



# Quick Start Guide

**TWR-IND-IO**  
Industrial I/O Module



**TOWER SYSTEM**

# Get to Know the TWR-IND-IO



## TWR-IND-IO Freescale Tower System

The TWR-IND-IO module is part of the Freescale Tower System, a modular development platform that enables rapid prototyping and tool re-use through reconfigurable hardware. Take your design to the next level and begin prototyping with your Tower System today.

# TWR-IND-IO Features

- USB to Serial Ready Play solution, providing serial connectivity via USB
- RS-232 transceiver with available flow control signaling
- RS-485 transceiver with optional isolation and PROFIBUS capability
- Dual CAN transceivers
- Analog signals accessible via screw terminals: 3x ADC, 1x DAC, VDDA, VSSA
- Digital signals accessible via LEDs and thru-hole points: 6x PWM, 3x timer
- Signal jumpers to allow isolation, probing and remapping of interfaces
- Compatible with the TWR-SER to provide access to additional industrial I/O interfaces

# Step-by-Step Installation Instructions

## 1 Configure Jumpers

Configure the TWR-IND-IO jumpers to align with the intended Tower System controller module. Be aware that not all controller modules will provide access to all features available on the TWR-IND-IO. Refer to the Jumper Table in this document for reference and the user manual for additional details regarding the flexibility of this module.

## 2 Ensure Compatibility

Each interface featured on the TWR-IND-IO is capable of being isolated from the Tower System. To maintain the best compatibility with additional Tower peripheral modules it is recommended that any unused interfaces be isolated.

## 3 Assemble Your Tower System

Assemble your Tower System, including a Tower System controller module, the TWR-IND-IO peripheral module, and the TWR-ELEV elevator modules. Refer to the assembly instructions provided with the TWR-ELEV modules for correct orientation and assembly of boards. NOTE: The TWR-IND-IO module is intended to be compatible with the TWR-SER serial module, thus expanding the number of available interfaces.



## 4 Refer to Additional Materials

Many existing MQX™ example projects can be adapted to utilize the respective I/O interfaces on the TWR-IND-IO by modifying the “user\_config.h” file and recompiling the MQX BSP. Refer to the TWR-IND-IO user manual and the latest MQX release notes for details. Refer to the TWR-IND-IO page on [freescale.com/Tower](https://www.freescale.com/Tower) for additional information and example application projects for select Tower System controller modules.

# TWR-IND-IO Jumper Options

The following is a list of all jumper options. The default installed jumper settings are shown in white text within the black boxes.

| Jumper | Option                                           | Setting | Description                                                                                |
|--------|--------------------------------------------------|---------|--------------------------------------------------------------------------------------------|
| J3     | LED Enable for Digital Signal Block A (3x PWM)   | 1-2     | Provides power to the associated LEDs, remove to isolate PWM signals or to use JP1 - JP3   |
| J4     | LED Enable for Digital Signal Block B (3x PWM)   | 1-2     | Provides power to the associated LEDs, remove to isolate PWM signals or to use JP4 - JP6   |
| J5     | LED Enable for Digital Signal Block C (3x Timer) | 1-2     | Provides power to the associated LEDs, remove to isolate timer signals or to use JP7 - JP9 |
| J6     | Voltage I/O selection                            | 1-2     | 5V interface between MCU and transceivers                                                  |
|        |                                                  | 2-3     | 3.3V interface between MCU and transceivers                                                |
| J7     | USB2SER RTS/CTS                                  | 1-2     | Provides a loopback of RTS/CTS, remove to allow access to RTS and CTS                      |
| J9     | USB2SER TX/RX                                    | 1-2     | Connects UART0 TX to USB2SER RX.<br>Pin 1 - UART0 TX, Pin 2 - USB2SER RX                   |
|        |                                                  | 3-4     | Connects UART0 RX to USB2SER TX.<br>Pin 3 - UART0 RX, Pin 4 - USB2SER TX                   |
| J13    | CAN1 Termination Enable                          | 1-2     | Enables 121 Ohm termination between CANH and CANL                                          |
| J14    | CAN2 Termination Enable                          | 1-2     | Enables 121 Ohm termination between CANH and CANL                                          |
| J15    | CAN Isolation Jumpers                            | 1-2     | Connects CAN1_TX to TXD on CAN transceiver associated with J11                             |
|        |                                                  | 3-4     | Connects CAN1_RX to RXD on CAN transceiver associated with J11                             |
|        |                                                  | 5-6     | Connects CAN1_TX to TXD on CAN transceiver associated with J12                             |
|        |                                                  | 7-8     | Connects CAN1_RX to RXD on CAN transceiver associated with J12                             |

## TWR-IND-IO Jumper Options continued

The following is a list of all jumper options. The default installed jumper settings are shown in white text within the black boxes.

| Jumper | Option                         | Setting | Description                                                            |
|--------|--------------------------------|---------|------------------------------------------------------------------------|
| J16    | UART3 Isolation/Access Jumpers | 1-2     | Connects UART3_TX to T1IN on RS-232 transceiver associated with J17    |
|        |                                | 3-4     | Connects UART3_RX to R1OUT on RS-232 transceiver associated with J17   |
|        |                                | 5-6     | Connects UART3_RTS to T2IN on RS-232 transceiver associated with J17   |
|        |                                | 7-8     | Connects UART3_CTS to R2OUT on RS-232 transceiver associated with J17  |
| J18    | UART3 RTS/DCD Loopback         | 1-2     | Provides a loopback of RTS to DCD on UART3                             |
|        |                                | 2-3     | Provides a pulldown on UART3 DCD                                       |
| J19    | UART2 RTS/DCD Loopback         | 1-2     | Provides a loopback of RTS to DCD on UART3                             |
|        |                                | 2-3     | Provides a pulldown on UART3 DCD                                       |
| J20    | UART2 Isolation/Access Jumpers | 1-2     | Connects UART2_RX to R on RS-485 transceiver associated with J22/J23   |
|        |                                | 3-4     | Connects UART2_TX to D on RS-485 transceiver associated with J22/J23   |
|        |                                | 5-6     | Connects UART2_RTS to DE on RS-485 transceiver associated with J22/J23 |
|        |                                | 7-8     | Connects UART2_CTS to a pull-down resistor                             |
| J21    | RS-485 Termination Enable      | 1-2     | Enables 121 Ohm termination between RS-485 A and B                     |

# TWR-IND-IO Header Descriptions

The following is a list of all available headers and their descriptions

| Header        | Description                    | Pin Details                                                              |
|---------------|--------------------------------|--------------------------------------------------------------------------|
| J2 (J24, J25) | Analog Screw Terminal          | 1-VDDA, 2-VSSA, 3-DAC0,<br>4-VSSA, 5-AN1, 6-AN2<br>7-AN3, 8-VSSA, 9-VDDA |
| J7            | USB2SER RTS/CTS                | 1-CTS, 2-RTS                                                             |
| J8            | UART1                          | 1-TXD1, 2-RXD1, 3-RTS1,<br>4-CTS1                                        |
| J11           | CAN1 Header                    | 1-CANH, 2-GND, 3-CANL                                                    |
| J12           | CAN2 Header                    | 1-CANH, 2-GND, 3-CANL                                                    |
| J17           | RS-232 Header                  | 3-TXD, 4-CTS, 5-RXD, 6-RTS,<br>9-GND<br>(others signals are NC)          |
| J22           | RS-485 Screw Terminal (Power)  | 1-Isolated GND, 2-Isolated<br>VCC, 3-Isolated GND                        |
| J23           | RS-485 Screw Terminal (Signal) | 1-Isolated DE, 2-RS-485 B,<br>3-RS-485 A                                 |

Visit **freescale.com/Tower** for information on the TWR-IND-IO module, including:

- TWR-IND-IO user guide
- TWR-IND-IO schematics
- Tower System fact sheet

## Support

Visit **freescale.com/support** for a list of phone numbers within your region.

## Warranty

Visit **freescale.com/warranty** for complete warranty information.

For more information, please visit **freescale.com/Tower**  
Join the online Tower community at **towergeeks.org**

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