

Development System

Rapid prototyping system with RS232 and USB interfaces

CC0064-SU

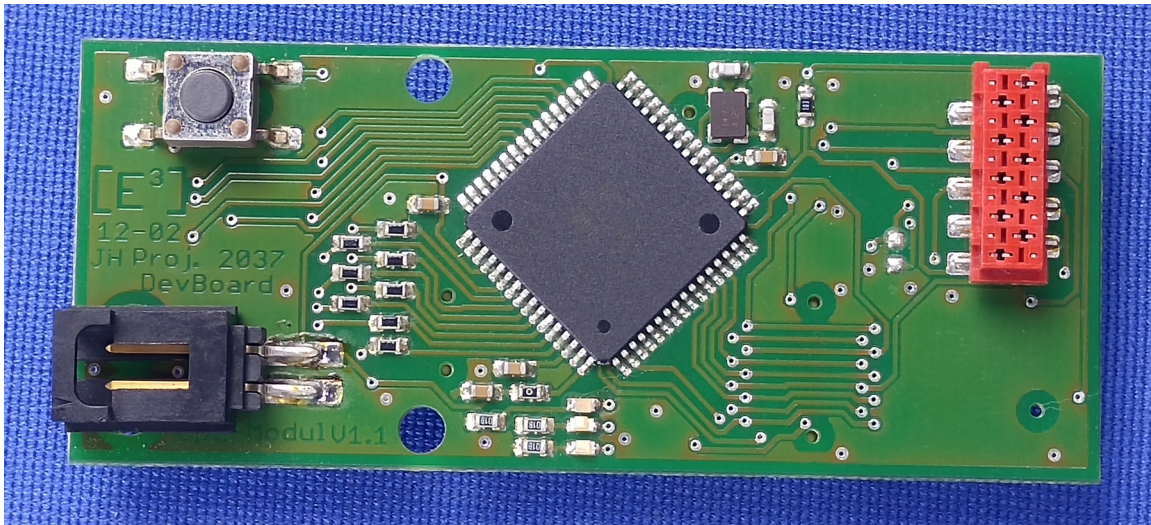
*Custom Controller
for up to 64 Sxnnnn
with RS232 and USB
interfaces*

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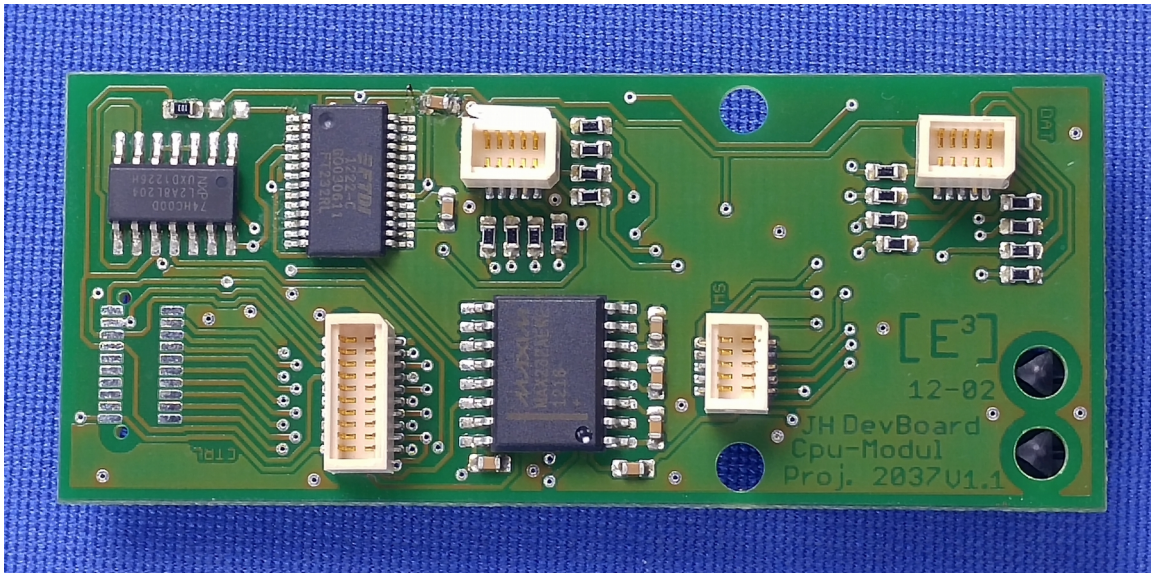
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GENERAL DESCRIPTION

The CC0064 controller provides the basis for the modular CP Series of custom control panels with Sxnnnn switches from [E³]. This CPU board contains the complete hardware to control up to 64 Sxnnnn switches. It also provides interface connections for power supply, RS232 or USB and key matrix circuit boards. A programming interface allows for the re-programming of the unit's firmware. The CC0064 supports heartbeat, key status (press/release) and on-board memory for 256 bitmaps. On PowerUp the CC0064 recognizes the interface, either RS232 or USB2.0, that is connected. Only one interface may be connected at a time.

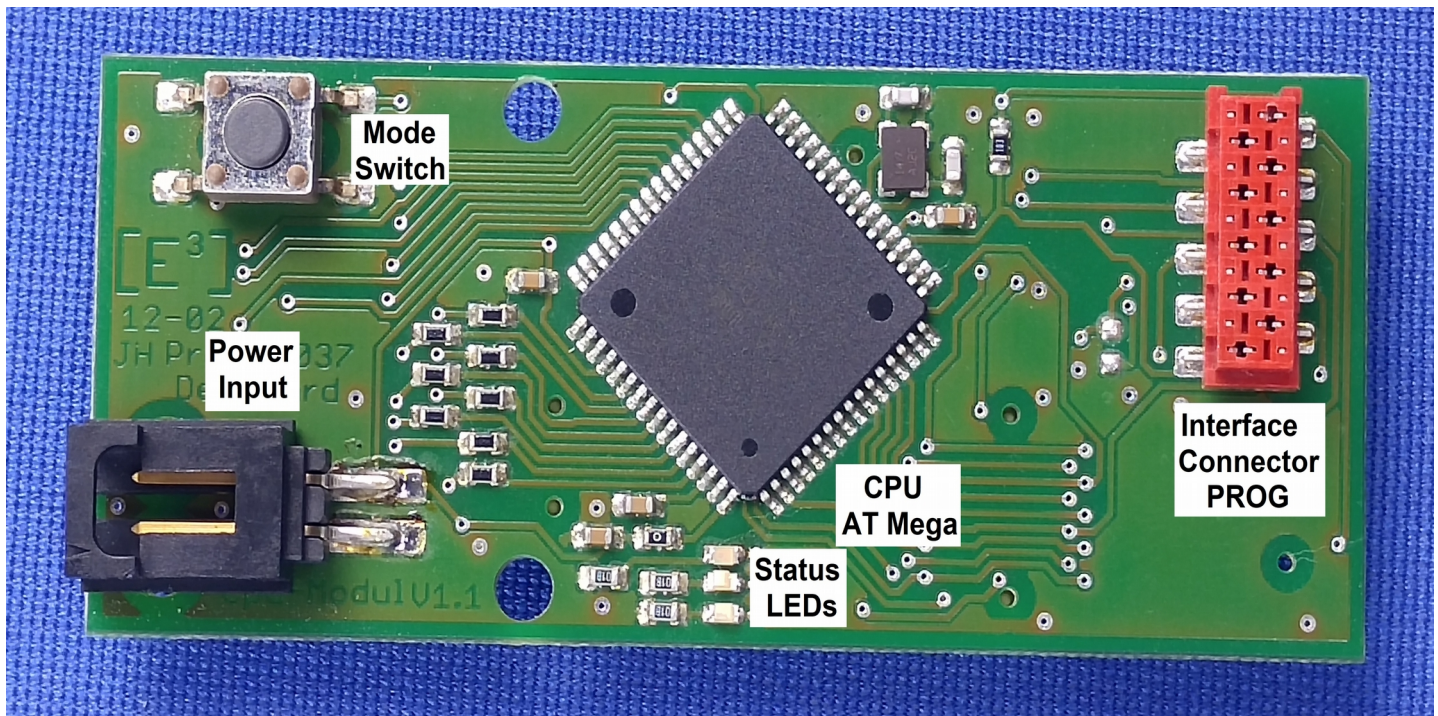


CC0064 – top view



CC0064 – bottom view

HARDWARE DESCRIPTION



Power Input

Direct +5V power may be supplied via this connector.

Function	Pin
GND	1
5V	2

Alternatively power may also be supplied via pins 1 and 20 of the CTRL interface. This option is used with the PS0002 power supply (see corresponding datasheet).

Mode Switch

The Mode Switch allows for the selection of different operating modes in the DevBoard configuration and firmware. Different operating modes are not supported in the CP Series panel firmware.

Status LEDs

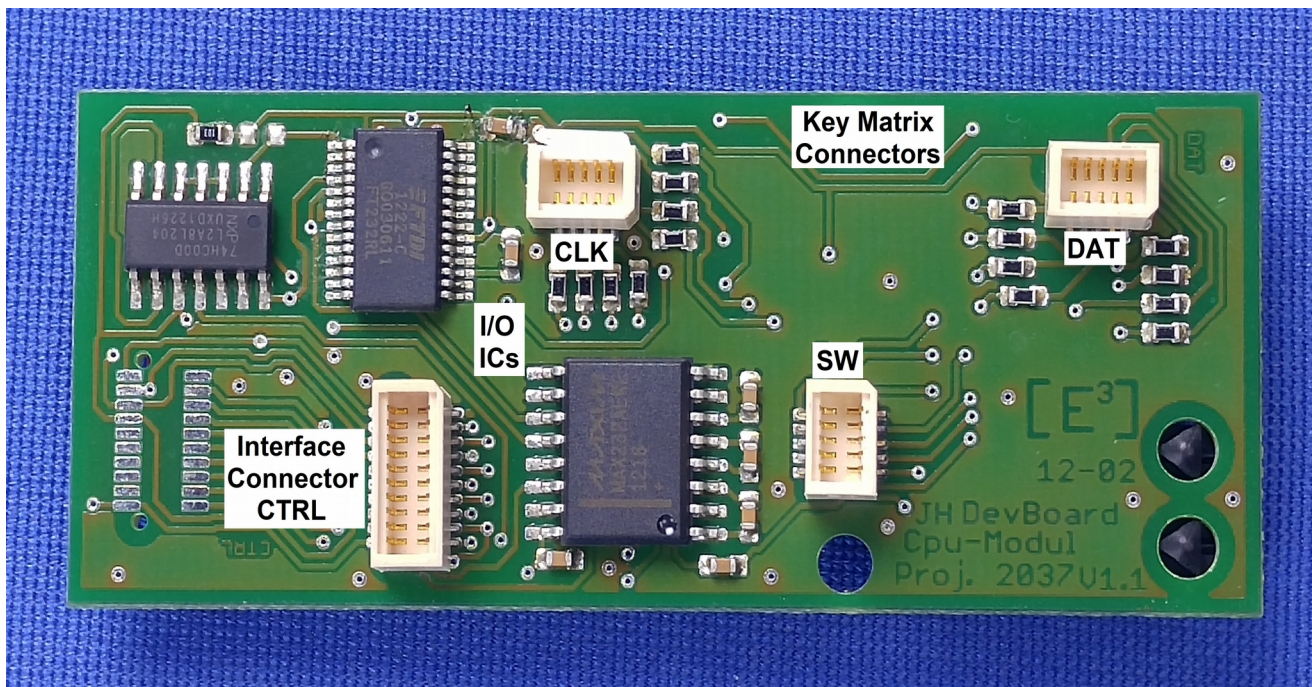
The CC0064 has three status LEDs which indicate the following states:

LED		State
red	on	Power on
yellow	on	Data transmission
green	on	Idle state

PROG Interface Connector

This interface allows for the (re-)programming of the CC0064 controller's firmware. This function is for internal use only and not documented here. Unauthorized use of this interface may cause the CC0064 to stop operating properly.

Function	Pin	Pin	Function
5V	1	2	GND
USB - DP	3	4	USB - DM
RS232 - Rx	5	6	RS232 - Tx
V11 - Tx	7	8	V11 - Rx
ISP - SCK	9	10	RESET



CLK Key Matrix Connector

This connection provide CLOCK signals for up to 64 Sxnnnn switches.

Function	Pin	Pin	Function
GND	1	2	Clock7
Clock6	3	4	Clock5
Clock4	5	6	Clock3
Clock2	7	8	Clock1
Clock0	9	10	5V

DAT Key Matrix Connector

This interface provides DATA signals for up to 64 Sxnnnn switches.

Function	Pin	Pin	Function
GND	1	2	Data7
Data6	3	4	Data5
Data4	5	6	Data3
Data2	7	8	Data1
Data0	9	10	5V

SW Key Matrix Connector

This interface provides switch MAKE/BREAK code signals for up to 64 Sxnnnn switches.

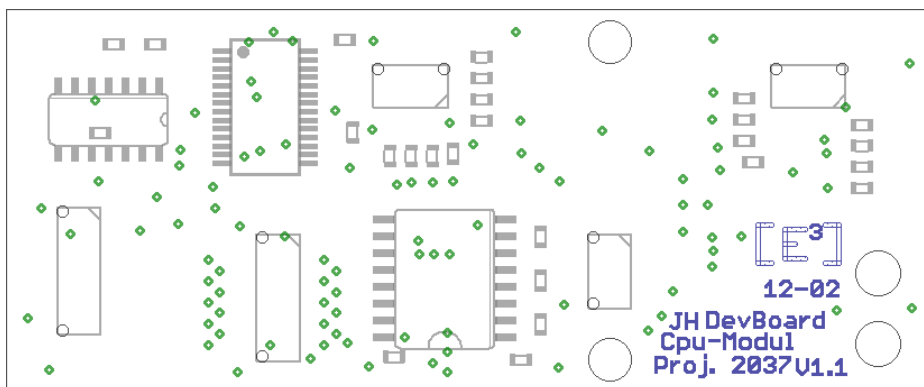
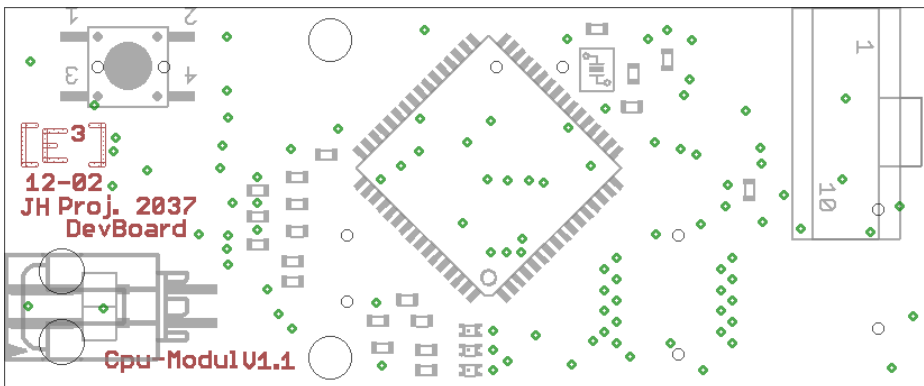
Function	Pin	Pin	Function
GND	1	2	Switch7
Switch6	3	4	Switch5
Switch4	5	6	Switch3
Switch2	7	8	Switch1
Switch0	9	10	5V

CTRL Interface Connector

This interface provides connection for I/O signals for RS232 and USB2.0 communication as well as 5V power.

Function	Pin	Pin	Function
GND	1	2	RS232 - Tx
USB - DM	3	4	RS232 - Rx
USB - DP	5	6	V11 - Tx
PSU - PWM	7	8	V11 - Rx
SPI - MISO	9	10	NC
SPI - MOSI	11	12	NC
SPI - SCK	13	14	NC
SPI - SS	15	16	NC
TWI - SDA	17	18	NC
TWI - SCL	19	20	5V

PCB LAYOUT



COMMAND SET

The CC0064 controller manages communication via serial data commands to/from a host system, provides memory storage for bitmaps and controls key matrices with up to 64 Sxnnnn switches.

NOTE: This section describes the communication between the controller, host system and key matrix only. For a detailed description of the control scheme for the Sxnnnn switches, please refer to the corresponding datasheet on our website at www.e3-keys.com.

CC0064 → Host Commands

Power On Reset (CC0064 → Host)	
Command	Comments
0xF0	Power On Reset
	0xF0 + 0xSTATUS (0 = OK)

Reset after missing Heartbeat(CC0064 → Host)	
Command	Comments
0xF0	Reset after missing heartbeat
	0xF0 + 0xSTATUS (1 = Reset after missing heartbeat)

Acknowledge (CC0064 → Host)	
Command	Comments
0xFA	Acknowledge
	Issued by the CC0064 in response to heartbeat 0xFE within 1 second.

Key Press (CC0064 → Host)	
Command	Comments
0xFD	Key Press + Key Number
	0xFD 0x01 key press for key 1

Key Release (CC0064 → Host)	
Command	Comments
0xFC	Key Release + Key Number
	0xFC 0x01 key release for key 1

Host → CC0064 Commands

Reset (Host → CC0064)	
Command	Comments
0xFB	Reset
	Panel clears all keys, re-initializes with PowerOn + ResetStatus and commences heartbeat

Heartbeat (Host → CC0064)	
Command	Comments
0xFE	Heartbeat sent from the HOST
	HOST issues heartbeat every less than 1 second (0.9 sec.) and expects an Acknowledge 0xFA. If the Heartbeat is missing for more than 1 second, CC0064 controller will blank all displays and set backlight to RED until it receives the next color/image command and heartbeat resumes. NOTE: display images & colors on the keys will be lost.

Enable/Disable Heartbeat (Host → CC0064)	
Command	Comments
0x65	Heartbeat Request Enable/Disable
	Example: 0x65 0x01 Enables Heartbeat Request ON Example: 0x65 0x00 Disables Heartbeat Request OFF

Select Key (Host → CC0064)	
Command	Comments
0xFF	Select key x
	0xFF <keynumber>
	0 = all Keys 1..64 = see key select table for corresponding key matrix. 65..256 not used for this command NOTE: If a command is issued for a non-existing switch <65 (e.g. key no. 16 on a CP0304 panel with only 12 keys), the command is sent to key no. 1; if a command is sent to a key >64, then the command is sent to a random switch, which may also not be visible.

Set Bitmap (Host → CC0064)	
Command	Comments
0x40	Set bitmap for key x
	0xFF <keynumber> 0x40 <data nibbles> Command 0x40 is analogous to Sxnnnn switch command (see corresponding Sxnnnn datasheets)

Set Color (Host → CC0064)	
Command	Comments
0x42	Set color of key x
	0xFF <keynumber> 0x42 <data nibbles> Command 0x42 is analogous to Sxnnnn switch command (see corresponding Sxnnnn datasheets)

Set Bitmap from Library (Host → CC0064)	
Command	Comments
0xF4	SetBitmap for key x from BitmapLibrary #
	0xFF <keynumber> 0xF4 <librarynumber> valid keynumbers 0..64 valid librarynumbers 0..255

Write Bitmap to Library (Host → CC0064)	
Command	Comments
0xF5	WriteBitmap to BitmapLibrary #
	0xF5 <librarynumber> valid librarynumbers 0..255 – saves image data from buffer <i>OR</i> 0xF5 <librarynumber> <data nibbles> valid librarynumbers 0..255 – saves following image data Note: This command requires a 4ms pause until the next command is issued or a Heartbeat ACK sequence as described in Host Commands (0xFE)

Write Text (Host → CC0064)	
Command	Comments
0x64	Write Text for key x with offset, font
	0x64 <number chars (n)> <offset chars> text (n chars) valid offset 0..39 for small fonts, 0..11 for large fonts valid font 0..3 (0 and 1 fixed; 2 and 3 user-defined) For details on character sets, please see Application Note – User Defined Fonts CC0064 controller supports dynamic ASCII text displays by either transmitting dynamic text or transmitting a background image from memory plus dynamic text.
0xFF 0x03 0xF4 0x02 0x64 0x03 0x01 0x00 0x61 0x62 0x63	writes bitmap no. 2 from library to key 3 and writes text “abc” to key no. 3. with character set 1 and no offset

Read Key – ID (Host → CC0064)	
Command	Comments
0x69	Read Keyswitch ID
0xFF 0x03 0x69	Read Keyswitch ID from key Nr. 0X03. Returns: “SXnnnn” (6 bytes)

Read Serial Number – ID (Host → CC0064)	
Command	Comments
0x6A	Read Keyswitch Serial Number
0xFF 0x03 0x6A	Read Keyswitch Serial Number from key Nr. 0X03. Returns: “SNYYWW#####” (11 bytes)

Logon Message (Host → CC0064)	
Command	Comments
0xF8	Read Panel and Firmware Information
	Returns a String containing Information about - Controller Type - Firmware Version & Date - Board Type Terminated with '\0'

NOTICES

Copyright Notice

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Technical Notice

This datasheet is intended for technically qualified personnel trained in the field of electronics.

The knowledge of electronics and the technically correct implementation of the content of this datasheet are required for problem free installation, implementation and safe operation of the described product. Only qualified personnel have the required know-how to implement the specifications given in this data sheet.

For clarity, not all details regarding the product or its implementation, installation, operation, or maintenance have been included. Should you require additional information or further assistance, please contact your local [E³] distributor or [E³] Engstler Elektronik Entwicklung GmbH at techsupport@e3-keys.com. You may also visit our website at www.e3-keys.com.

Warranty Disclaimer

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ORDERING INFORMATION

Part Number	Description
CC0064-SU	CP controller board with RS232, V11 and USB2.0 interfaces for up to 64 Sxxxx switches
PS0002	20W power supply for CP panel series
SB6432	Programmable LCD keyswitch with 64x32 pixel resolution and RGB backlighting

CHANGE HISTORY

Version	Date	Comments
0.1	01/25/13	Initial draft document
0.2	01/29/13	Updated draft document
1.0	02/01/13	Release document
1.1	03/28/13	Minor document edits
1.2	10/12/15	Heartbeat Enable/Disable, Key ID, Serial Number ID, Logon Information commands documented
1.3	01/25/17	Bitmap memory information added Ordering information updated Commands updated
2.0	11/06/18	Version 1 images deleted
2.1	07/14/20	New Formatting
2.2	01/18/22	PCB layout added
3.0	06/15/22	Updated release document
3.1	07/07/22	Note on 0xFF command for non-existent keys

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