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# **MOST ToGo Getting Started**

User's Guide

Supporting **MOST**<sup>®</sup> Networks

Media Oriented Systems Transport

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**Preface**

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**NOTICE TO CUSTOMERS**

All documentation becomes dated, and this manual is no exception. Microchip tools and documentation are constantly evolving to meet customer needs, so some actual dialogs and/or tool descriptions may differ from those in this document. Please refer to our web site ([www.microchip.com](http://www.microchip.com)) to obtain the latest documentation available.

Documents are identified with a “DS” number. This number is located on the bottom of each page, in front of the page number. The numbering convention for the DS number is “DSXXXXXA”, where “XXXXX” is the document number and “A” is the revision level of the document.

For the most up-to-date information on Microchip development tools, please visit [www.microchip.com](http://www.microchip.com).

**INTRODUCTION**

This chapter contains general information that will be useful to know before using the MOST ToGo Getting Started User’s Guide. Items discussed in this chapter include:

- Notice to Customers
- Introduction
- Document Layout
- Conventions Used in this Guide
- Warranty Registration
- The Microchip Website
- Customer Change Notification Service
- Customer Support
- Recommended Reading
- Document Revision History

**DOCUMENT LAYOUT**

This Specification describes how to use the *MOST ToGo Evaluation Kit*. The document is organized as follows:

- [Chapter 1. “MOST ToGo Evaluation Kit Overview” on page 7](#)
- [Chapter 2. “MOST50 ePhy MOST ToGo Kit Basic Setup” on page 10](#)
- [Chapter 3. “MOST150 cPhy MOST ToGo Kit Basic Setup” on page 14](#)
- [Chapter 4. “Menu/Display and Exercises” on page 18](#)
- [Chapter 5. “Debug Output” on page 24](#)
- [Chapter 6. “Installing MOST ToGo Application Firmware” on page 26](#)
- [Appendix A: “Connecting the Flex Cable” on page 33](#)

# MOST ToGo Getting Started

## CONVENTIONS USED IN THIS GUIDE

Within this manual, the following abbreviations and symbols are used to improve readability.

Example	Description
<b>BIT</b>	Name of a single bit within a field
<b>FIELD.BIT</b>	Name of a single bit (BIT) in FIELD
x...y	Range from x to y, inclusive
<b>BITS[m:n]</b>	Groups of bits from m to n, inclusive
<b>PIN</b>	Pin Name
<b>SIGNAL</b>	Signal Name
msb, lsb	Most significant bit, least significant bit
<b>MSB, LSB</b>	Most significant byte, least significant byte
zzzzb	Binary number (value zzzz)
0zzzz	Hexadecimal number (value zzz)
zzh	Hexadecimal number (value zz)
rsvd	Reserved memory location. Must write 0, read value indeterminate
code	Instruction code, or API function or parameter
<i>Multi Word Name</i>	Used for multiple words that are considered a single unit, such as: <i>Resource Allocate message, or Connection Label, or Decrement Stack Pointer instruction.</i>
<i>Section Name</i>	Emphasis, Reference, Section or Document name.
$\overline{\text{VAL}}$	Over-bar indicates active low pin or register bit
x	Don't care
<Parameter>	<> indicate a Parameter is optional or is only used under some conditions
{,Parameter}	Braces indicate Parameter(s) that repeat one or more times.
[Parameter]	Brackets indicate a nested Parameter. This Parameter is not real and actually decodes into one or more real parameters.

## WARRANTY REGISTRATION

Please complete and mail the Warranty Registration Card that was enclosed with the development board. Sending in the registration card entitles you to receive new product updates. Interim software releases are available at the Microchip web site.

## THE MICROCHIP WEBSITE

Microchip provides online support via our WWW site at [www.microchip.com](http://www.microchip.com). This web site is used as a means to make files and information easily available to customers. Accessible by using your favorite Internet browser, the web site contains the following information:

- **Product Support** – Data sheets and errata, application notes and sample programs, design resources, user's guides and hardware support documents, latest software releases and archived software
- **General Technical Support** – Frequently Asked Questions (FAQ), technical support requests, online discussion groups, Microchip consultant program member listing
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- Distributor or Representative
- Local Sales Office
- Field Application Engineer (FAE)
- Technical Support

Customers should contact their distributor, representative or Field Application Engineer (FAE) for support. Local sales offices are also available to help customers. A listing of sales offices and locations is included in the back of this document.

Technical support is available through the web site at: <http://microchip.com/support>

# MOST ToGo Getting Started

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## RECOMMENDED READING

This user's guide describes how to use the *MOST ToGo Evaluation Kit* and references the following documents as recommended and supplemental resources.

Documents listed below and referenced within this publication are current as of the release of this publication and may have been reissued with more current information. To obtain the latest releases of Microchip documentation please visit the Microchip website. Please note, some Microchip documentation may require approval. Contact information can be found at [www.microchip.com](http://www.microchip.com).

All non-Microchip documentation should be retrieved from the applicable website locations listed below. Microchip is not responsible for the update, maintenance or distribution of non-Microchip documentation.

Because the Internet is a constantly changing environment, all Internet links mentioned below and throughout this document are subject to change without notice.

- [1] MOST ToGo Architecture and Implementation User's Guide  
DS60001272. Microchip. [www.microchip.com](http://www.microchip.com).
- [2] MOST ToGo Basic Function Catalog  
Microchip. [www.microchip.com](http://www.microchip.com).
- [3] MOST ToGo System Hardware Principles Specification  
DS20005241. Microchip. [www.microchip.com](http://www.microchip.com).
- [4] OS81092 ePhy Evaluation Board User's Guide  
DS60001239. Microchip. [www.microchip.com](http://www.microchip.com).
- [5] OS81110 cPhy Evaluation Board User's Guide  
DS60001267. Microchip. [www.microchip.com](http://www.microchip.com).
- [6] Port Message Viewer v6+ User's Guide  
DS60001219. Microchip. [www.microchip.com](http://www.microchip.com).
- [7] PIC32 Bootloader Application Note (AN1388)  
DS01388. Microchip. [www.microchip.com](http://www.microchip.com).
- [8] INIC Hardware Concepts  
DS60001264. Microchip. [www.microchip.com](http://www.microchip.com).
- [9] MOST ToGo Code Documentation  
Microchip. [www.microchip.com](http://www.microchip.com).
- [10] MOST Specification 3.0  
MOST Cooperation. [www.mostcooperation.com](http://www.mostcooperation.com).

## DOCUMENT REVISION HISTORY

The most extensive and pertinent application changes are listed in Table 1, although various other differences may be observed between document revisions.

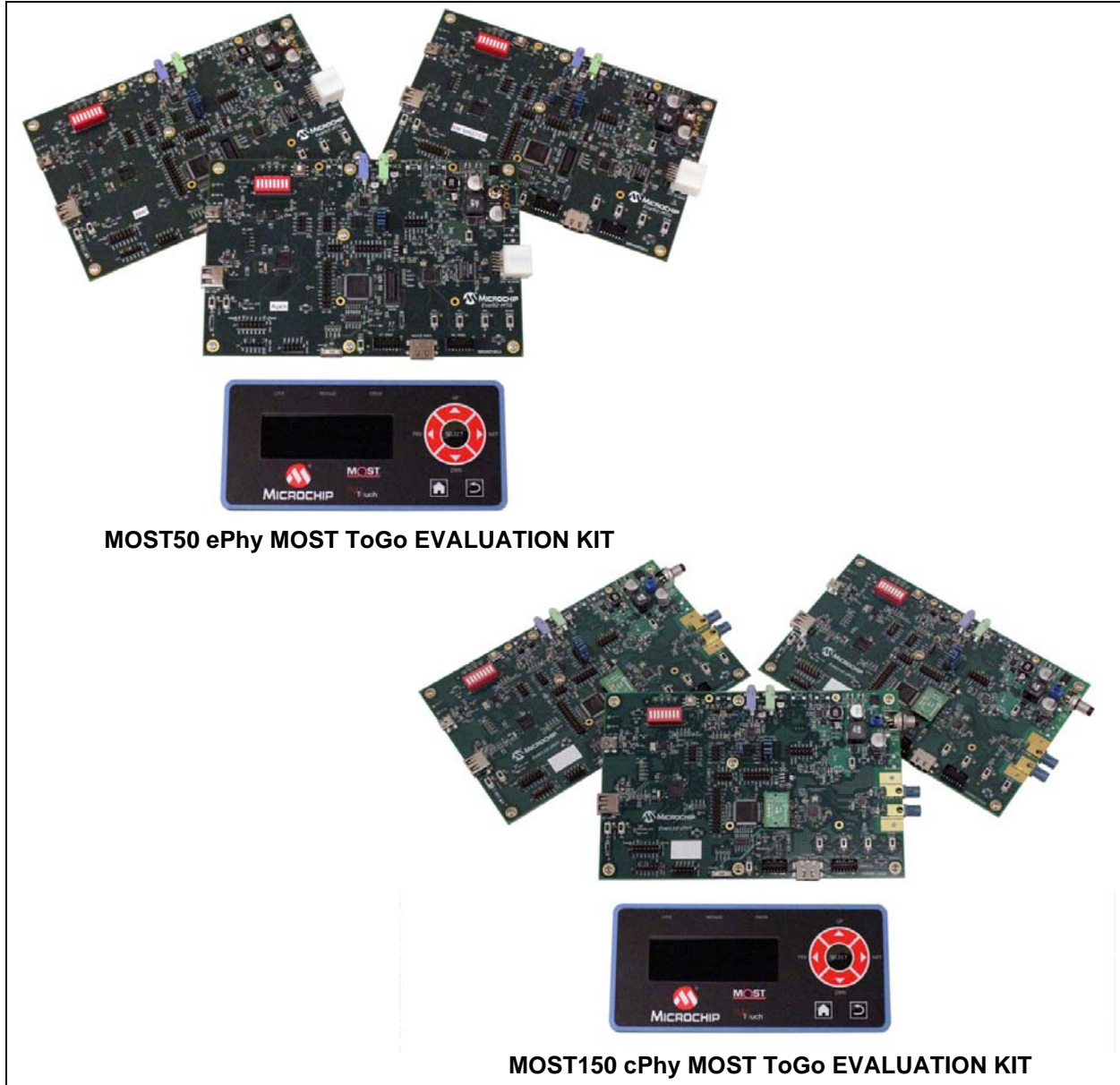
**TABLE 1: REVISION SUMMARY**

Location	Description of Changes
<b>DS60001262A</b>	Feb. 2014: First official release
<b>DS60001262B</b>	May. 2014: Update for customer distribution release

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**Chapter 1. MOST ToGo Evaluation Kit Overview**

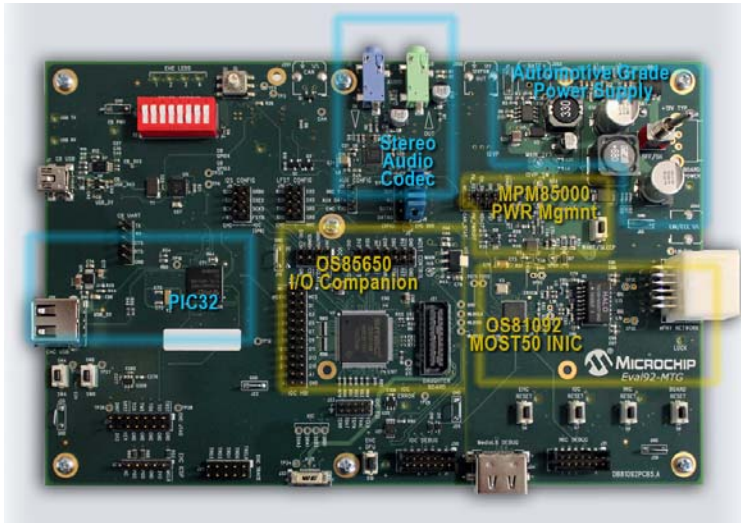
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**FIGURE 1-1: MOST ToGo EVALUATION KITS**

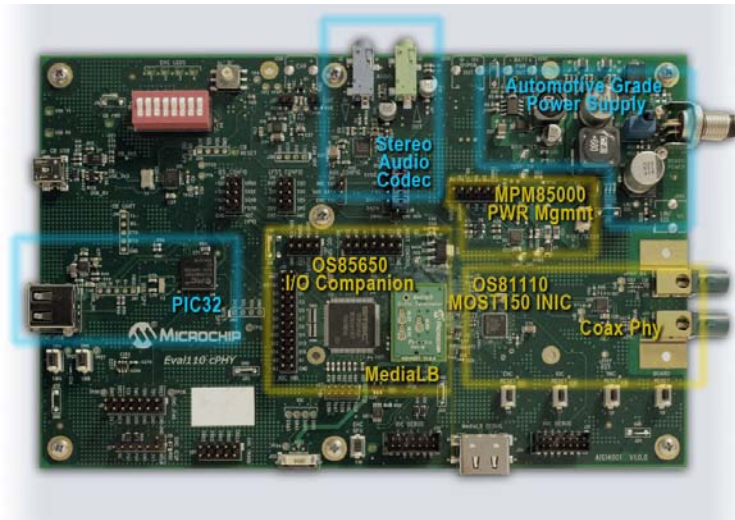
This guide describes how to setup and get started using the basic *MOST ToGo* three node kit which is shown in [Figure 1-1](#). The kit includes 3 Microchip Evaluation boards, an LCD HMI display, a power supply, and a USB hub to connect the debug output of the three boards. The kits are delivered with either OS81092 ePhy Evaluation Boards for MOST50, or OS81110 cPhy Evaluation Boards for MOST150 as shown in [Figure 1-2](#). The Evaluation boards in the kit are all identical, but each has different firmware to provide different functionality.

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FIGURE 1-2: MOST ToGo ePhy AND cPhy EVALUATION BOARDS



OS81092 ePhy EVALUATION BOARD



OS81110 cPhy EVALUATION BOARD

The default firmware creates a system which includes a master or controller device, a source device and an sink device. The source and sink devices are slave nodes in the system. The master controller device is connected to the simple HMI display and is referred to as the HMI\_Master device in the system. The source device is meant to connect an analog source (MP3 player) to the MOST network and is called the MP3\_AuxIn node. The sink device implements a MOST network sink which connects to headphones or powered speakers and is called the Main\_Amp node. Additionally, the master device can also provide another analog source input (HMI\_AuxIn) and headphone output (HMI\_Amp) so that the overall system has two sources and two sinks.

The following documents give detailed information for the system:

- [\[1\] MOST ToGo Architecture and Implementation User's Guide](#) - Explains the architecture of the 3 node system, and how it is implemented using MOST NetServices.



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- [\[3\] MOST ToGo System Hardware Principles Specification](#) - Explains the hardware architecture and specifications
- [\[9\] MOST ToGo Code Documentation](#) - Full documentation of the master application (the source and sink applications are subsets) generated from Doxygen. This is a compressed help file (.chm format).
- Additional documentation and tools are listed in the [Recommended Reading](#) section of the Preface chapter.
- The following are links to the Microchip Development Tool web pages where you can find the most recent collateral and contact information.
  - MOST50 ePhy MOST ToGo Evaluation Kit  
<http://www.microchip.com/b20004>
  - MOST150 cPhy MOST ToGo Evaluation Kit  
<http://www.microchip.com/b20001>
  - OS81092 ePhy Evaluation Board  
<http://www.microchip.com/b20003>
  - OS81110 cPhy Evaluation Board  
<http://www.microchip.com/b20002>

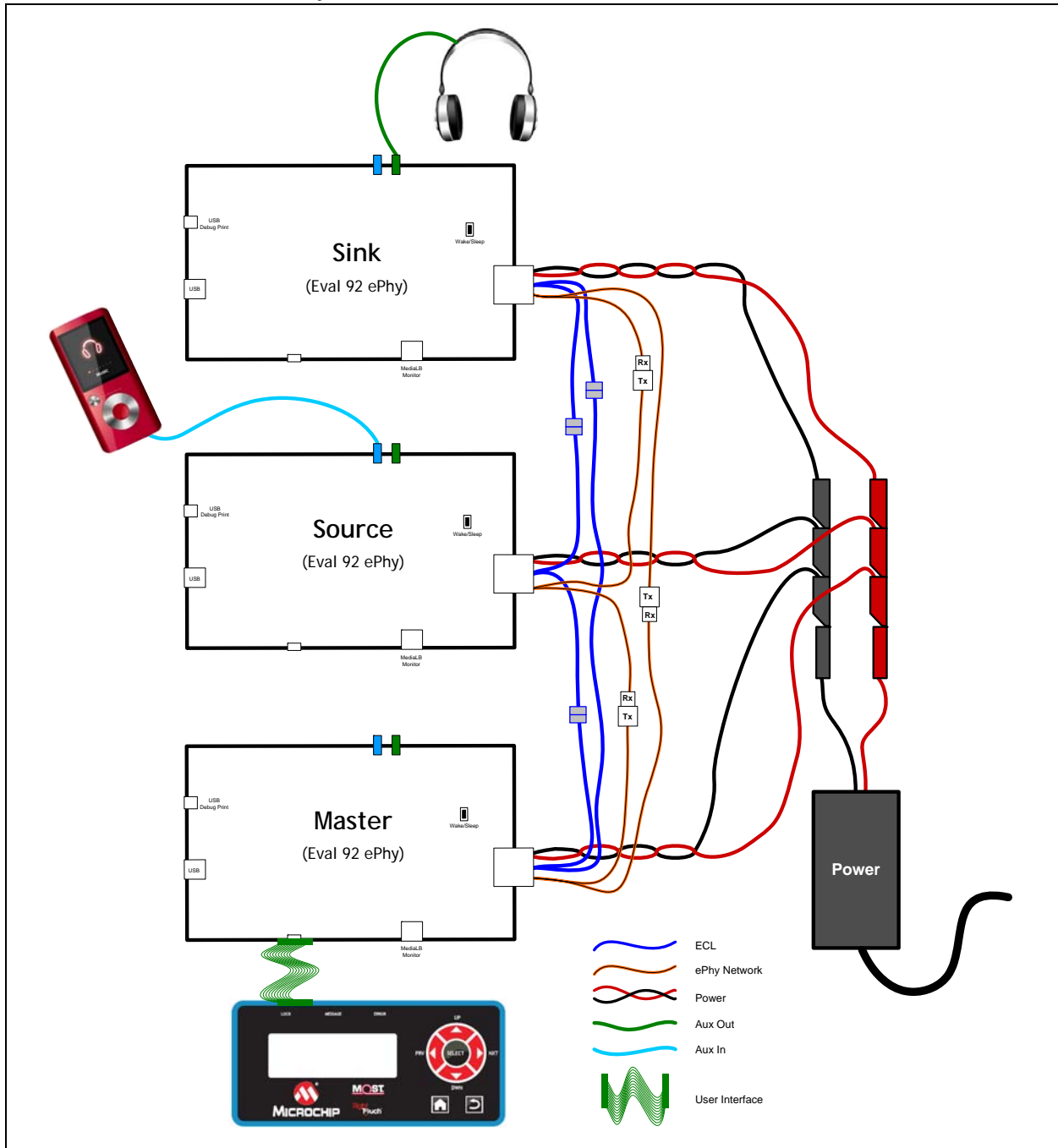
[Chapter 2. MOST50 ePhy MOST ToGo Kit Basic Setup](#) describes how to connect the MOST50 ePhy MOST ToGo Kit, while [Chapter 3. MOST150 cPhy MOST ToGo Kit Basic Setup](#) describes the MOST150 cPhy system connections. [Chapter 4. Menu/Display and Exercises](#) describes how to operate the system using the menus on the HMI display and describes some exercises to show the main features of the *MOST ToGo* system. [Chapter 5. Debug Output](#) describes how to connect a PC to the Evaluation boards to see the debug print output and how to use Port Message Viewer to decode the messages. [Chapter 6. Installing MOST ToGo Application Firmware](#) describes how to update the firmware on the boards.

The *MOST ToGo* system is meant to be a 'living project' and there will be regular updates and new features added.

**Chapter 2. MOST50 ePhy MOST ToGo Kit Basic Setup**

**2.1 PROPER SET UP**

**FIGURE 2-1: MOST50 ePhy MOST ToGo KIT BASIC RING SETUP**



## 2.2 KIT CONTENTS

The MOST50 ePhy *MOST ToGo* Evaluation Kit contains the following items:

- 3 OS81092 ePhy Evaluation boards (DB81092PCB5.A)
- 1 Microchip RightTouch™ HMI board (DB0600PCB1.A)
- 3 ePhy cable sets
- 1 USB82514 4 port USB hub
- 3 USB A - MiniB cables for hub
- 1 USB A - B cable for Hub to PC connection
- 1 12V Power supply with banana jacks for Evaluation Boards
- 1 5V Power supply for USB Hub
- 1 1/8" Audio cable for AuxIn connection
- 1 Set of Headphones

## 2.3 OS81092 ePhy EVALUATION BOARD

The kit is based on the OS81092 ePhy Evaluation Board. In addition to the major components called out in [Figure 1-2](#), the board also has several user interface components which are listed below and are outlined in [Figure 2-2](#).

The board contains the following features:

- Application LEDs
- WAKE/SLEEP switch (ON\_SW to MPM85000)
- Reset Switches
- DIP switches
- Rotary switch
- Power switch
- ePhy/ power / ECL connector
- Lock LED
- USB debug print and flashing port

Each board has unique firmware installed for its intended application. The boards have labels on them indicating which is Network Master, AuxIn and AudioAmp. Connect all the components according to [Figure 2-1](#).

**Note:** Please see [Appendix A: Connecting the Flex Cable](#) for special instructions for connecting the Flat Ribbon Cable from the display to the board.

When done, the setup might look something like [Figure 2-3](#).

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FIGURE 2-2: OS81092 ePhy EVALUATION KIT

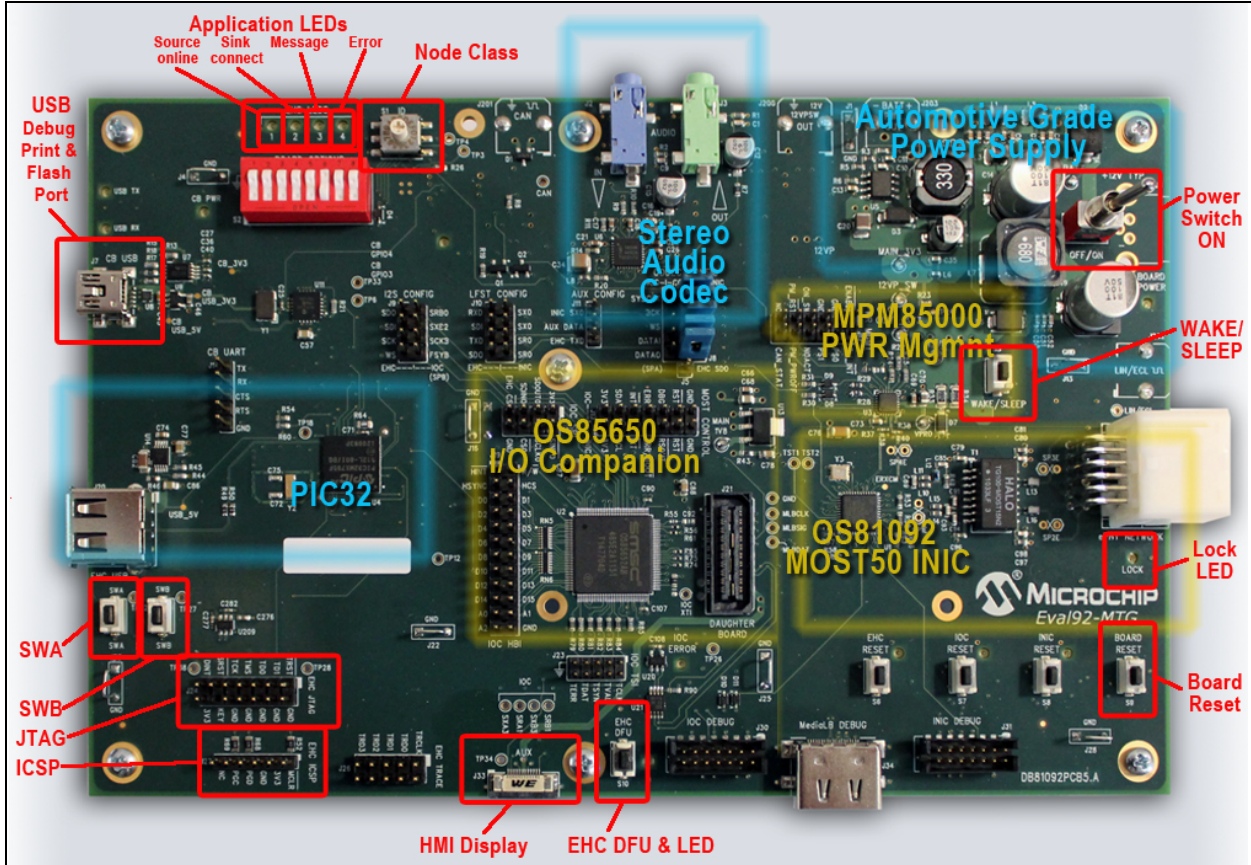
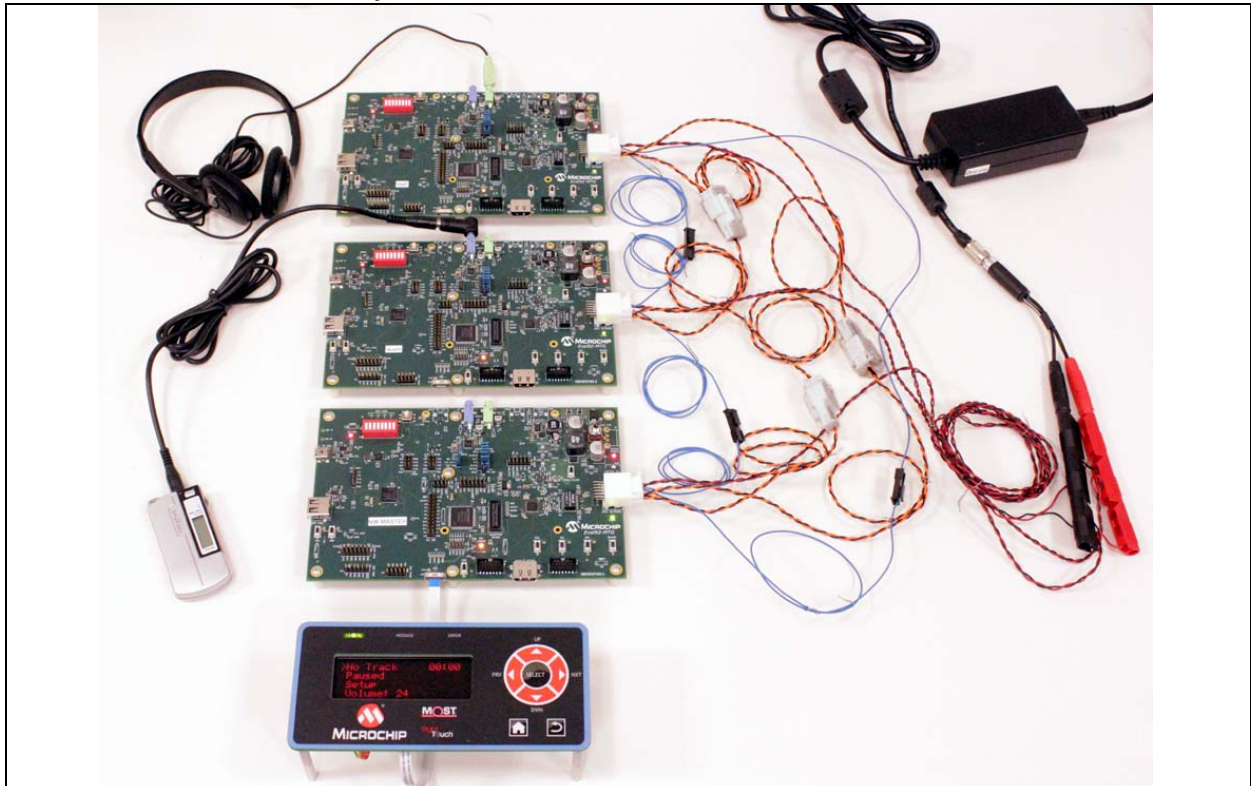


FIGURE 2-3: MOST50 ePhy MOST ToGo EVALUATION KIT



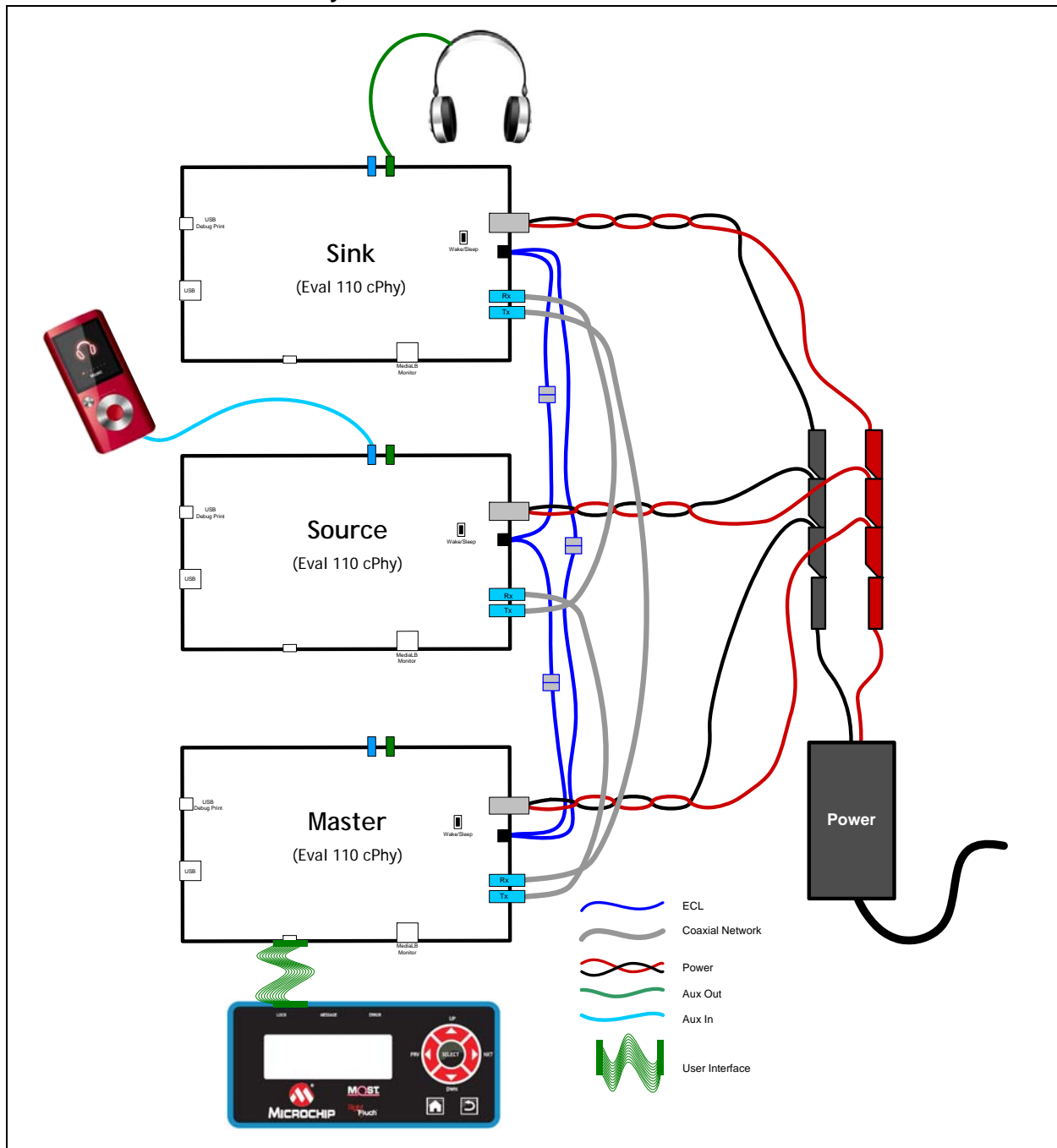
## 2.4 INITIAL POWER UP

- Connect kit as shown in [Figure 2-1](#).
- It should look similar to [Figure 2-3](#).
- See [Appendix A: Connecting the Flex Cable](#) for proper connection of display
- Set all power switches on the boards to ON (switch toward the edge of the board)
- Plug in the power supply.
  - All boards should power up
  - Should stay powered for about 5 seconds and then power down
  - This is a Switch To Power event (STP) and is not considered a valid wake event
- Normal Startup
  - Press the WAKE/SLEEP switch
  - All boards should power up
  - The Lock LEDs should come on
  - Display shows 2 Sinks and 2 Sources found
- Normal Shutdown
  - Press the WAKE/SLEEP switch
  - Message in display about shutdown
  - After 2 seconds, network stops, all Lock LEDs off
  - About 5 seconds later, all boards power down.

**Chapter 3. MOST150 cPhy MOST ToGo Kit Basic Setup**

**3.1 PROPER SET UP**

**FIGURE 3-1: MOST150 cPhy MOST ToGo KIT BASIC RING SETUP**



## 3.2 KIT CONTENTS

The MOST50 ePhy *MOST ToGo* Evaluation Kit contains the following items:

- 3 OS81110 cPhy Evaluation boards (AIS14001V1.0.0)
- 1 Microchip RightTouch™ HMI board (DB0600PCB1.A)
- 3 Coaxial cables with FAKRA connectors
- 3 board power cables - Binder to banana plugs
- 3 ECL cables
- 1 USB8514 4 port USB hub
- 3 USB A - MiniB cables for hub
- 1 USB A - B cable for Hub to PC connection
- 1 12V Power supply with banana jacks for Evaluation Boards
- 1 5V Power supply for USB Hub
- 1 1/8" Audio cable for AuxIn connection
- 1 Set of Headphones

## 3.3 OS81110 cPhy EVALUATION BOARD

The kit is based on the OS81110 cPhy Evaluation Board. In addition to the major components called out in [Figure 1-2](#), the board also has several user interface components which are listed below and are outlined in [Figure 3-2](#).

The board contains the following features:

- Application LEDs
- WAKE/SLEEP switch (ON\_SW to MPM85000)
- Reset Switches
- DIP switches
- Rotary switch
- Power switch
- Connectors for cPhy, 12V power, and ECL
- Lock LED
- USB debug print and flashing port

Each board has unique firmware installed for its intended application. The boards have labels on them indicating which is Network Master, AuxIn and AudioAmp. Connect all the components according to [Figure 3-1](#).

**Note:** Please see [Appendix A: Connecting the Flex Cable](#) for special instructions for connecting the Flat Ribbon Cable from the display to the board.

When done, the setup might look something like [Figure 3-3](#).

# MOST ToGo Getting Started

FIGURE 3-2: OS81110 cPhy EVALUATION KIT

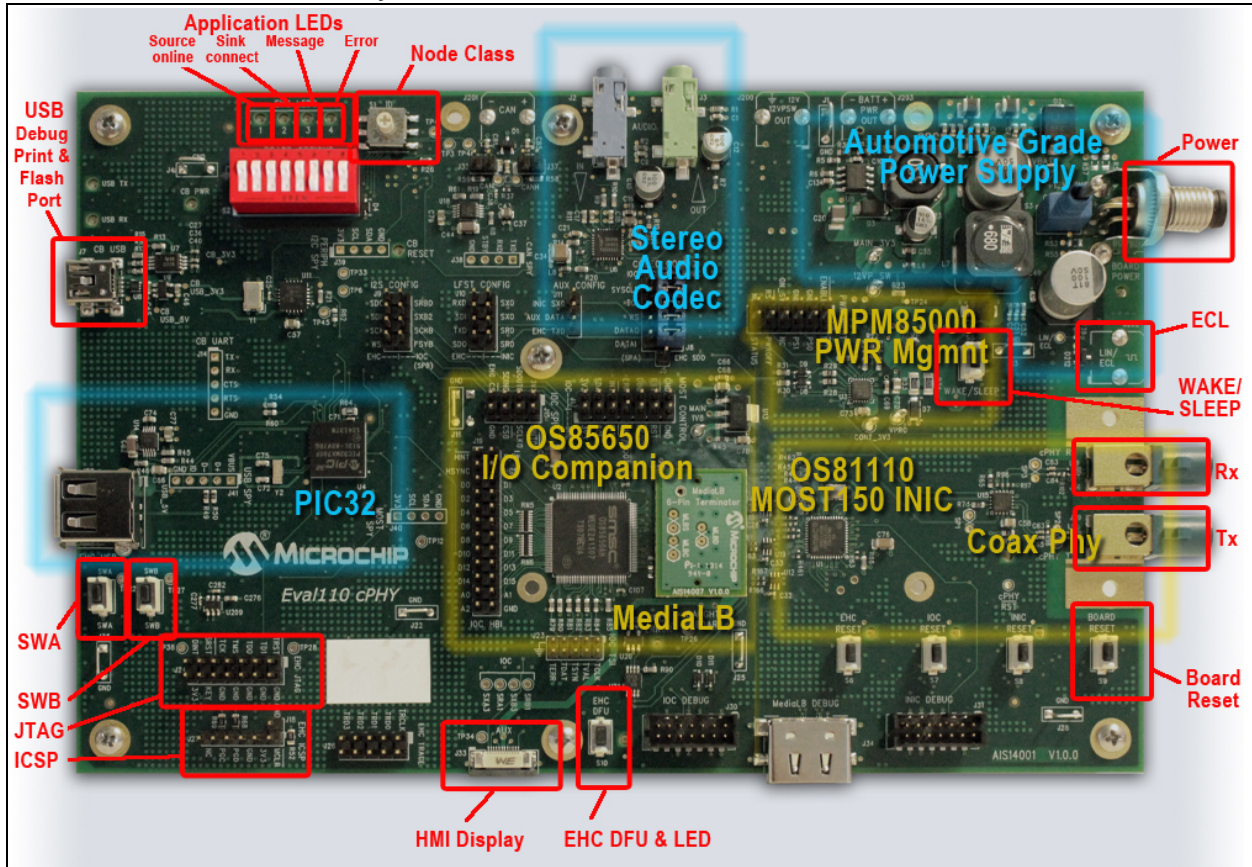
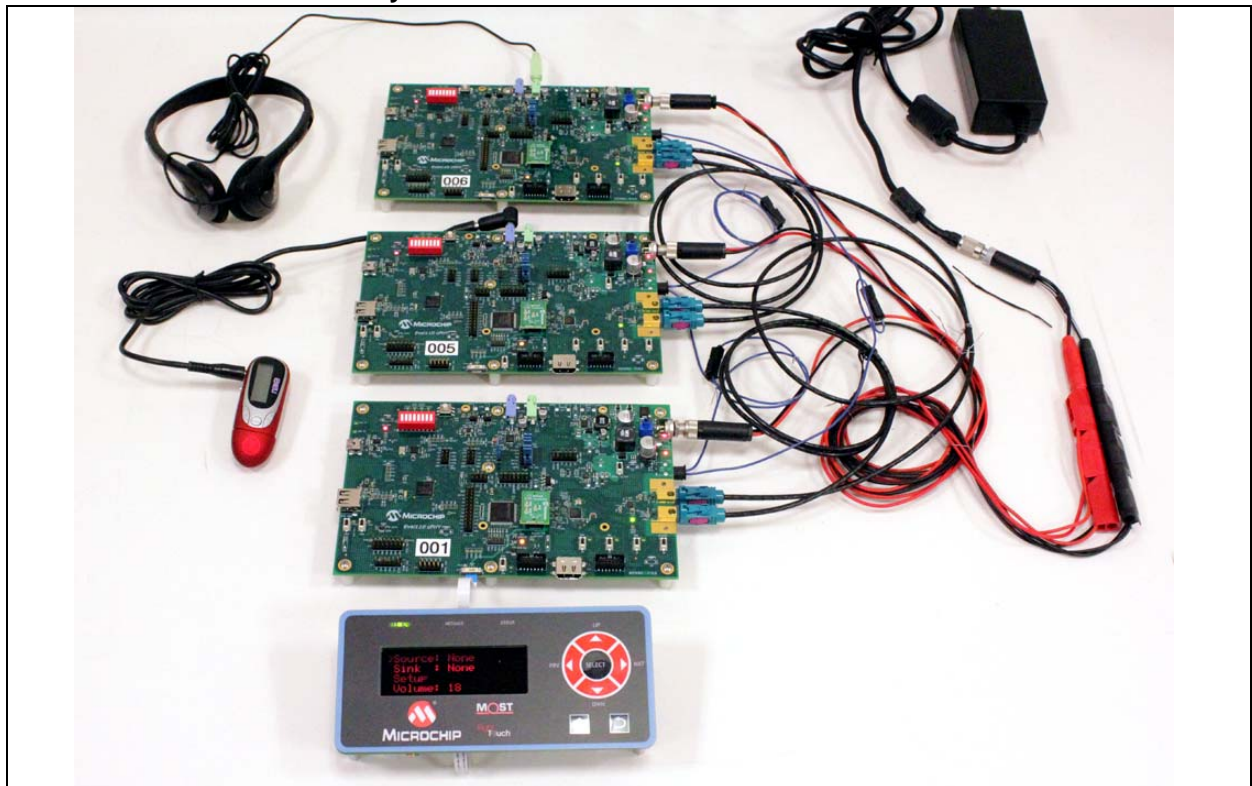


FIGURE 3-3: MOST150 cPhy MOST ToGo EVALUATION KIT





## 3.4 INITIAL POWER UP

- Connect kit as shown in [Figure 3-1](#).
- It should look similar to [Figure 3-3](#).
- See [Appendix A: Connecting the Flex Cable](#) for proper connection of display
- Set all power switches on the boards to ON (switch toward the edge of the board)
- Plug in the power supply.
  - All boards should power up
  - Should stay powered for about 5 seconds and then power down
  - This is a Switch To Power event (STP) and is not considered a valid wake event
- Normal Startup
  - Press the WAKE/SLEEP switch
  - All boards should power up
  - The Lock LEDs should come on
  - Display shows 2 Sinks and 2 Sources found
- Normal Shutdown
  - Press the WAKE/SLEEP switch
  - Message in display about shutdown
  - After 2 seconds, network stops, all Lock LEDs off
  - About 5 seconds later, all boards power down.

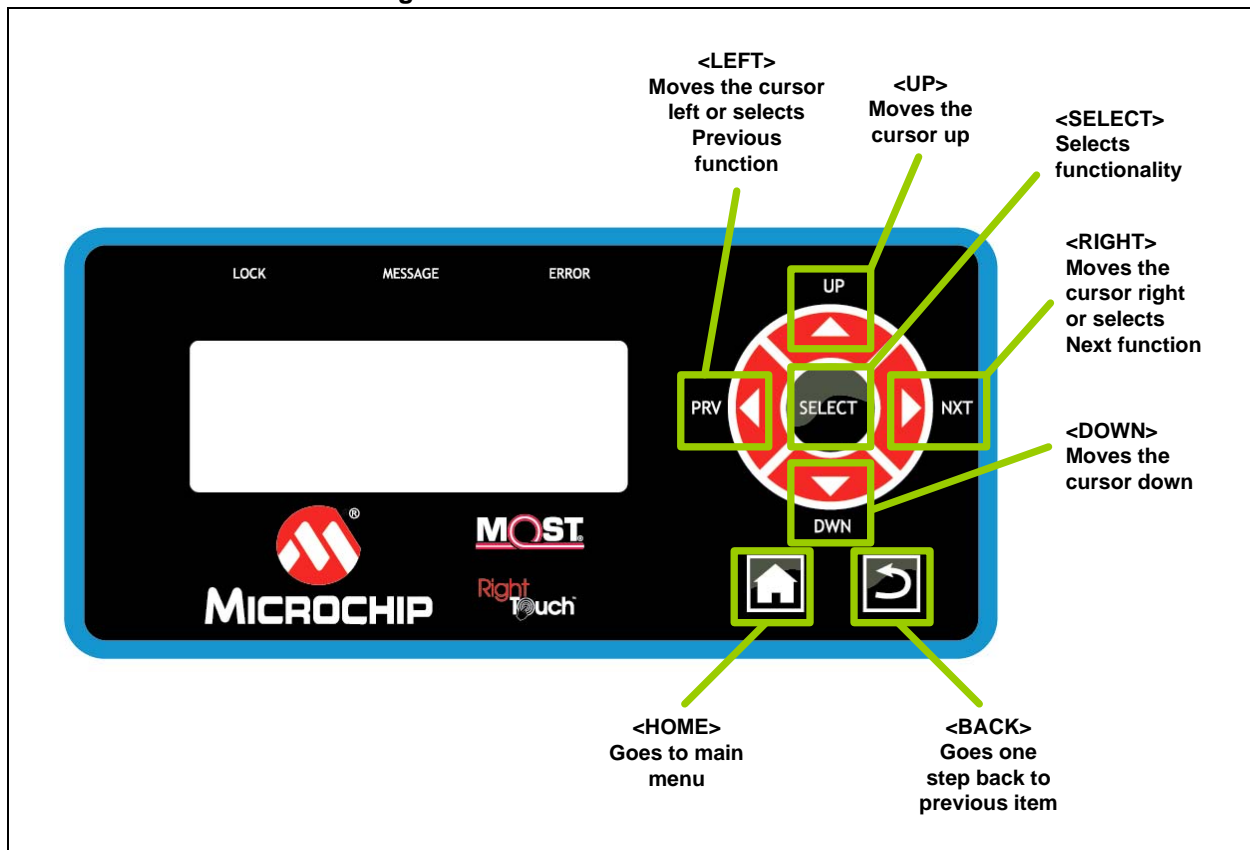
**Chapter 4. Menu/Display and Exercises**

This chapter describes how to use the menus to operate the *MOST ToGo* system. Several exercises are outlined to demonstrate a few of the major features of the system.

Figure 4-1 shows the *MOST ToGo* RightTouch™ User Interface and the seven corresponding button designations.

<UP>	Moves the cursor up
<DOWN>	Moves the cursor down
<LEFT>	Moves the cursor left or selects a functionality
<RIGHT>	Moves the cursor right or selects a functionality
<SELECT>	Selects a functionality
<HOME>	Goes back to the main menu
<BACK>	Goes one step back to the previous item

**FIGURE 4-1: MOST ToGo RightTouch USER INTERFACE LAYOUT AND BUTTON DESIGNATIONS**



## 4.1 AUDIO CONNECTION

Use menu system on the HMI display as shown below to connect the audio source on the MP3\_AuxIn node to the Main\_Amp node.

- Connect MP3 player or smart-phone to blue AUDIO IN jack on AuxIn board and start playing a song
- Connect headphones or powered speakers to the green AUDIO OUT jack on the Amp board
- Follow the steps below to select the Main Amp as the sink, and the MP3\_AuxIn as the source. Verify audio playing on headphones / speakers.

### 4.1.1 Display

The display consists of 4 lines with each 40 characters. When the system is starting up, some version information is displayed:

```
Microchip/SMSC
MOST ToGo Master
V2.0.1
```

### 4.1.2 System startup and discovery, setup sub-menu

When a system of 2 or more boards starts up, the Master/HMI application automatically discovers the available sources and sinks in the system. When the system scan is finished, the number of available sources and sinks are displayed:

```
>MOST ToGo Demo
Sinks [ 2 found ]
Sources [ 2 found ]
Volume: 24
```

This is the **setup sub-menu**.

At system startup no connections are established therefore you need to setup the connections first.

Whenever you see a cursor (“>”), it can be moved by the <UP> and <DOWN> buttons and some functionality can be selected by the <SELECT> button.

### 4.1.3 How to connect, main menu

Connections can be made the following way:

**Select “Sinks” from the setup sub-menu to choose a sink to connect:**

```
MOST ToGo Demo
>Sinks [ 2 found ]
Sources [ 2 found ]
Volume: 24
```

# MOST ToGo Getting Started

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*You will now get a list of all sinks that can be connected to a source. Scroll to the Main Amp and press Select.*

```
>HMI_Amp  
Main_Amp
```

*Now you get the possibility to select a source or to set the audio control options (volume, bass, treble). Choose "Select Audio Source" and press Select:*

```
>Select Audio Source  
Audio Control
```

*Now you will get a list of all available sources in the system. Choose the MP3\_Aux (AuxIn board) and press Select.*

```
>HMI_AuxIn  
MP3_Aux
```

*Connection will be established and main menu will be displayed:*

```
>Source: MP3_Aux  
Sink: Main_Amp  
Setup  
Volume: 24
```

If you are located in any sub-menu, the <HOME> button will bring you always back to the main menu.

## 4.1.4 Changing Volume

Volume can be changed by selecting the 4<sup>th</sup> line of the main menu:

```
Source: MP3_Aux  
Sink: Main_Amp  
Setup  
>Volume: 24
```

Volume can be incremented by the <RIGHT> and decremented by the <LEFT> button.

## 4.1.5 Audio Control

Audio properties can be accessed by the audio control sub-menu.

**To get there from the main menu choose “Sink” and press Select:**

```
Source: MP3_Aux
>Sink: Main_Amp
Setup
Volume: 24
```

Use the UP/DOWN buttons to select the audio parameter to control.

Use LEFT/RIGHT buttons to adjust the parameter.

Press HOME button to return to Main Menu.

```
Volume: 24
Bass: 0
Treble: 0
Mute/Demute
```

Observe the Message LEDs on the boards as settings are changed. The Amp board will blink when it receives a message to change a setting. The HMI master board will blink when notification of the changed setting is received.

## 4.2 NOTIFICATION

When the system starts up and the Network Master completes the system scan, the AV\_Manager component in the HMI Master node subscribes to notification of the properties of FBlock `AudioAmp` on the Main\_Amp board and FBlock `AuxIn` on the MP3\_AuxIn board.

- With the display showing the Volume setting on screen, change the volume on the Main\_Amp board by pressing switch SWA (Local volume up) and switch SWB (Local volume down). Verify volume changing, and notice the volume setting in the display changing appropriately.
- Notice the Message LED on the HMI Master board as the volume on the Main\_Amp board is changing - messages represent notification updates from FBlock `AudioAmp` to the FBlock `AudioAmp Shadow` on the master board.

## 4.3 CONNECT SECOND AMP

MOST networks support multiple sinks connected to a single source, no additional configuration of the source is needed.

- Go back to the HOME screen by pressing the HOME button on the display
- Go to Sinks -> HMI\_Amp -> Select Audio Source -> MP3\_AuxIn
- Move the headphones to the green AUDIO OUT jack on the HMI\_Master board, verify audio
- Verify the same audio is playing on both boards
- Check Sink LED on master board
- Shows 1 source connected to 2 sinks

# MOST ToGo Getting Started

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## 4.4 SWITCH SOURCES

MOST networks can easily support multiple sources connected to multiple sinks.

- Connect another MP3 player or smartphone to the blue AUDIO IN jack on the HMI\_Master board and start it playing.
- Go back to HOME menu
- Select Sinks -> Main\_Amp -> Select Audio Source -> HMI\_AuxIn
- Verify Main\_Amp is playing the source connected to HMI board while HMI Amp is still playing the source from the AuxIn board.
- Shows 2 separate sources connected to 2 separate sinks

## 4.5 RING BREAK

The *MOST ToGo* basic applications support diagnostics over ECL in the event of a broken ring. If the Master detects a ring break it will initiate an ECL System Test and perform the Stable Lock test. The results of the test are shown in the LCD display (and in the debug output if connected).

- With system operating normally, break the ring by unplugging the connection between the Main\_Amp board and the HMI\_Master board. (If connected according to the diagram, the ring is HMI\_Master -> MP3\_AuxIn -> Main\_Amp -> HMI\_Master)
- Immediately all LOCK LEDs will go off.
- The Master will begin 4 retries - verify the messages on the display. Note the LOCK LEDs on the MP3\_AuxIn and Main\_Amp boards will come on, but the one on the HMI\_Master will not.
- After 4 failed attempts the HMI\_Master will begin diagnostics by initiating a System Test (Stable Lock Test) over the ECL.
- After a few seconds, the results of the test will be displayed.
- Each node returns 2 bits of data - one bit (the E bit) indicates that the node is powered and participated in the test properly. The 2nd bit (the O bit) indicates if the node saw a stable lock during the test. The nodes return a 0 (asserting ECL low) to indicate a pass, or a 1 (de-asserting ECL) to indicate a failure.
- In this scenario, the results should be

	E	O
Slot1:	0	1
Slot2:	0	0
Slot3:	0	0

- This indicates that all 3 nodes participated in the test correctly. Nodes 2 and 3 saw a stable lock, while node 1 (Master) did not. This indicates the break is between Node 3 (Main\_Amp) and Node 1 (HMI\_Master). The Node Class is NOT the node position address. Instead it is set for each board by the rotary switch on the board.
- After a few seconds of showing the results, the boards will power down.

## 4.6 STARTUP WITH BROKEN RING

- Reconnect the Main\_Amp to the HMI\_Master, and break the ring between the HMI\_Master and the MP3\_AuxIn board.
- Try a normal startup by pressing the W050B1500U switch.
- All boards should power up
- After a short time, the HMI\_Master will begin retries as the initial startup will fail.
- Note the results when the diagnostics are done.

	E	O
Slot1:	0	1
Slot2:	0	1
Slot3:	0	1

- This indicates that none of the nodes saw a stable lock, and therefore the problem exists between the HMI\_Master and the first node (MP3\_AuxIn)

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## Chapter 5. Debug Output

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The Evaluation boards used in the *MOST ToGo* kits have a Microchip MCP2200 USB-to-UART chip (U11) that is used to output informational and debug text from the EHC (U4) to a PC. The MCP2200 is USB bus-powered and will remain powered through board power cycles.

### 5.1 MCP2200 DRIVERS

The MCP2200 drivers and configuration utilities can be found on Microchip's website at [www.microchip.com/MCP2200](http://www.microchip.com/MCP2200). Go to the *Documents & Software* section to download the drivers.

1. Run the MCP2200 Driver Installation Tool to install the drivers on a PC.
2. Connect J7 to a USB port. The drivers should install automatically and a new USART COM port will be created.
3. Note that if all 3 boards are connected to the supplied USB hub, and the hub is plugged into the PC USB port, then 3 COM ports will be created.

### 5.2 PORT MESSAGE VIEWER

Port Message Viewer ([\[6\] Port Message Viewer v6+ User's Guide](#)) is a PC application that connects to the board debug USART port. A simple terminal application will work, but the Port Message Viewer provides message filtering and searching for a more informative debug capability. Protocol and Device Setup files that are specific to the firmware application may be used to provide decoding of INIC/MOST messages and I<sup>2</sup>C traffic.

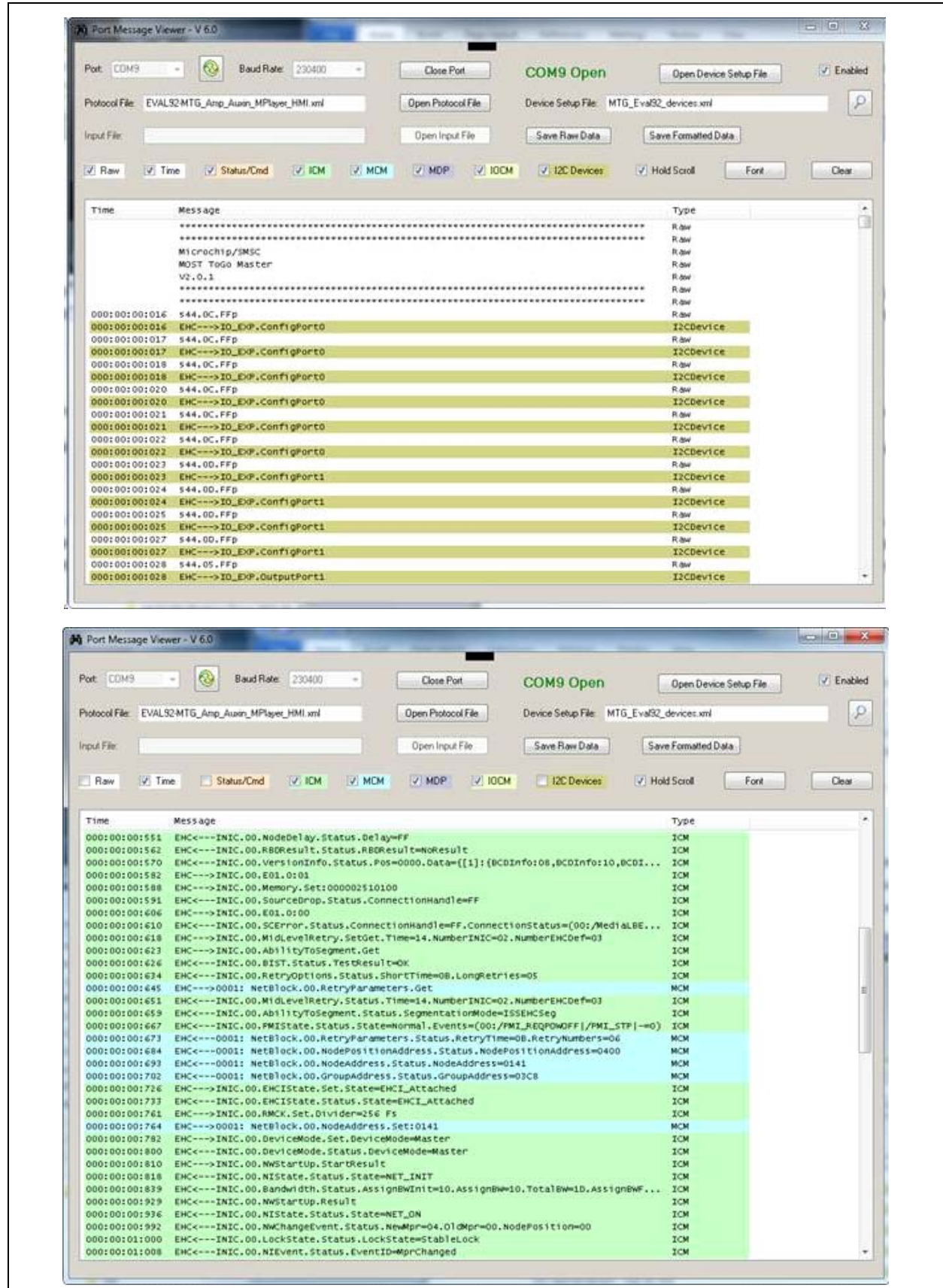
Start the program and select the port (or one of the ports) that is instantiated when the board is plugged in. Set the Baud Rate to 230400, and Open the port. Press RESET on the board that is connected and verify output on the screen.

Multiple instances of Port Message Viewer can be run simultaneously when multiple boards are connected.



# MOST ToGo Getting Started

FIGURE 5-1: ACTUAL OUTPUT FROM THE NETWORK MASTER FIRMWARE



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**Chapter 6. Installing MOST ToGo Application Firmware**

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There are three main ways to load application code onto the *MOST ToGo* Evaluation Boards:

- Serial Bootloader
- MPLAB IPE (Microchip Integrated Programming Environment)
- MPLAB X

The 2nd and 3rd options both require one of the following Microchip debugger tools:

- Pickit3
- MPLAB ICD 3
- MPLAB Real ICE

The Serial Bootloader only requires using the on-board USB debug print port and a USB port on the PC.

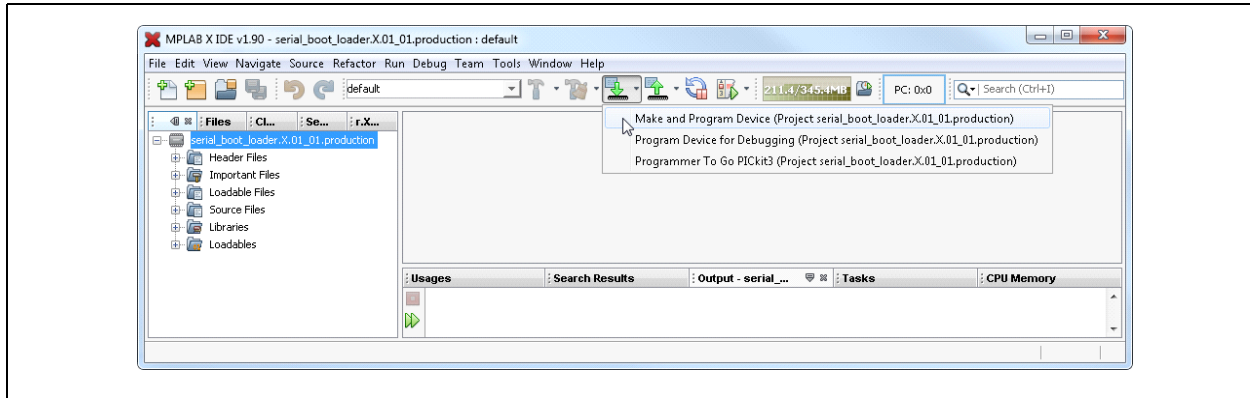
## 6.1 INSTALLING THE SERIAL BOOTLOADER

*MOST ToGo* boards are shipped with application firmware and a bootloader installed. The serial bootloader allows new firmware applications to be flashed via the USB debug print port at J7. When the PIC32 controller comes out of reset it will first enter the bootloader. If the EHC DFU button is pressed, or no application firmware is detected, then the bootloader enters Device Firmware Update (DFU) mode to allow flashing of the application firmware. When in DFU mode, the DFU LED will be blinking. If application firmware is present and the EHC DFU switch is not pressed during reset, then the bootloader will jump to the application code and the application will begin to run.

Typically, Microchip will provide new application firmware images in the form of HEX files to be flashed with the serial bootloader. However, the user may connect a Microchip debugger device to the EHC ICSP 6 pin header or JTAG header and load application code directly for development and debugging. In this case the serial bootloader gets overwritten and must be restored if the normal flashing processes is again desired. This section provides information on installing the serial bootloader and application firmware.

Run MPLAB X and open the `serial_boot_loader_*` project. Choose *Make and Program Device*:

**FIGURE 6-1: INSTALLING BOOTLOADER**



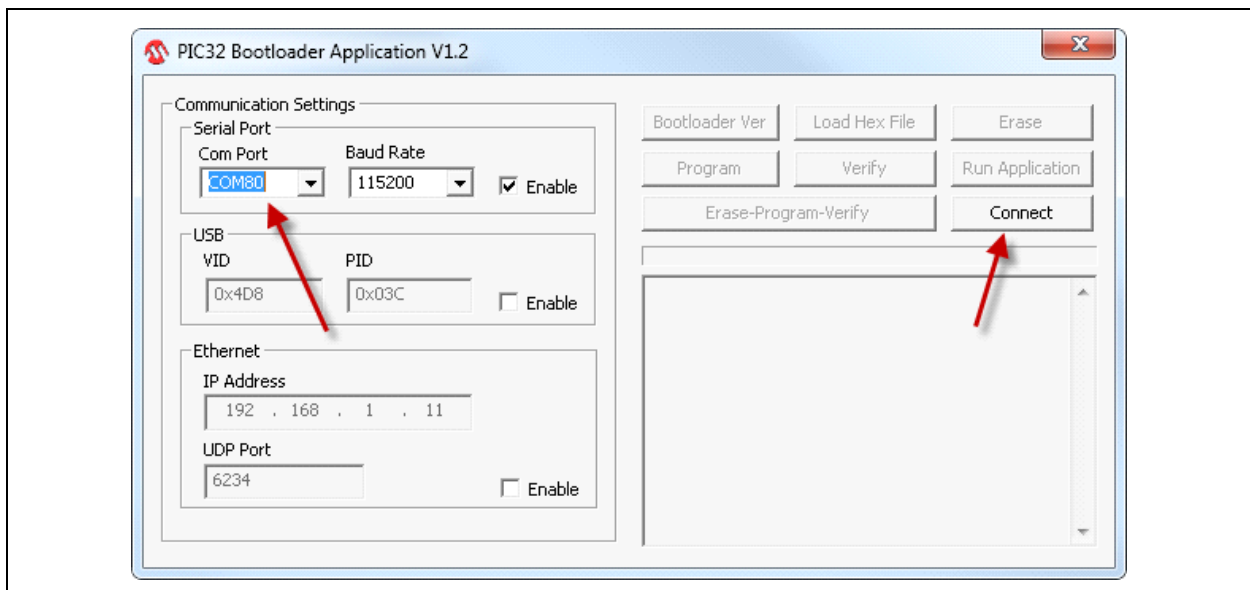
Once the Serial bootloader is installed, the LED next to the EHC DFU button should be blinking to indicate the bootloader is running.

## 6.1.1 Installing Application Firmware with Serial Bootloader

While pressing the EHC DFU button press and release the BOARD RESET button. This places the EHC into bootloader mode and the LED next to the EHC DFU switch should be blinking.

The PIC32UBL.exe application is used to download a new application via the serial bootloader. This application and [\[7\] PIC32 Bootloader Application Note \(AN1388\)](#) is available on the MOST50 ePhy and MOST150 cPhy Microchip *MOST ToGo* Development Tools websites where the code images are available. Run the PIC32UBL.exe bootloader application, type the COM port into the Com Port dialog, then click “Connect”:

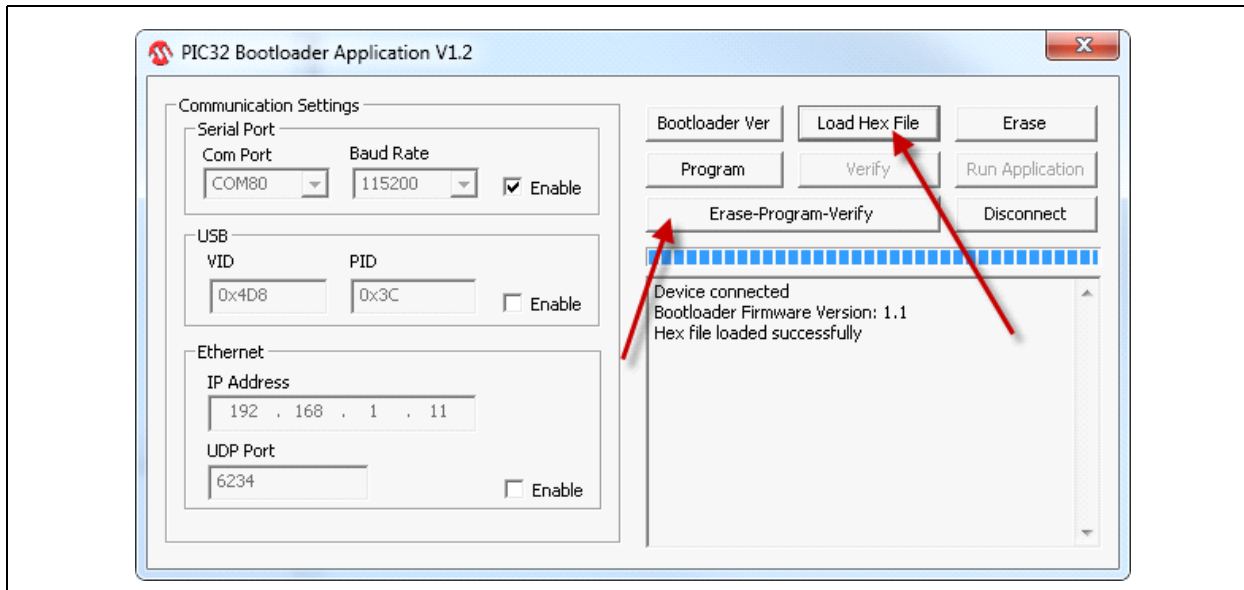
**FIGURE 6-2: CONNECTING TO BOOTLOADER**



Click “Load Hex File”, browse to and select the appropriate firmware file, then click “Erase-Program-Verify”:

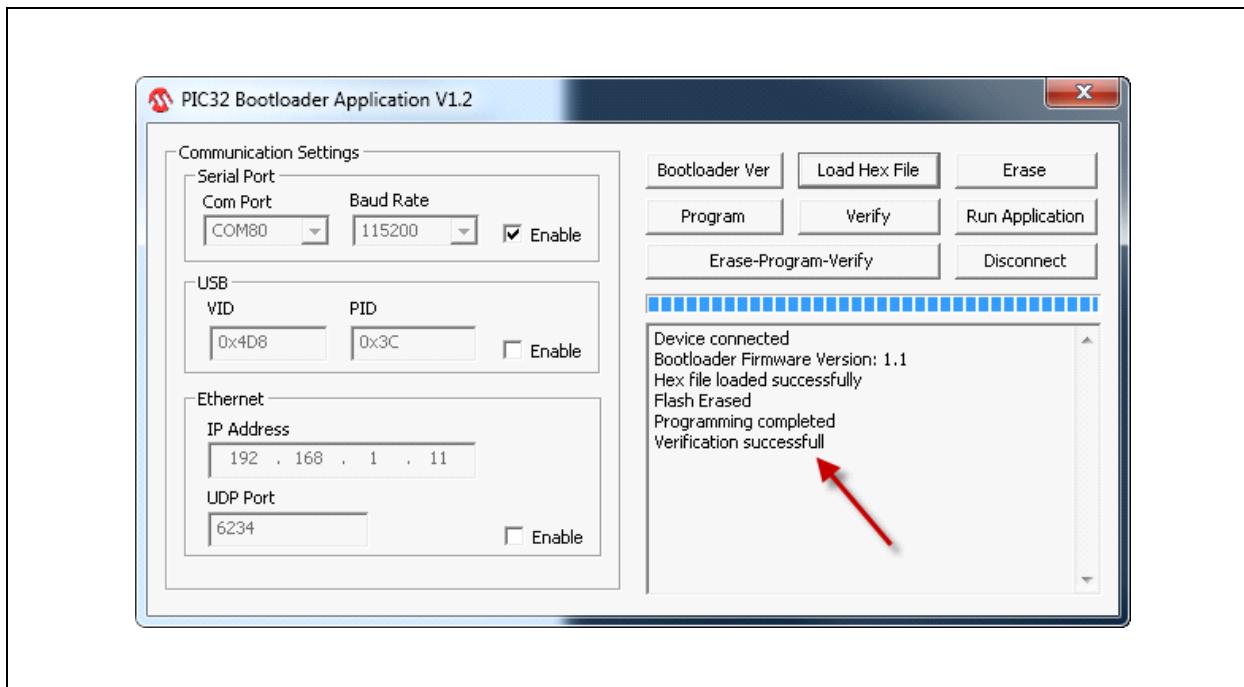
# MOST ToGo Getting Started

FIGURE 6-3: PROGRAMMING APPLICATION FIRMWARE



Check that the load was successful:

FIGURE 6-4: PROGRAMMING COMPLETE



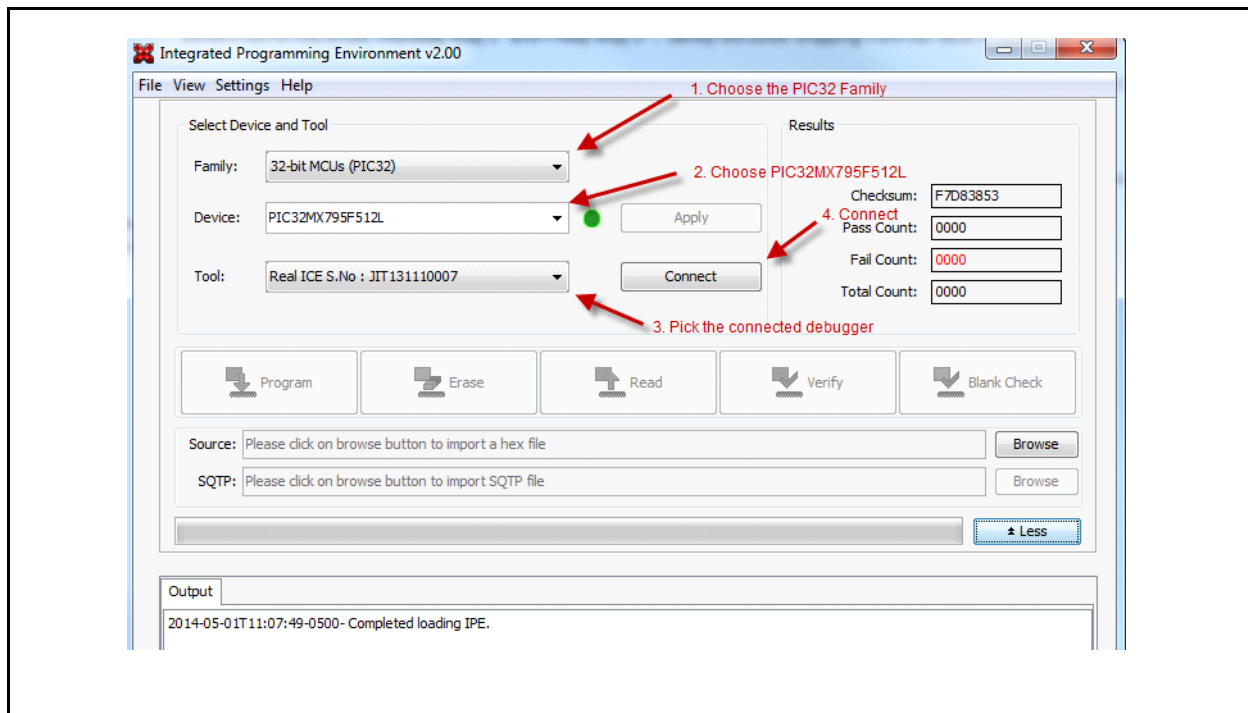
## 6.2 USING MPLAB IPE

(Integrated Programming Environment).



The Microchip MPLAB Integrated Programming Environment (IPE) is another method that can be used to program hex files that are either downloaded from the *MOST ToGo* product page or are generated by the user. This utility is installed automatically when MPLAB X is installed. Open MPLAB IPE and connect to the PIC32MX795F512L on the Evaluation board as shown below:

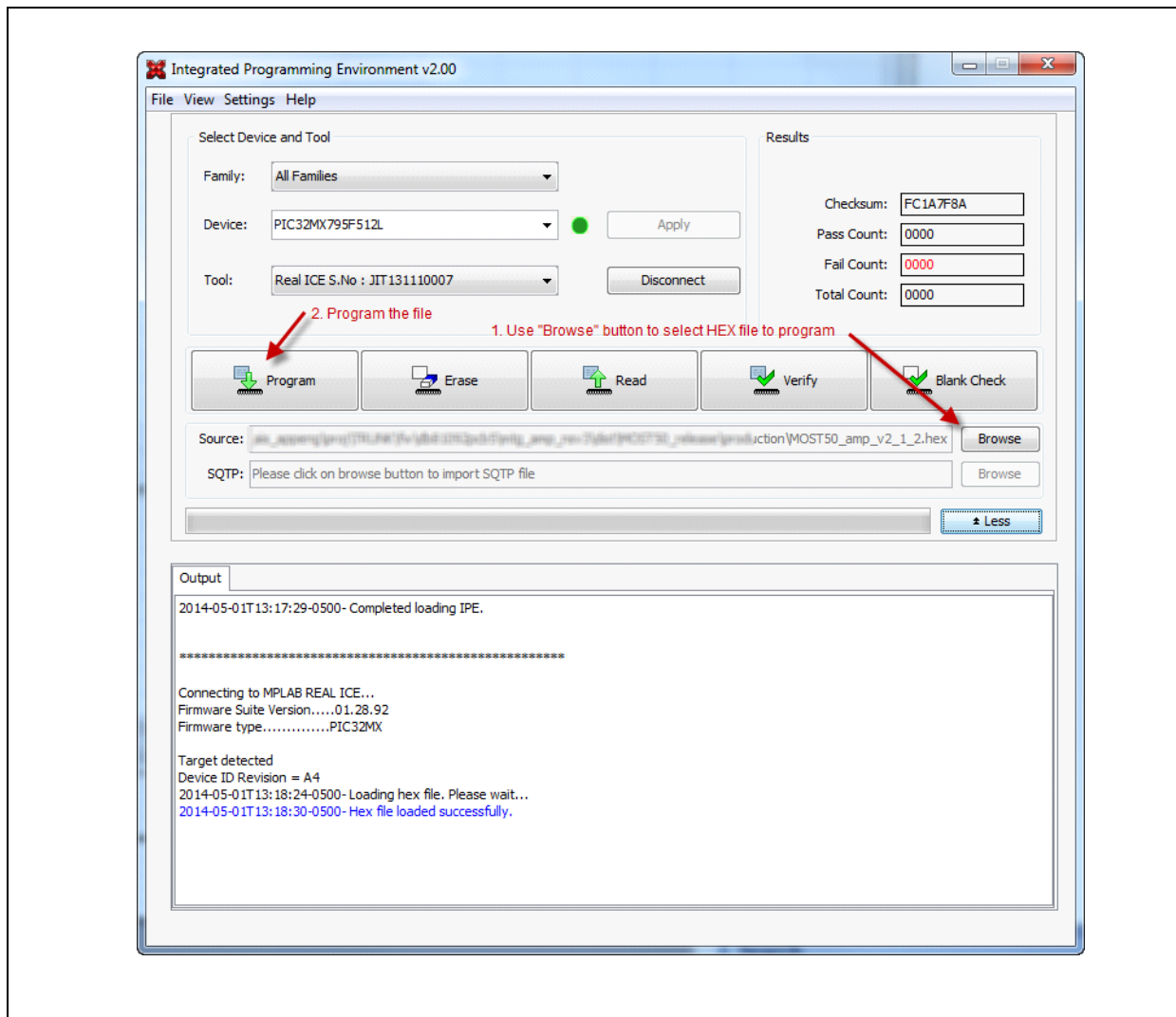
FIGURE 6-5: CONNECTING TO PIC32MX795F512L



# MOST ToGo Getting Started

Once the debugger is connected to the PIC32, select the HEX file to program and flash it as shown below.

**FIGURE 6-6: SELECTING THE HEX FILE TO PROGRAM AND FLASH**



When selecting a file to open, MPLAB IPE may show a warning about ignoring debug information that may have been in the hex file. This is normal, just acknowledge by clicking “OK” and continue with programming.

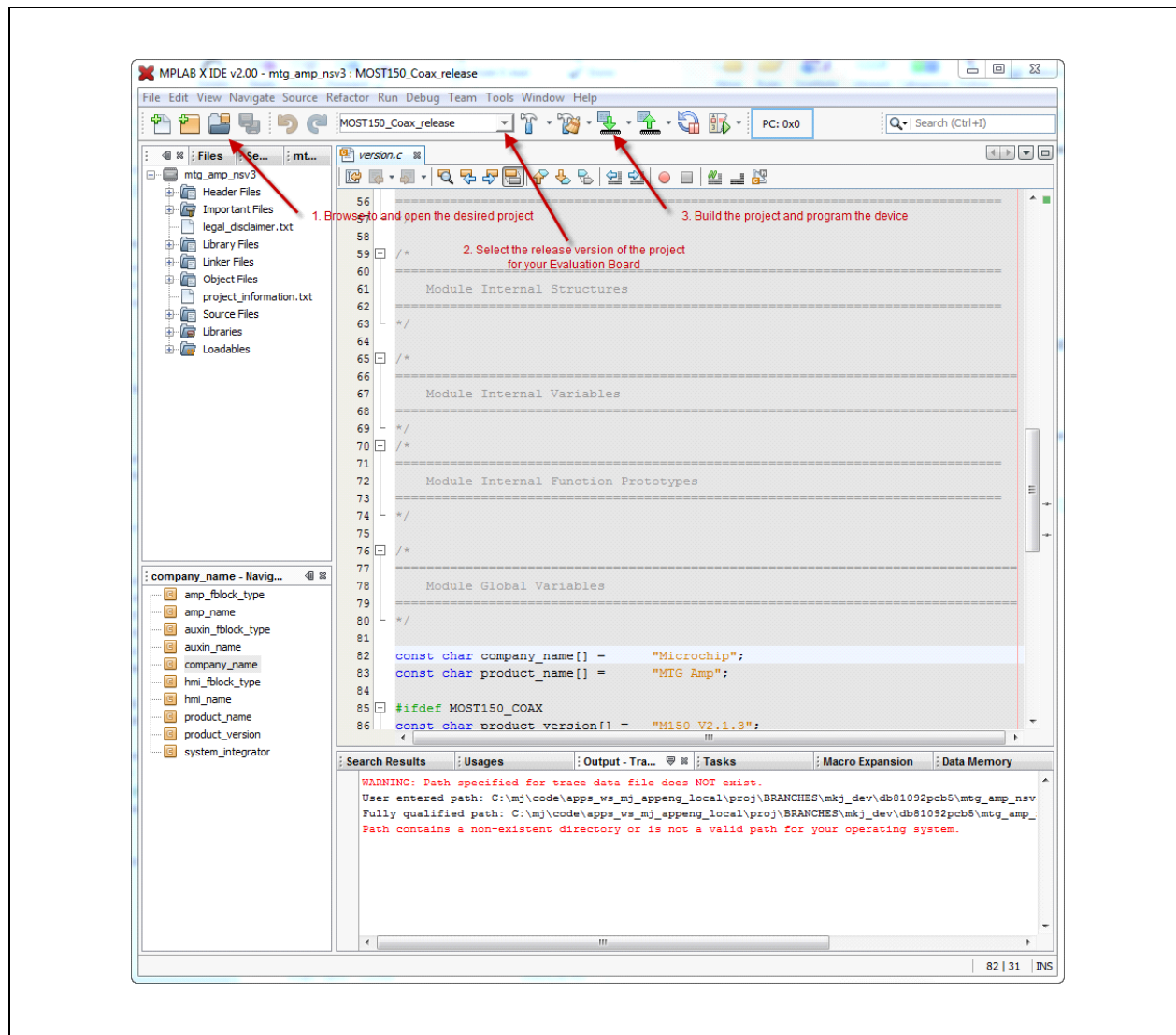
## 6.3 PROGRAMMING WITH MPLAB X

A third option to program new application code on the Evaluation boards is to use the full MPLAB X development system along with a Microchip debugger. The entire source code projects can be downloaded from Microchip and opened in MPLAB X.

**Note:** Each project has multiple build configurations for the different Evaluation Boards supporting MOST50 or MOST150, and there are debug and release versions of each configuration.

Choose a release configuration, build and program it as shown below:

**FIGURE 6-7: CHOOSE A RELEASE CONFIGURATION**



# MOST ToGo Getting Started

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**Note:** When opening a project file, you may get path warnings as shown. When using the trace logging feature, the tool stores the absolute path used, and when transferring projects to other machines, those paths are not valid. If the trace logging option is used, then MPLAB X will prompt for a new path.

The actual serial number of the debug tool in use when the project is saved is also stored in the project properties. Before programming it will be necessary to go to the project properties (right click on project name in the project tree) and select “Properties” at the bottom of the pop up menu. Then select the connected debug tool in the “Hardware Tool” section.

As mentioned before, programming application firmware with any of the Microchip debug tools will erase the serial bootloader. The serial bootloader is not needed when using these methods. The serial bootloader can be restored at any time as described in [Section 6.1 Installing the Serial Bootloader](#).



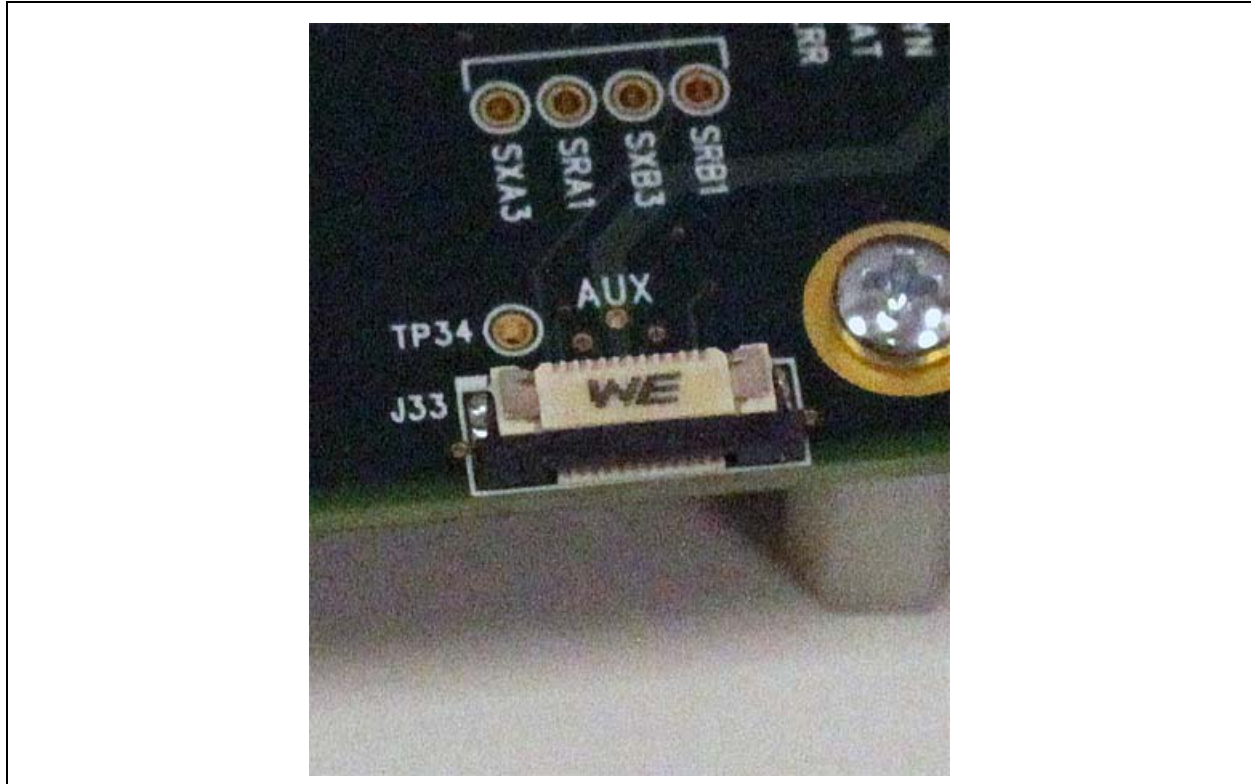
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## Appendix A: Connecting the Flex Cable

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The display connects to the Master board via a 12 pin Flat Flex Cable. Care must be taken when connecting the cable to the board.

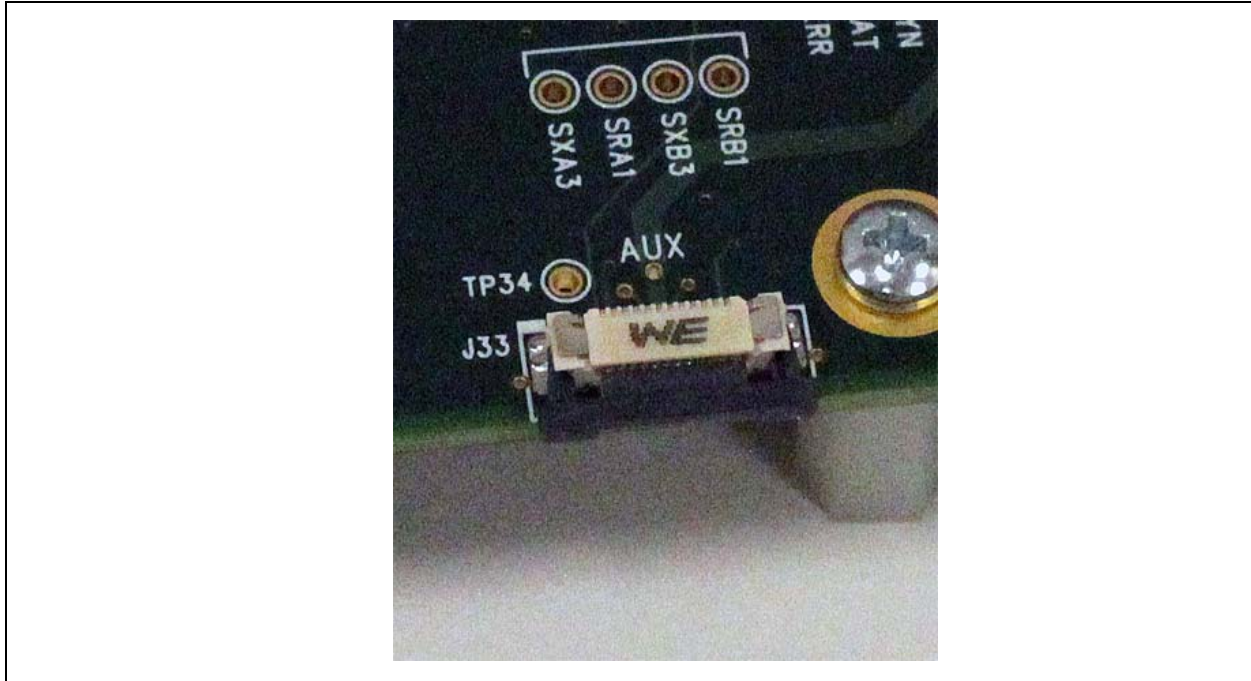
**FIGURE A-1: CONNECTOR CLOSED**



Carefully pry the black locking bail outward with 2 fingers. It only moves about 2mm.

# MOST ToGo Getting Started

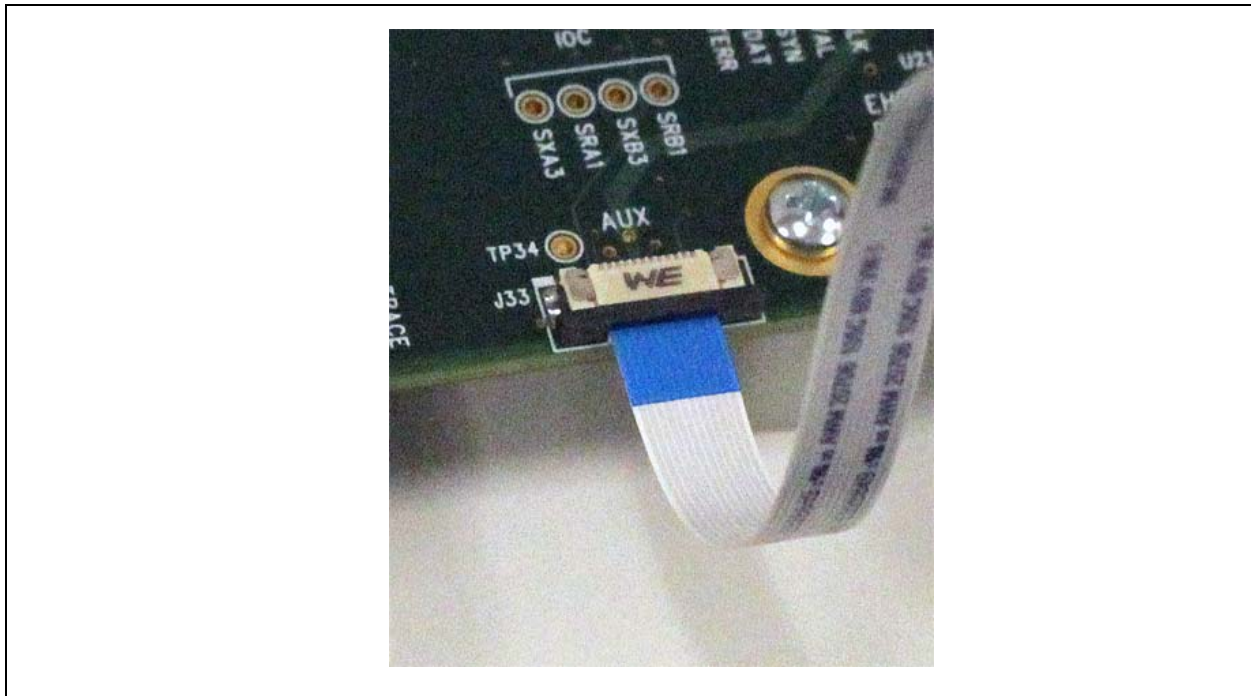
**FIGURE A-2: CONNECTOR OPEN**



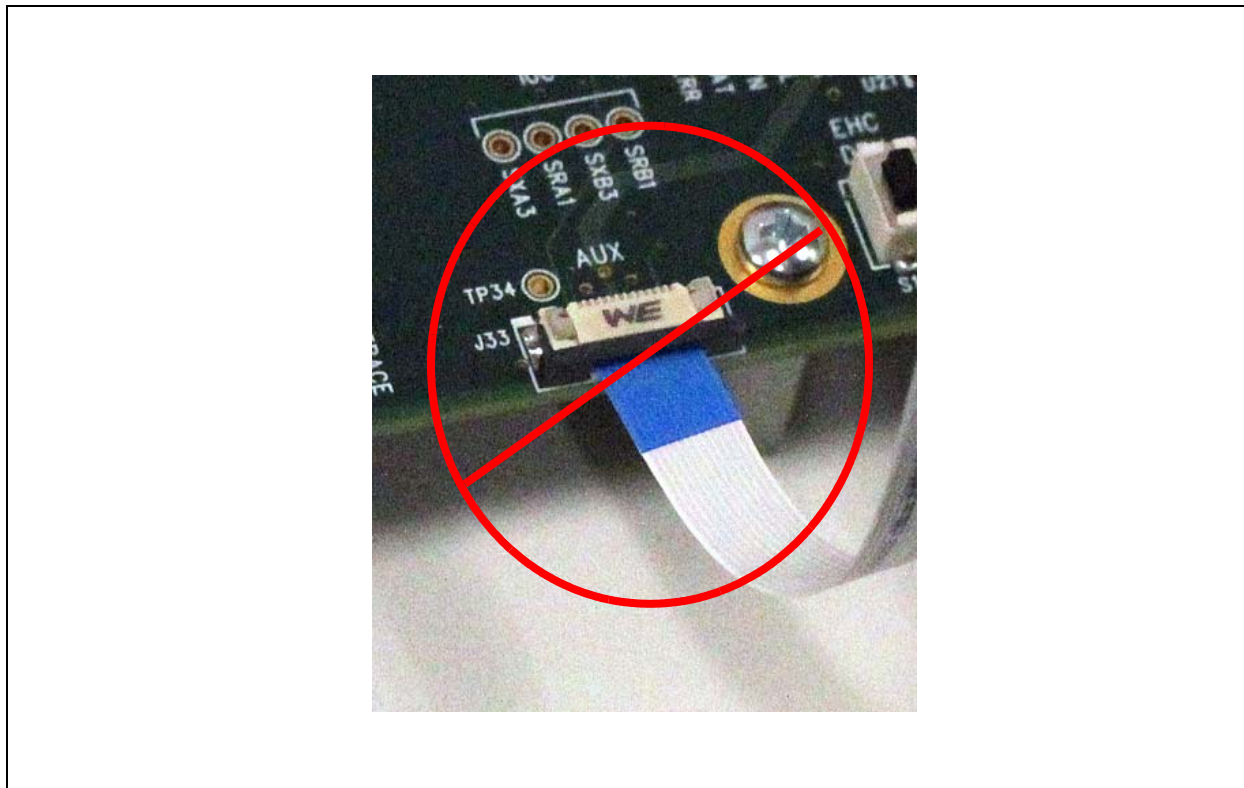
Turn the display upside down and place it near the master board. Insert the cable into the housing with the blue side of the cable facing up. It helps to insert it at a slight upward angle rather than exactly on the plane of the board. Make sure it is inserted until it seats against the back of the connector housing.

Now push the black latching bail back in evenly with both thumbs. When done it should look like this:

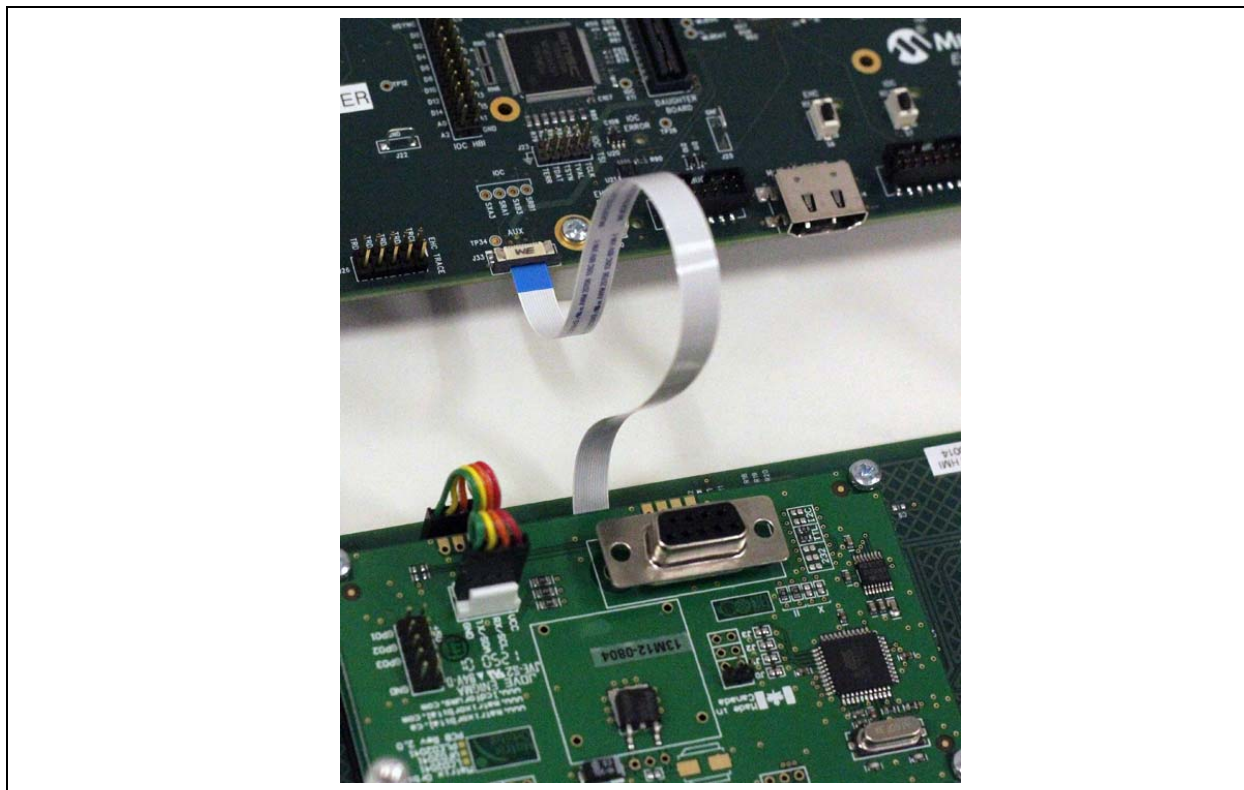
**FIGURE A-3: CONNECTOR INSERTED CORRECTLY**



**FIGURE A-4: FLEX CABLE INSERTED INCORRECTLY**



**FIGURE A-5: FLEX CABLE INSERTED**





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