7,94 s
R5F101LF	96 KB Code Flash	FR01LAN Two-wire UART Baudrate: 1 Mhz	Erase+Blank Check+Program+Verify	8,84 s
R5F100LJ	256 KB Code Flash + 8 KB Data Flash	FR01LAN Single-wire UART Baudrate: 1 Mhz	Erase+Blank Check+Program+Verify	20,70 s
R5F100LJ	256 KB Code Flash + 8 KB Data Flash	FR01LAN Two-wire UART Baudrate: 1 Mhz	Erase+Blank Check+Program+Verify	23,11 s

Programming times depend on Programming Algorithm version, target board connections, communication mode, target microcontroller mask, and other conditions. Programming times for your actual system may therefore be different than the ones listed here. SMH Technologies reserves the right to modify Programming Algorithms at any time.

9. References

FlashRunner User's Manual.

Microcontroller-specific Datasheets and User's Guides.

SoFTec Microsystems

SMH Technologies is the licensee of the SofTec Microsystems trademark