



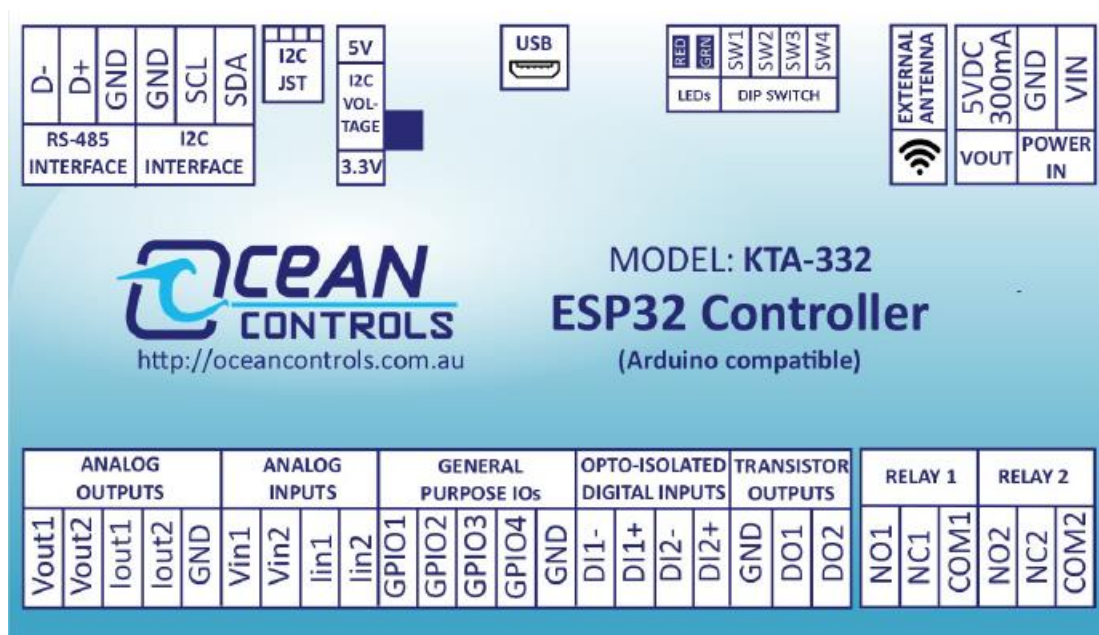
- 2x Relays with 10A, 250Vac rated Contacts
- 2x Open Collector Transistor Outputs
- 2x Opto-Isolated Digital Inputs
- 2x 0-10V and 2x 0/4-20mA Inputs
- 2x 0-10V and 2x 0/4-20mA Outputs
- 4x General Purpose IO pins
- Power indicator and serial transmissions LEDs
- Supports USB Serial, RS-485 and I2C
- Supports Wi-Fi and Bluetooth
- Arduino compatible
- DIN-Rail Mountable Enclosure
- Dimensions: 145 x 90 x 40 mm

The KTA-332 is an ESP32-powered, Arduino compatible USB or RS-485 controller for interfacing a PC to real world applications. The controller is pre-programmed with a custom sketch loaded that listens and responds to custom ASCII commands on the USB or RS-485 ports. The sketch is available on Ocean Controls website as an example of Arduino programming for the controller.

Specifications:

Parameters	Value
Voltage and Power	5 – 36 VDC; 0.7W
Operating Temperature	-20 – 80 °C
Default Voltage Output	5Vdc 300mA
RS485 Communication Setting	1200 – 115200 baud; 8 data bit; No Parity; 1 Stop bit
USB Communication Setting	1200 – 115200 baud; 8 data bit; No Parity; 1 Stop bit
I2C Bus Interface	Fast mode 400 Kbit/s
Open Collector Outputs	50Vdc max at 220mA
Relay output	SPDT 250Vac 8A max* (for a short time)
Opto-Isolated Digital Input	0 to 30Vdc, ≤2.5 VDC activation threshold
Analog Inputs	12-bit resolution, ~0.1% accuracy
Analog Outputs	12-bit resolution, ~0.1% accuracy

Connections:



Name	Description
VIN	Positive Supply Voltage (5-36VDC). Reverse Polarity Protected
GND	Negative Supply Voltage / Common Ground
VOUT	Output voltage 5V – 300mA max
External Antenna	External 2.4GHz antenna for KTA-3321
Micro USB connector	For Send/Receiving Commands and Programming (ESP32 UART0)
I2C 5V-3V VOLTAGE SWITCH	I2C voltage selector – choose between 3.3V and 5V
I2C JST	I2C standard JST connector
SCL	I2C Clock Line
SDA	I2C Data Line
D+	RS-485 Data+ (ESP32 UART1)
D-	RS-485 Data- (ESP32 UART1)
RELAY1 – COM1, NC1, NO1	Relay 1 Common, Normally Closed and Normally Open Contacts
RELAY2 – COM2, NC2, NO2	Relay 2 Common, Normally Closed and Normally Open Contacts
DO1	Open Collector Transistor Output 1
DO2	Open Collector Transistor Output 2
DI1+, DI1-	Opto-Isolated Input 1
DI2+, DI2-	Opto-Isolated Input 2
Vout1, Vout2	0-10V Voltage Outputs
Iout1, Iout2	0-20mA/4-20mA Analog Outputs
Vin1, Vin2	0-10V Voltage Inputs
Iin1, Iin2	0-20mA Current Inputs
GPIO1, GPIO2, GPIO3, GPIO4	General Purpose IO Pins

Communicating with the Controller:

The commands the controller uses are in the form:

@AA CCC X<CR>

@ symbol is used to define the start of a command.

AA is the address of the unit from 00 to 99.

CCC is a three-letter command used to determine the command type.

X is a one or more characters which determines the parameter for the command.

<CR> is the carriage return character. This is ASCII character 13, or 0x0d.

Each time a valid command is received the unit will respond with #AA followed by any values that are requested from the unit. Note that **00 is the Broadcast Address**. All controllers will respond to address 00 regardless of what their address has been set to.

Note that the unit will automatically ignore any spaces between the command characters. Therefore, the command can also be sent as @AACCCX<CR>.

The Address and Baud Rate of the unit can be set and stored in the controller's non-volatile memory. By default, the controller is listening for serial data at 9600 baud and has address 01. The controller will always use 1 Stop Bit, 8 Data Bits and No Parity on both USB and RS-485.

Command Set:

Command	Function	Parameters
RON	Turn Relay On	1-2: Turn Relay 1 and 2 On Individually 0: Turn All Relays On at Once
ROF	Turn Relay Off	1-2: Turn Relay 1 and 2 Off Individually 0: Turn All Relays Off at Once
TON	Turn Relay On	1-2: Turn Transistor 1 and 2 On Individually 0: Turn All Transistors On at Once
TOF	Turn Relay Off	1-2: Turn Transistor 1and 2 Off Individually 0: Turn All Transistors Off at Once
ODI	Read Status of Opto-Isolated Inputs 1 and 2	Return values: 1: Opto-Isolated Input 1 ON 2: Opto-Isolated Input 2 ON 3: Both Opto-Isolated Inputs ON
CO1	Set Current Output 1	2 decimal points from 0-2000 (mA)
CO2	Set Current Output 2	2 decimal points from 0-2000 (mA)
VO1	Set Voltage Output 1	2 decimal points from 0-1000 (V)
VO2	Set Voltage Output 2	2 decimal points from 0-1000 (V)
CI1	Read Current Input 1	Return value with 2 decimal points from 0-2000 (mA)
CI2	Read Current Input 2	Return value with 2 decimal points from 0-2000 (mA)
VI1	Read Voltage Input 1	Return value with 2 decimal points from 0-1000 (V)
VI2	Read Voltage Input 2	Return value with 2 decimal points from 0-1000 (V)
SAD	Set Address	01-99: Sets the Address of the unit in Memory

SBR	Set Baud Rate	1-10: Sets the Baud Rate	
		1: 1200 baud	6: 19200 baud
		2: 2400 baud	7: 28800 baud
		3: 4800 baud	8: 38400 baud
		4: 9600 baud (default)	9: 57600 baud
		5: 14400 baud	10: 115200 baud

RON: Relays ON Command

This command is used to turn a single relay or both relays ON.

E.g.: @01 RON 1 will turn Relay 1 ON and @01 RON 2 will turn Relay 2 ON for the unit with address 01. It can also be used to turn both Relays ON by setting the parameters to be 0: @01 RON 0.

ROF: Relays OFF Command

This command is used to turn a single relay or both relays OFF.

E.g.: @01 ROF 1 will turn Relay 1 OFF and @01 ROF 2 will turn Relay 2 OFF for the unit with address 01. It can also be used to turn both Relays OFF by setting the parameters to be 0: @01 ROF 0.

TON: Open Collector Transistor ON Command

This command is used to turn a single transistor or both transistors ON.

E.g.: @01 TON 1 will turn Transistor 1 ON and @01 TON 2 will turn Transistor 2 ON for the unit with address 01. It can also be used to turn both Transistors ON by setting the parameters to be 0: @01 TON 0.

TOF: Open Collector Transistor OFF Command

This command is used to turn a single transistor or both transistors OFF.

E.g.: @01 TOF 1 will turn Transistor 1 OFF and @01 TOF 2 will turn Transistor 2 OFF for the unit with address 01. It can also be used to turn both Transistors OFF by setting the parameters to be 0: @01 TOF 0.

ODI: Read Opto-Isolated Inputs

This command will return the status of both opto-isolated inputs:

- If Opto-Isolated Input 1 is active, it will return 1.
- If Opto-Isolated Input 2 is active, it will return 2.
- If both Opto-Isolated Inputs are active, it will return 3.

CO1 and CO2: Set Current Outputs, in 2 decimal points from 0-2000 (mA)

This command is used to set the output current values of Current Output Channel 1 (Iout1) and Current Output Channel 2 (Iout2). The parameter is the current value with 2 decimal points, represents as whole number. Range 0-2000mA.

E.g.: @01 CO1 400 will set ~4.00mA on Channel 1; @01 CO2 1250 will set ~12.50mA on Channel 2.

VO1 and VO2: Set Voltage Output, in 2 decimal points from 0-1000 (V)

This command is used to set the output voltage values of Voltage Output Channel 1 (Vout1) and Voltage Output Channel 2 (Vout2). The parameter is the voltage value with 2 decimal points, represents as whole number. Range 0-1000V.

E.g.: @01 VO1 500 will set ~5.00V on Channel 1; @01 VO2 950 will set ~9.50V on Channel 2.

CI1 and CI2: Read Current Inputs, in 2 decimal points from 0-2000 (mA)

This command is used to read the current input values of Current Input Channel 1 (Iin1) and Current Input Channel 2 (Iin2). The return value is the real current input with 2 decimal points, represented as a whole number.

E.g.: If you have a current of 15.50mA on Channel 1 then @01 CI1 will return #01 1550.

VI1 and VI2: Read Voltage Inputs, in 2 decimal points from 0-1000 (V)

This command is used to read the voltage input values of Voltage Input Channel 1 (Vin1) and Voltage Input Channel 2 (Vin2). The return value is the real voltage input with 2 decimal points, represented as a whole number.

E.g.: If you have a voltage of 5.5V on Channel 2 then @01 VI2 will return #01 550.

SAD: Set Address

This command is used to set address of the device. Addresses are valid from 01-99. A unit will only respond if its address in memory is the same as that of the command sent, or if the address of the command sent is 00 (Broadcast Address). The address is saved to non-volatile memory inside the controller, meaning it will be preserved even after power is disconnect from the controller.

SBR: Set Baud

This command is used to set the Baud Rate of the RS-485 Port. Parameters from 1 to 10 are valid, corresponding to values shown in Table 3.

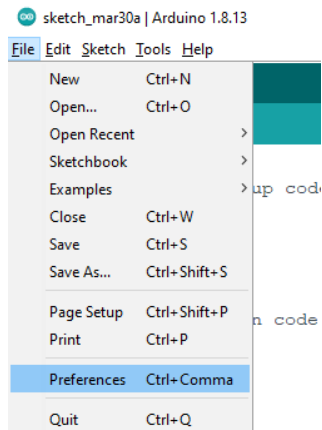
1: 1200 baud	6: 19200 baud
2: 2400 baud	7: 28800 baud
3: 4800 baud	8: 38400 baud
4: 9600 baud (default)	9: 57600 baud
5: 14400 baud	10: 115200 baud

The baud rate is saved to non-volatile memory inside the controller, meaning it will be preserved even after power is disconnect from the controller.

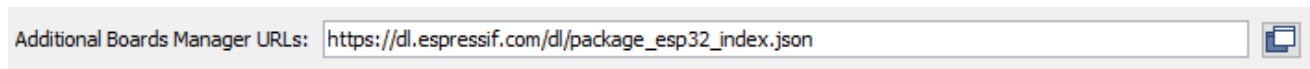
Using the controller as an Arduino:

The controller uses the common Espressif's **ESP32-DevkitC-32D** and can be programmed/modified using Arduino environment. To add the ESP32-DevkitC-32D to your Arduino IDE, please follow the steps below:

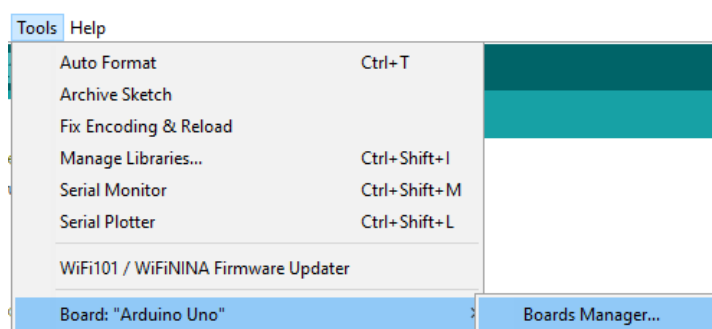
1. In your Arduino IDE, go to **File> Preferences**



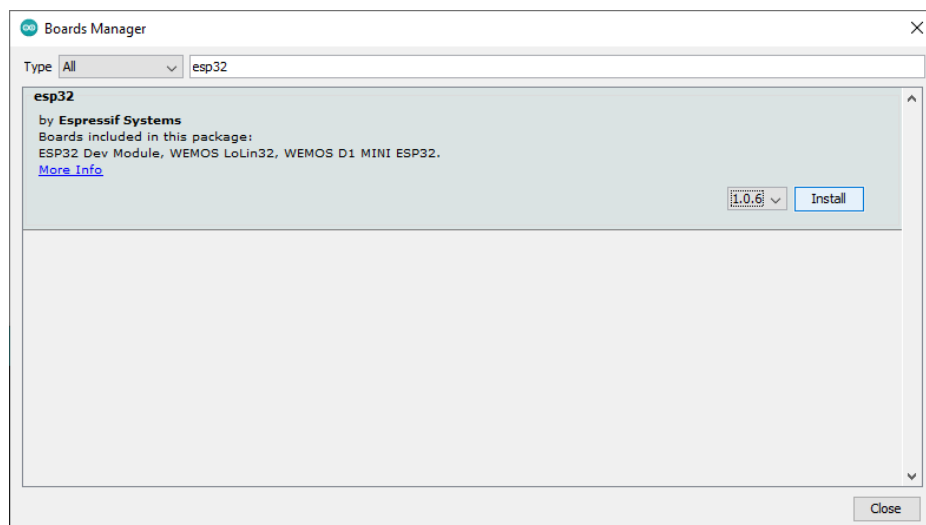
2. Enter **https://dl.espressif.com/dl/package_esp32_index.json** In the “Additional Board Manager URLs” field. Then, click the “OK” button.



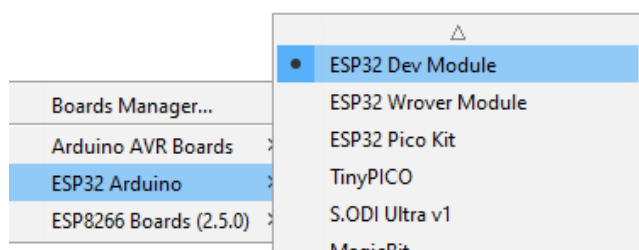
3. Then go to **Tools > Boards > Boards Manager...**



4. In the Board Manager, search for **esp32** then press **Install**.



5. To program your KTA-332, go to **Tools > Board** then select **ESP32 Dev Module**



The pin mapping of the KTA-332 is shown in the table below:

Peripheral	ESP32/ Arduino Pins
RS485 – TX	18
RS485 – RX	17
RS485 – EN	5
I2C SCL	4
I2C SDA	16
RELAY 1	14
RELAY 2	12
OPEN COLLECTOR TRANSISTOR 1	26
OPEN COLLECTOR TRANSISTOR 2	27
OPTO-ISOLATED INPUT 1	33
OPTO-ISOLATED INPUT 2	25
GENERAL PURPOSE IO 1	21
GENERAL PURPOSE IO 2	22
GENERAL PURPOSE IO 3	23
GENERAL PURPOSE IO 4	32
DIP SWITCH 1	36
DIP SWITCH 2	39

DIP SWITCH 3	34
DIP SWITCH 4	35
GREEN LED	13
RED LED	15

Hardware notes:

One drawback of the ESP32 is its weak Analog performance. Therefore, the KTA-332 uses two external I2C 12-bit ADC (MAX11615) and DAC (MAX5815) chips to handles the Analog I/O accurately. A basic Arduino library is provided with the default sketch to allow DIY modifications.

The external I2C on controller can work with either 3.3V logic devices or 5V logic devices by selecting the correct voltage using the I2C voltage switch. Note that this switch will only affect the pull-up voltage of the external device.

The 2 relays on boards have contacts rated to 10 A and 30 VDC/250 VAC. At the maximum current, the PCB tracks would rise approximately 80°C so the controller can only handle the full rated relay current for short periods of time.

The KTA-332 comes with 4 DIP Switches. These switches all have hardware 4.7kΩ pull-up resistors. Therefore, when the switches are OFF, the signal is HIGH and when the switches are ON, the signals are LOW. At current firmware version (1.0), there is no functions assigned to these DIP Switches.

The KTA-332 also comes with 4x GPIOs which are connected directly to the ESP32. Thanks to the ESP32's ability to set multiple functions to a pin, you can assign different functions to these GPIOs. With default hardware, each GPIO has a 10kΩ pull-up resistor to 3.3V and a series 4.7kΩ current limiting resistor. However, each GPIO can also be set up with pull down resistor or act as Open Collector Transistor Outputs or additional UART output. At current firmware version (1.0), there is no functions assigned to these GPIOs.

For help with programming and modifying the default sketch, please contact info@oceancontrols.com.au.

Hardware Revision History:

KTA-332 v1.0: initial release

Software Revision History:

Firmware v1.0: initial Release.