Hitex HiTOP Emulator

Abstract

This document describes tips and hints for using the Hitex HiTOP emulator as target system. Individual settings for specific compilers are also described. This document covers both the old HiTOP version 4 as well as HiTOP5.

***Please note**: The following changes were introduced with HiTOP 5.31 which resulted in changed settings within Tessy. Older versions of HiTOP5 will require changing at least the loader name attribute.*

- The HiTOP5 loader name has been changed within HiTOP5 version 5.31 and later. You will need to change the default "Loader Name" entry within TEE, if you are running an older HiTOP5 version.

- HiTOP 5.31 and later requires a HiTOP project to be open. It is not sufficient to connect to the target system.

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HiTOP

HiTOP needs to be started prior to test execution. Tessy will then connect to a running instance of HiTOP. Please make sure that HiTOP is open and connected to the target hardware (if not running with the simulator).

Prepare and load a HiTOP project

With HiTOP 5.31 and later, it is mandatory to create **and** save a HiTOP project and to have this project open before executing tests with Tessy.

***Please note**: If HiTOP is only started and connect to the target hardware (or simulator) but no project is open, the test execution will fail*

Loader Name within HiTOP5

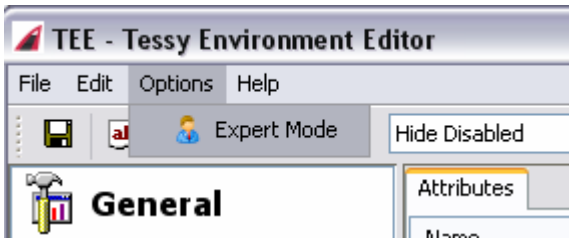
Within HiTOP5 version 5.31 and later, the name of the loader for GNU Arm/Cortex binaries have been changed. The Tessy configuration already contains the new loader name, but if you are running an older version of HiTOP, you will need to adapt the respective attribute within the Tessy Environment Editor (TEE). The following loader names are valid for the respective HiTOP versions and Controller:

HiTOP5 Version	Loader Name	Controller
< 5.31	GnuCED	Arm/Cortex
>= 5.31	GnuCED_A	Arm
>= 5.31	GnuCED_C	Cortex

Start TEE and enable the Expert Mode

Start the TEE from within Tessy using the **Edit Environment …** entry from the **Options** menu. This will start TEE either with the default configuration or with the respective configuration selected for your project database.

You need to switch to expert mode using the **Expert Mode** entry from the **Options** menu. This will show more attributes that are normally hidden. Please be careful when changing those attributes because this may damage your Tessy installation.



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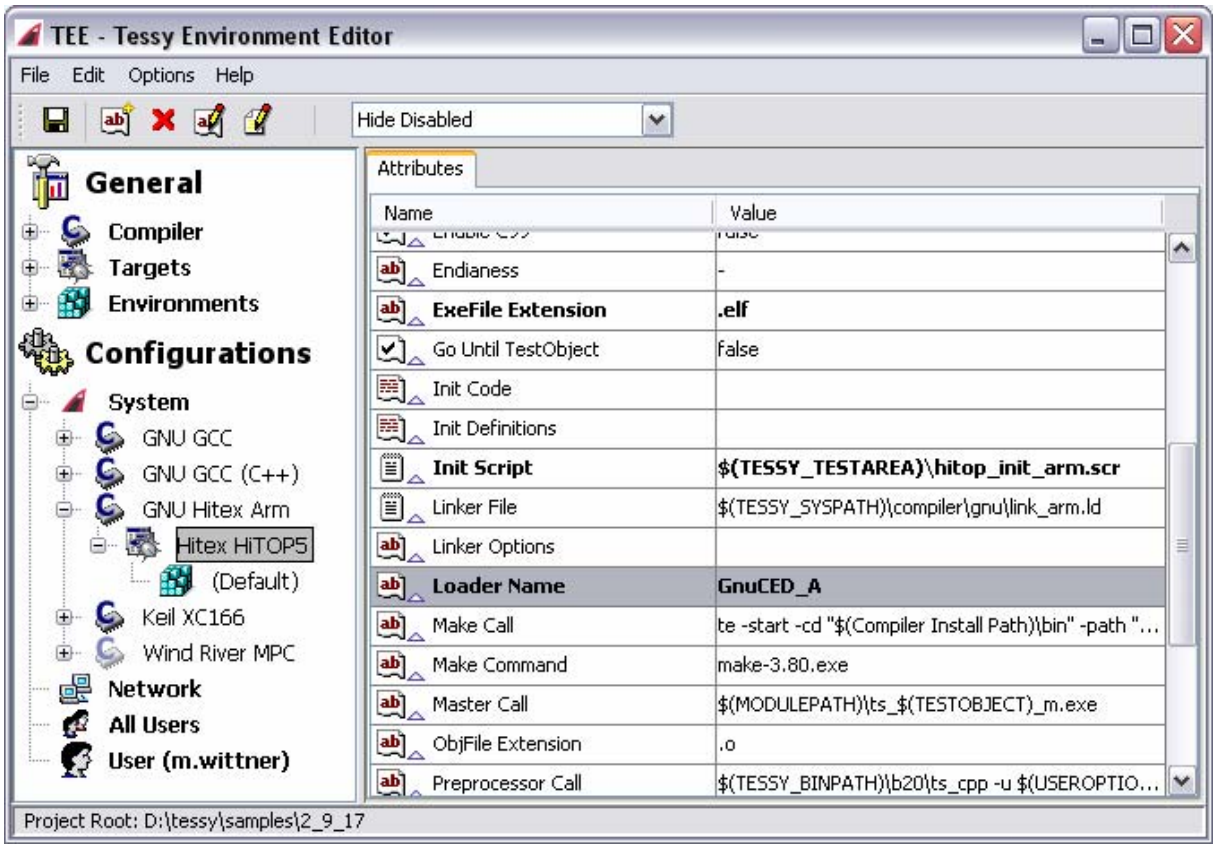
Review the Loader Name Setting

The attribute **Loader Name** may need to be changed according to the table above.



Communication between Tessy and HiTOP

Initial communication fails

Normally, Tessy assumes that HiTOP is already started and configured. However, Tessy is also able to start HiTOP automatically (see below). An initial communication failure is indicated in Tessy's Message window as follows:

```
+-----------------------------+
| Execute test                |
+-----------------------------+

[tslowm:hitop connect] unable to connect, rci error code 0
[tstcomm open] Error connecting to slave
Error establishing communication. Errorcode: -1
Error starting Master.
Errorcode 255
```

Reason:

- HiTOP is not started (and **Slave Call** is empty (see below)).

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Remedy:

- Start HiTOP before testing with Tessy.

HiTOP is started, but communication still fails

Check, if HiTOP's INI-file contains an entry like

```
[HiSCRIPT Remote]
Activate=1
Port=4215
DebugLevel=0
```

Also, the DLL **h32hsrem.dll** must be accessible by HiTOP. Check in HiTOP File> Info Details:

```
HiTOP remote control DLL loaded.
   DLL name        : H32HSREM.DLL
   DLL version     : V 1.1.1.0 (1.1.1.0)
Connection is NOT active.
```

The DLL with version V2.0.0.1 and V2.0.1.1 is known to work **not** correct. V1.1.1.0 is o.k. Contact the Hitex Technical Support to get a correct DLL.

Automatic HiTOP Start

Normally, Tessy assumes that HiTOP is already started and configured. However, Tessy is able to start HiTOP automatically. To achieve this, you have to edit the **Slave Call** entry within the Tessy **Environment Editor** like shown below. The command line to call HiTOP would be like follows (i.e. HiTOP for C166, all within one text line):

```
$(ProgramFiles)\Hitex\DProbe167\Hfw_166b.exe -y0 -i
-d"$(ProgramFiles)\Hitex\DProbe167\C167\C167.ddc"
-u"$(ProgramFiles)\Hitex\DProbe167\C167\C167.sfr"
```

By default, the **Slave Call** entry is empty for target HiTOP. You may add the above command line to start HiTOP from within Tessy.

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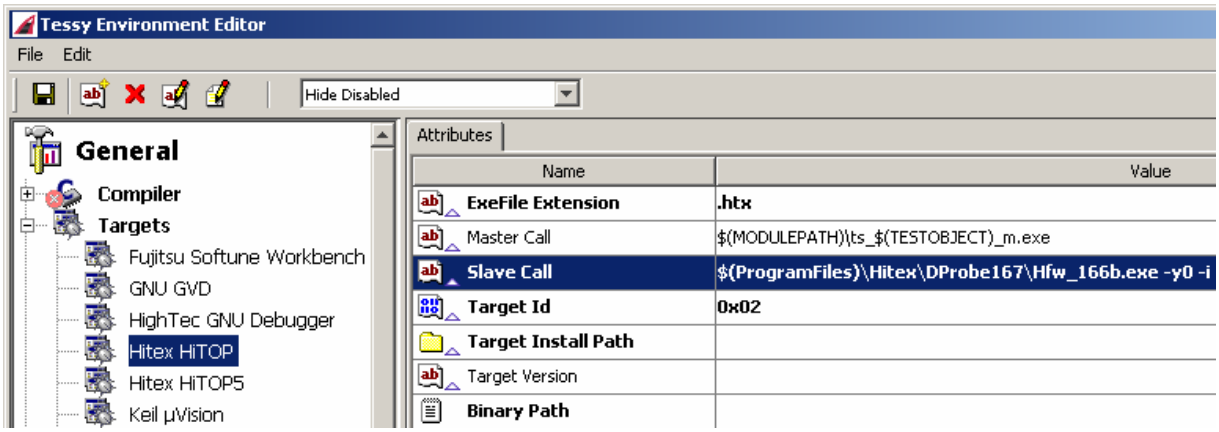
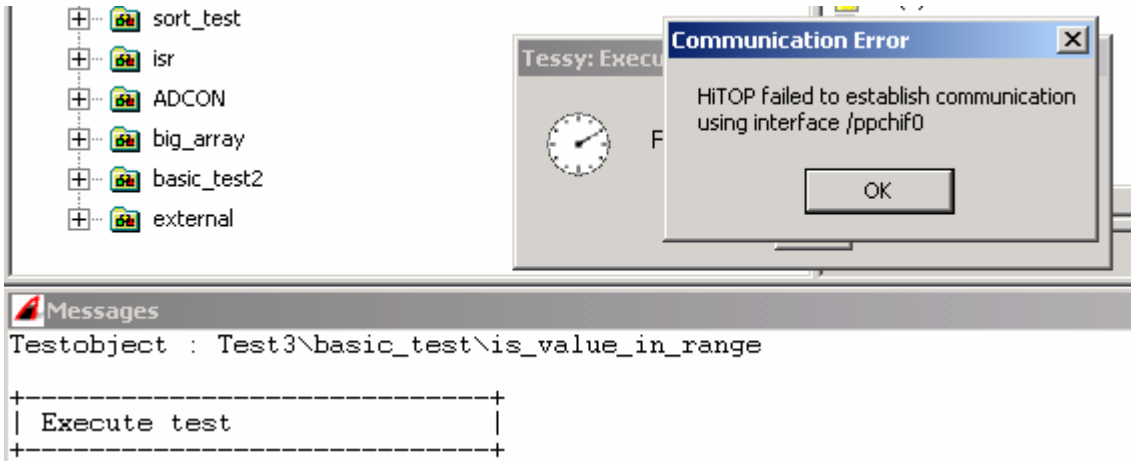


Obviously, this is also the right place to pass additional/different command line parameters to HiTOP.

What happens, if HiTOP is already started?

If Tessy starts automatically an additional incarnation of HiTOP while another is already running, you will get a message like follows:



This message stems from the HiTOP started by Tessy. However, Tessy communicates with the HiTOP that was already started. You should close the second HiTOP (and probably disable the automatic HiTOP start)

Symbol Preprocessor

The call of the symbol preprocessor is specified in the file `…\bin\ts_hitex_sp` in the Tessy installation directory. You may change this file if you have special requirements for the usage of the symbol preprocessor. The contents of this file are intended to be processed by sh.

The "-Noreload" command line parameter to the symbol preprocessor command line avoids the "Reload Yes/No" question of the symbol preprocessor when he has finished preprocessing the application and recognizes, that that application has been loaded previously by HiTOP.

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ts_hitex_sp is called by a rule from the generated makefile within the modules test directory:

```
$(MODULE_PATH_DOS)\ts_$(TESTOBJECT)_s.abs : $(MODULE_PATH_DOS)\ts_$(TESTO
   ieee166 $< $@

$(MODULE_PATH_DOS)\ts_$(TESTOBJECT)_s.htx : $(MODULE_PATH_DOS)\ts_$(TESTO
   sh ts_hitex_sp tasking$(MODULE_PATH) $(MODULE_PATH_DOS)\ts_$(TEST
```

This makefile also contains the necessary rules to transform the executable embedded program from one format to another, if the format the linker emits is not the format the symbol preprocessor processes.

Where are the HiTOP system files?

If HiTOP is started by Tessy, this is done with Tessy's bin directory as current directory. Therefore, the HiTOP system files (*.INI, *.SYS, etc.) reside in that directory and files created by logging the communication between Tessy and HiTOP (DebugLevel set to 1 in HiTOP's INI file) are also created in that directory.

Also files generated by the compiler / linker (e.g. map files) are created in Tessy's bin directory, if not another location is specified by an absolute path.

HiTOP Host/Remote Operation

This not possible at the moment. Tessy and HiTOP have to reside on the same host and have to use the predefined port number.

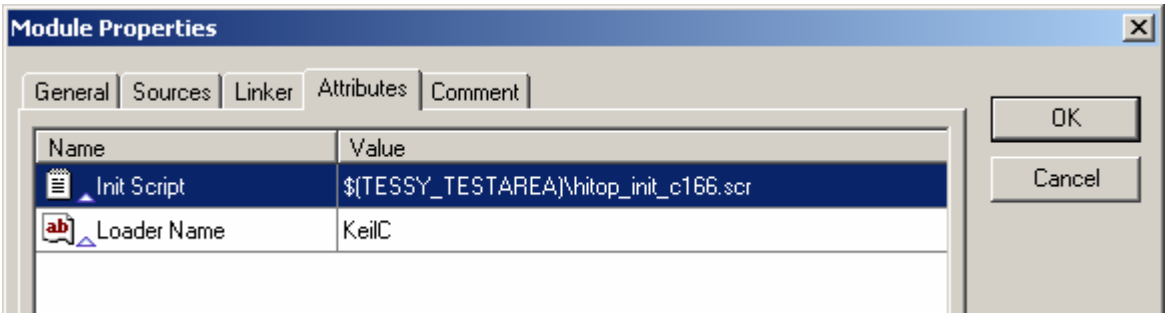
Another prerequisite would be the access to a common file system from both hosts using the same mappings and paths.

Debug System Control

How to make special settings of the debug system, e.g. define emulation memory or set breakpoints? How to close down HiTOP after the test are finished?

HiSCRIPT commands from three HiSCRIPT files are sent to HiTOP for execution by Tessy during the tests. Default **Init Script**, **Start Script** and **Stop Script** files will be created, if none exist. To get the default files again, just remove/rename the actual files and generate a new test driver within Tessy.

The **Init Script** attribute is available by default, the other attributes need to be created if required. Add a **new** attribute of type file in this case.



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hitop_init_c166.scr is specific for a microcontroller architecture (and for the in-circuit emulator for that architecture, e.g. C166). Commands from hitop_init_XXX.scr are sent at the very beginning of the tests, directly after communication is established. These commands are used to initialize the test system, e.g. to reset the system and to define emulation memory.

Commands from **Start Script** are sent after the test application is loaded (i.e. these commands may use the symbol information of the test application) and before the first test case is executed.

Commands from **Stop Script** are sent after the tests are finished

Another attribute **Load Options** allows specifying additional parameters to the load command (HiTOP5 only). The text within this attribute will be passed as options to the LOADAPP command of HiTOP5.

Known problems with older HiTOP versions

Older HiTOP versions have problems, if the length of the path to the modules test directory exceeds a certain maximum length. The path name depends on the database root directory, the project and module names and the name of your test object. The binary name would be like follows:

```
C:\tessy\<database>\<project>\<module>\ts_<testobjectname>.htx
```

If you encounter problems (e.g. HiTOP can't find the symbol file), please update to the newest HiTOP version available or rename your project/module or place the database directory into another location with shorter path names.

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Compiler Remarks

Cosmic 68HC08/68HC12

Interrupts

If you comment out the interrupt keyword to make the compiler treat an interrupt service routine like a normal function, like

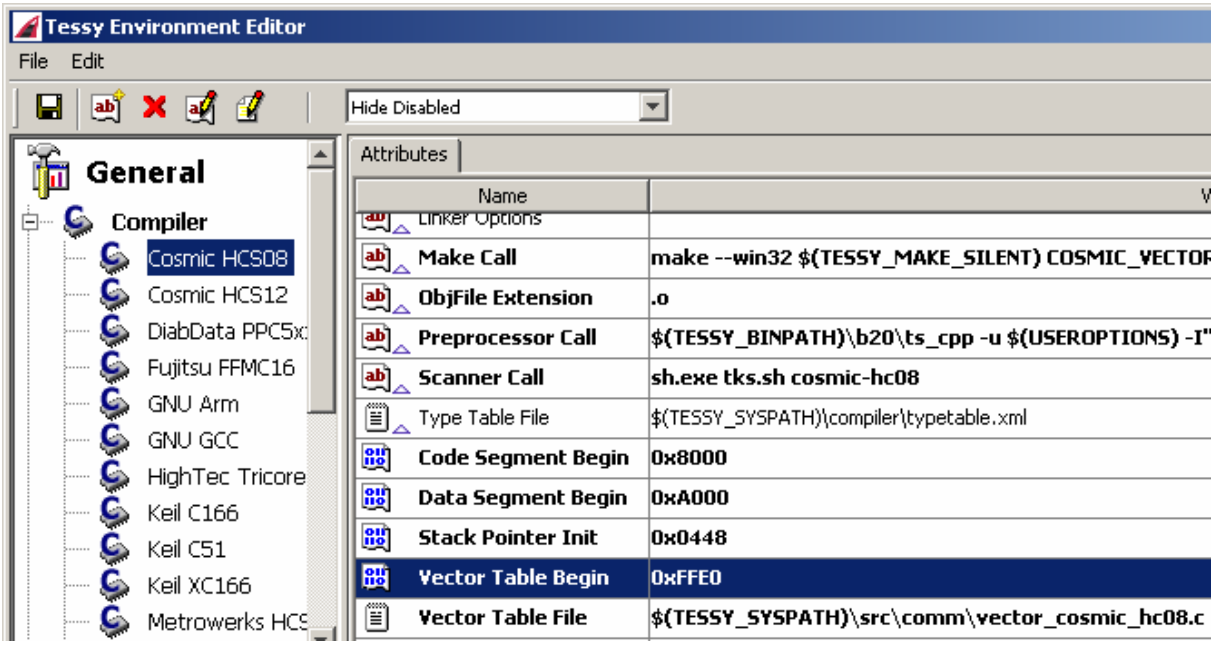
```
/* @interrupt */ void ad_convert(void)
```

be sure to also change the function template (if there is any), e.g.

```
/* @interrupt */ void ad_convert(void);
```

Vector Table Start Address

Tessy provides an attribute **BeginVectorTable** within the **Module Properties** to specify the start address of the vector table. The default vector table to be used, is available as source code in the `…\sys\src\comm`. directory of the Tessy installation. It contains 16 entries with the last entry being the start address of the program. You should change the start address of the vector table only, if you want to use a different vector table with a different size.



***Important notice**: If the size of the vector table and the start address do not match, then there may be a wrong value at the address 0xffff, which will be loaded into the PC at startup. This will result in improper start of the test application.*

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Keil C166

Linker L166

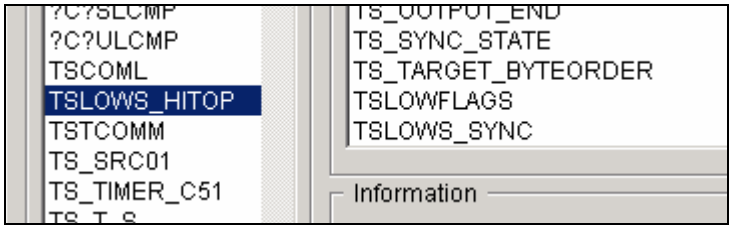
The linker L166.exe from Keil sometimes crashes when linking test applications. This is probably due to the path names used. This bug is fixed with **L166.exe V4.22**.

However, it seems that this bug is again present in L166.exe V4.23.

Keil C51

Ignore case

Symbol names generated by the Keil C51 compiler appear all in upper case (e.g. displayed in HiTOP as follows)

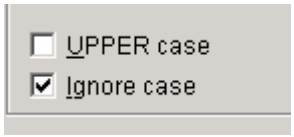


Even if the symbol names in the actual C source contain lower case. The reason is not yet quite clear. Because Tessy uses the symbols in the form used in the C source, symbols in commands from Tessy to HiTOP (e.g. " BREAK AT tslows_sync") may not be recognized by HiTOP.

To remedy this, Tessy sets the HiSCRIPT variable %ignorecase in $(TESSY_TESTAREA)**hitop_init_c51.scr** to %yes

```
%ignorecase = %yes
```

This is equivalent with checking the option **Ignore case** using the HiTOP command Option > Variables



With this option set, HiTOP does not distinguish between upper and lower case. Therefore, regardless of the case, the symbols used by Tessy are recognized by HiTOP.

XDATA segment used

The initial configuration of Tessy creates a test application that uses memory in the external data segment (XDATA) starting from address 0.

Therefore, you must make sure that your execution environment (i.e. the 8051 emulator) provides access to the XDATA segment (i.e. the data and address line must not be used as ports) and that this kind of memory is available (e.g. by mapping emulation memory). If this is not the case, testing will hang because Tessy will try to read variables from the xdata segment for communication.

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A sample **Init Script** (Refer to the **Module Properties**) may look like this:

```
// This is a Tessy generated init script for HiTOP AX/MX51 or DProbeHS
// You may edit this script but BE CAREFUL WITH ANY CHANGES!

LOAD OBJECT ""
MAP REMOVE
BREAK REMOVE

%ignorecase = %yes

PROCESSOR {P3.6/7  } = {R/W}

// Setup memory map
// The following mapping will work for most derivatives, e.g. 80C32
MAP M1 AT C:0x0000 END C:0x7FFF
MAP M2 AT X:0x0000 END X:0xFFFF
```

Static functions

There is a restriction in testing static functions with parameters: The generated test driver code contains code for getting the address of such a static function to be called indirectly using a function pointer. The Keil linker will produce the following error message, if there are more than one parameters:

```
*** ERROR C212 IN LINE 146 OF C:\\TESSY\\TS_T_S.C: indirect call:
parameters do not fit within registers
```

The only solution is to remove the static keyword from the function definition.

Metrowerks

The Metrowerks Compiler can create applications in two different formats, one is the older, proprietary Hiware/HiCross format, the other is the newer, standardized ELF/DWARF2 format. Tessy supports both formats by treating the formats like generated by different compilers. This is due to different compiler switches, symbol preprocessors etc. that have to be used and lead to different makefile templates for each format eventually. Therefore, you must select the appropriate format/compiler under **Module properties**:

- Metrowerks/HC08 for ELF/DWARF 2.0 format
- Metrowerks/HC08Hi for Hiware/HiCross format

Because different installations of the Metrowerks HC08 compiler use different directories to store libraries and startup code of the different formats, you must check that there is no mismatch in formats between the code of the test application that is generated and compiled by Tessy and the libraries, that Tessy links to the test application. By default, Tessy uses the libraries from the directory

```
<Metrowerks installation directory>\lib\HC08c\
```


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This is consistent with the notion of Metrowerks, that this directory should hold the default libraries. Libraries of a determined format are found in appropriate named libraries, e.g. in

```
<Metrowerks installation directory>\lib\HC08c\lib.e20
```

or

```
<Metrowerks installation directory>\lib\HC08c\lib.hix
```

(Please note: Not all directories may be present in your installation.)

One solution to avoid format mismatches is simply to copy the libraries etc. of the format of your choice to the lib directory. This is the preferred solution, since this directory should contain the libraries in the default format anyway. However, this solution is only practicable if you don't want to use both formats alternatively.

Another solution is to edit the makefile template used by Tessy to generate the test application. Dependant on the choice you made for the Target Compiler, this is either

```
…\sys\templates\make\ts_make_hitop_hiware_hc08.tpl
```

or

```
…\sys\templates\make\ts_make_hitop_metrowerks_hc08.tpl
```

within the installation directory of Tessy. Both of these template files contain lines like

```
@echo $(TESSY_METROWERKS_HOME)\\lib\hc08c\\lib\\ansi.lib >> $(MODULE_PATH_…
@echo $(TESSY_METROWERKS_HOME)\\lib\hc08c\\lib\\start08.o >> $(MODULE_PA…
```

that should be changed to either

```
@echo $(TESSY_METROWERKS_HOME)\\lib\hc08c\\lib.e20\\ansi.lib >> $(MODULE_ …
@echo $(TESSY_METROWERKS_HOME)\\lib\hc08c\\lib.e20\\start08.o >> $(MODULE_…
```

or

```
@echo $(TESSY_METROWERKS_HOME)\\lib\hc08c\\lib.hix\\ansi.lib >> $(MODULE_…
@echo $(TESSY_METROWERKS_HOME)\\lib\hc08c\\lib.hix\\start08.o >> $(MODULE_…
```

whatever is appropriate. Obviously, if you edit both makefile templates, you are able to use both formats in alternative Tessy projects.

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