## How to program HEX File into board by BootLoader(chip45Boot2 Protocol)

In this case, user can program HEX File into board without using any external Programmer because MCU on Board ET-BASE MEGA1280/2560 of ETT has already been installed Program BootLoader. So, user can program Hex File into MCU through RS232 Serial Port Communication via Channel USARTO of board instantly.

Program BootLoader that has been installed in MCU of Board ET-BASE MEGA1280/2560 uses Protocol of Chip45Boot2 with the fixed Baud Rate of 115200bps for communication. It can be used with Program chip45boot2 GUI that can be downloaded free from website http://www.chip45.com/info/chip45boot2.html as described below;

- Supply Power into board by using 5VDC Adapter. Be careful and please check connector of Power Supply correctly. If it is correct, user will see LED Power ON.
- 2. Interface Cable RS232 from RS232 Serial Port Communication of computer PC to board through Connector RS232 of USARTO as in the picture below;





- Press and hold SW PG2 for awhile; or Close Jumper PG2 and GND, it makes PG2 as Logic 0
- Press Switch RESET and Switch PG2 still is pressed
- Release Switch RESET first but Switch PG2 still is pressed
- Finally, release Switch PG2; or Open Jumper PG2 and GND. If everything is ok, LED PG5 blinks 3 times and then ON.



- 4. Run Program chip45boot2 GUI and set options for program as shown in the picture;
  - Select COM Port: Choose the Com Port number according to the actual connection
  - Baud Rate: Set as 115200
  - Choose Enable for Send This Pre-String Before Connect and Wait = OmS; then, set String as U letter in the format of ASCII; or as 55 in the format of HEX
  - Finally, click *Connect to BootLoader*. If everything is ok, Status of program will be changed to *Connected*! with green tab.

22 chip45boot2 GUI         Version 1.8         Wein Automator Command Shell         Select COM Port       RS485         Basch Hex/lie         C:XET_BASE_AVR/ET-BASE xMEGAVFinal_WinAVRUED_BIT\def         Select COM Port       RS485         Basch Hex/lie         C:XET_BASE_AVR/ET-BASE xMEGAVFinal_WinAVRUED_BIT\def         Select Comment to Bootloader       Program Eash         Program Eash       Program Eeprom         Start Application       Status         Show Communication Log       Egt	ogramming Hex into Board E	I-BASE MEGA	1280/2560 by Bootl	oader ET
Chip45boot2 GUI   Version 1.8   Mem Quionator Command Shell   Select COM Port   PISAb Hex/ile   C:VET_BASE_AVR/ET-BASE_xMEGAVFinal_WinAVR/LED_BIT/del   Select Eeprom Hex/ile   Select Commend to Beotocoder   Program Each   P	chip45boot2 GUI		➡ chip45boot2 GUI	
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Flash Hexfile       C:\ET_BASE_AVR\ET-BASE_wHEGA\Final_WinAVR\LED_BIT\def       Select Flash Hexfile         Exprom Hexfile       Select Eeprom Hexfile       Select Eeprom Hexfile         Image: Select Eeprom Hexfile       Select Eeprom Hexfile       Select Eeprom Hexfile         Image: Select Eeprom Hexfile       Select Eeprom Hexfile       Select Eeprom Hexfile         Image: Select Eeprom Hexfile       Select Eeprom Hexfile       Select Eeprom Hexfile         Image: Select Eeprom Hexfile       Select Eeprom Hexfile       Select Eeprom Hexfile         Image: Select Eeprom Hexfile       Select Eeprom Hexfile       Select Eeprom Hexfile         Image: Select Eeprom Hexfile       Select Eeprom Hexfile       Select Eeprom Hexfile         Image: Select Eeprom Eeprom       Read Eeprom       Eeprom Eeprom Eeprom       Read Eeprom         Image: Statt Application       Status       Image: Select Eeprom Eeprom       Read Eeprom         Show Communication Log       Egit       Show Communication Log       Show Communication Log	Select COM Port R5485 Baudrate Show Non-Standard Bau	udrates elp	Select COM Port RS485 Baudrah COM3 20400 I115200 76800 S75600	e Show Non-Standard Baudrates
Eeprom Hexile       Select Eeprom Hexile       Select Eeprom Hexile         Send This Pre-String Before Connect and wait        Select Eeprom Hexile       Select Eeprom Hexile         Send This Pre-String Before Connect and wait        Select Eeprom Hexile       Select Eeprom Hexile         Connect to Bootloader       Program Elash       Program Eeprom       Bead Eeprom         Start Application       Status       Disconnect Bootloader       Program Elash       Program Eeprom         how Communication Log       Est       Show Communication Log       Show Communication Log	Flash Hextile c:\ET_BASE_AVR\ET-BASE xMEGA\Final_WinAVR\LED_BIT\def Select Flash	Hexfile	Flash Hexfile c:\ET_BASE_AVR\ET-BASE xMEGA\Final_WinAV	R\LED_BIT\def Select Flash Hexfile
Image: Send This Pre-String Before Connect and waik Image: U       Image: Send This Pre-String Before Connect and waik Image: U         Image: Connect to Bootloader       Program Eleptor       Image: Connect to Bootloader         Image: Start Application       Start Application       Image: Connect to Bootloader         Start Application       Start Application       Image: Connect to Bootloader         Start Application       Start Application       Connect to Bootloader	Eeprom Hextile Select Eeprom		Eeprom Hexfile	Select Eeprom Hexfile
Connect to Bootloader       Program Elash       Progra	✓ Send This Pre-String Before Connect and wait ♀ 0 msec. U ④ Ascii ○	Hex	Send This Pre-String Before Connect and wait 🗑	0 msec.
Start Application     Start Application     Connection       ihow Communication Log     Exit     Show Communication Log	Connect to Bootloader Program Elash Program Eeprom Read E	eprom	Disconnect Bootloader Program Elash	Program Eeprom Read Eeprom
how Communication Log Egit Show Communication Log	Start Application Status	s <b>200</b>	Start Application	Connected!
	how Communication Log	Egit	Show Communication Log	E

5. Choose *Flash Hexfile* that user requires programming and then click *Program Flash*. User has to waits for a while until the program runs completely, and user will see Status has been changed to *Done*!

hip45boot2 GUI srsion 1.8 Main Automator Command	Shell Better Embedd
Select COM Port R COM3 COM4	S485         Baudrate         Show Non-Standard Baudrates           220400         115200
Flash Hexfile	
CIVET_BASE_AVRIVET-BASE >	MEGAVEINAL_WINAVEXLED_BIT (der Select Flash Hextile
Eeprom Hexhle	Select Eeprom Hexfile
C SE I_BASE_AVH SE I-BASE & Eeprom Hexhie	Select Flash Hexrile Connect and wait
C KE _ DASE_AVHNET BASE > Eeprom Hexhle Send This Pre-String Before U Disconnect Bootloader	Connect and wait 0 msec. Program Elash Program Eeprom Read Eeprom
C LE L_BASE_AVH LE HBASE > Eeprom Hextile Send This Pre-String Before U Disconnect Bootloader Start Application	Select Flash Hexile Select Eeprom Hexile Select Eeprom Hexile Onnect and wait O Regram Elash Program Eeprom Read Eeprom Connected
C: KE I_BASE_AVH VE I-BASE > Eeprom Hextile  Send This Pre-String Before  Disconnect Bootloader  Start <u>Application</u> how Communication Log	Select Flash Hexile  Select Eeprom Hexile  Connect and wait  Program Elash Program Eeprom Econnected

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chip45boot2 GUI		X
chip45boot2 GUI Version 1.8 Main Automator Comman	d Shell	hip45 Better Embedded.
Select COM Port	Image: Second state state         Baudrate state state         Show it is it i	Non-Standard Baudrates
Flash Hexfile c:\ET_BASE_AVR\ET-BASE Eeprom Hexfile	xMEGA\Final_WinAVR\LED_BIT\def	Select Flash Hexfile Select Eeprom Hexfile
Send This Pre-String Befor	e Connect and wait 🗐 🛛 msec.	Ascii Hex
Disconnect Bootloader	Program Elash Program Eepro	om Read Eeprom
Show Communication Log		Egit
(C) chip45 GmbH & Co. KG	http://www.chip45.com	better embedded.

6. When programmed HEX File into MCU on board successfully, click *Start Application* on Program GUI; or press Switch RESET on Board ET-BASE MEGA1280/2560 directly. Board starts running according to the programmed HEX File instantly.



## How to install BootLoader(chip45Boot2 Protocol)

If installing BootLoader into MCU, it has to use external Programmer to program BootLoader Code into MCU on board. Normally, it is unnecessary to re-program BootLoader because the MCU on Board ET-BASE MEGA1280/2560 has already included Program BootLoader. This manual is written to be guideline when user encounters any problem and it makes program in BootLoader damaged unintentionally; for example, user programs HEX File into MCU by PDI Programmer instead of BootLoader. In this case, we use Programmer AVRISP mkll or ET-AVRISP mkll that has the same method and file BootLoader in included in CD-ROM that is "chip45boot2\_BaseMega1280.hex" or "chip45boot2\_BaseMega2560.hex". The method to process is mentioned below;

- Supply power into board by using 5VDC Adapter; please be careful, check the Connector of Power Supply correctly. If it is ok, user will see LED Power ON.
- 2. Interface ISP Cable between AVRISP mkll and Connector ISP of Board ET-BASE MEGA1280/2560. Please check pin position and do not interface it reversely. If using Programmer and Board from ETT, it uses Connector 6-PIN IDE that protects user from interfacing cable reversely. However, if there is any error; for example, LED Power is OFF while interfacing cable, please remove the cable from device instantly and then check to find out the causes instantly.



3. After interfacing USB Cable of AVRISP mkll with computer PC and everything is ok, user can run Program AVR Studio instantly. In this case, program asks user for choosing the created Project, click *Cancel* to skip over as shown in the picture below;



 Click Menu Tools → Program AVR → Connect.. → AVRISP mkII; set Port as USB; and then, click Connect as shown in the picture below;



5. If everything is ok, program enters window of Program AVRISP mkll instantly. Please check the connection between ATMEGA1280/2560 and AVRISP mkll to ensure that it is able to communicate correctly. Go to Tab Main, set MCU number in the blank of Device and Signature Bytes as ATmega1280; choose the connection type in the blank of Programming Mode and target Settings as ISP Mode; and then click Read Signature. If everything is ok, program should read Signature of ATMEGA1280 or 2560 correctly as shown in the picture below;

AVRISP mkll in ISP mode with ATmega1280           Main         Program         Fuses         LockBits         Advanced         HW Setting           Device and Signature Bites         ATmega1280         Image: Signature not read         Image: Signature not r	HW Info Auto  AVRISP mkll in ISP mode with ATmega1280  Main Program Fuses LockBits Advanced HW Settings HW Info Auto  Device and Signature Bytes  ATmega1280  Erase Device  (Dx1E 0x97 0x03  Signature matches selected device
Detecting on 'USB' AVRISP mkII with serial number 000040012825 found. Getting isp parameter SD=0x06 DK	Settings ISP Frequency: 125.0 kHz
	Setting mode and device parameters., OK! Entering programming mode., OK! Reading signature., OXHE, OX97, Ox03., OK! Leaving programming mode., OK!

Go to Tab Program and then set options as follows;

- Device: Choose Erase device before flash programming and Verify device after programming
- Flash: Choose Input HEX File that is BootLoader according to the actual MCU on board; "chip45boot2\_BaseMega1280.hex" or "chip45boot2\_BaseMega2560.hex". Next, choose Program to program HEX File into MCU.
- Fuses: Choose Enable in the part of BOOTRST; in this case, MCU always starts running at the area of BootLoader every time after resetting. Next, set Boot Size in BOOTSZ; if it is MEGA1280, please set the value as **F800**; on the other hand, if it is MEGA2560, please set the value as **1F800**.

• LockBits: Set *BLB1* as *LPM* and *SPM* prohibited in Boot Section; it protects memory area of BootLoader from re-written.

AVRISP mkll in ISP mode with ATmega1280	AVRISP mkll in ISP mode with ATmega1280
Main       Program       Fuses       LockBits       Advanced       HW Settings       HW Info       Auto         Device       Erase Device       Erase Device       Image: Comparison of the set of	Main     Program     Fuses     LockBits     Advanced     HW Settings     HW Info     Auto       Fuse     Value       LB     No memory lock features enabled       BLB0     No lock on SPM and LPM in Apolication Section       BLB1     LPM and SPM prohibited in Boot Section
Flash         Use Current Simulator/Emulator FLASH Memory         Input HEX File       C:WinAVR-20100110%ETT_Examples%BootChip45_Base         Program       Verify         Read	
EEPROM         Use C Intent Simulator/Emulator EEPROM Memory         Imput HEX File         C:VET_BASE_AVR/AVR_ISP_MKIIVProjects/AVRISP-MK         Program         Verify         Read	
Input ELF Fig: Save From: IF FLASH IF EEPROM FUSES LOCKBITS Fuses and lockbits settings must be specified before saving to ELF	Image: Ward or local diagram in the second diagra
Efasing device DKI Programming FLASH OKI Reading FLASH OKI FLASH contents is equal to file DK Leaving programming mode OKI Leaving programming mode OKI	Entering programming mode OKI Writing lockbits OKCF OKI Reading lockbits OKCF OKI Lock bits verification OK Leaving programming mode OKI

VRISP mkll in ISP mode with ATmega1280	AVRISP mkll in ISP mode with ATmega2560	
Main Program Fuses LockBits Advanced HW Settings HW Info Auto	Main Program Fuses LockBits Advanced HW Settings HW Info Auto	
Fuse Value	Fuse Value	^
JTAGEN	JTAGEN	
SPIEN	SPIEN	
WDTON	WDTON	
EEGAVE	EESAVE	
BOOTSZ Boot Flash size=2048 words start address=\$F800	BOOTSZ Boot Flash size=2408 words start address=\$1F800	
BOOTRST	BOOTRST 🔽	
CKDIV8	CKDIV8	
СКОИТ	CKOUT	
SUT_CKSEL Ext. Crystal Osc. 8.0- MHz; Start-up time: 258 CK + 4.1 ms	SUT_CKSEL Ext. Crystal Osc. 8.0- MHz; Start-up time: 258 CK + 4.1 ms	
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EXTENDED DIVEE	EXTENDED DIFE	
HIGH 0x9A	HIGH 0x9A	
LOW 0xCE	LOW 0xCE	
▼ Auto read	Auto read	
Smart warnings	Smart warnings	
Verifu Stor programming		ad
veny allei programming		
Ritering programming mode UK!  Writing fuses address 0 to 2 OVCE 0V90 OVEE OKI	Chtering programming mode UK!	
leading fuses address 0 to 2 0xCE, 0xSA, 0xFF 0K!	Reading fuses address 0 to 2 0xCE, 0xQA, 0xFF 0K!	
use bits verification OK	Fuse bits verification. DK	
zaving programming mode UK!	Leaving programming mode UK!	

After programmed BootLoader successfully, user is able to program HEX File into board through BootLoader as described above instantly.