ST7MDT10-EMU3
probe user guide

Introduction

The ST7-EMU3 series emulators are the third generation of high-end emulators for ST7. EMU3 series emulators are designed to provide a complete range of advanced debugging features during emulation. They come with all the adapters, connectors and sockets you need to emulate any of the supported ST7 devices. In addition, they provide in-circuit debugging and programming capability to give you start-to-finish control of application development with ST7 Flash devices.

Your EMU3 probe is the component of the ST7-EMU3 emulator that contains target-emulation hardware. It connects to your PC via the ST Micro Connect box, and it can connect to your application board in place of your ST7.

The EMU3 probe's Target Emulation Board (TEB) contains the hardware that allows you to emulate an ST7 or ST7 sub-family. The modularity provided by the TEB makes it possible to emulate a range of ST7 MCUs with one ST7-EMU3 emulator. For this reason, the ST7MDT10 target emulation board is delivered either as part of the ST7MDT10-EMU3 emulator kit, or independently, in the ST7MDT10-TEB kit.

The ST7MDT10-EMU3 emulator is designed to emulate MCUs in the ST7226x, ST7LITE sub-families and the ST7DALI.

Table 1.   Related hardware for ST7MDT10-EMU3 probe

| Orderable part number	Description
AC7MDT10-D16/S16	SDIP16/SO16 Connection kit
AC7MDT10-D20/S20	DIP20/SO20 Connection kit
AC7MDT10-D32/S28	SDIP32/SO28 Connection kit
ST7MDT10-TEB	EMU3 probe's Target Emulation Board (TEB)

Contents

1   Delivery Checklist

The EMU3 probe is typically delivered as part of the ST7MDT10-EMU3 emulator kit. This kit contains the emulator components (refer to the delivery check list in your *ST7-EMU3 Emulator User Manual*), as well as all of the probe accessories listed below.

Figure 1.   ST7-EMU3 terminology
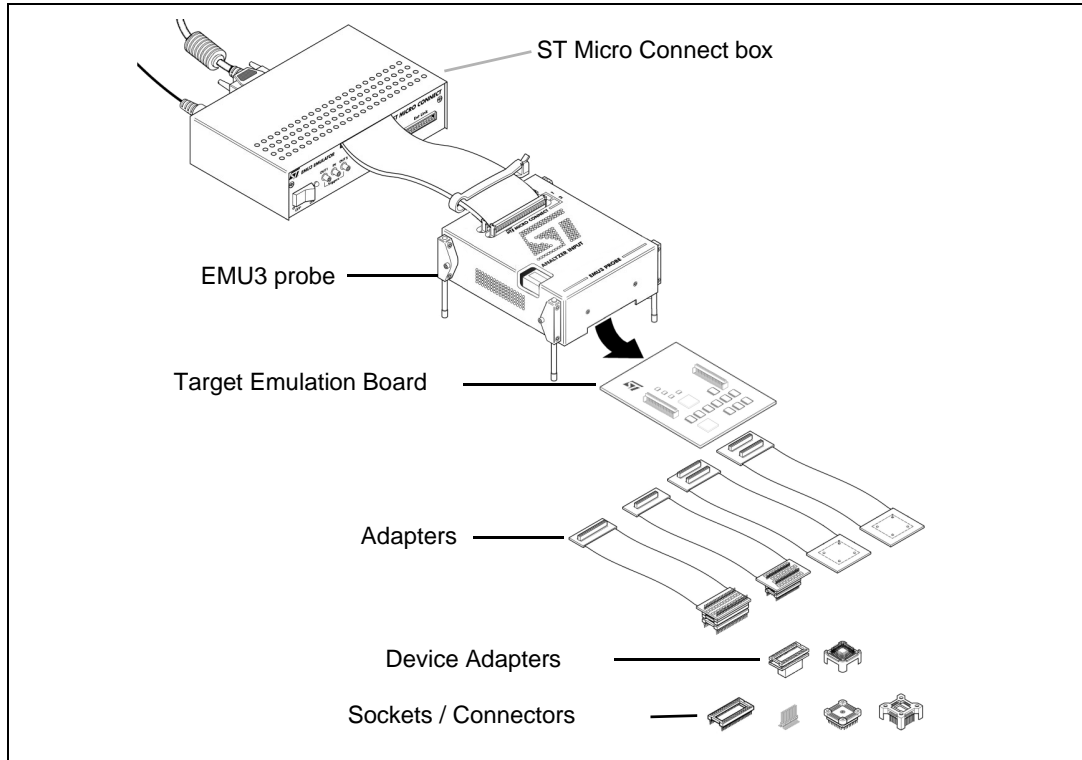
The ST7MDT10-EMU3 probe includes (refer to *Figure 2*):

1. The ST7-EMU3 probe with slots for connections to the ST Micro Connect box, as well as a connector for analyzer input. The ST7MDT10-TEB target emulation board (ref.: DB509) already installed in the ST7-EMU3 probe.

2. Connection accessories for DIP8, DIP16, SO8, SO16 and DFN8 packages:

   a) Flex adapter with DIP16 connector (ref.: DB483A) for connection between the ST7-EMU3 probe and your application board.

   b) A DIP16 to SO8 device adapter (DB645) with connection pins to install on your application board.

   c) An SO8 to DIP8 device adapter (DB646).

   d) A DIP16 to SO16 device adapter (ref.: DB489) with connection pins to install on your application board.

   e) An SO8 to DFN8 device adapter (DB715) with a female connector to solder to your application board and a male-male connector for connection of the device adapter.

3. Connection accessories for the DIP20 and SO20 packages:

f) Flex adapter with DIP20 connector (ref.: DB482A) for connection between your probe and your application board.

g) A DIP20 to DIP20 device adapter (ref.: DB535).

Note: *The DIP20 pinout on the flex adapter is askew by 90°. You must place the DIP20 to DIP20 device adapter (ref.: DB535) between the flex adapter connector and a socket (not included) on your application board socket in order to correctly emulate your DIP20 application.*

h) A DIP20 to SO20 device adapter/socket (ref.: DB093).

4. Connection accessories for the SDIP32 and SO28 packages:

i) Flex adapter with SDIP32 connector (ref.: DB510) for connection between the EMU3 probe and your application board.

j) An SDIP32 to S028 device adapter (ref.: DB359) with connection pins to install on your application board.

5. ICD adapter (MB509) for connection to your application board when in-circuit debugging ST7FLITEUS microcontrollers.

Note: *The ICD Adapter comes with 16-pin variants of the ST7FLITEUSx with 1K of Flash memory (Package marking: ST7FLITEUSICD) and ST7FLITEU0x with 2K of Flash memory (Package marking: ST7FLITEU0ICD). Select the device that corresponds to the microcontroller that you are developing with and insert it in the SDIP16 socket on the ICD Adapter.*

Owners of other versions of ST7-EMU3 emulators can configure them to emulate the ST7226x, ST7LITE families and the ST7DALI with the ST7MDT10-TEB kit. This kit includes the ST7MDT10 TEB (ref.: DB509) to install in the probe, as well as the connection accessories listed above (No. 2-5).
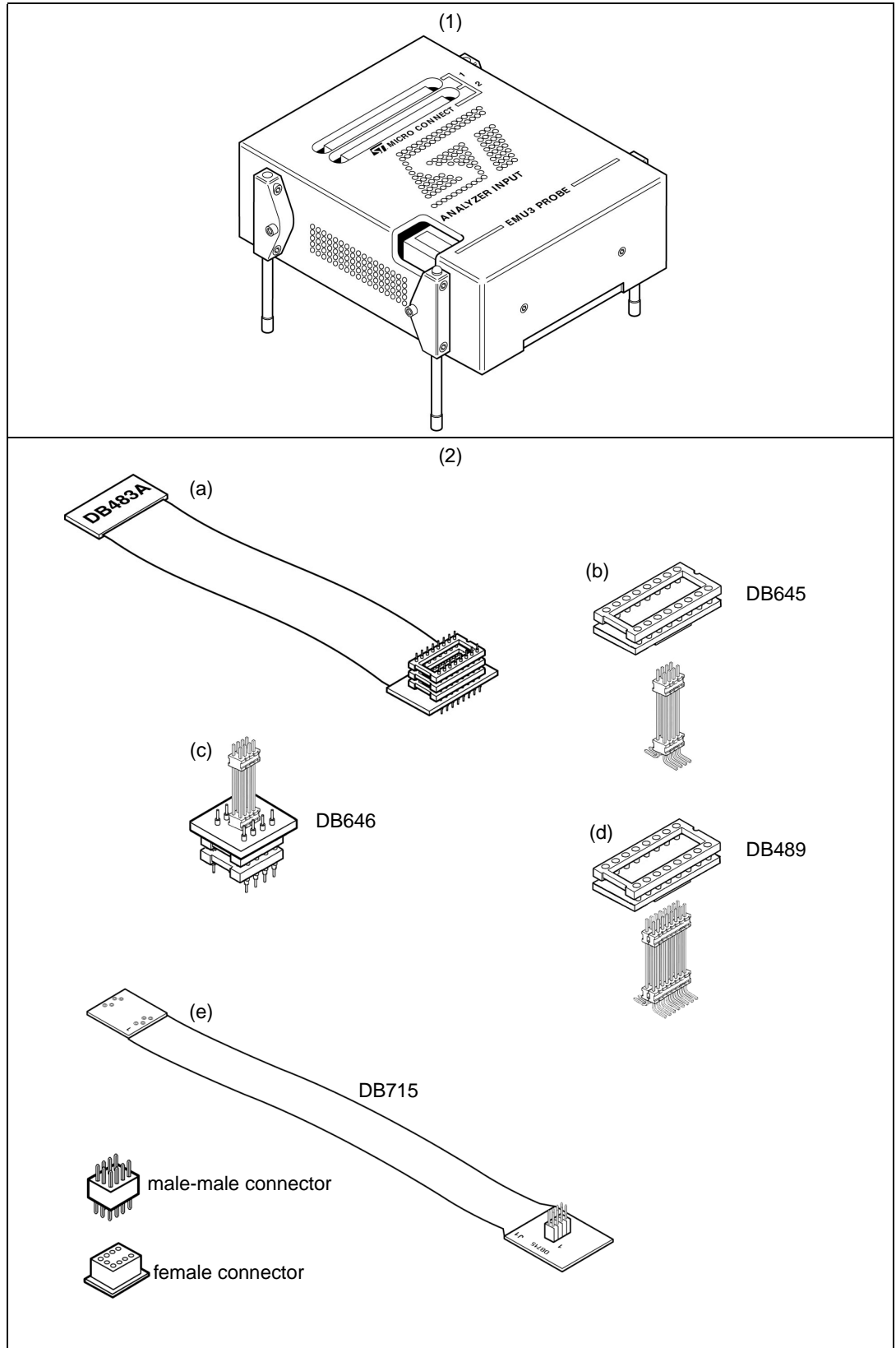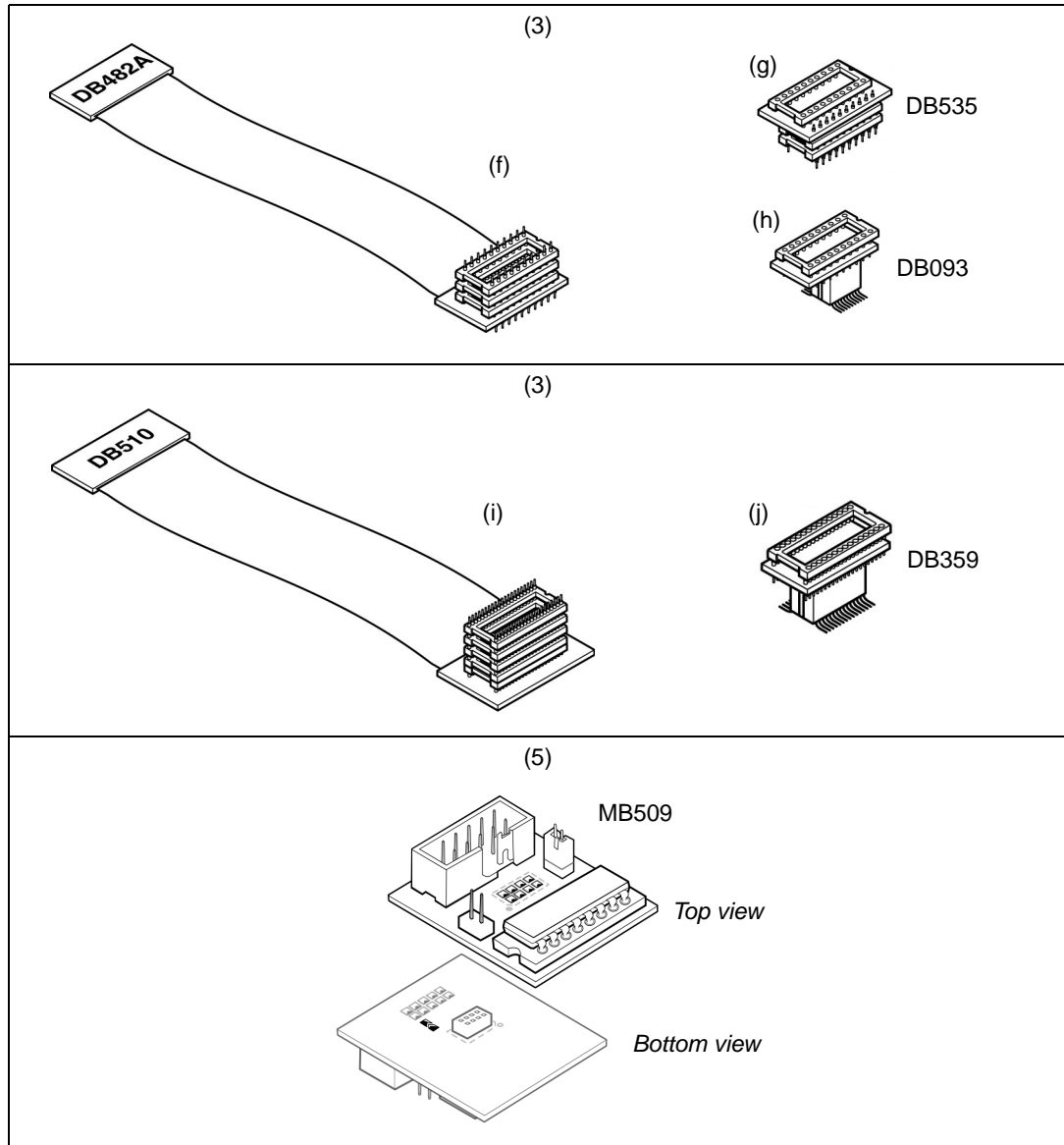
Figure 2. Probe kit contents (not to scale)

Figure 2.   Probe kit contents (not to scale) (continued)

2 Connecting to the application board for emulation

The following sections tell you how to:

● select the adapters and accessories for the target MCU
● connect the flex adapter to the TEB, which is housed in the EMU3 probe,

The target MCUs that are emulated by the ST7MDT10-EMU3 probe exist in various microcontroller packages. To connect the emulator to your application board, you must select the flex adapter, device adapter(s) and socket for the target microcontroller based on its package. *Table 2* indicates which TEB connector to use, and the connection accessories required for emulation of each supported microcontroller package.

Table 2.   **TEB connectors and connection accessories for supported packages**

MCU Package	TEB connector (see *Figure 4*)	Flex adapter	Device Adapter	On application socket/connector
DIP16	W1	DB483A	none	DIP16
SO16 (150-mil width)	W1	DB483A	DB489	Provided connection pins
SO8	W1	DB483A	DB645	Provided connection pins
DIP8	W1	DB483A	DB645 + DB646	DIP8
DFN8	W1	DB483A	DB645 + DB715	Provided female connector
DIP20	W1	DB482A	DB535	DIP20
SO20	W1	DB482A	DB093	Provided connection pins
SDIP32	W2	DB510	none	SDIP32
SO28	W2	DB510	DB359	Provided connection pins

Caution: Only use the flex adapters provided with the ST7MDT10-EMU3. Even though flex adapters from other ST7-EMU3 series emulators may look similar, each flex adapter is designed for use with the emulator that it is delivered with.

2.1 Connecting the flex adapter to the EMU3 probe

1. Turn the EMU3 probe upside-down, unscrew the retaining screw and slide the bottom out as shown in *Figure 3*.

Figure 3.   **Opening the bottom of the probe**
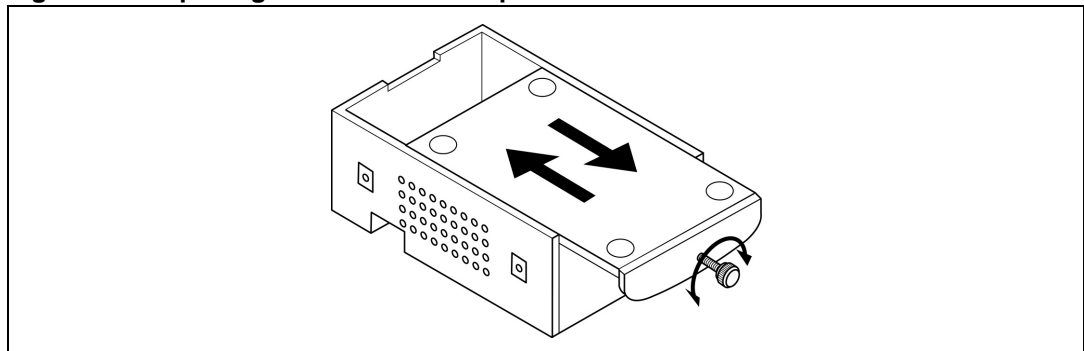
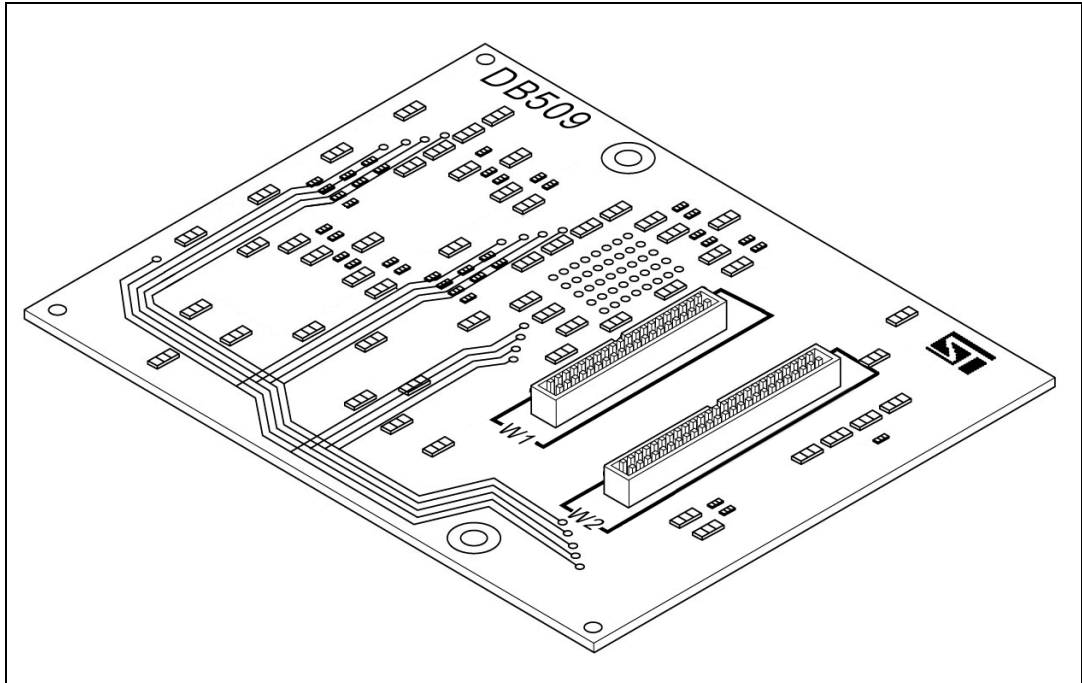2. Using *Table 2*, identify the TEB connector to use based on your microcontroller's package. Connect the flex adapter supporting your microcontroller package to the appropriate connector on the TEB. *Figure 4* shows the 40-pin connector (W1) and 48-pin connector (W2) on the ST7MDT10-TEB (DB509).

Figure 4. TEB connectors

3. Replace the bottom panel of the probe housing so that the flex adapter feeds through the slot provided.

4. Reconnect the probe to the ST Micro Connect box by connecting the two 80-pin flat cables to the ST Micro Connect connection ports on the top face of the probe housing.

5. Continue by connecting to your application board. A procedure for each supported package is provided in the following sections:

   – *Section 2.2: DIP16 microcontroller package on page 9*
   – *Section 2.3: SO16 microcontroller package on page 10*
   – *Section 2.4: SO8 microcontroller package on page 12*
   – *Section 2.5: DIP8 microcontroller package on page 13*
   – *Section 2.6: DFN8 microcontroller package on page 14*
   – *Section 2.7: DIP20 microcontroller package on page 16*
   – *Section 2.8: SO20 microcontroller package on page 17*
   – *Section 2.9: SDIP32 microcontroller package on page 18*.
   – *Section 2.10: SO28 microcontroller package on page 19*

2.2 DIP16 microcontroller package

1. Solder a DIP16 socket onto your application board.
2. Align the pin 1 indicators on the DIP16 connector of the DB483A flex adapter and the socket on your application board. Insert the flex adapter's pins into the socket as shown in *Figure 5*.

Figure 5.   DIP16 connection
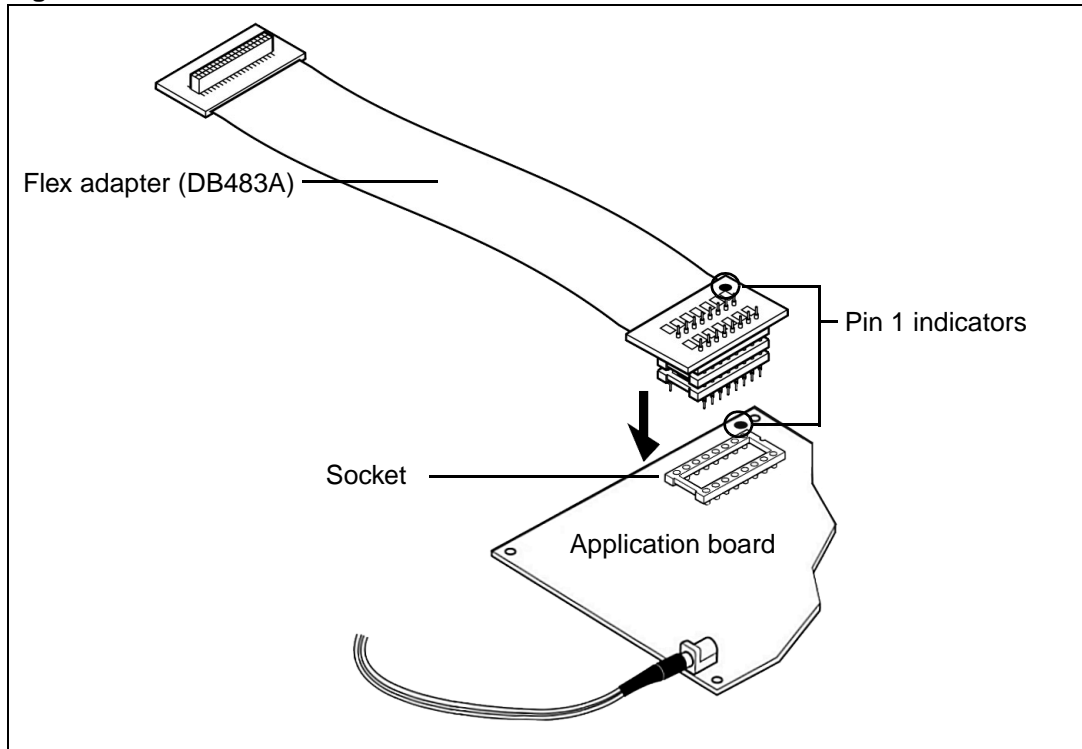
2.3 SO16 microcontroller package

1. Solder the connection pins onto your application board in place of your microcontroller in SO16 package.

Figure 6.   Solder the SO16 socket to your application board
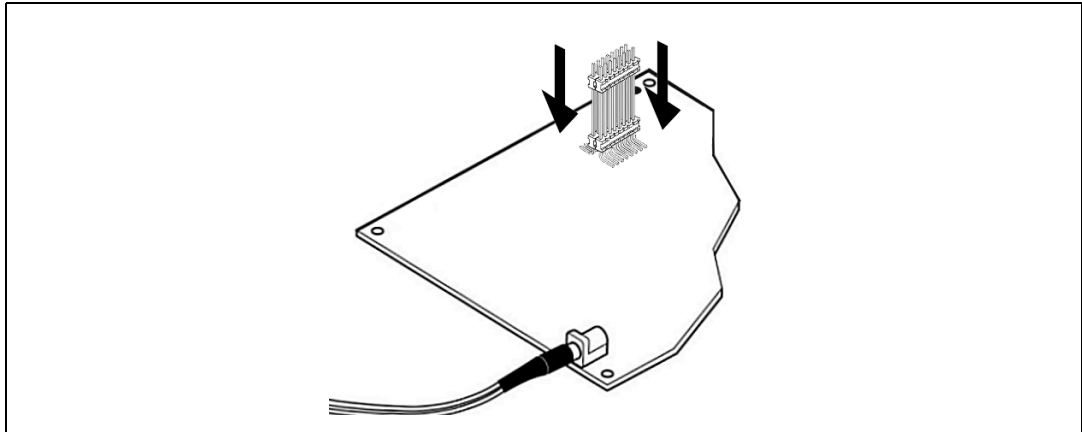
Note: *Care must be taken when designing the circuitry surrounding the component-side footprint for the emulated SO16 device on your application board. This is because the provided set of connection pins has larger pins than the actual SO16 microcontroller package.*

If wire on wire connections are made on the SO16 (150-mil width) footprint between the two 8-pin rows (as shown on the top-right), a short circuit may occur when soldering the connection pins for the emulator on the same footprint.

To avoid short circuits we recommend using wire on wire connections as shown in the illustration on the bottom-right.

SO16
(0.15")
footprint
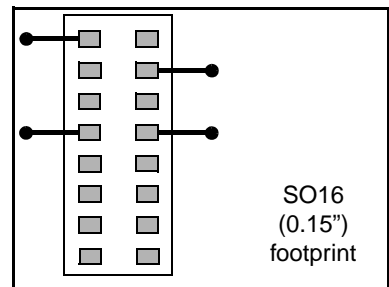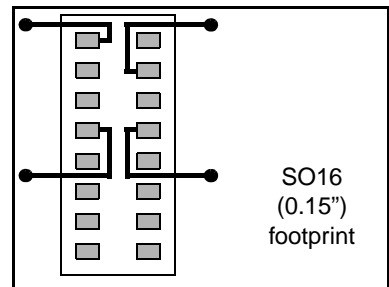
SO16
(0.15")
footprint

2. Align the pin 1 indicators and then insert the pins of the DB483A flex adapter into the DIP16/SO16 device adapter (DB489) as shown in *Figure 7*.
3. Align the pin 1 indicators and then insert the pins soldered on your application board into the DIP16/SO16 device adapter (DB489).

Figure 7. SO16 connection

Flex adapter (DB483A)

Pin 1 indicators

DIP16/SO16 Device adapter (DB489)

Application board

2.4 SO8 microcontroller package

1. Solder the connection pins for the DIP16/SO8 device adapter (DB645) onto your application board.

2. Align the pin 1 indicators of the DB483A flex adapter and the DIP16/SO8 device adapter (DB645), then insert the flex adapter's pins into the DIP16/SO8 device adapter as shown in *Figure 8*.

3. Align the pin 1 indicators and then insert the pins soldered on your application board into the DIP16/SO8 device adapter (DB645).

Figure 8.   SO8 connection

2.5   DIP8 microcontroller package

1. Solder the a SO8/DIP8 device adapter (DB646) onto your application board.
2. Align the pin 1 indicators of the DB483A flex adapter and the DIP16/SO8 device adapter (DB645), then insert the flex adapter's pins into the device adapter as shown in *Figure 9*.
3. Align the pin 1 indicator of the DIP16/SO8 device adapter with the pin 1 indicator for the SO8/DIP8 device adapter (DB646) on your application board, then insert the pins of the SO8/DIP8 device adapter into the DIP16/SO8 device adapter (see *Figure 9*).

Figure 9.   DIP8 connection

Flex adapter (DB483A)

Pin 1 indicators

DIP16/SO8 Device adapter (DB645)

SO8/DIP8 Device adapter (DB646)
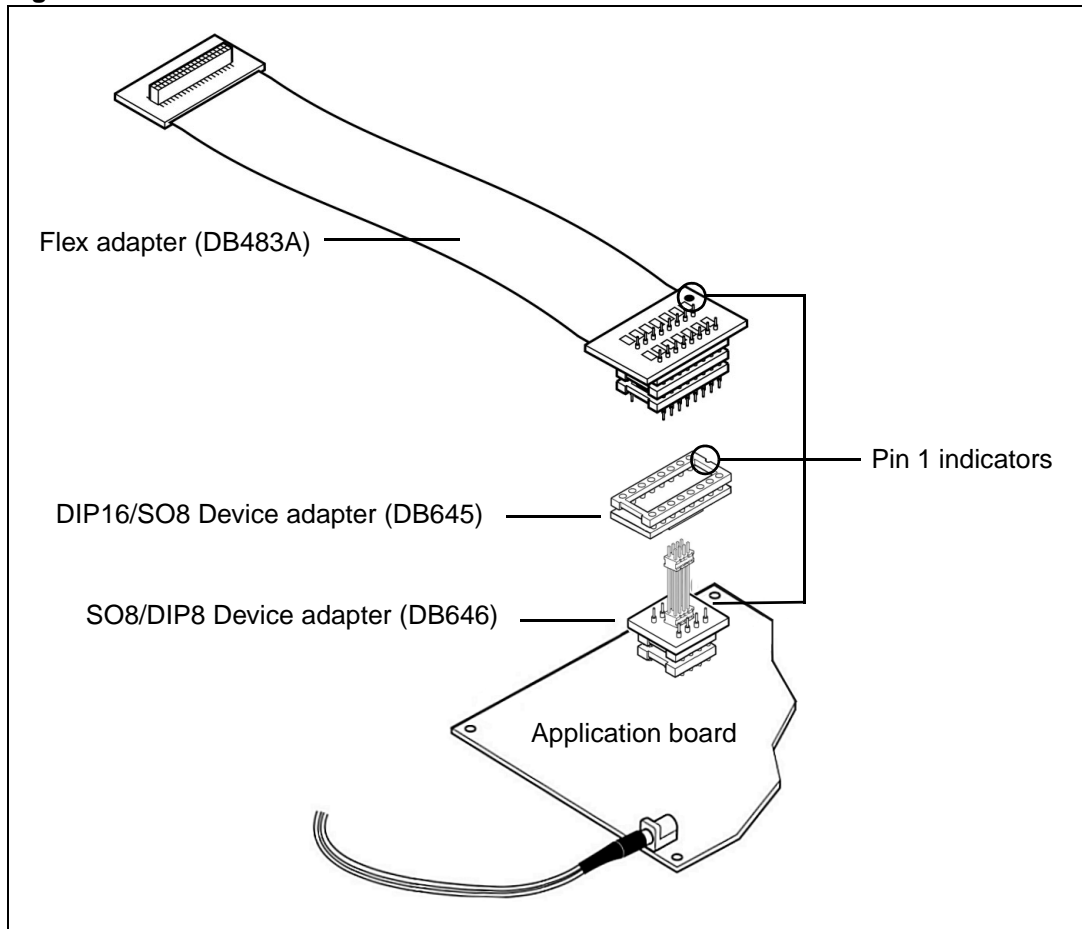
Application board

2.6 DFN8 microcontroller package

1. Solder the female DFN8 connector to your application board.

2. Align the pin 1 indicators of the DB483A flex adapter and the DIP16/SO8 device adapter (DB645), then insert the flex adapter's pins into the device adapter as shown in *Figure 10*.

3. Align the pin 1 indicators of the DIP16/SO8 device adapter (DB645) and the 8-pin male connector of the SO8/DFN8 device adapter (DB715), then insert the pins of the SO8/DFN8 device adapter into the DIP16/SO8 device adapter (see *Figure 10*).

4. Insert the pins of the male-male DFN8 connector into the SO8/DFN8 device adapter (DB715). Because of the position of the ground (GND) pin, there is only one way to connect these (see inset in *Figure 10*).

5. Finally, insert the pins of the male-male DFN8 connector into the female DFN8 connector on your application board. Again, because of the position of the ground (GND) pin, there is only one way to connect these (see inset in *Figure 10*).

Figure 10.   DFN8 connection
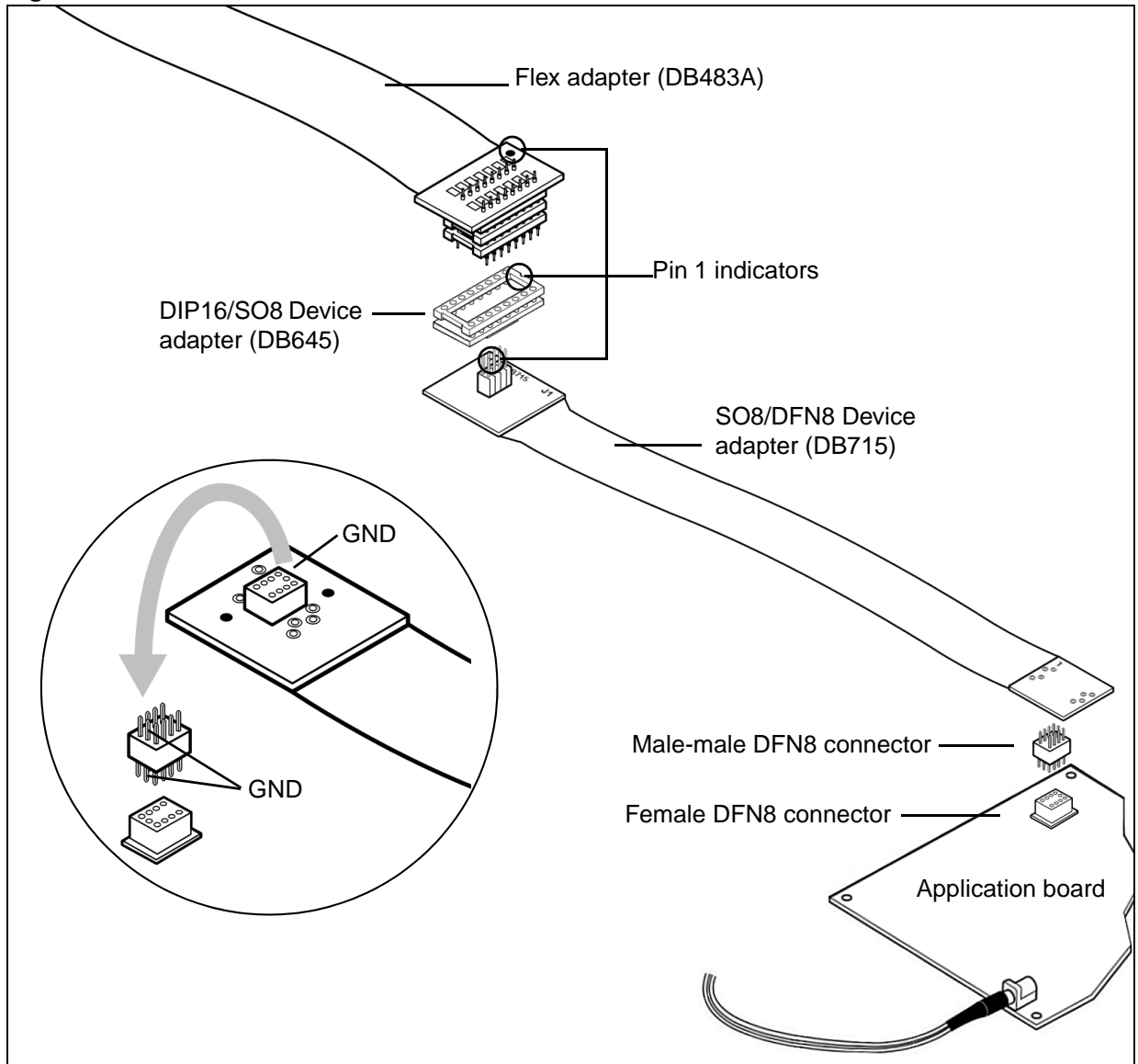
2.7 DIP20 microcontroller package

1. Solder a DIP20 socket onto your application board.

2. Align the pin 1 indicators on the DIP20/DIP20 device adapter (ref.: DB535) and the DB482A flex adapter. Then insert the flex adapter's pins into the DIP20/DIP20 device adapter as shown in *Figure 11*.

3. Next insert the pins of the DIP20 to DIP20 device adapter into the socket on your application board.

Note: *The DIP20 pinout on the flex adapter is askew by 90° from that of the microcontroller. You must install the DIP20/DIP20 device adapter (ref.: DB535) between the flex adapter and the socket on your application board socket in order to correctly emulate your MCU in DIP20 package.*

Figure 11. DIP20 connection

2.8 SO20 microcontroller package

1. Solder the connection pins for the DIP20/SO20 device adapter (DB093) onto your application board. When soldering, insert the two sets of connection pins into the device adapter. The device adapter will serve as a support during soldering and will ensure the correct spacing and alignment of the pins (see inset in *Figure 12*).

2. Align the pin 1 indicators of the DB482A flex adapter and the DIP20/SO20 device adapter, then insert the flex adapter's pins into the device adapter soldered on your application board as shown in *Figure 12*.

Figure 12. SO20 connection

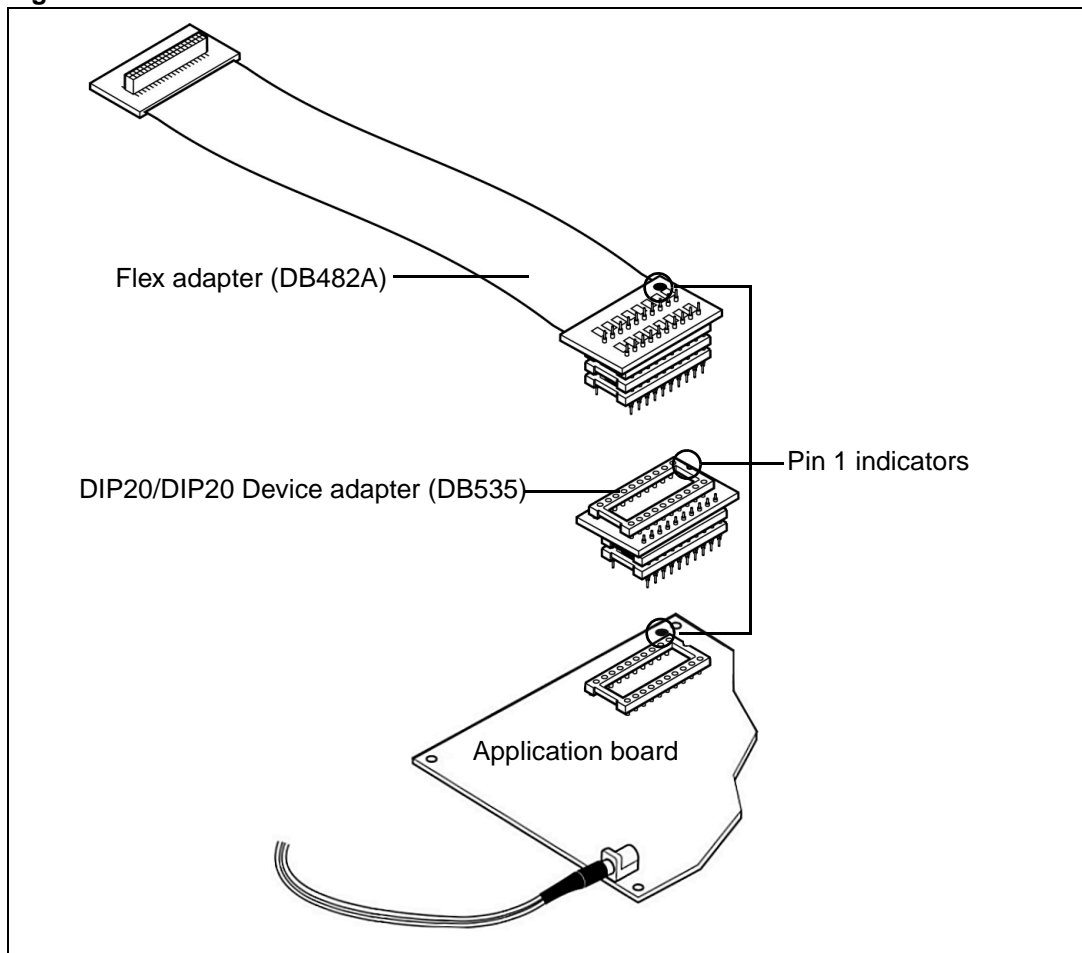## 2.9 SDIP32 microcontroller package

1. Solder a SDIP32 socket onto your application board.
2. Align the pin 1 indicators on the SDIP32 connector of the DB510 flex adapter and the socket on your application board. Insert the flex adapter's pins into the socket as shown in *Figure 13*.
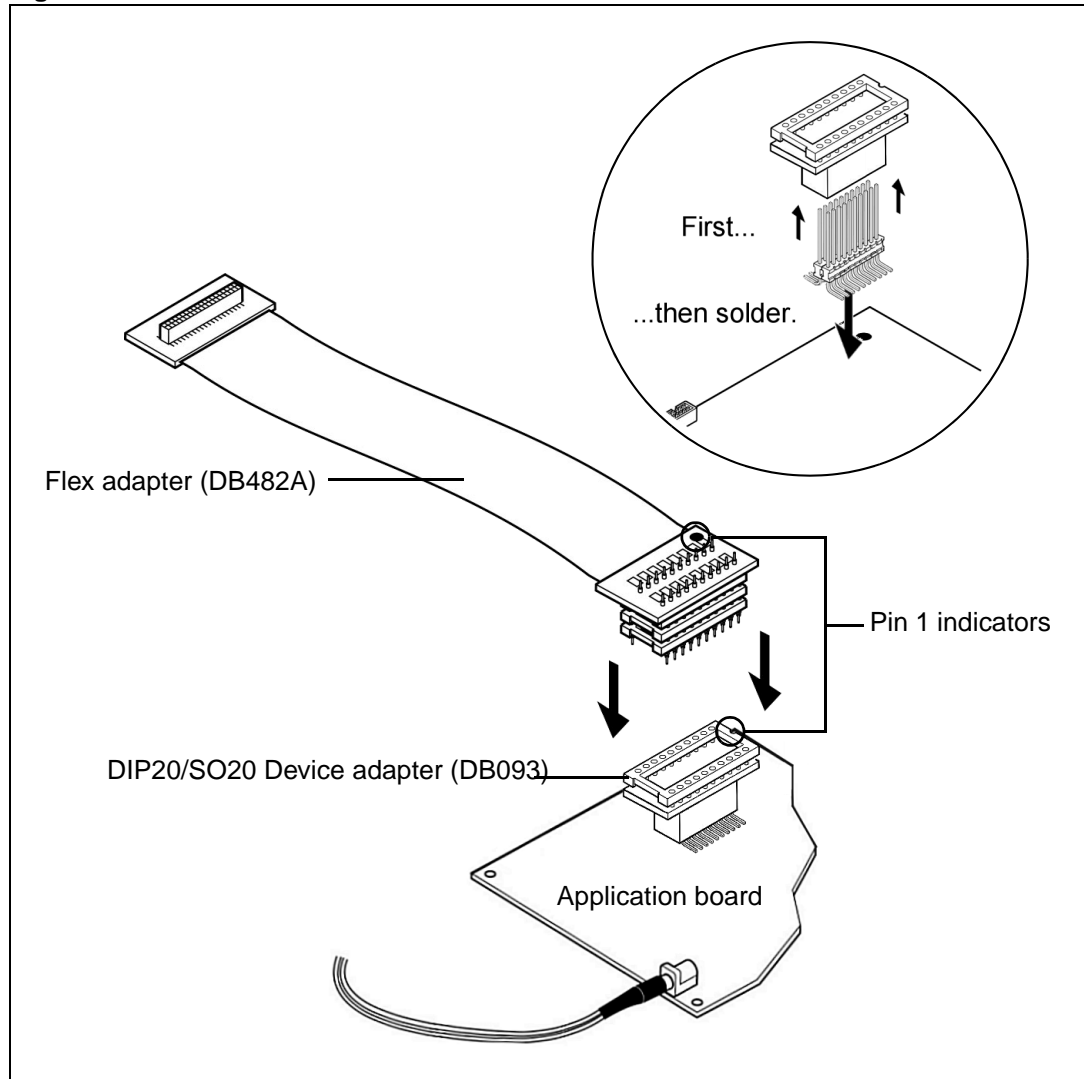
Figure 13. SDIP32 connection
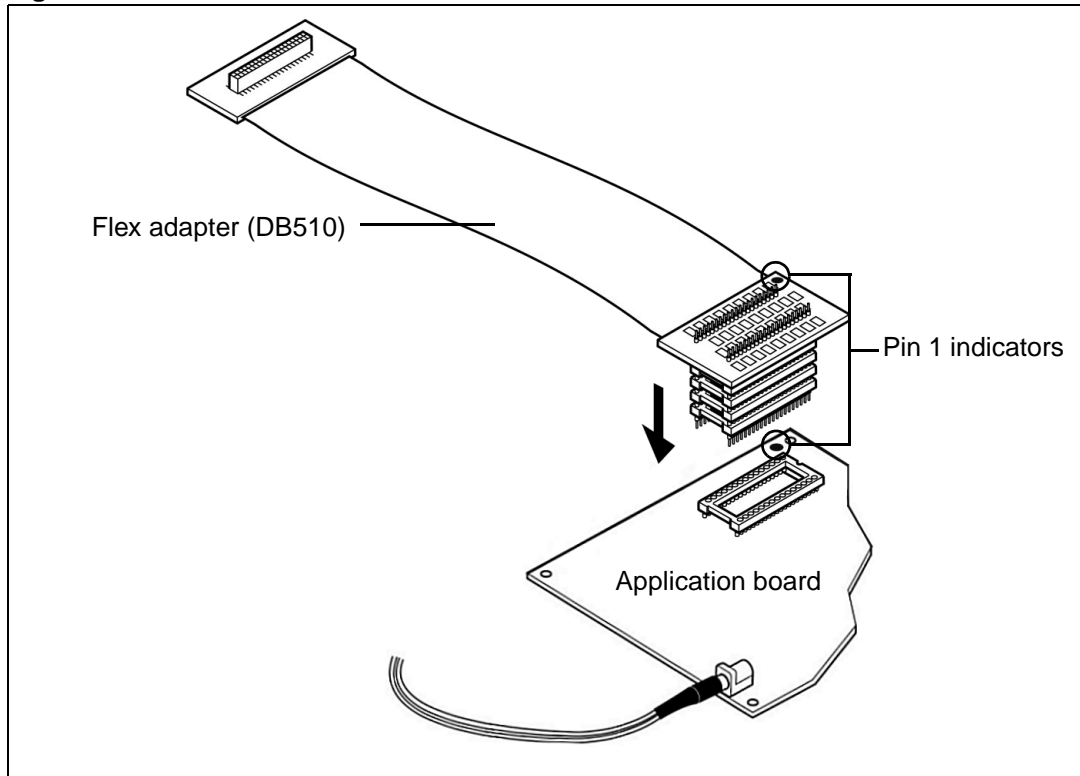
2.10   SO28 microcontroller package

1.   Solder the connection pins for the SDIP32/SO28 device adapter (DB359) onto your
     application board. When soldering, insert the two sets of connection pins into the
     device adapter. The device adapter will serve as a support during soldering and will
     ensure the correct spacing and alignment of the pins (see inset in *Figure 14*).

2.   Align the pin 1 indicators on the SDIP32/SO28 device adapter and the DB510 flex
     adapter. Insert the flex adapter's pins into the SO28 device adapter as shown in
     Figure 14.

Figure 14.   SO28 connection
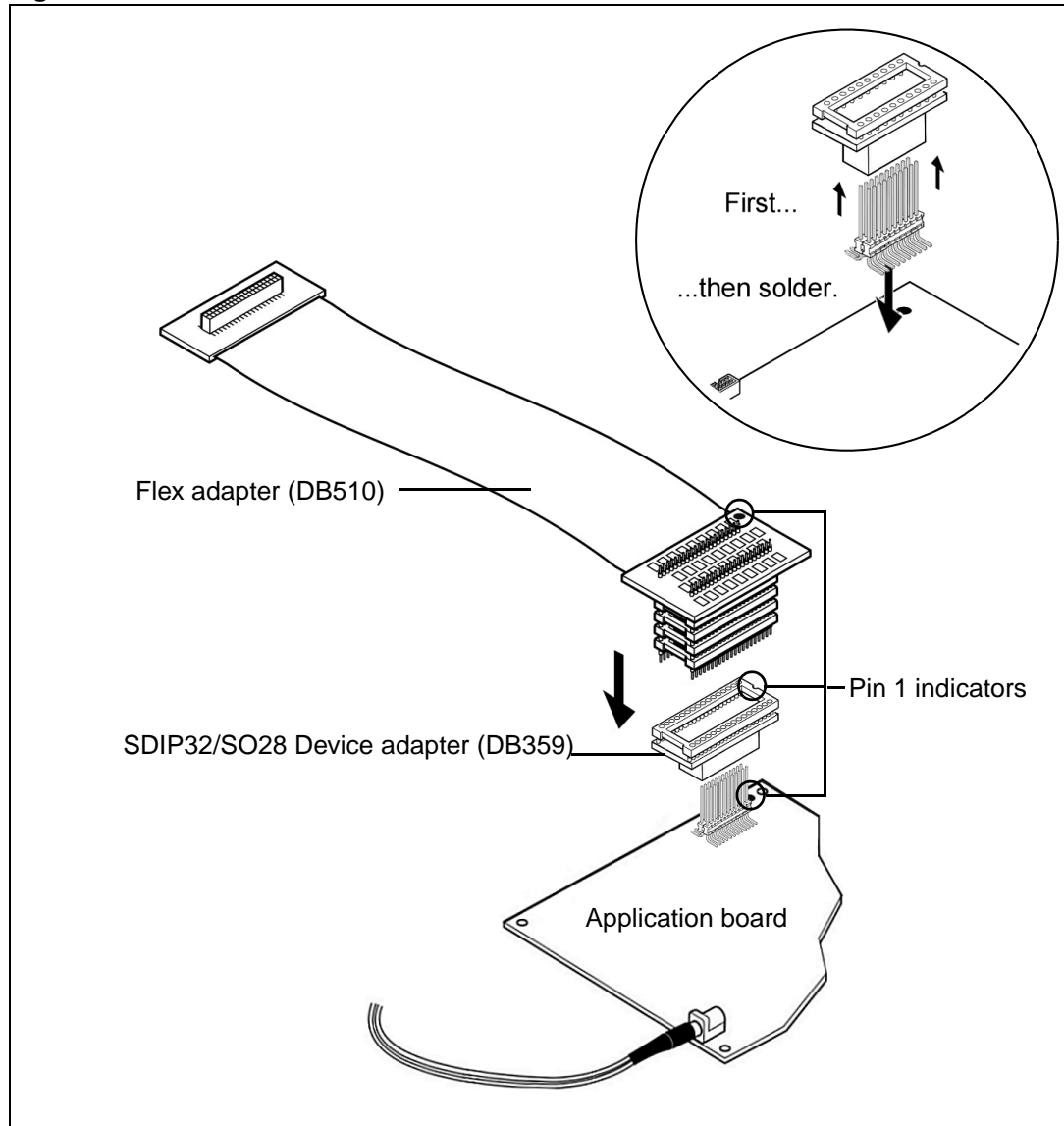
3 Emulation Characteristics

3.1 On-chip peripheral configuration

You can configure certain on-chip peripherals in ST7 Visual Develop's **MCU Configuration** dialog box so that the ST7-EMU3 probe accurately emulates your target device.

The on-chip peripheral options available for configuration for the ST7MDT10-TEB are described in this section.

MCU

In STVD7's **MCU Selection** window, choose the MCU that you are using in your application. A complete and up-to-date listing of supported MCUs for your ST7-EMU3 emulator is provided in the current version of the *STVD7 Release Notes*.

Clock

The clock frequency options are summarized in *Table 3* below.

Table 3.   Clock frequency options

Emulated MCU	Clock name and type	Frequency options
ST7226x	f_{OSC} On-probe fixed frequency divided	125 kHz 250 kHz 500 kHz 1 MHz 2 MHz 4 MHz 8 MHz 16 MHz
	Other_freq_kHz This option allows you to program the frequency of **f_{OSC}** on an on-probe programmable clock system. (See *Other_freq_kHz* below.)	
ST7LITEx ST7DALI	f_{CPU} On-probe fixed frequency divided	62.5 kHz 125 kHz 250 kHz 500 kHz 1 MHz 2 MHz 4 MHz 8 MHz
	Other_freq_kHz This option allows you to program the frequency of **f_{CPU}** on an on-probe programmable clock system. (See *Other_freq_kHz* below.)	

Other_freq_kHz

This option allows you to enter the f_{OSC} or f_{CPU} value in kHz, that will be generated by the Programmable Clock system on probe. When the entered f_{OSC} or f_{CPU} cannot be generated, a warning message will be displayed giving the two nearest values that the Programmable Clock system is able to generate. The user will have to retype the correct value.

Watchdog

This option allows you to choose whether the watchdog timer is enabled by software or by hardware.

Refer to the datasheet of your target ST7 MCU for more information on the watchdog timer.

Watchdog halt

There are two options: *Reset* or *No Reset*. If this option is set to Reset, when the Watchdog is enabled and a Halt instruction is encountered in the executable code, a chip reset will be performed. If this option is set to No Reset, no chip reset will be performed.

EXT_IT

This option bit allows the Port C external interrupt mapping to be configured as ei0 or ei1.

Table 4. EXT_IT option bit mapping

ei0	ei1	EXT_IT bit value
PA[7:0] Ports	PB[7:0] Ports PC[5:0] Ports	1
PA[7:0] Ports PC[5:0] Ports	PB[7:0] Ports	0

3.2 Hardware simulation

The ST7MDT10-EMU3 emulator has a hardware simulation function that allows you to simulate the reaction of the target MCU under certain circumstances. This feature can only be accessed when your emulator is not running.

To access the hardware simulation function, select **Debug Instrument > Hardware Simulation** from STVD7's main menu bar.

Note: *The list of Simulation commands may vary according to the selected microcontroller.*

Figure 15. Hardware simulation window
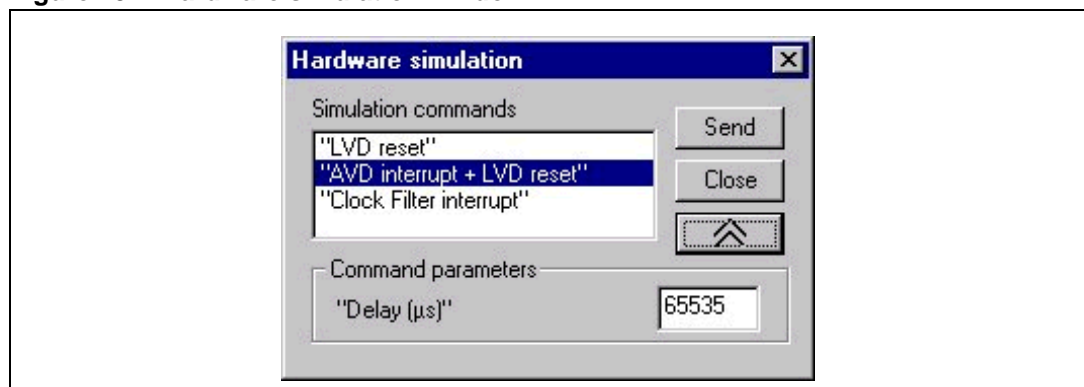
Table 5 shows the Hardware Simulations that are available, depending on the target MCU that you have chosen in the MCU Configuration window.

Table 5. **Hardware simulation functions by target MCU**

Target MCU	Hardware simulations available
ST7226x	LVD Reset AVD Interrupt + LVD Reset Clock Filter Interrupt
ST7LITEx ST7DALI	LVD Reset AVD Interrupt + LVD Reset

The simulation scenarios that you may choose in the Hardware Simulation window are:

● **LVD (Low Voltage Detector) Reset**: When this simulation is chosen, a chip reset is generated immediately, as if low voltage had been detected by the emulator. The reset generated typically lasts 30 µs.

● **AVD (Auxiliary Voltage Detector) Interrupt + LVD Reset**: When this simulation is chosen, an interrupt occurs immediately and lasts for a configurable duration. Once the duration of the interrupt is over, a chip reset occurs (lasting 30 µs typically), and immediately afterwards, another interrupt of the same configured duration occurs. To configure the duration of the two interrupts, click on the downward arrow button, and type in the duration in µs in the *Delay* field.
This simulation scenario allows you to simulate a power-down of the chip (first interrupt), followed by a reset, and a power-up of the chip (2nd interrupt). By varying the duration of the interrupts preceding and following the chip reset, you can simulate different rates of powering down and up.

● **Clock Filter Interrupt**: This feature is available with only certain target MCUs—see *Table 5*. When this simulation is chosen, an interrupt occurs immediately, of configurable duration. Once the interrupt is over, the program continues running. To configure the duration of the interrupts, click on the downward arrow button, and type in the duration in µs in the *Delay* field.

In the Hardware Simulation window, choose the scenario you wish to simulate on the emulator, and enter the duration of the interrupts (if applicable). Click **Send** to begin the simulation.

3.3 Emulator electrical characteristics

This section details the specific electrical characteristics of the ST7MDT10-EMU3 emulator.

3.3.1 I/O port electrical characteristics

The values shown in *Table 6* are the specified values for the I/O port in pull up mode (at 25°C).

Table 6.   Values for I/O port in pull up mode

Parameter Symbol and Description		Test Conditions		Value in Volts (V)		
	V_{CC} (V)			Min.	Typ.	Max.
V_{IH} **High level input voltage**	2.0			1.5	--	--
	4.5			3.15	--	--
	6.0			4.2	--	--
V_{IL} **Low level input voltage**	2.0			--	--	0.5
	4.5			--	--	1.35
	6.0			--	--	1.8
V_{OH} **High level output voltage**	2.0	$V_I = V_{IH}$ or V_{IL}	I_O = -20 µA	1.9	2.0	--
	4.5			4.4	4.5	--
	6.0			5.9	6.0	--
	4.5		I_O = -6.0 mA	4.18	4.31	--
	6.0		I_O = -7.8 mA	5.68	5.8	--
V_{OL} **Low level output voltage**	2.0	$V_I = V_{IH}$ or V_{IL}	I_O = 20 µA	--	0.0	0.1
	4.5			--	0.0	0.1
	6.0			--	0.0	0.1
	4.5		I_O = 6.0 mA	--	0.17	0.26
	6.0		I_O = 7.8 mA	--	0.18	0.26

The values shown in *Table 7* are the specified values for the I/O port in true open drain mode (at 25°C).

Table 7.   Values for I/O port in true open drain mode

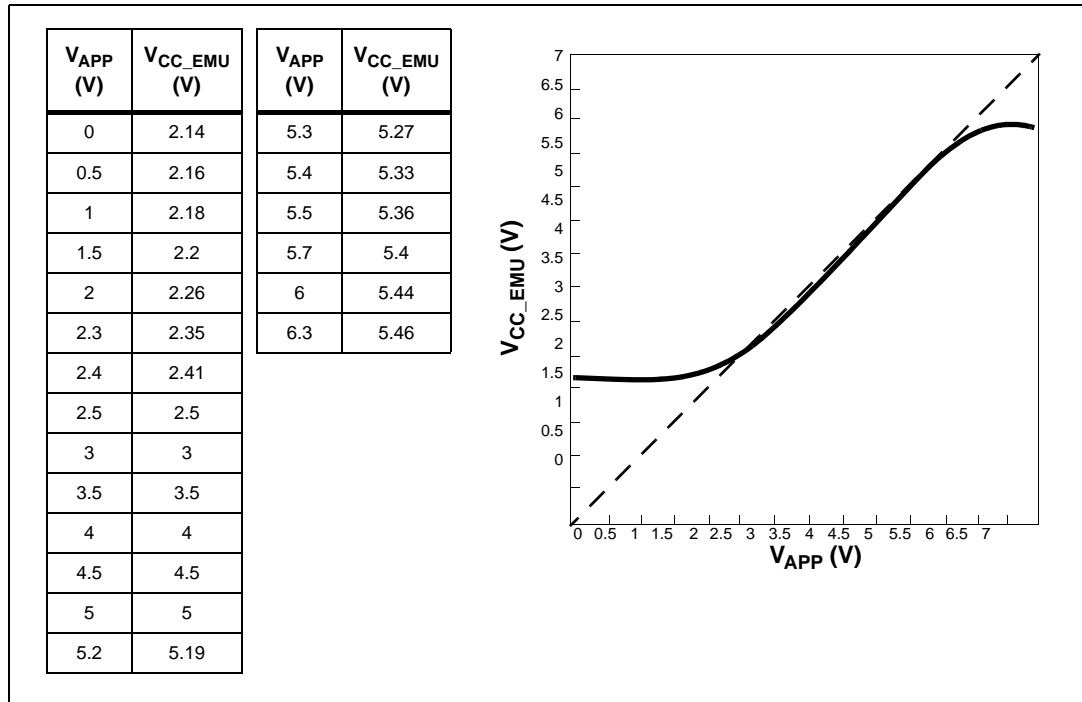| Parameter Symbol and Description		Test Conditions		Value in Volts (V)		
		V_{CC} (V)		Min.	Typ.	Max.
V_{IH}	High level input voltage	2.0		1.5	--	--
		4.5		3.15	--	--
		6.0		4.2	--	--
V_{IL}	Low level input voltage	2.0		--	--	0.5
		4.5		--	--	1.35
		6.0		--	--	1.8
V_{OH}	High level output voltage	2.0		1.9	2.0	--
		4.5	I_O = -20 µA	4.4	4.5	--
		6.0		5.9	6.0	--
		4.5	I_O = -4.0 mA	4.18	4.31	--
		6.0	I_O = -5.2 mA	5.68	5.8	--
V_{OL}	Low level output voltage	2.0		--	0.0	0.1
		4.5	I_O = 20 µA	--	0.0	0.1
		6.0		--	0.0	0.1
		4.5	I_O = 4.0 mA	--	0.17	0.26
		6.0	I_O = 5.2 mA	--	0.18	0.26

3.3.2 Power follower characteristics

The application power supply follower converts the application voltage V_{APP} to a voltage within the range of 2.4 V and 5.5 V.

The curve plotted on the graph below shows how the value of V_{CC_EMU} evolves with the value of V_{APP}

Note: *This curve this not necessarily characteristic of all emulators—it is based on measurements taken using a single emulator. Slight differences may occur between emulators.*

Figure 16. Power follower behavior

V_{APP} (V)	V_{CC_EMU} (V)	V_{APP} (V)	V_{CC_EMU} (V)
0	2.14	5.3	5.27
0.5	2.16	5.4	5.33
1	2.18	5.5	5.36
1.5	2.2	5.7	5.4
2	2.26	6	5.44
2.3	2.35	6.3	5.46
2.4	2.41		
2.5	2.5		
3	3		
3.5	3.5		
4	4		
4.5	4.5		
5	5		
5.2	5.19		

Caution: Because the V_{REF} used by the ADC function is V_{CC_EMU}, and the V_{CC_EMU} value only coincides with the actual V_{APP} value when V_{APP} is between 2.5 to 5 V (refer to *Figure 16*), the ADC conversion will be erroneous when V_{APP} is outside of the 2.5 to 5 V range.

3.4 Emulation functional limitations and discrepancies

Some MCU's may present specific limitations and discrepancies. You will find information specific to your MCU and your hardware configuration in STVD7's **Discrepancies window**. For more information refer to the *STVD7 User Manual*

3.4.1 Limitations

●   The Flash status control register is not emulated; flash memory is replaced by ROM on the emulator. Therefore, read/write access has been blocked at the FCSR address, to avoid misinterpretation of the contents of this address. If you attempt a read/write access the Flash Control/Status Register (FCSR), your program will stop running (the equivalent of a breakpoint) and an "access denied" message will appear. If this occurs, click **Continue** to continue running your program.
To avoid interruptions in the running of your program on the emulator, it is advisable to temporarily comment out any read or write accesses to the FCSR.

●   For the **ST7DALI** and all targets in the **ST7LITE2** family, the **AMPCAL** bit (bit 4) of the AMP CONTROL/DATA REGISTER LOW (ADCDRL) register (part of the ADC peripheral) can be set in STVD7 but will have no effect in emulation (this functionality is not emulated).

3.4.2 Discrepancies

●   When emulating the **ADC** peripheral on all supported microcontrollers, a stabilization time of 20 μs is required after changing the channel or starting a conversion.

●   For the **ST7DALI** and all targets in the **ST7LITE2** family, stabilization time is required when changing the Amplifier Control bit **AMPON**:

–   300 μs is needed to stabilize the ADC system when setting this bit,

–   800 μs is needed to stabilize the ADC system when clearing this bit.

4 In-circuit debugging connection with ICD adapter

This chapter describes the configuration and connection of the ICD adapter to your application board for in-circuit debugging (ICD) of ST7FLITEUS and ST7FLITEU0 microcontrollers. Complete instructions for setting up your ST7-EMU3 series emulator for ICD are found in the **ST7-EMU3 Emulator User Manual**.

Note: *The emulator comes with both ST7FLITEUS and ST7FLITEU0 devices in DIP16 package to allow debugging of applications developed for either microcontroller. Ensure that the device on the adapter corresponds to the target device for your application.*

4.1 In-circuit debugging

ICD On jumper (TP1)

When in-circuit debugging the target application via the 10-pin ICC connection, the **ICD On** jumper (TP1) must be fitted to allow the interface with an in-circuit debugging tool and the host PC. During in-circuit debugging, the *RST/PA3 On* jumper (TP2) must not be fitted.

**Figure 17. ICD On jumper (TP1)**
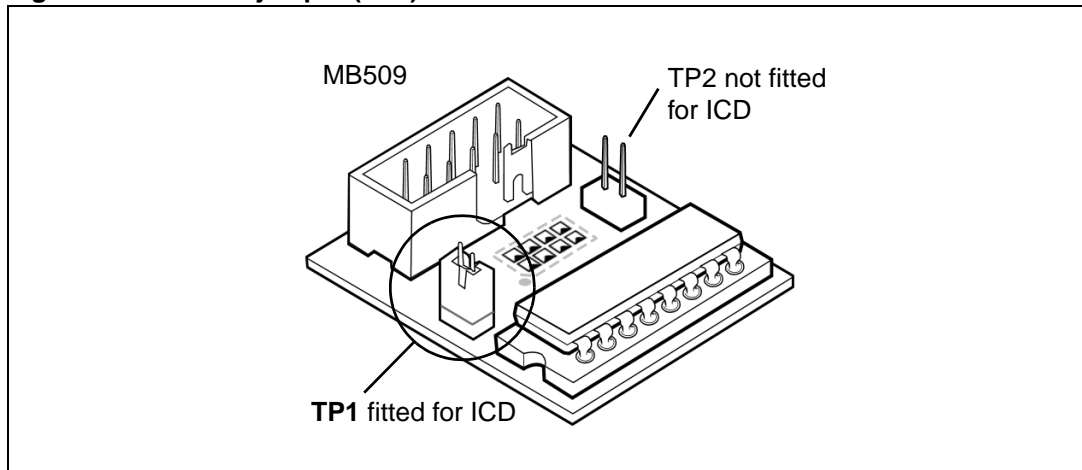
To set the **ICD On** jumper (TP1):

1. Make sure the in-circuit debugging tool and the application are powered off.
2. Place the jumper on **TP1** as shown in *Figure 17*.
3. Connect to and power on the in-circuit debugging tool and application board.

Refer to the on-line help of your integrated development environment/debugging software for further information about in-circuit programming and debugging the microcontroller on the ICD adapter.

CLKIN solder point (G2)

Your in-circuit debugging tool can provide the clock signal for initiating in-circuit communication with the microcontroller on the ICD adapter. To do this, you must complete the connection with a drop of solder on the **CLKIN** solder point (G2) shown in *Figure 18*.

Figure 18.   CLKIN solder point (G2)
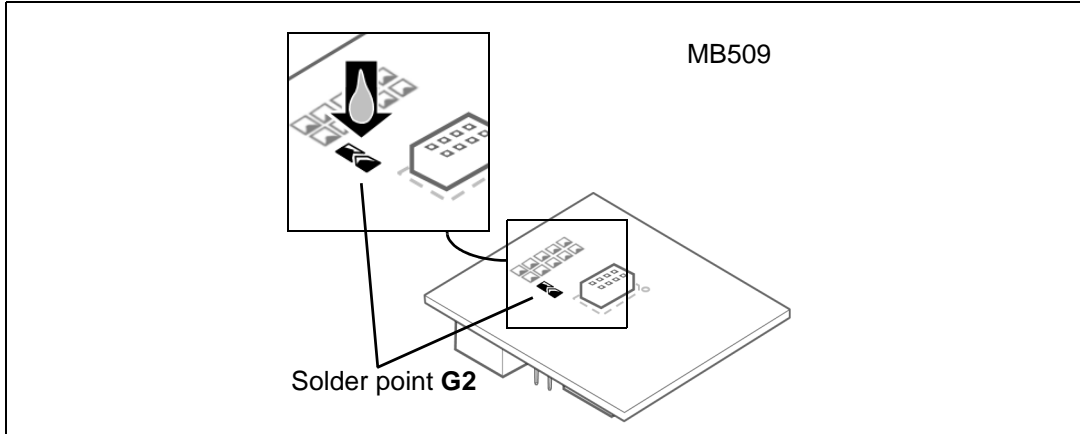
When the solder drop is placed on the CLKIN solder point (G2), pin PA5 is relayed to CLKIN on the ICC connector. PA5 is not available for the application.

When the clock signal is furnished by the in-circuit debugging tool, use the **Option Bytes Disabled** mode to start the in-circuit debugging session. For further information about this mode refer to the online help of your integrated development environment or debugging software.

4.2   Run the application in standalone mode

Once the microcontroller on the ICD adapter has been programmed during an in-circuit debugging or in-circuit programming session, it can run the application in place of the target microcontroller without being connected to an in-circuit debugging tool or the host PC.
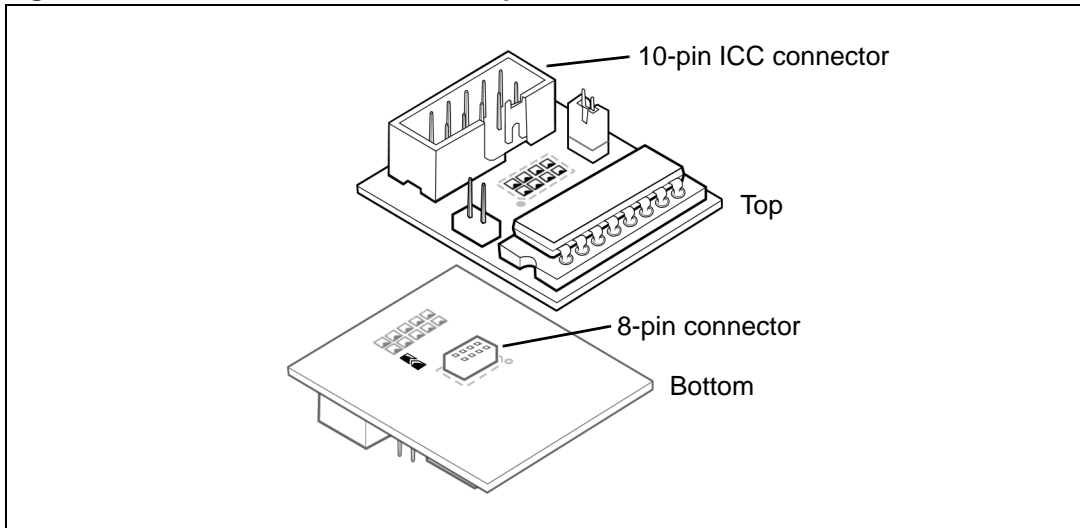
Figure 19.   RST/PA3 On jumper (TP2)
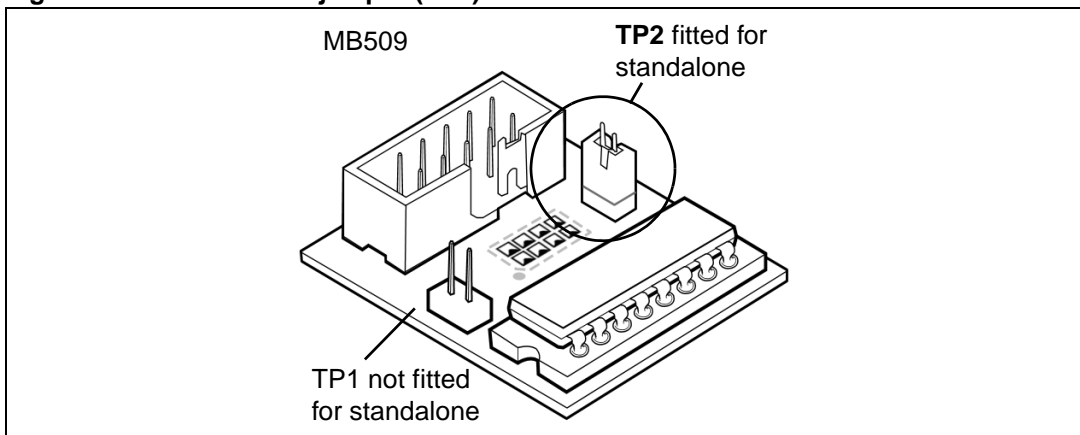
To run the application in standalone mode, the **RST/PA3 On** jumper (TP2) must be fitted and the *ICD On* jumper (TP1) must not be fitted.

4.3   Connecting to the application

Figure 20.   Connectors on the ICD Adapter

The ICD Adapter (MB509) connects to your in-circuit debugging tool via the 10-pin ICC connector on the top of the adapter. It connects to the connector installed on you application board via an 8-pin connector on the bottom of the adapter (see *Figure 20*).

To use the ICD Adapter you will have to solder the appropriate package specific connector to your application board in place of your target ST7FLITEUx microcontroller. *Table 8* shows the connectors available for use with the ICD adapter, which are delivered with your ST7MDT10-EMU3.

Note: *PA3/RESET pin use limitation – during in-circuit debugging, the PA3/RESET pin of the target microcontroller can only be used for reset.*

Table 8.   Target MCU packages and their application connectors

| Package	ICD Adapter	Application board connector(s)
DIP8	MB509	DB646
SO8	MB509	8-pin header
DFN8	MB509	DB715 flexible connector

The following sections show connection illustrations for each supported package type:

● *Section 4.3.1: Connection for DIP8 microcontroller package on page 30*

● *Section 4.3.2: Connection for SO8 microcontroller package on page 31*

● *Section 4.3.3: Connection for DFN8 microcontroller package on page 32*

4.3.1 Connection for DIP8 microcontroller package

1. Solder the DIP8 Device adapter (DB646) onto your application board in place of your microcontroller.

2. Plug the ICC cable from the in-circuit debugging tool into the 10-pin ICC connector on the top of the ICD Adapter (MB509).

3. Align the pin 1 indicator on the ICD Adapter (MB509) with the pin 1 indicator for the DIP8 Device adapter on your application board and insert the pins into the 8-pin connector on the bottom of the ICD Adapter.
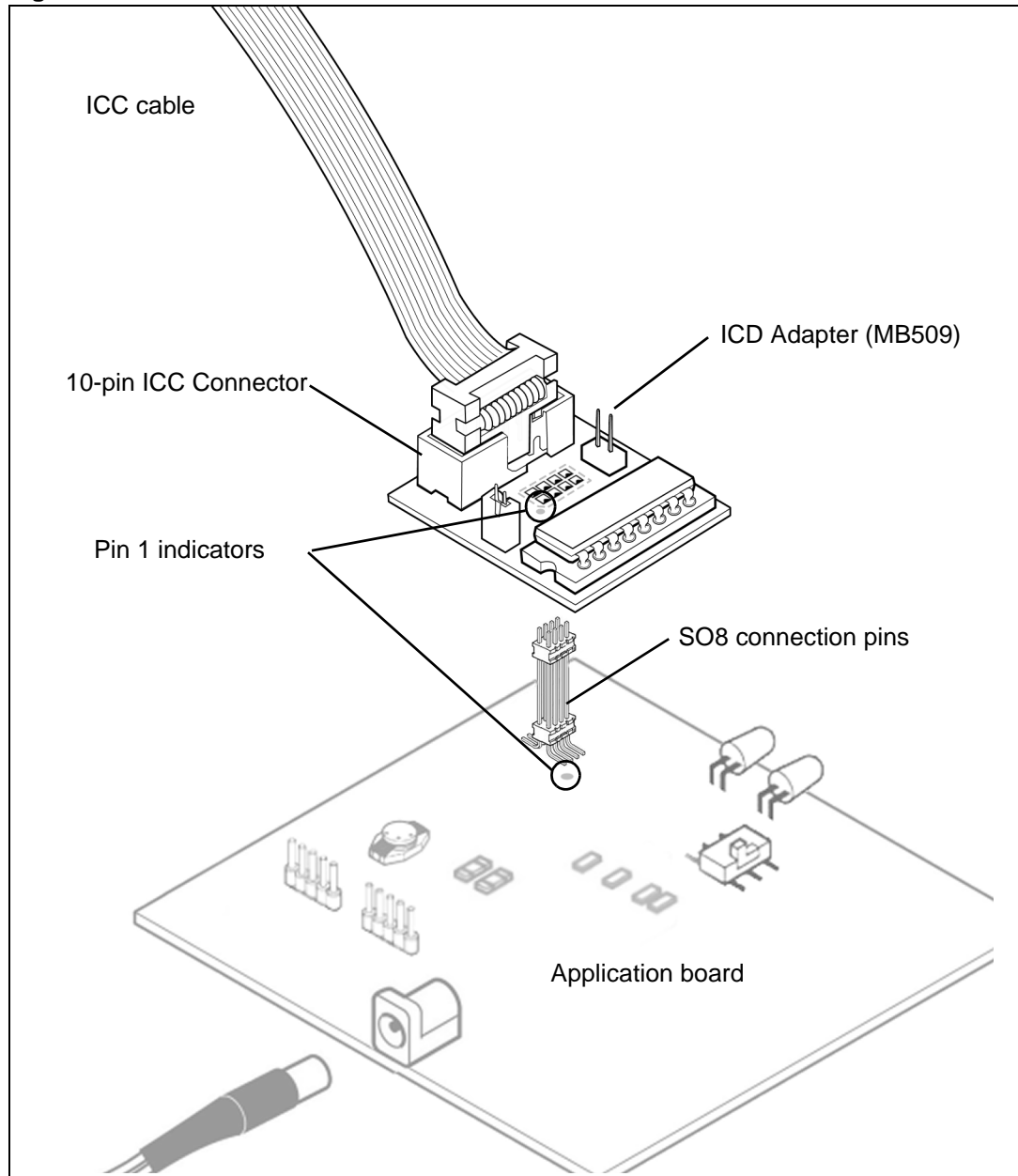
Figure 21. DIP8 connection
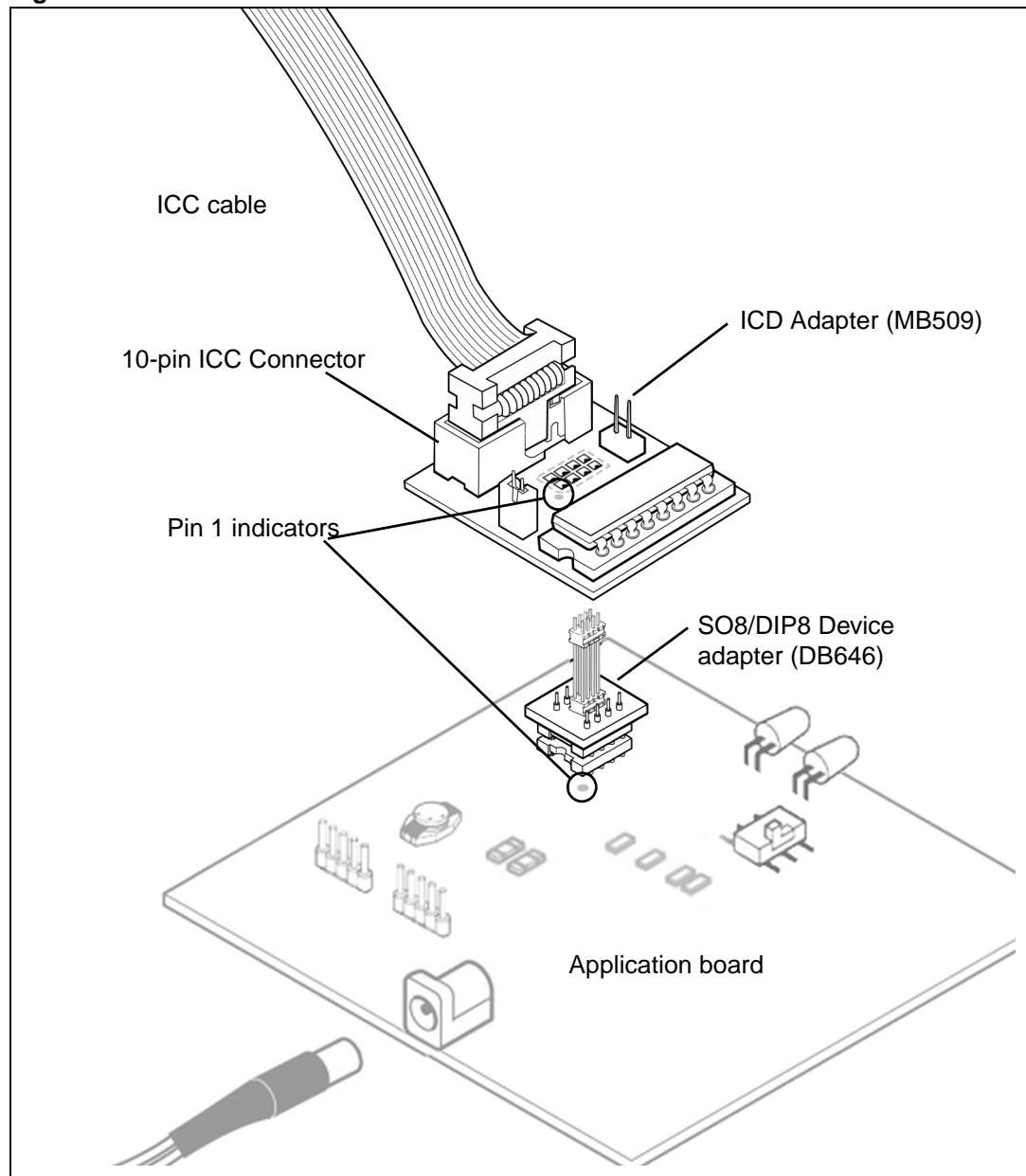
4.3.2 Connection for SO8 microcontroller package

1. Solder the SO8 connector (8-pin header) onto your application board in place of your microcontroller.
2. Plug the ICC cable from the in-circuit debugging tool into the 10-pin ICC connector on the top of the ICD Adapter (MB509).
3. Align the pin 1 indicator on the ICD Adapter (MB509) with the pin 1 indicator for the SO8 connector on your application board and insert the pins into the 8-pin connector on the bottom of the ICD Adapter.

Figure 22. SO8 connection

4.3.3 Connection for DFN8 microcontroller package

1. Solder the DFN8 female connector onto your application board in place of your microcontroller.

2. Plug the ICC cable from the in-circuit debugging tool into the 10-pin ICC connector on the top of the ICD Adapter (MB509).

3. Plug the 8 pins of the DFN8 Device adapter (DB715) into the 8-pin connector on the bottom of the ICD Adapter (MB509).

4. Connect the DFN8 Device adapter (DB715) to the DFN female connector on your application board using the DFN male-male connector. Because of the position of the GND pin on these connectors, there is only one way to connect them together (see detail in *Figure 23*).

Figure 23. DFN8 connection
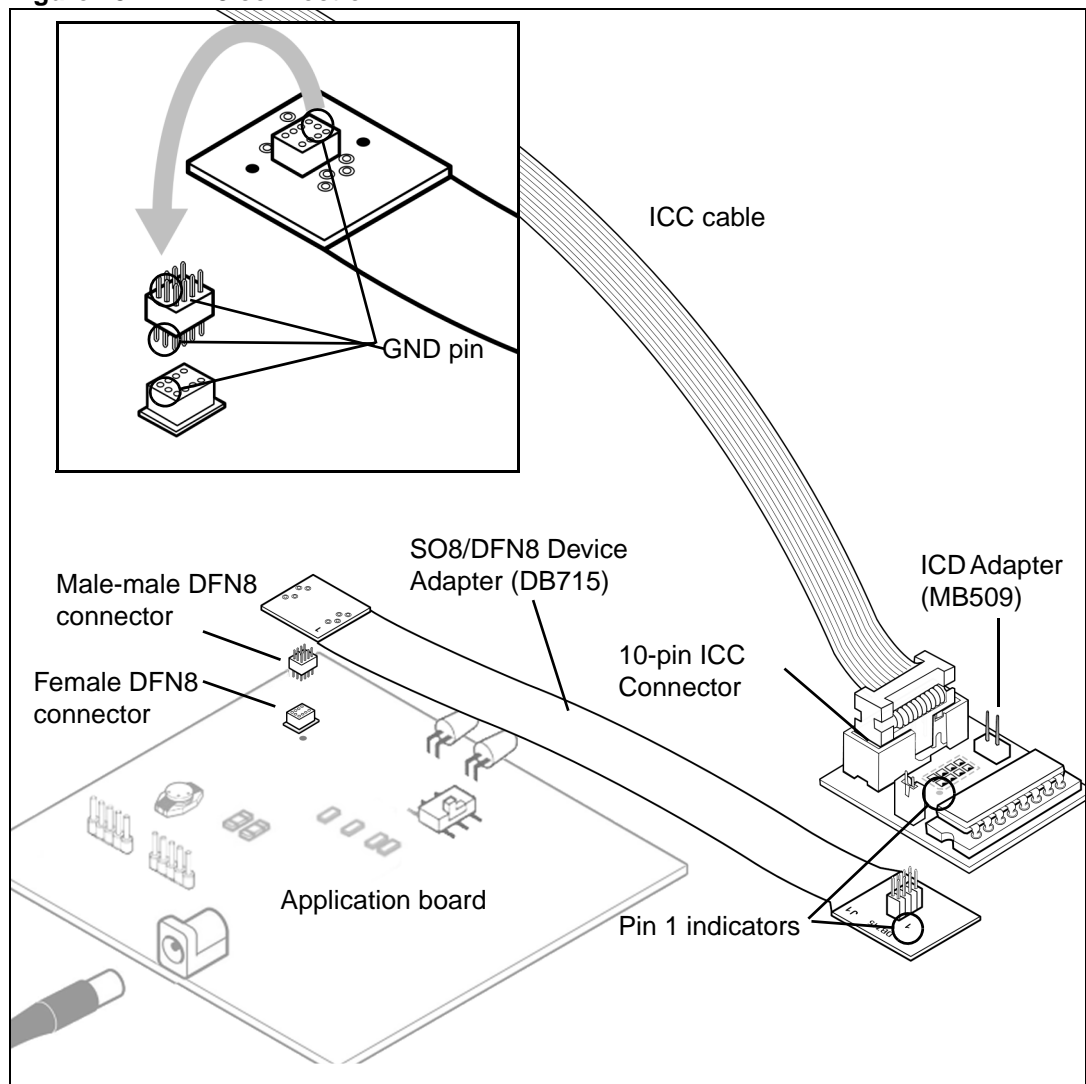
Appendix A   EMC conformity and safety requirements

This product respects the EMC requirements of the European guideline 89/336/EEC under the following conditions:

● Any tester, equipment, or tool used at any production step, or for any manipulation of semiconductor devices, must have its shield connected to ground.

● All provided ferrites must be attached as described in the hardware installation instructions of the relevant user manual.

● The product must be placed on a conductive table top, made of steel or clean aluminum, or covered by an antistatic surface (superficial resistivity equal to or higher than 0.5 MΩ/cm^2), grounded through a ground cable (conductive cable from protected equipment to ground isolated with a 1 MΩ resistor placed in series). Before every contact with the emulator, the operator must touch the surface of the grounded worktable just behind the rear panel of the emulator. All manipulation of finished goods must be done at such a grounded worktable.

● The worktable must be free of all non-antistatic plastic objects.

● An antistatic floor covering grounded through a conductive ground cable (with serial resistor between 0.9 and 1.5 MΩ) should be used.

● It is recommended that you wear an antistatic wrist or ankle strap, connected to the antistatic floor covering or to the grounded equipment.

● If no antistatic wrist or ankle strap is worn, before each manipulation of the powered-on tool, you must touch the surface of the grounded worktable just behind the rear panel of the emulator.

● It is recommended that antistatic gloves or finger coats be worn.

● It is recommended that nylon clothing be avoided while performing any manipulation of parts.

Appendix B   Changing the TEB in your ST7-EMU3 probe

Each EMU3 probe has a modular design that is made up of three emulation boards. Two boards, the Common Emulation Board (CEB) and the Dedicated Emulation Board (DEB) are identical for all ST7-EMU3 probes. However, the third board, the Target Emulation Board (TEB), is specific to an ST7 MCU, or a family of ST7 MCUs. Therefore, what makes each EMU3 probe distinct and defines its emulation capabilities, is the type of TEB it contains.

The EMU3 probe has been designed to work with many different Target Emulation Boards (TEBs). This appendix tells you how to replace the TEB in your EMU3 probe.

1. Turn the EMU3 probe upside-down, unscrew the retaining screw and slide the bottom out as shown in *Figure 3 on page 7*.

2. Remove the two screws that secure the TEB to the rest of the probe boards, as shown in *Figure 24*.

Figure 24.   Removing the TEB screws
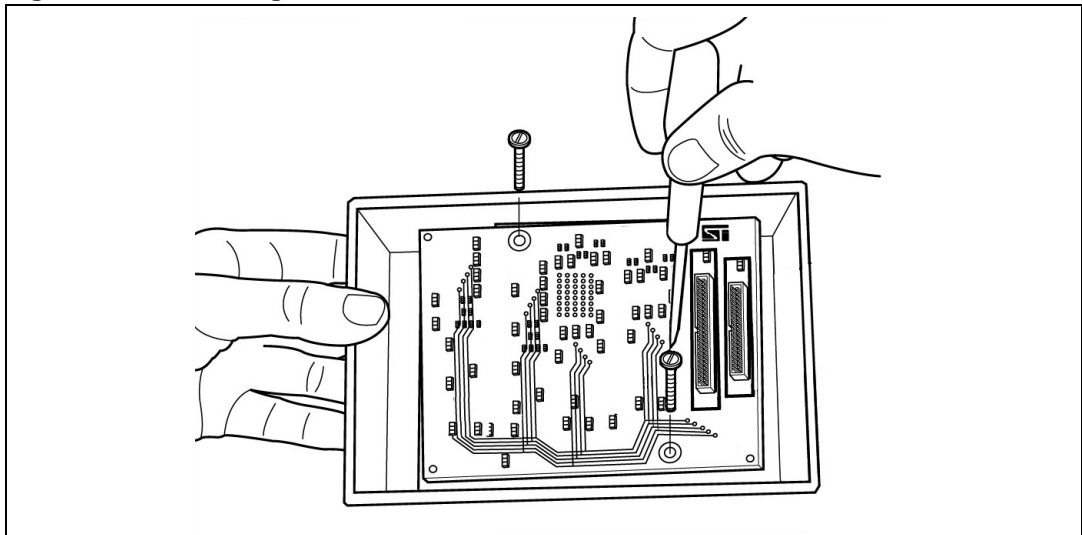
3. Remove the target emulation board that is currently in the probe by gripping the edge of the board and pulling it straight out (see *Figure 25*). Store it somewhere safe and static-free for future use.

Figure 25. Removing the TEB
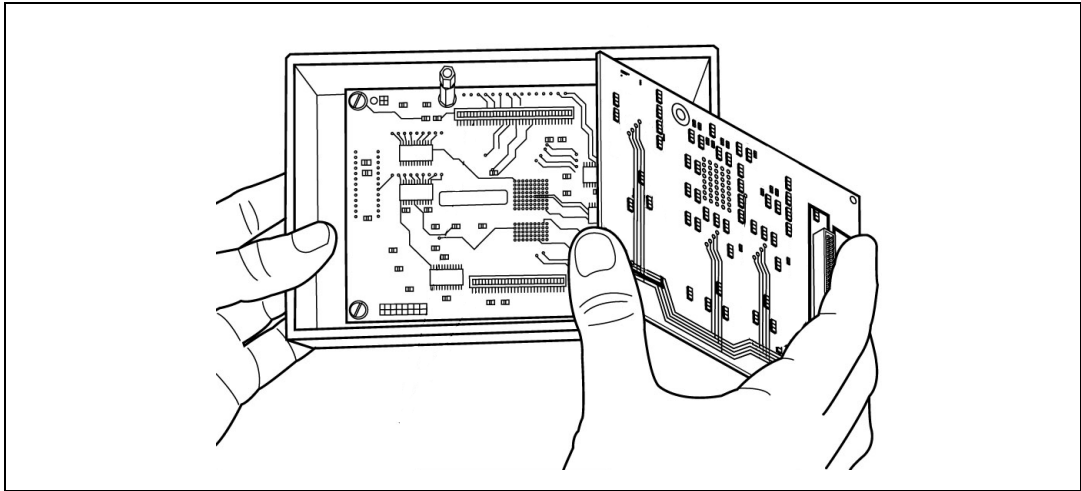
The board under the TEB – the Dedicated Emulation Board (DEB), should now be visible (see *Figure 26*).

4.   Identify the top and bottom faces of the TEB you wish to install. The bottom face is distinguished by the presence of two or more flex cable connectors placed side by side. The top face is distinguishable by two DEB connectors along the long edges of the TEB. There is one 84-pin connector and one 64-pin connector, which match the DEB connectors shown in *Figure 26*.

Figure 26. DEB and TEB connectors
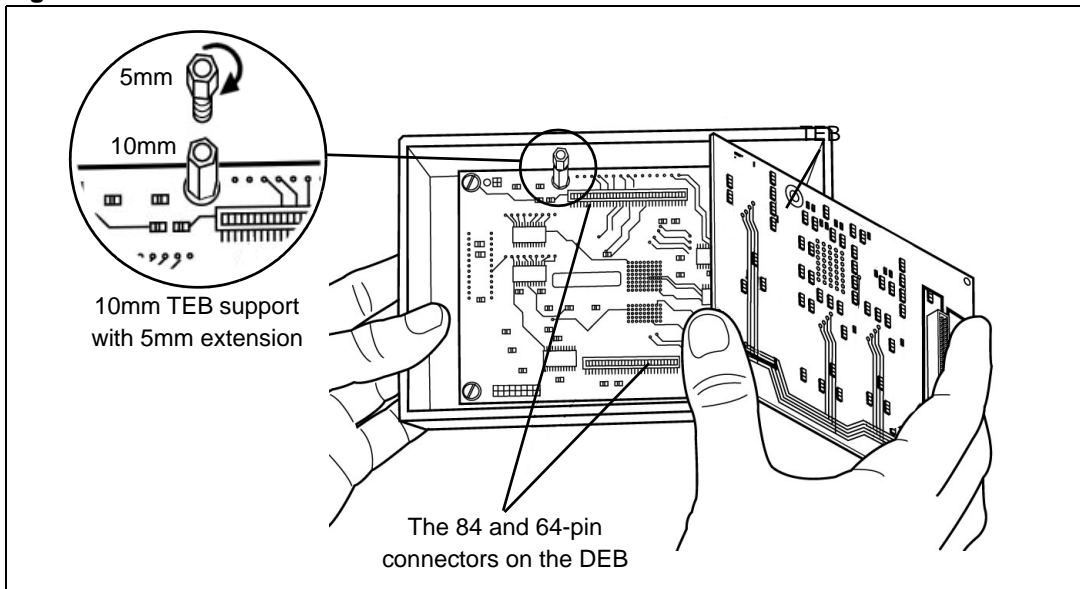
5.   Install the replacement TEB in the EMU3 probe by inserting the male 84-pin/64-pin connectors into the TEB's female 84-pin/64-pin connectors (refer to *Figure 26*). Because the connectors are asymmetric, there is only one possible connection scheme.

Note: *For some TEBs, the microcontroller is mounted on a support and not soldered directly to the board. In this case the TEB's 84-pin and 64-pin connectors have an additional height of 5mm to allow enough room for the microcontroller. To compensate you will need to add a*

5mm extension to the 10mm support on the DEB, as shown in Figure 26. The 5mm extensions are provided with your TEB and screw into the 10mm supports. However, remember that if you install a TEB with surface mounted microcontroller later, you will have to remove the 5mm extensions.

6. Once the TEB is firmly in place, refasten the two screws that fix the TEB to the DEB, as shown in *Figure 15*. Take care not to over-tighten the screws.

7. Connect the appropriate flex cable for your MCU package, as described in *Section 2.1: Connecting the flex adapter to the EMU3 probe on page 7*.

8. Replace the bottom panel of the probe housing such that the flex cable feeds through the slot provided.

9. Reconnect the probe to the ST Micro Connect box by connecting the two 80-pin flat cables to the ST Micro Connect connection ports on the top face of the probe housing. For details, refer to the *ST7 EMU3 Emulator User Manual*.

If this is the first time that you have installed a new TEB in your EMU3 probe, your emulator and probe firmware will be updated automatically by STVD7 when you start a debug session. For more information refer to your *STVD7 User Manual*.

Revision history

Table 9. Document revision history

Date	Revision	Changes
01-August-2001	1	Initial release.
01-November-2001	2	• Updated for new ST7LITE devices • Updated Product Support – with spare parts information
01-January-2002	2.1	• Updated Section 4 – clock frequency options • Updated Product Support – getting support procedure
01-July-2002	2.2	• Added Section 3.2 - Section 3.7 – connection information for supported packages
01-November-2002	2.3	• Updated Section 4.4 – limitations and discrepancies
01-May-2005	3	• Added Figure 1 – EMU3 terminology and product structure • Updated Section 1 – product terminology and description and supported MCU families • Updated illustrations in Section 3.2 - Section 3.7 – with pin 1 indicators • Updated Section 4.3 – removed MCU specific characteristics • Updated Section 4.4 – with STVD7 Discrepancies window information • Updated Appendix B – changing the TEB • Removed Firmware update procedure • Added Appendix C – revision history
31-July-2006	4	• Updated *Introduction* – for ST7LITEUS microcontroller • Updated *Section 1* – with connection accessories for DIP8, SO8 and DFN8 packages • Updated *Table 1* – with accessories and connection information for DIP8, SO_ and DFN8 packages • Added *Section 2.4*, *Section 2.5* and *Section 2.6* with connection illustration and instructions for SO8, DIP8 and DFN8 packages • Added *Section 4* with ICD connection instructions for the ICD-AD adapter (MB509)
26-June-2007	5	Updated references to include all ST7FLITEUx part numbers. ST7MDT10-EMU3 orderable part number replaced by ST7-EMU3 root part number in the whole document.
29-June-2007	6	ST7-EMU3 replaced by ST7MDT10-EMU3 when relevant.

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