Flex-Cable Target Adapters for Nohau's HCS12- Emulators

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Accessibility between an in-circuit-emulator and an HC12 target, for debugging purposes, is an issue for many new applications in general, and especially for automotive applications. Many of today's MCUs (Micro Controller Units) are buried deep in a car engine or other car unit with very limited access. For such applications, Nohau and Motorola have developed special flex-cable adapters. In this article we will show the latest Nohau flex-cable adapters for the MC9S12D family of micro-controllers. Recent Nohau experience shows that more HC12 emulator users choose a flex-cable adapter, rather than a conventional adapter.

BDM vs. Full-Featured Emulators

BDM (Background Debug Mode) emulators are small, and thus have an advantage in hooking up to access-limited MCU target boards. However, for the majority of complex HC12 applications, a BDM emulator usually falls short, and does not supply the needed debugging power to find and solve the complex bugs. Most HCS12 applications involve assembly code of up to 64K, 128K, or 256K. A Full-Featured-Emulator offers a variety of features that are crucial for successful debugging of complex applications. These features include A) The trace, which records and displays the bus activity of the MCU. B) The ability to set complex and sequential triggers which may halt the trace and/or the MCU. C) The ability to set an unlimited number of breakpoints, as compared to only 2 on a BDM emulator. D) The ability to load and debug code in the flexible emulator RAM, rather than in the internal MCU Flash memory. For these full-featured-emulators Nohau has developed the flex-cable adapters.

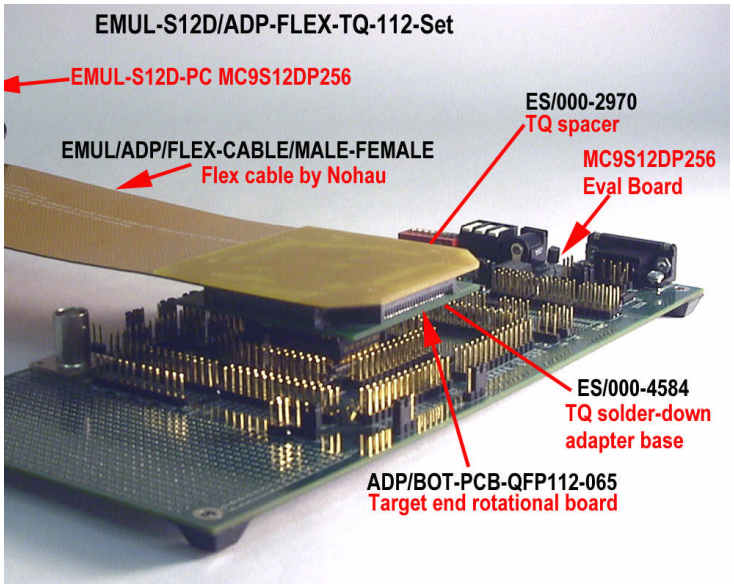

Figure 1 – Typical Flex-Cable Adapter Kit Connects an Emulator System to a Target System

What's in a Flex-Cable Adapter Set and how does it work?

A typical flex-cable adapter set consists of the 4 following basic elements:

A. The flex-cable - 12 inches long.
B. A TET (Tokyo-Eletech) solder-down adapter base to solder onto the target HC12 QFP footprint.
C. A top adapter rotational board to adapt between the emulator system and the flex-cable.
D. A bottom adapter rotational board to adapt between the flex-cable and the TET solder-down adapter base.

Figure 1 shows how these 4 elements plug together to adapt between a Full-Featured Emulator system and an accessibility-limited HC12 target board. The flex-cable can escape from the target in one of 4 different directions, as shown in Figure 3. The flex-cable can also be moderately twisted to allow further flexibility. A typical Nohau Flex-Cable adapter kit shown here is sold in the US for roughly $1000 (including all 4 elements). This is less than one half the price for similar competing flex-cable adapter sets.

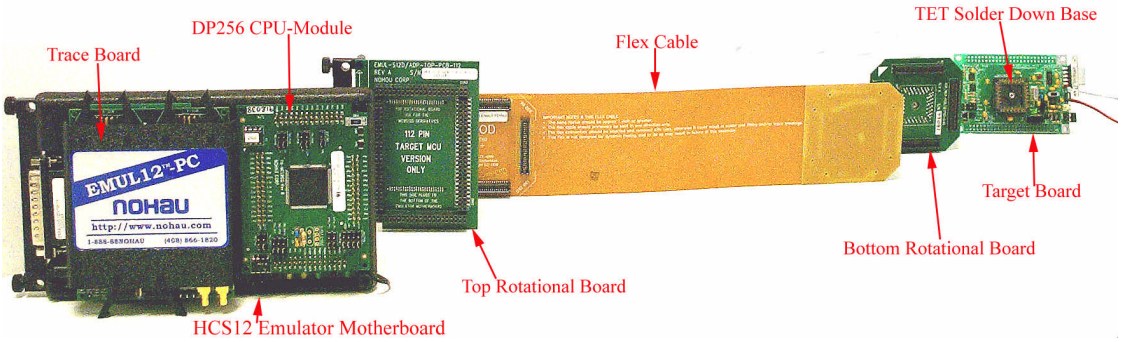

Figure 2 – An HCS12 Emulator & Target System with a Flex-Cable Adapter

The Flex-Cable

The Flex-Cable is developed and manufactured by Nohau. It is 12 inches long, and may carry up to 180 MCU signals between an emulator and a target system. The flex-cable is shielded, and all the signals have 50 Ohm controlled impedance. The flex-cable is demonstrated to operate at bus rates above 100MHz. In fact, Dan Beeker at Motorola liked the Nohau Flex-Cable so much, that he has decided to use it for all his new flex-cable adapter designs. The Nohau flex-cable is also used with competing emulators, and other MCU families. Nohau has two versions of the Flex-Cable:

A. EMUL/ADP/FLEX/UNIV – a flex-cable with female connectors at both ends. Older designs use this flex-cable. Motorola and Dan Beeker are also using this flex-cable.

B. ADP/FLEX-CABLE/MALE-FEMALE – a flex-cable with opposite connectors on opposite ends. This is the same flex-cable in A, with different connectors. It is being used by the adapters shown here, and has the benefit of allowing the top and the bottom adapter rotational boards to also plug into each other to form a plain no-flex-cable adapter configuration.

These Flex-Cables are both sold in the US for $450.

Nohau can supply the mechanical and electrical data for relevant adapter designs.

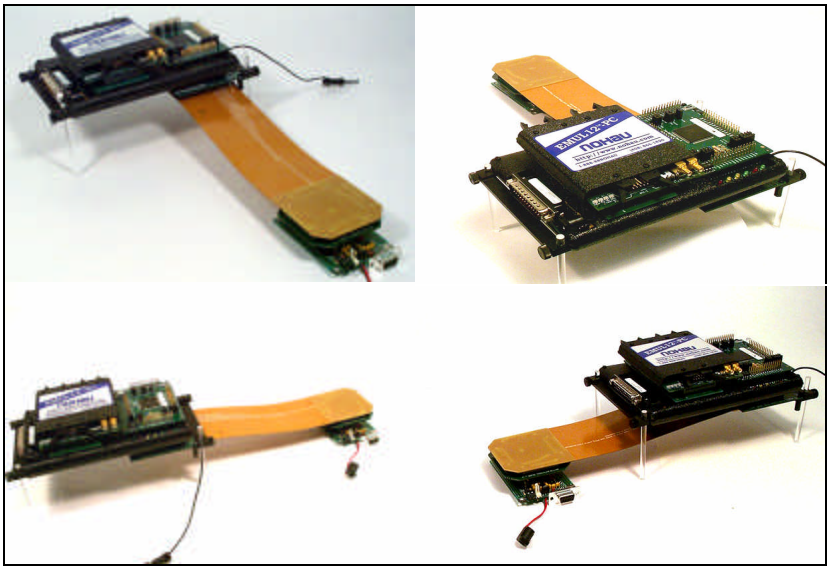

Figure 3 – The Flex-Cable can escape from the Target in one of 4 different directions: 0°, 90°, 180°, or 270°

The Top and Bottom Adapter Rotational Boards

The flex-cable can escape from the target in one of 4 different directions 0°, 90°, 180°, and 270°, as best fits the target's mechanical constraints. This ability is achieved using the top and bottom adapter rotational boards, as follow: Each one of the top and the bottom adapter rotational boards has 4 identical connectors placed as a square and symmetrical to each other. Also the flex-cable has 4 identical and square symmetrical connectors on each end. This allows for the connection of the flex-cable and both rotational boards to be rotated, to one of four orientations: 0°, 90°, 180°, or 270°. The flex-cable has 0°, 90°, 180°, and 270° markings on both the emulator end and the target end. The rotational boards both have an arrow marked on one corner. The arrows on both the top rotational board and the bottom rotational board need to point on the same 0°, 90°, 180°, or 270° orientation, marked on the flex-cable.

The newest top and the bottom rotational boards shown here also have opposite connectors. This allows the rotational boards to also plug into each other to form a plain no-flex-cable adapter. For such a plain adapter rotation is not possible, and the emulator is placed physically above the target board, in a single possible orientation.

The top rotational board is derivative and pin-count specific. For example the MC9S12D family has one 112 pin, and one 80 pin top rotational boards. For the MC9S12H family different top rotational boards will be required.

The bottom rotational board is not derivative specific, but is package specific. Thus it may be used for two different MCUs that have the same QFP package.

The TET (Tokyo Eletech) Solder-Down Base

The solder-down QFP Base is made by Tokyo-Eletech. Two configurations are available for most QFP footprints. The basic configuration, named TQ-PACK, includes a one-part adapter base, which solders down to the target QFP footprint with its bottom end, and has PGA pin-array at its top end to plug into an adapter board (into the bottom rotational board in our case). A higher-end configuration, named NQ/YQ/HQ-Pack, consists of 3 parts, and has room to place a real CPU, or to connect to an emulator system. Both configurations have similar top PGA footprint to connect to the emulator system. For more information about the TET adapters refer to http://www.tetc.co.jp/e_tet.htm.

Some Part-Numbers
The adapters shown in the pictures are for the MC9S12D family of micro-controllers.
The part numbers are:
EMUL-S12D/ADP-FLEX-TQ-112-Set – for a 112-pin QFP footprint
EMUL-S12D/ADP-FLEX-TQ-80-Set – for an 80-pin QFP footprint

Similar adapters are also available for the new MC9S12H family, as well as the 68HC912D family.

For more information go to:
http://www.nohau.com/emul12pc.html and
http://www.nohau.com/parts_lists/em12pc.pdf

Or email: support@nohau.com