HANDHELD V3 PROGRAMMER QUICK START GUIDE

Installing Software

1) Run the executable file you have downloaded. This will install software and pre-install USB drivers.

2) Plugin PC dongle to a USB port. The drivers should install automatically. If they do not, see Troubleshooting section at end.

LOADING FROM THE PC

1) Connect the PC adapter (Dongle 2) to the PC USB port.

2) Connect the PC adapter directly to the programmer using the short ribbon cable.

Method 1

50cm
Cable

Progra
m

ERRO
R

Connect Handheld
Programmer to PC
adapter with short cable
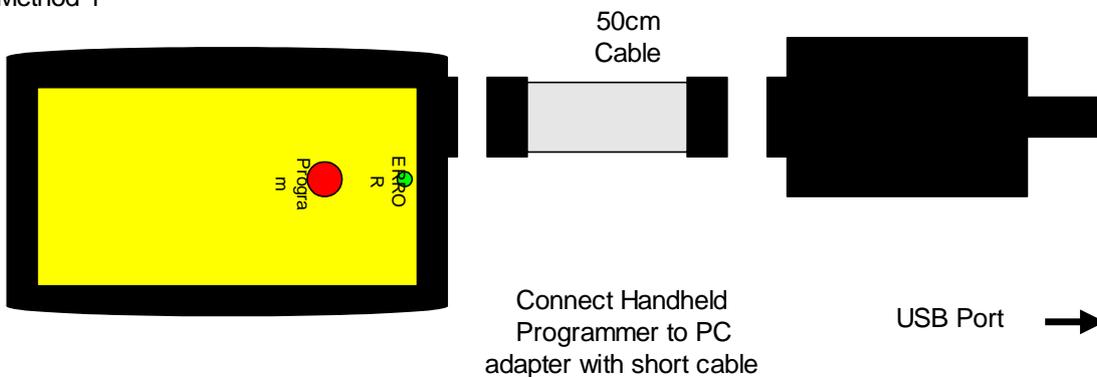
USB Port →

3) To load code, follow the instructions in the software.

Run the Handheld Programmer software

1. If USB dongle is not detected, this message appears. Plug in Dongle2.

Error

No USB devices found!

Abort   Retry   Ignore
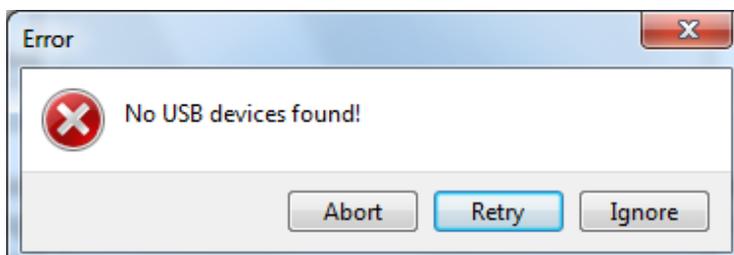
2. If USB port is in use or another Kanda dongle is present, then this error appears. Make sure only one Kanda dongle is plugged in.
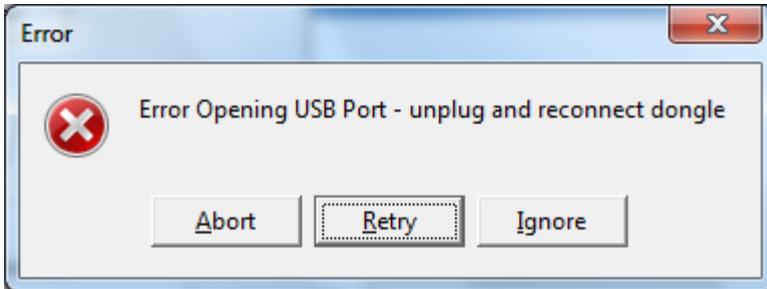
a) If the AVR Hand held Programmer is not detected, then this message will appear. Make sure the programmer is connected to the dongle, and the programmer is powered or battery is Ok.
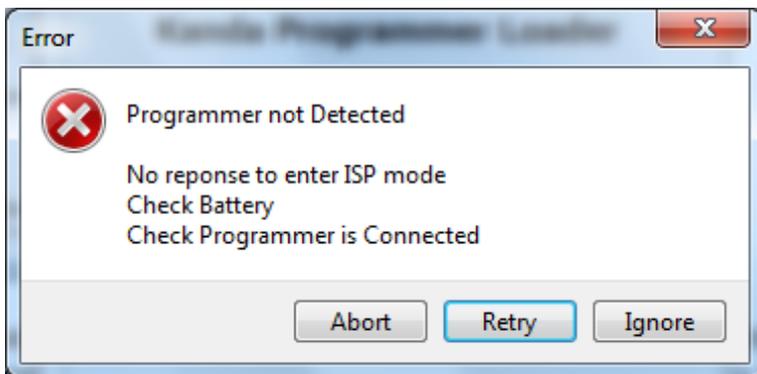
Or this message
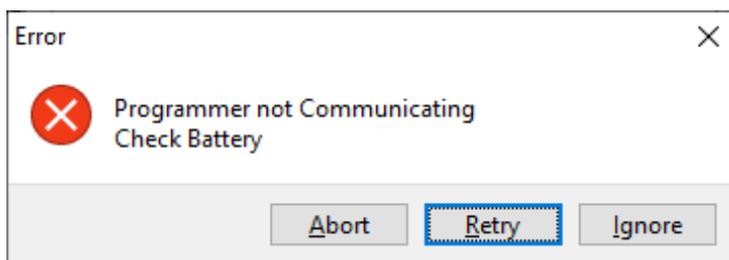
b) To run programmer in Demo mode, Click Ignore. The programmer software will load but you will not be able to Read or Load a programmer until one is connected.

You will need to select your programmer type in this dialog box-

X versions say Version 2
Version 3 single and 8-way handheld programmers have label saying Version 3.

Programmer Type

Programmer
- ⦿ VERSION 3 Single Programmer: HH0120V3
- ○ VERSION 3 8-way Programmer: HH0820V3
- ○ Single Programmer: HH0120(X)
- ○ 8-way Programmer: HH0820(X)
- ○ Keyfob : KF0020U
- ○ Portable Programmer: PP0110

OK
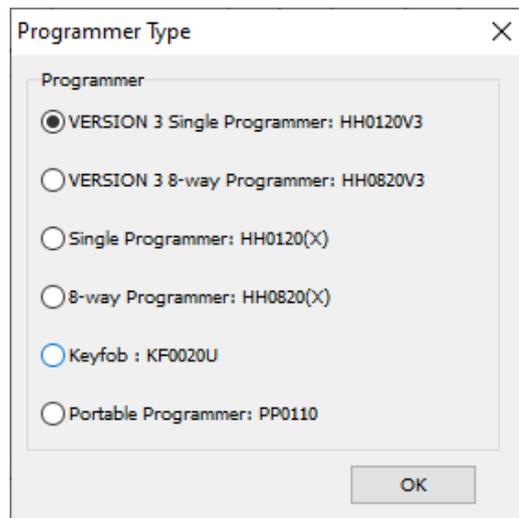
c) If the AVR Programmer requires a firmware update, this message appears. Click OK to carry out firmware update.

Information

Programmer Needs Firmware update or Flat battery
Version:$DB
Firmware:C:\Program Files (x86)\Kanda\PICHHP\firmware\bkfpicusb.upd
Click Cancel to Exit and check battery or OK to do Update

OK
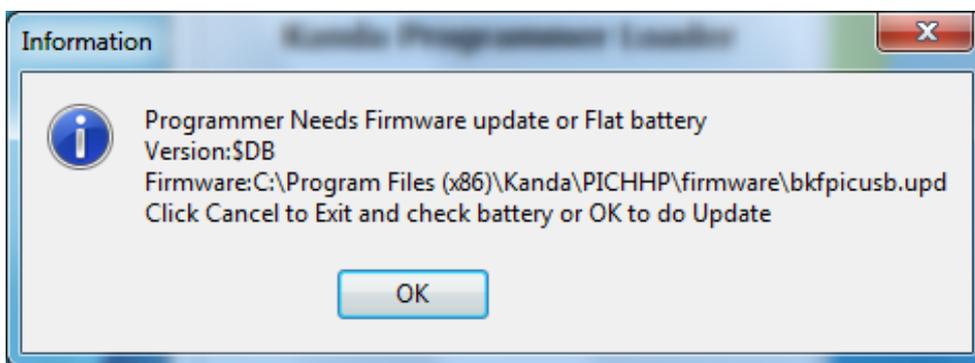
Once the programmer is detected and any firmware update necessary has been carried out, the main programmer window will appear.

The message at the top of the screen tells you which programmer has been detected, Keyfob, Portable Programmer, older AVR Handhelds or Version 3. It also shows software version number.

For example, here is the top caption for Version 3 Handheld.

Kanda USB Handheld Programmer v7.0.0 - AVR, Xmega and UPDI - Version 3
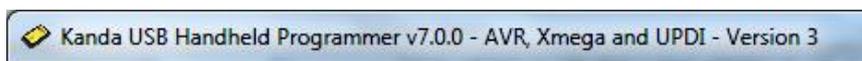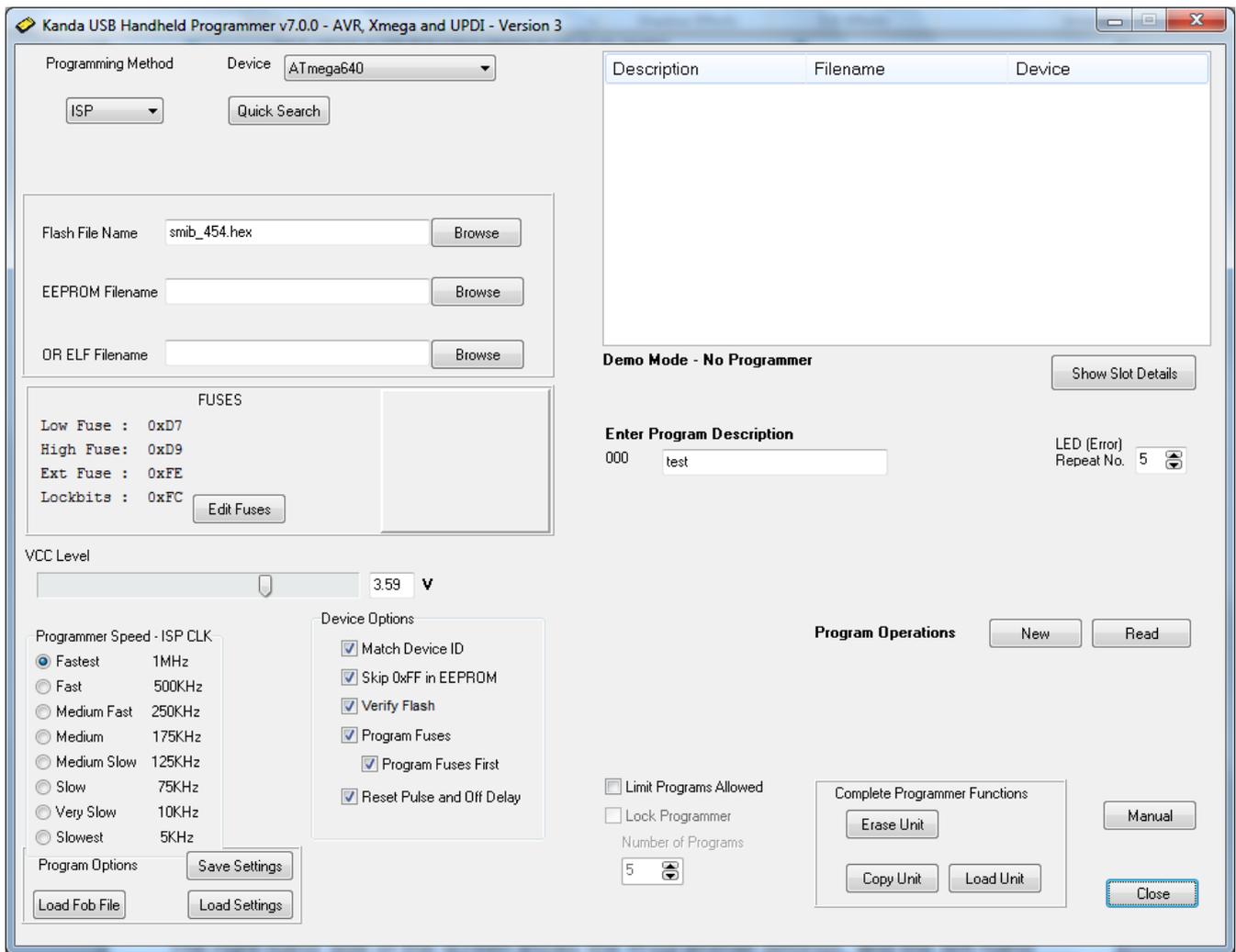
The right-hand side of the screen shows the Programmer settings, and the left-hand side shows details about the AVR (or ATxmega) device, filename, programming method, fuses and other details that will be used to load the programmer. This is single programmer screen, 8-way programmer adds some buttons (Delete and Replace).

The old version 1 (HH0110, HH0120, HH0810, HH0820) will not have PDI or UPDI as a programming method as this is on ATxmega version 2 (HH0110X, HH0120X, HH0810X, HH0820X) and Version 3 (HH0110V3, HH0120V3, HH0810V3, HH0820V3) only.

Programmer and Device Setup

- Select **Program Method** - ISP, JTAG, TPI, UPDI or PDI.
- Select **Device** which lists device with the program method chosen
- **OR** use **Quick Search** button

Quick Search finds all devices whatever their programming method. You can use any part of the device name or all of it.

If the device has JTAG method as well as another method (ISP, PDI), a checkbox lets you choose this if required.
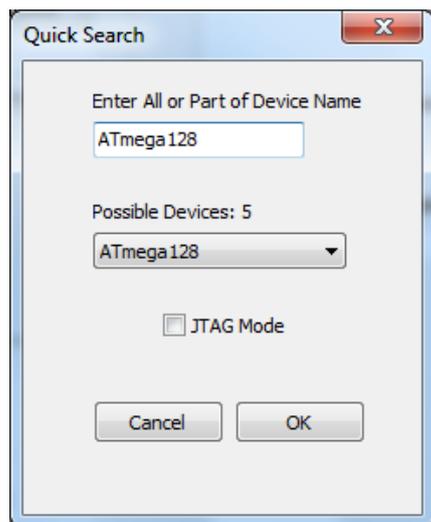
- **Flash Filename** box. Enter your flash filename or leave blank if you want to only program EEPROM.
- **EEPROM Filename** box – if AVR device has EEPROM and data is required, then select your EEPROM file
- **ELF filename** box. Load a production ELF file (produced by Atmel Studio 7) *instead* of flash and EEPROM files. This file includes flash, EEPROM, fuses, lockbits, User Row and device signature.
- **Edit Fuses button** - click to change fuses, see section below.

- **VCC Level** - use slider to select voltage of target circuit

- **Programmer Speed** - Select speed of programming clock. As a guide, for ISP, Fastest is for 16MHz target clock, Fast is 8MHz target clock, Medium Fast is 1MHz target clock. Fuse settings on new AVR devices give 1MHz clock by default. JTAG has a simple speed setting and TPI, UPDI and PDI use BAUD rate.
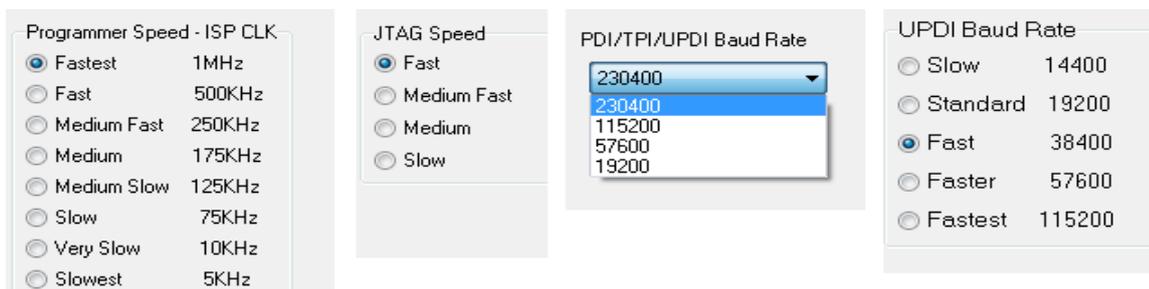
- **Device Options**

  - **Match Device ID**. If checked, programmer checks that target device ID (signature bytes) match device selected. Error code for mismatch is 7 red flashes. UPDI see below.
  - **Skip 0xFF in EEPROM**. If checked, locations set to 0xFF in EEPROM file are not programmed. This increases programming speed but old data can be left in EEPROM

- **Verify Flash**. Check to verify flash memory, which is best practice. If unchecked, flash is not verified, which is faster.

- **Apply 12V Pulse** – UPDI only, see below

- **Program Fuses**. Check to program fuses and lock bits, with values set by Fuse button.

- **Program Fuses First**. Check to program fuses before device is erased. This is useful for setting EESAVE fuse to preserve EEPROM or use faster programming speed on new AVR microcontrollers. **This will not work on locked AVR microcontroller.**

- **Reset Pulse and Off Delay.** Toggles reset and keeps target power on until green flashes stop

UPDI Settings
ATtiny devices with UPDI interface use one-wire programming connected to the Reset pin. The fuse settings allow Reset pin to be selected as UPDI, Reset or GPIO.

On ATtiny devices, if the Reset pin is configured as Reset or GPIO, a 12V pulse is needed to enter programming mode. Select **Apply 12V Pulse** (with optional adapter connected) to generate this 12V pulse. It will not damage a device to apply 12V even if it is not needed. New devices default to UPDI on Reset pin.

ATmega and AVR D devices have separate Reset and UPDI pins so this is not necessary.

Match Device ID.
The device is erased before Device ID is checked. This is because the Device ID cannot be read from a locked device and the software can't determine the lock state of the device.

Other Setup Features

- **Program Description**. You must enter a program description of up to 28 characters. This is displayed in pane at top when programmer is read.

- **LED (Error) repeat No**. If there is an error, a number of red flashes will indicate the cause of the error. On success, it gives the number of green flashes. This box sets the number of times this code is repeated. Holding mouse over this box will show what error codes are.
  Note: You can press button to program again or remove the programming lead while error codes are flashing.

- **Limit Programs Allowed**. If this is checked, the programmer can only be used to program the number of target devices set in the **Number of Programs** box. This is per slot on 8-way. The programmer can be locked to stop this being altered, see next section.

Programmer Speed

ISP Mode
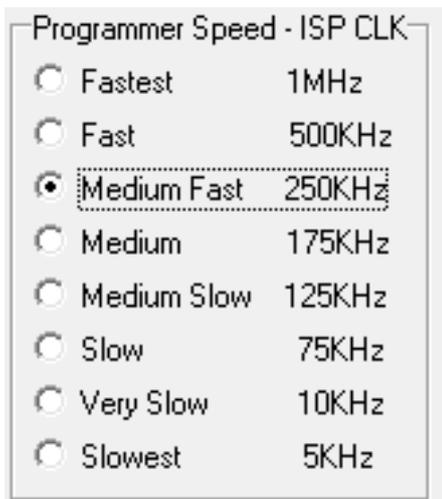
ISP clock should be below 1/4 of target clock speed. New AVR microcontrollers have 1MHz internal clock enabled (or 8MHz internal clock and Clock divide 8 fuses set).

In this case, choose Medium or Medium Slow for programmer speed.

JTAG Mode
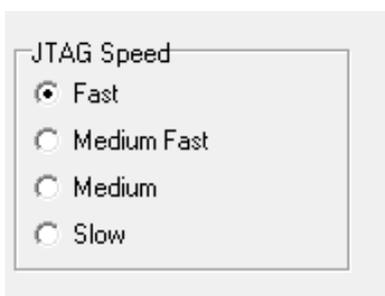
Unlike ISP, JTAG programming is independent of target clock speed and most applications will run with speed set to fast. If you get programming errors, try slowing it down.

PDI and TPI Mode
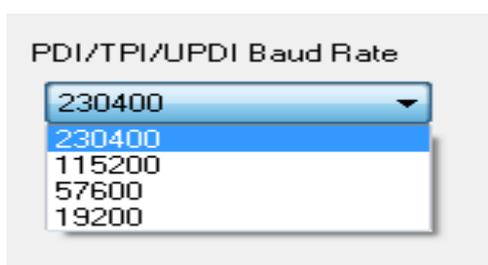
PDI and TPI programming use a synchronous USART protocol, hence speed is defined as the Baud Rate. Again most applications will run fine with Baud Rate set to 230400.

UPDI uses a UART protocol with no clock. Version 3 programmers support 115,200 which the maximum UPDI speed.
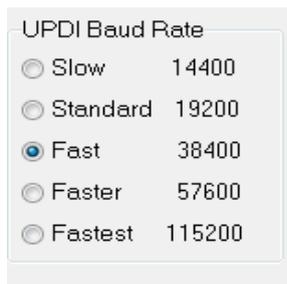
If you get programming errors, try slowing it down.

Lock Programmer

This is enabled when **Limit Programs** is checked. It will prevent the programmer being copied or reloaded to prevent alterations to the number of programs allowed. The only way to clear it is by choosing **Erase Unit** button.

On 8-way programmer, only the last slot loaded should be locked. If you lock first slot, you will not be able to load any more. Locking the last slot used will lock the whole programmer.

Loading the Programmer

Once all these settings have been selected, the programmer can be loaded. The buttons to load the programmer are labelled as **Program Operations**. They are different on one way, 8-way and empty 8-way programmers.

One way (standard) Programmer
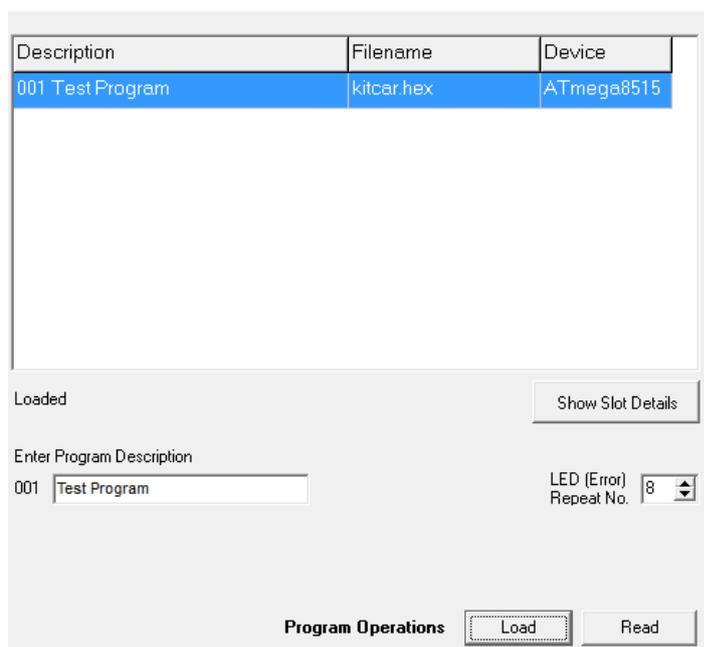
Cllick **Load Button** to load the programmer with all the settings, fuses and files we have already selected. This will clear any old settings.

Click **Read** to examine the contents of the programmer. **Show Slot details** button will give more information, see section below.

8-Way Loaded Programmer

The 8-way programmer has more buttons because we can delete, replace or add new programs. Once the programmer is loaded with 8 programs the New program button is disabled.
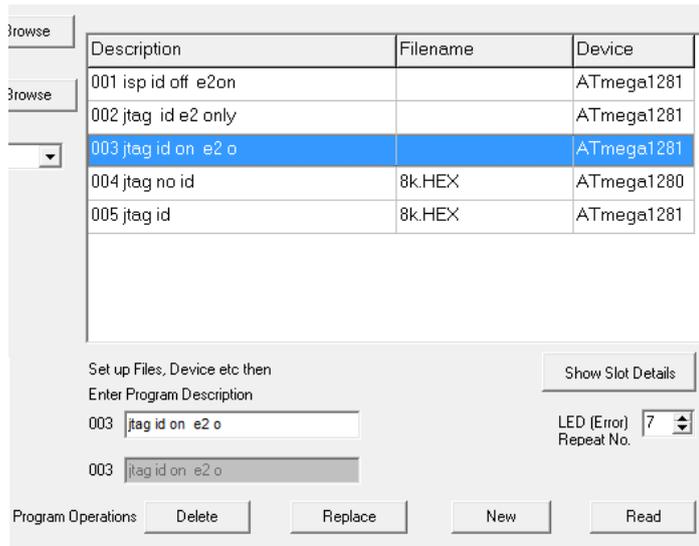
New Button. This will add the program to the next free slot

Replace Button. This will replace the slot selected in the pane above.

Delete Button. This will remove the slot selected in pane above the buttons and set description to Empty.

Read Button. This will read the programmer and display Device, Description and Filename in the pane above buttons.

Show Slot Details button. This will show more details, see section below.

8-way Empty Programmer

If the 8-way programmer is empty, only New and Read buttons are shown. Clicking on these buttons will load the programmer or the first slot on the 8-way unit. This PC software ignores the slot selector switch on the 8-way programmer itself.

Fuse Button

Click the Fuse button to edit the Fuses for the currently selected device. If you select a different device, the default fuses will be loaded, otherwise the fuse values you select will be saved.

ATtiny44 Fuses and Lockbits

General Options:
- ☑ Enable Divide clock by 8 (CKDIV8)
- ☐ Enable Clock Output (CKOUT)
- ☐ Enable debugWire (DWEN)
- ☐ Watchdog Always On (WDTON)
- ☐ EEPROM memory is preserved after Chip Erase (EESAVE)
- ☐ RESET Pin is I/O (RSTDISBL)
- ☐ Enable Self programming (SPMEN or SELFPRGEN)

Brown-out trigger level:
111 : BOD disabled

SUT:
- ☑ SUT0 Programmed
- ☐ SUT1 Programmed

Clock Sources
Device Clock Select:
0100 : Watchdog Oscillator 128kHz
CKSEL:
- ☑ CKSEL3 ☐ CKSEL2 ☑ CKSEL1 ☑ CKSEL0

NOTES:
A checked box indicates that the fuse is programmed (Set to logical 0)

Low Fuses: 01100100 (0x64)   High Fuses: 11011111 (0xDF)   Edit Hex

Ext Fuses: 11111111 (0xFF)   Lock Bits: 11111111 (0xFF)   Edit Binary

Defaults   Cancel   Close

Fuses / Lockbits & Boot Options

The available fuses and lock bits for the currently selected AVR are displayed. Click on the tab on the right of the screen to **see Lockbits and Boot Block** options.

Enabled AVR and ATxmega fuses (programmed) are actually 0 value. The binary and hex values of each available fuse are displayed at the button of the screen. Click **Edit Binary** or **Edit Hex** button to enter fuse values as binary numbers or hex numbers.

Default button will load defaults for the device selected.
Cancel button will close Fuse box without saving changes.
OK button will close Fuse box and save your changes.

ATxmega Fuses
The Fuses section is different on ATxmega and includes User Row.

FUSEBYTE0: 0x00   FUSES   USER ROW
FUSEBYTE1: 0x00
FUSEBYTE2: 0xFF   User Row Off
FUSEBYTE4: 0xFE
FUSEBYTE5: 0xFF
Lockbits: 0xFF   Edit Fuses   User Row
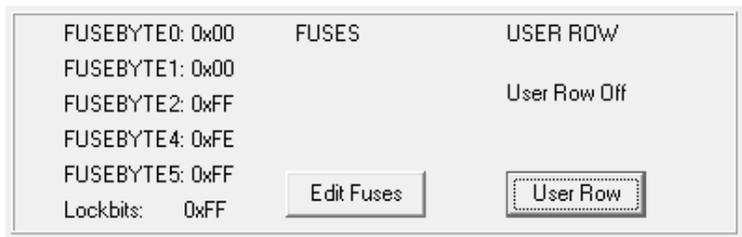
There are 5 Fuse bytes but Fuse byte0 is JTAGID and only available if device has JTAG Interface. Edit Fuses button works the same as AVR section.

UPDI fuses
The lastest ATtiny and ATmega devices with a UPDI programming interface have 10 Fuse bytes (FUSE0 to FUSE9) and 1 lock byte.
FUSE3 and FUSE9 are both always reserved and are not shown.
AVR D series have the same fuses.

```
WDTCFG  : 0x00      FUSES                USER ROW
BODCFG  : 0x00       APPEND  : 0x00
OSCCFG  : 0x02       BOOTEND : 0x00      User Row Off
TCD0CFG : 0x00       LOCKBITS: 0xC5
SYSCFG0 : 0xC4        Edit Fuses
SYSCFG1 : 0x07                            User Row
```

UPDI Fuse Screen

UPDI Fuses Form

FUSE00: WDTCFG
WDT Timeout Period (WDPER)
[0000 : OFF   - ▼]

WDT Window Timeout (WDWPER)
[0000 : OFF   - ▼]

FUSE01: BODCFG
LVL
[000 : 1.8V   ▼]

☑ Sample Frequency is 1KHz

BOD Active
[00: BOD Disabled   ▼]

BOD in Sleep
[00: BOD Disabled   ▼]

FUSE02: OSCCFG

Clock Select CLKSEL
[00: Internal HS Oscillator   ▼]

FUSE04: TDC0CFG

FUSE04 IS RESERVED

FUSE05: SYSCFG0
CRCSRC
[11: No CRC   ▼]

☐ CRC32

Reset PIN Configuration
[GPIO   ▼]

☑ Save EEPROM

FUSE06: SYSCFG1
SUT
[000: 0ms   ▼]

MVSYSCFG
[DUAL Supply   ▼]

LOCKBITS
☐ Lock Device

FUSE00: WDTCFG 0x00	FUSE04: RESERVED	FUSE07: CODESIZE 0x 0
FUSE01: BODCFG 0x00	FUSE05: SYSCFG0 0xC0	FUSE08: BOOTSIZE 0x 0
FUSE02: OSCCFG 0x00	FUSE06: SYSCFG1 0x08	LOCKBITS 0x5CC5C55C

[Edit HEX] [Defaults] [Cancel] [Close]

User Row (ATxmega and AVR UPDI)

User row or User signature row is only programmed if there is data for it. If you load an ELF file that contains User Row data, user row will be programmed. Label will say User Row On

User Row Button

An Open File dialog lets you choose a Hex file that contains User ID data. The User ID area is one page in size. Once a file is loaded, the label says "User Row On" and User row or User ID will be programmed.

Show Slot Details button

This button (at right hand side below display pane) will give more details of the contents of the programmer.

Clicking on this button will update all the settings to those saved in the programmer slot that is currently selected in the display pane, including fuses.

Program Options
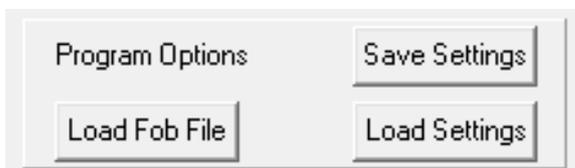
Located at button left of the screen, the **Load Fob File** button allows all the settings to be updated from a Fob file (.fob) that has been saved from earlier versions of AVR Handheld software.

Save Settings creates an Inifile where you want to save it and **Load Settings** will open an Inifile.

The programmer settings are also automatically saved to the registry and when software is run again, these settings will be loaded.

Complete Programmer Functions
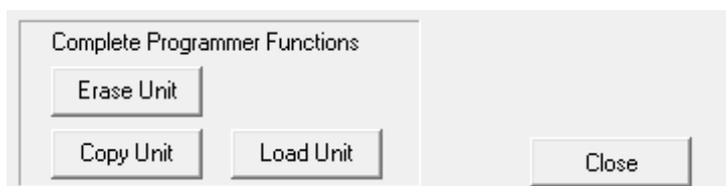
These are at bottom right of screen.

Erase Unit button. This will erase all programs and settings from the programmer. The programmer will then be empty. This is the only way to reset a locked programmer.

Copy Unit button. This allows the contents of the programmer to be saved to a file (.prg). All the settings and data are saved.

This file can be encrypted if required.
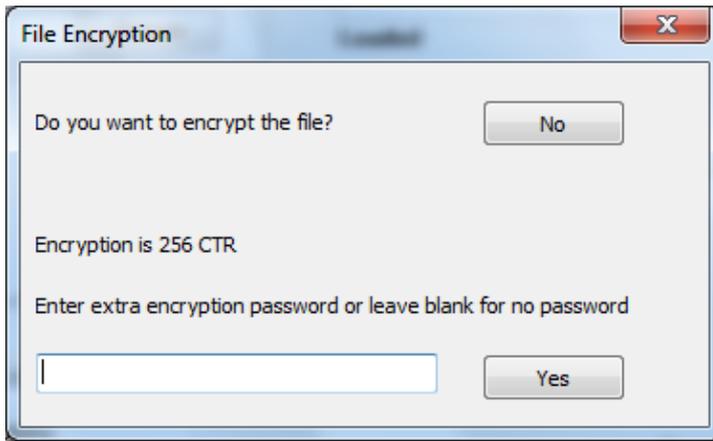
Click No button if you do not want encryption
Click Yes button to encrypt the file.
If you add a password, it is more secure but the password is needed to open it.

Load Unit button. This allows the settings and data from one programmer previously saved as a PRG file to be loaded into another programmer.

This is the easiest way to load multiple programmers. Load the first one with all the slots you need, then Copy Unit. Use Load Unit to transfer the contents to other programmers.

This is also the simplest way to transfer settings to another user. Just create a PRG file with Copy Unit, send the file to another user and they just use Load Unit button to recreate all the programmer settings, including your code and data.

This replaces the Fob file mechanism used on old AVR handheld software.

If the PRJ file is encrypted and a password has been set, you will get this box. Enter the password to open the file.
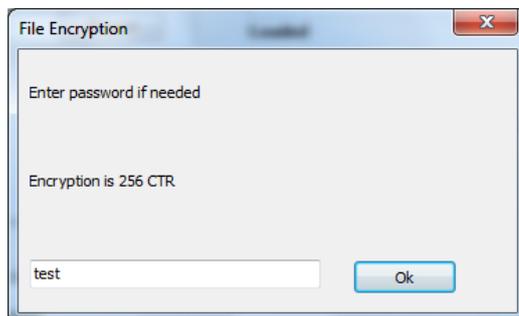
Smart Phone App

The PRJ file can be loaded from a Smart Phone App. To see details and get the App from Google Play, visit this page on Kanda Site.

Smart Phone App

Load from Command line or Process

Loading the programmer and then using Copy Unit button will create a PRG file that can be loaded into another programmer using the load button or these functions.

The software can be launched from a command line, batch file or another process by calling avrHHP.exe with a Load parameter and optional .PRG filename parameter, for example

avrHHP Load

This will open PRG open file dialog box. Select file to load programmer

Call it with a second parameter, a .PRG filename eg

avrHHP.exe Load "C:\Test Files\test1.prg" will load this file

The software will run, load the programmer and then close.

To keep the software open after load add a third parameter called SHOW, for example avrHHP.exe Load "C:\Test Files\test1.prg" SHOW

Simple Loader

This can be downloaded from Kanda software downloads page. It gives a simple load PRG (programmer) file and load it to programmer for inexperienced users.

Switch On and Off

Version 3 Programmers

These have different behaviour from older handhelds.

Switch On – Connect programmer to target (powered or unpowered) and press button.

Switch Off – Programmer will switch off when programming has finish and success (green) or error (red) flashes have finished.

You can unplug programmer when it is flashing, which will switch it off. The button can be pressed again during flashes to program again.

Adapters eg JTAG, 10DIL6, flying lead can be left connected.

PC connection – programmer will power up automatically when connected to PC. PC USB dongle will power the handheld unit. LED will show green when PC software is run and programmer is connected.

Version 1 and 2 (X Handheld)

When it is connected to PC dongle, it will switch on and LED will show green.

When it is connected to target or adapter, it will switch on and LED will flash green once and then go off as programmer goes to sleep.

When programmer button is pressed, the LED will show green. If a programming error occurs it will flash red (see error codes at end). If programming is OK, it will give slow green flashes. Once flashes stop, programmer goes back to sleep.

The programmer can be unplugged from the target or button can be pressed before LED finishes flashing.

Unplugging it from target and adapter or PC, switches it off again.

Adapters eg JTAG, 10DIL6, flying lead must not be left connected.

Programming Target

POWER OPTIONS
There a three power options with the Handheld Programmer

1) **Programmer powers target**
   Plug into unpowered target. Connector pin 2 (Vcc) must be
   connected to Vcc on your board and all 4 GND pins must be connected to target
   ground. Use battery or external PSU. **There is a 150mA current limit for
   powering the target.**
   *In Software, select Vcc needed by target circuit on VCC Level selector (0-5V or
   0-3.6V on some devices)*

2) **Target Powered and Vcc connected to ISP Header**
   If target Vcc is connected to ISP header – Pin 2, then
   *Set voltage in software, on VCC level Selector, to 0V (or less than target
   voltage).*
   All 4 GND pins must be connected and target must be powered.

3) **Target Powered and Vcc NOT connected to ISP header**
   If target Vcc line is NOT connected to Pin 2 – Vcc on ISP header,
   *In Software, select Vcc on VCC level selector (0-5V) to match target circuit
   voltage.*
   Do connect all four GND pins to target ground. Power Target

TARGET Connection -ISP

1) Connect the programmer to the target system using the short ribbon cable.

- Target Layout – not end of lead view

- Header is 0.1" (2.54mm) box header in 5 x 2 format, with polarising notch - 10-way IDC header

- See section below for *6 Way, 1.27mm or 2.0mm adapters*

- GND* These pins must be connected to target ground

- GND One or both must be connected to Target ground

TARGET CONNECTOR FOR AVR
PROGRAMMERS

MOSI	1	2	VCC
LED OPTIONAL	3	4	GND
RESET	5	6	GND*
CLK	7	8	GND*
MISO	9	10	GND
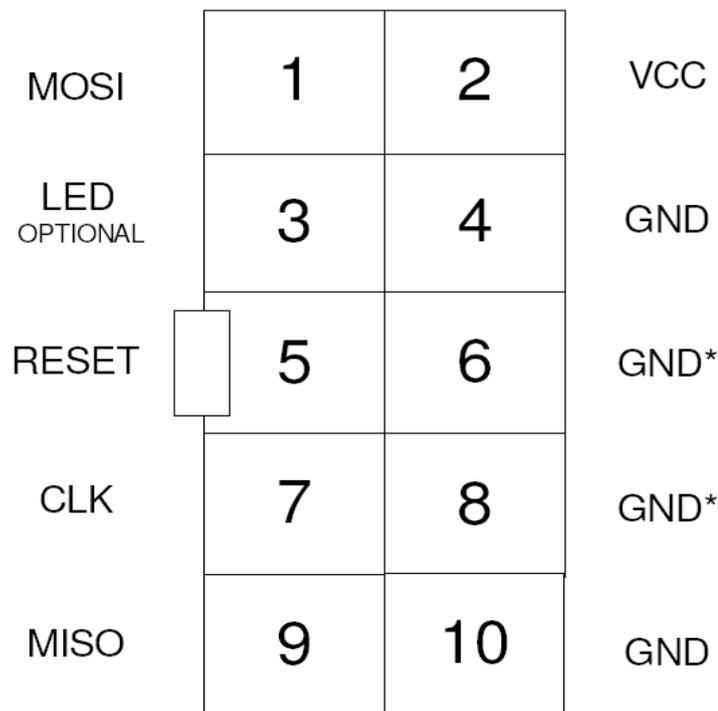
TOP VIEW OF THE CONNECTOR ON
THE TARGET SYSTEM

0.1" PITCH 2*5 BOXHEADER
WITH POLARISING NOTCH

Recommended ISP Circuit

This diagram shows a typical ISP circuit that will work with the Handheld Programmer. Please read the notes for more detail.
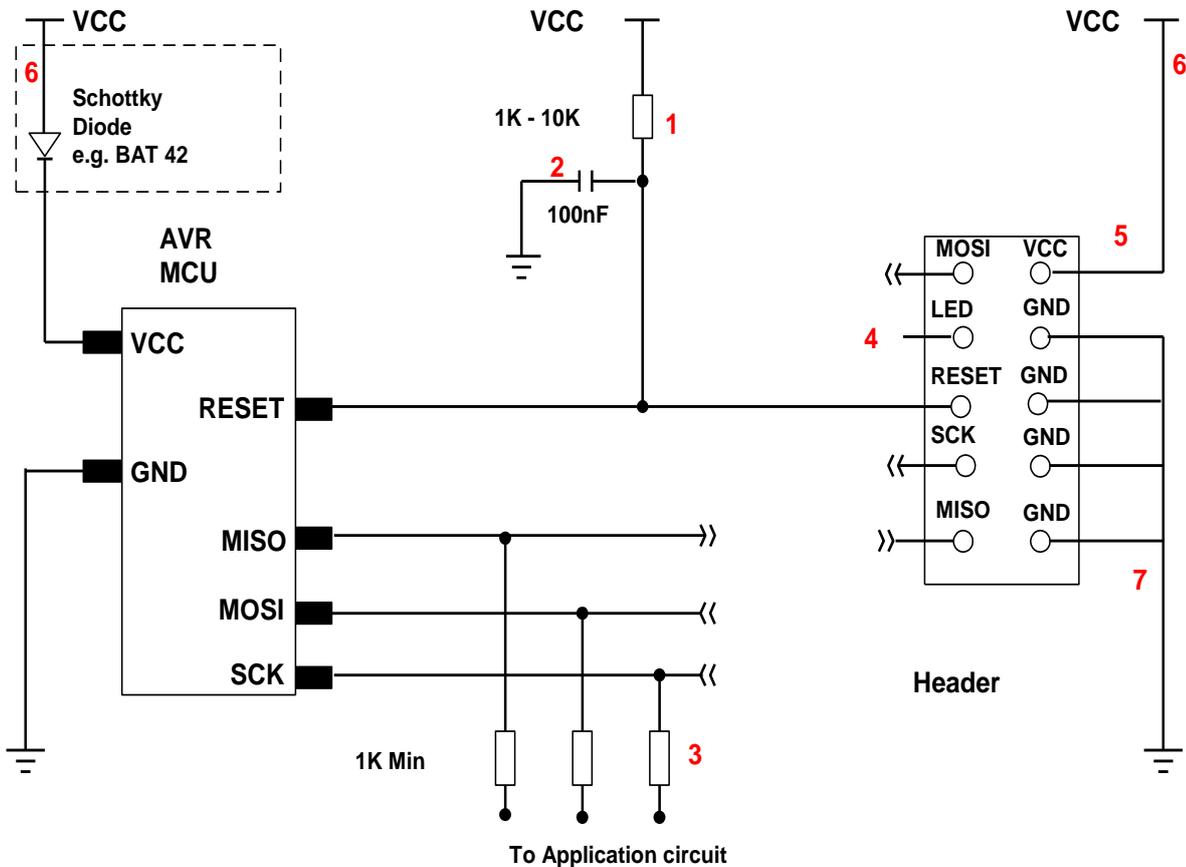
1) This resistor should be fitted. It can larger than 10K if required, but not smaller than 1K

2) Again 100nF is a typical value. We suggest a minimum of 10nF.

3) Programming lines should be isolated from application circuit with series resistors, especially if application circuits force the state of the AVR pins. In exceptional cases, a multiplexer may be needed to isolate these lines. Capacitors on these lines may mean that a slower programming speed should be selected. AVRs that use RX/TX pins for programming eg ATmega128 need at least a 1K resistor for RX line if UART is used.

4) Optional LED line. This can be connected to an indicator LED if desired, or used to drive a multiplexer. It is LOW during programming

5) If Vcc is not connected to header, see **Power Options** section for programmer setup.

6) If the programmer is powering the target, it is current limited to 150mA. If the rest of your circuit draws too much current, then fit this diode, and connect VCC to header and AVR through it.

7) GND pins. We recommend that all GND pins are connected. If not, then either pin 4 or pin 10 MUST be connected – these are programmer Ground. Pin 6 is connected to programmer battery but can be omitted. Pin 8 MUST be connected as it is the mode pin. The programmer uses this pin to check if it is connected to a PC or a target.

Note: The 10-way lead is not wired Pin 1 to Pin 1, so the connector on the programmer shown below is NOT the end of the 10-way lead.

10-way Connector on Programmer

HAND HELDPROGRAMMER
CONNECTOR (AVR)

GND	1	2	MISO
MODE CONNECT TO GND	3	4	CLK
BAT - CONNECT TO GND	5	6	RESET
GND	7	8	LED OPTIONAL
VCC	9	10	MOSI

TOP VIEW OF THE CONNECTOR ON
THE PROGRAMMER

0.1" PITCH 2*5 BOXHEADER
WITH POLARISING NOTCH

SIX WAY ADAPTERS

Because of the need to connect more than 1 GND pin on the programmer, the adapter should connect GND pins together. So, the adapter is not as straight forward as it first appears.

TARGET CONNECTOR FOR AVR
PROGRAMMERS (ATMEL 6WAY)

MISO	1	2	VCC
SCK	3	4	MOSI
RESET	5	6	GND
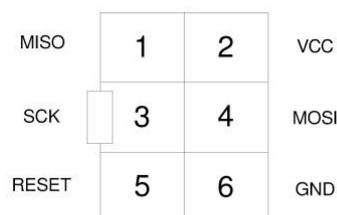
TOP VIEW OF THE CONNECTOR ON
THE TARGET SYSTEM

0.1" PITCH 2*3 BOXHEADER
WITH POLARISING NOTCH

Available Adapters

Kanda supply a range of adapters from the standard 10-way programming lead for 6-way ISP, Micromatch, JTAG, PDI and connectors with 2mm pitch or 1.27mm (0.05") pitch.

These connectors are available from Kanda website.

https://www.kanda.com/Adapters--Connectors.188.html

Some order Codes are:

10FLEX6 10DIL6 10MICR6 10ISP1-27

JTAG, PDI/TDI adapters are also available as 1.27mm (0.05") and 2.0mm.

JTAG Programming

Everything is the same for JTAG programming except the programmer needs a JTAG adapter. These are available on our shop

Order Code: AVRHHP-JTAG
https://www.kanda.com/products/Kanda/AVRHHP-JTAG.html
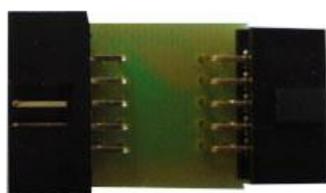
Target

If you want to make your own JTAG adapter, the pin outs on the programmer are shown below

Note: These are NOT the same as the end of the 10-way lead, which is not wired pin 1 to pin 1. We recommend that you make up your own lead and use the 10-way connector on the programmer.
All the GND pins on this connector must be wired to ground.

The first column is an Atmel JTAG layout usually used on target PCBs.

Atmel JTAG Header	Handheld Programmer
1: TCK	6 : TCK
2: GND	1,3,5,7: GND
3 TDO	2: TD0
4: Vtref	9: VCC
5: TMS	4: TMS
6:SRST	8 : NsRST
7: Vsup	9: VCC
8: TRST	N/C
9: TDI	10: TDI
10: GND	1,3,5,7 : GND

1) TRST is not available

2) VCC pin 9 on programmer needs connecting to both Pin 4 AND Pin 7 on target end (Vtref and Vsup)

3) All 4 GND pins on programmer must be connected to either Pin 2 or Pin 10 or both, depending on which are connected to Ground on your target.

4) Misconnection (to JTAG without adapter or ISP with adapter) will NOT damage programmer, you will get solid red over-current LED. It may damage your target.

JTAGEN fuse must be set on target device or JTAG programming will fail - 2 red flashes.

HANDHELD PROGRAMMER CONNECTOR (AVR-JTAG MODE)

TOP VIEW OF THE CONNECTOR ON THE **PROGRAMMER**
This is not end of 10-way lead
TRST Pin is not available

0.1" PITCH 2*5 BOXHEADER WITH POLARISING NOTCH

ATMEL JTAG CONNECTOR

TOP VIEW OF THE CONNECTOR ON TARGET BOARD
0.1" PITCH 2*5 MALE BOXHEADER WITH POLARISING NOTCH
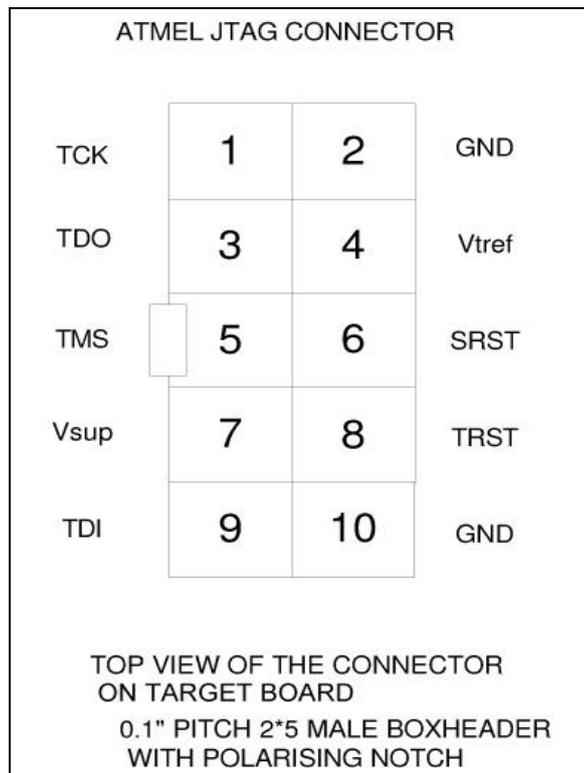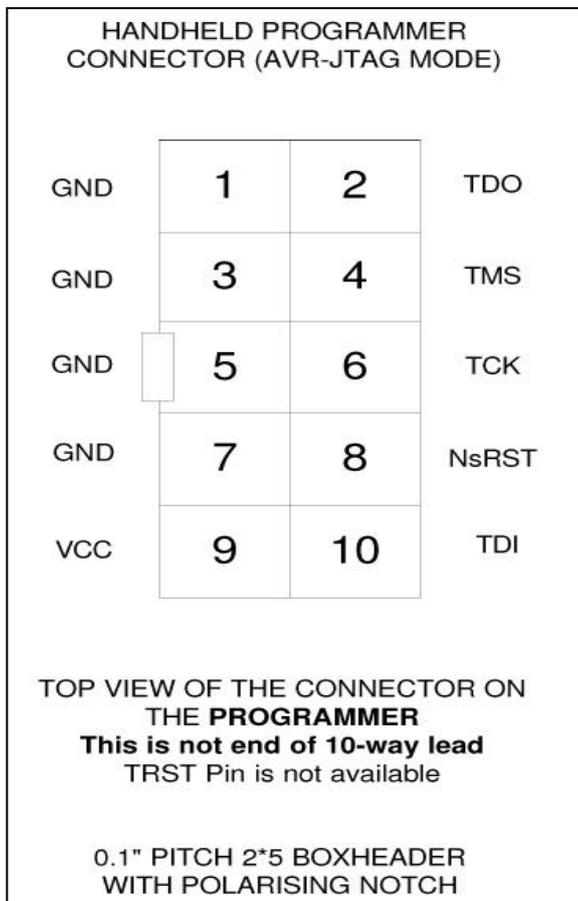
ATxmega PDI Programming

Only available on ATxmega version - HH0110X, HH0120X, HH0810X and HH0820X.

Connect the flying lead adapter to the end of the 10-way lead.

These wires need connecting to the target for XMEGA PDI programming

Yellow - PDI Clock
Blue   - PDI Data
Green - VCC
Brown - GND

There is a Microchip recommended 6-way PDI connector layout for using on your PCB.

6-Pin PDI Target Layout
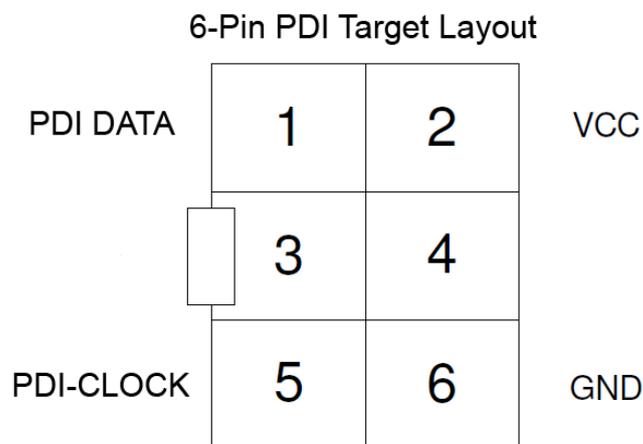
Kanda supply a 6-way adapter for this interface, **10PDI6**, available on our website.

Kanda 10PDI6 Adapter

If you want to make your own connector from the programmer, this is the 10-way connector on the programmer in PDI mode. The 10-way lead is NOT wired pin1 to pin1 so connections are swapped at end of lead.

Important: All GND pins must be connected

HANDHELD PROGRAMMER
CONNECTOR (XMEAGA PDI
MODE)

GND	1	2	DATA
GND	3	4	CLOCK
GND	5	6	N/C
GND	7	8	N/C
VCC	9	10	N/C

TOP VIEW OF THE CONNECTOR ON
THE PROGRAMMER
This is not end of 10-way lead

0.1" PITCH 2*5 BOXHEADER
WITH POLARISING NOTCH
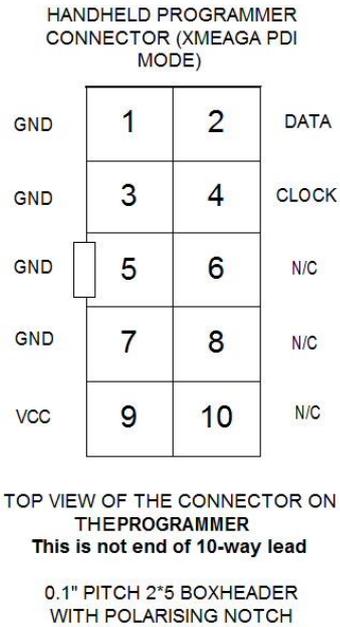
ATxmega Programming interface

Reset (PDI-CLOCK)

Any pull-up resistor should be a minimum of 10K or removed altogether.

Any reset decoupling capacitor should be removed.

Any other load on RESET should be removed.

PDI-DATA

This pin should be dedicated to programming only. It should only be connected to the programming header.

Typical PDI Connection

Figure 3-1. PDI connection.
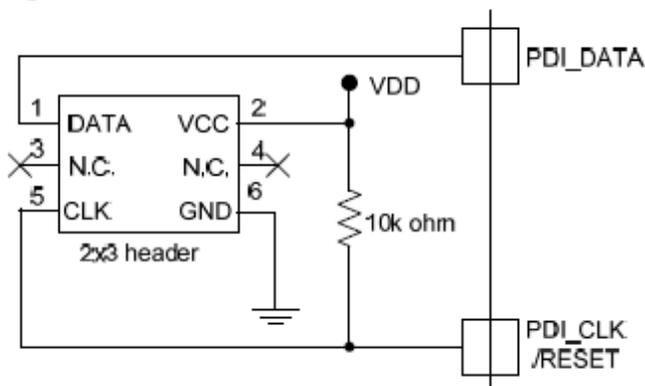
PDI programming default speed is 230,400 baud so any capacitance on programming lines will create problems. Slow it down if you get 2 red error flashes.
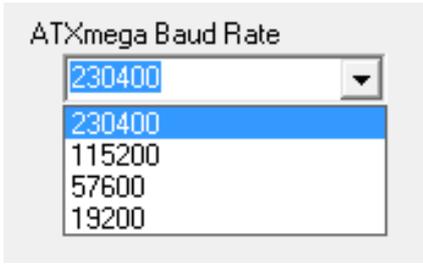
You will also need to slow down baud rate for lower voltage applications e.g. 57,600 at 1.9V.

TPI interface

Some ATtiny devices have a TPI interface eg ATtiny10. TPI support is available on both standard AVR handheld and X version. This is not the same as PDI as it uses 3 programming lines, TPI Clock, TPI data and Reset.

If you want to use the flying lead adapter (supplied with X version) the connections are

Yellow - PDI Clock
Blue   - PDI Data
Red   - Reset
Green   - VCC
Brown   - GND

Microchip recommended layout for 6-way interface on your target PCB is
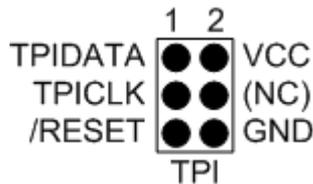
Figure 1.   The Atmel Tiny Programmer Interface for external programmers.
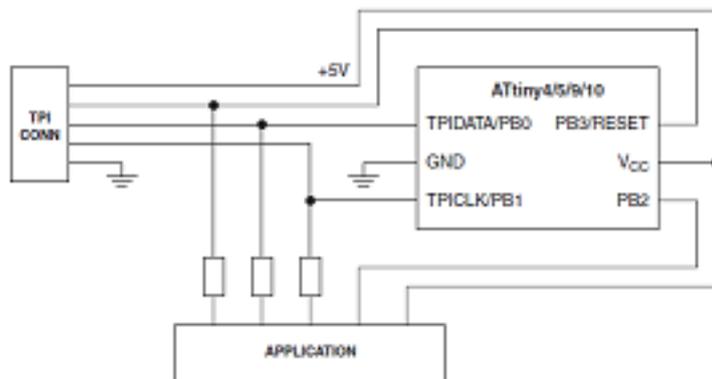
Kanda **10DIL6** adapter for ISP will also work with TPI programming. It is available on our website.

Kanda 10DIL6 Adapter for ISP,TPI and UPDI

AVR UPDI Programming

Only available on ATxmega version - HH0110X, HH0120X, HH0810X and HH0820X and Version 3.

Microchip recommend the following layout for ISP header on your target circuit. Only 3 wires need connecting.
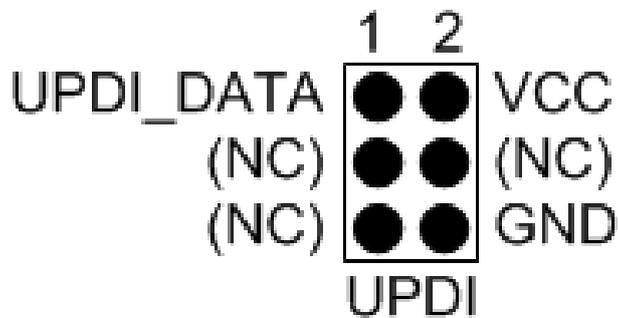
Connect the flying lead adapter to the end of the 10-way lead.

These wires need connecting to the target for AVR UPDI programming

Blue   - UPDI_Data
Green - VCC
Brown - GND

UPDI_DATA is Reset pin on AVR microcontroller.

Microchip recommend that no other circuitry is connected to UPDI_DATA especially if 12V pulse is applied.

12V Pulse

A 12V pulse is needed on Reset to enter UPDI programming if **Reset Pin Configuration fuse** (**SYSCFG0**) is set to Reset or GPIO rather than default UPDI setting. An optional adapter is needed for this 12V pulse.

[UPDI 12V Adapter](#)

In software, UPDI BAUD Rate can be set. Most devices work at 115,200 but if you get problems, reduce the speed.
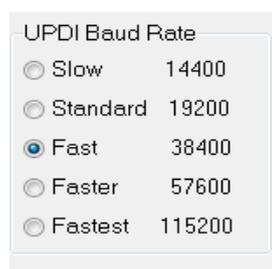
LED Codes

The programmer will give a brief green flash when plugged in to target or adapter. When button is pressed, LED will flicker green during programming. When programming has finished, these codes appear.

Version 3 Programmers are off when connected to target. Power is switched on when button is pressed. LED will flicker green during programming. When programming has finished, these codes appear.

Green Flashes, 1 second interval: Programmed OK

Solid Red: Current limit (150mA) exceeded. Try powering the target. This can also be caused by large capacitance on target, see troubleshooting section or contact Kanda support for advice.

2 Red Flashes: Failed to enter ISP, JTAG, UPDI or PDI. Possible causes:
- No device connected
- Wrong programming method selected
- JTAGEN fuse disabled on JTAG
- No adapter or faulty adapter for JTAG or PDI
- Programmer speed too fast for target clock (ISP)
- UPDI – Reset pin is not set to UPDI mode in SYSCFG0

3 Red Flashes: EEPROM did not verify

4 Red Flashes: Flash did not verify

5 Red Flashes: Fuses/Lockbits did not verify

6 Red Flashes: Program Limit reached

7 Red Flashes: Device ID did not match

8 Red Flashes: Empty slot selected

9 Red Flashes: Header checksum mismatch

10 Red Flashes: Flash checksum mismatch

If you get either 9 or 10 flashes, the user program has become damaged, possibly by firmware updater. Reload the programmer (or first slot on 8-way) to correct this.

11, 12, 13, 14 Red Flashes: JTAG or PDI timeout problem, usually caused by removing lead during programming.

You can press button again to start programming when error or success codes are still flashing or unplug programmer. This switches off programmer.

BATTERY AND POWER SUPPLY

The Handheld Programmer uses a standard 9V PP3 battery. These are commonly available, typically 500 mA hours. As maximum current during programming is 150mA, this should give several hours of actual programming.

The time for each cycle and current drawn will depend on many factors eg target current, voltage, device and file size.

The Handheld Programmer can also be powered from an external Power Supply. The power supply should be

- 2.1mm barrel connector (coaxial plug), centre positive.
- Ideally 9V DC regulated but 9-15V will work. Do not exceed 15V.
- 300 mA plus

A universal PSU or Wall Transformer is available on the Kanda shop – **Order Code PSU9V-UNI**

TROUBLESHOOTING

Windows driver problems

If you get a driver error or FTDIxx.DLL not found, make sure that you have run the install software on CD and then plugged in programmer, NOT the other way round.

The driver should appear as a "USB Serial Converter" in USB section of Device Manager. Windows should do this automatically. If it does not, please follow this procedure.

- Plugin Programmer and ideally remove other USB devices
- Go to Control Panel > System > Hardware screen
- Click on Device Manager button
- Open USB section and select "USB Serial Converter"
- Right click on it, and select Update Driver
- Driver location is (default install path)
  C:\Program Files\Kanda\AVRHHP\driver\driver

Error Message: "Programmer is not responding – check connections and battery power"
1) Check dongle is attached to USB port
2) Check that programmer is connected to PC as shown on Page 1
3) Check battery or power supply to the programmer
4) Make sure you have a Handheld Programmer dongle, not a standard AVRISP-U/STK200 dongle. The unit will say "Dongle2" on it.
5) Remove other USB devices that may be conflicting

Programming Errors – RED Flashes on LED when programming
1) Ensure your target circuit is wired correctly as shown in connection diagrams
2) Check power options are correct – see Power

3) Slow down programmer speed in software – especially if you have capacitors on programming lines or other unusual circuitry.
4) Check battery voltage

Programming Errors – Solid RED on LED when programming

1. If using JTAG or PDI, check adapter is connected

2. If target is unpowered, check it is not drawing more than 130-150mA

3. Check for bad connections

4. Low battery indication

Smart Phone App to Load Programmer

There is a mobile phone App to load the programmer with PRG files. The steps are

- Load the programmer as normal
- Use Copy Unit button to create a PRG file
- Send PRG file to phone
- Connect dongle and programmer to phone
- Use Kanda AVR App to reload programmer with new PRG file

Details

1. Load programmer as normal then click on Copy Unit Button to Copy programmer

Encryption
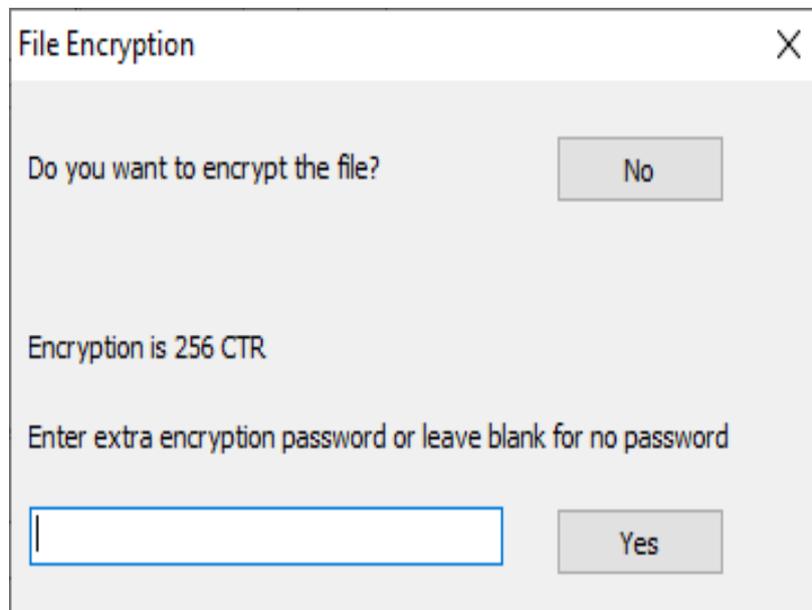
Click No if you do not want to encrypt the programmer (.PRG) file.

Click Yes to encrypt the file with 256-bit CTR encryption. This can be opened by Kanda App or Kanda PC software but nothing else.

For extra security add a file specific password that must be sent to the user to open and decrypt the file. This is 32 characters maximum, case sensitive with letters numbers and punctuation.

2. Email file (and password separately) to user's phone or upload to cloud for download.

The user's phone must have the following features

- Kanda App loaded – available from Google Play
- Android 7.0 or later
- USB Host mode available
- OTG cable

3. The user browses for and selects the file, loads it and loads programmer with the new code.
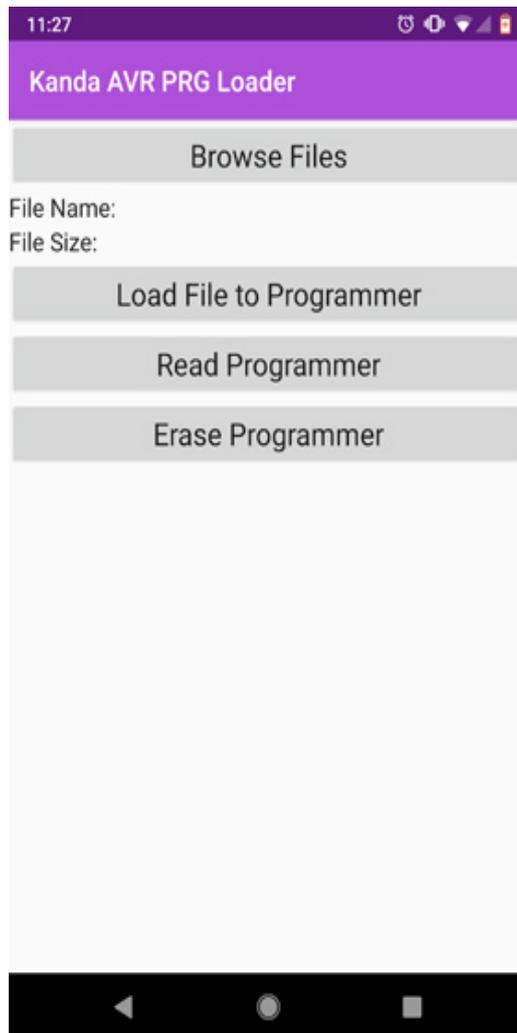
They can also read the programmer to see what is currently loaded.

For more information, including where to download the App, visit Kanda website

[Kanda Smart Phone Loader for AVR Handheld Programmer](#)

Handheld Programmer Part Numbers

	Version 1	Version 2	Version 3
SINGLE STARTER KIT	HH0110	HH0110X	HHO110V3
SINGLE PROGRAMMER	HH0120	HH0120X	HHO120V3
8-WAY STARTER KIT	HH0810	HH0810X	HHO810V3
8-WAY PROGRAMMER	HH0820	HH0820X	HHO820V3

Version 1 are still available but not recommended for new users.

Version 2 (AVR and ATxmega) are discontinued.

Version 3 are current release and support all AVR, ATxmega and AVR D series.

FURTHER INFORMATION

Please contact support@kanda.com for technical support or go to our website support pages for latest software.

https://www.kanda.com/software

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