

**Description**

CambridgeIC's CTU chips sense the position of targets relative to inductive sensors built from a PCB. The system is contactless; there is no physical or electrical contact between sensors and targets.

For demonstration, test and development purposes, it is convenient to communicate with CTU chips using a PC. The CTU Adapter converts between the SPI interface of CTU chips and the USB interface of a PC. The Adapter is an SPI master and the CTU is an SPI slave.

**Features**

- USB powered
- Selectable CTU power supply: 2.7V, 3.3V or 3.6V
- Adapter firmware can be updated in the field
- Full speed USB operation
- Interface DLL available for software developers
- Compact, rugged, metal housing

**Performance**

- 100 SPI write/reads per second (typical PC)
- 1Mbit/s SPI clock rate
- SPI timings compatible with CTU chips
- 100mA max power supply output current

**Applications**

- Connecting CTU chips to a PC for demos and test
- Developing CTU chip applications
- PC based measurement systems

Product identification	
Part no.	Description
013-7001	CTU Adapter

CTU connector 14-way IDC pin-out		
Pin	Name	Description
1	VCTU	CTU supply voltage output
2	GND	Supply return (0V)
3	IO1	User IO input
4	IO2	User IO input
5	IO3	User IO input
6	IO4	User IO input
7	GND	Supply return (0V)
8	MOSI	Master Out Slave In output
9	nSSA	Slave Select A output
10	SCK	Serial Clock output
11	MISO	Master In Slave Out input
12	IO5	User IO input
13	IO6	User IO input
14	nRST	RESET output

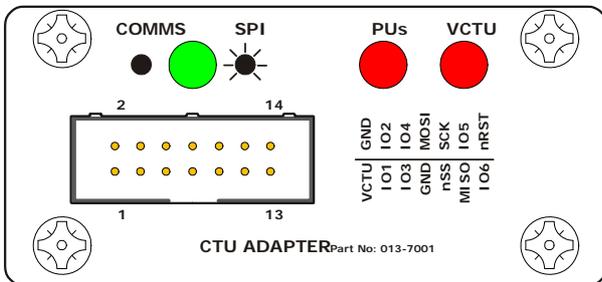


Figure 1 Adapter's front panel

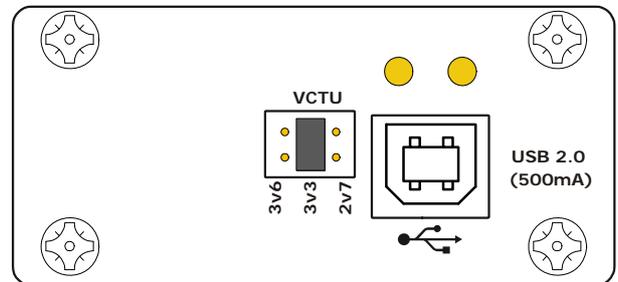


Figure 2 Adapter's rear panel

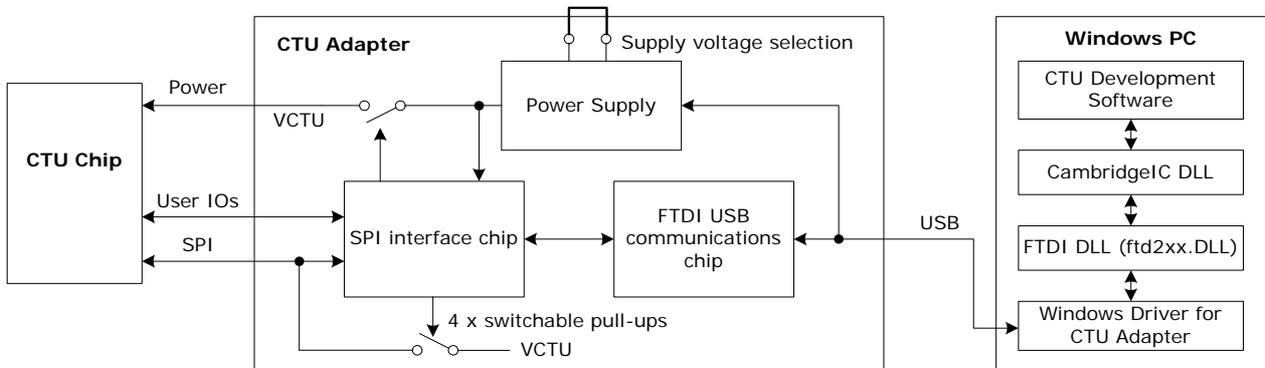


Figure 3 block diagram

# 1 CTU Adapter Operation

## 1.1 CTU Development Applications

A number of PC applications are available for communicating with CTU chips through the Adapter. Please refer to the CTU Development Applications User Guide.

These include an application to upload new firmware to the Adapter. Adapter firmware is distributed by CambridgeIC in the form of an Adapter Firmware File (.aff).

## 1.2 CTU Communication with Customer Software

Development tools are available to enable customers to communicate with CTU chips within their own applications.

If developing with LabVIEW, a set of LabVIEW Virtual Instruments (VIs) is available. These include sample applications and lower level VIs for configuration and communication. Please refer to the CTU LabVIEW VI User Guide for documentation.

If developing with .NET applications such as C++ and Visual Basic, the class library CambridgeIC.DLL is documented for customer use. Please refer to the CTU Adapter Class Library User Manual. Visual Basic sample code is also available for a simple application that reads position measurements from Type 1 sensors.

## 1.3 Front Panel Indicator LED Functions

There are 3 LEDs on the front panel labeled COMMS, PUs and VCTU, as illustrated in Figure 1.

During normal operation, the green COMMS LED flashes rapidly when the Adapter is performing SPI transactions. Flashes do not correspond to individual SPI messages because they usually happen too rapidly. Instead, the LED flashes once for single SPI transaction and at a rate of approximately 5Hz when SPI transactions are repeated rapidly.

The red LED marked PUs lights when the SPI interface's pull-ups are active in normal operation, and the red LED marked VCTU lights when VCTU is switched on.

During firmware upload to the Adapter, the COMMS LED flashes at approximately 2.5Hz and the PUs LED lights continuously. When the process completes successfully, the COMMS LED lights continuously and the PUs and VCTU LEDs are both off. If the process fails (for example due to being interrupted while in progress) the PUs LED flashes at approximately 2.5Hz. Any time the PUs LED flashes in this way, the Adapter's firmware must be uploaded again.

During firmware upload to the CTU via the Adapter, the COMMS LED flashes at approximately 5Hz to indicate repeated SPI transactions, and the PUs and VCTU LEDs light to show power and pull-ups are on. When the process completes, the COMMS LED lights continuously and the PUs and VCTU LEDs remain on. If the COMMS light goes off during the upload process, communications may have been interrupted and the upload may have failed.

## 1.4 Rear Panel Indicator LED Functions

The two small yellow LEDs on the Adapter's rear panel illustrated in Figure 2 relate to the USB interface. The right hand LED lights when the USB interface is connected to a PC and is correctly enumerated. The left hand LED flashes during USB data transfer.

## 2 Connection to CTU Chips

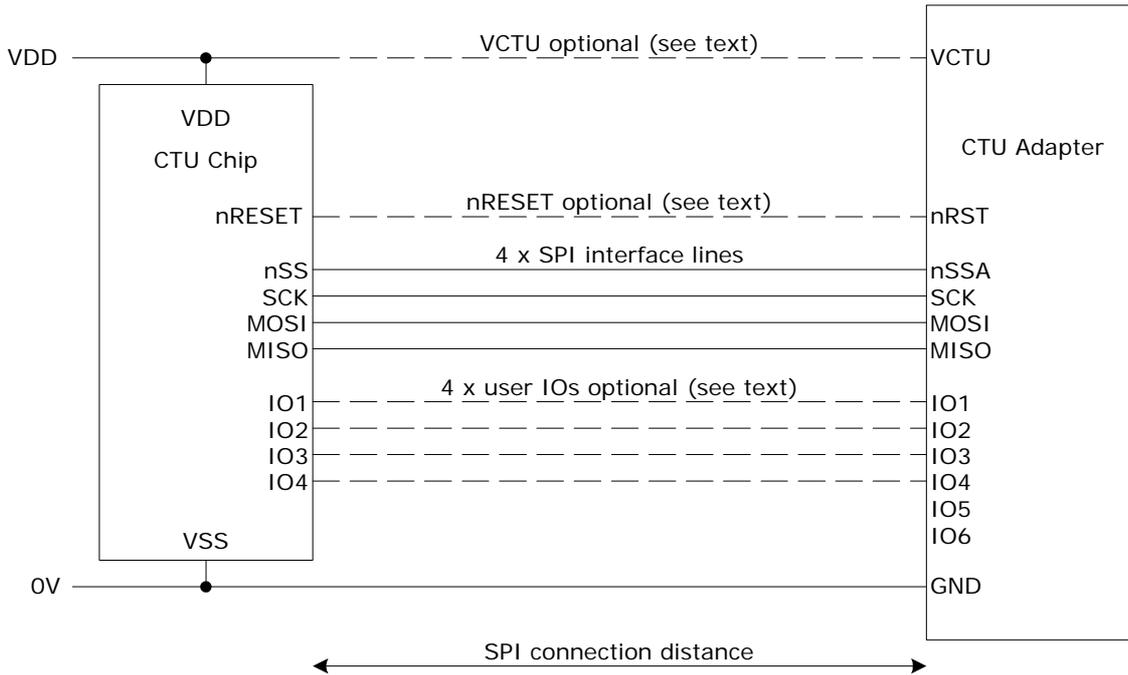


Figure 4 connections between Adapter and CTU chip

### 2.1 CTU Development Kit Connections

The CTU Development Kit includes a 14-way IDC cable that connects the Adapter to a CTU chip mounted on the CTU Development Board. This makes a full set of connections between the CTU chip and the Adapter. The connections should work without modification.

The following subsections deal with special cases, where there is a reason to use a different configuration.

### 2.2 SPI Interface Lines

All 4 SPI interface lines must be always be connected. nSS is not an optional connection.

The CTU's SPI lines require pull-ups. These can be provided by the Adapter; they are under software control.

### 2.3 Power Supply

The Adapter can provide power for the CTU circuit from VCTU. If the CTU is powered by other means, VCTU should not be connected. The Adapter's interface lines and internal circuitry operate from VCTU, and the VCTU jumper in the Adapter's rear panel should be set to the voltage closest to the externally applied source.

The two GND connections on pin 2 and 7 are connected within the Adapter.

### 2.4 nRST

The Adapter's nRST output should preferably be connected to the CTU's nRESET pin. This enables the Adapter to reset the CTU chip immediately before uploading new firmware in the special case that the CTU chip's internal firmware has been corrupted by a previous, incomplete, upload. The alternative is to ensure that the CTU chip can be reset immediately before uploading firmware by other means, for example by removing and reapplying power.

### 2.5 User IOs

The CTU's user IOs can be used for position triggers and/or sample indicators. Sample indicators are required for the Adapter to read CTU measurements with the CTU in continuous mode. User IOs need not be connected for measurement in single shot mode, where measurement timing is under the control of the PC.

### 3 Document History

Revision	Date	Reason
0001	20 August 2009	First draft
0002	4 February 2010	Updated logo and style Changed main part number to 033-0014

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