# Lighting Communications Development Platform
## Product Highlights & Demonstrations



**www.microchip.com/lighting**

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Revision 1.1

# Lighting Communications Development Platform

**Universal Lighting Protocol Development**

**FREE 'C' Library Stack (DALI, DMX512A)**

**Dimming & Color Mixing Control**

**Customizable Capabilities**

## Platform Features

### Main Communication Board Highlights (DM160214)

- Populated with PIC16F1947 controlling:
    - Communications
    - User Interface: LCD, buttons, slider
    - LED constant current drive
- Populated with Cree XLamp MC-E Color LED
- Populated with the LEDnLIGHT optic and holder

### Prototyping Communication Board Highlights (AC160214)

- Populated with PIC16F1947 for user interface and communications
- Bread boarding space for customized lighting development

### Universal Communications Adapter Interface

- DALI Adapter (DM160214-1)
- DMX512A Adapter (DM160214-2)
- Support for future protocol adapters (eg. RF)
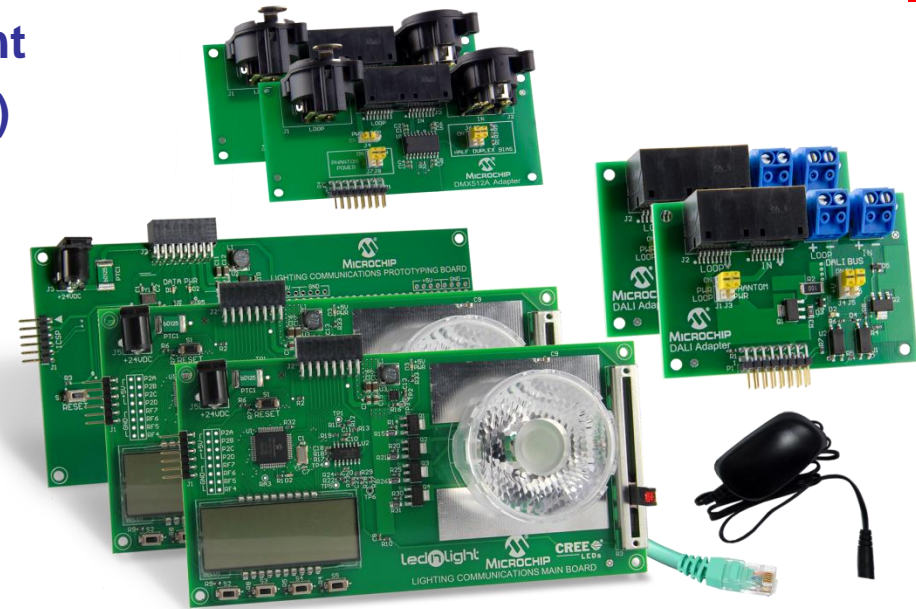
*Available for purchase separately or as a kit…*

**DALI Starter Kit (DV160214-1)**

**DMX512A Starter Kit (DV160214-2)**

- (2) DALI or (2) DMX512A Adapters
- (2) Main Communication Boards
- (1) Prototyping Communication Board
- 9V International power supply
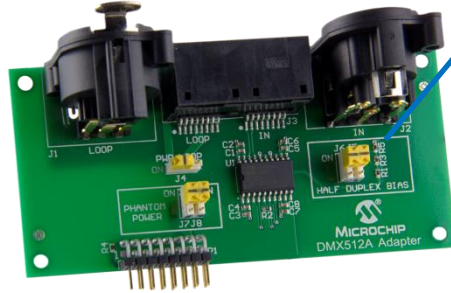- RJ45 Patch cable

*Go to www.microchip.com/lightingcomms*

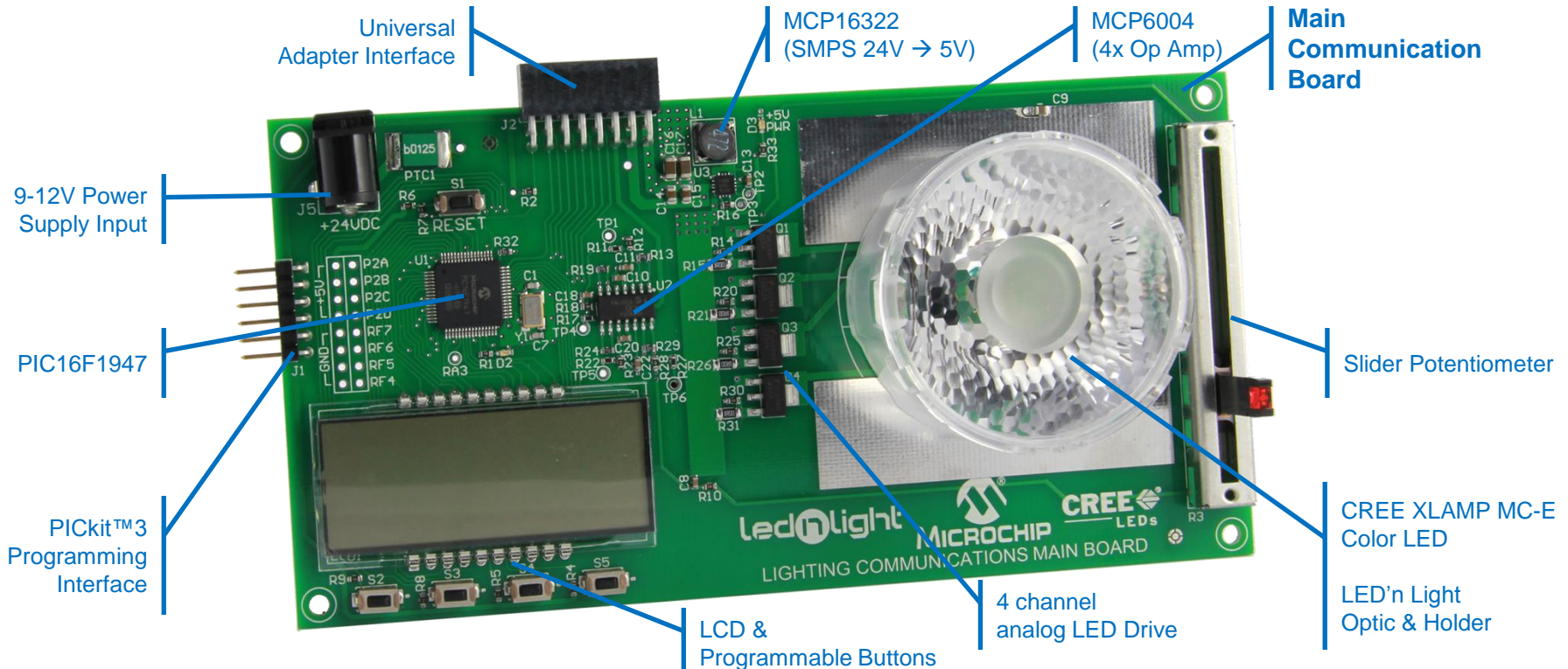# Lighting Communications Development Platform
## Main Communication Board & Adapters

**DALI** Adapter with 2-wire & RJ45 connections

**DMX512A** Adapter with 5-pin barrel & RJ45 connections

Support for future adapters (eg. Wireless)

Universal Adapter Interface

MCP16322 (SMPS 24V → 5V)

MCP6004 (4x Op Amp)

**Main Communication Board**

9-12V Power Supply Input

PIC16F1947

PICkit™3 Programming Interface

LCD & Programmable Buttons

4 channel analog LED Drive

Slider Potentiometer

CREE XLAMP MC-E Color LED

LED'n Light Optic & Holder

# Lighting Communications Development Platform
## Prototyping Communication Board & Adapters



**DALI** Adapter with 2-wire & RJ45 connections

**DMX512A** Adapter with 5-pin barrel & RJ45 connections
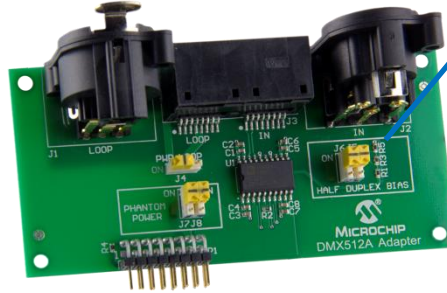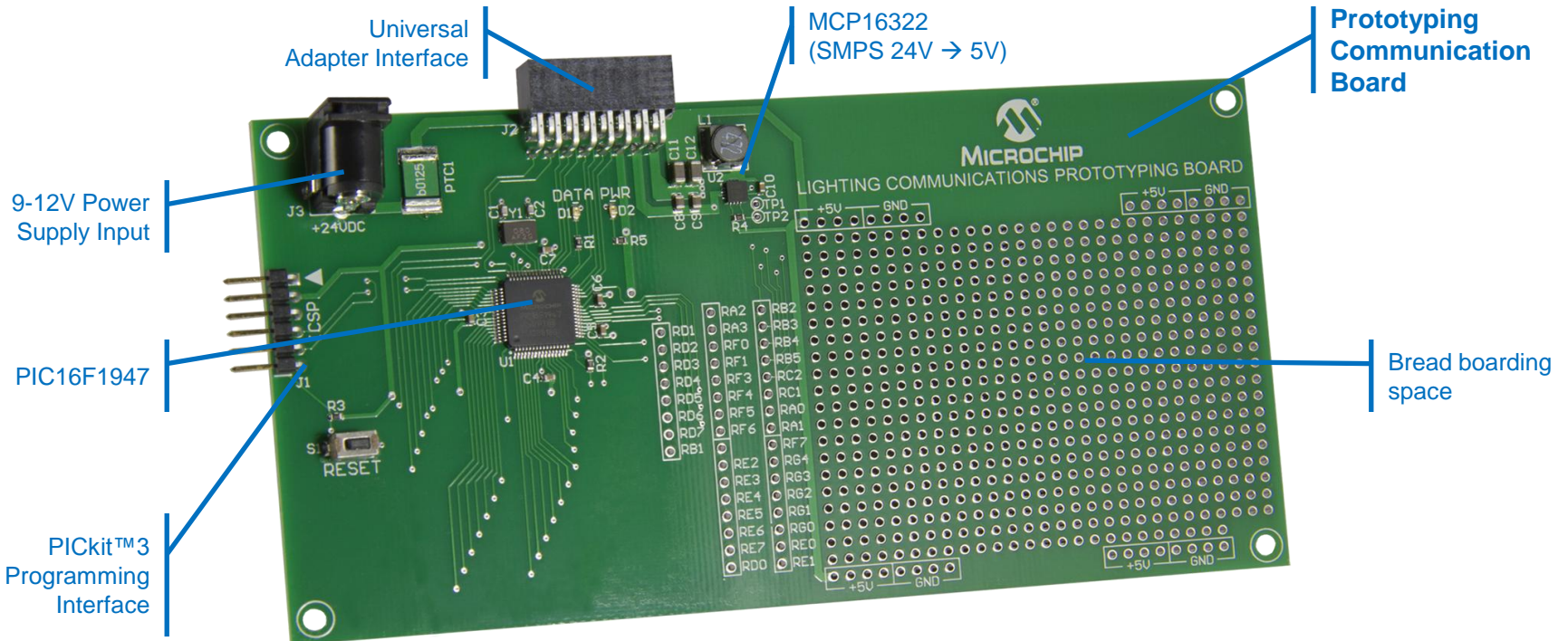
Support for future adapters (eg. Wireless)

Universal Adapter Interface

MCP16322 (SMPS 24V → 5V)

**Prototyping Communication Board**

9-12V Power Supply Input

PIC16F1947

Bread boarding space

PICkit™3 Programming Interface

LIGHTING COMMUNICATIONS PROTOTYPING BOARD

# Configuration

- Minimum of (2) main or (2) prototyping boards
- Minimum of (2) adapters
  - connected via appropriate cabling
    - RJ45 patch cable
    - DMX512A 5-pin barrel cable
    - DALI 2-wire
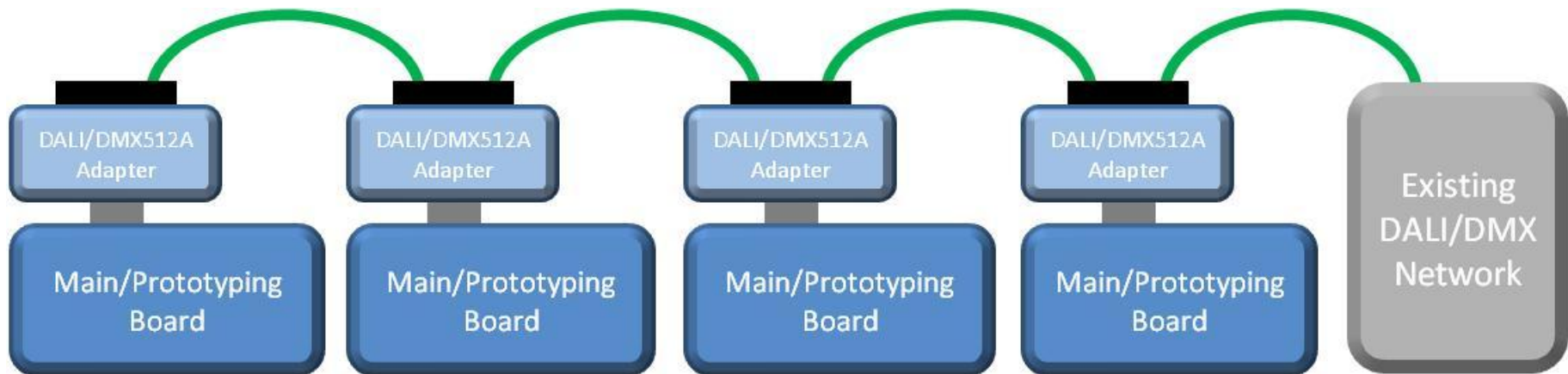
# DALI

**DALI – "Digital Addressable Lighting Interface"**

- Designed primarily for Commercial & Industrial lighting
- 2-wire connection and offers individual lamp or group addressability in a bus configuration

**FREE DALI Firmware Library**

- 'C' based firmware library
- Control Device (master) & Control Gear (slave) libraries
- Automated Commissioning
- Simple API for ease of use
- Firmware implementation on any 8-bit PIC Microcontroller
  - PIC Microcontroller Requirements
    - (1) 8-bit timer / (1) 16-bit timer
    - EEPROM or Emulated EEPROM (self-write Flash)
    - ~4KW Flash Program memory footprint (final code size TBD)
  - Portable across 8-, 16-, 32-bit PIC microcontrollers
- Compliance
  - IEC 62386-101 (DALI general system requirements)
  - IEC 62386-102 (DALI general system requirements – control gear)
  - Ready for IEC 62386-2xx implementation (particular requirements for control gear; eg. LED, Fluorescent, etc.)

**Downloadable at www.microchip.com/lightingcomms**

# DMX512A

## DMX512 – "Digital Multiplex with 512 pieces of information"

- Designed primarily for Theatrical & Architectural lighting
- Increased reliability over that of 0-10V

## FREE DMX512A Firmware Library

- 'C' based firmware library
- Controller (master) & Receiver (slave) in a single library
- Simple API for ease of use
- Firmware implementation on any PIC Microcontroller
    - PIC Microcontroller Requirements
        - (1) EUSART
        - (1) 16-bit timer
        - ~4KW Flash Program memory footprint (final code size TBD)
    - Portable across 8-, 16-, 32-bit PIC microcontrollers
- Compliance
    - ANSI E1.11-2008 (USITT DMX512-A, Asynchronous Serial Digital Data Transmission Standard for Controlling Lighting Equipment and Accessories)

## Downloadable at **www.microchip.com/lightingcomms**

# Partner Overview

Cree®, Inc. leads the industry through performance and application optimized lighting-class LEDs that simplify design and lower system costs to obsolete energy-wasting traditional lighting. Cree's relentless innovation drives the LED lighting revolution with products designed to accelerate LED adoption and push the boundaries of what's possible with LED lighting. Cree's LED product families include Cree® XLamp® and High Brightness LEDs.

LEDnLIGHT optics are made by Gaggione SAS the LaCluse, France plastic optics manufacturer, who produces the very narrow beam collimator providing excellent color mixing properties to address stage lighting, entertainment lighting and architectural lighting applications to name a few.
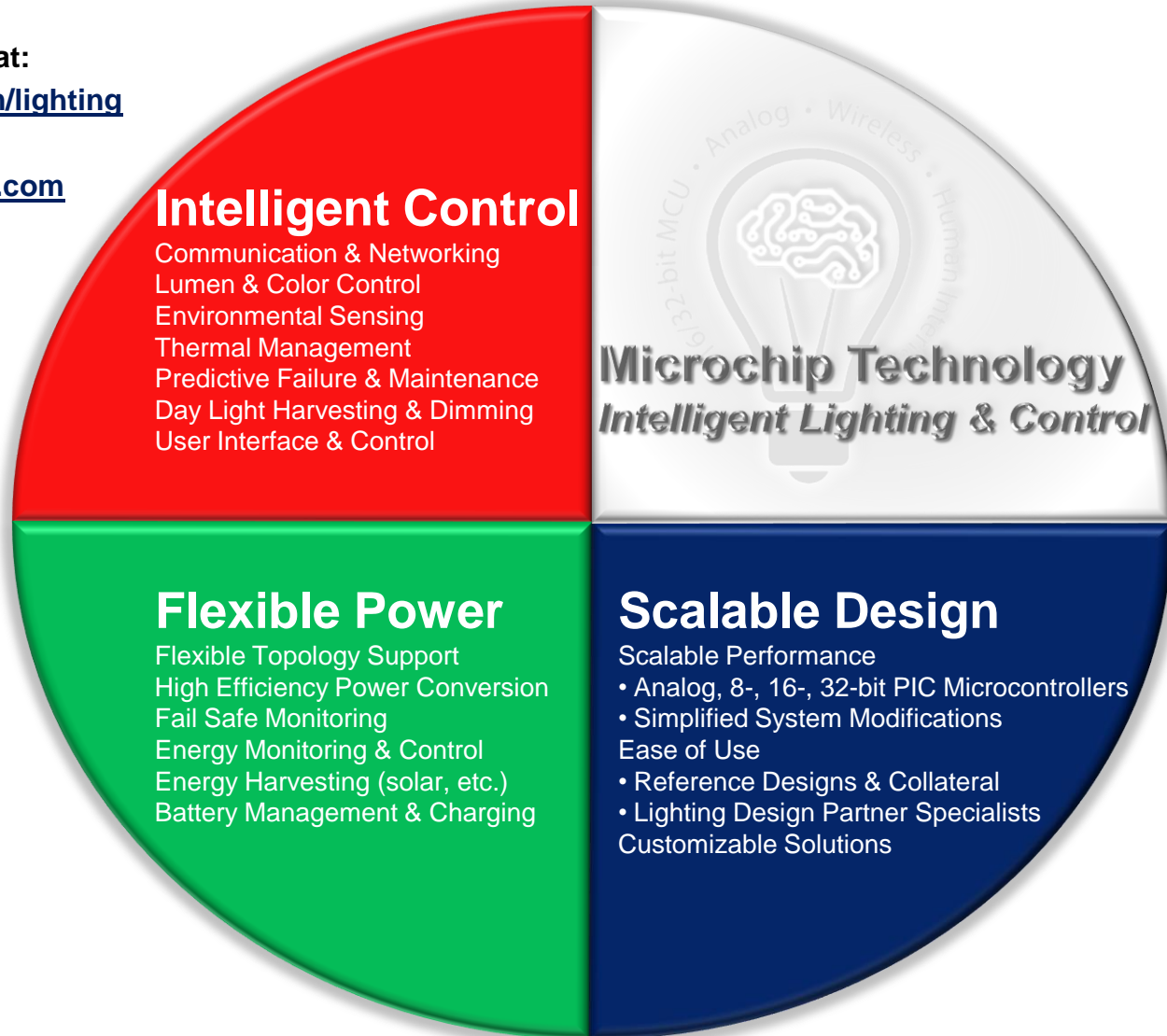
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## Scalable Design
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• Simplified System Modifications
Ease of Use
• Reference Designs & Collateral
• Lighting Design Partner Specialists
Customizable Solutions

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# Demonstrations

**Stand-Alone RGBW**

**DMX512A Controller & Receiver**

**DALI Control Device & Control Gear**

# Stand-Alone RGBW
## Demonstration Overview

## Demonstration Overview

- Self contained demonstration WITHOUT communications control
- Main Communication Board performing RGBW (RED, GREEN, BLUE, WHITE) color mix
- PIC16F1947 Controlled Features
    - RGBW LED color mixing via constant current control
    - Slider & button interface
    - LCD drive & control

## Hardware Requirements

- (1) Main Communication Board
- 9-12V Power Supply

## Firmware Requirements

- Demonstration code
    - StandAloneDemo.X.production.hex

Downloadable at www.microchip.com/lightingcomms

# Stand-Alone RGBW
## Demonstration Setup

**1** **Program Main Board**

- Utilize PICkit3 to program Main Communication Board with StandAloneDemo.X.production.hex

**2**

**Provide Power**

- Insert 9-12V DC power cord
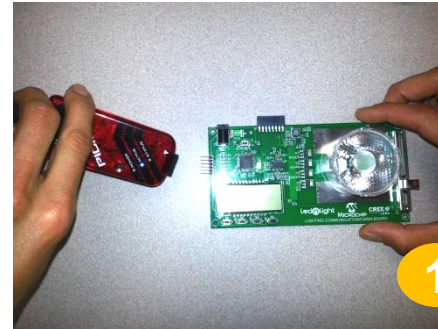
# Stand-Alone RGBW
## Demonstration Operation

**Button 1 (S2) – 'rGb' LCD Display (power-up mode)**

- Auto rotates through RED, GREEN, BLUE, WHITE and custom color mix
- Slider not used



**Button 2 (S3) – 'FAdE' LCD Display**

- Auto rotates through RED, GREEN, BLUE, WHITE and custom color mix with transition fade
- Slider not used



**Button 3 (S4) – 'SLId' LCD Display**

- Slider controlled rotation through RED, GREEN, BLUE, WHITE and custom color mix



**Button 4 (S5) – 'LItE' LCD Display**

- RED, GREEN, BLUE, WHITE simultaneously 'ON'
- Slider controlled simultaneous dimming of RED, GREEN, BLUE, WHITE

## Demonstration Overview

- DMX512A uni-directional communications control
- Single Controller sending commands to multiple Receivers
- Receivers performing RGBW (RED, GREEN, BLUE, WHITE) color mix based on Controller commands
- PIC16F1947 Controlled Features
    - RGBW LED color mixing via constant current control
    - Slider & button interface
    - LCD drive & control
    - DMX512A command & control

## Hardware Requirements

- (3) Main Communication Board
- (3) DMX512A Adapters
- (2) RJ45 Patch Cables
    - Optional: (2) XLR5 Barrel Cables
- 9-12V Power Supply
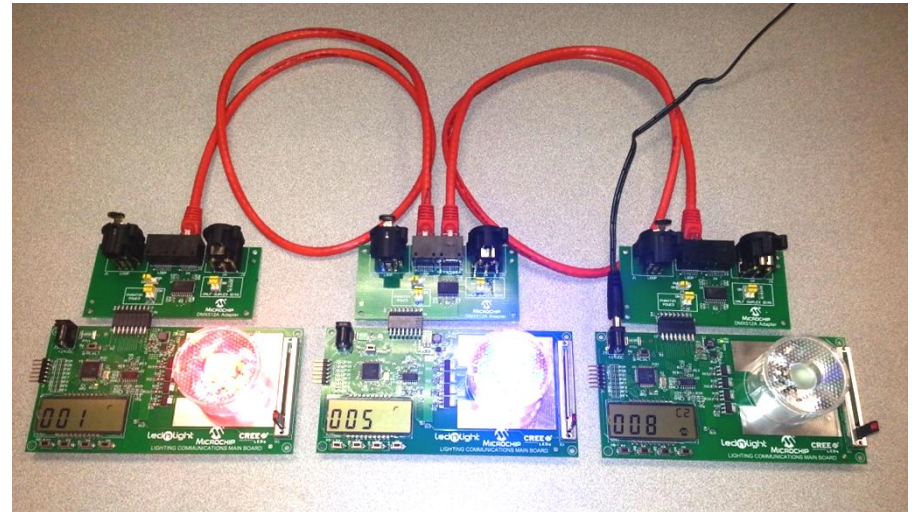


## Firmware Requirements

- Controller Demonstration code: ControllerDemo.X.production.hex
- Receiver Demonstration code: ReceiverDemo.X.production.hex

Downloadable at www.microchip.com/lightingcomms

# DMX512A Controller & Receiver
## Demonstration Setup

**1** **Program Controller**

- Utilize PICkit3 to program Main Communication Board with ControllerDemo.X.production.hex to create Controller

**2** **Program Receivers**

- Utilize PICkit3 to program (2 or more) Main Communication Boards with ReceiverDemo.X.production.hex to create Receiver

**3** **Setup & Attach Adapters**

- Set DMX512A Adapter Jumper Settings
  - J4 – ON
  - J5 – ON
  - J6 – ON
  - J7 – ON
  - J8 – ON
- Insert DMX512A adapters to all Main Communication Boards

**4** **Connect Controller to Receivers**

- Connect Main Communication Boards with DMX512A adapters in a "Daisy Chain" configuration with either RJ45 patch cable or XLR5 barrel cables
  - Note whether the board is Controller or Receiver
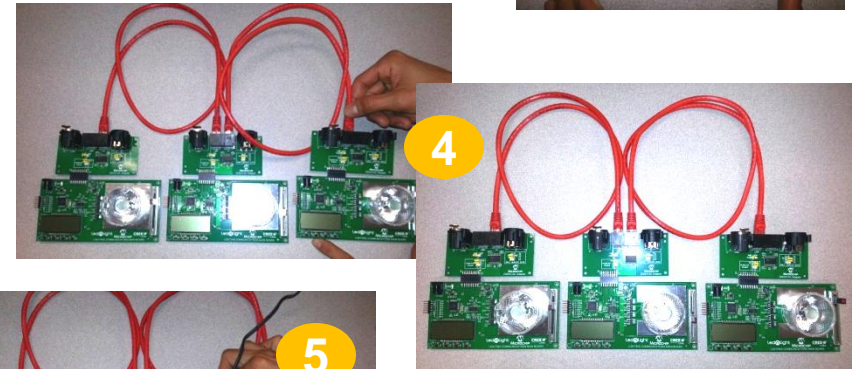
**5** **Provide Power**

- Insert 9-12V DC power cord to Controller
  - Note that power to Receivers is provided via cabling "Phantom Power"
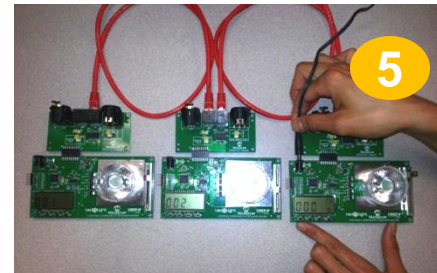






**Receiver   Receiver   Controller**

# DMX512A Controller & Receiver
## Demonstration Operation

## Receiver

**LCD Displays**

- 'r' for Receiver
- 3 Digit Base Address of Receiver: '000'

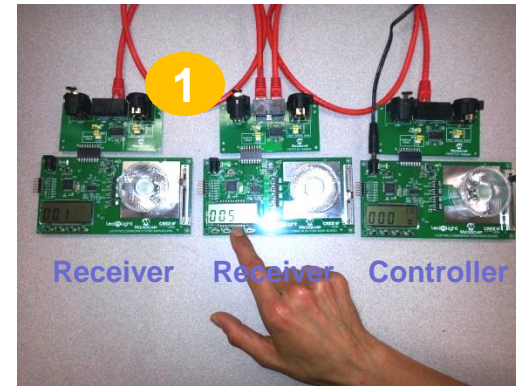**Button 1-3 (S2-S4)**

- Sets Base Address of Receiver

**Button 4 (S5)**

- Not used

**Slider**

- Not used

**1** **Set base address of each Receiver to a unique or common address. Address 000 Not Used.**

- Note that the base address of the Receiver sets the address of each individual color of the RGBW LED. The base address is assigned to RED with GREEN, BLUE and WHITE assigned incremental addresses.

- Example: Receiver base address set to 001 assigns address 001 to RED, 002 to BLUE, 003 to GREEN, 004 to WHITE of Receiver RGBW LED.

- Example: Receiver base address set to 005 assigns address 005 to RED, 006 to BLUE, 007 to GREEN, 008 to WHITE of Receiver RGBW LED.

## Controller

**RGBW LED Not Used**

**LCD Displays**

- 3 Digit Address of Specific Receiver LED: '000'
- Toggle Modes: 'C0', 'C1', 'C2'

**Button 1-3 (S2-S4)**

- Sets Address of Specific Receiver LED
  - Only used while in C2 mode

**Button 4 (S5) – Rotates through modes**

- C0 – 'OFF'
- **1** C1 – Sends commands to all Receivers to Auto rotate through RED, GREEN, BLUE, WHITE, and custom color mix (slider not used)
- **2** C2 – Controls specific Receiver LED colors based on Receiver address. Slider controlled dimming of individual RED, GREEN, BLUE, WHITE LEDs of the Receiver.
  - Example: Set Controller address display to '001'. Slider controls the RED LED of Receiver '001'
  - Example: Set Controller address display to '002'. Slider controls the GREEN LED of Receiver '001'
  - Example: Set Controller address display to '008'. Slider controls the WHITE LED of Receiver '005'



Receiver          Receiver          Controller







Receiver    Receiver    Controller
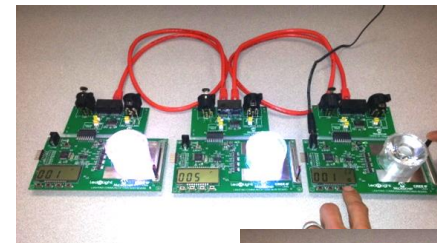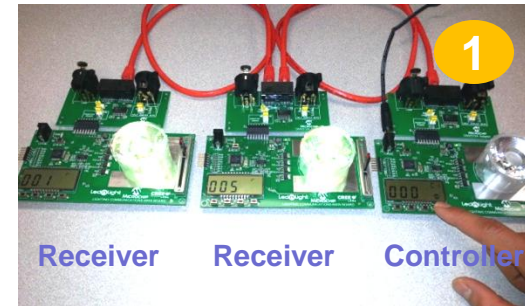
# DALI Control Device & Control Gear
## Demonstration Overview

## Demonstration Overview

- DALI bi-directional communications control
- Single Control Device sending commands to multiple Control Gear
- Control Gear performing WHITE dimming based on Control Device commands
- PIC16F1947 Controlled Features
    - WHITE LED dimming via constant current control
    - Slider & button interface
    - LCD drive & control
    - DALI command & control

## Hardware Requirements

- (3) Main Communication Board
- (3) DALI Adapters
- (2) RJ45 Patch Cables
    - Optional: (2) 2-wire cable
- 9-12V Power Supply
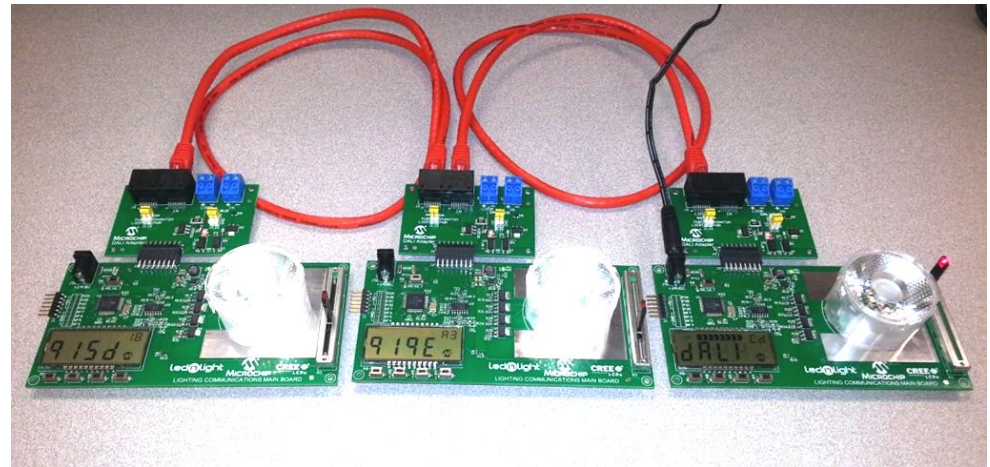


## Firmware Requirements

- Control Device Demonstration code: DALI_ControlDevice.X.production.hex
- Control Gear Demonstration code: DALI_ControlGear.X.production.hex

Downloadable at www.microchip.com/lightingcomms

# DALI Control Device & Control Gear
## Demonstration Setup

**1** **Program Control Device**

- Utilize PICkit3 to program Main Communication Board with DALI_ControlDevice.X.production.hex to create Controller
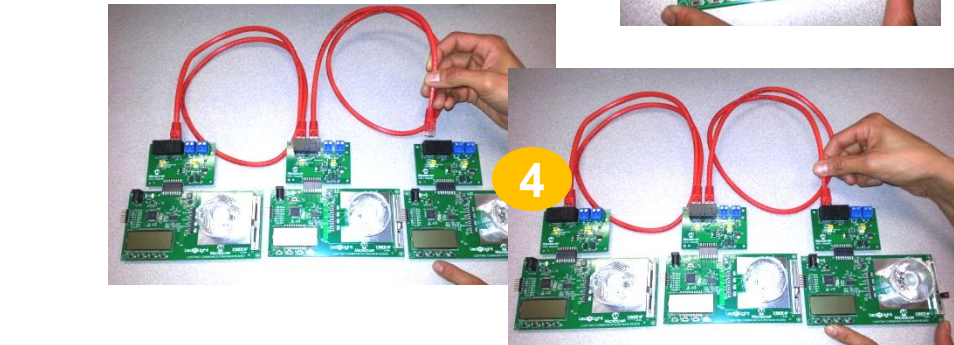
**2** **Program Control Gear**

- Utilize PICkit3 to program (2 or more) Main Communication Boards with DALI_ControlGear.X.production.hex to create Receiver

**3** **Setup & Attach Adapters**

- Set DALI Adapter Jumper Settings
  - J1 – ON
  - J3 – ON
  - J4 – ON
  - J5 – ON
- Insert DALI adapters to all Main Communication Boards

**4** **Connect Control Device to Control Gear**

- Connect Main Communication Boards with DALI adapters in a "Daisy Chain" configuration with either RJ45 patch cable or 2-wire cables
  - Note whether the board is Control Device or Control Gear

**5** **Provide Power**

- Insert 9-12V DC power cord to Control Device
  - Note that power to Control Gear is provided via cabling "Phantom Power"



Control Gear    Control Gear    Control Device

## Control Gear

**Only WHITE LED Used**

**LCD Displays**

- 'CG' for Control Gear
- When Non-Commissioned (address not assigned)
  - 'dALI'
- When Commissioned
  - 6 digit address of Control Gear: '0000$^{00}$'
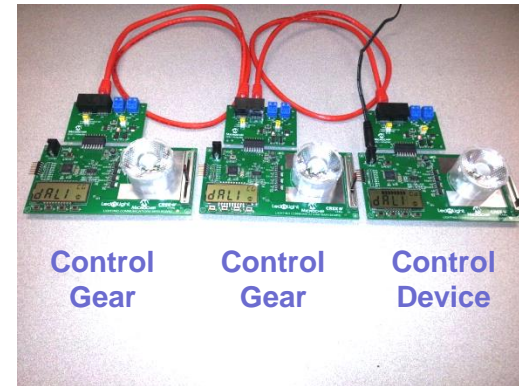
**Button 1-4 (S2-S5)**

- Not used

**Slider**

- Not used

   **Address of each Control Gear is set during the automated commissioning process initiated by the Control Device**



**Control Gear**     **Control Gear**     **Control Device**

## Control Device

**RGBW LED Not Used**

**LCD Displays**

- 'Cd' for Control Device
- Before/After Commissioning (addresses not assigned)
    - 'dALI'
- During Commissioning
    - 6 digit address of Control Gear: '$0000^{00}$'
- Status bar full: ▶▶▶▶▶▶▶▶▶

**Button 1 (S2)**

- Initiates automated commissioning

**Button 2-4 (S3-S5)**

- Assigned to specific Control Gear

**Slider**

- Dimming control of Control Gear

**1** Initiate automated commissioning process by pressing Button 1 of Control Device

- As the Control Device detects each Control Gear, the Control Gear WHITE LED will illuminate.
- Assign Control Gear to Button 2, 3, or 4 of Control Device – commissioning will continue. Repeat until all Control Gear are assigned to unique button.

**2** When commissioning is complete, Buttons 2-4 of Control Device will toggle "ON'/'OFF" specific Control Gear WHITE LED and enable slider controlled dimming



**Control Gear** **Control Gear** **Control Device**