EQCO-SDI-30-7502 HD-SDI Repeater User's Guide

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Object of Declaration: EQCO-SDI-30-7502 HD-SDI Repeater

EU Declaration of Conformity

Manufacturer: Microchip Technology Inc.
                     2355 W. Chandler Blvd.
                     Chandler, Arizona, 85224-6199
                     USA

This declaration of conformity is issued by the manufacturer.

The development/evaluation tool is designed to be used for research and development in a laboratory environment. This development/evaluation tool is not a Finished Appliance, nor is it intended for incorporation into Finished Appliances that are made commercially available as single functional units to end users under EU EMC Directive 2004/108/EC and as supported by the European Commission's Guide for the EMC Directive 2004/108/EC (8th February 2010).

This development/evaluation tool complies with EU RoHS2 Directive 2011/65/EU.

This development/evaluation tool, when incorporating wireless and radio-telecom functionality, is in compliance with the essential requirement and other relevant provisions of the R&TTE Directive 1999/5/EC and the FCC rules as stated in the declaration of conformity provided in the module datasheet and the module product page available at www.microchip.com.

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Signed for and on behalf of Microchip Technology Inc. at Chandler, Arizona, USA

Derek Carlson (signature)

Derek Carlson
VP Development Tools

12-Sep-14
Date

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Preface

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) 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 "DSXXXXXXXXA", where "XXXXXXXX" is the document number and "A" is the revision level of the document.

For the most up-to-date information on development tools, see the MPLAB® IDE online help. Select the Help menu, and then Topics to open a list of available online help files.

INTRODUCTION

This chapter contains general information that will be useful to know before using the EQCO-SDI-30-7502 HD-SDI Repeater. Items discussed in this chapter include:

- Document Layout
- Conventions Used in this Guide
- Recommended Reading
- The Microchip Web Site
- Development Systems Customer Change Notification Service
- Customer Support
- Document Revision History

DOCUMENT LAYOUT

This document describes how to use the EQCO-SDI-30-7502 HD-SDI Repeater as a development tool to emulate and debug firmware on a target board. This document includes the following chapters:

- **Chapter 1. "Product Overview"** provides a brief overview of the EQCO-SDI-30-7502, highlighting its features and uses.
- **Appendix A. "Specifications"** provides technical and performance specifications for the EQCO-SDI-30-7502.

CONVENTIONS USED IN THIS GUIDE

This manual uses the following documentation conventions:

DOCUMENTATION CONVENTIONS

Description	Represents	Examples
Italic characters	Referenced books	*MPLAB® IDE User's Guide*
	Emphasized text	...is the *only* compiler...
Initial caps	A window	the Output window
	A dialog	the Settings dialog
	A menu selection	select Enable Programmer
Quotes	A field name in a window or dialog	"Save project before build"
Underlined, italic text with right angle bracket	A menu path	*File > Save*
Bold characters	A dialog button	Click **OK**
	A tab	Click the **Power** tab
Text in angle brackets < >	A key on the keyboard	Press <Enter>, <F1>
`Plain Courier New`	Sample source code	`#define START`
	Filenames	`autoexec.bat`
	File paths	`c:\mcc18\h`
	Keywords	`_asm, _endasm, static`
	Command-line options	`-Opa+, -Opa-`
	Bit values	`0, 1`
	Constants	`0xFF, 'A'`
Italic Courier New	A variable argument	`file`.o, where `file` can be any valid filename
Square brackets [ ]	Optional arguments	`mcc18 [options] file [options]`
Curly brackets and pipe character: {|}	Choice of mutually exclusive arguments; an OR selection	`errorlevel {0|1}`
Ellipses...	Replaces repeated text	`var_name [, var_name...]`

	Represents code supplied by user	`void main (void)`
		`{ ...`
		`}`

Notes	A Note presents information that we want to re-emphasize, either to help you avoid a common pitfall or to make you aware of operating differences between some device family members. A Note can be in a box, or when used in a table or figure, it is located at the bottom of the table or figure.	**Note:** This is a standard note box. **CAUTION** **This is a caution note.** **Note 1:** This is a note used in a table.

RECOMMENDED READING

The following document is recommended as a supplemental reference resource.

- **AN1306 – "EqcoLogic HD-SDI Repeater Reference Design" (DS00001837)**

Consult this document for detailed information on the HD-SDI Repeater. Reference information found in this data sheet includes:

- Basic principles of operation
- Printed circuit board design
- Instructions for use and troubleshooting

This document is available for download from the Microchip website (www.microchip.com).

THE MICROCHIP WEB SITE

Microchip provides online support via our web site at: http://www.microchip.com. This web site makes files and information easily available to customers. Accessible by most Internet browsers, 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 (FAQs), technical support requests, online discussion groups, Microchip consultant program member listings
- **Business of Microchip** – Product selector and ordering guides, latest Microchip press releases, listings of seminars and events; and listings of Microchip sales offices, distributors and factory representatives

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The Development Systems product group categories are:

- **Compilers** – The latest information on Microchip C compilers and other language tools
- **Emulators** – The latest information on the Microchip in-circuit emulator, MPLAB® REAL ICE™
- **In-Circuit Debuggers** – The latest information on the Microchip in-circuit debugger, MPLAB ICD 3
- **MPLAB X IDE** – The latest information on Microchip MPLAB X IDE, the Windows® Integrated Development Environment for development systems tools
- **Programmers** – The latest information on Microchip programmers including the PICkit™ 3 development programmer

CUSTOMER SUPPORT

Users of Microchip products can receive assistance through several channels:

• 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://support.microchip.com

DOCUMENT REVISION HISTORY

Revision A (October 2014)

Initial release of this document.

Chapter 1. Product Overview

1.1 INTRODUCTION

The repeater contains three critical components to correct and then retransmit the HD-SDI signal:

- Adaptive Equalizer to return the signal to its original amplitude and modulation
- Reclocker to resynchronize the signal and bring it back to its original condition
- Cable Driver to retransmit the signal with its original characteristics restored

Furthermore, the repeater design allows for unique benefits:

- Power can be transmitted from the recorder side to the camera over the coax cable.
- Up to five repeaters may be powered from the coax cable; if one or two repeaters are used, the power may also be adequate to power the camera on the remote end.
- Five or more repeaters can be connected if power is added in the middle of the link.
- A control signal (RS485) can be transmitted from the recorder (DVR) side to the camera over the coax cable.
- Simultaneous video signal transmission, camera control and power over a single cable allows full re-use of legacy coax infrastructure.

1.2 REQUIREMENTS

- 75Ω coaxial cable with 75Ω BNC connectors on each end (maximum length based on cable type – see specifications)
- HD-SDI camera or source (with or without power over coax capability)
- HD-SDI DVR or capture source (with or without power over coax capability)
- 24V DC power supply (not provided).
- 12V DC power supplies can be used if only two repeaters are used and there is no need to power the camera over the coax (not provided).

1.3 SETUP

Each repeater supports a link of up to 200m at 1.485 Gbps and 130m with a data-rate of 2.97 Gbps (depending on cable quality). Longer lengths can be supported with lower-speed cameras; e.g., 720m for SDI cameras. Up to five repeater units can be daisy-chained together, all powered over the coax cable by power injected to the first repeater.

Step 1: Connect the 24V DC or 12V DC power supply (for the DVR side) and the RS485 in/out cables to the plug connector.

Step 2: plug the plug connector in to the repeater (on the camera side or DVR side).

Step 3: If using multiple repeaters and RS485 uplink, connect the RS485 Out cable to the camera (or breakout board) at camera side.

Step 4: If using multiple repeaters and RS485 uplink, connect the RS485 In cable to the DVR (or breakout board) at DVR side.

Step 5: Connect 75Ω coaxial cable to 75Ω BNC connector on repeater.

Step 6: If powering a camera or remote source over the coax, draw power from VCC and GND pins of the plug connector at the camera side.

> **Note 1:** If used, repeaters 2-5 are powered via the first repeater.
>
> **2:** Camera control is one-way only, from DVR to camera.

1.4   CONNECTION DIAGRAM

Extend HD-SDI links up to 1 km with power over cable and camera control link over a single coax cable.

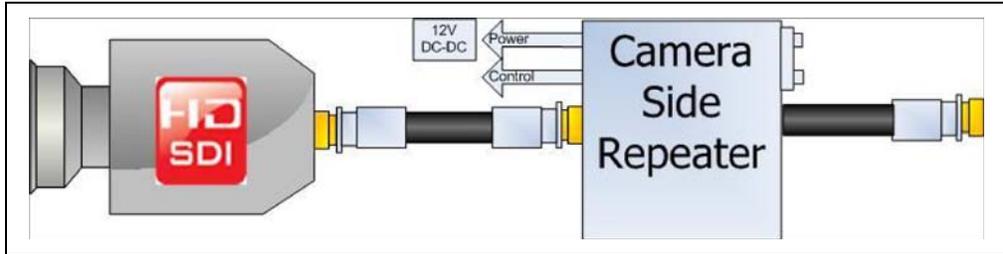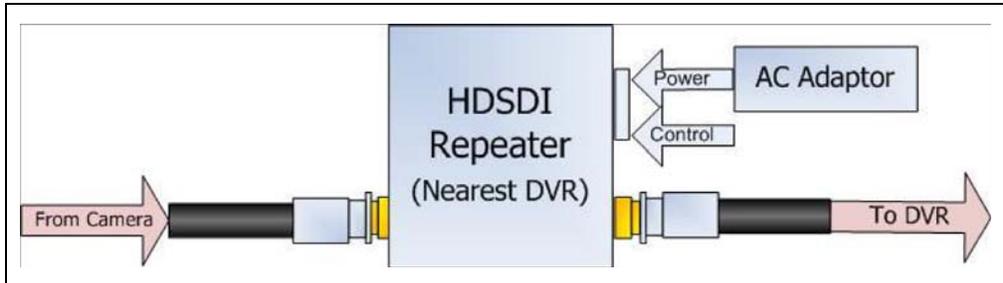**FIGURE 1-1:   CAMERA SIDE HD-SDI REPEATER WITH POWER AND CONTROL OUTPUTS**

FIGURE 1-2:   IN-LINE HD-SDI REPEATER (UP TO FIVE REPEATERS BEFORE ADDITIONAL POWER IS REQUIRED)

FIGURE 1-3:   DVR SIDE REPEATER INCLUDING LINK POWER AND CONTROL CHANNEL

The characteristic impedance of coaxial cable and connectors must all match. The EQCO-SDI-30-7502 Repeater must have 75Ω (± 3Ω) impedance. The illustration below shows the difference between a 50Ω connector versus a 75Ω connector. A 75Ω coaxial cable with 75Ω connectors must be used.

FIGURE 1-4: DIFFERENCE BETWEEN 50Ω VS 75Ω CONNECTORS

1.5   CABLE CONNECTION

When using the repeater at the DVR side, the 24V DC or 12V DC power supply can be connected to the plug connector. The cable used for the RS485 input signal should be connected to the RS485 pins of the plug connector. Make sure that all the cables are connected in the right order, as shown in Figure 1-5. Insert the plug connector into the repeater box at the DVR side.

When using the repeater at the camera side, the camera can be powered (when no more than two repeaters are used) by connecting the power to the VCC and GND of the plug connector. Connect the RS485 output pins to the right pins of the Mini-Combicon plug connector as illustrated in Figure 1-6. Make sure that all the cables are connected in the right order. Insert the plug connector into the repeater box at the camera side.

> **Note:** Camera can be powered if only two repeaters are used in-line. It is required to power the first repeater with 24V. Use of more than two repeaters will not allow sufficient supply for powering the camera. In this case, external power will have to be supplied to the camera.
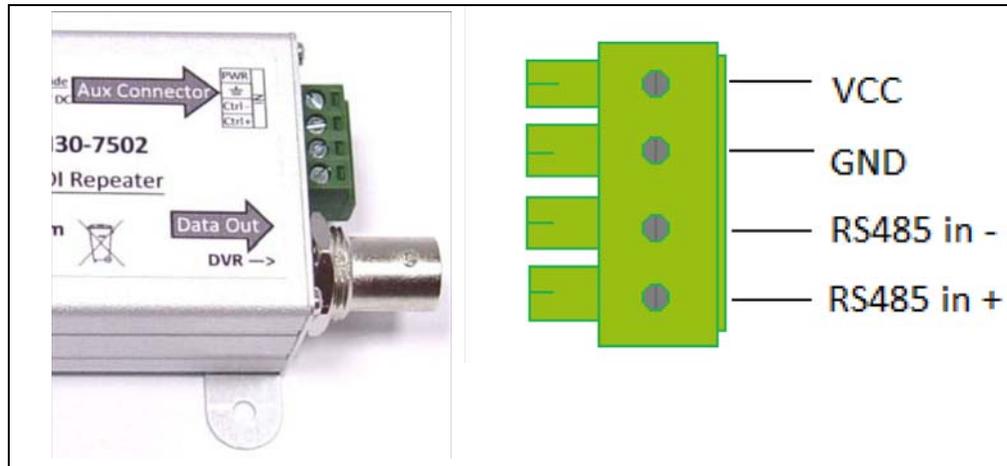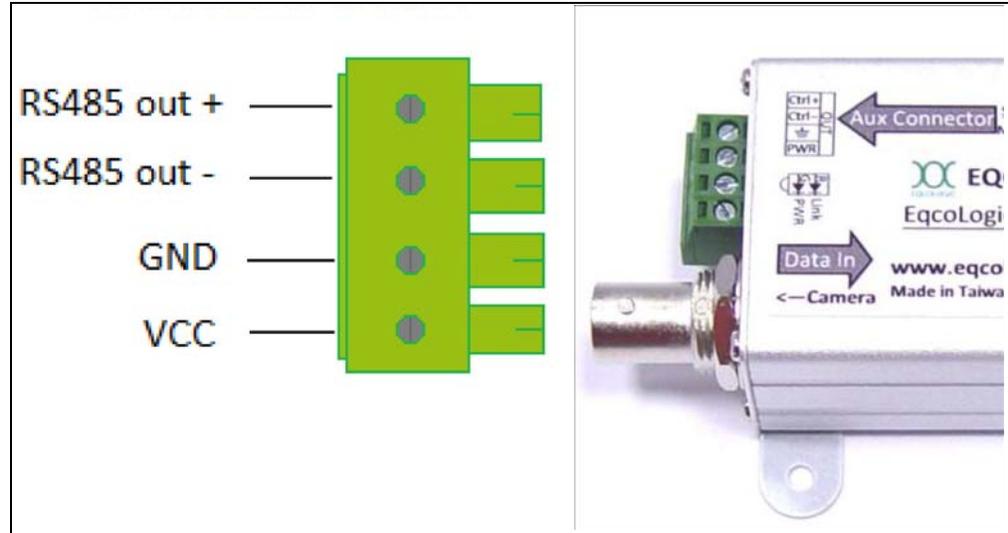
FIGURE 1-5: DVR SIDE

FIGURE 1-6: **CAMERA SIDE**

Appendix A. Specifications

This appendix includes the following figures:

- **Table A-1: "Technical Specifications"**
- **Table A-2: "Performance Specifications"**

TABLE A-1:   TECHNICAL SPECIFICATIONS

HD-SDI Interface	
Connectors	BNC True 75Ω
Cable Impedance	75Ω ± 3Ω
Data Throughput	270 Mbps, 1.485 Gbps, 2.97 Gbps
Aux Interface	
Connector (Head End)	Plug connector
Signaling	RS485 in, RS485 out, Gnd, +24V
Power Supply Input (Head End Input)	
Aux Power In	24V @ 720 mW, plus any concatenated repeaters
DC Feed via Coax	Min 9-24V DC, rated current 0.5-2A
Power Supply Output (Camera Side Output)	
Aux Power Out	VIN @ Head End-1V-Coax DC Drop (varies with cable type/length)
DC Feed via Coax	VIN @ Head End-1V-Coax DC per hop (varies with cable type/length)
DC Supply Current	Maximum 400 mA-30 mA per repeater
Environmental	
Operating Temperature	0°C to 50°C
Relative Humidity	Up to 85% non-condensing
Storage Temperature	-20°C to 70°C

TABLE A-2:   PERFORMANCE SPECIFICATIONS

Performance by Coax Type[1]	Max Coax Length for Error Free Operation @ 1.485 Gbps	Max Coax Length for Error Free Operation @ 2.97 Gbps	Cable/Power Budget[1]	
			Max # Repeaters (total length)	DC Power after 2 Repeaters
RG6 Sample 1 (16 dB/100m) (Belden 1694A)	220m/720 ft	120m/390 ft	5 (1 km)	6w
RG6 Sample 2 (16 dB/100m) (Carol Brand)	220m/720 ft	120m/390 ft	3 (600m)	1.8w
5C-HFBT Sample (16 dB/100m) (Amphenol)	220m/720 ft	120m/390 ft	5 (1 km)	6w
RG59 Sample (23 dB/100m)	153m/502 ft	83m/272 ft	5 (700m)	6.5w
3C-2V Sample 1 (41 dB/100m) (Hangzhou Linan Tongda Cable Co., Ltd.)	85m/280 ft	47m/154 ft	5 (390m)	6.5w
RG11 Sample (10 dB/100m) (CommCCope F1160BVV)	350m/1150 ft	192m/630 ft	4 (1.3 km)	4w

1:   At 1.485 Gbps

EQCO-SDI-30-7502 HD-SDI Repeater User's Guide

NOTES:

Worldwide Sales and Service

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Fax: 82-2-558-5932 or
82-2-558-5934

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Fax: 34-91-708-08-91

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