

# *C/C++ Development Kit*

*for*

*TERN 16/32-bit embedded controllers*

*with*

*Paradigm C++-TERN Edition*

## *Technical Manual*

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### Important Notice

**TERN** is developing complex, high technology integration systems. These systems are integrated with software and hardware that are not 100% defect free. **TERN products are not designed, intended, authorized, or warranted to be suitable for use in life-support applications, devices, or systems, or in other critical applications.** **TERN** and the Buyer agree that **TERN** will not be liable for incidental or consequential damages arising from the use of **TERN** products. It is the Buyer's responsibility to protect life and property against incidental failure.

**TERN** reserves the right to make changes and improvements to its products without providing notice.

Temperature readings for controllers are based on the results of limited sample tests; they are provided for design reference use only.

# Chapter 1: Introduction

## 1.1 Description

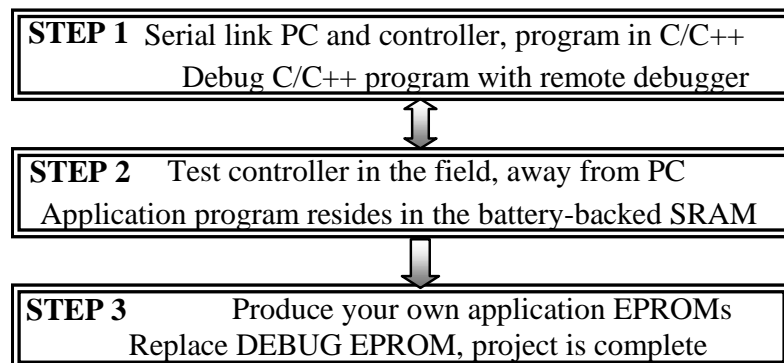
Welcome to TERN C/C++ Evaluation (EV) or Development Kit (DV) for 16/32-bit embedded controllers. TERN controllers are based on PC compatible processors, easy to program in C/C++. The use of ANSI C/C++ compilers for your projects will support your development needs now and into the future.

TERN's EV/DV Kit supports a complete user-friendly integrated development environment for embedded application. It integrates Paradigm C++-TERN Edition, a state-of-the-art integrated development environment (IDE), including a C/C++ compiler, remote debugger, C libraries, I/O drivers, configuration files, project files, sample programs, technical manuals, power supply, serial cable, remote debug kernel, and a TERN controller.

Within the IDE, you can create, debug, and deploy real-time embedded system applications without resorting to the use of external tools. If you are used to running separate editor, debugger, make, and other tools to get a job done, then you are in for a real treat with Paradigm C++-TERN Edition. After installing the software and serial link connecting your PC with the controller, you can run a sample program "led.c" by simply click the "run" button. The kit takes care of the whole operation steps including compile, link, locate, download, and ready to run. You can single step, set breakpoint, or run your program on the target controller. After debug and setting a jumper on the board, you can take the controller to a standalone field test. After the standalone field test, the DV kit can generate a HEX/BIN file for your EPROM/Flash. It will dramatically reduce your development time and tool investments. You'll be able to put a dedicated system together in record time.

TERN EV/DV kits support a complete product line of 16/32-bit embedded controllers based on AM188/186, i386EX, and V25 processors, featuring operational amplifiers, ADC, DAC, real time clock, EE, solenoid drivers, power relays, UART, opto-coupler, LCD, keypads, PCMCIA, Flash, 9-bit network, and quadrature decoders. MemCard-A™ can support up to 1 GB external memory space. With ACTF™ support, you can download a program to a FLASH without burning a ROM.

## 1.2 Development of application software consists of just three easy steps



### STEP 1

You can program TERN controllers from your PC via serial link with an RS232 interface. Your C/C++ program can be remotely debugged over the serial link at up to 115,000-baud rate. You can single-step, set

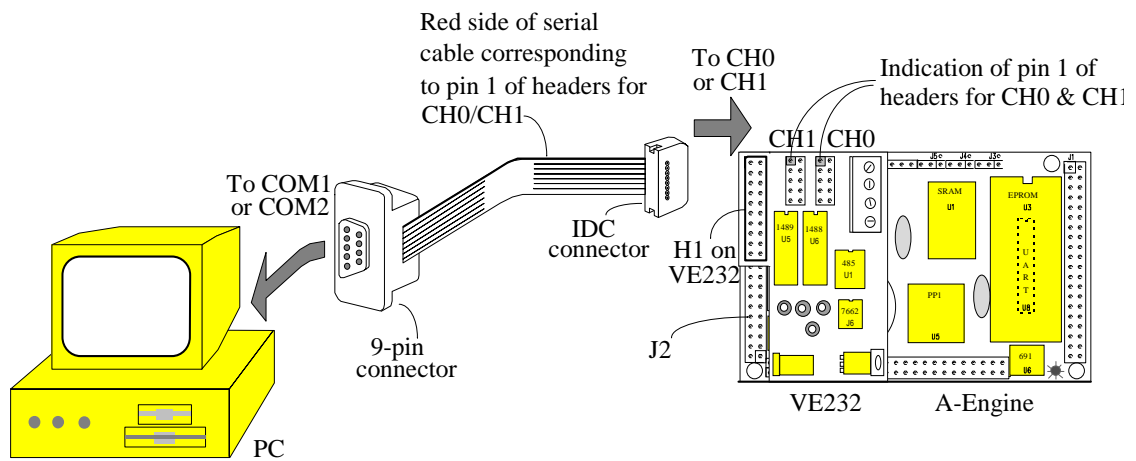
breakpoint, or run your program. Figure 1.1 illustrates how the A-Engine, VE232, serial cable and PC are connected.

**STEP 2**

After debugging your program, changing a single jumper will permit you to test-run the controller in the field, away from the PC, with the application program residing in battery-backed SRAM. The battery should last 3-5 years under normal conditions.

**STEP 3**

When the STEP 2 field test is complete, an application HEX or BIN file can be easily generated on your PC. You may produce your own ROM, or download the application file into FLASH.



**Figure 1.1 Hardware Installation of A-Engine™, VE232™, Serial Cable, and a PC**

# Chapter 2: Installation

## 2.1 Software Installation

Installation instructions launch automatically from the Paradigm C++-TERN Edition CD.

- If you are using V25 based controller, your working directory is C:\TERN\V25
- If you are using Am186/188 based controller, your working directory is C:\TERN\186
- If you are using i386EX based controller, your working directory is C:\TERN\386

## 2.2 Hardware Installation

Use A-Engine as an example. Install the VE232™ interface with the H1(10x2) socket connector on the upper half of the J2 (dual row header) of the A-Engine™. Figure 2.1a and 2.1b shows the VE232™ and the A-Engine™ before and after installation. A serial cable (PC-V25) should be used to link the A-Engine™ with your PC. Install the 5x2 IDC connector to the V232™ CH0 header (J2). *Note that the red side of the cable must point to pin 1 of the VE232 J2 header.* A small circle is drawn for indication in the Fig. 2.2. The DB9 connector should be connected to the PC's COM1/COM2. Connect a wall transformer +9V DC output to the VE232™ DC power jack. The LED should blink twice after the A-Engine™ is powered off/on or reset (Figure 2.3).

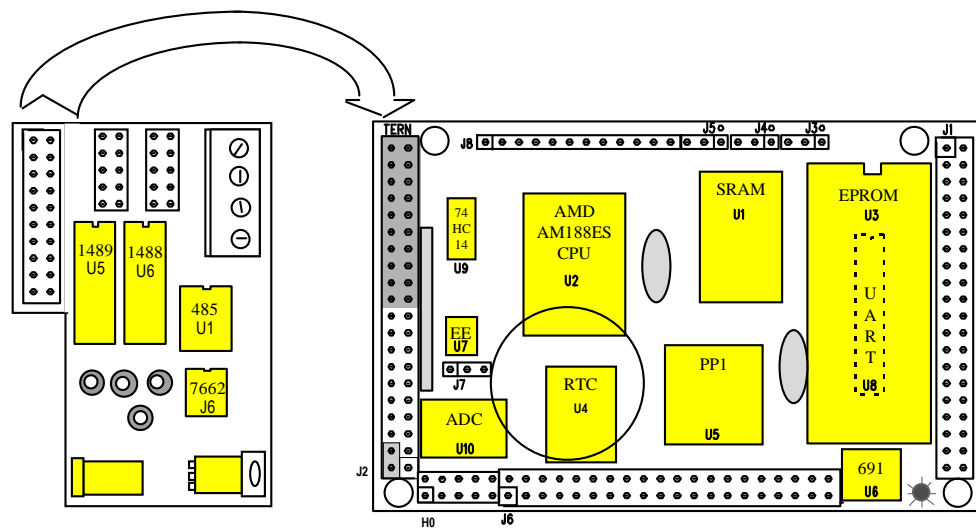


Figure 2.1a. Before installing the VE232™ on the A-Engine™

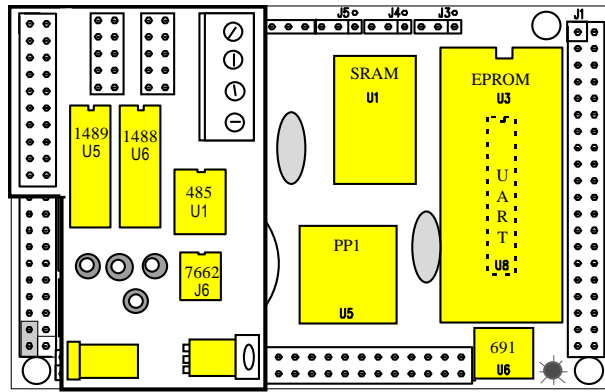


Fig. 2.1b. After installing the VE232™ on the A-Engine™

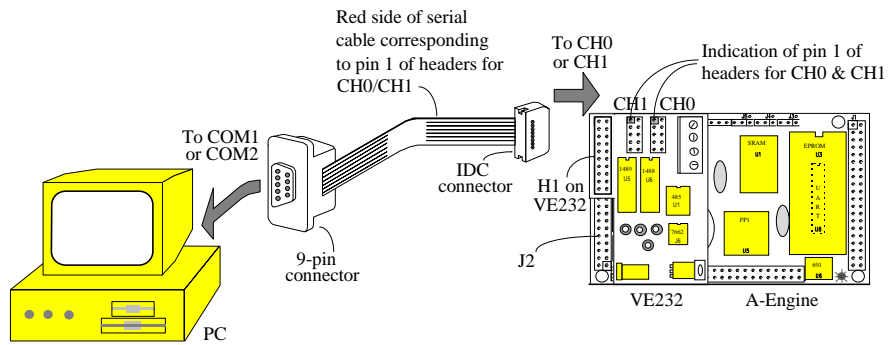


Fig. 2.2. Serial connection between the A-Engine™ and the PC

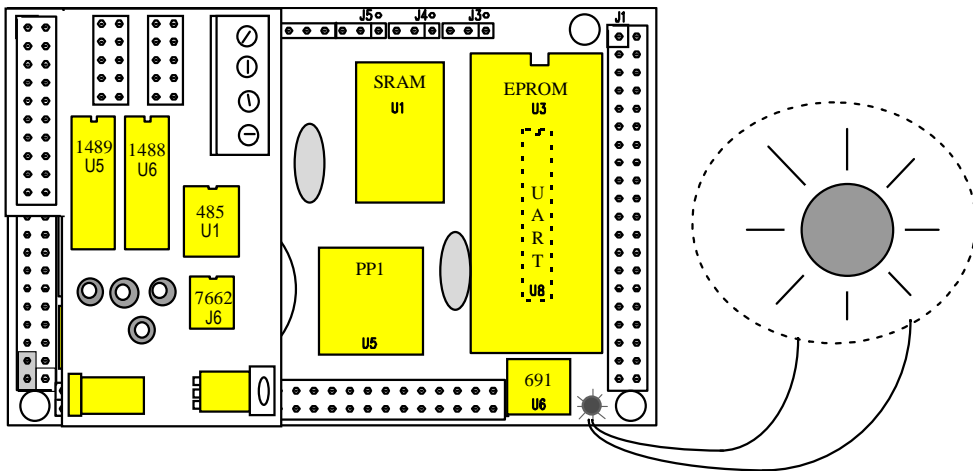
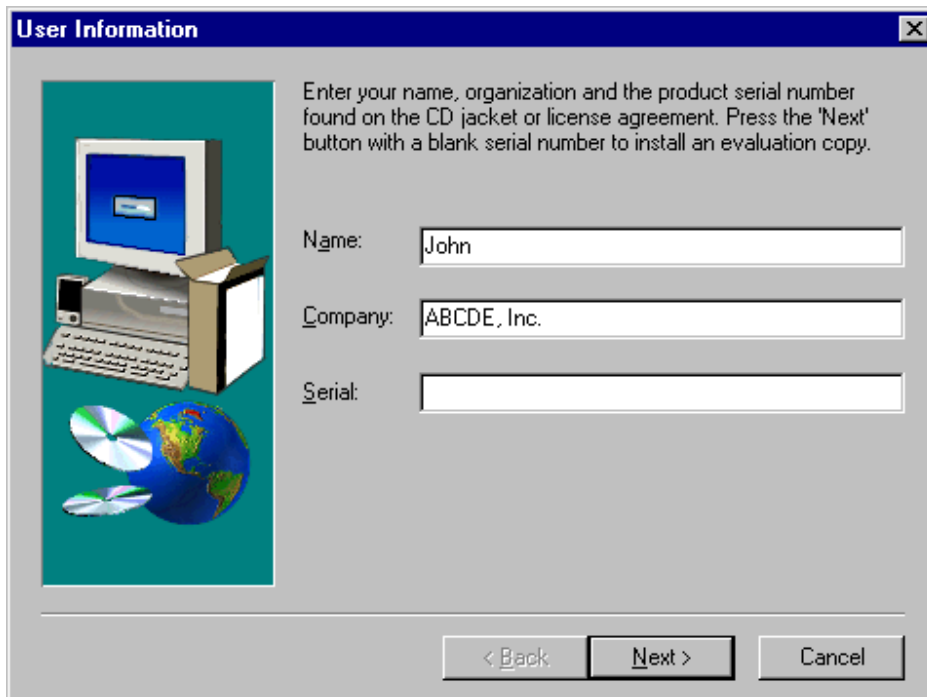


Fig. 2.3. The LED blinks twice indication hardware ready.

## Chapter 3: Quick Start Guide

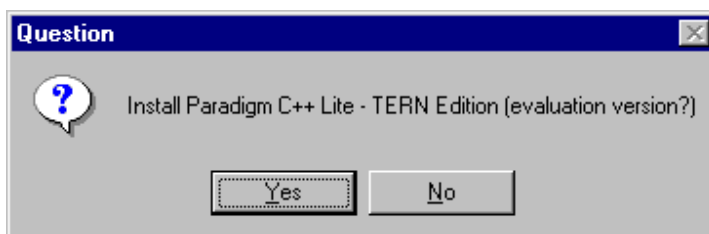
### 3.1 Getting started

Installation instructions launch automatically from the TERN CD. It will prompt you as shown below.



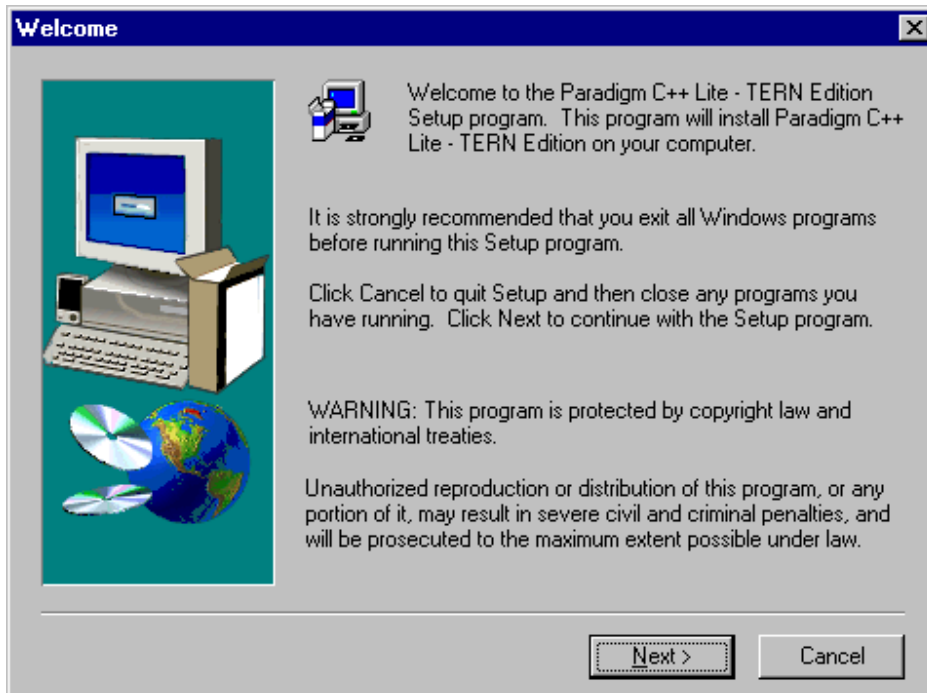
The "User Information" dialog box has a blue title bar with a close button. On the left is a graphic showing a computer monitor, keyboard, mouse, and CD-ROMs. The main text reads: "Enter your name, organization and the product serial number found on the CD jacket or license agreement. Press the 'Next' button with a blank serial number to install an evaluation copy." There are three input fields: "Name:" with "John", "Company:" with "ABCDE, Inc.", and "Serial:" which is empty. At the bottom are three buttons: "< Back", "Next >", and "Cancel".

If you purchased a full version DV-P kit from TERN, you will have a Serial Number from TERN with your order. Type in your Serial number for full version installation. If you do not have a correct serial number, you can install the Paradigm C++ Lite-TERN Edition evaluation version, by pressing the "Next" button without any serial number.

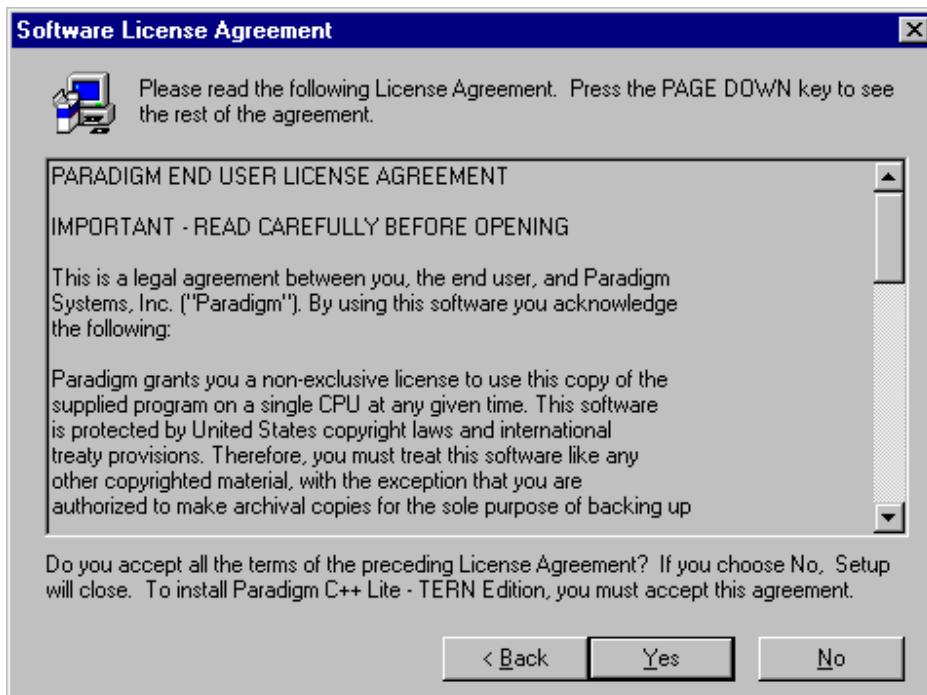


The "Question" dialog box has a blue title bar with a close button. It features a question mark icon and the text: "Install Paradigm C++ Lite - TERN Edition (evaluation version?)". At the bottom are two buttons: "Yes" and "No".

"Yes", then "Next".

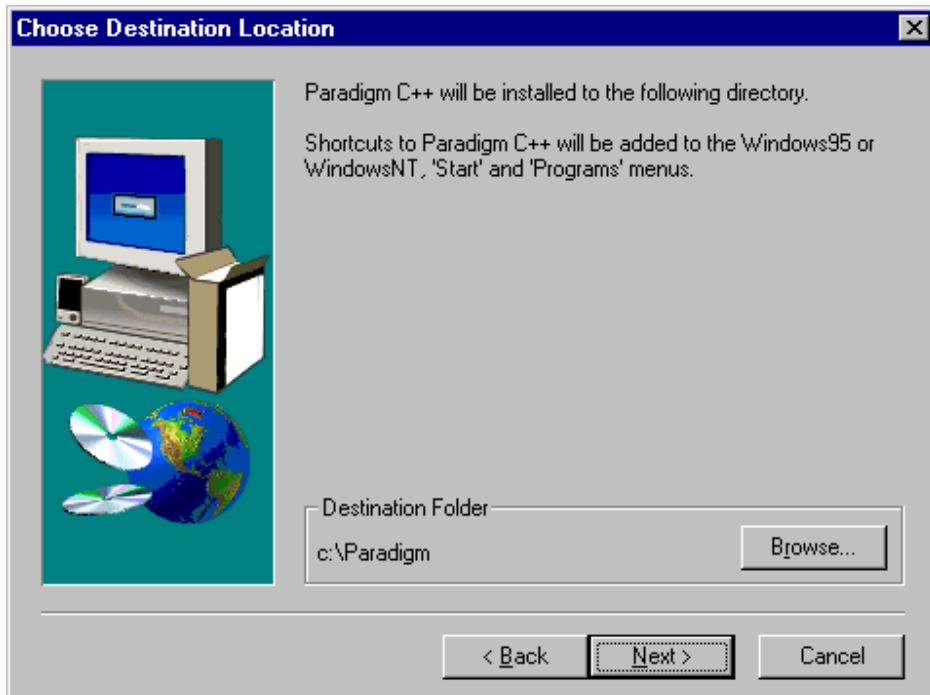


"Next"

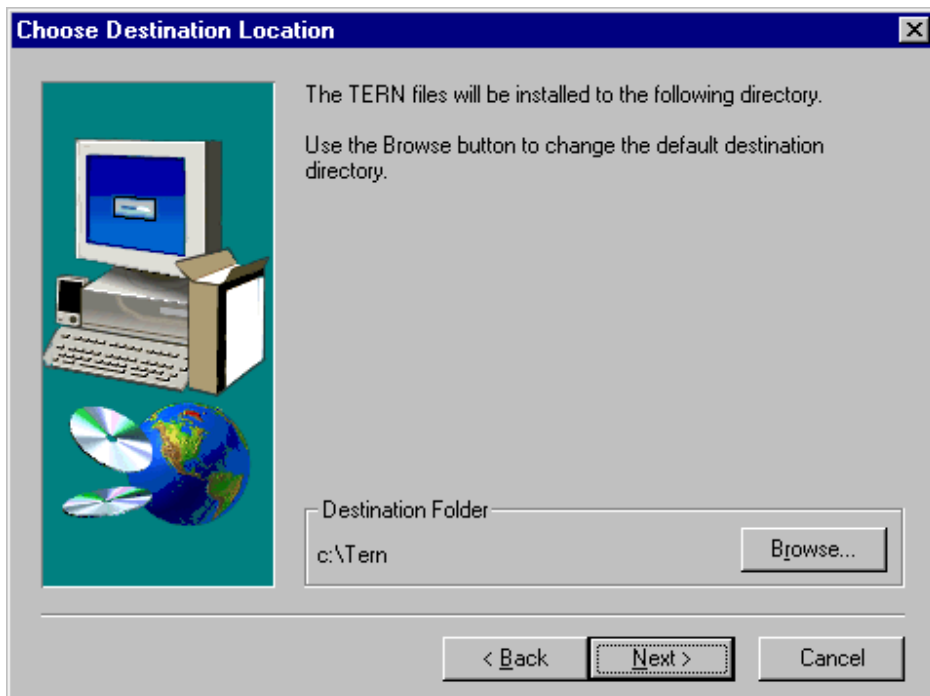


"Yes"

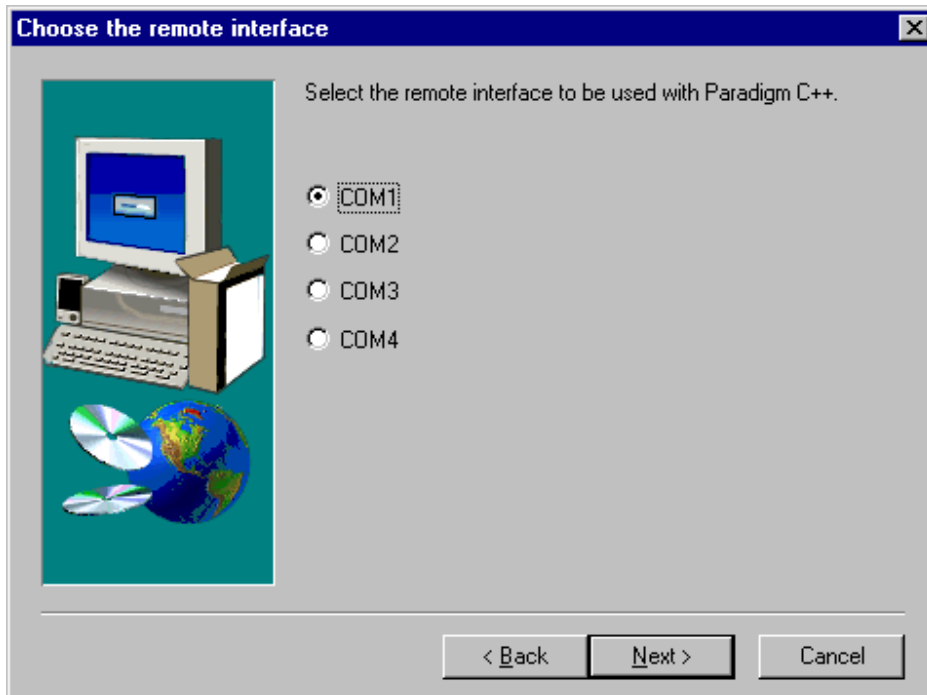




"Next"

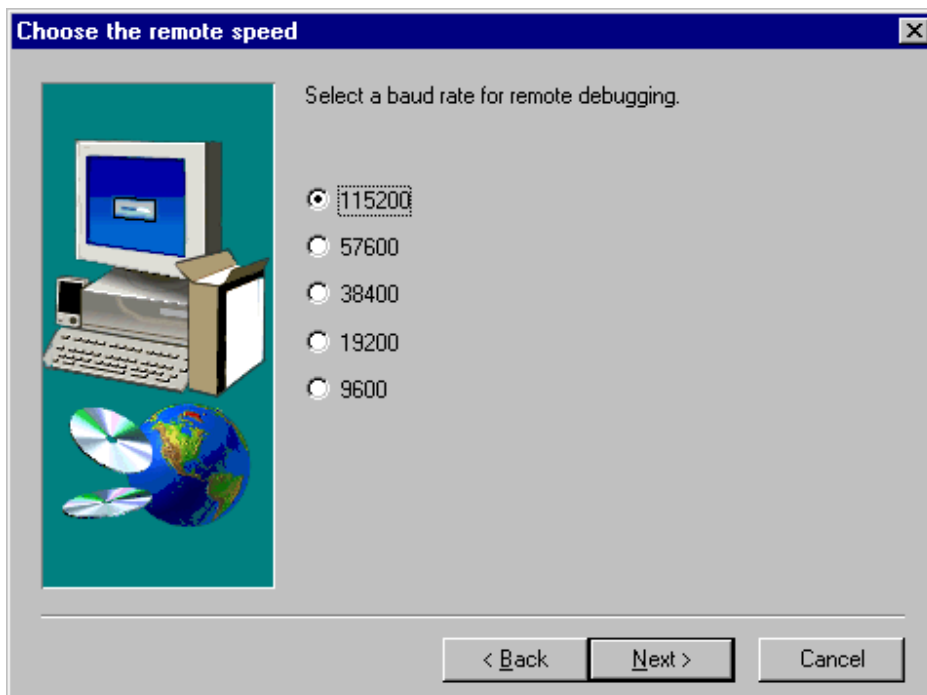


"Next"



Select "COM1" for example, then "Next".

If you are not sure which COM port you will use, you can modify the COM port setting with TargetExpert later.



Select 115,200 for example.

Please also check your TERN controller with the corresponding DEBUG ROM installed.

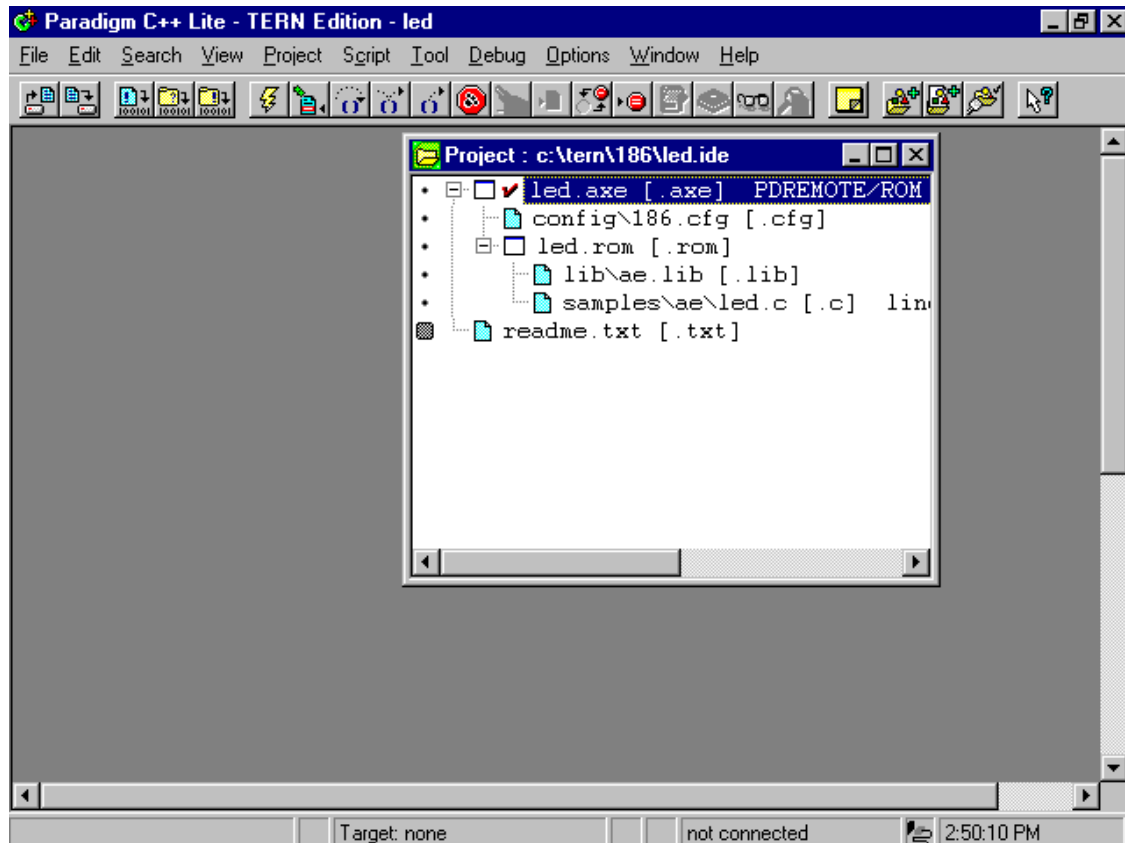
By default, most TERN controllers are setup for 115,200 baud remote debugging. You can change this baud rate later.

After following the instructions, “Finish”, exit the install screen, a program item titled Paradigm C++-TERN Edition will be added to the Windows95/98/NT/2000 “Start” menu.



Double click the icon of Paradigm C++-TERN Edition to launch the IDE.

At the first time, a default `c:\tern\186\LED.IDE` project will be open for TERN's AM188/186 based controllers.

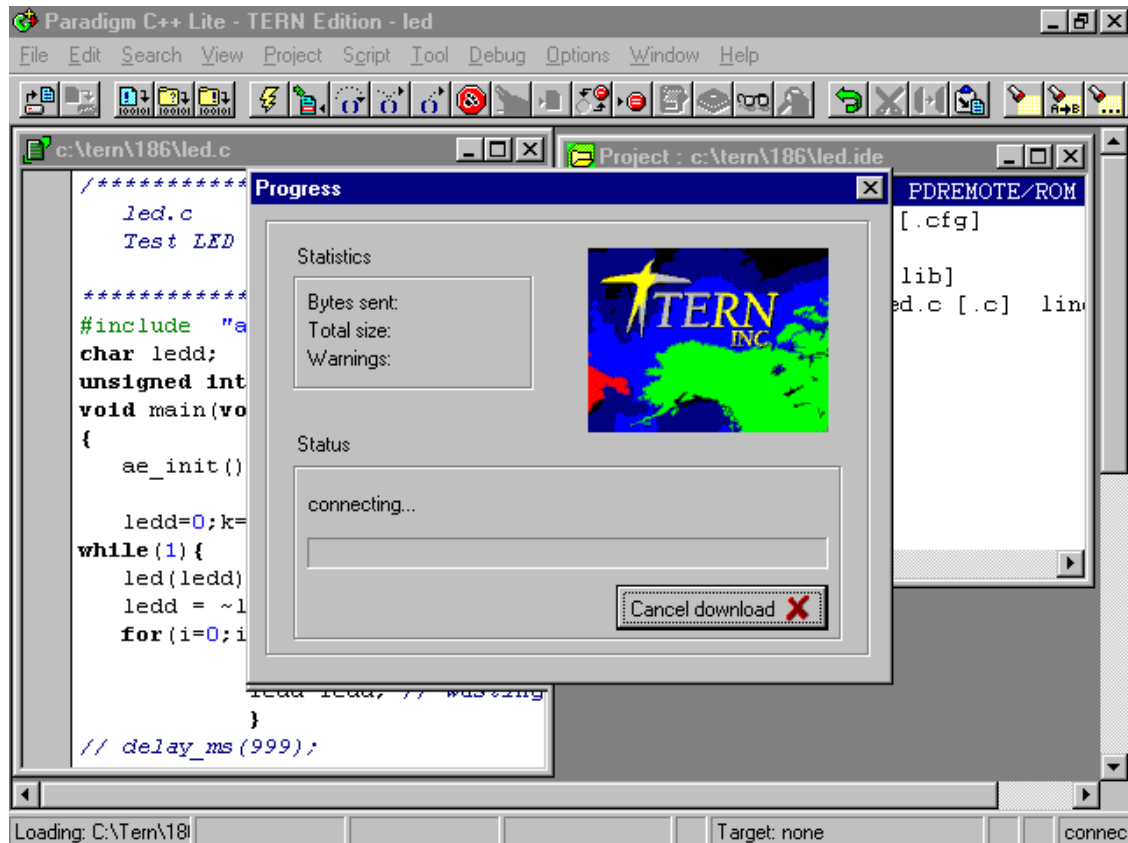


If you have a TERN controller connecting to PC COM1/2 via RS232 cable, it will show a downloading window waiting for the remote controller to respond. If the remote controller works with a DEBUG ROM installed (for example, label AE\_0\_115, see DEBUG ROM list included in the CD terndocs directory), an application code needs to be downloaded, otherwise will show a time out prompt.

If you have a connecting problem, You should check:

- 1) The RS-232 connection, the Cable red strip should pointing to the pin 1 of the 10-pin header. When the DC power on your controller, a red LED should blink twice and then stay on.
- 2) The DEBUG ROM has a correct label. See CD for DEBUG\_ROM\_list. The default debug baud rate is 115,200, if you are using a 40 MHz A-Engine, RS-232 cable connecting to SER0, with a DEBUG ROM “AE\_0\_115”.

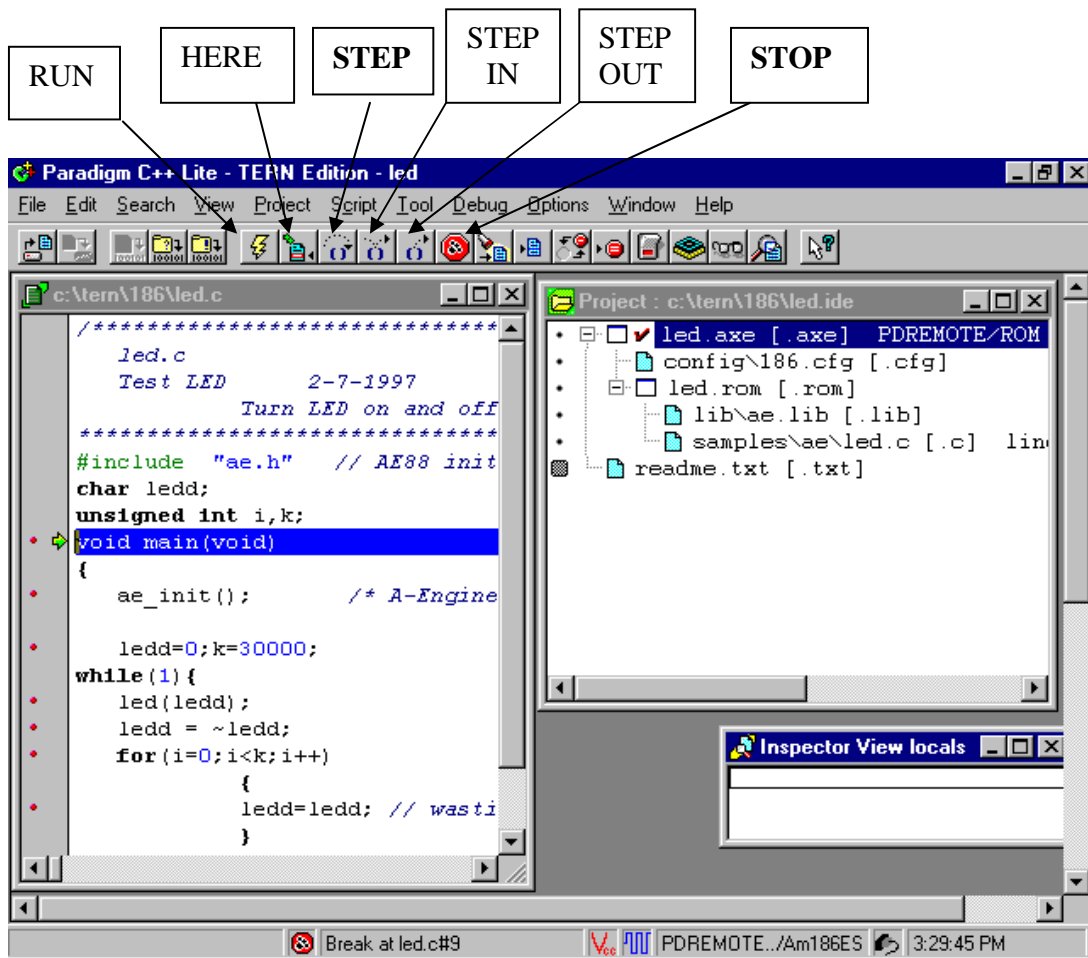
- 3) For a 20 MHz A-Engine, you must change the debug baud rate to 57,600. If you want to change the Baud Rate setting, use “TargetExpert”.
- 4) Your PC connection is using COM1 by a default installation; otherwise you have to change the COM port setting with “TargetExpert”.



With no connection, the bottom of the window shows “Target none”.

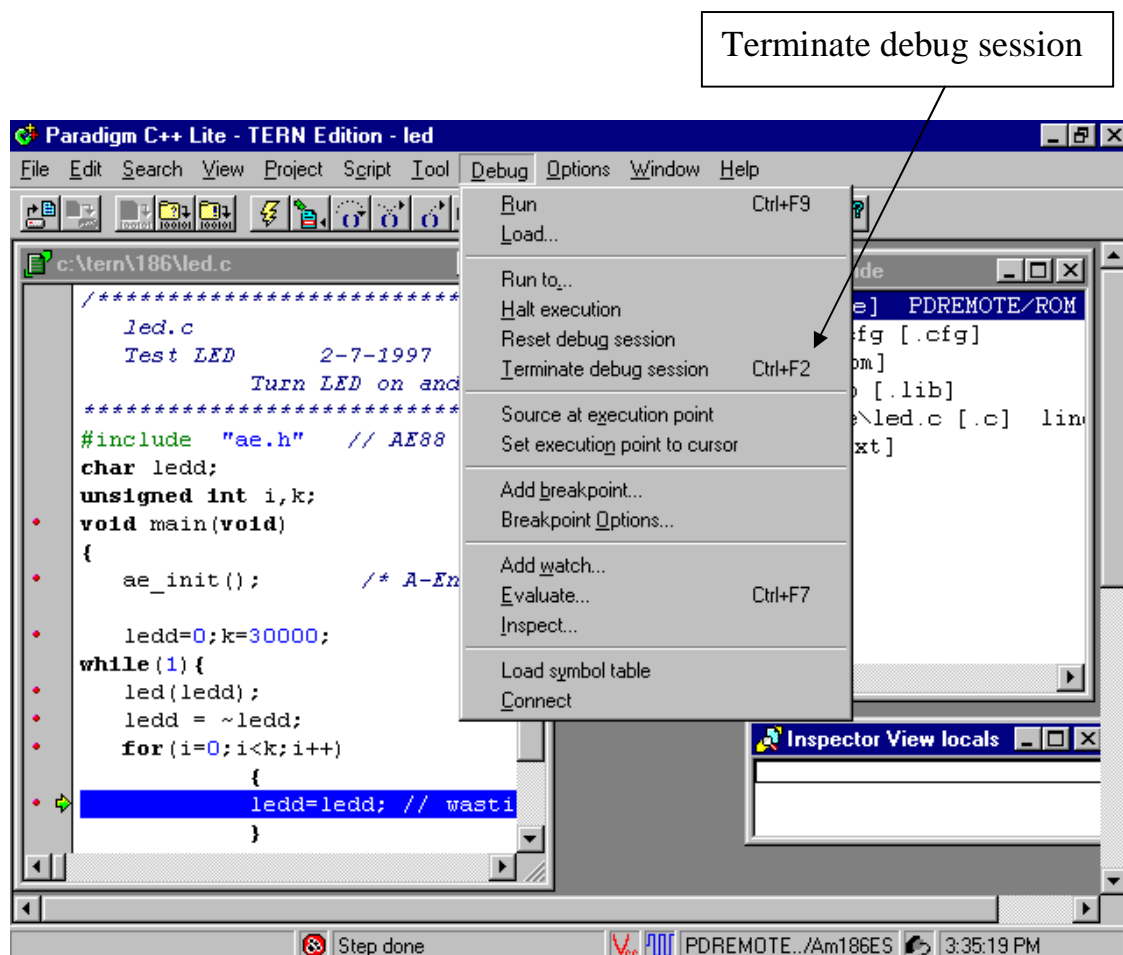
After your code is successfully downloaded, a debug window with C source code will show up with a blue highlight line at the C code main() line, indicating the code stop at that line. The bottom of the window will show “Break at led.c#9”, a Vcc and red waveform indicating that it is ready for you to debug and run.

You can use left mouse click at the “Single Step” button at the top SpeedBar, or “F8” on keyboard to single step your code. Use mouse to select “Run”, then the LED on your controller should blink. Hit the RED button to “Stop”.



### 3.2 How do I terminate the debug session ?

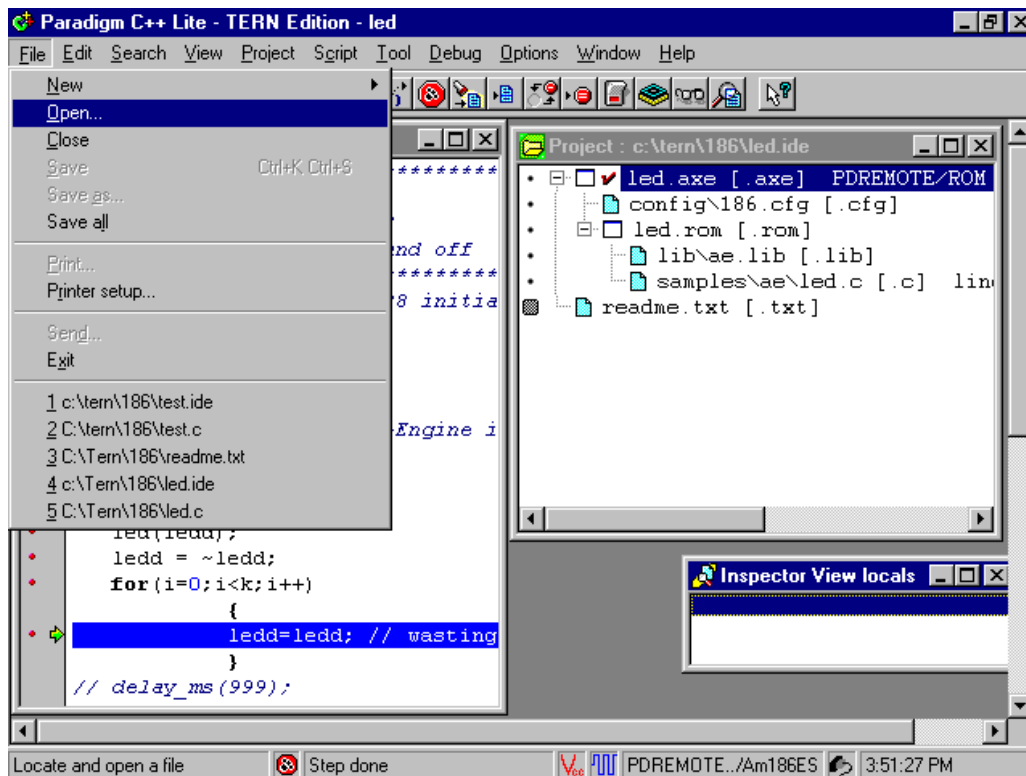
Select the top SpeedBar “Debug” menu, right click on “Terminate debug session”, or “Ctrl+F2” key. The led on your controller should blink twice then stay on indicating a RESET. Then you can stop your debug session, close the IDE.



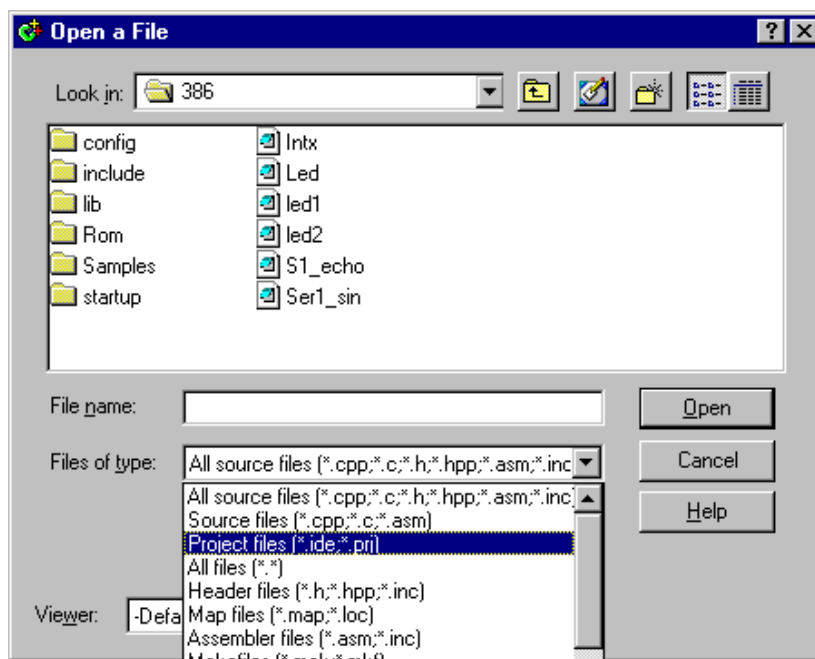
### 3.3 How do I open an existing project?

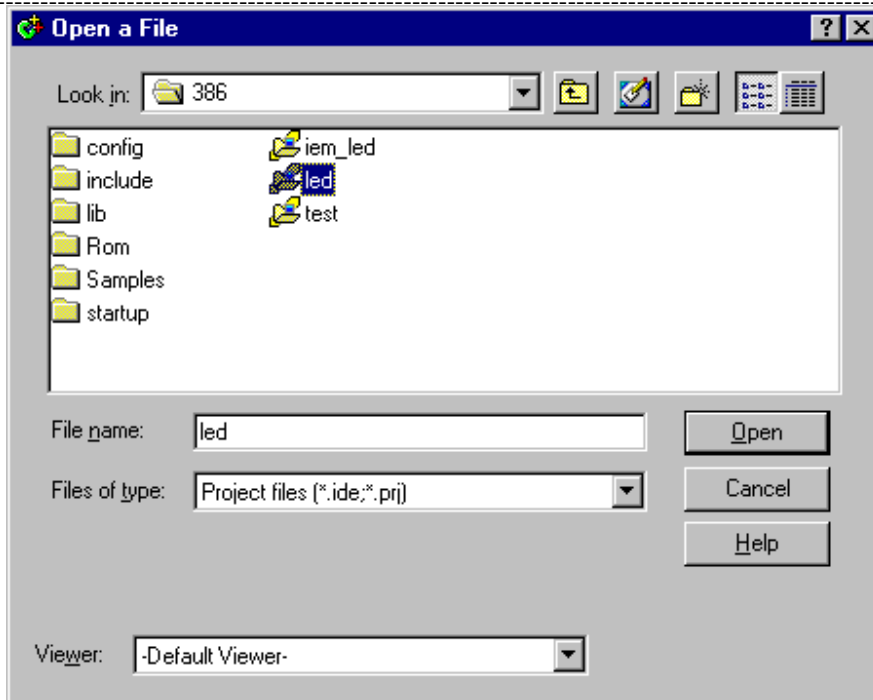
If you have an i386EX, or a V25 based controller, you cannot use the c:\tern\186\led.ide project, you need to open another project c:\tern\386\led.ide, or c:\tern\V25\led.ide.

Use i386-Engine as example. The working directory is c:\tern\386.

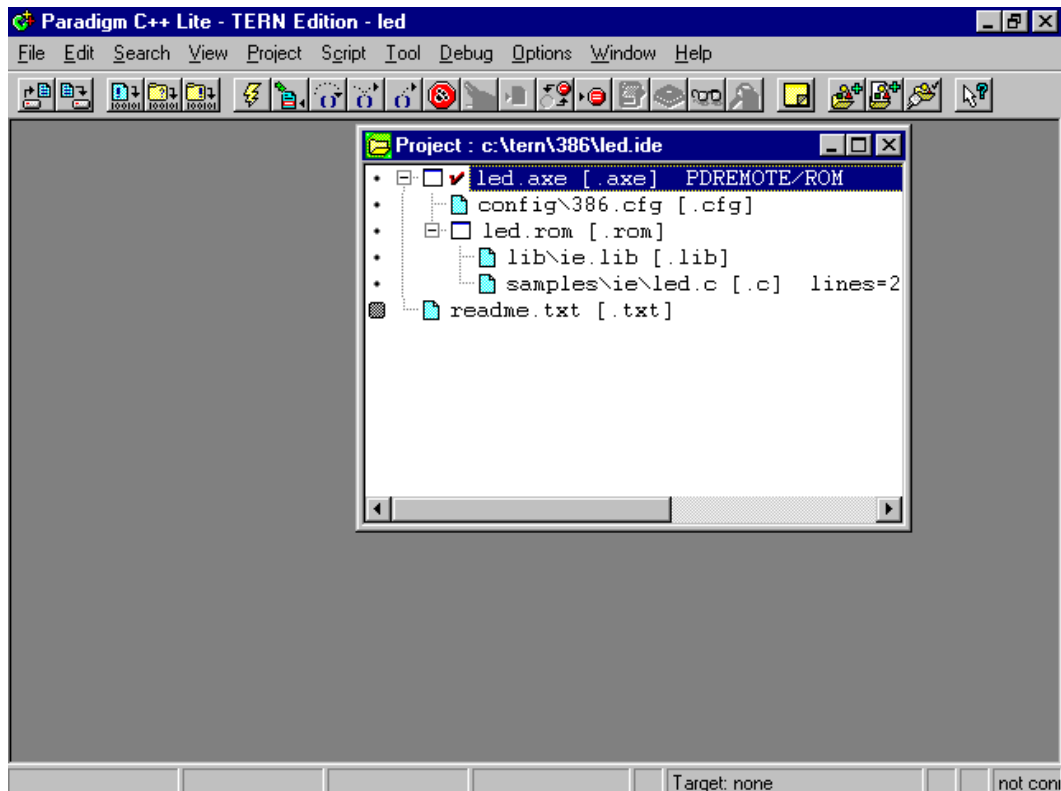


Try to open a new project file. You need to select the existing led.ide file, under c:\tern\386 directory.





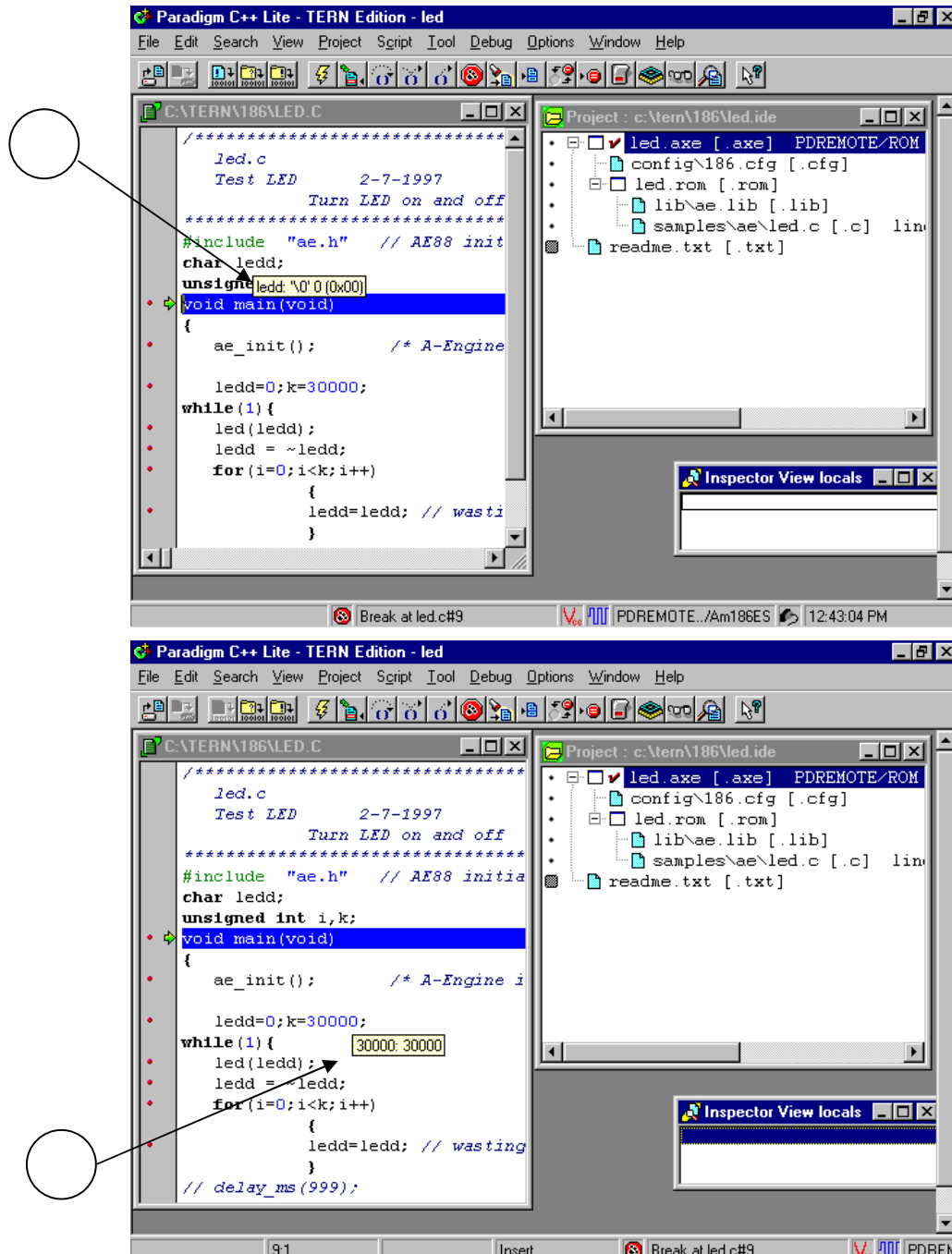
Select “Open”, then a project window for the 386 will be available.



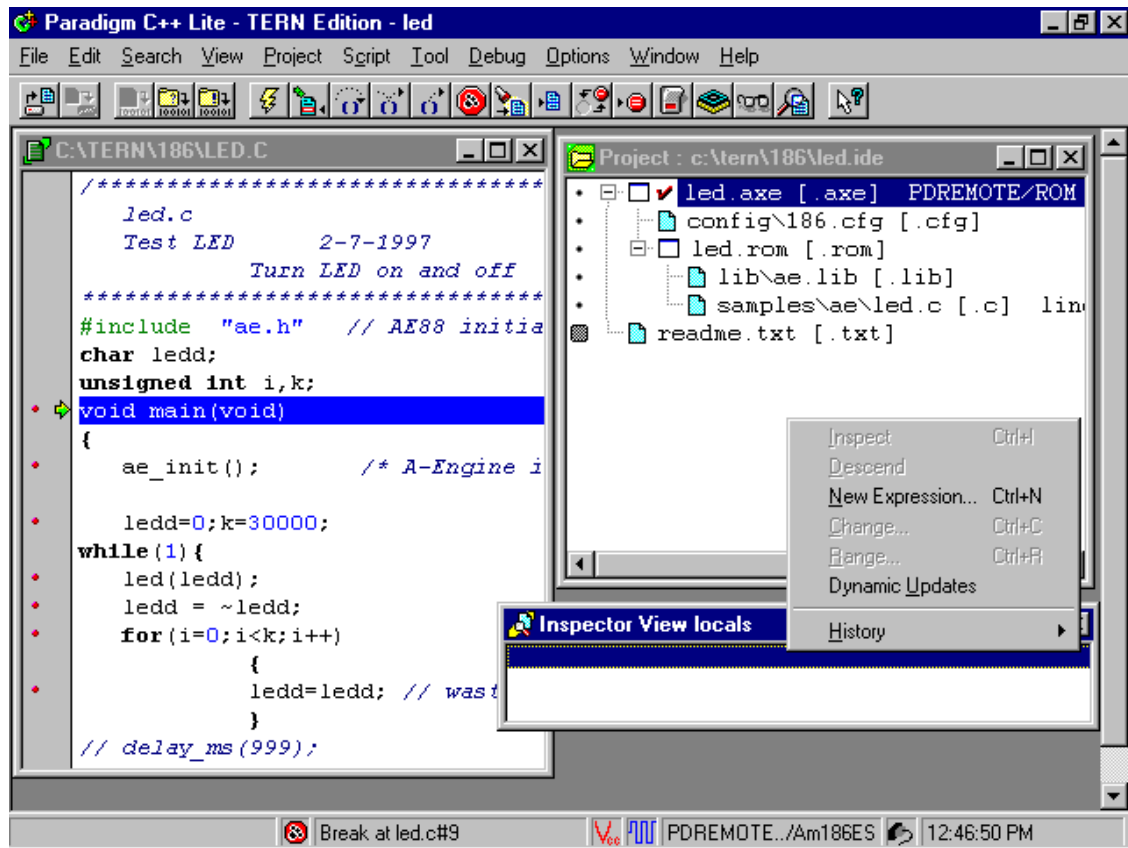


### 3.4 How do I inspect the value of a variable ?

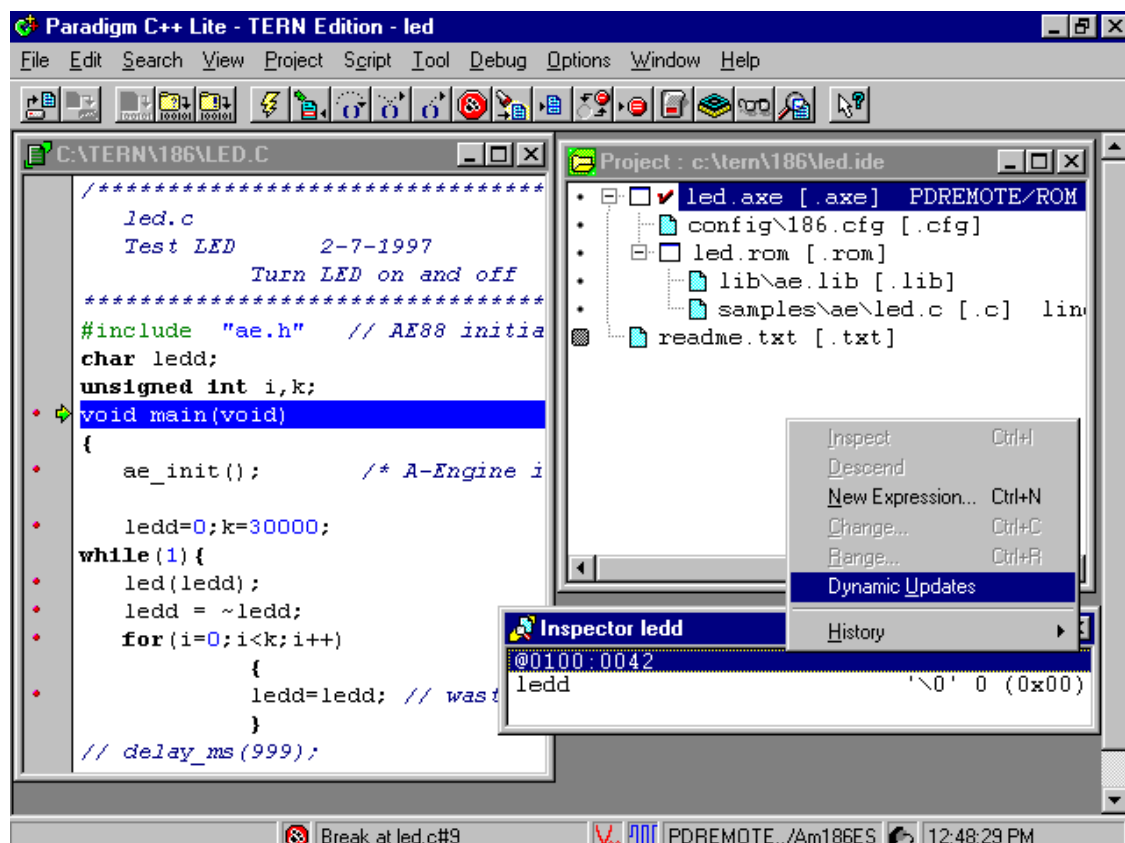
After downloading the code or during debugging, if you want to see what value of the variable “ledd” or “k”, you can simply use mouse point to the “ledd” or “k”, a report will be shown.



You can also right click in the “Inspector View” window. A menu popup show “New Expression” or “Dynamic Updates”.

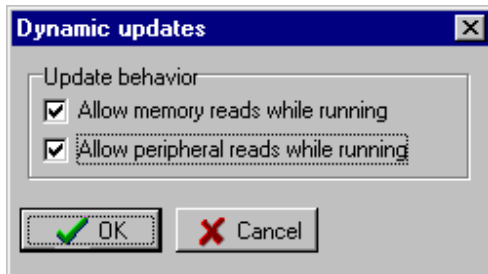


If you are interested on “ledd”, you enter the “ledd” to add it into “Inspector View” window.

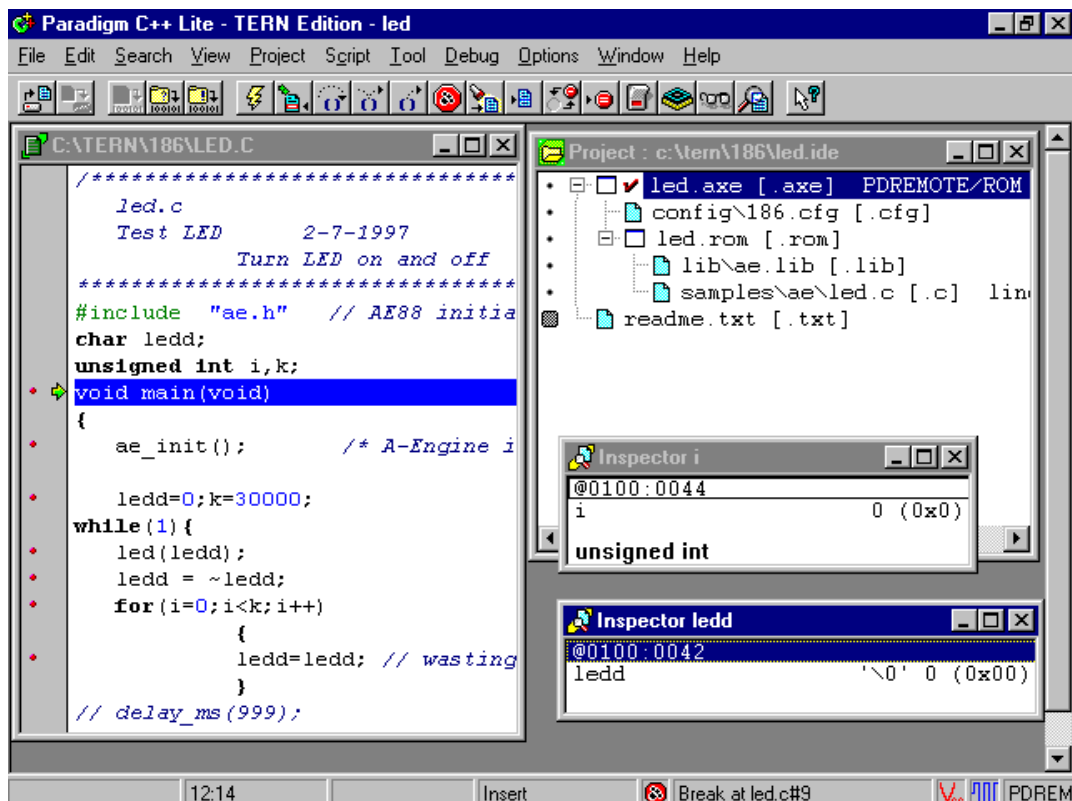


Then select “OK”.

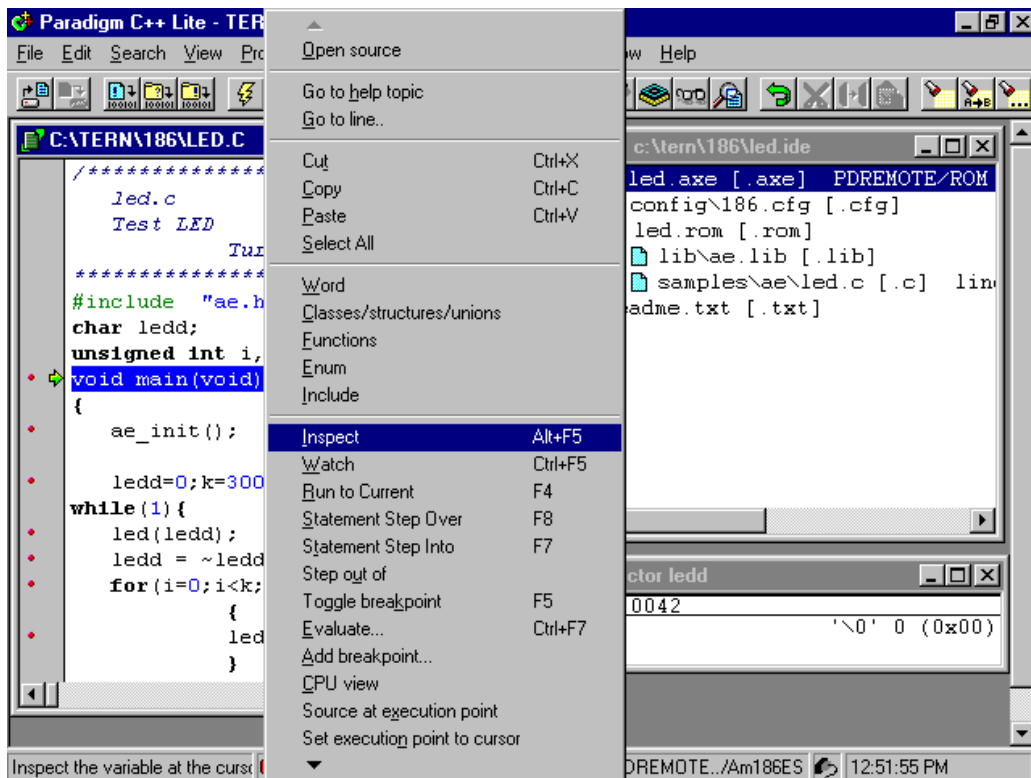
The ledd will be seen in the “Inspector” window. You may enable the “Dynamic Updates” by right clicking on the “Inspector” window; select the “Dynamic Updates”. Please be aware of the interrupt latency and communication overhead while the “Dynamic updates” enabled.



After the Dynamic updates being enabled, you can see the value change in the Inspector windows. Disable the Dynamic updates, if you want to test your own code for a real time performance.

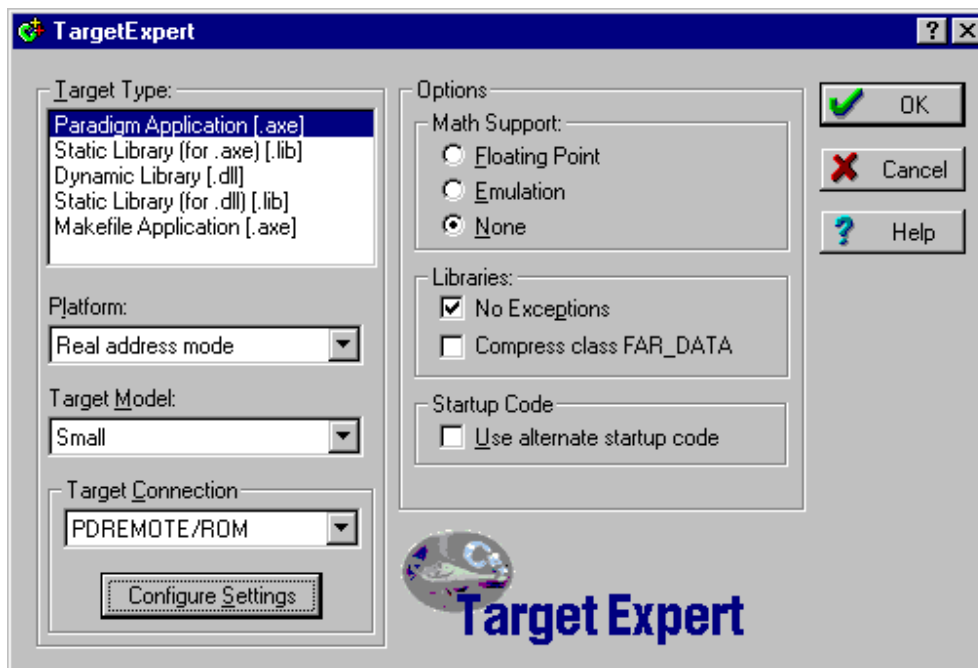


You can add more Inspect windows to see more than on variables, ledd and k.

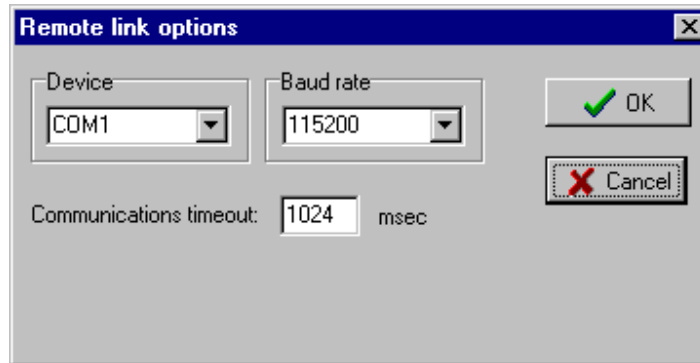


### 3.5 How do I change the debug baud rate?

In side the “project window,” right click on the `.axe` node and select the TargetExpert.

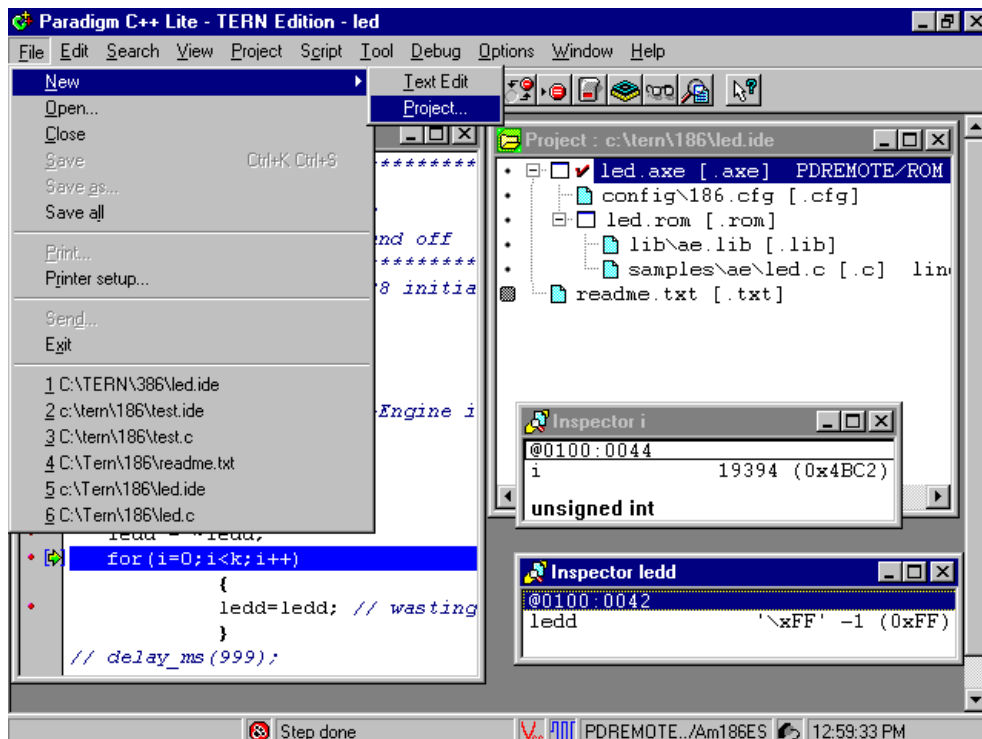


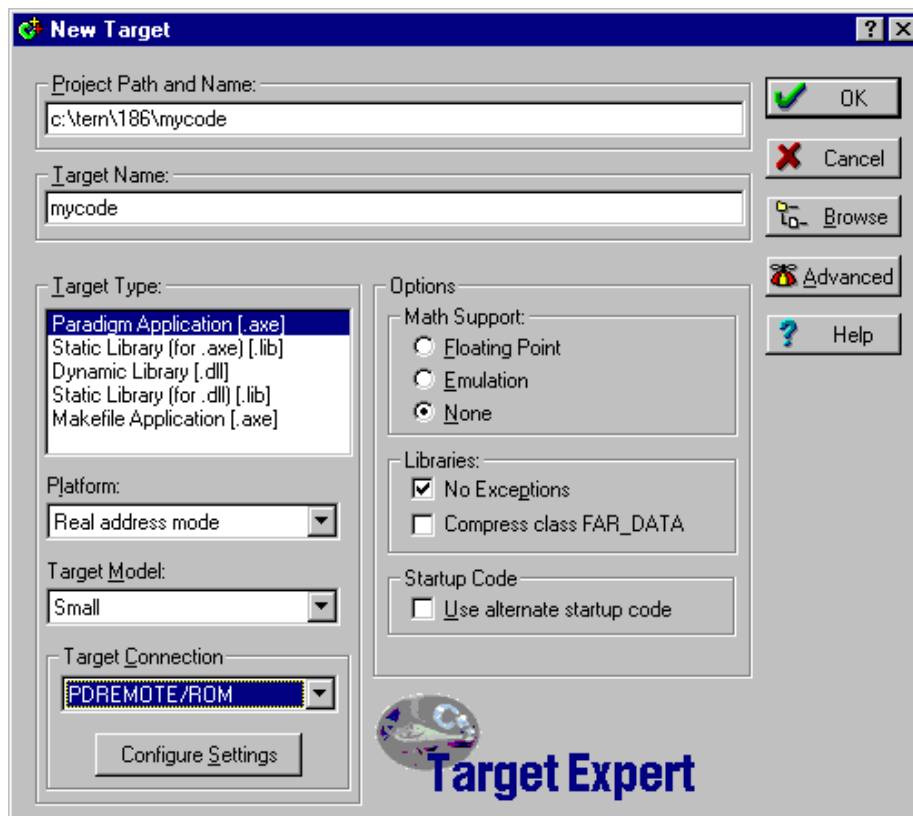
Then select the “Configure Settings”. You can select the Remote link options.



### 3.6 How do I make a new project?

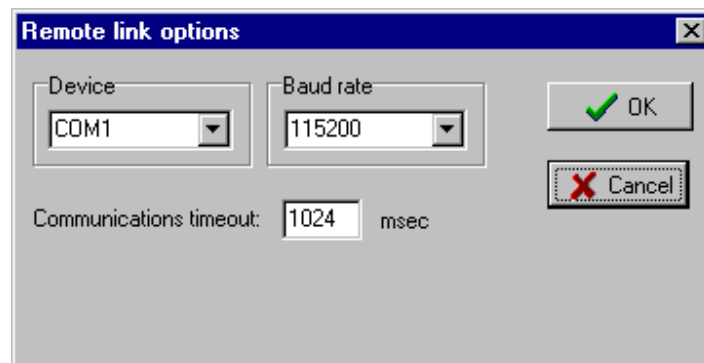
Select the “File”, then “new”, then “Project”, a “New Target” window pops up.





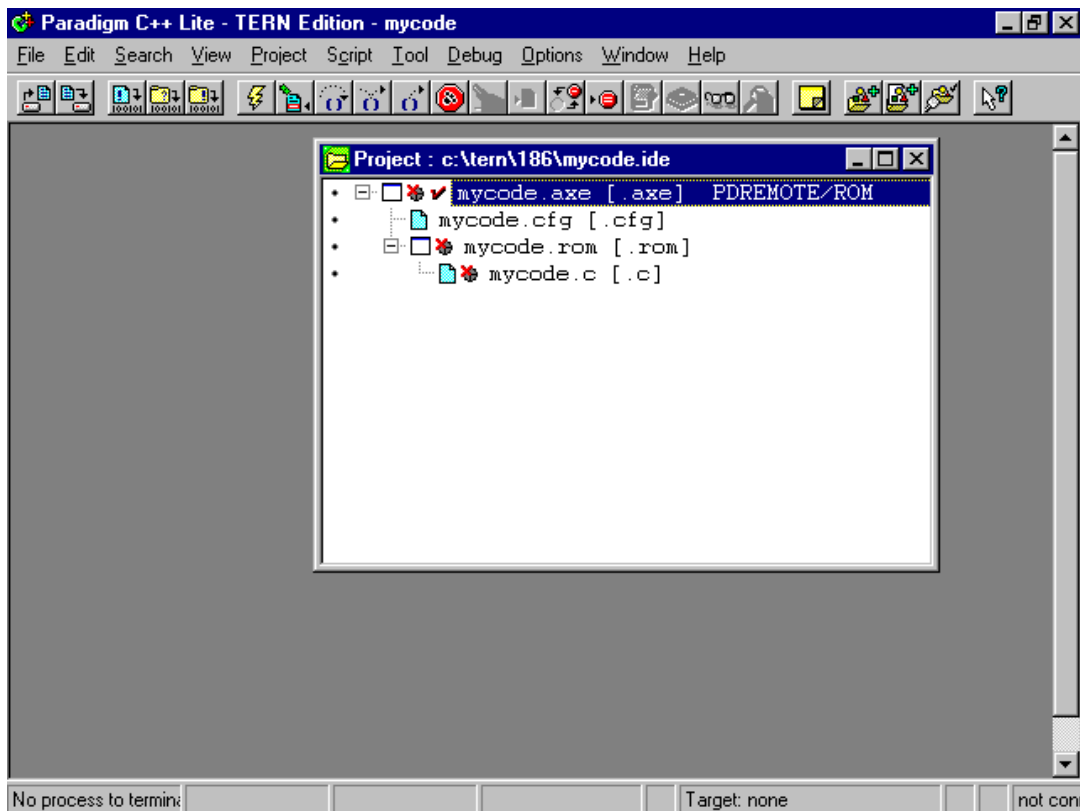
You need to setup the “Project Path and Name” to c:\tern\186\mycode, as an example for a TERN Am188 based controller and your application “mycode”.

Always make sure the Libraries: No Exceptions is **CHECKED**. You also need to define the Target Connection as PDREMOTE/ROM for debugging. If you select No Target/ROM, in order to generate a ROM file, then you have to have the full version Paradigm C++-TERN Edition, not the Lite evaluation version.



Select the Configure Settings to setup correct Remote link options.

A new project named c:\tern\186\mycode.ide is created.



### 3.7 What is a node?

In the Project window, each line can be called a “node”. The root node is always the [.axe] node, which representing the final application code ready for downloading to your controller.

The [.axe] node has two children nodes: [.cfg] and [.rom].

The generation of the [.axe] nodes depends on the [.cfg] node and the [.rom] node.

The [.cfg] node is the configuration file for mapping your code and data. The [.rom] node is the product of the application source compiled and linked by C compiler and linker.

A default configuration file is under c:\tern\186\config\186.cfg. You may use it by change the name of the “mycode.cfg”.

The mycode.rom [.rom] node has its own children. The numbers of children nodes depends on your application including all source files and necessary libraries.

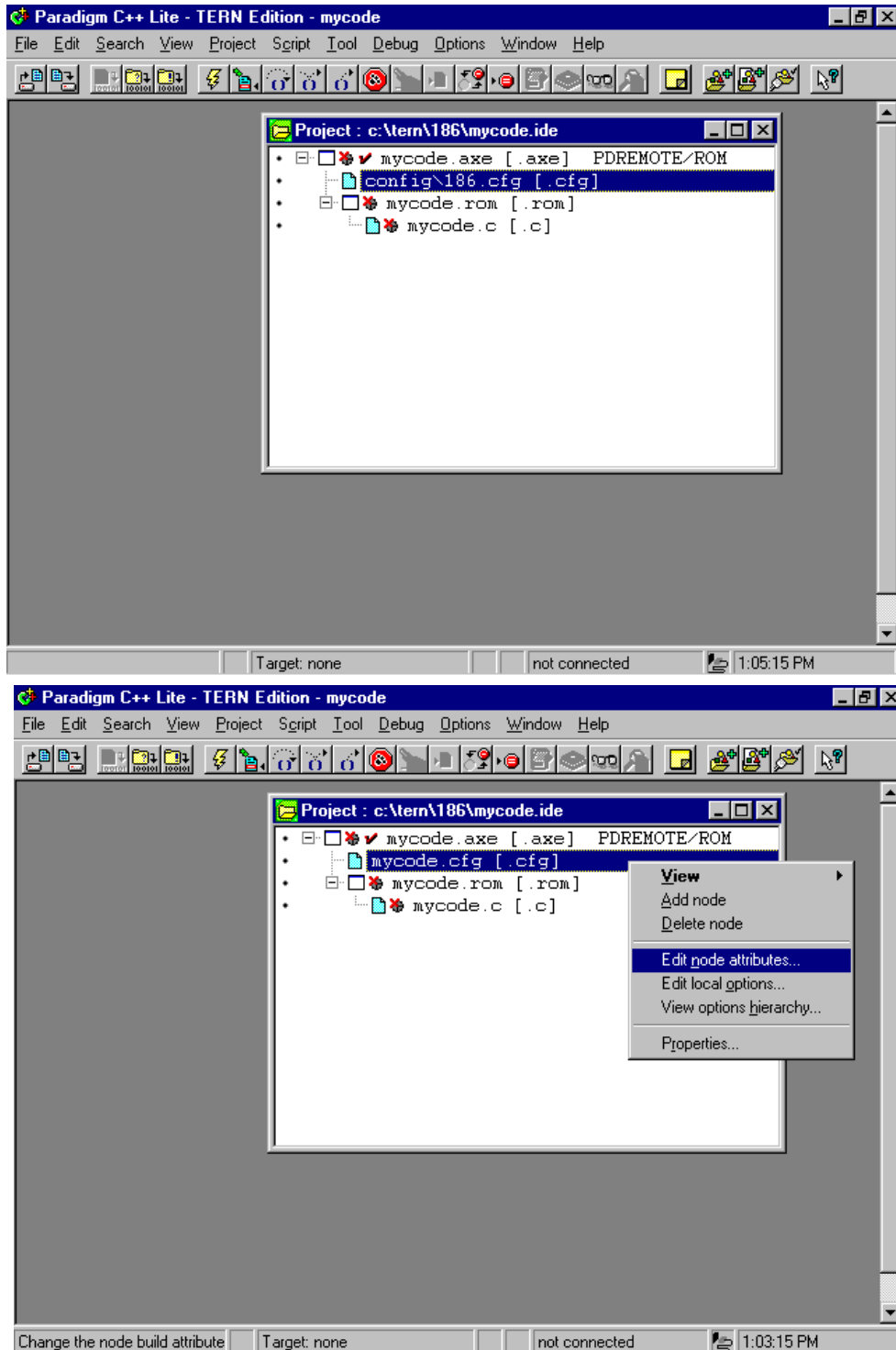
Only the source code “mycode.c” may be not enough. You may need to add a children node of “c:\tern\186\lib\ae.lib” for example.

### 3.8 How to move a node in the Project window?

Highlight the node you want to move, hold down the “Alt” key, and then use up or down arrow.

### 3.9 How to change or rename, or delete a node?

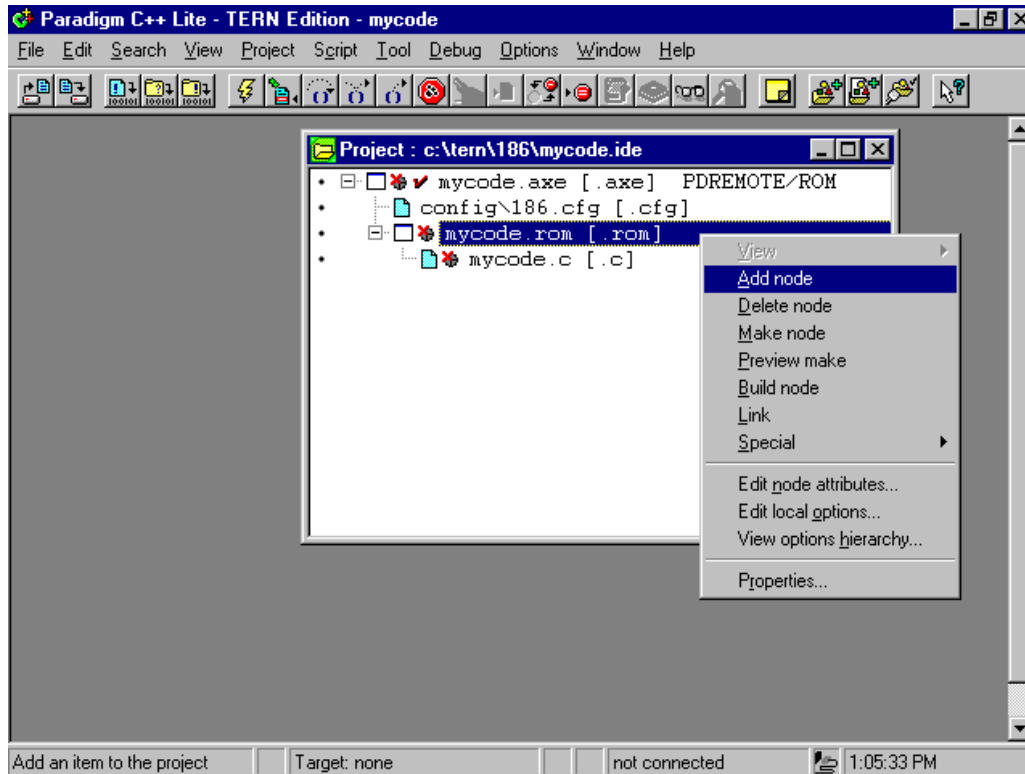
Lets try to rename the mycode.cfg node to config\186.cfg. highlight the node, right click.





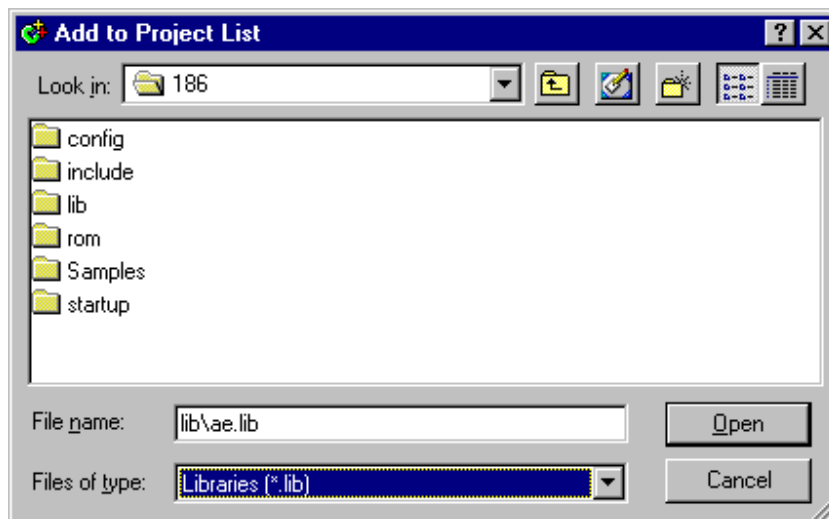
### 3.10 How do I add a node, ae.lib for example?

Select the father node of the new children node you are going to add.



For example, if you want to add a ae.lib node for the mycode.rom [.rom] node, you highlight the mycode.rom [.rom] node, then right click, then select “Add node”.

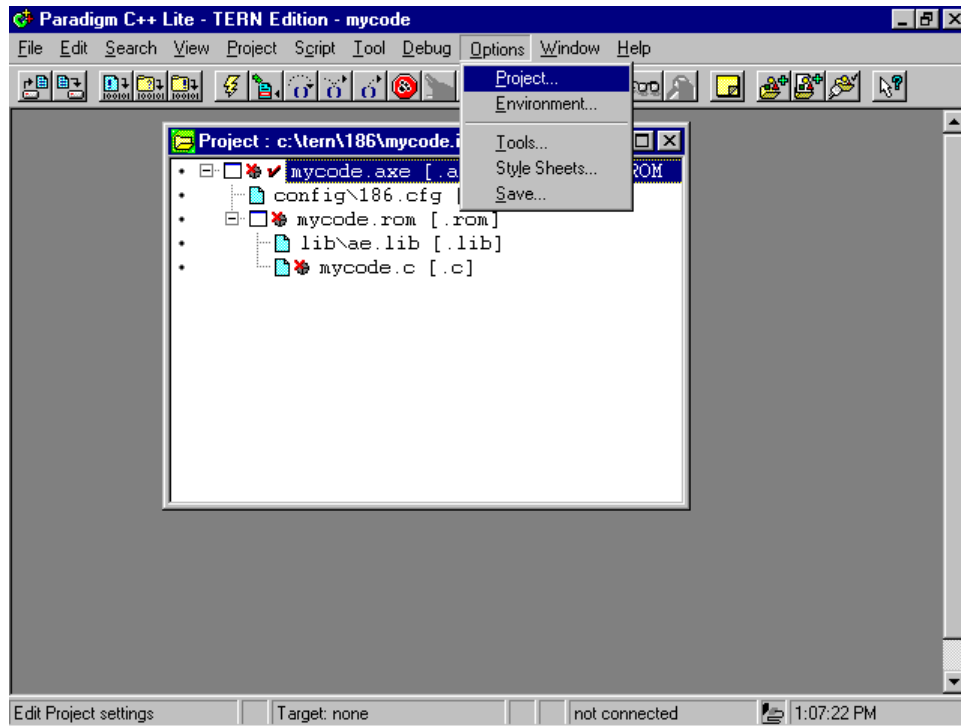
A window of “Add Project List” pops up.



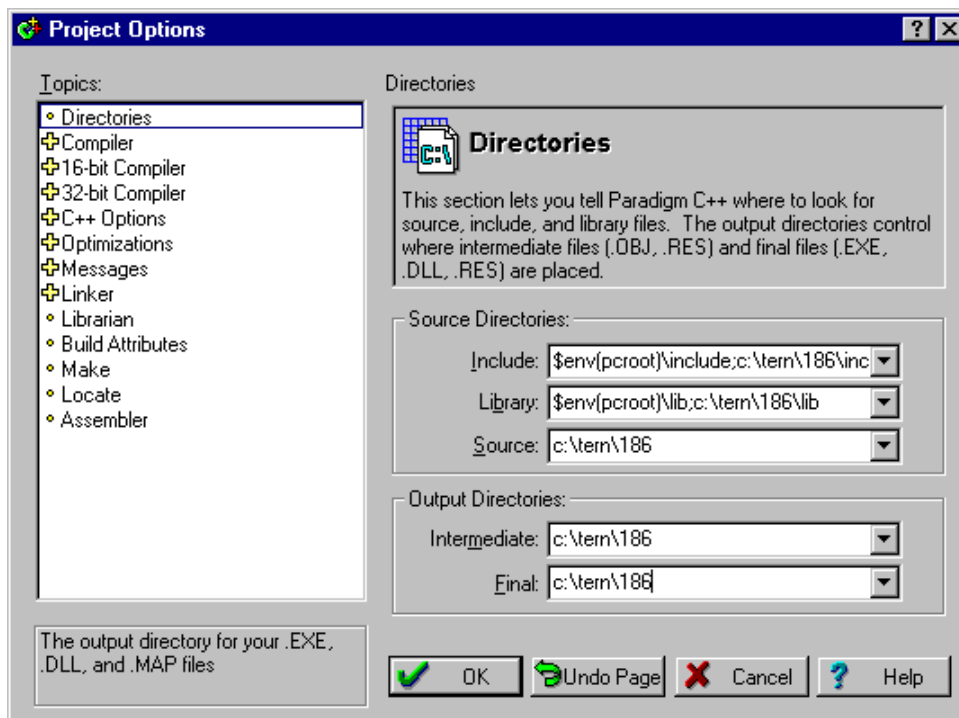
You can type in the lib\ae.lib, or use mouse to select.

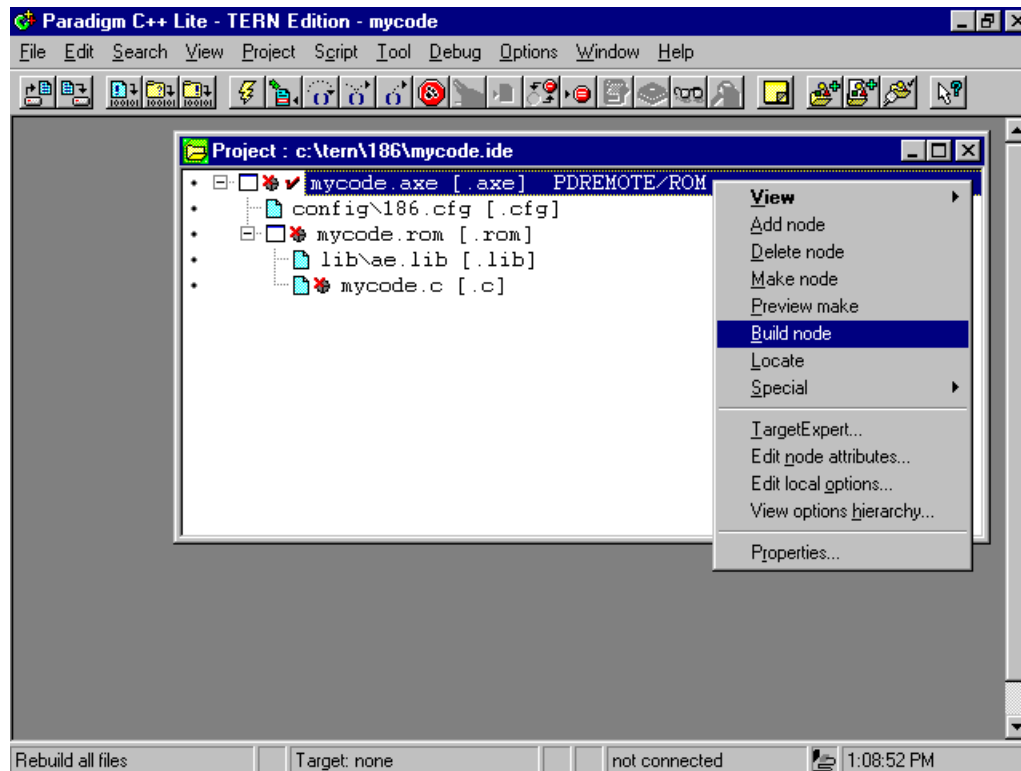
### 3.11 How do I setup the Project and Environment?

You must correctly setup your Project and Environment for your new project.



At the top line menu, select Options, then Project. A Project Options window pops up.

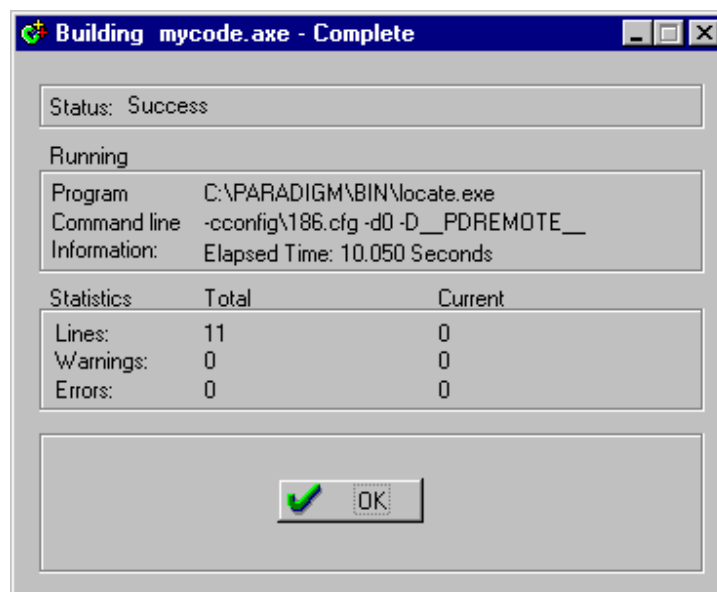




You must add the working directory to Include, Library and source, as shown above.

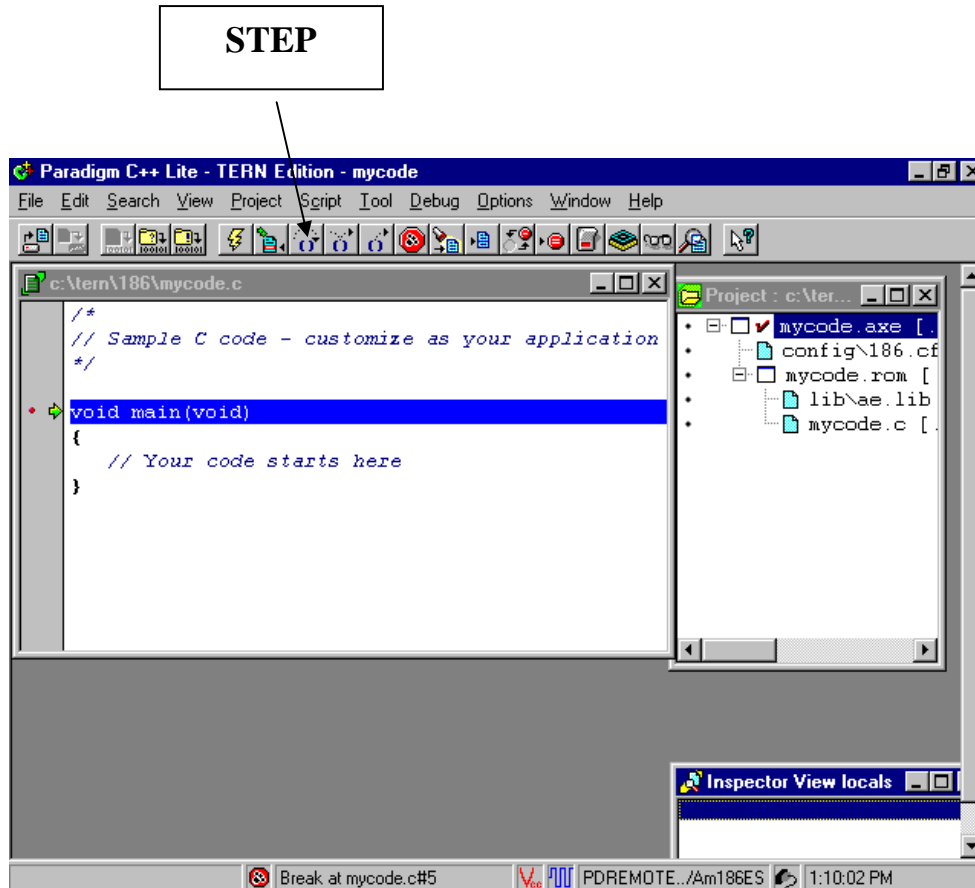
### 3.12 How do I test my project and environment setting? Build a node.

Any time, you can select the [.axe] node, then right click, select "Build node". It will compile and link all your children nodes under the [.rom] nodes. Produce [.rom] file, then locate to correct memory mappin based on the configure file in the [.cfg] node, finally generate the [.axe] file.



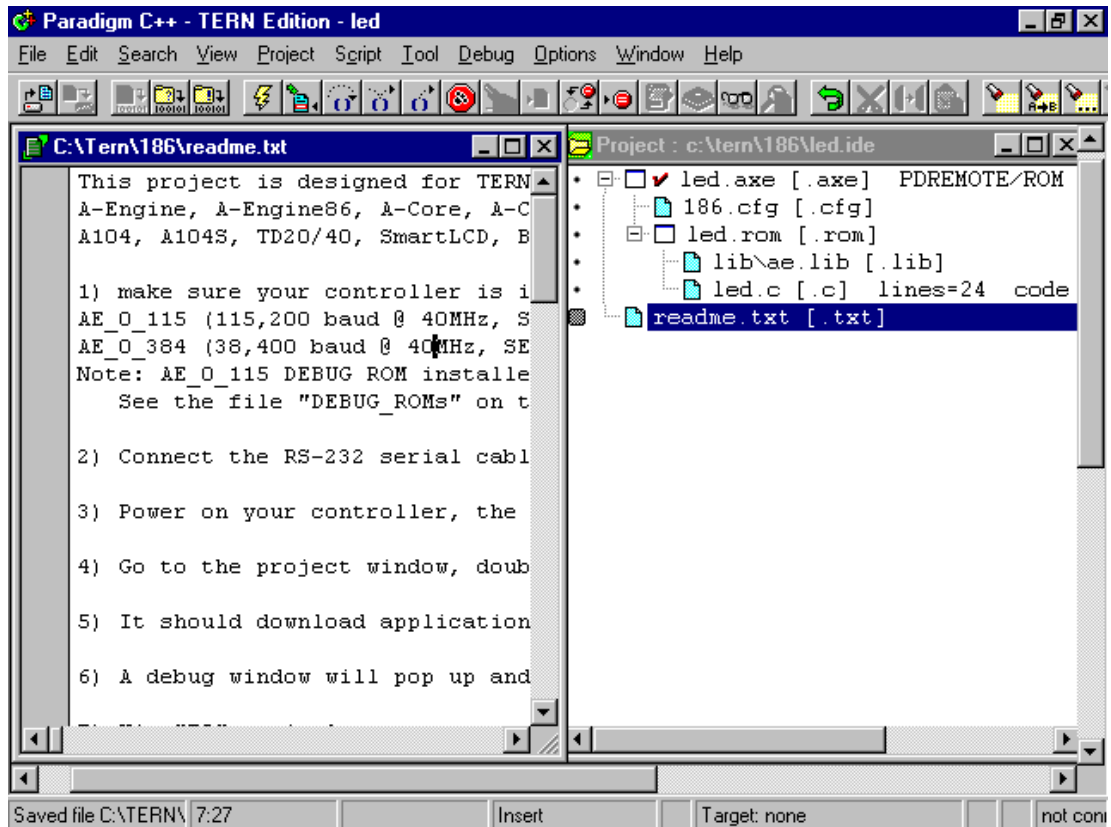
### 3.14 How do I download the new project code?

Right click on the STEP button, it will build, and download your code, ready for you to debug, and run



### 3.16 How to open a file?

Right double click on the readme.txt [.txt], it will open it for you.



## Chapter 4: Questions & Answers

### 4.1 How does the software organize on my PC?

After install the Paradigm C++-TERN Edition CD, directories are created on your PC drive C: for programming TERN embedded controllers.

TERN controllers are based on 80x86 PC compatible microprocessors, such as V25 from NEC, Am188/186 from AMD, and i386EX from Intel. Embedded hardware drivers are provided in libraries. V25 based files are under c:\tern\v25. Am186 based files are under c:\tern\186, i386EX based files are under c:\tern\386.

Core sample programs for controllers are in sub-directories:  
c:\tern\186\samples\ae for Am188/186, c:\tern\386\samples\ie, and c:\tern\v25\samples\ve.

After the installation of the CD, the directory C:\TERN and sub-directories are created.

```
C:\TERN\V25 ----- working directory for V25 based controllers
C:\TERN\V25\SAMPLES\ ---- sample programs
C:\TERN\V25\CONFIG\ ---- configuration files
C:\TERN\V25\INCLUDE\ ---- Header files
C:\TERN\V25\LIB\ ----- Libraries for V25 boards

C:\TERN\186 ----- working directory for Am188/6 based controllers
C:\TERN\186\SAMPLES\ ---- sample programs
C:\TERN\186\CONFIG\ ---- configuration files
C:\TERN\186\INCLUDE\ ---- Header files
C:\TERN\186\LIB\ ----- Libraries for 186 boards

C:\TERN\386 ----- working directory for i386EX based controllers
C:\TERN\386\SAMPLES\ ---- sample programs
C:\TERN\386\CONFIG\ ---- configuration files
C:\TERN\386\INCLUDE\ ---- Header files
C:\TERN\386\LIB\ ----- Libraries for 386 boards

C:\Paradigm\ ----- Paradigm C++-TERN Edition files.
```

### 4.2 Where is the initial working directory?

If you are using V25 based controllers, your working directory is c:\tern\v25.

If you are using 186 based controllers, your working directory is c:\tern\186.

If you are using 386 based controllers, your working directory is c:\tern\386.

### 4.3 What is the Project file?

A project file is an intelligent program manager that does all the work necessary to keep your program up-to-date. It reads a special "makefile" designed for managing whole compile, link, debug and locate operation.

The project file uses .ide.

### 4.4 Controller Memory mapping

There is 1 MB memory space for 16-bit controllers. TERN controllers map lower 512KB (0x00000-0x7ffff) to the RAM socket, and map upper 512KB into ROM socket.

In order to correctly download a program in STEP1 via PC RS232 serial link, the controller must meet these requirements:

1). DEBUG EPROM “AE\_0\_115” for A-Engine, SER0 debug at 115,200 installed in ROM socket.  
See attached DEBUG ROM list

2). SRAM installed must be large enough to hold your program.  
For a 32K SRAM, the physical address is 0x00000-0x07fff  
For a 128K SRAM, the physical address is 0x00000-0x01ffff  
For a 512K SRAM, the physical address is 0x00000-0x07ffff

3). Your program must be located at a correct starting address to match your SRAM size.  
For example, if you have a 32K SRAM, which maps into 0-0x07fff. Even for a 10K program, if you locate the code into a starting address of 0x08000, it cannot be downloaded nor run because there is no RAM.

4). Your program is located by configure file,  
c:\tern\186\config\186.cfg, or  
c:\tern\v25\config\v25.cfg, or  
c:\tern\386\config\386.cfg.

5). In the “186.cfg” file, you will see these lines:

```
map 0x00000 to 0x00fff as reserved // interrupt vector table
map 0x01000 to 0x07fff as rdwr // System RAM area(32 K)
map 0x08000 to 0x1ffff as ronly // Simulated ROM area(96K)
map 0x20000 to 0xffff as reserved // No access
dup DATA ROMDATA // Make a copy of initialized data
class CODE = 0x0800 // Assume loading at address 08000H
class DATA = 0x0100 // Data at address 01000H
```

The bolded 0x8000 indicates your code will be located at a start address of 0x0800:0000.

6). It is very important to know, what size SRAM you have, where is your effective SRAM address, and where you located your program while you are using the “186.cfg” file.

If you have a only 32K SRAM (0-0x7fff), you may modify the “186.cfg” file to select RAM=32.

```
map 0x00000 to 0x00fff as reserved // interrupt vector table
map 0x01000 to 0x03fff as rdwr // System RAM area(16 K)
map 0x04000 to 0x07fff as ronly // Simulated ROM area(16K)
map 0x08000 to 0xffff as reserved // No access
dup DATA ROMDATA // Make a copy of initialized data
class CODE = 0x0400 // Assume loading at address 04000H
class DATA = 0x0100 // Data at address 01000H
```

The bolded 0x4000 indicates your code will be located at a start address of 0x0400:0000.

7). In order to run STEP2 stand alone mode, you must know where your code are located during STEP1 downloading. You must correctly set the STEP2 jumping address in your serial EEPROM (EE address 0x10 to 0x13). You may run the “step2.c” program to setup your EE jumping address. You only need to run the “step2.c” once. Please see “step2.c” in c:\tern\186\samples\ae directory.

## 4.5 DEBUG baud rates

Paradigm C++-TERN Edition supports one of the debug Baud Rate: 19,200, or 38,400, or 57,600, or 115,200.

The DEBUG ROM installed determines the DEBUG Baud Rate.

For example: DEBUG ROM labeled “AE\_0\_115” installed on a 40 MHz A-Engine, the debug baud rate is 115,200. The same debug rom installed on a 20 MHz A-Engine, the baud rate is 57,600.

## 4.6 What are differences between the Lite version and full version?

The Lite version supports STEP1 and STEP2 only, not STEP3.

In addition to all the Lite version features, the full version provides support that you will need to generate your own application ROM, STEP3.

## 4.7 What is ACTR/ACTF™?

*Operating TERN's 16-bit controllers with ACTR/ACTF™*

With ACTR™/ ACTF™ firmware support, you only need a terminal, such as PC windows terminal, set up to 19200, 8, N, 1, via serial link. By typing text commands, you can operate the controller and exercise C functions immediately. The ACTR/ACTF™ provides an interactive menu and on-line help for you, so you do not have to dig into manuals. ACTR/ACTF™ not only provides you easy access to C functions, but also allows you to download a remote debugger kernel for your C/C++ program development.

ACTR™ is in a 64K EPROM. ACTF™ is a FLASH version of ACTR™. You may use DV kit to generate your application HEX file and download the file into the on-board Flash with ACTF™.

ACTF™ can be used in your final OEM product. As long as the jumper is on every time the power is on or reset, the controller always runs your program. You may download several application programs in different memory locations, remove the jumper, use ACTF™ “Gxxxxx” commands to set up a new CS:IP, and when the jumper is restored, it will run that program at power on or reset

## 4.8 Where is the technical manual?

Complete sets of Technical Manuals, photos, schematics, and help manuals are in the Paradigm C++-TERN Edition CD. You may use Windows Explore to copy, use Adobe Reader to read and print.

## 4.9 What is the .MAP file and the .LOC file?

After you “Build node” on the .axe [.axe] node, or run the code on the controller it will generate a .map file and a .loc file, in your working directory, c:\tern\186.

The led.map file, as below, will list generated code and data locations.

Start	Stop	Length	Name	Class
00000H	0187DH	0187EH	_TEXT	CODE
01880H	01897H	00018H	_INIT_	INITDATA
01898H	01898H	00000H	_INITEND_	INITDATA
01898H	01898H	00000H	_EXIT_	EXITDATA
01898H	018A7H	00010H	_EXITEND_	EXITDATA
018B0H	018B0H	00000H	_RD	ROMDATA
018B0H	018BFH	00010H	_ERD	ENDROMDATA
018C0H	01A43H	00184H	_DATA	DATA
01A44H	01A44H	00000H	_CVTSEG	DATA
01A44H	01A44H	00000H	_SCNSEG	DATA
01A44H	01CA1H	0025EH	_BSS	BSS
01CA2H	01CA3H	00002H	_BSEND	BSEND



---

```

01CB0H 02CAFH 01000H _STACK          STACK
02CB0H 02CB0H 00000H _BFD           FAR_DATA
02CB0H 02CBFH 00010H _EFD           ENDFAR_DATA
02CC0H 02CC0H 00000H _BRFD          ROMFARDATA
02CC0H 02CCFH 00010H _ERFD          ENDROMFARDATA

```

Program entry point at 0000:0000

The led.loc file, as below, will list generated code and data locations, which is the memory location on the target controller.

Memory Address Map for Program LED

Start	Stop	Length	Segment	Class
001000H	001183H	00184H	_DATA	DATA
001184H	001184H	00000H	_CVTSEG	DATA
001184H	001184H	00000H	_SCNSEG	DATA
001184H	0013E1H	0025EH	_BSS	BSS
0013E2H	0013E3H	00002H	_BSEND	BSEND
0013F0H	0023EFH	01000H	_STACK	STACK
0023F0H	0023F0H	00000H	_BFD	FAR_DATA
0023F0H	0023FFH	00010H	_EFD	ENDFAR_DATA
008000H	00987DH	0187EH	_TEXT	CODE
009880H	009897H	00018H	_INIT_	INITDATA
009898H	009898H	00000H	_INITEND_	INITDATA
009898H	009898H	00000H	_EXIT_	EXITDATA
009898H	0098A7H	00010H	_EXITEND_	EXITDATA
0098B0H	0098B0H	00000H	_RD	ROMDATA
0098B0H	009A33H	00184H	_DATA	ROMDATA
009A34H	009A34H	00000H	_CVTSEG	ROMDATA
009A34H	009A34H	00000H	_SCNSEG	ROMDATA
009A40H	009A4FH	00010H	_ERD	ENDROMDATA
009A50H	009A50H	00000H	_BFD	ROMFARDATA
009A50H	009A50H	00000H	_BRFD	ROMFARDATA
009A50H	009A5FH	00010H	_ERFD	ENDROMFARDATA

```

Entry point: 0800:0000
Initial stack: 013F:1000

```

## 4.10 EPROM and FLASH support.

Your final firmware can be program into a EPROM, such 27C256-70 (32K) or 27C512-70 (64K), with your EPROM programmer.

You can also use ACTF kit to generate a downloadable .HEX file, and install an FLASH ACTF chip in the ROM socket. With a terminal serial link at 19,200, you can download your code and program the Flash on-board.

## 4.11 DEBUG ROM List is on your CD, under tern\_docs.

## 4.12 How to access 1 MB memory

Most application has been using Small Model to program TERN controllers. The Small Model code is smaller, more efficient, more reliable, and faster, but it is limited in 64K code and data. Many users developed successfully data acquisition type product with Small Model and collecting more than 64K data. The V25 or 80x86 processor supports memory access by simply using

pokeb (segment, offset, dat); and peekb (segment, offset).

Please refer to the .LOC file listed in Chapter 4, After you use “m.bat” batch file, a .LOC file will be generated. It will show where and how many bytes that your C CODE and DATA will use. Suppose, your complete C stuff only use upto 0xffff, but your SRAM is 128K, mapping in 0x0000 to 0x1ffff. So you have memory space from 0x10000 to 0x1ffff of a total 64K space, which are free, battery backed, very save for you to store your data.

You may use pokeb(0x1000, unsigned int offset, unsigned char data); to store your data and increment offset, and use peekb(0x1000, unsigned int offset); to read data back in the future.